Illinois Power Generating Company
1500 Eastport Plaza Dr.
Collinsville, IL 62234

April 22, 2025

Illinois Environmental Protection Agency
DWPC – Permits MC #15
Attn: Part 845 Coal Combustion Residual Rule Submittal
2520 W Iles Ave
P.O. Box 19276
Springfield, IL 62794-9276

Re: Baldwin Power Plant Fly Ash Pond System; IEPA ID # W1578510001-01-02-03

Dear Mr. LeCrone:

In accordance with 35 I.A.C. § 845.220(c) Dynegy Midwest Generation, LLC is submitting a corrective action construction permit application for the Baldwin Power Plant Fly Ash Pond System (IEPA ID # W1578510001-01-02-03). One hard copy is provided with this submittal.

The permit application was prepared in accordance with 35 I.A.C. § 845.220 (a) and (c). This submittal includes the completed permit application forms as required by § 845.210.

Sincerely,

Cynthia Vodopivec
SVP, Environmental, Health & Safety

Enclosures

Form CCR 1	Illinois Environmental Protection Agency CCR Surface Impoundment Permit Application Form CCR 1 – General Provisions

Bureau of Water ID Number: W1578510001-01,02,03 **CCR Permit Number:** No Permit Issued **Facility Name:** Baldwin Power Plant	For IEPA Use Only

SECTION 1: FACILITY, OPERATOR, AND OWNER INFORMATION (35 Ill. Adm. Code 845.210(b))

Facility, Operator, and Owner Information

1.1	Facility Name		
	Baldwin Power Plant		
1.2	Illinois EPA CCR Permit Number (if applicable)		
	No Permit Issued		
1.3	Facility Contact Information		
	Name (first and last) Phil Morris	Title Senior Director - Environmental	Phone Number 618-343-7794
	Email address phil.morris@vistracorp.com		
1.4	Facility Mailing Address		
	Street or P.O. box 1500 Eastport Plaza Dr		
	City or town Collinsville	State IL	Zip Code 62234
1.5	Facility Location		
	Street, route number, or other specific identifier 10901 Baldwin Road		
	County name Randolph	County code (if known)	
	City or town Baldwin	State Illinois	Zip Code 62217
1.6	Name of Owner/Operator		
	Dynegy Midwest Generation, LLC		

Facility, Operator, and Owner Info				
1.7	Owner/Operator Contact Information			
	Name (first and last) Phil Morris	Title Senior Director - Environmental	Phone Number 618-343-7794	
	Email address phil.morris@vistracorp.com			
1.8	Owner/Operator Mailing Address			
	Street or P.O. box 1500 Eastport Plaza Dr			
	City or town Collinsville	State IL	Zip Code 62234	

SECTION 2: LEGAL DESCRIPTION (35 Ill. Adm. Code 845.210(c))

Legal Description		
2.1	Legal Description of the facility boundary	
	See Attachment A	

SECTION 3: PUBLICLY ACCESSIBLE INTERNET SITE REQUIREMENTS (35 Ill. Adm. Code 845.810)

Internet Site				
3.1	Web Address(es) to publicly accessible internet site(s) (CCR website)			
	www.luminant.com/illinois-ccr/			
3.2	Is/are the website(s) titled "Illinois CCR Rule Compliance Data and Information"			
	☑	Yes	☐	No

SECTION 4: IMPOUNDMENT IDENTIFICATION

Impoundment Identification			
4.1	List all the impoundment identification numbers for your facility and check the corresponding box to indicate that you have attached a written description for each impoundment.		
	W1578510001-01 (see Attachment A)	☑	Attached written description
	W1578510001-02 (see Attachment A)	☑	Attached written description
	W1578510001-03 (see Attachment A)	☑	Attached written description
		☐	Attached written description
		☐	Attached written description
		☐	Attached written description

		☐	Attached written description
		☐	Attached written description
		☐	Attached written description
		☐	Attached written description

SECTION 5: CHECKLIST AND CERTIFICATION STATEMENT

Checklist and Certification Statement

5.1 In Column 1 below, mark the sections of Form 1 that you have completed and are submitting with your application. For each section, specify in Column 2 any attachments that you are enclosing.

Column 1		Column 2	
Section 1: Facility, Operator, and Owner Information	☑	w/attachments	☐
Section 2: Legal Description	☑	w/attachments	☑
Section 3: Publicly Accessible Internet Site Requirement	☑	w/attachments	☐
Section 4: Impoundment Identification	☑	w/attachments	☑

5.2 **Certification Statement**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name (print or type first and last name) of Owner/Operator	Official Title
Cynthia Vodopivec	SVP - Environmental
Signature: Cynthia E Vodopivec	Date Signed: 7/22/25

Form CCR 2CA	Illinois Environmental Protection Agency CCR Surface Impoundment Permit Application Form CCR 2CA – Corrective Action Construction

Bureau of Water ID Number: W1578510001-01,02,03 **CCR Permit Number:** No Permit Issued **Facility Name:** Baldwin Power Plant	For IEPA Use Only

SECTION 1: DESIGN AND CONSTRUCTION PLANS (35 Ill. Adm. Code 845.220)

Design and Construction Plans	1.1	CCR surface impoundment name.
		Fly Ash Pond System
	1.2	Identification number of the CCR surface impoundment (if one has been assigned by the Agency).
		W1578510001-01,02,03
	1.3	Describe the boundaries of the CCR surface impoundment (35 Ill. Adm. Code 845.210 (c)).
		See Attachment A
	1.4	State the purpose for which the CCR surface impoundment is being used.
		See Attachment C
	1.5	How long has the CCR surface impoundment been in operation?
		See Attachment C
	1.6	List the types of CCR that have been placed in the CCR surface impoundment.
		See Attachment D
	1.7	List the name of the watershed within which the CCR surface impoundment is located.
		See Attachment F

Design and Construction Plans (Continued)	1.8	What is the size in acres of the watershed within which the CCR surface impoundment is located?	
		See Attachment C	
	1.9	Check the corresponding boxes to indicate that you have attached the following:	
		☑	Drawings satisfying the requirements of 35 Ill. Adm. Code 845.220(a)(1)(F).
		☑	A description of the type, purpose, and location of existing instrumentation.
		☑	Area capacity curves for the CCR Impoundment.
		☑	A description of each spillway and diversion design features and capacities and provide the calculations used in their determination.
		☑	The construction specifications and provisions for surveillance, maintenance, and repair of the CCR surface impoundment.
		☑	A description of the physical and engineering properties of the foundation and abutment materials on which the CCR surface impoundment is constructed.
		☑	A statement of the type, size, and physical and engineering properties of the materials used in constructing each zone or stage of the CCR surface impoundment.
		☑	A statement of the method of site preparation and construction of each zone of the CCR impoundment.
		☑	A statement of the approximate dates of construction of each successive stage of construction of the CCR surface impoundment.
	1.10.1	Is there any record or knowledge of structural instability of the CCR surface impoundment?	
		☑ Yes	☐ No
	1.10.2	If you answered yes to Item 1.10.1, provide detailed explanation of the structural instability.	
		See Attachment C	

SECTION 2: NARRATIVE DESCRIPTION OF THE FACILITY (35 Ill. Adm. Code 845.220)

Narrative Description	2.1	List the types of CCR expected in the CCR surface impoundments.
		See Attachment D

Narrative Description (Cont.)	2.2	Have you attached a chemical analysis of each type of expected CCR?	
		✔	Yes
	2.3	Estimate of the maximum capacity of the surface impoundment in gallons or cubic yards.	
		See Attachment C	
	2.4	Enter the rate at which CCR and non-CCR waste streams currently enter the CCR impoundment in gallons per day and dry tons.	
		See Attachment C GPD	See Attachment C dTn
	2.5	Estimate length of time the CCR surface impoundment will receive CCR and non-CCR waste streams.	
		See Attachment C	
	2.6	Have you attached an on-site transportation plan that includes all existing and planned roads in the facility that will be used during the operation of the CCR surface impoundment?	
		✔	Yes
SECTION 3: MAPS (35 Ill. Adm. Code 845.220)			
Maps	3.1	Check the corresponding boxes to indicate that you have attached the following maps:	
		✔	A site location map on the most recent United Sates Geological Survey (USGS) quadrangle of the area from the 7 ½ minute series (topographic) or on another map whose scale clearly shows the information required in 35 Ill. Adm. Code 845.220(a)(3).
		✔	Site plans maps satisfying the requirements of 35 Ill. Adm. Code 845.220(a)(4).
SECTION 4: ATTACHMENTS			
Attachments	4.1	Check the corresponding boxes to indicate that you have attached the following:	
		✔	A narrative description of the proposed construction of, or modification to, a CCR surface impoundment and any projected changes in the volume or nature of the CCR or non-CCR waste streams.
		✔	Plans and specifications fully describing the design, nature, function, and interrelationship of each individual component of the facility.
		✔	The signature and seal of a qualified professional engineer.
		✔	Certification that the owner or operator of the CCR surface impoundment completed the public notification and public meetings required under 35 Ill. Adm. Code 845.240.
		✔	A summary of the issues raised by the public during the public notification and public meetings.
		✔	A summary of any revisions, determinations, or other considerations made in response to those issues raised by the public during the public notification and public meetings.
		✔	Certification that all contractors, subcontractors, and installers utilized to construct, install, modify, or close a CCR surface impoundment are participants in a training program that is approved by and registered with the U.S. Department of Labor's Employment and Training Administration and that includes instruction in erosion control and environmental remediation.

		☑	Certification that all contractors, subcontractors, and installers utilized to construct, install, modify, or close a CCR surface impoundment are participants in a training program that is approved by and registered with the U.S. Department of Labor's Employment and Training Administration and that includes instruction in the operation of heavy equipment and excavation.
SECTION 5: GROUNDWATER MONITORING PROGRAM			
Groundwater Monitoring	5.1	Indicate that you have attached the following components of a new groundwater monitoring program or any modifications to an existing groundwater monitoring program by checking the corresponding boxes:	
		☑	A hydrogeologic site investigation meeting the requirements of 35 Ill. Adm. Code 845.620, if applicable.
		☑	Design and construction plans of a groundwater monitoring system meeting the requirements of 35 Ill. Adm. Code 845.630.
		☑	A proposed groundwater sampling and analysis program that includes selection of the statistical procedures to be used for evaluating groundwater monitoring data as required by 35 Ill. Adm. Code 845.640 and 845.650.
SECTION 6: CORRECTIVE ACTION (35 Ill. Adm. Code 845.220(c))			
Corrective Action	6.1	Indicate that you have attached a corrective action plan as specified in 35 Ill. Adm. Code 845.670 by checking the box below:	
		☑	Corrective action plan as specified in 35 Ill. Adm. Code 845.670.
		☑	Corrective action groundwater monitoring program, including identification of revisions to the groundwater system for corrective action.
		☑	Any interim measures necessary to reduce the contaminants leaching from the CCR surface impoundment, and/or potential exposures to human or ecological receptors, including an analysis of the factors specified in 35 Ill. Adm. Code 845.680(a)(3).
SECTION 7: GROUNDWATER MODELING (35 Ill. Adm. Code 845.220(c))			
Groundwater Modeling	7.1	Indicate that you have attached the following by checking the corresponding boxes:	
		☑	The results of groundwater contaminant transport modeling and calculations showing how the corrective action will achieve compliance with the applicable groundwater standards.
		☑	All modeling inputs and assumptions.
		☑	Description of the fate and transport of contaminants with the selected corrective action over time.
		☑	Capture zone modeling, if applicable.
		☑	Any necessary licenses and software needed to review and access both the model and the data contained within the models required by 35 Ill. Adm. Code 845.220(c)(2).

Visual Road Map for Corrective Action
Construction Permit Application
Baldwin Power Plant, Fly Ash Pond System
Baldwin, IL

CONSTRUCTION PERMIT APPLICATION
Baldwin Power Plant - Fly Ash Pond System

Appendix A
LEGAL DESCRIPTION
§845.210(c)
Legal description of the facility

Appendix B.1
CORRECTIVE ACTION GROUNDWATER MONITORING PLAN
§845.680(a)(1)
Plan that establishes how data will be collected, documented, and evaluated to assess remedy effectiveness

Appendix B.2
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
§845.620
Hydrogeology, groundwater quality data, conceptual site model

Appendix C
HISTORY OF CONSTRUCTION
§845.220(a)(1)
Construction and operational history of the CCR surface impoundment

Appendix D
TYPES OF CCR AND CHEMICAL CONSTITUENTS
§845.220(a)(2)(A)
Types of CCR expected in the CCR surface impoundment, including chemical analysis of each type

Appendix E & F
SITE PLAN MAP & TRANSPORTATION MAP
§845.220(a)(4)
Maps showing the facility and existing CCR surface impoundments, site boundaries, groundwater monitoring wells, access roads and transportation corridors

Appendix G
CORRECTIVE ACTION PLAN
§845.670
Identifies the selected remedy based on the results of the Corrective Measures Assessment

Appendix A
CORRECTIVE ACTION ALTERNATIVE ANALYSIS (CAAA)
§845.670(e)
Evaluation of potential viable corrective actions identified in the Corrective Measures Assessment

Appendix A
HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
§845.670(f)(4)
Evaluation of potential risks to human and ecological receptors

Appendix B
CAAA SUPPORTING INFORMATION REPORT
§845.670(e)
Information to support preparation of CAAA

Appendix A
FEASIBILITY LEVEL DRAWINGS
Conceptual design drawings showing approximate extents and details of alternatives presented in the CAAA

Appendix B
GROUNDWATER MODELING TECHNICAL MEMORANDUM
§845.220(c)(2)
Presents additional groundwater modeling simulations and incorporates data collected since 2022 modeling (Appendix B.2) to support alternatives presented in the CAAA

Appendix C
LABOR/MILEAGE ESTIMATES
Detailed material quantity, labor and mileage estimates for alternatives presented in the CAAA

Appendix C
CORRECTIVE MEASURES ASSESSMENT
§845.660
Assessment of potential corrective measure technologies to address GWPS exceedances at the CCR surface impoundment

Appendix B
DRAWINGS AND MATERIAL SPECIFICATIONS
Permit-level design drawings and specifications

Appendix D
NATURE AND EXTENT REPORT (WITH ADDENDUM)
§845.650(d)(1)
Documents the nature and extent of constituents detected above the GWPS that are attributable to the CCR surface impoundment

Appendix E
GROUNDWATER POLISHING REPORT
§845.220(c)(2)
Presents results of geochemical modeling used to evaluate chemical mechanisms on groundwater polishing under current conditions and after implementation of the corrective measure

Appendix H
PUBLIC NOTIFICATION
§845.220(a)(9)
Certification that public notification and public meeting have been completed required under *§845.240*

Appendix I
CONTRACTOR CERTIFICATION
415 ILCS 5/22.59(b)(4)
Certification that CCR owner/operator will utilize contractors who are participants in an approved training program

Legend

- New Submittal
- Updated Submittal from Previous Submittal
- Re-submitted from Previous Submittal (No Updates)

Ramboll

Road Map for Corrective Action
Construction Permit Application
Baldwin Power Plant, Fly Ash Pond System
Baldwin, IL

Section	Rule Text	Location of Information Demonstrating Compliance			Version History			Notes
		Document	Section or Appendix	PDF Page No. & Hyperlink	Submitted Previously	Updated Submittal	New Submittal	
Section 845.220 - Construction Permits								
845.220(a)	All construction permit applications must contain the following information and documents.							
845.220(a)(1)	Design and Construction Plans (Construction History)	CPA	Appendix C	420	X			
845.220(a)(2)	Narrative Description of the Facility. The permit application must contain a written description of the facility with supporting documentation describing the procedures and plans that will be used at the facility to comply with the requirements of this Part. The descriptions must include, but are not limited to, the following information:	CPA	Section 2.2	18			X	
845.220(a)(2)(A)	The types of CCR expected in the CCR surface impoundment, including a chemical analysis of each type of expected CCR;	CPA	Section 2.2	18		X		
845.220(a)(2)(B)	An estimate of the maximum capacity of each surface impoundment in gallons or cubic yards;	CPA	Section 2.2	18		X		
845.220(a)(2)(C)	The rate at which CCR and non-CCR waste streams currently enter the CCR surface impoundment in gallons per day and dry tons;	CPA	Section 2.2	18		X		
845.220(a)(2)(D)	The estimated length of time the CCR surface impoundment will receive CCR and non-CCR waste streams; and	CPA	Section 2.2	18		X		
845.220(a)(2)(E)	An on-site transportation plan that includes all existing and planned roads in the facility that will be used during the operation of the CCR surface impoundment.	CPA	Section 2.2	18			X	
845.220(a)(3)	Site Location Map. All permit applications must contain a site location map on the most recent United States Geological Survey (USGS) quadrangle of the area from the 7½ minute series (topographic), or on such other map whose scale clearly shows the following information:	CPA	Appendix F	450		X		
845.220(a)(3)(A)	The facility boundaries and all adjacent property, extending at least 1000 meters (3280 feet) beyond the boundary of the facility;	CPA	Appendix F	450		X		
845.220(a)(3)(B)	All surface waters;	CPA	Appendix F	450		X		
845.220(a)(3)(C)	The prevailing wind direction;	CPA	Appendix F	450		X		
845.220(a)(3)(D)	The limits of all 100-year floodplains;	CPA	Appendix F	450		X		
845.220(a)(3)(E)	All natural areas designated as a Dedicated Illinois Nature Preserve under the Illinois Natural Areas Preservation Act [525 ILCS 30];	CPA	Appendix F	450		X		
845.220(a)(3)(F)	All historic and archaeological sites designated by the National Historic Preservation Act (16 USC 470 et seq.) and the Illinois Historic Sites Advisory Council Act [20 ILCS 3410]; and	CPA	Appendix F	450		X		
845.220(a)(3)(G)	All areas identified as critical habitat under the Endangered Species Act of 1973 (16 USC 1531 et seq.) and the Illinois Endangered Species Protection Act [520 ILCS 10].	CPA	Appendix F	450		X		
845.220(a)(4)	Site Plan Map. The application must contain maps, including cross-sectional maps of the site boundaries, showing the location of the facility. The following information must be shown:	CPA	Appendix E	448		X		
845.220(a)(4)(A)	The entire facility, including any proposed and all existing CCR surface impoundment locations;	CPA	Appendix E	448		X		
845.220(a)(4)(B)	The boundaries, both above and below ground level, of the facility and all CCR surface impoundments or landfills containing CCR included in the facility;	CPA	Appendix E	448		X		
845.220(a)(4)(C)	All existing and proposed groundwater monitoring wells; and	CPA	Appendix E	448		X		
845.220(a)(4)(D)	All main service corridors, transportation routes, and access roads to the facility.	CPA	Appendix E	448		X		
845.220(a)(5)	A narrative description of the proposed construction of, or modification to, a CCR surface impoundment and any projected changes in the volume or nature of the CCR or non-CCR waste streams.	CPA	Section 2.4	20			X	
845.220(a)(6)	Plans and specifications fully describing the design, nature, function and interrelationship of each individual component of the facility.	CPA	Appendix G	452			X	
845.220(a)(7)	A new groundwater monitoring program or any modification to an existing groundwater monitoring program that includes but is not limited to the following information:	CPA	Appendix B.1	33			X	
845.220(a)(7)(A)	A hydrogeologic site investigation meeting the requirements of Section 845.620, if applicable;	CPA	Appendix B.2	140	X			
845.220(a)(7)(B)	Design and construction plans of a groundwater monitoring system meeting the requirements of Section 845.630; and	CPA	Section 2.6	22			X	
845.220(a)(7)(C)	A proposed groundwater sampling and analysis program that includes selection of the statistical procedures to be used for evaluating groundwater monitoring data, as required by Sections 845.640 and 845.650.	CPA	Appendix B.1	33			X	
845.220(a)(8)	The signature and seal of a qualified professional engineer	CPA	Section 2.7	23			X	
845.220(a)(9)	Certification that the owner or operator of the CCR surface impoundment completed the public notification and public meetings required under Section 845.240, a summary of the issues raised by the public, a summary of any revisions, determinations, or other considerations made in response to those issues, and a list of interested persons in attendance who would like to be added to the Agency's listserv for the facility.	CPA	Appendix H	2418			X	
845.220(c)	Corrective Action Construction. In addition to the requirements in subsection (a), all construction permit applications that include any corrective action performed under Subpart F must also contain the following information and documents:							
845.220(c)(1)	Corrective action plan (see Section 845.670);	CPA	Appendix G	452			X	
845.220(c)(2)	Groundwater modeling, including:	CPA	Appendix G	452			X	
845.220(c)(2)(A)	The results of groundwater contaminant transport modeling and calculations showing how the closure will achieve compliance with the applicable groundwater standards;	CPA	Appendix G	452			X	
845.220(c)(2)(B)	All modeling inputs and assumptions;	GWTM	Section 4	650			X	
845.220(c)(2)(C)	Description of the fate and transport of contaminants, with the selected closure over time; and	CPA	Appendix G	452			X	
845.220(c)(2)(D)	Capture zone modeling, if applicable.	CPA	Appendix G	452			X	

Road Map for Corrective Action
Construction Permit Application
Baldwin Power Plant, Fly Ash Pond System
Baldwin, IL

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845.220(c)(3)	Any necessary licenses and software needed to review and access both the models and the data contained within the models required by subsection (c)(2);	CPA	Section 2.9	24			X	
845.220(c)(4)	Corrective action groundwater monitoring program, including identification of revisions to the groundwater monitoring system for corrective action; and	CPA	Section 2.9	24			X	
845.220(c)(5)	Any interim measures necessary to reduce the contaminants leaching from the CCR surface impoundment, and/or potential exposures to human or ecological receptors, including an analysis of the factors specified in Section 845.680(a)(3).	CPA	Section 2.9	24			X	
Section 845.620 - Hydrogeologic Site Characterization								
845.620(a)	The owner or operator of the CCR surface impoundment must design and implement a hydrogeologic site characterization.	CPA	Appendix B.2	140	X			Additional hydrogeologic site characterization information is also provided in the Nature & Extent Report - location depicted on the visual roadmap above.
Section 845.670 - Corrective Action Plan								
845.670(b)	Within one year after completing the assessment of corrective measures as specified in 35 I.A.C. § 845.660, and after completion of the public meeting in 35 I.A.C. § 845.660(d), the owner or operator of the CCR surface impoundment must submit, in a CP application [or modification to the facility's operating permit] to IEPA, a CAP that identifies the selected remedy. This requirement applies in addition to, not in place of, any applicable standards under any other State or federal law.	CPA	Appendix G	452			X	
845.670(c)	The CAP must meet the following requirements:							
845.670(c)(1)	Be based on the results of the CMA conducted under 35 I.A.C. § 845.660;	CAAA	Appendix C	972				
845.670(c)(2)	Identify a selected remedy that at a minimum, meets the standards listed in subsection (d);	CAAA	Section 2	510			X	
845.670(c)(3)	Contain the corrective action alternatives analysis specified in subsection (e); and	CAAA	Section 2	510			X	
845.670(c)(4)	Contain proposed schedules for implementation, including an analysis of the factors in subsection (f).	CAP	Table 1	475			X	
845.670(d)	The selected remedy in the CAP must:							
845.670(d)(1)	Be protective of human health and the environment;	CAAA	Section 2.2.1	518			X	
845.670(d)(2)	Attain the GWPS specified in 35 I.A.C. § 845.600;	GWTM	Section 7	671			X	
845.670(d)(3)	Control the sources of releases to reduce or eliminate, to the maximum extent feasible, further releases of constituents listed in 35 I.A.C. § 845.600 into the environment;	CAAA	Section 2.2.2	518			X	
845.670(d)(4)	Remove from the environment as much of the contaminated material that was released from the CCR surface impoundment as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems; and	CAAA	Section 2.5	535			X	
845.670(d)(5)	Comply with standards for management of wastes as specified in 35 I.A.C. § 845.680(d).	CAAA	Section 2	510				
845.670(e)	CAAA. In selecting a remedy that meets the standards of subsection (d), the owner or operator of the CCR surface impoundment must consider the following evaluation factors:							
845.670(e)(1)	The long- and short-term effectiveness and protectiveness of each potential remedy, along with the degree of certainty that the remedy will prove successful based on consideration of the following:	CAAA	Section 2.2	518			X	
845.670(e)(1)(A)	Magnitude of reduction of existing risks;	CAAA	Section 2.2.1	518			X	
845.670(e)(1)(B)	Magnitude of residual risks in terms of likelihood of further releases due to CCR remaining following implementation of a remedy;	CAAA	Section 2.2.3	519			X	
845.670(e)(1)(C)	The type and degree of long-term management required, including monitoring, operation, and maintenance;	CAAA	Section 2.2.4	520			X	
845.670(e)(1)(D)	Short-term risks that might be posed to the community or the environment during implementation of a remedy, including potential threats to human health and the environment associated with excavation, transportation, and re-disposal of contaminants;	CAAA	Section 2.2.5	521			X	
845.670(e)(1)(E)	Time until GWPS in 35 I.A.C. § 845.600 are achieved;	CAAA	Section 2.2.6	527			X	
845.670(e)(1)(F)	The potential for exposure of humans and environmental receptors to remaining wastes, considering the potential threat to human health and the environment associated with excavation, transportation, re-disposal, containment, or changes in groundwater flow;	CAAA	Section 2.2.7	528			X	
845.670(e)(1)(G)	The long-term reliability of the engineering and institutional controls, including an analysis of any off-site, nearby destabilizing activities; and	CAAA	Section 2.2.8	529			X	
845.670(e)(1)(H)	Potential need for replacement of the remedy.	CAAA	Section 2.2.9	530			X	
845.670(e)(2)	The effectiveness of the remedy in controlling the source to reduce further releases based on consideration of each of the following potential factors:	CAAA	Section 2.2.2	518			X	
845.670(e)(2)(A)	The extent to which containment practices will reduce further releases; and	CAAA	Section 2.2.2	518			X	
845.670(e)(2)(B)	The extent to which treatment technologies may be used.	CAAA	Section 2.2.2	518			X	
845.670(e)(3)	The ease or difficulty of implementing each potential remedy based on consideration of the following types of factors:	CAAA	Section 2.3	531			X	
845.670(e)(3)(A)	Degree of difficulty associated with constructing the technology;	CAAA	Section 2.3.1	531			X	
845.670(e)(3)(B)	Expected operational reliability of the technologies;	CAAA	Section 2.3.2	532			X	
845.670(e)(3)(C)	Need to coordinate with and obtain necessary approvals and permits from other agencies;	CAAA	Section 2.3.3	532			X	
845.670(e)(3)(D)	Availability of necessary equipment and specialists; and	CAAA	Section 2.3.4	533			X	
845.670(e)(3)(E)	Available capacity and location of needed treatment, storage, and disposal services.	CAAA	Section 2.3.5	534			X	

Road Map for Corrective Action
Construction Permit Application
Baldwin Power Plant, Fly Ash Pond System
Baldwin, IL

Section	Rule Text	Location of Information Demonstrating Compliance			Version History			Notes
		Document	Section or Appendix	PDF Page No. & Hyperlink	Submitted Previously	Updated Submittal	New Submittal	
845.670(e)(4)	The degree to which community concerns are addressed by each potential remedy.	CAAA	Section 2.4	535			X	
845.670(f)	The owner or operator must specify, as part of the CAP, a schedule for implementing, of and completing, remedial activities. The schedule must require the completion of remedial activities within a reasonable time, taking into consideration the factors in this subsection (f). The owner or operator of the CCR surface impoundment must consider the following factors in determining the schedule of remedial activities:							
845.670(f)(1)	Extent and nature of contamination, as determined by the characterization required under 35 I.A.C. § 845.650(d);	CAP	Section 3.3	466			X	
845.670(f)(2)	Reasonable probabilities of remedial technologies achieving compliance with the GWPS established by 35 I.A.C. § 845.600 and other objectives of the remedy;	CAP	Section 3.3	466			X	
845.670(f)(3)	Availability of treatment or disposal capacity for CCR managed during implementation of the remedy;	CAP	Section 3.3	466			X	
845.670(f)(4)	Potential risks to human health and the environment from exposure to contamination before completion of the remedy;	CAP	Section 3.3	466			X	
845.670(f)(5)	Resource value of the aquifer, including:							
845.670(f)(5)(A)	Current and future uses, including potential residential, agricultural, commercial industrial and ecological uses;	CAP	Section 3.3	466			X	
845.670(f)(5)(B)	Proximity and withdrawal rate of users;	CAP	Section 3.3	466			X	
845.670(f)(5)(C)	Groundwater quantity and quality;	CAP	Section 3.3	466			X	
845.670(f)(5)(D)	The potential impact to the subsurface ecosystem, wildlife, other natural resources, crops, vegetation, and physical structures caused by exposure to CCR constituents;	CAP	Section 3.3	466			X	
845.670(f)(5)(E)	The hydrogeologic characteristic of the facility and surrounding land; and	CAP	Section 3.3	466			X	
845.670(f)(5)(F)	The availability of alternative water supplies; and	CAP	Section 3.3	466			X	
845.670(f)(6)	Other relevant factors.	CAP	Section 3.3.1	470			X	
Section 845.680 Implementation of the Corrective Action Plan								
845.680(a)	Within 90 days after the Agency's approval of the corrective action plan submitted under Section 845.670, the owner or operator must initiate corrective action. Based on the schedule approved by the Agency for implementation and completion of corrective action, the owner or operator must:							
845.680(a)(1)	Establish and implement a corrective action groundwater monitoring program that:							
845.680(a)(1)(A)	At a minimum, meets the requirements of the monitoring program under Section 845.650;	CA GMP	Section 2.1	44			X	
845.680(a)(1)(B)	Documents the effectiveness of the corrective action remedy; and	CA GMP	Section 3	48			X	
845.680(a)(1)(C)	Demonstrates compliance with the groundwater protection standard under subsection (c).	CA GMP	Section 3	48			X	
845.680(a)(2)	Implement the corrective action remedy approved by the Agency under Section 845.670; and	CAP	Section 1.5	458			X	
845.680(a)(3)	Take any interim measures necessary to reduce the contaminants leaching from the CCR surface impoundment, and/or potential exposures to human or ecological receptors. Interim measures must, to the greatest extent feasible, be consistent with the objectives of, and contribute to the performance of, any remedy that may be required by Section 845.670. The following factors must be considered by an owner or operator in determining whether interim measures are necessary:							
845.680(a)(3)(A)	Time required to develop and implement a final remedy;	CAP	Section 3.4	470			X	
845.680(a)(3)(B)	Actual or potential exposure of nearby populations or environmental receptors to any of the constituents listed in Section 845.600;	CAP	Section 3.4	470			X	
845.680(a)(3)(C)	Actual or potential contamination of sensitive ecosystems or current or potential drinking water supplies;	CAP	Section 3.4	470			X	
845.680(a)(3)(D)	Further degradation of the groundwater that may occur if remedial action is not initiated expeditiously;	CAP	Section 3.4	470			X	
845.680(a)(3)(E)	Weather conditions that may cause any of the constituents listed in Section 845.600 to migrate or be released;	CAP	Section 3.4	470			X	
845.680(a)(3)(F)	Potential for exposure to any of the constituents listed in Section 845.600 as a result of an accident or failure of a container or handling system; and	CAP	Section 3.4	470			X	
845.680(a)(3)(G)	Other situations that may pose threats to human health and the environment.	CAP	Section 3.4	470			X	

Notes:
CAA = Closure Alternatives Analysis
CAAA = Corrective Action Alternatives Analysis
CAP = corrective action plan
CCR = coal combustion residuals
CMA = Corrective Measures Assessment
CPA = Construction Permit Application
GMP = Groundwater Monitoring Plan
GWPS = groundwater protection standards
GWTM = Groundwater Modeling Technical Memorandum
HCR = Hydrogeologic Site Characterization Report

Intended for
Dynegy Midwest Generation, LLC
10941 Baldwin Road
Baldwin, Illinois 62217

Date
April 22, 2025

Project No.
1940110241-005

CONSTRUCTION PERMIT APPLICATION FOR GROUNDWATER CORRECTIVE ACTION

BALDWIN POWER PLANT FLY ASH POND SYSTEM IEPA ID NO. W1578510001-01/02/03

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CONSTRUCTION PERMIT APPLICATION FOR GROUNDWATER CORRECTIVE ACTION BALDWIN POWER PLANT FLY ASH POND SYSTEM IEPA ID NO. W1578510001-01/02/03

Project name	**Baldwin Power Plant Fly Ash Pond System**
Project no.	**1940110241-005**
Recipient	**Dynegy Midwest Generation, LLC**
Document type	**Construction Permit Application**
Revision	**FINAL**
Date	**April 22, 2025**
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Checked by	**J. Austin Bond, PE**
Approved by	**Brian G. Hennings, PG**
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Table 1	CCR Surface Impoundments at Baldwin Energy Complex

APPENDICES

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Appendix B	Groundwater Information (845.220(a)(7)(A-C) and 845.220(c)(2-5))
Appendix C	History of Construction (845.220(a)(1))
Appendix D	Types of CCR and Chemical Constituents (845.220(a)(2)(A))
Appendix E	Site Plan Map and Transportation Plan ((845.220(a)(4) and 845.220(a)(2)(E))
Appendix F	Site Location Maps (845.220(a)(3))
Appendix G	Corrective Action Plan and Proposed Schedule (845.670), including the Corrective Action Alternatives Analysis (845.670(e))
Appendix H	Public Notification and Public Meeting Certification (845.220(a)(9))
Appendix I	Contractor Training Certification (45 ILCS 5/22.59(b)(4))

1. INTRODUCTION

Dynegy Midwest Generation, LLC (DMG) is the owner of the active coal-fired Baldwin Energy Complex (BEC), also referred to as the Baldwin Power Plant (BPP), in Baldwin, Randolph County, Illinois. According to the Illinois Environmental Protection Agency (IEPA), this power plant has four coal combustion residuals (CCR) surface impoundments, as listed in **Table 1** below. This construction permit application is for groundwater corrective action activities at the Fly Ash Pond System (FAPS) only. The FAPS is a CCR multi-unit which contains three of the four CCR surface impoundments identified by the IEPA including the Old East Fly Ash Pond, East Fly Ash Pond, and West Fly Ash Pond. The FAPS multi-unit is contained by a single earthen perimeter dike and was closed using a single final cover system that extended across all three units in 2020 [1].

Table 1 – CCR Surface Impoundments at Baldwin Energy Complex

Impoundment Name	Status	Acronym	IEPA ID Number	Vistra CCR Unit ID	National Inventory of Dams Number
Old East Fly Ash Pond (FAPS CCR Multi-Unit)	**Closed**	**FAPS (Fly Ash Pond System)**	**W1578510001-01**	**605**	**IL50720**
East Fly Ash Pond (FAPS CCR Multi-Unit)			**W1578510001-02**	**605**	**IL50720**
West Fly Ash Pond (FAPS CCR Multi-Unit)			**W1578510001-03**	**605**	**IL50720**
Bottom Ash Pond	Active	BAP	W1578510001-06	601	IL50721

Note - Bold indicates impoundments included in this Corrective Action Construction Permit Application

This construction permit application for groundwater corrective action activities (application) was developed in accordance with Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845, Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments [2].

1.1 Legal Description

Section 845.210(c): All permit applications must contain a legal description of the facility boundary and a description of the boundaries of all units included in the facility.

A legal description of the facility is provided in **Appendix A**.

1.2 Previous Assessments

Section 845.210(d): Previous Assessments, Investigations Plans, and Programs

The FAPS is also regulated by Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257, herein referred to as the Federal CCR Rule [3] and subsequently became regulated by 35 I.A.C. § 845 [2]. Several assessments and plans were completed for the FAPS to satisfy the requirements of both the Federal CCR Rule and 35 I.A.C. § 845; some of which are referred to within and attached to this application.

Section 845.210(d)(1): The Agency may approve the use of any hydrogeologic site investigation or characterization, groundwater monitoring well or system, or groundwater monitoring plan,

bearing the seal and signature of an Illinois Licensed Professional Geologist or Licensed Professional Engineer, completed before April 21, 2021 to satisfy the requirements of this Part.

A Supplemental Hydrogeologic Site Characterization Report (HCR) and Groundwater Monitoring Plan (GMP) [4] was prepared in March 2016 and included in the closure plan for the FAPS [5] that was subsequently approved by IEPA [6]. Applicable groundwater information is provided to meet the requirements of 845.220(a)(7)(A-C), and 845.220(c)(2-5) in **Appendix B**.

Section 845.210(d)(2): *For existing CCR surface impoundments, the owner or operator of the CCR surface impoundment may use a previously completed location restriction demonstration required by Section 845.300 (Placement Above the Uppermost Aquifer), Section 845.310 (Wetlands), Section 845.320 (Fault Areas), Section 845.330 (Seismic Impact Zones), and Section 845.340 (Unstable Areas) provided that the previously completed assessments meet the applicable requirements of those Sections.*

No previous assessments for Placement Above the Uppermost Aquifer, Wetlands, Fault Areas, Seismic Impact Zones, and/or Unstable Areas are included within this construction permit application.

Section 845.210(d)(3): *For existing CCR surface impoundments, the owner or operator of the CCR surface impoundment may use a previously completed assessment to serve as the initial assessment required by Section 845.440 (Hazard Potential Classification Assessment), Section 845.450 (Structural Stability Assessment) and Section 845.460 (Safety Factor Assessment) provided that the previously completed assessment: A) Was not completed more than five years ago; and B) Meets the applicable requirements of those Sections.*

No previous assessments for the Hazard Potential Classification, Structural Stability, and/or Safety Factors are included within this construction permit application.

Section 845.210(d)(4): *For inactive closed CCR surface impoundments, the owner or operator of the CCR surface impoundment may use a post-closure care plan previously approved by the Agency.*

A Closure and Post-Closure Care Plan for the Baldwin Fly Ash Pond System [5] was prepared and submitted to the IEPA in March 2016. The Closure and Post-Closure Care Plan was approved by the IEPA in 2016 [6].

2. CONSTRUCTION PERMIT

2.1 History of Construction

Section 845.220(a)(1): Design and Construction Plans (Construction History)

The History of Construction report for the FAPS and subsequent update prepared in 2021 are provided in **Appendix C**.

2.2 Narrative Description of Facility

Section 845.220(a)(2): Narrative Description of the Facility. The permit application must contain a written description of the facility with supporting documentation describing the procedures and plans that will be used at the facility to comply with the requirements of this Part. The descriptions must include, but are not limited to, the following information:

The Facility Narrative Description details are described in the following sections.

Section 845.220(a)(2)(A): The types of CCR expected in the CCR surface impoundment, including a chemical analysis of each type of expected CCR;

The types of CCR expected in the FAPS and analysis of the chemical constituents found within the CCR in the FAPS is provided in **Appendix D**.

Section 845.220(a)(2)(B): An estimate of the maximum capacity of each surface impoundment in gallons or cubic yards;

The FAPS was estimated to contain approximately 11 million cubic yards (MCY) of CCR in 2016 [7, 8, 9], which is when the units were last active. Closure of the FAPS was initiated in 2018 and was completed in 2020 [1]. As part of closure, approximately 0.75 MCY cubic yards of production CCR was utilized as subgrade fill, resulting in a total estimated waste volume of 11.75 MCY of CCR within the FAPS. This volume is not expected to change in the future as the FAPS is closed and is no longer capable of receiving CCR waste.

Section 845.220(a)(2)(C): The rate at which CCR and non-CCR waste streams currently enter the CCR surface impoundment in gallons per day and dry tons;

There are no waste streams that are currently entering or will enter the FAPS in the future as final closure of the FAPS has been completed.

Section 845.220(a)(2)(D): The estimated length of time the CCR surface impoundment will receive CCR and non-CCR waste streams; and

There are no CCR or other non-CCR waste streams that are currently entering the FAPS or will enter the FAPS in the future as final closure of the FAPS has been completed.

Section 845.220(a)(2)(E): An on-site transportation plan that includes all existing and planned roads in the facility that will be used during the operation of the CCR surface impoundment.

An On-Site Transportation Plan was developed as required by Section 845.220(a)(2)(E) and is provided for the FAPS in **Appendix E** that includes all on-site access roads and the surrounding roadways.

2.3 Site Maps

Section 845.220(a)(3): Site Location Map. All permit applications must contain a site location map on the most recent United States Geological Survey (USGS) quadrangle of the area from the 7½ minute series (topographic), or on another map whose scale clearly shows the following information:

A. The facility boundaries and all adjacent property, extending at least 1000 meters (3280 feet) beyond the boundary of the facility;

B. All surface waters;

C. The prevailing wind direction;

D. The limits of all 100-year floodplains;

E. All-natural areas designated as a Dedicated Illinois Nature Preserve under the Illinois Natural Areas Preservation Act [525 ILCS 30];

F. All historic and archaeological sites designated by the National Historic Preservation Act (16 USC 470 et seq.) and the Illinois Historic Sites Advisory Council Act [20 ILCS 3410]; and

G. All areas identified as critical habitat under the Endangered Species Act of 1973 (16 USC 1531 et seq.) and the Illinois Endangered Species Protection Act [520 ILCS 10].

A Site Location Map for the FAPS showing the information required in Section 845.220(a)(3) is provided in **Appendix F**. The Site Location Map consists of the most recent USGS topographic map (2024) which contains the facility and at least 1,000 meters of the surrounding area. Information included on the site location map meets the requirements for a Flood Hazard Map, Topographic Vicinity Map, Designated Nature Map, Designated Historic and Archeological Site Map, and Identified Critical Habitat Map.

The data in the Site Location Map was collected by performing a comprehensive search of the Illinois Department of Natural Resources (IDNR) natural heritage database [10] for natural and protected areas within 1,000 meters of the FAPS. Within Randolph County, a total of 13 sites were identified from the Illinois Natural Areas Inventory (INAI) and 7 were identified from the Illinois Nature Preserves Commission (INPC). Within St. Clair County, a total of 21 sites were identified from the INAI and 15 were identified from the INPC. The BPP Cooling Pond is reserved as a State Fish and Wildlife Area, leased to the IDNR for public recreational use. The Kaskaskia River State Fish and Wildlife Area is adjacent to the site to the west. None of the other natural areas or preserves fall within 1,000 meters of the FAPS.

The IDNR natural heritage database also includes a list of Endangered Species by County [11] and notes that a total of 37 threatened and endangered species are located within Randolph County, including 28 endangered and 9 threatened species. A review of the U.S. Fish and Wildlife Service (USFWS) Threatened & Endangered Species Active Critical Habitat Report [12] identified no critical habitat for threatened or endangered species within 1,000 meters of the FAPS.

A search of the IDNR Historic and Architectural Resources Geographic Information System (HARGIS) database [13] for historical sites within the 1,000 meters of the Site located no results.

The 100-year flood plain limits were obtained from the Federal Emergency Management Area (FEMA) Flood Map Service Center [14]. Portions of the BPP site are within the 100-year

floodplain, but the floodplain does not extend beyond limited portions of the exterior toe of the FAPS embankments.

Section 845.220(a)(4): Site Plan Map. The application must contain maps, including cross-sectional maps of the site boundaries, showing the location of the facility. The following information must be shown:

A. The entire facility, including any proposed and all existing CCR surface impoundment locations;

B. The boundaries, both above and below ground level, of the facility and all CCR surface impoundments or landfills containing CCR included in the facility;

C. All existing and proposed groundwater monitoring wells; and

D. All main service corridors, transportation routes, and access roads to the facility.

The Site Plan Map for the FAPS showing the information required in Section 845.220(a)(4) is provided in **Appendix E**.

2.4 Narrative Description of Proposed Construction

Section 845.220(a)(5): A narrative description of the proposed construction of, or modification to, a CCR surface impoundment and any projected changes in the volume or nature of the CCR or non-CCR waste streams.

The proposed construction will consist of a groundwater management system (GMS). This will involve supplementing the IEPA-approved final closure plan [5] and completed source control (*e.g.,* final closure of the FAPS) with the installation and operation of a new GMS as outlined in the Corrective Action Plan for the FAPS (see **Appendix G**). The GMS, when combined with the completed final closure (described in the Closure and Post Closure Care Plan [5]) will serve as groundwater corrective action for the FAPS.

The GMS is intended to reduce the accumulation of hydraulic head beneath the FAPS cover system, which reduces the potential for liquids that may be from the FAPS to mix with groundwater. The GMS will reduce to the maximum extent feasible releases and minimize off-site migration of CCR-derived constituents in groundwater until the groundwater protection standards (GWPS) are achieved. Any liquids collected by the GMS will be transferred to an appropriate location for discharge in accordance with applicable permits that will be obtained after approval of the Corrective Action Plan.

2.4.1 Proposed Corrective Action Construction

Corrective action construction will involve the construction of multiple elements of the GMS. These will include installation of an extraction trench; construction of a consolidation area to dispose of CCR-impacted trench construction spoils; installation of mechanical, electrical, and piping systems to manage extracted liquids; and site restoration. After system installation is complete, system operation and maintenance activities will be performed.

Information associated with each of these construction elements of the GMS is described below.

2.4.1.1 Extraction Trench Installation

Roughly 8,700 linear feet of extraction trench will be installed down the central axis of the FAPS, within the footprint of the existing final cover system. The extraction trench will include the following characteristics and components:

- Approximate dimensions of 2 to 3 foot in width and up to 50 to 60 feet in depth, corresponding to the expected deepest portions of the base of the CCR;
- Backfill materials consisting of permeable drainage aggregate surrounding a horizontal perforated collection pipe installed near the base of the trench; and,
- Collection sumps every 400 to 500 feet along the trench (17 total), consisting of a vertical stainless-steel casing connected to the horizontal perforated pipe.

In order to facilitate the installation of the extraction trench and provide equipment access, a working platform will be constructed and centered on the trench alignment. The working platform will be constructed out of engineered fill materials, be at least 35 feet in width, be level laterally, and will follow the existing final cover system grades longitudinally.

2.4.1.2 Consolidation Area Construction

CCR-impacted materials generated during GMS construction will be placed in a Consolidation Area located in the south-central portion of the FAPS, within the limits of the existing final cover system. CCR-impacted materials are expected to include spoils generated during trench construction, final cover soils that become impacted with CCR, and working platform materials that become impacted with CCR. The Consolidation Area is expected to be up to 5 acres in area and will be sited in a relatively flat area on the existing FAPS final cover system, in order to avoid impeding stormwater flow along existing drainage swales. The area will be graded for drainage with a top slope of 5 percent, a side slope of 20 percent, and covered with a low-permeability clay barrier layer and vegetative soil support layer, consistent with the existing FAPS final cover materials. The total volume expected to be placed in the on-site consolidation area is approximately 50,000 CY.

2.4.1.3 Mechanical, Electrical, and Piping Installation

A mechanical, electrical, and piping system will be installed to support the removal of infiltrated liquids from the extraction trench. The system will include the following components:

- A single pneumatic pump will be installed in each of the collection sumps along with a discharge pipe that will carry extracted liquids to an equalization (EQ) tank in the nearby compressor shed.
- Five compressor sheds consisting of an air compressor, EQ tank, and transfer pump will be installed every 1,000 to 2,000 feet along the trench alignment to supply compressed air to the pneumatic pumps and to transfer any liquids from the EQ tank to any treatment, as needed, before conveyance to the approved discharge location in accordance with applicable permits.
- An overhead electrical power drop and a buried electrical distribution system will be installed to provide power for the groundwater management and water conveyance systems.

2.4.1.4 Site Restoration

Areas of the final cover system disturbed during GMS construction will be repaired after the system has been installed. This will include removing working platforms, re-establishing final cover subgrades consistent with the original final closure system design, and replacing the final cover system in disturbed areas. Final cover system replacement will be performed using the same material and construction specifications and will be constructed to the same grades as the existing final cover system. This will include the construction of a low-permeability barrier layer and a vegetative support layer (*i.e.*, topsoil).

After the final cover system is repaired, vegetation will be established in disturbed areas.

2.4.1.5 System Operation and Waste Streams

Operation of the GMS is expected to result in the generation of greater than 30 gallons per minute (gpm) for the first 8 years of operation with flowrates decreasing to approximately 10 gpm during long-term operation. However, actual flow rates could vary from this estimate. Extracted groundwater will be totalized and discharged in accordance with applicable permits that will be obtained after approval of this Construction Permit Application.

2.5 Plans and Specifications

Section 845.220(a)(6): Plans and specifications fully describing the design, nature, function and interrelationship of each individual component of the facility.

Permit-level design plans and specifications are included within the Corrective Action Plan (CAP) for the FAPS, provided in **Appendix G**. These plans were prepared in accordance with Section 845.670(a)(6) and are consistent with the narrative description provided in **Appendix G**, per Section 845.220(a)(5).

2.6 Groundwater Monitoring Program

Section 845.220(a)(7): A new groundwater monitoring program or any modification to an existing groundwater monitoring program that includes but is not limited to the following information:

A Corrective Action Groundwater Monitoring Plan is included in **Appendix B.1** of this application.

Section 845.220(a)(7)(A): A hydrogeologic site investigation meeting the requirements of Section 845.620, if applicable;

Hydrogeologic site investigations for the FAPS are provided in **Appendix B.2**.

Section 845.220(a)(7)(B): Design and construction plans of a groundwater monitoring system meeting the requirements of Section 845.630; and

Design and construction plans of a GMS as required by Section 845.630 are provided in the Operating and Closure and Post Closure Care Plan [15, 5]. The Corrective Action Groundwater Monitoring Plan (**Appendix B.1**) includes content requirements specific to 35 I.A.C. § 845.630 (Groundwater Monitoring System), 35 I.A.C. § 845.640 (Groundwater Sampling and Analysis), 35 I.A.C. § 845.650 (Groundwater Monitoring Program), and 35 I.A.C. § 845.680 (Implementation of the Corrective Action Plan) for the FAPS.

Section 845.220(a)(7)(C): A proposed groundwater sampling and analysis program that includes selection of the statistical procedures to be used for evaluating groundwater monitoring data (see Sections 845.640 and 845.650).

A groundwater sampling and analysis program that meets the requirements of Section 845.640 and 845.650 is provided in **Appendix B.1.**

2.7 Certification

Section 845.220(a)(8): The signature and seal of a qualified professional engineer

I, J. Austin Bond, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this construction permit application has been prepared in accordance with the accepted practice of engineering. The content of this construction permit application is not to be used other than for its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

J. Austin Bond, PE
Printed name

4/22/25
Signature Date

062-075181 IL 11/30/25
Registration No. State Exp. Date

Affix Seal

2.8 Public Meeting Information

Section 845.220(a)(9): Certification that the owner or operator of the CCR surface impoundment completed the public notification and public meetings required under Section 845.240, a summary of issued raised by the public, a summary of any revisions, determinations, or other considerations made in response to those issues, and a list of interested persons in attendance who would like to be added to the Agency's listserv for the facility.

Certification that public notification and public meetings have been completed as required by Section 845.240 are provided in **Appendix H**.

2.9 Corrective Action Construction

Section 845.220(c)(1): Corrective action plan (see Section 845.670);

The corrective action plan is provided in **Appendix G**.

Section 845.220(c)(2): Groundwater modeling, including:

A. The results of groundwater contaminant transport modeling and calculations showing how the corrective action will achieve compliance with the applicable groundwater standards;

B. All modeling inputs and assumptions;

C. Description of the fate and transport of contaminants with the selected corrective action over time; and

D. Capture zone modeling, if applicable.

Groundwater modeling as required by Section 845.220(c)(2) is provided within Appendix B.1 of Corrective Action Alternatives Analysis Supporting Information Report, which is included as Appendix B of the Corrective Action Alternatives Analsyis, which is provided as **Appendix G** of this application.

Section 845.220(c)(3): Any necessary licenses and software needed to review and access both the models and the data contained within the models required by subsection (c)(2).

Consistent with previously submitted construction permit applications, electronic copies of the model files are provided within Appendix B.1 of the Corrective Action Alternatives Analysis Supporting Information Report, which is included as Appendix B of the Corrective Action Alternatives Analsyis, which is provided as **Appendix G** of this application. Publicly available software can be used to review and acces the models and the data; no additional licenses or software are required.

Section 845.220(c)(4): Corrective action groundwater monitoring program, including identification of revisions to the groundwater monitoring system for corrective action.

The corrective action groundwater monitoring program as required by Section 845.220(c)(4) is provided in **Appendix B.1**. The corrective action groundwater monitoring plan establishes how data will be collected, documented, and evaluated to assess remedy effectiveness for all currently documented and potential future releases from the FAPS. The presence of exceedances at the waste boundary will continue to be evaluated under the Operating Permit GMP previously submitted to IEPA [15].

Section 845.220(c)(5): Any interim measures necessary to reduce the contaminants leaching from the CCR surface impoundment, and/or potential exposures to human or ecological receptors, including an analysis of the factors specified in Section 845.680(a)(3).

No interim measures are necessary or planned ahead of permit approval and completion of the final design. The Corrective Action Plan, provided in **Appendix G**, provides an analysis of the factors specified in Section 845.680(a)(3).

3. ADDITIONAL INFORMATION

Certification that DMG will utilize contractors, subcontractors, and installers who are participants in an approved training program, in accordance with 415 Illinois Compiled Statutes (ILCS) 5/22.59(b)(4), is provided in **Appendix I**.

4.REFERENCES

[1] Dynegy Midwest Generation, LLC, "Notification of Completion of Closure, Baldwin Energy Complex,Old East Fly Ash Pond, East Fly Ash Pond, West Ash Pond," December 17, 2020.

[2] Illinois Administrative Code, "Title 35, Subtitle G, Chapter I, Subchapter J, Part 845: Standards for The Disposal Of Coal Combustion Residuals In Surface Impoundments," April 21, 2021.

[3] Code of Federal Regulations, "Title 40, Chapter I, Subchapter I, Part 257, Subpart D, Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments," April 17, 2015.

[4] Natural Resource Technology, "Supplemental Hydrogeologic Site Characterization Report and Groundwater Monitoring Plan, Baldwin Fly Ash Pond System, Baldwin Energy Complex, Baldwin, Illinois," Natural Resource Technology, Baldwin, Illinois, March 2016.

[5] AECOM, "Closure and Post-Closure Care Plan for the Baldwin Fly Ash Pond System at Dynegy Midwest Generation, LLC, Baldwin Energy Complex, 10901 Baldwin Road, Baldwin, IL 62217," AECOM, Saint Louis, Missouri, March 2016.

[6] Illinois Environmental Protection Agency, "Re: Dynegy Midwest Generation, Inc. - Baldwin Energy Complex: Ash Pond System Closure and Post Closure Plan - NDPES Permit No. IL0000043," July 13, 2016.

[7] Dynegy Midwest Generation, LLC, "Closure Plan for Existing CCR Surface Impoundment, East Fly Ash Pond, 40 CFR 257.102(b), REV 1 - 10/17/2016," Dynegy Midwest Generation, LLC, Baldwin, Illinois, October 2016.

[8] Dynegy Midwest Generation, LLC, "Closure Plan for Existing CCR Surface Impoundment, Old East Fly Ash Pond, 40 CFR 257.1025(b), Rev 1 - 10/17/2016," Dynegy Midwest Generation, LLC, Baldwin, Illinois, October 2016.

[9] Dynegy Midwest Generation, LLC, "Closure Plan for Existing CCR Surface Impoundment, West Fly Ash Pond, 40 CFR 257.102(b), Rev 0 - 10/17/2016," Dynegy Midwest Generation, LLC, Baldwin, Illinois, October 2016.

[10] Illinois Department of Natural Resources, "IDNR Natural Heritage Database," [Online]. Available: https://www2.illinois.gov/sites/naturalheritage/DataResearch/Pages/Access-Our-Data.aspx. [Accessed 7 February 2025].

[11] Illinois Natural Heritage Database, "Illinois Threatened and Endangered Species by County," April 2023. [Online]. Available: https://naturalheritage.illinois.gov/content/dam/soi/en/web/naturalheritage/documents/EORS%20by%20County%20LastObs%20for%20website%20November2024.pdf. [Accessed 7 February 2025].

[12] U.S. Fish & Wildlife Service, "USFWS Threatened & Endangered Species Active Critical," [Online]. Available: https://ecos.fws.gov/ecp/report/table/critical-habitat.html. [Accessed 7 February 2025].

[13] Illinois Department of Natural Resources, "IDNR Historic Preservation Division HARGIS," [Online]. Available: https://www2.illinois.gov/dnrhistoric/Preserve/Pages/HARGIS.aspx. [Accessed 7 February 2025].

[14] Federal Emergency Management Agency, "FEMA Flood Map Service Center: Welcome!," [Online]. Available: https://msc.fema.gov/portal/home. [Accessed 7 February 2025].

[15] Burns & McDonnell, "Initial Operating Permit Application, Baldwin Power Plant Fly Ash System, Saint Louis, Missouri," Burns & McDonnell, Saint Louis, Missouri, October 25, 2021.

APPENDIX A
LEGAL DESCRIPTION (845.210(c))

DYNEGY MIDWEST GENERATION, LLC.
BALDWIN ENERGY COMPLEX

RESTRICTED USE AREA BOUNDARY CORNERS SET

POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1000	558099.27	2386252.87	0.00	NOT SET
1001	557997.15	2386239.41	438.03	SET I.P.
1002	554411.84	2385766.91	435.95	SET I.P.
1003	553565.22	2384563.53	0.00	NOT SET
1004	554393.69	2380743.66	421.28	SET I.P.
1005	554452.32	2380756.38	421.88	SET I.P.
1006	554609.17	2380033.19	425.35	SET I.P.
1007	554692.24	2380051.21	428.47	SET I.P.
1008	554741.38	2380256.97	429.37	SET I.P.
1009	555276.51	2380560.02	420.34	SET I.P.
1010	555395.00	2380545.00	410.63	SET I.P.
1011	556148.45	2382673.53	432.53	SET I.P.
1012	555439.18	2384460.16	456.33	SET I.P.
1013	555587.51	2384814.85	457.91	SET SPIKE NAIL
1014	557500.00	2385625.00	461.05	SET I.P.
1015	557850.04	2385679.81	461.18	SET I.P.
1016	558066.67	2386043.45	439.87	SET I.P.

SURVEY PERFORMED ON APRIL 9, 2021

N

0' 400' 800'

LEGEND

- ***SECTION LINE***
- ***RESTRICTED USE BOUNDARY***
- ● ***FOUND SURVEY MARKER AS NOTED***
- ○ ***SET 5/8" IRON REBAR (UNLESS OTHERWISE NOTED)***

SURVEY NOTE:
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CONTROL CORNERS AND WELLS

Point #	Northing	Easting	Elevation	Description
558	558186.76	2379152.13	427.99	FOUND I.P.
2001	558088.80	2387102.75	441.46	FOUND PK NAIL
2002	555415.58	2387061.32	454.17	FOUND I.P.
2005	555533.52	2379125.44	422.82	FOUND I.P.
2008	560842.70	2379172.83	424.09	FOUND I.P.
3209	560750.15	2387149.86	435.66	FOUND PIPE
5001	558867.47	2388512.38	451.01	MW-306
5002	554494.24	2386609.22	453.04	MW-304
5003	556586.30	2385208.50	457.28	MW-383
5004	555445.72	2384518.91	456.78	MW-384
5005	555865.41	2381901.76	425.92	MW-390
5006	555581.74	2381170.93	422.65	MW-366
5007	555101.10	2380477.23	424.10	MW-391
5008	554435.21	2380838.65	420.35	MW-375
5009	554198.54	2381923.80	418.58	MW-377

Land Description of the Baldwin Energy Complex
Closed Fly Ash Pond Restricted Use Area
263.05 Acres

Part of the Southeast Quarter of Section 9, Part of the South Half of Section 10, Part of the North Half of Section 15 and Part of the Northeast Quarter of Section 16 in Township 4 South, Range 7 West of the Third Principal Meridian, Randolph County, Illinois and being more particularly described as follows:

Commencing at the Iron Pin at the Center of Section 9 from which bears an Iron pin at the North Quarter corner of Section 9, North 0 degrees 25 minutes 30 seconds East a distance of 2656.02 feet and from which also bears an Iron Pin at the South Quarter corner of section 9, South 0 degrees 35 minutes 53 seconds West a distance of 2653.39 feet; thence from said commencement point at the center of Section 9 along a line bearing South 89 degrees 17 minutes 38 seconds East a distance of 7950.22 feet to the PK nail at the East Quarter corner of Section 10 from which bears an Iron Pipe at the Northeast corner of Section 10, North 1 degrees 00 minutes 51 seconds East a distance of 2661.77 feet and from which also bears a pinched Pipe at the Southeast corner of Section 10, South 0 degrees 53 minutes 16 seconds West a distance of 2673.54 feet; thence from said PK nail at the East Quarter corner of Section 10, North 89 degrees 17 minutes 38 seconds West a distance of 849.95 feet; thence South 7 degrees 30 minutes 27 seconds West a distance of 103.00 feet to the Point of Beginning of the Tract described herein; thence South 7 degrees 30 minutes 27 seconds West a distance of 3616.31 feet; thence along a curve to the right having a radius of 1000.00 feet, a curve length of 1653.34 feet and having a chord bearing South 54 degrees 52 minutes 20 seconds West a chord distance of 1471.36 feet; thence North 77 degrees 45 minutes 47 seconds West a distance of 3908.68 feet; thence North 12 degrees 14 minutes 13 seconds East a distance of 60.00 feet; thence North 77 degrees 45 minutes 47 seconds West a distance of 740.00 feet; thence North 12 degrees 14 minutes 13 seconds East a distance of 85.00 feet; thence North 76 degrees 34 minutes 11 seconds East a distance of 211.55 feet; thence North 29 degrees 31 minutes 23 seconds East a distance of 614.98 feet; thence North 7 degrees 13 minutes 22 seconds West a distance of 119.44 feet; thence North 70 degrees 30 minutes 26 seconds East a distance of 2257.95 feet; thence South 68 degrees 20 minutes 52 seconds East a distance of 1922.27 feet; thence along a curve to the left having a radius of 275.00 feet, a curve length of 425.70 feet and having a chord bearing North 67 degrees 18 minutes 19 seconds East a chord distance of 384.45 feet; thence North 22 degrees 57 minutes 29 seconds East a distance of 2077.01 feet; thence North 8 degrees 53 minutes 57 seconds East a distance of 354.31 feet; thence along a curve to the right having a radius of 275.00 feet, a curve length of 483.01 feet and having a chord bearing North 59 degrees 13 minutes 00 seconds East a chord distance of 423.28 feet; thence South 70 degrees 27 minutes 58 seconds East a distance of 207.93 feet to the Point of Beginning and containing 263.05 Acres.

SURVEYOR CERTIFICATE:
THIS IS TO CERTIFY THAT WE, INGENAE, LLC, HAVE AT THE REQUEST OF AND FOR THE EXCLUSIVE USE OF VISTRA CORP., PERFORMED A SURVEY OF THE TRACT AS SHOWN HEREON AND THAT THIS IS A TRUE REPRESENTATION OF THAT SURVEY. THIS PLAT AND THE SURVEY FROM WHICH IT IS BASED WERE DONE IN ACCORDANCE WITH THE "MINIMUM STANDARDS OF PRACTICE" FOR LAND SURVEYING IN THE STATE OF ILLINOIS.

INGENAE, LLC
PROFESSIONAL DESIGN FIRM
LICENSE NO. 184.007588-0010

STATE OF ILLINOIS
MICHAEL J. GRAMINSKI
35-2901
PROFESSIONAL LAND SURVEYOR

May 4th 2021

MICHAEL J. GRAMINSKI, I.P.L.S. NO. 035.002901 ***DATE***
EXPIRES: 11/30/2022

IngenAE
502 Earth City Plaza, Suite 120
Earth City, MO 63045
www.ingenae.com

Submissions / Revisions: Date:

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13		

Project Name & Location:

BALDWIN
ENERGY COMPLEX
10901 BALDWIN RD.
BALDWIN, IL 62217

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Drawing Name:
CLOSED FLY ASH POND
RESTRICTED USE
BOUNDARY EXHIBIT

Date: 5/4/2021	Project No.
Type: SITE	Drawing No. 1
Drawn By: CB	
Approved By: MG	
Scale: AS NOTED	

Luminant

DYNEGY MIDWEST GENERATION, LLC.
BALDWIN ENERGY COMPLEX

RESTRICTED USE AREA BOUNDARY CORNERS SET				
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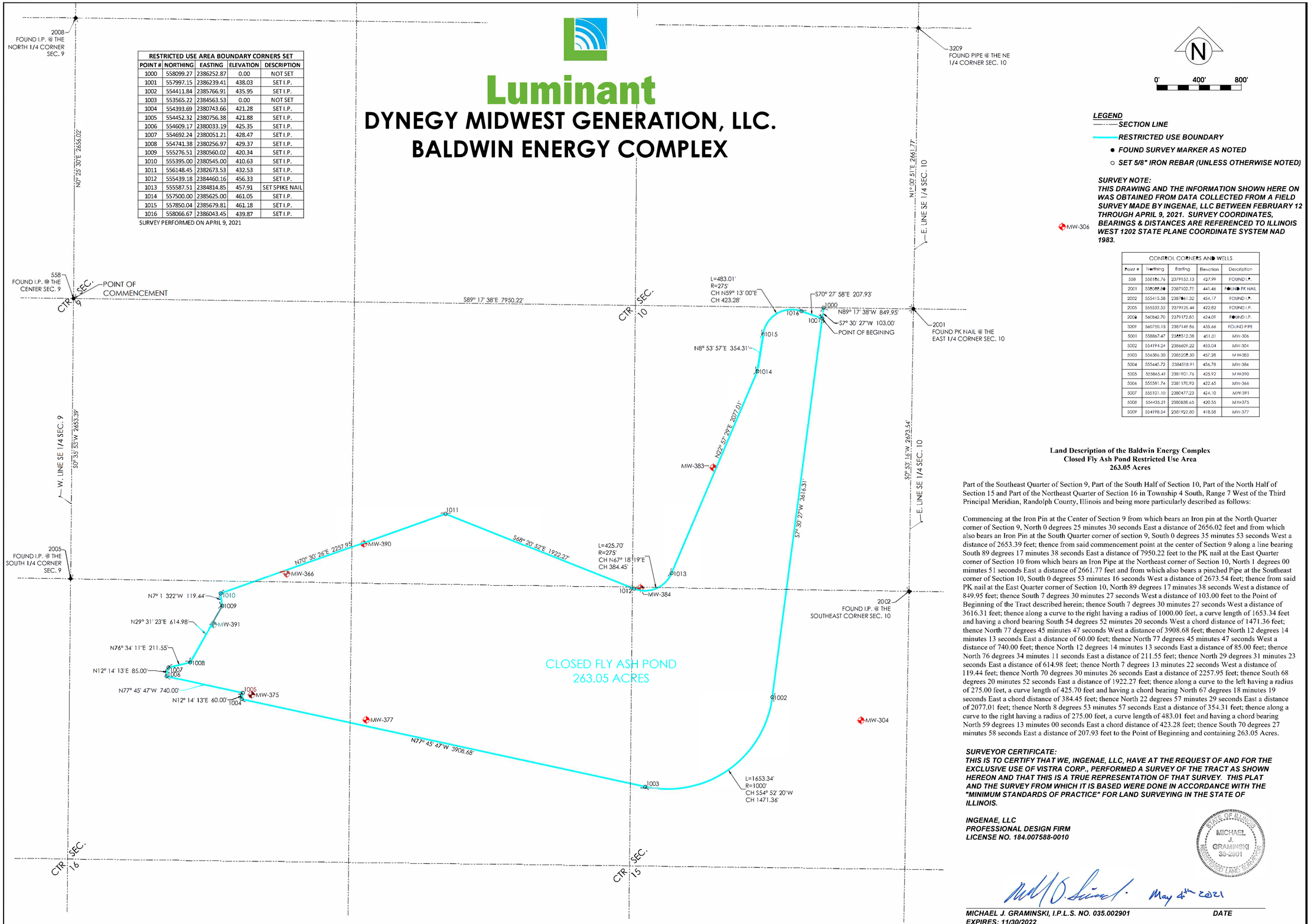
1016	558066.67	2386043.45	439.87	SET I.P.

SURVEY PERFORMED ON APRIL 9, 2021



N

0' 400' 800'

LEGEND

- ***SECTION LINE***
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MW-306

CONTROL CORNERS AND WELLS				
Point #	Northing	Easting	Elevation	Description
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INGENAE, LLC
PROFESSIONAL DESIGN FIRM
LICENSE NO. 184.007588-0010

STATE OF ILLINOIS
MICHAEL J. GRAMINSKI
35-2901
PROFESSIONAL LAND SURVEYOR

May 4th 2021

MICHAEL J. GRAMINSKI, I.P.L.S. NO. 035.002901 ***DATE***
EXPIRES: 11/30/2022

IngenAE
502 Earth City Plaza, Suite 120
Earth City, MO 63045
www.ingenae.com

Submissions / Revisions:	Date:
1	
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Project Name & Location:

BALDWIN
ENERGY COMPLEX
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Drawing Name:
CLOSED FLY ASH POND
RESTRICTED USE
BOUNDARY EXHIBIT

Date: 5/4/2021	Project No.
Type: SITE	Drawing No. 1
Drawn By: CB	
Approved By: MG	
Scale: AS NOTED	

APPENDIX B
GROUNDWATER INFORMATION (845.220(a)(7)(A-C), 845.220(c)(2-5))

APPENDIX B.1
CORRECTIVE ACTION GROUNDWATER MONITORING PLAN

Intended for
Dynegy Midwest Generation, LLC
10901 Baldwin Road
Baldwin, IL 62217

Date
April 22, 2025

Project No.
1940110241-005

CORRECTIVE ACTION GROUNDWATER MONITORING PLAN

BALDWIN POWER PLANT, FLY ASH POND SYSTEM, IEPA ID NO. W1578510001-01, W1578510001-02, AND W1578510001-03

RAMBOLL Bright ideas. Sustainable change.

CORRECTIVE ACTION GROUNDWATER MONITORING PLAN BALDWIN POWER PLANT, FLY ASH POND SYSTEM, IEPA ID NO. W1578510001-01, W1578510001-02, AND W1578510001-03

Project name	**Baldwin Power Plant Fly Ash Pond System**
Project no.	**1940110241-005**
Recipient	**Dynegy Midwest Generation, LLC**
Document type	**Corrective Action Groundwater Monitoring Plan**
Revision	**FINAL**
Date	**April 22, 2025**

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FIGURES (ATTACHED)

Figure 1-1 Corrective Action Monitoring Outline
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APPENDICES

Appendix A Boring Logs and Well Construction Forms
Appendix B 35 I.A.C. § 845 Multi-Site Statistical Analysis Plan

ACRONYMS AND ABBREVIATIONS

35 I.A.C.	Title 35 of the Illinois Administrative Code
40 C.F.R.	Title 40 of the Code of Federal Regulations
ASD	Alternative Source Demonstration
BPP	Baldwin Power Plant
CCR	coal combustion residuals
COC	constituent of concern
CSM	conceptual site model
DMG	Dynegy Midwest Generation, LLC
E001	Event 1
FAPS	Fly Ash Pond System
GMP	Groundwater Monitoring Plan
gpm	gallons per minute
GWMS	groundwater management system
GWPS	groundwater protection standard
ID	identification
IEPA	Illinois Environmental Protection Agency
IPCB	Illinois Pollution Control Board
No.	Number
PMP	Potential migration pathway
QA/QC	quality assurance/quality control
Ramboll	Ramboll Americas Engineering Solutions, Inc.
RL	reporting limit
SI	surface impoundment
StAP	Statistical Analysis Plan
UA	uppermost aquifer
UU	Upper unit
USEPA	United States Environmental Protection Agency

1. INTRODUCTION

1.1 Overview

In accordance with requirements of Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845: Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments, Ramboll Americas Engineering Solutions, Inc. (Ramboll) has prepared this Corrective Action Groundwater Monitoring Plan (GMP) on behalf of Baldwin Power Plant (BPP), operated by Dynegy Midwest Generation, LLC. (DMG). This GMP will apply specifically to the coal combustion residuals (CCR) Multi-Unit referred to as the Fly Ash Pond System (FAPS; CCR unit identification [ID] number [No.] 605 and National Inventory of Dams [NID] No. IL50723). The FAPS consists of three CCR SIs including the Old East Fly Ash Pond System (Illinois Environmental Protection Agency [IEPA] ID No. W1578510001-01), the East Fly Ash Pond (IEPA ID No. W1578510001-02), and the West Fly Ash Pond (IEPA ID No. W1578510001-03). The FAPS is a closed, unlined CCR Multi-Unit that was previously used to manage CCR and non-CCR waste streams at the BPP. This Corrective Action GMP includes content requirements specific to 35 I.A.C. § 845.630 (*Groundwater Monitoring System*), 35 I.A.C. § 845.640 (*Groundwater Sampling and Analysis*), 35 I.A.C. § 845.650 (*Groundwater Monitoring Program*), and 35 I.A.C. § 845.680 (*Implementation of the Corrective Action Plan*) for the FAPS at the BPP.

A checklist in **Table 1-1** provides references to sections, tables, and figures within this document that meet the specific requirements of 35 I.A.C. § 845.630, 35 I.A.C. § 845.640, 35 I.A.C. § 845.650, and 35 I.A.C. § 845.680.

This Corrective Action GMP will be included as Appendix B.1 to the Construction Permit Application for the BPP FAPS. DMG completed significant source control efforts in 2020 as part of final closure of the FAPS [1]. The final closure was performed in accordance with the Closure and Post-Closure Care Plan [2] that was developed in accordance with Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257 and submitted to IEPA for review. IEPA found "*…that the plan…represent an appropriate means by which to close the Baldwin Fly Ash Pond System which is comprised of the East Fly Ash Pond, the Old East Fly Ash Pond and the West Fly Ash Pond*" [3].

The Corrective Action Plan proposes source control with a groundwater management system (GMS) as the remedy for the FAPS. As described in the Corrective Action Plan, the proposed remedy meets the performance standards of 35 I.A.C. § 845.670(d) and addresses all current and potential future releases from the FAPS. Likewise, this Corrective Action GMP establishes how data will be collected, documented, and evaluated to assess remedy effectiveness for all currently documented and potential future releases from the FAPS[1] per the process outlined in **Figure 1-1**.

Adaptive site management strategies are an integral part of corrective action groundwater monitoring. The adaptive site management approach consistent with National Research Council, Interstate Technology & Regulatory Council and United States Environmental Protection Agency (USEPA) methodologies will allow timely incorporation of new site information throughout corrective action to ensure the achievement of the groundwater protection standard (GWPS). The adaptive site management approach expedites progress toward meeting the GWPS while acknowledging uncertainties, such as the persistence of current groundwater flow directions and

[1] The presence of exceedances at the waste boundary will continue to be evaluated under the Operating permit GMP previously submitted to IEPA [10].

potential related changes in geochemical conditions. The structured decision-making process proposed in this Corrective Action GMP includes specific metrics used to evaluate remedy progress, criteria which would trigger adaptive management evaluation, and options for those management actions.

1.2 Site Location and Background

The BPP is located in southwest Illinois in Randolph and St. Clair Counties. The Randolph County portion of the BPP is located within Sections 2, 3, 4, 9, 10, 11, 14, 15, and 16 of Township 4 South and Range 7 West. The St. Clair County portion of the property is located within Sections 33, 34, and 35 of Township 3 South and Range 7 West. The FAPS is approximately one-half mile west-northwest of the Village of Baldwin (**Figure 1-2**).

The BPP property is bordered to the west by the Kaskaskia River; to the east by Baldwin Road, farmland, and strip-mining areas; to the southeast by the village of Baldwin; to the south by the Illinois Central Gulf railroad tracks, scattered residences, and State Route 154; and to the north by farmland. The St. Clair/Randolph County Line crosses east-west at approximately the midpoint of Baldwin Lake (*i.e.,* Cooling Pond). **Figure 1-2** shows the location of the BPP; **Figure 1-3** is a site map showing the location of the FAPS (a 35 I.A.C. § 845 regulated CCR Unit and the subject of this GMP), Bottom Ash Pond (BAP), Secondary Pond, Tertiary Pond, and Cooling Pond. Information regarding the BAP, Secondary Pond, Tertiary Pond, and Cooling Pond is solely for background information, as this GMP applies specifically to the FAPS CCR unit, which will hereinafter be referred to as the Site.

1.3 Conceptual Site Model

Significant site investigation has been completed at the BPP to characterize the geology, hydrogeology, and groundwater quality. Based on the extensive investigation and monitoring, the FAPS has been well characterized, as detailed in the Hydrogeologic Site Characterization Report [4] (HCR), Nature and Extent Report [5] and HCR Revision 1 that was provided for the adjacent BAP [6], which were prepared to comply with the requirements specified in 35 I.A.C. § 845.620. These documents expand upon the Hydrogeologic Monitoring Plan [7] and the conceptual site model as presented below.

In addition to CCR, materials at the BPP have been categorized into two hydrostratigraphic units at the FAPS based on stratigraphic relationships, geologic composition, and common hydrogeologic properties. The units, listed from surface downward, are summarized as follows:

- **Upper Unit (UU):** Predominantly clay with some silt and minor sand, silt layers, and occasional sand lenses. Includes the lithologic layers identified as the Cahokia Alluvium, Peoria Loess, Equality Formation, and Vandalia Till Member. This unit is composed of unlithified natural geologic materials and extends from the upper saturated materials to the bedrock. Thin sand seams and the interface (contact) between the UU and bedrock have been identified as potential migration pathways (PMPs). No continuous sand seams were observed within or immediately adjacent to the FAPS; however, the sand seams may act as a PMP due to relatively higher hydraulic conductivities. The acronym UU and the materials it contains is synonymous with Upper Groundwater Unit used in previous documents.
- **Bedrock Unit:** This unit is considered the Uppermost Aquifer (UA) and is composed of interbedded shale and limestone bedrock, which underlies and is continuous across the entire Site.

Groundwater flow in the UA (**Figure 1-4**) is generally to the west and southwest across the Site toward the Kaskaskia River. Groundwater flow in bedrock is toward the northwest in the east and central areas of the BAP, and southwest to northwest on the east area of the FAPS until groundwater reaches the bedrock valley feature underlying the Secondary and Tertiary Ponds west of the BAP and FAPS, at which point the flow direction veers towards this bedrock surface low.

Immediately upgradient and downgradient of the BPP property boundaries, both the shallow glacial deposits and the shallow bedrock have served as a source of water supply. The shallow unlithified deposits off-site have yielded water through intermittent, discontinuous sand lenses and, in the bedrock, through fractured sandstone and limestone. However, within the area of the Site, investigations have indicated only thin and intermittent sand lenses are present within predominantly clay deposits; thus, the unlithified materials do not represent a continuous aquifer unit. Based on these details, the Bedrock Unit was designated as the UA in the *Supplemental Hydrogeologic Site Characterization and Groundwater Monitoring Plan* [8], consistent with the USEPA definition in 40 C.F.R. § 257.53.

The shallow bedrock is the only water-bearing unit that is continuous across the Site. Shallow sandstone and creviced limestone may yield small supplies in some areas, but water quality becomes poorer (*i.e.,* highly mineralized) with increasing depth. The Pennsylvanian and Mississippian rocks generally have low porosities and permeabilities, are not a reliable source of groundwater, and the quality varies considerably [9]. Therefore, the lower limit of the UA is the depth at which either the groundwater is mineralized to a point that it is no longer a useable water source, or the secondary porosities do not yield a sufficient volume of groundwater to produce a useable water supply.

1.4 Groundwater Quality

Groundwater monitoring in accordance with the proposed Operating GMP and sampling methodologies provided in the operating permit application for groundwater compliance at the FAPS began in the second quarter of 2023 [10]. The proposed compliance monitoring wells yield groundwater samples that represent the quality of downgradient groundwater at the CCR boundary (as required in 35 I.A.C. § 845.630(a)(2)).

The Event 1 (E001) quarterly groundwater monitoring event was completed on May 23, 2023. In accordance with 35 I.A.C. § 845.610(b)(3)(C), and the statistical analysis plan submitted with the operating permit application (Appendix A of the Groundwater Monitoring Plan Revision 1) constituent concentrations observed at compliance wells were evaluated for compliance with the GWPSs summarized in 35 I.A.C. § 845.600 to determine exceedances[2] of the GWPS. The following GWPS exceedances were determined at compliance groundwater monitoring wells [11]:

- Boron at wells MW-150 and MW-391
- Sulfate at well MW-150

[2] Throughout this document, "exceedance" or "exceedances" is intended to refer only to potential exceedances of proposed applicable background statistics or Groundwater Protection Standards (GWPSs) as described in the proposed groundwater monitoring program, which was submitted to the IEPA on October 25, 2021, as part of Dynegy Midwest Generation, LLC's operating permit application for the Baldwin Fly Ash Pond System. That operating permit application, including the proposed groundwater monitoring program, remains under review by the IEPA and therefore Dynegy Midwest Generation, LLC has not identified any actual exceedances.

Subsequent compliance sampling events (following E001) were also evaluated for exceedances of the GWPS as described in 35 I.A.C. § 845.600. Additional exceedances identified during the subsequent events [12, 13, 14, 15, 16] consist of the following:

- Boron at well MW-152
- Fluoride at well MW-384
- pH at wells MW-253 and MW-350
- Sulfate at wells MW-252, MW-253R, and MW-366

Pursuant to 35 I.A.C. § 845.650(e), an Alternative Source Demonstration (ASD) was completed for the pH exceedance [17] detected at MW-253 during the Quarter 3, 2023 event and received concurrence in a letter from the IEPA dated March 7, 2024 [18]. The ASD identified contamination of the groundwater by grout used in construction of the monitoring well as the alternative source for the GWPS exceedance. Consequently, a work plan to address this contamination via well abandonment and replacement was submitted to the IEPA on March 14, 2024 [19]. Similar conditions were also observed historically in background well MW-306 and compliance well MW-350 during Quarter 1, 2024, and these wells were also proposed for abandonment in the work plan. The IEPA provided written concurrence with the work plan on April 9, 2024 [20] and the wells were subsequently abandoned and replaced in early May of 2024.

During evaluation of results from groundwater sampling and Alternative Source Demonstrations, inconsistencies in concentrations and water level measurements at background well MW-358 and compliance well MW-391 were identified. Well construction at each location was inspected using a downhole camera and identified that the well casings were compromised. A plan to abandon and replace the wells was submitted to the IEPA [21] and approved in a letter/email dated September 17, 2024. The monitoring wells were replaced in October 2024, and following installation, MW-391R has been dry during monitoring events. This is consistent with the original wells at this location, MW-387 and MW-391, prior to its suspected failure in 2018. This is an indication that the bedrock at this location does not yield recoverable amounts of water and there are no potential exceedances of the GWPS at this location.

In accordance with 35 I.A.C. § 845.660, a Corrective Measures Assessment was developed to address current and potential future GWPS exceedances originating from the FAPS, excluding the pH exceedances at wells MW-253 and MW-350 as addressed in the ASD and associated work plan, and was submitted to IEPA on April 24, 2024 [22]. The selected remedy will meet the performance standards of 35 I.A.C. § 845.670(d) and once implemented and completed, the selected remedy presented in the Corrective Action Plan will attain the GWPSs.

1.5 Supplemental Site Investigation

Additional investigations were conducted in 2024 in accordance with 35 I.A.C. § 845.650 to further assess the nature, degree, and extent of boron groundwater impacts downgradient of the FAPS.

A total of four monitoring wells were installed off-site, south of the FAPS, in two phases to further delineate the extent of boron concentrations above the 35 I.A.C. § 845 GWPS. Soil samples were collected from the unconsolidated material at each location and submitted for full mineral analysis, clay mineral analysis, cation exchange capacity, metals, and loss on ignition. Three wells were

installed across PMPs within the UU in May of 2024 (MW-195, MW-196, and MW-197). After two rounds of sampling, an additional monitoring well was installed in October of 2024 (MW-198).

The Supplemental Site Investigation fully delineated the boron impacts to groundwater downgradient of the FAPS. Boron has migrated laterally to the southwest through PMPs within the UU; however, the lateral migration does not extend greater than 300 feet off-site and is limited by the creek adjacent to the BPP [23].

Sulfate concentrations above the GWPS were first detected at MW253R in July 2024 following installation of the well in May 2024. The monitoring well was installed to replace MW-253 which was impacted by grout contamination. Concentrations measured in groundwater shortly after well installation and development are often not representative of long-term stabilized concentrations, specifically in low permeability units like the UU. Additional samples collected in August and October, 2024 confirmed the elevated concentrations of sulfate and evaluation of the nature and extent of these concentrations is ongoing but is expected to be limited in extent.

2. CORRECTIVE ACTION GROUNDWATER MONITORING PLAN

This Corrective Action GMP is being provided to propose a groundwater monitoring program specific to the FAPS that will comply with 35 I.A.C. § 845.680. The Corrective Action GMP will monitor and evaluate groundwater quality specifically to document the effectiveness of the corrective action remedy. The groundwater monitoring program will include sampling and analysis procedures that are consistent and that provide an accurate representation of groundwater quality.

2.1 Corrective Action Groundwater Monitoring Program and Parameters

2.1.1 35 I.A.C. § 845 Corrective Action Groundwater Monitoring

The proposed 35 I.A.C. § 845 corrective action monitoring well network will consist of 11 wells to document the effectiveness of the corrective action remedy and ultimately demonstrate compliance with GWPSs (**Figure 2-1**). The wells included in the corrective action monitoring well network include select compliance monitoring wells from the Operating GMP network (*e.g.*, those with previously reported exceedances of the GWPS) (**Section 1.4**) and monitoring wells installed during the Supplemental Site Investigation (**Section 1.5**).

As appropriate to meet the corrective action monitoring objectives and evaluate the effectiveness of the corrective action remedy (as described in **Section 3**), the corrective action monitoring program involves assigning each well to a monitoring category or purpose (**Table 2-1**). These monitoring categories include:

- **Inside Plume**– wells located at the CCR boundary with GWPS exceedances.
- **Plume Definition** - wells located along the lateral or vertical boundary of the plume.

A summary of the well locations and associated purpose as it relates to the above categories is presented in **Table 2-1** and **Figure 2-1**. Monitoring well depths and construction details are listed in **Table 2-2** and boring logs and monitoring well construction forms are provided in **Appendix A**. Groundwater samples will be collected and analyzed for the laboratory and field parameters in **Table 2-3**. Laboratory parameters include major ions for evaluating groundwater chemistry and constituents of concern (COCs) (*i.e.*, reported exceedances in accordance with the Operating GMP) the Corrective Action is intended to address. Sampling to evaluate corrective action effectiveness will begin the quarter after the corrective action remedy is implemented and commissioned.

2.2 Sampling Schedule

All wells in the 35 I.A.C. § 845 corrective action GMP network, as presented in **Table 2-1**, will be sampled quarterly to provide a complete picture of corrective action effectiveness. Groundwater elevations will be determined at the time of sample collection from each well. Sampling will end in accordance with 35 I.A.C. § 845.680(c), when compliance with the GWPS has been demonstrated "at all points within the plume of contamination that lies beyond the waste boundary […] for a period of three consecutive years" (details in **Section 3.3**).

Consistent with 35 I.A.C. § 845.650(b)(4), quarterly sampling may be reduced to a semiannual frequency with IEPA approval after completion of five years of monitoring. A request for reduced sampling frequency will include a demonstration that corrective action monitoring effectiveness will not be compromised; sufficient data has been collected to evaluate ongoing remedy effectiveness; and existing data show trends consistent with anticipated remedy performance (details in **Section 3.1**).

2.3 Groundwater Sample Collection

Groundwater samples will be collected and analyzed in accordance with the Multi-Site Sampling and Analysis Plan [24]. Groundwater sampling procedures have been developed and the collection of groundwater samples is being implemented to meet the requirements of 35 I.A.C. § 845.640. In addition to groundwater well samples, quality assurance samples will be collected as described in **Section 2.5** (**Table 2-3**).[3]

2.4 Laboratory Analysis

Laboratory analysis will be performed consistent with the requirements of 35 I.A.C. § 845.640(j) by a state-certified laboratory using methods approved by IEPA and USEPA. Laboratory methods may be modified based on laboratory equipment availability or procedures, but the Reporting Limit (RL) for all parameters analyzed, regardless of method, will be lower than the applicable groundwater quality standard [24]. Concentrations lower than the RL will be reported as less than the RL.

2.5 Quality Assurance Program

Consistent with the requirements of 35 I.A.C. § 845.640(a)(5), the sampling and analysis program includes procedures and techniques for quality assurance/quality control (QA/QC). Additional quality assurance samples to be collected will include the following:

- Field duplicates will be collected at a frequency of one per group of ten or fewer investigative water samples.
- One equipment blank sample will be collected and analyzed for each day of sampling. If dedicated sampling equipment is used, then equipment blank samples will not be collected.
- The duplicate and equipment blank quality assurance samples will be supplemented by the laboratory QA/QC program, which typically includes:
  - Regular generation of instrument calibration curves to assure instrument reliability
  - Laboratory control samples and/or quality control check standards that have been spiked, and analyses to monitor the performance of the analytical method
  - Matrix spike/matrix spike duplicate analyses to determine percent recoveries and relative percent differences for each of the parameters detected
  - Analysis of replicate samples to check the precision of the instrumentation and/or methodology employed for all analytical methods
  - Analysis of method blanks to assure that the system is free of contamination

[3] The Multi-Site Sampling and Analysis Plan and Multi-Site Quality Assurance Project plan are living documents which are subject to routine evaluation and updates in accordance with USEPA recommended best practices [35] [36].

Water quality meters used to measure pH and turbidity will be calibrated according to manufacturer's specifications. At a minimum, it is recommended that calibration of pH occur daily prior to sampling and checked for accuracy at the end of each day. Unusual or suspect pH measurements during sampling events will be flagged, evaluated, and additional calibration may be performed throughout the sampling events. Turbidity meters will be checked daily, prior to and following sampling. Unusual measurements or erratic meter performance will be flagged and evaluated for overall effects on the data prior to reporting.

2.6 Groundwater Monitoring Well Maintenance Plan

Consistent with the requirements of 35 I.A.C. § 845.630(e)(2), maintenance will be performed according to the Multi-Site Quality Assurance Project Plan [25] as needed to assure that the monitoring wells provide representative groundwater samples. Monitoring wells will be inspected during each groundwater sampling event; inspections will consist of the following:

- Visual inspection, clearing of vegetation, replacement of markers, and painting of protective casings as needed to assure that monitoring wells are clearly marked and accessible
- Visual inspection and repair or replacement of well aprons as needed to assure that they are intact, drain water away from the well, and have not heaved
- Visual inspection and repair or replacement of protective casings as needed to assure that they are undamaged, and that locks are present and functional
- Checks to assure that well caps are intact and vented, unless in flood-prone areas in which case caps will not be vented
- Routine measurement of monitoring well depths to determine the degree of siltation within the wells. Wells will be redeveloped as needed to remove siltation from the screened interval if it impedes flow of water into the well
- Checks to assure that wells are clear of internal obstructions, and flow freely

If wells are damaged or become otherwise inoperable, they will be replaced by wells screened at the same elevation and as close to the original well as possible (ideally within 10 feet) and notification will be provided to IEPA. If a replacement well cannot be installed within approximately 10 feet of the original well location, notification will be sent to IEPA and a monitoring well will be installed as close as possible to the original monitoring well and given a new well identification number. Any well replacement activities will also be documented in the Annual Groundwater Monitoring and Corrective Action Report.

2.7 Statistical Analysis

A Multi-Site Statistical Analysis Plan (StAP) (**Appendix B**) has been developed to describe the statistical procedures that will be used to evaluate the groundwater results.

2.8 Data Reporting

Groundwater monitoring and analysis completed in accordance with 35 I.A.C. § 845 under an approved monitoring program will be reported to IEPA annually by January 31 as required by I.A.C. § 845.550, for data collected the preceding year. The Annual Groundwater Monitoring and Corrective Action Report will include the status of the groundwater monitoring and Corrective Action Plan for the FAPS in addition to other requirements detailed in 35 I.A.C. § 845.610(e).

2.9 Compliance with Applicable Groundwater Protection Standards

As provided in 35 I.A.C. § 845.680(c)(2), corrective action is considered complete when compliance with the GWPS has been achieved by demonstrating that concentration of constituents listed in 35 I.A.C. § 845.600 have not exceeded the GWPSs for a period of three consecutive years, using the statistical procedures and performance standards in 35 I.A.C. § 845.640(f) and (g).

Attainment of GWPSs and conclusion of corrective action monitoring is discussed below in **Section 3.3**.

If a new exceedance is determined during monitoring under the Operating GMP, the Corrective Action groundwater monitoring program will be evaluated for monitoring of additional locations and/or constituents using the adaptive site management methods presented herein.

3. EFFECTIVENESS OF THE CORRECTIVE ACTION REMEDY

The methods for evaluating the effectiveness of the corrective action remedy described in this section are based on the following guidance documents:

- "Methods for Evaluating the Attainment of Cleanup Standards Volume 2: Ground Water," USEPA, Office of Policy, Planning, and Evaluation, 1992 [26].
- "Groundwater Remedy Completion Strategy: Moving Forward with the End in Mind," Office of Solid Waste and Emergency Response, 2014 [27].
- "Adaptive Site Management – A Framework for Implementing Adaptive Management at Contaminated Sediment Superfund Sites," USEPA, Office of Superfund Remediation and Technology Innovation, 2022 [28].
- "Environmental Cleanup Best Management Practices: Effective Use of the Project Life Cycle Conceptual Site Model," USEPA, Office of Solid Waste and Emergency Response, 2011 [29].

Evaluation of corrective action remedy effectiveness will occur in three phases (**Figure 3-1**): remedy progress evaluation, stability evaluation, and attainment evaluation [30].

1. Remedy progress evaluation occurs after implementation of corrective actions to assesses if the remedy is functioning as anticipated.
2. The stability evaluation, which occurs after groundwater management system has been concluded and a re-equilibration period has elapsed, assesses if a new post-groundwater management system steady state in the groundwater has been reached.
3. Attainment evaluation occurs after a new steady state has been achieved and assesses if COC concentrations are below the GWPS.

COCs are parameters with exceedances of the GWPS to be addressed by the Corrective Action Plan. Corrective action monitoring at BPP FAPS includes the following COC parameters:

- Boron, fluoride, and sulfate

The effectiveness of the remedy at each phase is evaluated using performance metrics designed to assess the goals of that phase. Performance metrics answer questions designed to evaluate multiple aspects of remedy effectiveness with the ultimate goal of holistically guiding management decisions [31]. These metrics may be evaluated using qualitative (subject to expert judgement) or quantitative (numerical outcomes) methods.

This section details the goals and performance metrics of each phase of remedy evaluation. Within each phase, the well groups described in **Section 2.1** have distinct applicable metrics and/or potential management actions consistent with the role of that well group within the corrective action monitoring framework. The remedy evaluation metrics documented here are specific to wells within the Corrective Action monitoring program.

3.1 Remedy Progress Evaluation

The goal of remedy process evaluation is to determine if a groundwater remedy is on track to achieve cleanup standards within the proposed time frame and to inform adaptive management decisions if performance metrics are not achieved. Evaluation of remedy progress includes evaluating the response of COCs in individual monitoring wells and in the plume as a whole.

Remedy progress is evaluated using performance metrics as described below. **Table 3-1** details the questions used to assess remedy progress and metrics which would trigger additional evaluation of adaptive site management options. **Figure 3-2** presents an outline of the decision-making process regarding adaptive management actions (the first step of which is assessing remedy progress per **Table 3-1**).

Documentation of remedy progress metrics will be provided in the Annual Groundwater Monitoring and Corrective Action Report (**Section 2.8**) beginning after the second year of data collection: a minimum of eight data points is required to complete meaningful statistical analysis required for evaluation of the remedy progress metrics, which will be available after two years of quarterly sampling. Per USEPA guidance [31], a thorough review of corrective action progress and remedy effectiveness will be conducted every five years. A Five-Year Annual Groundwater Monitoring and Corrective Action Report will evaluate the comprehensive data set and, if triggered by the results of the remedy progress evaluation metrics (**Table 3-1**), evaluate whether adaptive management actions are needed (**Figure 3-2**). The five-year time frame allows adaptive management decisions to be based on robust data sufficient to complete meaningful statistical analysis while remaining responsive to changing site conditions [31]. The remedy progress evaluation metrics and triggers for additional evaluation are described below.

3.1.1 Comparison to Groundwater Protection Standard

The Inside Plume wells in this monitoring plan were defined based on exceedances of the GWPS. The question posed to evaluate whether exceedances of the GWPS occur, and associated method of evaluation is (**Table 3-1**):

- Are COC concentrations greater than the GWPS? – Compare data points or summary statistics to site-specific GWPS values.

COC concentrations below the GWPS in Inside Plume wells may indicate that remedial actions are approaching completion and that moving to the next phase of remedy effectiveness evaluation may be warranted (see **Section 3.2**). Persistence of COC concentrations above the GWPS in Plume Definition wells may indicate that the plume is no longer properly delineated. Therefore, the trigger criterion for further evaluation is a central tendency measure of the last eight data points exceeding the GWPS.

3.1.2 Agreement with Groundwater Model

A groundwater flow and transport model[4] was used to compare the anticipated time to reach the GWPS for the different corrective actions considered at the FAPS.

The question posed to evaluate agreement of corrective action remedy progress with the groundwater model results is provided in **Table 3-1** and summarized below:

- Are concentrations of COCs at individual wells consistent with modeling expectations? – Evaluate if the observed results track with the predicted results in general direction and magnitude using expert professional judgement.

Only Inside Plume and Plume Definition wells included in the flow and transport model are evaluated according to this metric. Trigger criteria for additional adaptive site management

[4] The Groundwater Modeling Technical Memorandum is included as an attachment to the Corrective Actions Alternative Analysis presented as part of the Corrective Action Plan.

evaluation include monitoring results failing to follow the general magnitude and direction of groundwater model results at one or more locations. It is acceptable to conclude that no further adaptive site management evaluation is triggered if future observations do not precisely match modeled results on an individual well basis if the direction of remedy progress is adequate.

3.1.3 Trend Analysis

Evaluation of COC trends in wells both within and outside of the plume is a major component of remedy progress evaluations [30, 31]. Decreasing COC concentrations within the groundwater plume provides critical support for remedy effectiveness evaluations. Changing concentrations in wells defining the plume may indicate unanticipated plume migration or a need for better plume definition. Both short-term and long-term trends are important to evaluate remedy performance [30]. All trend analyses are performed in accordance with the Multi-Site StAP (**Appendix B**) and the USEPA Unified Guidance for groundwater statistics [32].

The questions posed to evaluate if COC concentrations are decreasing in Inside Plume wells and the associated methods for evaluation are provided in **Table 3-1** and summarized as follows:

- Are average plume COC concentrations decreasing? – Evaluate trend based on quarterly average of COC concentrations of Inside Plume wells, both for the last eight sampling events and since corrective action was initiated.

The questions posed to evaluate if COC concentrations are changing in Inside Plume wells and Plume Definition wells and the associated methods for evaluation are provided in **Table 3-1** and summarized below:

- Are concentrations of COCs at individual wells changing? – Evaluate trend of COC concentrations, both for the last eight sampling events and since corrective action was initiated.

The goal of the corrective action is to reduce COC concentrations in the groundwater. Therefore, trigger criteria have been established for the three types of corrective action monitoring wells as follows:

- Inside Plume well triggers for adaptive site management evaluation are based on no decreasing trend in COC concentrations (short-term or long-term).
- Plume Definition well triggers are based on increasing COC concentrations, which may indicate improper delineation of the plume. Therefore, the trigger criterion for adaptive site management evaluation at Plume Definition wells is increasing short- or long-term trend.

3.1.4 Adaptive Management Actions

The goal of adaptive management actions is to understand why performance metrics are not met and, if the remedy is found to be unsuccessful in meeting remediation goals, drive supplemental corrective actions or, in extreme cases, re-evaluation of remedy selection. This section describes in greater detail the steps in the flow chart presented in **Figure 3-2** (adapted from Figure 2 in [31]).

As the remedy progress evaluation metrics are evaluated annually, failure to meet the metrics (as described in **Table 3-1**) leads to further action. If the data available at the time of the Five-Year Review are anticipated to be inadequate for determining the need for adaptive site

management actions, additional data may be collected before the Five-Year Review including collecting samples from additional wells or measuring additional parameters.

If the remedy progress is not found to be adequate during the Five-Year Review, the most critical question is whether or not the remedy is likely to achieve the GWPS in a reasonable time frame. This may be evaluated using methods such as regression analysis or analysis of groundwater flow with respect to operation of the GWMS. If the remedy progress is not judged to be adequate but the remedy is likely to achieve the GWPS in a reasonable time frame, the CSM or the groundwater model may require updating to reflect evolving field conditions[5]. Additional data collected may also suggest ways to optimize the monitoring network or performance metrics [31].

If the remedy does not appear likely to achieve the GWPS in a reasonable time frame, it may be due to changing hydrogeochemical dynamics within the plume or an additional source of COCs not accounted for in the CSM. If available data suggests either occurrence, the Five-Year Review will describe additional activities planned to investigate if the existing remedy is still a viable option for attaining the GWPS. If the remedy is still viable, an update to the CSM and groundwater model is likely required and will be conducted after additional investigation is completed.

If the remedy does not appear likely to achieve the GWPS in a reasonable time frame, there is no alternative source of COCs not accounted for in the CSM, and the plume is appropriately delineated; or if the investigation into the hydrogeochemical changes or alternative source of COCs determines that the remedial action is no longer solely viable as a corrective action, an evaluation of additional remedial actions will be initiated.

If the remedy progress evaluation metrics indicate that concentrations across the monitoring network are below the GWPS (and the GWMS system has ceased operation; see **Section 3.1.5**), the remedy progress phase may be considered complete, and the monitoring program may move to the Stability Evaluation phase (see **Section 3.2**).

3.1.5 Concluding operation of the GMS

Groundwater modeling used to support design of the GMS (Appendix B of the CAAA-SIR) [33] estimates the selected remedy of source control with the GMS will attain the GWPS in greater than 100 years. The GMS is intended to reduce the accumulation of hydraulic head beneath the FAPS cover system which reduces the potential for liquids from the FAPS to mix with groundwater and migrate past the limits of the FAPS towards the BPP southern property boundary. Source control with GMS was the most effective remedy at reducing predicted concentrations of CCR derived constituents in groundwater and minimizing the footprint of impacted groundwater. The GMS operation will only be ceased when concentrations of COCs at on-site wells adjacent to the system do not exceed the GWPS. Additional considerations such as trends in COC concentrations, analysis of groundwater flow, or seasonal variability may also influence the decision of whether to cease operating the GWMS.

A period of equilibration and rebound is typical when discontinuing groundwater management system operations and caution should be used when interpreting short-term changes in COC

[5] As stated in Section 1.4.1 of the Corrective Action Plan: "Estimated timelines for GWMS and times to reach GWPS will be periodically reviewed and updated based on observed corrective action performance via an adaptive site management strategy."

concentrations [26]. The groundwater flow and transport model may be revised to estimate the potential for rebound to occur. A "slack period" of one year (or more, based on modeling results, if applicable) will be allowed to elapse after conclusion of groundwater management system operations before stability and GWPS attainment are evaluated.

3.2 Stability Evaluation

Evaluation of groundwater stability reflects the idea that implementation of a remedy will, by necessity, cause changes to the physical and chemical environment of the groundwater. Before assessing if compliance with the GWPS has been attained (**Section 3.3**), any transient effects of treatment on the groundwater (e.g., rebounding concentrations) should be allowed to dissipate [30]. Stability is evaluated to assess if a new stable equilibrium has been reached after groundwater management system has been discontinued. Stability is achieved when groundwater elevations are stable (accounting for seasonal variability), average COC concentrations are stable across all wells, and COC concentrations are stable at each well. If groundwater management operations have been stopped, a slack period of at least one year is recommended before evaluating stability [30].

Trends in groundwater elevation and COC concentrations at each plume well will be evaluated using the most recent eight data points (*i.e.*, two years of data when sampling quarterly) according to methods presented in the Multi-Site StAP (**Appendix B**). This metric is met for a plume well when there is no statistically significant trend in groundwater elevation or COC concentrations.

Plume COC concentrations will be evaluated for trend using the most recent eight data points, with the average concentration across plume wells per sampling event considered as one data point, according to methods presented in the Multi-Site StAP (**Appendix B**). This metric is met when there is no statistically significant trend in average COC concentrations.

3.3 Attainment Evaluation and Conclusion of Corrective Action Monitoring

The ultimate goal of groundwater corrective action is to attain compliance with the GWPS for each COC in Inside Plume wells. After stability has been achieved per the metrics discussed in **Section 3.2**, attainment evaluation will begin. Per 35 I.A.C. § 845.680(c), corrective action is considered complete when compliance with the GWPS has been demonstrated "at all points within the plume of contamination that lies beyond the waste boundary […] for a period of three consecutive years". Attainment of the GWPS will be evaluated in accordance with the Multi-Site StAP (**Appendix B**). Corrective action monitoring is considered complete for the site when COCs in the corrective action monitoring well network do not exceed the GWPS for three years.

4. REFERENCES

[1] Luminant, "Letter from Phil Morris (Dynegy Midwest Generation, LLC) to Darin Lecrone, P.E. (IEPA), re: Letter from Phil Morris (Dynegy Midwest Generation, LLC) to Darin Lecrone, P.E. (IEPA), re: Baldwin Power Plant Groundwater Well Abandonment and Replacement.," December 17, 2020.

[2] AECOM, "Closure and Post-Closure Care Plan for the Baldwin Fly Ash Pond System. Baldwin Energy Complex. Baldwin, Illinois," March 31, 2016.

[3] Illinois Environmental Protection Agency, "Dynegy Midwest Generation, Inc. Baldwin Energy Complex: Baldwin Fly Ash Pond System Closure - NDPES Permit No. IL0000043.," August 16, 2016.

[4] Ramboll Americas Engineering Solutions, Inc., Hydrogeologic Site Characterization Report, Bottom Ash Pond, Baldwin Power Plant, Baldwin, Illinois., October 25, 2021.

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TABLES

Table 1-1. 35 I.A.C. § 845 Requirements Checklist
Corrective Action Groundwater Monitoring Plan
Baldwin Power Plant
Fly Ash Pond System
Baldwin, IL

35 I.A.C. § 845 Reference	35 I.A.C. § 845 Components	Location of Information in Corrective Action GMP
845.630	**Groundwater Monitoring Systems**	
845.630(a)(2)	Potential contaminant pathways must be monitored.	NA
845.630(a) 845.630(b) 845.630(c)	At least two upgradient wells and four downgradient wells (min. 1 and 3, but requires additional documentation)	Section 2.1 Figure 1-4
845.630(a) 845.630(b) 845.630(c)	Downgradient Well Density	Figure 1-4
845.630(a)(2)	Downgradient wells at waste boundary	Figure 1-4
845.640	**Groundwater Sampling and Analysis Requirements**	
845.640(a)	Consistent sampling and analysis procedures	Section 2 Tables 2-3 and 2-4
845.640(b)	Methods are appropriate	Section 2 Tables 2-3 and 2-4
845.640(c)	Groundwater elevations must be measured in each well prior to purging, each time groundwater is sampled.	Section 2.2
845.640 (d)(e)(f)(g)(h)	Establishment of background and application of statistical methods	Section 2.7 Appendix A
845.640(i)	Analyze total recoverable metals	Table 2-3
845.640(j)	Analyze groundwater samples using a certified laboratory	Section 2.4
845.650	**Groundwater Monitoring Program**	
845.650(a)	Must include monitoring for all constituents with a groundwater protection standard in Section 845.600(a), calcium, and turbidity	Section 2.1 Table 2-3
845.650(b)(c)	Groundwater Monitoring Frequency	Section 2.2
845.650(d)(e)	Exceedances of the groundwater protection standard	Sections 2.9 and 3.1.1
845.650(b)(2) and (3)	Staff gauge/ piezometer to monitor head in impoundment	NA
NA	Staff gauge/ piezometer to monitor head of neighboring surface water body	NA
845.680	**Implementation of the Corrective Action Plan**	
845.680(a)(1)(a)	Establish and implement a corrective action groundwater monitoring program that meets requirements of 845.650	Sections 2.1 and 3 Tables 2-1 and 3-1 Figure 2-1
845.680(a)(1)(b)	Document the effectiveness of the corrective action remedy	Section 3
845.680(a)(1)(c)	Demonstrate compliance with the groundwater protection standard under Subsection [845.680] (c)	Sections 2.9 and 3
845.680(c)(1)	Demonstrate compliance with the groundwater protection standards established by 845.600 has been achieved at all points within the plume of contamination that lies beyond the waste boundary	Section 3.3
845.680(c)(2)	Demonstrate that concentrations of constituents listed in 845.600 have not exceeded the groundwater protection standards for a period of three consecutive years using statistical procedures and performance standards in 845.640(f) and (g)	Sections 3.3 and 3.4

[O: EGP 12/05/24; C: CJC 01/17/25]

Notes:
GMP = Groundwater Monitoring Plan
NA = Not Applicable

Table 2-1. Summary of Monitoring Well Locations and Purpose

Corrective Action Groundwater Monitoring Plan

Baldwin Power Plant

Fly Ash Pond System

Baldwin, IL

Well ID	Monitored Unit	Corrective Action Monitoring Well System	
		Inside Plume	Plume Definition
MW-150	PMP	X	
MW-152	PMP	X	
MW-252	PMP	X	
MW-253R	PMP	X	
MW-350R	UA		X
MW-352	UA		X
MW-366	UA	X	
MW-384	UA	X	
OW-257	PMP		X
PZ-174	PMP	X	
PZ-176	PMP		X

[O: EGP 1/14/25; C: CJC 1/17/25; U: AOC 02/06/25]

Notes:

PMP = Potential Migration Pathway

UA = Uppermost Aquifer

Table 2-2. Monitoring Well Locations and Construction Details

Corrective Action Groundwater Monitoring Plan

Baldwin Power Plant

Fly Ash Pond System

Baldwin, IL

Location	HSU	Date Constructed	Top of PVC Elevation (ft)	Measuring Point Elevation (ft)	Measuring Point Description	Ground Elevation (ft)	Screen Top Depth (ft bgs)	Screen Bottom Depth (ft bgs)	Screen Top Elevation (ft)	Screen Bottom Elevation (ft)	Well Depth (ft bgs)	Bottom of Boring Elevation (ft)	Screen Length (ft)	Screen Diameter (inches)	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
MW-150	PMP	2010-09-01	396.76	396.93	Top of Casing	394.08	15	24.7	379.08	369.38	25.2	368.88	9.6	2	38.189408	-89.878474
MW-152	PMP	2010-09-01	424.94	425.11	Top of Casing	422.12	7.5	16.7	414.62	405.42	17.2	404.92	9.3	2	38.187576	-89.866771
MW-252	PMP	2010-09-01	424.94	425.11	Top of Casing	422.29	44.4	49	377.89	373.29	49.5	372.79	4.6	2	38.18757	-89.866752
MW-253R	PMP	2024-05-01	445.49	445.66	Top of Casing	442.65	29.5	34.5	413.15	408.15	35	407.65	5	2	38.185890	-89.860997
MW-350R	UA	2024-05-03	396.13	396.30	Top of Casing	394.13	42	47	352.13	347.13	47	347.13	5	2	38.189423	-89.878453
MW-352	UA	2010-09-01	424.76	424.93	Top of Casing	422.39	67.9	72.5	354.49	349.89	73	348.59	4.6	2	38.187560	-89.866736
MW-366	UA	2015-12-04	424.91	425.08	Top of Casing	422.51	42	52	380.51	370.51	52	368.21	10	2	38.192192	-89.872345
MW-384	UA	2015-12-18	458.70	458.87	Top of Casing	456.60	60.5	70.5	396.10	386.10	70.5	362.50	10	2	38.191789	-89.860699
OW-257	PMP	2013-08-01	430.94	431.11	Top of Casing	428.30	34	38.5	394.30	389.80	39.1	388.70	4.5	2	38.193873	-89.867461
PZ-174	PMP	2015-08-04	401.30	401.47	Top of Casing	399.07	14.5	24.5	384.57	374.57	24.5	374.37	10	2	38.189689	-89.877215
PZ-176	PMP	2015-08-06	405.72	405.89	Top of Casing	403.61	18.1	28.1	385.51	375.51	28.6	375.01	10	2	38.188573	-89.871629

[O: RAB 1/14/25; C: EGP 1/17/25; U: AOC 02/06/25]

Notes:

All elevation data are presented relative to the North American Vertical Datum 1988 (NAVD88), GEOID 12A

bgs = below ground surface

ft = foot or feet

HSU = Hydrostratigraphic Unit

PMP = Potential Migration Pathway

UA = Uppermost Aquifer

Table 2-3. Sampling and Analysis Summary
Corrective Action Groundwater Monitoring Plan
Baldwin Power Plant
Fly Ash Pond System
Baldwin, IL

Parameter	Analytical Method [1]	Number of Samples	Field Duplicates [2]	Field Blanks [3]	Equipment Blanks [3]	MS/MSD [4]	Total	Container Type	Minimum Volume [5]	Preservation (Cool to 4 °C for all samples)	Sample Hold Time from Collection Date
Corrective Action Parameter(s)[6]											
Boron	6020 [7]	11	2	0	0	1	14	plastic	600 mL	HNO_3 to pH<2	6 months
Fluoride	9214 or EPA 300	11	2	0	0	1	14	plastic	300 mL	Cool to 6 °C	28 days
Sulfate	9036 or EPA 300	11	2	0	0	1	14	plastic	50 mL	Cool to 6 °C	28 days
Inorganic Parameters											
Alkalinity, bicarbonate	SM 2320 B	11	2	0	0	1	14	plastic	500 mL	Cool to 6 °C	14 days
Alkalinity, carbonate	SM 2320 B	11	2	0	0	1	14	plastic	500 mL	Cool to 6 °C	14 days
Calcium	6020 [7]	11	2	0	0	1	14	plastic	600 mL	HNO_3 to pH<2	6 months
Chloride	9251 or EPA 300	11	2	0	0	1	14	plastic	100 mL	Cool to 6 °C	28 days
Magnesium	6020 [7]	11	2	0	0	1	14	plastic	600 mL	HNO_3 to pH<2	6 months
Potassium	6020 [7]	11	2	0	0	1	14	plastic	600 mL	HNO_3 to pH<2	6 months
Sodium	6020 [7]	11	2	0	0	1	14	plastic	600 mL	HNO_3 to pH<2	6 months
Total Dissolved Solids	SM2530C	11	2	0	0	1	14	plastic	200 mL	Cool to 6 °C	7 days
Field Parameters											
pH	SM 4500-H+ B	11	NA	NA	NA	NA	11	flow-through cell	NA	none	immediately
Dissolved Oxygen [8]	SM 4500-O/405.1	11	NA	NA	NA	NA	11	flow-through cell	NA	none	immediately
Temperature [8]	SM 2550	11	NA	NA	NA	NA	11	flow-through cell	NA	none	immediately
Oxidation/Reduction Potential [8]	SM 258O B	11	NA	NA	NA	NA	11	flow-through cell	NA	none	immediately
Specific Conductance [8]	SM 2510 B	11	NA	NA	NA	NA	11	flow-through cell	NA	none	immediately
Turbidity [9]	SM 2130 B	11	NA	NA	NA	NA	11	flow-through cell or hand-held turbidity meter	NA	none	immediately

[O: CJC 08/17/21; U: CJC 12/03/24; C: SWL 2/17/25]

Notes:
[1] Analytical method numbers are from SW-846 unless otherwise indicated. Analytical methods may be updated with more recent versions as appropriate.
[2] Field duplicates will be collected at a frequency of one per group of 10 or fewer investigative water samples. Field duplicates will not be collected for radium analysis.
[3] Field blanks will be collected at the discretion of the project manager; Equipment blanks will be collected at a rate of 1 per sampling event if non-dedicated equipment is used.
[4] Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples will be collected at a frequency of one per group of 20 or fewer investigative water samples per CCR unit/multi-unit. Additional volume to be determined by laboratory.
[5] Sample volume is estimated and will be determined by the laboratory.
[6] Determined by reported exceedances under the Operating Groundwater Monitoring Plan
[7] Metals may be analyzed via ICP/ICPMS USEPA methods 6010 or 6020 depending on laboratory instrument availability.
[8] Parameter collected for quality assurance and quality control for field sampling purposes only; not required to be collected or reported under 35 IAC § 845; collection of parameter may be discontinued without notification.
[9] If turbidity exceeds 10 NTUs, a duplicate sample filtered through a 0.45 micron filter may be collected for metals analysis in addition to the unfiltered sample. Both samples would be submitted for analysis.
< = less than
°C = degrees Celsius
HNO_3 = nitric acid
mL = milliliter
NA = not applicable
NTU = nephelometric turbidity unit

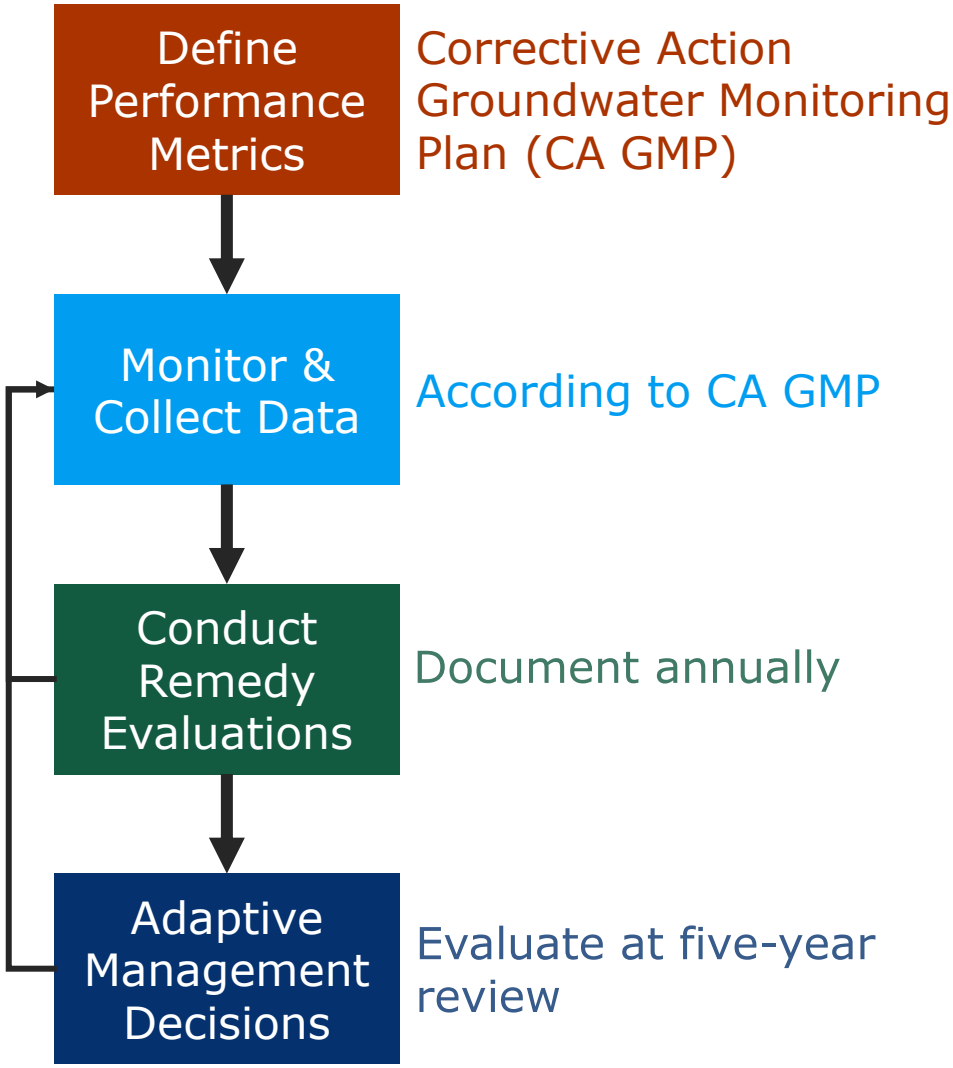
Table 3-1. Adaptive Site Management Metrics and Trigger Criteria
Corrective Action Groundwater Monitoring Plan
Baldwin Power Plant
Fly Ash Pond System
Baldwin, IL

QUESTION	**Are COC concentrations greater than the GWPS?**		**Are concentrations of COCs at individual wells consistent with modeling expectations?[a]**		**Are the average COC concentrations decreasing?**	**Are concentrations of COCs at individual wells changing?**	
EVALUATION[b]	Compare data points or summary statistics to site-specific GWPS		Do the observed results track with the predicted results in general direction and magnitude? (Professional judgement)		Evaluate trend on quarterly average of well concentrations, both for last 8 data points and since corrective action initiated or closure completed	Evaluate trend of COCs at each well, both for last 8 data points and since corrective action initiated	**Adaptive Site Management Outcome**
Inside Plume	Central tendency concentration of last eight data points above the GWPS	**AND**	Results inconsistent with model	**AND MORE THAN ONE OF**	Neither trend decreasing	Neither trend decreasing	**Additional Evaluation Triggered (See Figure 3-2)**
Lateral/Vertical Plume Definition	Central tendency concentration of last eight data points above the GWPS		Results inconsistent with model		--	Either trend increasing	

[O: AOC 07/22/24; C: CJC 12/05/24; U: AOC 02/06/25]

NOTES:
a. Only applies to wells included in the flow and transport model
b. To be documented in Annual Monitoring and Corrective Action Reports
-- = No relevant trigger criteria
COC = constituent of concern
CSM = conceptual site model
GWPS = groundwater protection standard

FIGURES



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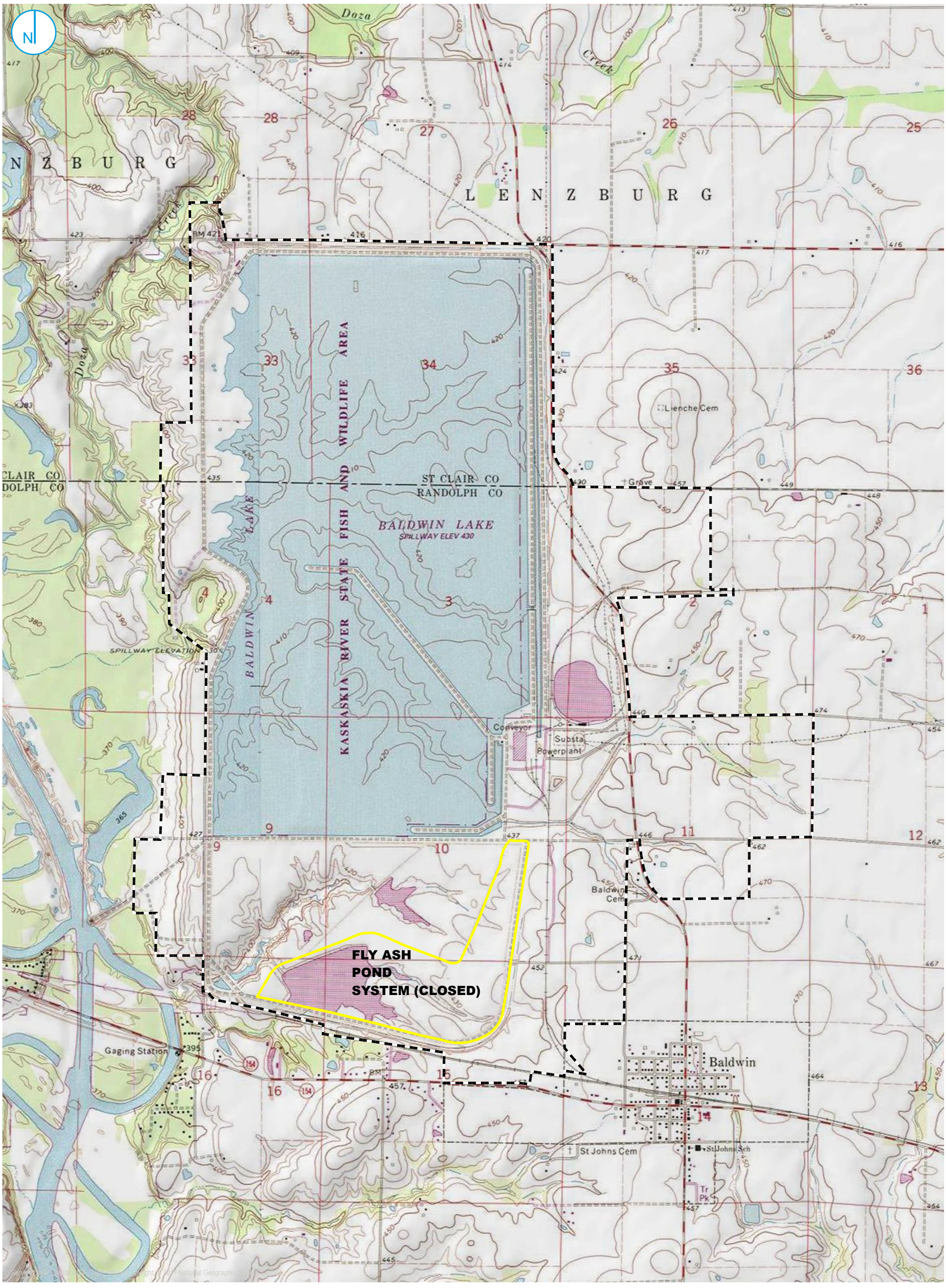
DRAFTED BY: AO

2/3/2025

CORRECTIVE ACTION MONITORING OUTLINE

CORRECTIVE ACTION GROUNDWATER MONITORING PLAN
BALDWIN POWER PLANT
FLY ASH POND SYSTEM
BALDWIN, ILLINOIS

Figure 1-1



REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY

0 1,000 2,000 Feet

SITE LOCATION MAP

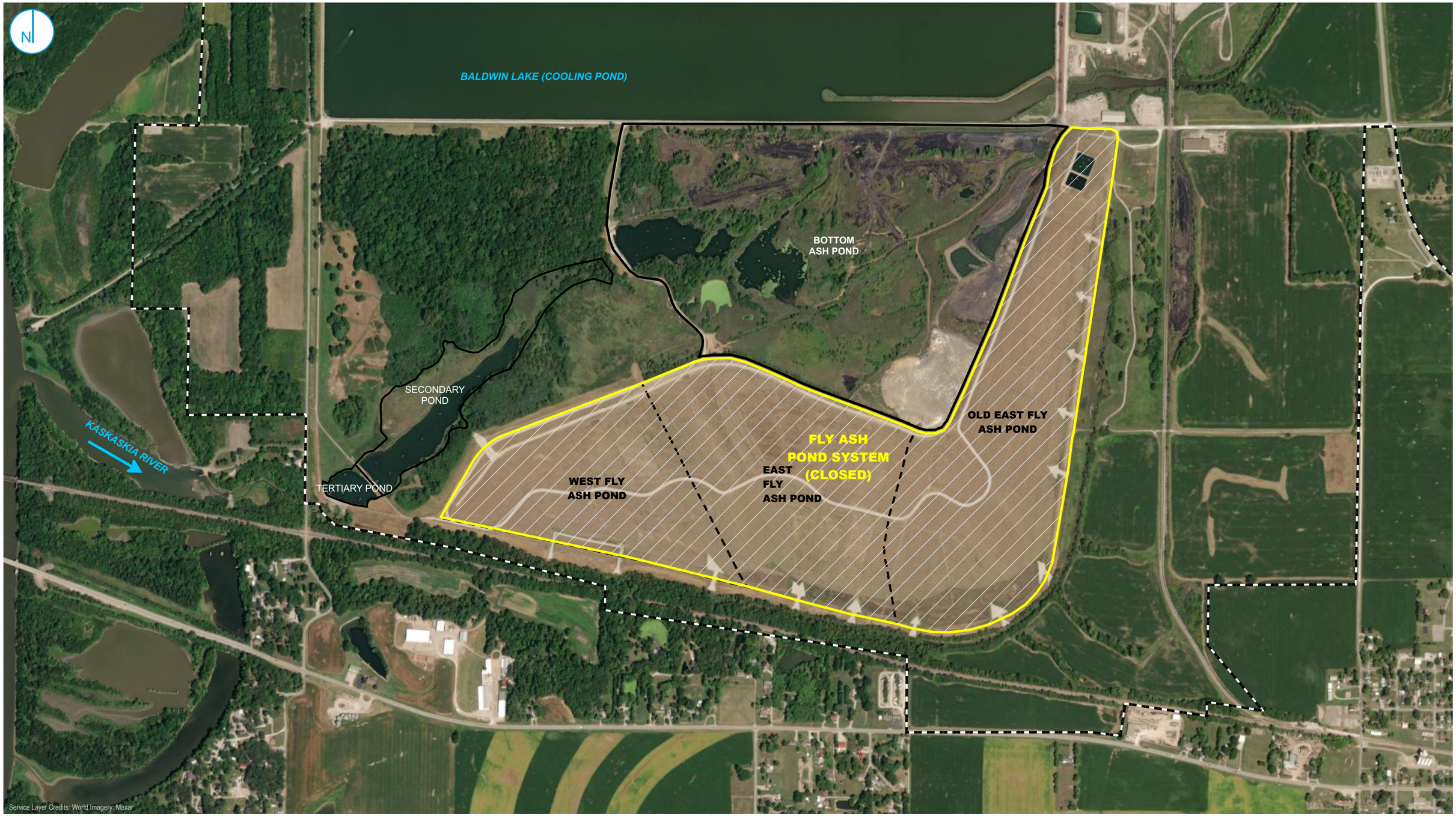
FIGURE 1-2

CORRECTIVE ACTION GROUNDWATER MONITORING PLAN
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

Y:\Mapping\Projects\22\2285\MXD\GMP\Baldwin\FAPS_605\845_CorrectiveAction\BAL_605_CA_GMP.aprx\Figure 1-2_Site Map



PROJECT: 169000XXXX | DATED: 1/13/2025 | DESIGNER: GALARNMC

REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
CAPPED AREA
PROPERTY BOUNDARY

0 400 800 Feet

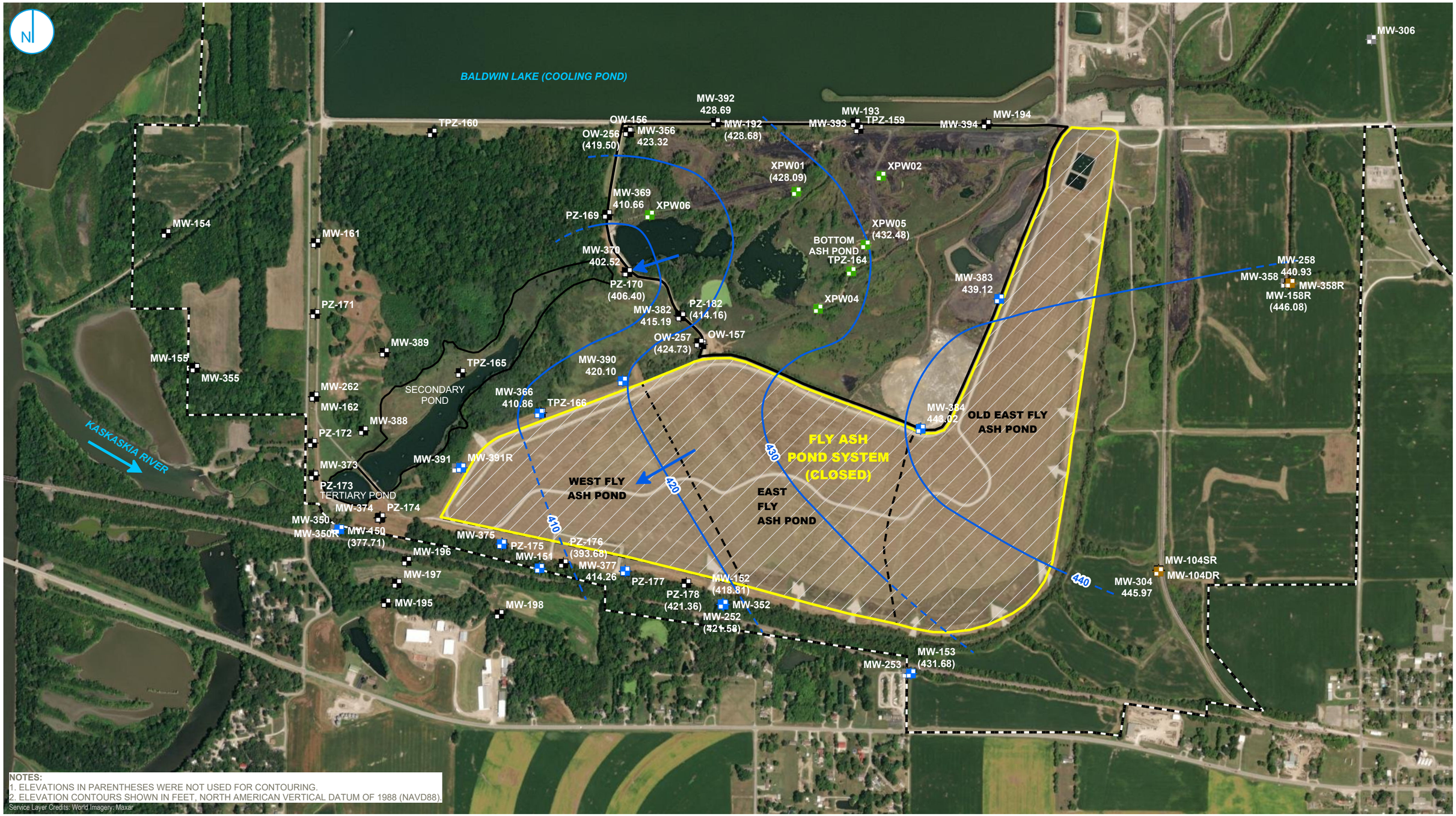
SITE MAP

CORRECTIVE ACTION GROUNDWATER MONITORING PLAN
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 1-3

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



NOTES:
1. ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
2. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

Service Layer Credits: World Imagery: Maxar

Y:\Mapping\Projects\22\2285\MXD\GW_Contours\Round_2024\Baldwin\FAPS_605\FAPS_605_2024.aprx\BAL 605 FAPS Pot Surface 20241110

PROJECT: 169000XXXX | DATED: 1/8/2025 | DESIGNER: GALARNMC

- COMPLIANCE MONITORING WELL
- BACKGROUND MONITORING WELL
- MONITORING WELL
- PORE WATER WELL
- CLOSED MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (10-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- CAPPED AREA
- PROPERTY BOUNDARY

0 400 800 Feet

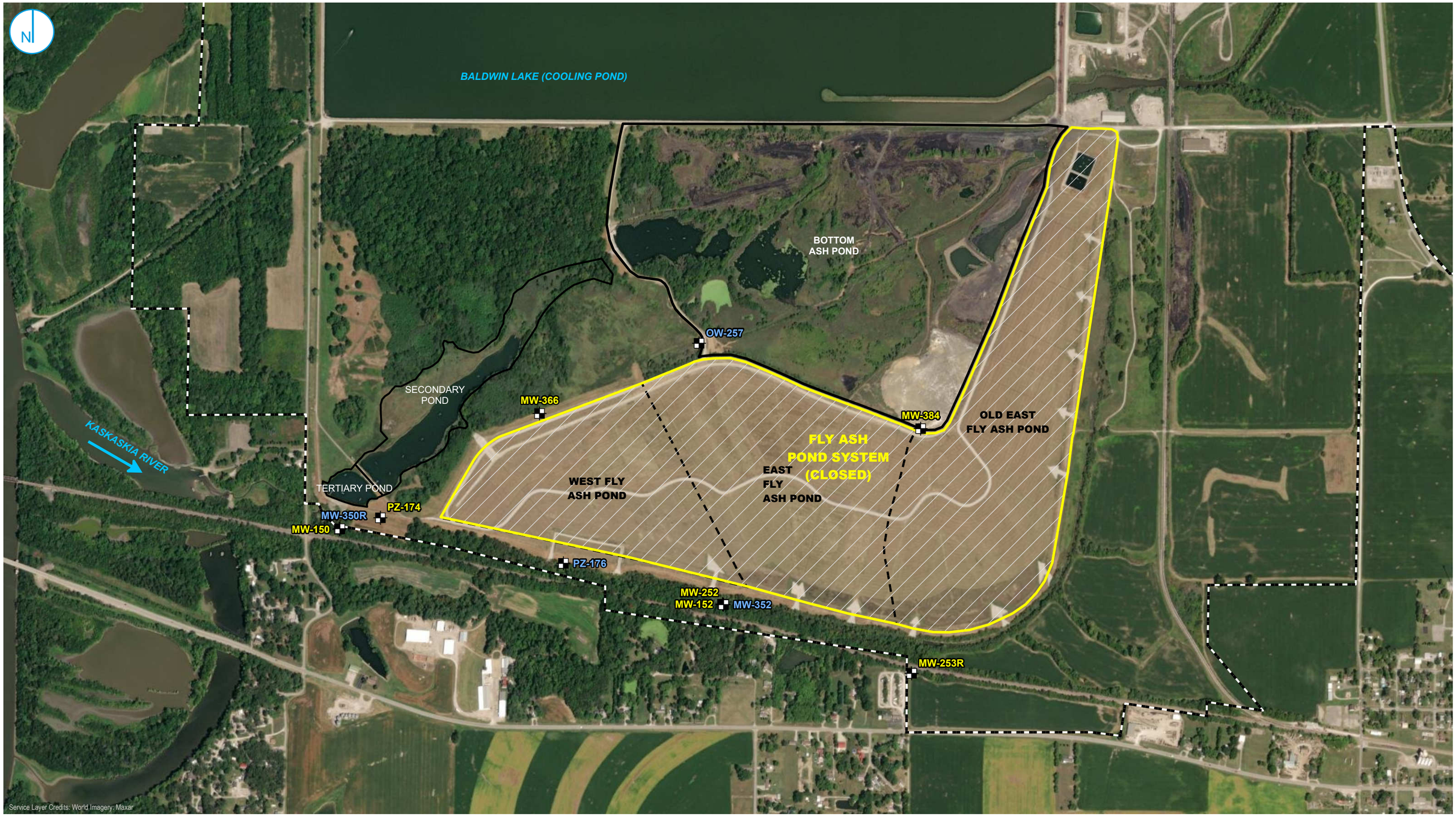
POTENTIOMETRIC SURFACE MAP
NOVEMBER 10, 2024

CORRECTIVE ACTION GROUNDWATER MONITORING PLAN
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 1-4

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



Y:\Mapping\Projects\2292285\MXD\GMP\Baldwin\FAPS_605845_CorrectiveAction\BAL_605_CA_GMP.aprx\Figure 2-1. Proposed 845 CA Monitoring Well Location Map

PROJECT: 169000XXXX | DATED: 2/7/2025 | DESIGNER: GALARNMC

MONITORING WELL
XXX INSIDE PLUME MONITORING WELL
XXX PLUME DEFINITION MONITORING WELL

REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
CAPPED AREA
PROPERTY BOUNDARY

0 400 800 Feet

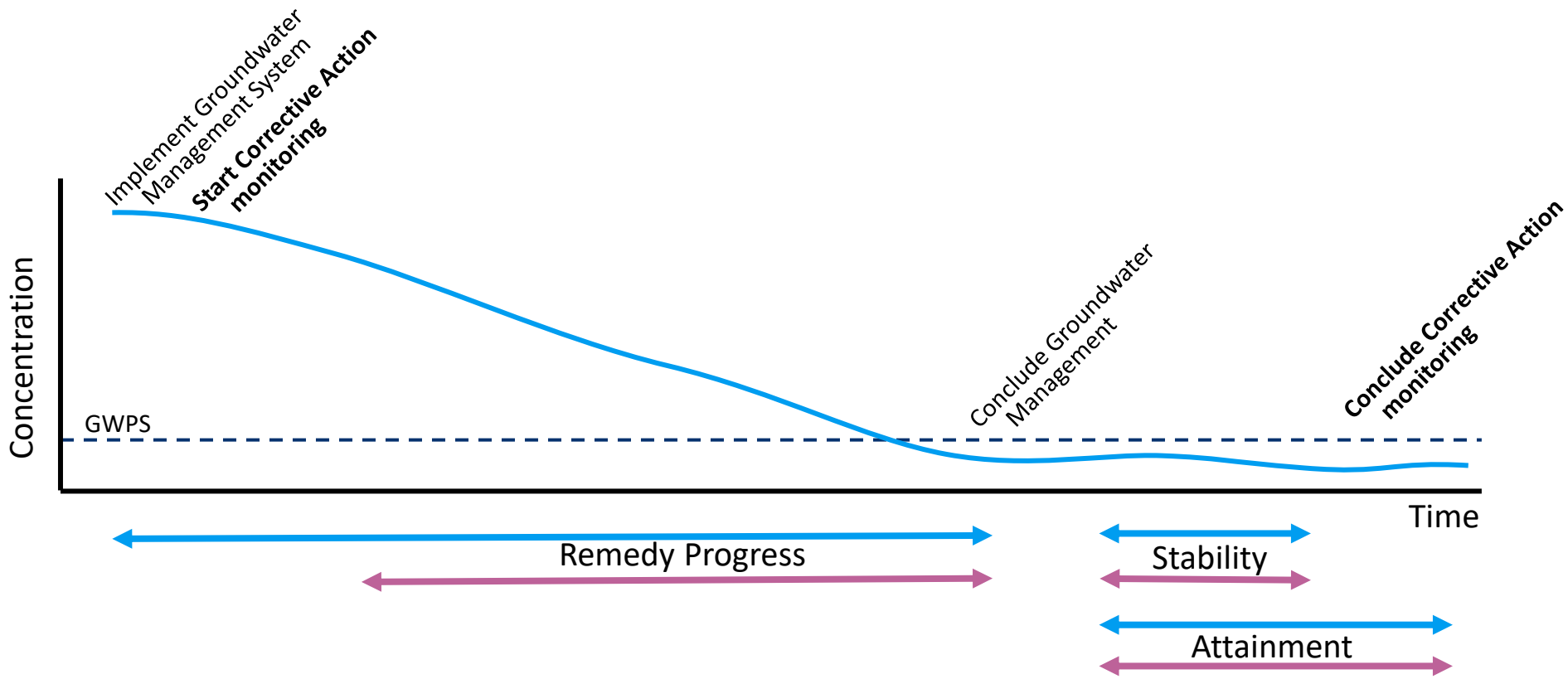
PROPOSED 35 I.A.C. § 845 CORRECTIVE ACTION MONITORING WELL LOCATION MAP

CORRECTIVE ACTION GROUNDWATER MONITORING PLAN
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 2-1

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL



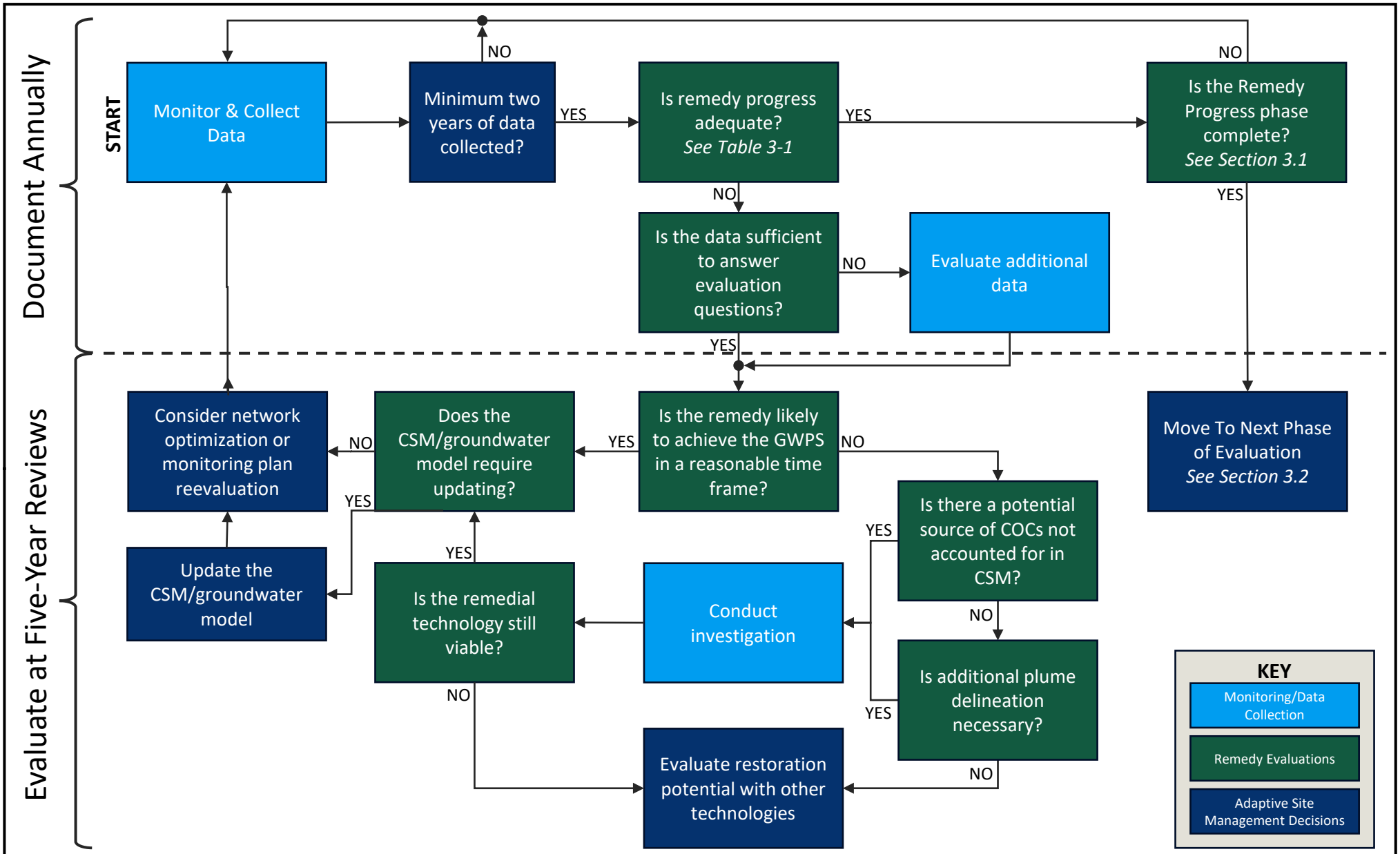
RAMBOLL

DRAFTED BY: AO | 2/3/2025

CORRECTIVE ACTION MONITORING TIMELINE

CORRECTIVE ACTION GROUNDWATER MONITORING PLAN
BALDWIN POWER PLANT
FLY ASH POND SYSTEM
BALDWIN, ILLINOIS

Figure 3-1



Adapted from Figure 2 in USEPA (2014) *"Groundwater Remedy Completion Strategy: Moving Forward with the End in Mind,"* Office of Solid Waste and Emergency Response. 9200.2-144. May. https://semspub.epa.gov/work/HQ/100000021.pdf

RAMBOLL

DRAFTED BY: AO | 10/23/2024

ADAPTIVE SITE MANAGEMENT DECISION-MAKING FLOW CHART

CORRECTIVE ACTION GROUNDWATER MONITORING PLAN
BALDWIN POWER PLANT
FLY ASH POND SYSTEM
BALDWIN, ILLINOIS

Figure 3-2

APPENDIX A
BORING LOGS AND WELL CONSTRUCTION FORMS

KELRON ENVIRONMENTAL
INCORPORATED

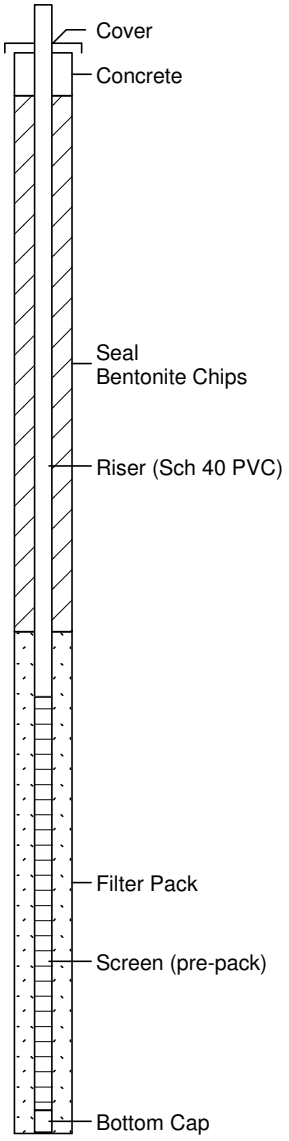
LOG OF BORING MW-150

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NW, NE

Date Completed	: 09/08/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD; 4 1/4" ID	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem (CME-550)	Land Surface Elevation	: 393.84
Sampling Method	: MacroCore (60")	Top of Casing Elevation	396.54
Drilling Company	: Terra Drill, Inc.	X,Y Coordinates	: 2379413, 554563

Depth in Feet	DESCRIPTION	Surf. Elev. 393.84	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	Continous boring - no soil sampling conducted.						
	Refer to boring log for adjacent nested well MW-350 for a description of subsurface materials	393					
5		388					
10		383					
15		378					
20		373					
25	END BOREHOLE AT 25.2 FEET BLS	368					
30							

Well: MW-150
Elev.: 396.54



KELRON ENVIRONMENTAL
INCORPORATED

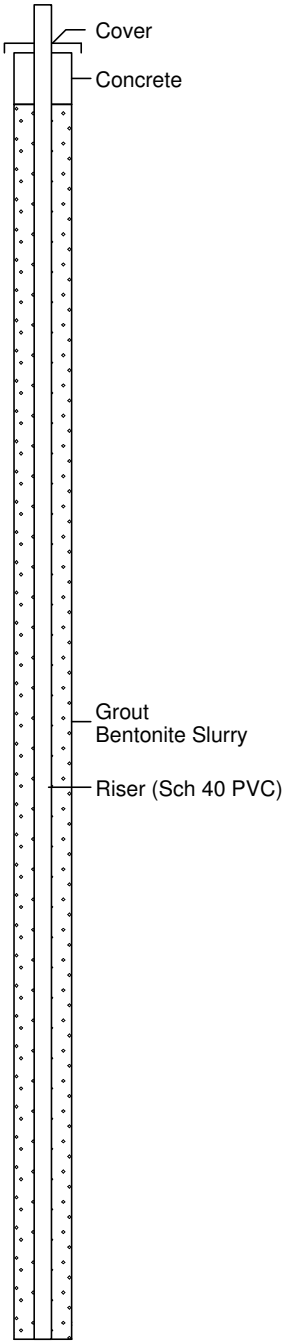
LOG OF BORING MW-350

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NW, NE

Date Completed	: 09/07/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID: 3 7/8" rock	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 394.11
Sampling Method	: MacroCore (60")/NX Core	Top of Casing Elevation	396.80
Drilling Company	: PSC	X,Y Coordinates	: 2379410, 554568

Depth in Feet	DESCRIPTION	Surf. Elev. 394.11	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	CLAY, very stiff to hard, brown, grayish-brown (10YR 5/2) mottled yellowish brown (10YR 5/8), dry	394	1	19/54	4.5	CH	
			2		2.25		
			3				
5	- grain size analysis @ 5 - 6 ft: 2.3% sand, 42.4% silt, 55.3% clay	389	4	47/60	4.5		
			5		3.5		
			6		3.25		
			7		4.0		
10		384	8	60/60	2.75		
	CLAY, brown to olive brown, moist		9		2.75	CL/CH	
	- grain size analysis @ 11 - 12 ft: 8.4% sand, 39.3% silt, 52.3% clay		10		2.75		
			11		1.75		
			12		2.0		
15		379					
	CLAY, soft, high plasticity, dark yellow brown, moist; 1-2" sand seams at 17' and 19'		13	45/60		CH	
	- grain size analysis @ 18 - 20 ft: 1.8% sand, 21.9% silt, 76.3% clay						
	- very stiff to hard, high plasticity						
20		374	14	60/60			
25			15	23/23			

Well: MW-350
Elev.: 396.80



KELRON ENVIRONMENTAL
INCORPORATED

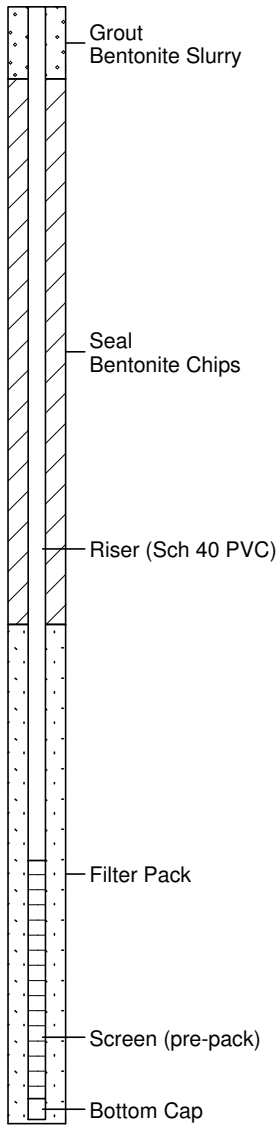
LOG OF BORING MW-350

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NW, NE

Date Completed	: 09/07/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID: 3 7/8" rock	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 394.11
Sampling Method	: MacroCore (60")/NX Core	Top of Casing Elevation	396.80
Drilling Company	: PSC	X,Y Coordinates	: 2379410, 554568

Well: MW-350
Elev.: 396.80

Depth in Feet	DESCRIPTION	Surf. Elev. 394.11	Samples	Recovery inches	Qp TSF	USCS
25	- Auger refusal at 26.4 feet bgs	369	15	23/23		CL
	LIMESTONE and SHALE, interbedded, banded, solid, very soft, light to dark gray; slightly weathered					LS/SH
	LIMESTONE, banded, medium bedded, solid, hard, medium gray; unweathered					LS
	LIMESTONE and SHALE, interbedded; limestone is banded, medium bedded, hard, medium gray; shale is very soft to medium soft, dark gray					
30	Borehole diameter from 26.4 to 46.7 feet bgs = 3 7/8"	364	16	116/120		LS/SH
	RQD for 26.4 - 36.4' = 72% (Fair) Recovery = 116/120"					
35	SHALE, banded, medium bedded, solid, soft to medium soft, dark gray	359				SH
40	LIMESTONE, banded, massive, solid, hard to very hard, light to medium gray	354	17	118/120		LS
45	RQD for 36.4 - 46.4' = 96% (Excellent) Recovery = 118/120"	349				
	END BOREHOLE AT 46.7 FEET BLS					
50						



KELRON ENVIRONMENTAL
INCORPORATED

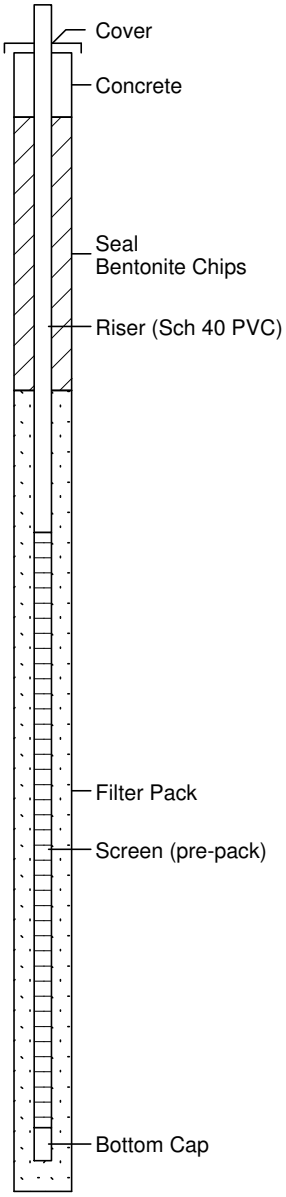
LOG OF BORING MW-152

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NE, NE

Date Completed	: 09/22/10	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 422.18
Sampling Method	: MacroCore (60")	Top of Casing Elevation	424.99
Drilling Company	: PSC	X,Y Coordinates	: 2382779, 553906

Depth in Feet	DESCRIPTION	Surf. Elev. 422.18	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	Continuous boring - no soil sampling conducted.	422					
	Refer to boring log for adjacent nested well MW-352 for a description of subsurface materials.						
5		417					
10		412					
15		407					
	END BOREHOLE AT 17.7 FEET BLS						
20							

Well: MW-152
Elev.: 424.99



KELRON ENVIRONMENTAL
INCORPORATED

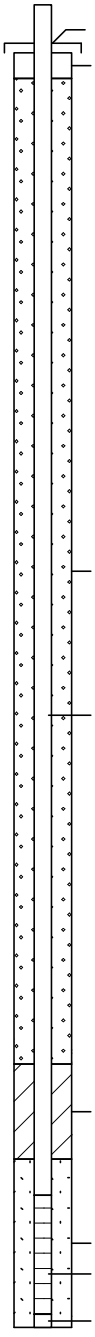
LOG OF BORING MW-252

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NE, NE

Date Completed	: 09/22/10	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 422.27
Sampling Method	: MacroCore (60")	Top of Casing Elevation	425.07
Drilling Company	: PSC	X,Y Coordinates	: 2382784, 553904

Depth in Feet	DESCRIPTION	Surf. Elev. 422.27	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	Continuous boring - no soil sampling conducted.	422					
	Refer to boring log for adjacent nested well MW-352 for a description of subsurface materials.						
5		417					
10		412					
15		407					
20		402					
25		397					
30		392					
35		387					
40		382					
45		377					
	END BOREHOLE AT 49.54 FEET BLS						
50							

Well: MW-252
Elev.: 425.07



KELRON ENVIRONMENTAL
INCORPORATED

LOG OF BORING MW-352

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NE, NE

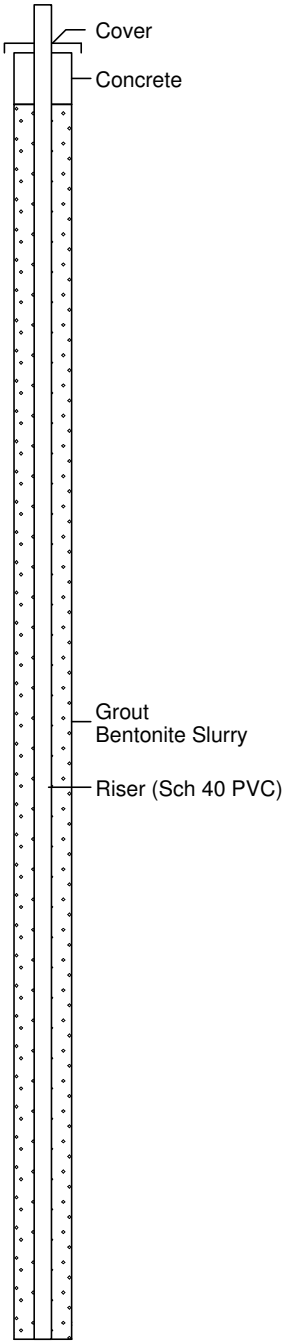
Date Completed	: 09/16/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID: 3 7/8" rock	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 422.36
Sampling Method	: MacroCore (60")/NX Core	Top of Casing Elevation	425.04
Drilling Company	: PSC	X,Y Coordinates	: 2382789, 553901

Depth in Feet	DESCRIPTION	Surf. Elev. 422.36
0	SILTY CLAY, very stiff to hard, yellow brown (10YR 5/6), dry	422
5	CLAY, trace sand and fine gravel, very stiff, high plasticity, few black organic material	417
10	- medium hard	412
	- soft	
15	- medium hard	407
	SAND, poorly graded, loose, wet (4-inch thick)	
	SANDY CLAY, trace fine gravel, yellow brown to olive brown (2.5Y 5/3)	
20		402
25		

Samples	Recovery inches	Qp TSF	USCS
1	46/48	4.5+	CL
2	60/60	3.5	
3		4.0	CL
4		2.75	
5		3.0	
6	60/60	2.75	
7		2.0	
8		1.0	
9		1.25	
10	60/60	1.5	
11		2.5	
12		2.75	SP
13		3.5	CL
14	60/60	4.5+	
15		2.5	
16		2.5	
17		2.75	
18	48/60	2.5	

GRAPHIC

Well: MW-352
Elev.: 425.04



KELRON ENVIRONMENTAL
INCORPORATED

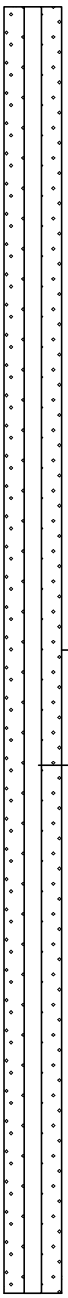
LOG OF BORING MW-352

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NE, NE

Date Completed	: 09/16/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID: 3 7/8" rock	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 422.36
Sampling Method	: MacroCore (60")/NX Core	Top of Casing Elevation	425.04
Drilling Company	: PSC	X,Y Coordinates	: 2382789, 553901

Well: MW-352
Elev.: 425.04

Depth in Feet	DESCRIPTION	Surf. Elev. 422.36	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
25	- grain size analysis @ 26.5 - 27.5 ft: 33.7% sand, 27.1% silt, 39.2% clay	397	18	48/60	2.5	CL	
	SAND with few gravel, yellow brown					SP	
	CLAY, some sand and fine gravel, hard to very hard, high plasticity, dark yellow brown (10YR 4/6)		19	60/60	3.0	CL	
30	CLAY, lean to fat	392	20		3.0	CL/CH	
	- grain size analysis @ 32 - 33 ft: 13.2% sand, 43.9% silt, 42.8% clay		21		3.5		
			22		3.0		
35		387	23	48/60	1.5		
	- medium hard, high plasticity, gray brown to light olive brown (2.5Y 5/2-5/3)		24		1.5		
	- trace silt, dark yellow brown (10YR 4/4)		25		1.75		
			26		1.5		
40		382	27	54/60	1.75		
			28		2.0		
			29		2.5		
			30		2.5		
45		377	31	57/60	2.0		
			32		1.75		
	CLAY, medium hard, low plasticity, olive brown (2.5Y 5/4)		33		1.75	CL	
			34		2.5		
			35		1.75		
50			36	3/3			



KELRON ENVIRONMENTAL
INCORPORATED

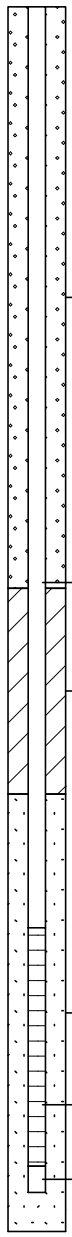
LOG OF BORING MW-352

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NE, NE

Date Completed	: 09/16/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID: 3 7/8" rock	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 422.36
Sampling Method	: MacroCore (60")/NX Core	Top of Casing Elevation	425.04
Drilling Company	: PSC	X,Y Coordinates	: 2382789, 553901

Well: MW-352
Elev.: 425.04

Depth in Feet	DESCRIPTION	Surf. Elev. 422.36	Samples	Recovery inches	Qp TSF	USCS
50		372				CL
	- Auger refusal at 53.7 feet bgs					
	LIMESTONE, weathered, thinly laminated, medium hard to hard, gray		37	5/5		LS
55		367	38	8/27		
	SHALE, clayey, gray					SH
	LIMESTONE, occasional shale partings		39	19/60		LS
60		362				
	- laminated, fossiliferous, medium gray		40	54/60		
	SHALE, soft, dark gray					SH
65		357				
	LIMESTONE, medium hard to hard, light gray		41	59/60		LS
70	Borehole diameter from 53.7 to 73.8 feet bgs = 3 7/8"	352				
	RQD for 53.8 - 73.8' = 57% (Fair) Recovery = 173/240"		42	33/34		
	END BOREHOLE AT 73.8 FEET BLS					
75						



KELRON ENVIRONMENTAL
INCORPORATED

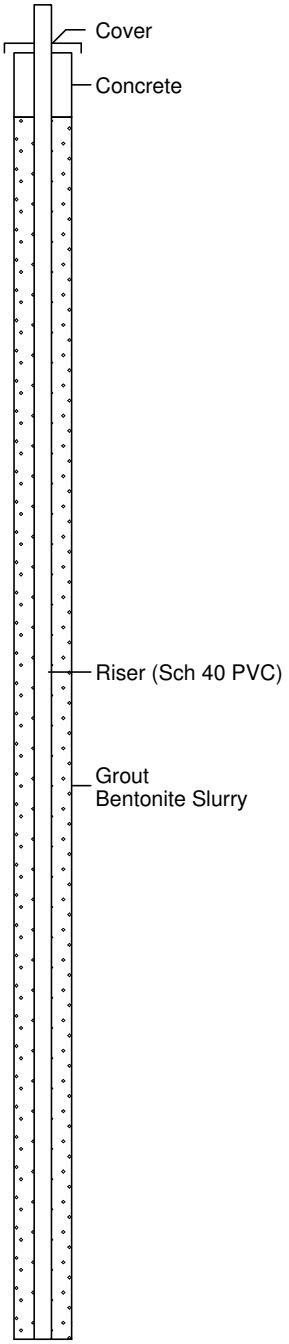
LOG OF BORING MW-253

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 15 SW, SW, NE

Date Completed	: 09/20/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 442.70
Sampling Method	: MacroCore (60")	Top of Casing Elevation	445.84
Drilling Company	: PSC	X,Y Coordinates	: 2384430, 553298

Depth in Feet	DESCRIPTION	Surf. Elev. 442.70	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	SILTY CLAY, trace gravel, hard, light brown, dry	442	1	25/48	4.5+	CL	
			2		4.5+		
5	- hard, medium plasticity, gray (2.5Y 6/1) with yellow-brown mottling (10YR 5/6), moist	437	3	47/60	4.5		
			4		4.5		
			5		4.5		
10		432	6	53/60	4.5		
	CLAY (fat) with SAND, trace gravel, dark yellow brown with light gray mottling, mottling decreases with depth - grain size analysis @ 11 - 12 ft: 0.7% gravel, 16.4% sand, 41.4% silt, 41.4% clay		7		4.0	CH	
			8		4.0		
			9		3.0		
15		427	10	52/60	4.5		
			11		3.5		
			12		3.5		
	- soft		13		2.0		
	CLAY (lean) with SAND, trace gravel, stiff to hard, medium plasticity, dark yellow brown		14	60/60		CL	
20							

Well: MW-253
Elev.: 445.84



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KELRON ENVIRONMENTAL
INCORPORATED

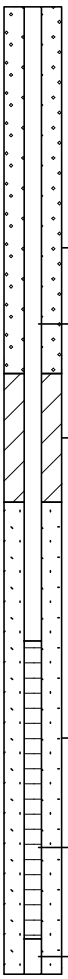
LOG OF BORING MW-253

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 15 SW, SW, NE

Date Completed	: 09/20/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 442.70
Sampling Method	: MacroCore (60")	Top of Casing Elevation	445.84
Drilling Company	: PSC	X,Y Coordinates	: 2384430, 553298

Well: MW-253
Elev.: 445.84

Depth in Feet	DESCRIPTION	Surf. Elev. 442.70	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
20	- grain size analysis @ 19 - 19.5 ft: 0.7% gravel, 26.9% sand, 38.1% silt, 34.3% clay	422	14	60/60		CL	
25	- small fine sand seams from 25 to 27 feet	417	15	60/60			
	CLAY (fat), shaley, platy/laminated, soft, low plasticity, light yellow brown (10YR 6/4)		16		3.5	CH	
	- stiff to very stiff, light olive brown (2.5Y 5/4) - grain size analysis @ 29 - 30 ft: 6.7% sand, 21.6% silt, 71.7% clay		17		3.0		
30		412	18	60/60	4.5		
			19		3.5		
	- Drove split-spoon 2-inches into bedrock: 34.5 to 34.7 feet bls		20		3.0		
	LIMESTONE with SHALE		21	2/2		LS/SH	
35	Auger refusal at 35.0 feet END BOREHOLE AT 35.0 FEET BLS	407					
40							



KELRON ENVIRONMENTAL
Incorporated

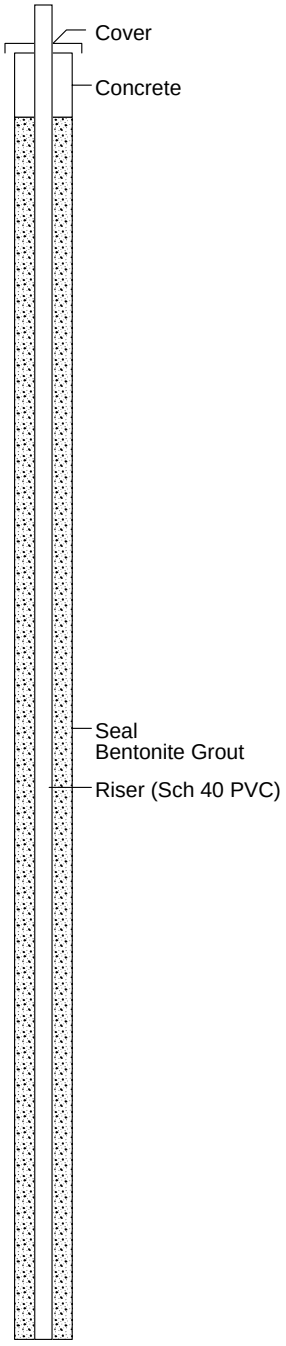
LOG OF PROBEHOLE OW-257

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/16/2013	Driller	: John Gates
Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 428.17
Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 431.02
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2382572, 556198

Depth in Feet	DESCRIPTION	Surf. Elev. 428.17	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	Continuous boring to 18.5 feet below ground surface. Refer to boring log for adjacent well OW-157.						
		425					
5							
		420				CL	
10							
		415					
15							
		410					
	Silty CLAY, trace sand and gravel, stiff, high plasticity, gray (10YR 6/1) with 25-50% reddish-brown mottling, moist [TILL]		1	56/60	3.0	CL	
20			2		2.75		

Well: OW-257
Elev.: 431.02



KELRON ENVIRONMENTAL
Incorporated

LOG OF PROBEHOLE OW-257

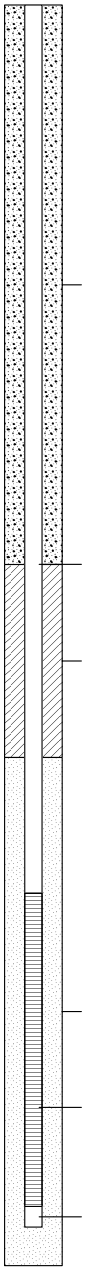
Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/16/2013	Driller	: John Gates
Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 428.17
Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 431.02
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2382572, 556198

Well: OW-257
Elev.: 431.02

Depth in Feet	DESCRIPTION	Surf. Elev. 428.17	Samples	Recovery inches	Qp TSF	USCS
20	- >50% mottling		2		2.75	CL
			3		2.5	
	Sandy CLAY with gravel (fine-coarse, sub-angular; granite piece of 1.5"), brownish yellow (10YR 6/6), wet					CL
	Silty CLAY, trace sand and gravel, soft, high plasticity, yellowish brown (10YR5/6) with 10-25% light gray mottling		4		1.0	CL
		405	5		1.5	
	- very soft, brownish yellow with <10% mottling		6	60/60	0.5	
25	- with trace pyrite crystals		7		1.0	
	- medium hardness grading to stiff		8		2.0	
			9		2.0	
		400	10		3.25	
			11	60/60	1.5	
30	- stiff, high plasticity, gray with <10% reddish-brown mottling, moist		12		3.5	
			13		2.75	
	- very stiff, dark gray (10YR 4/1)		14		2.0	
		395	15		3.5	
			16	60/60	2.0	
35			17		2.0	
	- low plasticity, very dark gray (10YR 3/1)		18		4.0	
	SHALE and CLAY (fat), intermittent lamination, hard, very dark gray, moist [note: top of weathered bedrock at 36.3 feet below ground surface]		19		3.0	SH/CL
		390	20		>4.5	
			21	13/13		
40	END BOREHOLE at 39.6 feet BLS					

GRAPHIC



SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		MW-366

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Jim Dittmaier Bulldog Drilling	12/3/2015	12/4/2015	4 1/4 HSA and rotary

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-366	Feet (NAVD88)	422.54 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 555,581.80 N, 2,381,171.15 E E/W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 31.8876"

Long -89° 52' 20.4414"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample: Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				0 - 5.6' **FILL, SILTY CLAY** CL/ML.	(FILL) CL/ML								0-33' Blind Drilled. See logs TPZ-166 and B-13-4 for soil description.
			1										
			2										
			3										
			4										
			5										
				5.6 - 33' **SILTY CLAY** CL/ML.	CL/ML								
			6										
			7										
			8										
			9										
			10										
			11										
			12										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Natural Resource Technology
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NATURAL RESOURCE TECHNOLOGY

Boring Number MW-366

Sample									Soil Properties					
Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram		Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				5.6 - 33' **SILTY CLAY** CL/ML. *(continued)*										
			13											
			14											
			15											
			16											
			17											
			18											
			19											
			20											
			21											
			22		CL/ML									
			23											
			24											
			25											
			26											
			27											
			28											
			29											
			30											
			31											
			32											

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-366

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				5.6 - 33' **SILTY CLAY** CL/ML. *(continued)*	CL/ML								
1 SS	23 18	17 21 20 50	33	33 - 35.6' **LEAN CLAY:** to **SHALE:** CL, gray, residual soil, hard (>4.5 tsf).	CL								
1 CORE	60 54		36	35.6 - 39.3' **SHALE:** BDX (SH), gray, highly decomposed, moderately fractured.	BDX (SH)								Core 1, RQD=54%
			38	38.4' limestone layer (approximately 2.5").									
2 CORE	60 47		40	39.3 - 42.3' **LIMESTONE:** BDX (LS), cherty, intensely fractured.	BDX (LS)								Core 2, RQD=32%
			42	42.3 - 42.9' **SHALE:** BDX (SH), dark gray, intensely fractured.	BDX (SH)								
			43	42.9 - 43.7' **SHALEY LIMESTONE:** BDX (LS/SH), intensely fractured.	BDX (LS/SH)								
			44	43.7 - 49.8' **SHALE:** BDX (SH), dark gray, moderately fractured.									
3 CORE	60 63		46		BDX (SH)								Core 3, RQD=73%
			50	49.8 - 54.3' **SHALEY LIMESTONE:** BDX (LS/SH), fossiliferous, slightly fractured.									
4 CORE	60 49		51		BDX (LS/SH)								Core 4, RQD=96%
			52										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-366

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
				49.8 - 54.3' **SHALEY LIMESTONE**: BDX (LS/SH), fossiliferous, slightly fractured. *(continued)*									
			53	52.8' - 53.1 shale bed. 53.1' fossiliferous.	BDX (LS/SH)								
			54										Bedrock corehole reamed 6" in diameter to 54' for well installation.
				54.3' End of Boring.									

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		MW-384

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Chad Dutton Bulldog Drilling	12/7/2015	12/16/2015	4 1/4 HSA and rotary

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-384	Feet (NAVD88)	456.70 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 555,446.11 N, 2,384,518.72 E E/W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 30.4398"

Long -89° 51' 38.5158"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24 8	2 3 4 6	1	0 - 2.5' **FILL, ASH (Coal):** very soft to moderately stiff (0-0.75 tsf).	(FILL)								
2 SS	24 19	2 4 3 6	2 3	2.5 - 4' **FILL, SILTY CLAY** CL/ML, strong brown (7.5YR 4/6), trace gravel, very soft to very stiff (0-3.5 tsf).	(FILL) CL/ML								
3 SS	24 10	1 2 3 4	4 5	4 - 18' **FILL, ASH (Coal):** yellowish red (5YR 4/6) to reddish black (10R 2.5/1), sand-sized ash and cinders, very soft to stiff (0-1.5 tsf).									
4 SS	24	2 2 2 2	6 7										
5 SS	24	1 2 1 1	8 9		(FILL)								
6 SS	24	1 2 1 1	10 11 12										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

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NATURAL RESOURCE TECHNOLOGY

Boring Number MW-384

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
7 SS	24	1 5 10 10		4 - 18' **FILL, ASH (Coal)**: yellowish red (5YR 4/6) to reddish black (10R 2.5/1), sand-sized ash and cinders, very soft to stiff (0-1.5 tsf). *(continued)*									
			13										
8 SS	24 14	5 10 11 11	14	14' wet.									
			15		(FILL)								
9 SS	24 14	5 8 14 15	16										
			17										
10 SS	24 16	2 2 3 4	18	18 - 22' **SILTY CLAY** CL/ML, gray (5Y 6/1), organic odor, stiff to very stiff (1.25-3.75 tsf), wet.									
			19										
11 SS	24 18	2 2 6 4	20		CL/ML								
			21										
12 SS	24 16	4 4 5 4	22	22 - 24' **SILT**: ML, very dark gray (10YR 3/1), dark yellowish brown (10YR 3/6) mottling, hard (4.25-4.5 tsf).									
			23		ML								
13 SS	24 22	1 2 5 7	24	24 - 42.4' **SILTY CLAY** CL/ML, gray (10YR 5/1) with yellowish brown (10YR 5/8), oxidation staining, very soft to hard (<0.25-4.5+ tsf).									
			25										Permanent 6" PVC casing set at 25' bgs.
14 SS	24 21	3 4 5 7	26	26' yellowish brown (10YR 5/4), trace yellowish brown (10YR 5/8) and very dark gray (10YR 3/1) mottling, 15-30% silt, 5-15% fine sand, trace fine gravel, stiff to very stiff (1.25-2.5 tsf), low to medium plasticity, moist.									
			27										
15 SS	24 21	3 4 5 6	28	28' color grades to gray (10YR 5/1), 30-50% silt, soft to stiff (0.5-1.25 tsf).	CL/ML								
			29										
16 SS	24 17.5	1 5 5 7	30	30' yellowish brown (10YR 5/8) mottling (15-30%), trace very dark gray (10YR 3/1) mottling, no gravel, very soft to very stiff (<0.25-2.5 tsf), medium plasticity.									
			31										
			32										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-384

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
17 SS	24 20.5	4 4 4 6		24 - 42.4' **SILTY CLAY** CL/ML, gray (10YR 5/1) with yellowish brown (10YR 5/8), oxidation staining, very soft to hard (<0.25-4.5+ tsf). *(continued)*									
			33	32' trace yellowish brown (10YR 5/8) and very dark gray (10YR 3/1) mottling, 15-30% silt, stiff to very stiff (1.75-3.5 tsf).									
18 SS	24 22	3 4 5 7	34	34' yellowish brown (10YR 5/8) mottling (15-30%), trace very dark gray (10YR 3/1) mottling, stiff to very stiff (1.5-2.5), dry to moist.									
			35	35.3' yellowish brown (10YR 5/8), trace gray (10YR 5/1) and very dark gray (10YR 3/1) mottling.									
19 SS	24 21	4 3 3 4	36	36' gray (10YR 5/1) mottling (15-30%), silt content increasing with depth, moderately stiff to stiff (0.75-1.25 tsf), low plasticity, moist.									
			37		CL/ML								
20 SS	24 24	2 4 7 14	38	38' grayish brown (10YR 5/2), trace gray (10YR 5/1), trace strong brown (7.5YR 4/6) mottling, 30-50% silt, soft to very stiff (0.5-3.75 tsf).									
			39	38.7' - 40' very dark gray (10YR 3/1) mottling (5-15%), 5-15% fine gravel.									
21 SS	24 25	3 11 21 44	40	40' sand (5-15%), trace gravel, very stiff to hard (3.5-4.5+ tsf). 40.3' wet.									
			41	40.8' very stiff to hard (3.5-4.5+ tsf), moist.									
22 SS	24 20	13 11 15 17	42	41.8' fine sand seam (1/4" thick). 42' - 42.4' fine gravel, 30-50% clay, trace sand, wet.									
			43	42.4 - 44.3' **CLAYEY SILT** ML/CL, gray (10YR 5/1) to grayish brown (10YR 5/2), 30-50% clay, 5-15% fine sand, trace subrounded gravel, very stiff to hard (3.5-4.5+), nonplastic to low plasticity, moist.	ML/CL								
23 SS	24 17	6 8 10 14	44	43.5' - 44.3' very dark grayish brown (10YR 3/2), brownish yellow trace (10YR 6/6) mottling, trace coal.									
			45	44.3 - 56' **LEAN CLAY:** CL, brownish yellow trace (10YR 6/6), trace light brownish gray (10YR 6/2) mottling, 15-30% silt, 5-15% gravel, trace gravel-sized oxidation-stained nodules, very stiff (2.5-3.0 tsf), low to medium plasticity, moist to dry.									
24 SS	24 16	5 10 11 15	46	46' decreasing silt content, trace gravel, clay becoming laminated with depth, very stiff (2.25-3.0 tsf).									
			47										
25 SS	24 13.5	6 8 12 22	48	48' silt (5-15%), trace shale gravel, very stiff (3.0 tsf), medium plasticity, dry.	CL								
			49	49.2' gravel (2" diameter).									
26 SS	24 16	8 9 15 19	50	50' very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2), trace silt, very stiff (3.5 tsf), medium to high plasticity, highly weathered shale (residual soil).									
			51										
			52										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-384

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
27 SS	24 22	13 14 9 14	53	44.3 - 56' **LEAN CLAY:** CL, brownish yellow trace (10YR 6/6), trace light brownish gray (10YR 6/2) mottling, 15-30% silt, 5-15% gravel, trace gravel-sized oxidation-stained nodules, very stiff (2.5-3.0 tsf), low to medium plasticity, moist to dry. *(continued)*									
28 SS	24 24	12 12 14 22	54 55	52' - 54' clay is fractured, light brownish gray (10YR 6/2) to light yellowish brown (10YR 6/4) in fractures. 54' trace very dark brown (10YR 2/2) laminations, hard (>4.5 tsf).	CL								
29 SS	23 20	11 14 20 50/5"	56	56 - 58.2' **SHALE:** BDX (SH), very dark gray (10YR 3/1), highly weathered, fissile, totally healed fractures, very weak, highly decomposed [light brownish gray (10YR 6/2) in fractures], very intensely fractured (closed to narrow apertures). 57' light yellowish brown (10YR 6/4) to very dark gray (10YR 3/1) layers, thinly bedded, highly decomposed to residual soil.	BDX (SH)								3" steel casing set at 57.7 ft bgs.
1 CORE	24 40		57 58										Core 1, RQD=36%
2 CORE	60 64		59 60	58.2 - 60.8' **LIMESTONE:** BDX (LS), light greenish gray (GLEY 1 7/10Y), microcrystalline, trace fossils, moderately strong to strong, medium bedded, slightly to moderately decomposed, moderately fractured.	BDX (LS)								Core 2, RQD=73%
			61 62 63	60.8 - 64' **SHALEY LIMESTONE:** BDX (LS/SH), weak, thin to medium bedded, moderately decomposed, slightly to moderately disintegrated.	BDX (LS/SH)								
3 CORE	60 73		64 65 66 67	64 - 82.6' **SHALE:** BDX (SH), greenish gray (GLEY 1 5/10Y), very weak, thinly bedded, highly to moderately decomposed, slightly to moderately disintegrated, intensely fractured (very narrow to moderately narrow apertures).									Core 3, RQD= 58%
			68	67.9' - 68.8' shale clasts within decomposed shale matrix.	BDX (SH)								
4 CORE	60 63		69 70 71 72	68.8' - 69.2' light yellowish brown (10YR 6/4), trace dark yellowish brown (10YR 3/6) layers. 69.2' - 74' intensely fractured (extremely narrow to narrow aperture).									Core 4, RQD=46%

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-384

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			73	64 - 82.6' **SHALE**: BDX (SH), greenish gray (GLEY 1 5/10Y), very weak, thinly bedded, highly to moderately decomposed, slightly to moderately disintegrated, intensely fractured (very narrow to moderately narrow apertures). *(continued)*									
5 CORE	60 20		74	74' - 79' intensely to very intensely fractured.									Core 5, RQD=0%
			75										
			76										
			77		BDX (SH)								Bedrock corehole reamed 6" in diameter to 77' for well installation.
			78										
6 CORE	60 64		79	79' - 82.6' intensely fractured.									Core 6, RQD=64%
			80										
			81										
			82										
			83	82.6 - 83.9' **SHALEY LIMESTONE**: BDX (LS/SH), light greenish gray (GLEY 1 7/10Y), fossiliferous, intensely fractured (extremely narrow to narrow apertures), slightly decomposed.	BDX (LS/SH)								
7 CORE	60 37		84	83.9 - 85.6' **SHALE**: BDX (SH), greenish gray (GLEY 1 5/10Y), very weak, medium bedded, highly to moderately decomposed, slightly to moderately disintegrated, intensely fractured (extremely narrow to narrow apertures).	BDX (SH)								Core 7, RQD=15%
			85										
			86	85.6 - 88.7' **SHALEY LIMESTONE**: BDX (LS/SH), light greenish gray (GLEY 1 7/10Y), shaley, fossiliferous, intensely fractured (extremely narrow to narrow apertures), slightly decomposed.									
			87	86.4' - 87' SHALE layer, greenish gray (GLEY 1 5/10Y), very weak, medium bedded.	BDX (LS/SH)								
			88										
			89	88.7 - 94.1' **SHALE**: BDX (SH), greenish gray (GLEY 1 5/10Y), very weak, medium bedded, highly to moderately decomposed, slightly to moderately disintegrated, intensely fractured (extremely narrow to narrow apertures).									
8 CORE	60 50		90		BDX (SH)								Core 8, RQD=49%
			91										
			92										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-384

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram		Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			93 94	88.7 - 94.1' **SHALE:** BDX (SH), greenish gray (GLEY 1 5/10Y), very weak, medium bedded, highly to moderately decomposed, slightly to moderately disintegrated, intensely fractured (extremely narrow to narrow apertures). *(continued)* 92.5' - 93.2' light greenish gray (GLEY 1 7/10Y), shaley, fossiliferous, intensely fractured, slightly decomposed. 94.1' End of Boring.	BDX (SH)									

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		PZ-174

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Chad Dutton Bulldog Drilling	8/4/2015	8/4/2015	hollow stem auger

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
PZ-174	Feet (NAVD88)	398.97 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 554,666.23 N, 2,379,774.23 E E /W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 22.8552"

Long -89° 52' 37.9524"

Local Grid Location

Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24 5	2 3 5 3	1	0 - 2' **TOPSOIL:** ML, brown (10YR 4/3), trace grass and roots, cohesive, nonplastic, dry.	ML								
2 SS	24 0	2 2 2 4	2, 3	2 - 4' No Recovery.									
3 SS	24 6	2 2 4 5	4, 5	4 - 24.7' **LEAN CLAY:** CL, dark grayish brown (10YR 4/2), dark yellowish brown (10YR 4/4) mottling, silt (10-20%), cohesive, medium plasticity, moist.	CL								
4 SS	24 6	4 4 5 7	6, 7										
5 SS	24 23	3 4 5 5	8, 9	8' - 9.9' increased yellowish brown (10YR 4/4) mottling, increase in silt content with depth (50%).									
6 SS	24 20	2 4 8 6	10, 11, 12	10' - 11.7' decrease in silt content with depth (10-20%). 10.6' - 11.2' dark yellowish brown (10YR 4/4) and very dark brown (10YR 2/2) mottling (50%), dry to moist.									

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Patrick M Hoffer

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NATURAL RESOURCE TECHNOLOGY

Boring Number PZ-174

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
7 SS	24 21	2 3 5 7		4 - 24.7' **LEAN CLAY:** CL, dark grayish brown (10YR 4/2), dark yellowish brown (10YR 4/4) mottling, silt (10-20%), cohesive, medium plasticity, moist. *(continued)*									
			13	12' - 13.8' trace coarse sand, dry.									
8 SS	24 21	2 4 5 8	14	14' - 15.8' increased sand content, trace gravel, dry.									
			15										
9 SS	24 24	2 4 5 7	16	16' - 18' yellowish brown (10YR 5/4), moist.									
			17										
10 SS	24 24	3 7 9 12	18	18' - 20' coarse sand and gravel (5-15%), moist.	CL								
			19										
11 SS	24 24	3 7 9 15	20										
			21										
12 SS	24 24	4 7 8 10	22										
			23										
13 SS	8 8	11 50 for 2"	24	24' - 24.7' decreased moisture content with depth.									Hollow Stem Auger Refusal at 24.7 ft bgs on Shale Bedrock.
				24.7' End of Boring.									

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		PZ-176

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Chad Dutton Bulldog Drilling	8/6/2015	8/6/2015	hollow stem auger

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
PZ-176	Feet (NAVD88)	403.46 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 554,264.76 N, 2,381,381.02 E E /W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 18.834"

Long -89° 52' 17.8428"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24 15	3 3 4 4		0 - 0.5' **TOPSOIL:** ML, dark grayish brown (10YR 4/2), clay (5-15%), trace grass and roots, cohesive, nonplastic, stiff (1.5 tsf), dry.	ML								
			1	0.5 - 2.4' **SILT:** ML, dark grayish brown (10YR 4/2), brownish yellow (10YR 6/6) and dark brown (10YR 3/3) mottling, clay (30-50%), trace roots, cohesive, low plasticity, very stiff (3.0 tsf), dry.	ML								
2 SS	24 16	3 3 5 5	2										
			3	2.4 - 6.3' **LEAN CLAY:** CL, dark yellowish brown (10YR 4/4), dark gray (10YR 4/1) mottling, silt (5-15%), trace roots, cohesive, medium plasticity, moist.									
3 SS	24 9	2 3 4 4	4	4' increase in silt content (40-60%), dry to moist.	CL								
			5										
4 SS	24 21	3 3 3 4	6	6.3 - 12' **SILT:** ML, dark gray (10YR 4/1), cohesive, nonplastic, moist.									
			7										
5 SS	24 12	1 1 1 2	8	8' sand (0-40%), sand content increasing with depth, moist to wet.									
			9		ML								
6 SS	24 13	1 1 1 2	10	10' increase in sand content (40-60%).									
			11										
			12										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Robert M Hafle

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NATURAL RESOURCE TECHNOLOGY

Boring Number PZ-176

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
7 SS	24 20	1 2 3 5		12 - 12.3' **WELL-GRADED SAND:** SW, very dark grayish brown (10YR 3/2), fine gravel (>15%), moist.	SW								
			13	12.3 - 16' **LEAN CLAY:** CL, gray (10YR 5/1), brownish yellow (5-15% 10YR 6/6) and trace very dark brown (10YR 2/2) mottling, silt (5-15%), trace sand seams, cohesive, medium plasticity, stiff to very stiff (1.5-3.0 tsf).									
8 SS	24	2 3 3 5	14	14' increase in thickness of sand seams (1"-2" thick, moist, wet).	CL								
			15										
			16										
9 SS	24 17	2 4 7 10		16 - 28.6' **LEAN CLAY:** CL, dark gray (10YR 4/1), light yellowish brown (10YR 6/4) mottling, cohesive, low plasticity, very stiff to hard (3.5->4.5 tsf) dry.									
			17										
			18										
10 SS	24 18	4 6 8 12		18' increased mottling, mostly brown (10YR 5/3), brownish yellow (10YR 6/6), dark gray (10YR 4/1), and olive gray (5Y 5/2) mottling.									
			19										
			20										
11 SS	24 17	5 16 22 25		20' olive gray (5Y 5/2), brownish yellow (10YR 6/6) mottling.									
			21	20.3' dark gray (2.5Y 4/1), brownish yellow (10YR 6/6) mottling, clay becoming blocky and laminated.									
			22										
12 SS	11 7	7 50 for 5"		22' pale olive (5Y 6/3), dark gray (10YR 4/1) mottling, laminated.	CL								
			23										
			24										At 23.6' rock fragment on bottom of split spoon. Refusal of split spoon.
13 SS	24 24	13 21 31 43		24' brownish yellow (10YR 6/6) mottling.									
			25										
			26										
14 SS	24 24	14 12 17 19											
			27										
			28										
15 SS	8 8	9 50 for 2"		28' hard (4.5 tsf).									
16 SS	1 0	50 for 1"		28.6' End of Boring.									

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Power Plant		MW-253R

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Ethan Orange Cascade Drilling LP	5/1/2024	5/1/2024	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-253R	Feet (NAVD88)	Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane N, E N/C/S
1/4 of 1/4 of Section , T N, R
Lat ___° ___' ___"
Long ___° ___' ___"
Local Grid Location
Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	IL	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	120 120			0 - 10.2' **SILTY CLAY:** CL/ML, brown (10YR 5/3), gravel (0-10%), hard, dry.									
			1										
			2	2.2' strong brown (7.5YR 4/6) mottling (20-30%), light gray (2.5Y 7/1) mottling (20-30%), very dark gray (10YR 3/1) mottling (0-10%).									
			3										
			4										
			5		CL/ML								
			6										
			7										
			8										
			9										
			10										
2 CS	120 120		11	10.2 - 15.4' **SILTY CLAY WITH SAND:** (CL/ML)S, brown (10YR 5/3), strong brown (7.5YR 4/6) mottling (20-30%), light gray (2.5Y 7/1) mottling (20-30%), very dark gray (10YR 3/1) mottling (0-10%), gravel (0-10%), medium to high plasticity, moist.	(CL/ML)S			3.5					
			12										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Ramboll
234 W. Florida St., Fifth Floor, Milwaukee, WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

Boring Number MW-253R

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			13	10.2 - 15.4' **SILTY CLAY WITH SAND:** (CL/ML)S, brown (10YR 5/3), strong brown (7.5YR 4/6) mottling (20-30%), light gray (2.5Y 7/1) mottling (20-30%), very dark gray (10YR 3/1) mottling (0-10%), gravel (0-10%), medium to high plasticity, moist. *(continued)*	(CL/ML)S			2.5					
			14										
			15					1.5					
			16	15.4 - 18.2' **LEAN CLAY WITH SAND:** (CL)s, yellowish brown (10YR 5/4), gravel (0-10%), medium plasticity, moist.	(CL)s								
			17					1					
			18										
			19	18.2 - 27.2' **SILTY CLAY WITH SAND:** (CL/ML)S, yellowish brown (10YR 5/4), strong brown (7.5YR 4/6) mottling (10-20%), light gray (2.5Y 7/1) mottling (10-20%), very dark gray (10YR 3/1) mottling (0-10%), sand (10-20%), gravel (0-10%), moist.	(CL/ML)S			3					
3 CS	120 120		20	20' gravel (10-20%).									
			21					3.5					
			22	22' - 25' intermittent fine sand seams.									
			23					3.5					
			24										
			25	25' - 27.2' coal (0-5%).				3					
			26										
			27					4.5					
			28	27.2 - 28.3' **LEAN CLAY:** CL, light yellowish brown (10YR 6/4), low plasticity, shaly, laminated, platy.	CL			4.5					
			29	28.3 - 35' **Weathered SHALE Bedrock:** BDX (SH), light olive brown (2.5Y 5/4), weathered shale, laminated.									
4 CS	60 60		30		BDX (SH)								
			31										
			32										

Boring Number MW-253R

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram		Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	
			33 34 35	28.3 - 35' **Weathered SHALE Bedrock:** BDX (SH), light olive brown (2.5Y 5/4), weathered shale, laminated. *(continued)*	BDX (SH)									
				35' End of Boring.										

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Power Plant		MW-350R

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Ethan Orange Cascade Drilling LP	5/3/2024	5/3/2024	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-350R	Feet (NAVD88)	Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane N, E N/C/S
1/4 of 1/4 of Section , T N, R
Lat ___° ___' ___"
Long ___° ___' ___"
Local Grid Location
Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	IL	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	120 120		1	0 - 14.4' **SILTY CLAY:** CL/ML, grayish brown (10YR 5/2), yellowish brown (10YR 5/8) mottling (30-40%), organics material and roots (0-10%), medium to high toughness, low to medium plasticity, moist.	CL/ML			1.5					
			2										
			3					2					
			4										
			5					2.5					
			6										
			7					3					
			8										
			9					4.5					
			10										
2 CS	120 120		11					3.5					
			12	11.5' sand (0-10%).									

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Ramboll
234 W. Florida St., Fifth Floor, Milwaukee, WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

Boring Number MW-350R

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			13	0 - 14.4' **SILTY CLAY:** CL/ML, grayish brown (10YR 5/2), yellowish brown (10YR 5/8) mottling (30-40%), organics material and roots (0-10%), medium to high toughness, low to medium plasticity, moist. *(continued)*	CL/ML			3.5					
			14										
			15	14.4 - 24.6' **LEAN CLAY:** CL, brown (10YR 5/3), light gray (10YR 7/1) mottling (20-30%), yellowish brown (10YR 5/8) mottling (20-30%), sand (20-30%), silt (20-30%), low to medium plasticity, moist.				1.5					
			16										
			17					1.5					
			18										
			19					1.5					
3 CS	60 60		20	19.7' brown (7.5YR 5/3), sand (0-10%), high plasticity.	CL								
			21					3					
			22	21.7' - 24.6' coarse subangular gravel (10-20%).									
			23					3					
			24					2					
4 CS	120 120		25	24.6 - 26.3' **Weathered SHALE Bedrock:** BDX (SH), olive gray (5Y 5/2), highly weathered, very weak.	BDX (SH)								
			26										
			27	26.3 - 27.1' **LIMESTONE:** BDX (LS), dark gray (10YR 4/1), fresh, competent, fossiliferous, medium bedded, strong.	BDX (LS)								
			28	27.1 - 28.3' **SHALE:** BDX (SH), very dark gray (10YR 3/1), medium bedded, very weak to weak, dry.	BDX (SH)								
			29	28.3 - 28.9' **LIMESTONE:** BDX (LS), dark gray (10YR 4/1), fresh, competent fossiliferous, medium bedded, strong.	BDX (LS)								
			30	28.9 - 32.2' **SHALE:** BDX (SH), very dark gray (10YR 3/1), lightly to moderately weathered, medium bedded.	BDX (SH)								
			31										
			32										

Boring Number MW-350R

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			33	32.2 - 39.5' **SHALEY LIMESTONE:** BDX (LS/SH), reddish gray (2.5YR 5/1), very slightly weathered, strong.									
			34										
			35	34.5' moderately decomposed, laminated.									
5 CS	60 60		36		BDX (LS/SH)								
			37										
			38										
			39										
6 CS	48 48		40	39.5 - 41.7' **SHALE:** BDX (SH), gray (10YR 5/1), weathered, laminated, very weak to weak.	BDX (SH)								
			41										
			42	41.7 - 47' **LIMESTONE:** BDX (LS), light gray (10YR 7/1), laminated, medium bedded, strong.									
			43										
7 CS	36 36		44		BDX (LS)								
			45										
			46										
			47	47' End of Boring.									

Illinois Environmental Protection Agency

Well Completion Report

Incident No.: None
Site Name: Dynegy-Baldwin Energy Complex
Drilling Contractor: Terra Drill
Driller: Matt Cooper
Drilling Method: Hollow-Stem Auger

Well No.: MW-150
Date Drilled Start: 09/08/10
Date Completed: 09/08/10
Geologist: Brendon Wilder
Drilling Fluids (Type): None

Annular Space Details

Type of Surface Seal: Concrete
Type of Annular Sealant: Bentonite Chips
Type of Bentonite Seal (Granular, Pellet): _____
Bentonite Chips (hydrated)
Type of Sand Pack: Clean Silica Sand

Well Construction Materials

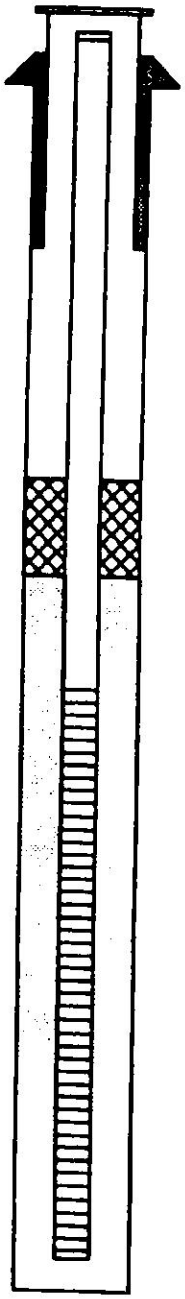
	Stainless Steel Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			
Riser pipe above w.t.		Sch. 40	
Riser Pipe below w.t.		Sch. 40	
Screen		Sch. 40	
Coupling joint screen to riser			
Protective casing			

Measurements

to .01 ft (where applicable)

Riser Pipe Length	17.72
Screen Length	9.64
Screen Slot Size	0.01
Protective casing length	
Depth to water	19.58
Elevation of water	376.96
Free Product thickness	
Gallons removed (develop)	4.05
Gallons removed (purge)	
Other	

Completed by: PSC Industrial Outsourcing, LP



Elevations - .01 ft.

_____ Top of Protective Casing
396.54 Top of Riser Pipe
393.84 Ground Surface
392.84 Top of Annular sealant
_____ Casing Stickup

383.34 Top of Seal
3.00 Total Seal Interval
380.34 Top of Sand

378.82 Top of Screen

9.25 Total Screen Interval

369.18 Bottom of Screen
368.67 Bottom of Borehole

Illinois Environmental Protection Agency

Well Completion Report

Incident No.: None
Site Name: Dynegy-Baldwin Energy Complex
Drilling Contractor: Terra Drill
Driller: Matt Cooper
Drilling Method: Hollow-Stem Auger

Well No.: MW-152
Date Drilled Start: 09/23/10
Date Completed: 09/23/10
Geologist: Brendon Wilder
Drilling Fluids (Type): None

Annular Space Details

Type of Surface Seal: Concrete
Type of Annular Sealant: Bentonite Chips
Type of Bentonite Seal (Granular, Pellet): _____
Bentonite Chips (hydrated)
Type of Sand Pack: Clean Silica Sand

Well Construction Materials

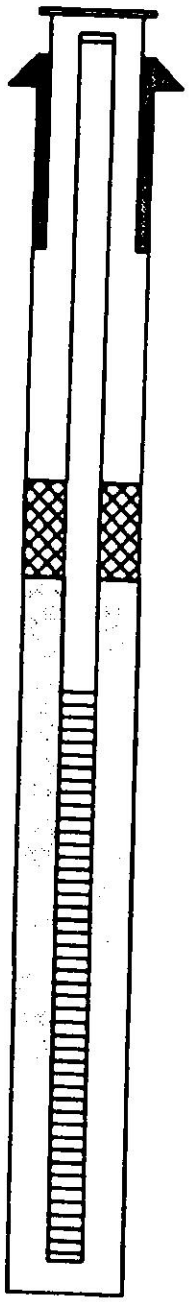
	Stainless Steel Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			
Riser pipe above w.t.		Sch. 40	
Riser Pipe below w.t.		Sch. 40	
Screen		Sch. 40	
Coupling joint screen to riser			
Protective casing			

Measurements

to .01 ft (where applicable)

Riser Pipe Length	9.88
Screen Length	9.25
Screen Slot Size	0.01
Protective casing length	
Depth to water	7.35
Elevation of water	417.64
Free Product thickness	
Gallons removed (develop)	6.20
Gallons removed (purge)	
Other	

Completed by: PSC Industrial Outsourcing, LP



Elevations - .01 ft.

_____ Top of Protective Casing
424.99 Top of Riser Pipe
422.18 Ground Surface
421.18 Top of Annular sealant
_____ Casing Stickup

418.68 Top of Seal
2.00 Total Seal Interval
416.68 Top of Sand

415.11 Top of Screen

9.64 Total Screen Interval

405.47 Bottom of Screen
404.48 Bottom of Borehole

IL 532-2274
LPC 500 Rev June 2004

Illinois Environmental Protection Agency

Well Completion Report

Incident No.: None
Site Name: Dynegy-Baldwin Energy Complex
Drilling Contractor: Terra Drill
Driller: Matt Cooper
Drilling Method: Hollow-Stem Aug.; Mud-Rotary

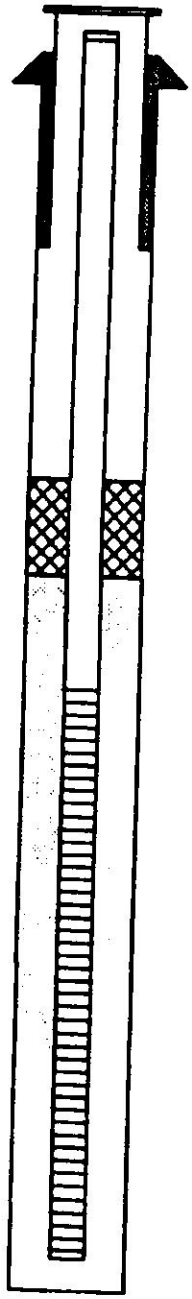
Well No.: MW-252
Date Drilled Start: 09/21/10
Date Completed: 09/22/10
Geologist: Brendon Wilder
Drilling Fluids (Type): Water w/ Polymer

Annular Space Details

Type of Surface Seal: Concrete
Type of Annular Sealant: Cement-Bentonite Grout
Type of Bentonite Seal (Granular, Pellet): Bentonite Chips (hydrated)
Type of Sand Pack: Clean Silica Sand

Elevations - .01 ft.

_____ Top of Protective Casing
425.07 Top of Riser Pipe
422.27 Ground Surface
421.27 Top of Annular sealant
_____ Casing Stickup



382.97 Top of Seal
3.70 Total Seal Interval
379.27 Top of Sand
377.87 Top of Screen
4.63 Total Screen Interval
373.24 Bottom of Screen
372.73 Bottom of Borehole

Well Construction Materials

	Stainless Steel Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			
Riser pipe above w.t.		Sch. 40	
Riser Pipe below w.t.		Sch. 40	
Screen		Sch. 40	
Coupling joint screen to riser			
Protective casing			

Measurements

to .01 ft (where applicable)

Riser Pipe Length	47.21
Screen Length	4.63
Screen Slot Size	0.01
Protective casing length	
Depth to water	0.40
Elevation of water	424.67
Free Product thickness	
Gallons removed (develop)	7.37
Gallons removed (purge)	
Other	

Completed by: PSC Industrial Outsourcing, LP

Illinois Environmental Protection Agency

Well Completion Report

Incident No.: None
Site Name: Dynegy-Baldwin Energy Complex
Drilling Contractor: Terra Drill
Driller: Matt Cooper
Drilling Method: Hollow-Stem Aug.; Mud-Rotary

Well No.: MW-253
Date Drilled Start: 09/20/10
Date Completed: 09/20/10
Geologist: Brendon Wilder
Drilling Fluids (Type): Water w/ Polymer

Annular Space Details

Type of Surface Seal: Concrete
Type of Annular Sealant: Cement-Bentonite Grout
Type of Bentonite Seal (Granular, Pellet): Bentonite Chips (hydrated)
Type of Sand Pack: Clean Silica Sand

Well Construction Materials

	Stainless Steel Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			
Riser pipe above w.t.		Sch. 40	
Riser Pipe below w.t.		Sch. 40	
Screen		Sch. 40	
Coupling joint screen to riser			
Protective casing			

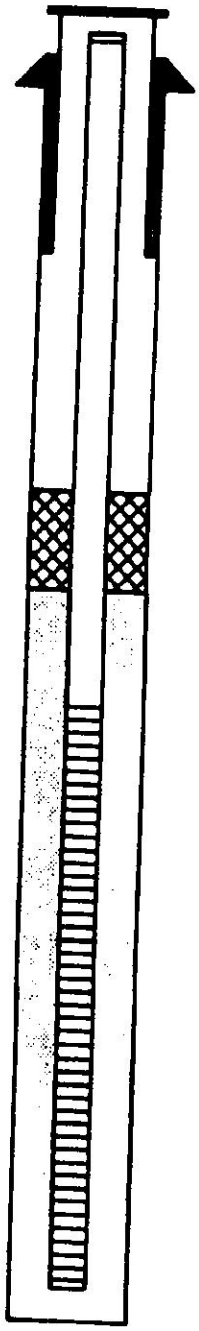
Measurements

to .01 ft (where applicable)

Riser Pipe Length	33.01
Screen Length	4.63
Screen Slot Size	0.01
Protective casing length	
Depth to water	12.71
Elevation of water	433.13
Free Product thickness	
Gallons removed (develop)	7.89
Gallons removed (purge)	
Other	

Completed by: PSC Industrial Outsourcing, LP

Elevations - .01 ft.



____ Top of Protective Casing
445.84 Top of Riser Pipe
442.70 Ground Surface
441.70 Top of Annular sealant
____ Casing Stickup

417.00 Top of Seal
2.00 Total Seal Interval
415.00 Top of Sand

412.84 Top of Screen

4.63 Total Screen Interval

408.21 Bottom of Screen
407.70 Bottom of Borehole

IL 532-2274
LPC 500 Rev June 2004

Illinois Environmental Protection Agency

Well Completion Report

Incident No.: None
Site Name: Dynegy-Baldwin Energy Complex
Drilling Contractor: Terra Drill
Driller: Matt Cooper
Drilling Method: Hollow-Stem Aug.; Mud-Rotary

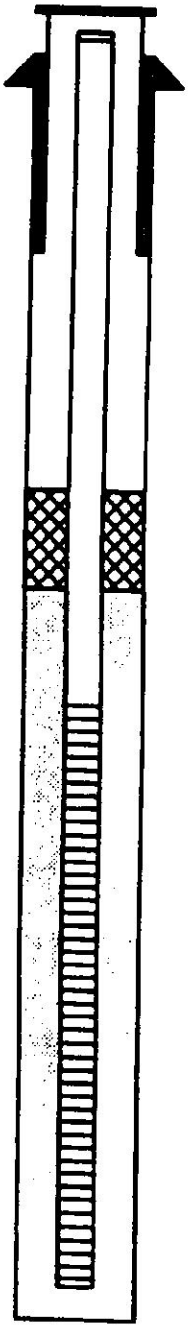
Well No.: MW-350
Date Drilled Start: 09/08/10
Date Completed: 09/09/10
Geologist: Brendon Wilder
Drilling Fluids (Type): Water w/ Polymer

Annular Space Details

Type of Surface Seal: Concrete
Type of Annular Sealant: Cement-Bentonite Grout
Type of Bentonite Seal (Granular, Pellet): _____
Bentonite Chips (hydrated)
Type of Sand Pack: Clean Silica Sand

Elevations - .01 ft.

_____ Top of Protective Casing
396.80 Top of Riser Pipe
394.11 Ground Surface
393.11 Top of Annular sealant
_____ Casing Stickup



367.71 Top of Seal
10.60 Total Seal Interval
357.11 Top of Sand
352.52 Top of Screen
4.63 Total Screen Interval
347.89 Bottom of Screen
347.38 Bottom of Borehole

Well Construction Materials

	Stainless Steel Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			
Riser pipe above w.t.		Sch. 40	
Riser Pipe below w.t.		Sch. 40	
Screen		Sch. 40	
Coupling joint screen to riser			
Protective casing			

Measurements

to .01 ft (where applicable)

Riser Pipe Length	44.29
Screen Length	4.63
Screen Slot Size	0.01
Protective casing length	
Depth to water	22.52
Elevation of water	374.28
Free Product thickness	
Gallons removed (develop)	10.00
Gallons removed (purge)	
Other	

Completed by: PSC Industrial Outsourcing, LP

Illinois Environmental Protection Agency

Well Completion Report

Incident No.: None
Site Name: Dynegy-Baldwin Energy Complex
Drilling Contractor: Terra Drill
Driller: Matt Cooper
Drilling Method: Hollow-Stem Aug.; Mud-Rotary

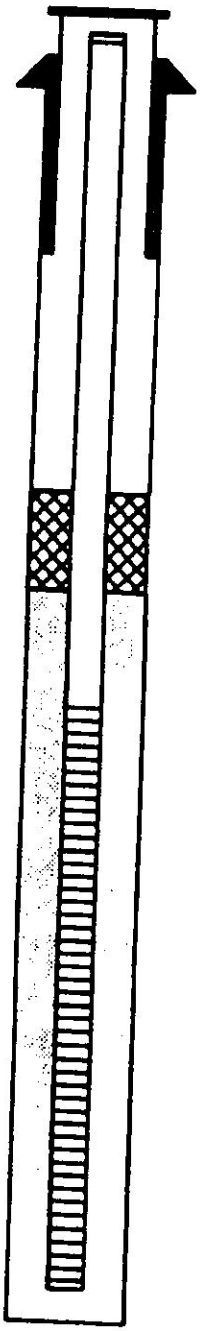
Well No.: MW-352
Date Drilled Start: 09/15/10
Date Completed: 09/17/10
Geologist: Brendon Wilder
Drilling Fluids (Type): Water w/ Polymer

Annular Space Details

Type of Surface Seal: Concrete
Type of Annular Sealant: Cement-Bentonite Grout
Type of Bentonite Seal (Granular, Pellet): Bentonite Chips (hydrated)
Type of Sand Pack: Clean Silica Sand

Elevations - .01 ft.

_____ Top of Protective Casing
425.04 Top of Riser Pipe
422.36 Ground Surface
421.36 Top of Annular sealant
_____ Casing Stickup



361.06 Top of Seal
4.00 Total Seal Interval
357.06 Top of Sand
354.46 Top of Screen
4.63 Total Screen Interval
349.83 Bottom of Screen
348.56 Bottom of Borehole

Well Construction Materials

	Stainless Steel Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			
Riser pipe above w.t.		Sch. 40	
Riser Pipe below w.t.		Sch. 40	
Screen		Sch. 40	
Coupling joint screen to riser			
Protective casing			

Measurements

to .01 ft (where applicable)

Riser Pipe Length	70.59
Screen Length	4.63
Screen Slot Size	0.01
Protective casing length	
Depth to water	23.85
Elevation of water	401.19
Free Product thickness	
Gallons removed (develop)	13.70
Gallons removed (purge)	
Other	

Completed by: PSC Industrial Outsourcing, LP

IL 532-2274
LPC 500 Rev June 2004

NATURAL RESOURCE TECHNOLOGY

MONITORING WELL CONSTRUCTION

Facility/Project Name: Baldwin Energy Complex	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: MW-366
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 38° 11' 31.888" Long. -89° 52' 20.441" or	
Facility ID	St. Plane 555,581.80 ft. N, 2,381,171.15 ft. E. E/Ⓦ	Date Well Installed: 12/04/2015
Type of Well: mw	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐ E ☐ W	Well Installed By: (Person's Name and Firm) Jim Dittmaier
Distance from Waste/Source ft. / State: Illinois	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☒ Downgradient n ☐ Not Known / Gov. Lot Number: ____	Bulldog Drilling

A. Protective pipe, top elevation ____ ft. (NAVD88)

B. Well casing, top elevation 425.08 ft. (NAVD88)

C. Land surface elevation 422.54 ft. (NAVD88)

D. Surface seal, bottom 421.5 ft. (NAVD88) or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☒

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☒ Hollow Stem Auger ☐ ____ Other ☐

15. Drilling fluid used: Water ☒ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):
Village of Baldwin

E. Bentonite seal, top 387.5 ft. (NAVD88) or 35.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 382.5 ft. (NAVD88) or 40.0 ft.

H. Screen joint, top 380.5 ft. (NAVD88) or 42.0 ft.

I. Well bottom 370.5 ft. (NAVD88) or 52.0 ft.

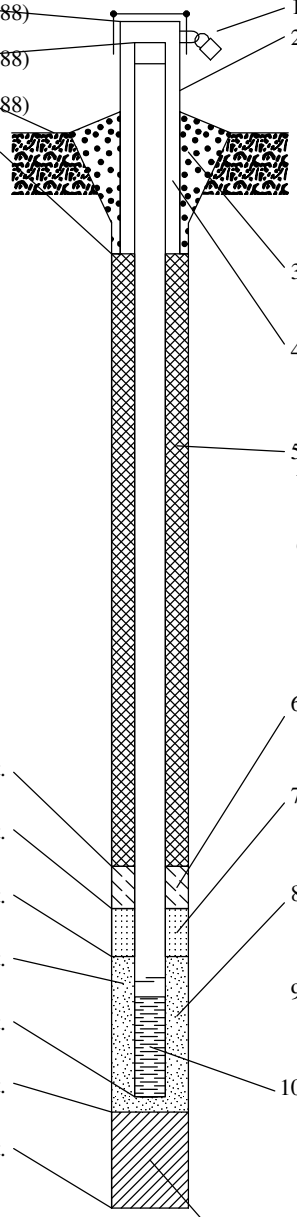
J. Filter pack, bottom 370.0 ft. (NAVD88) or 52.5 ft.

K. Borehole, bottom 368.5 ft. (NAVD88) or 54.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
   a. Inside diameter: 4.0 in.
   b. Length: 5.0 ft.
   c. Material: Steel ☒ ____ Other ☐
   d. Additional protection? ☒ Yes ☐ No
   If yes, describe: Three steel bollards
3. Surface seal: Bentonite ☐ Concrete ☒ ____ Other ☐
4. Material between well casing and protective pipe: Bentonite ☒ Sand Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☐
   b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
   c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐
   d. 30 % Bentonite . . . Bentonite-cement grout ☒
   e. ____ Ft^3 volume added for any of the above
   f. How installed: Tremie ☐ Tremie pumped ☒ Gravity ☐
6. Bentonite seal: a. Bentonite granules ☐
   b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
   c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
   a. ____
   b. Volume added ____ ft^3
8. Filter pack material: Manufacturer, product name & mesh size
   a. Unimin Corporation, FILTERSIL
   b. Volume added ____ ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ ____ Other ☐
10. Screen material: Schedule 40 PVC
    a. Screen Type: Factory cut ☒ Continuous slot ☐ ____ Other ☐
    b. Manufacturer ____
    c. Slot size: 0.010 in.
    d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☐ 1.5' bedrock drill cuttings Other ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Date Modified: 2/4/2016

Signature: Brad Rudzis

Firm: Natural Resource Technology
234 W. Florida Street, Floor 5, Milwaukee, WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

NATURAL RESOURCE TECHNOLOGY

MONITORING WELL CONSTRUCTION

Facility/Project Name: Baldwin Energy Complex	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: MW-384
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 38° 11' 30.440" Long. -89° 51' 38.516" or	
Facility ID	St. Plane 555,446.11 ft. N, 2,384,518.72 ft. E. E/W	Date Well Installed: 12/18/2015
Type of Well: mw	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐ E ☐ W	Well Installed By: (Person's Name and Firm) Chad Dutton, Bulldog Drilling
Distance from Waste/Source ft. / State: Illinois	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☒ Downgradient n ☐ Not Known	Gov. Lot Number: ____

A. Protective pipe, top elevation ____ ft. (NAVD88)

B. Well casing, top elevation 458.95 ft. (NAVD88)

C. Land surface elevation 456.70 ft. (NAVD88)

D. Surface seal, bottom 455.7 ft. (NAVD88) or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☒

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☒ Hollow Stem Auger ☐ ____ Other ☐

15. Drilling fluid used: Water ☒ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required): Village of Baldwin

E. Bentonite seal, top 402.7 ft. (NAVD88) or 54.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 398.2 ft. (NAVD88) or 58.5 ft.

H. Screen joint, top 396.2 ft. (NAVD88) or 60.5 ft.

I. Well bottom 386.2 ft. (NAVD88) or 70.5 ft.

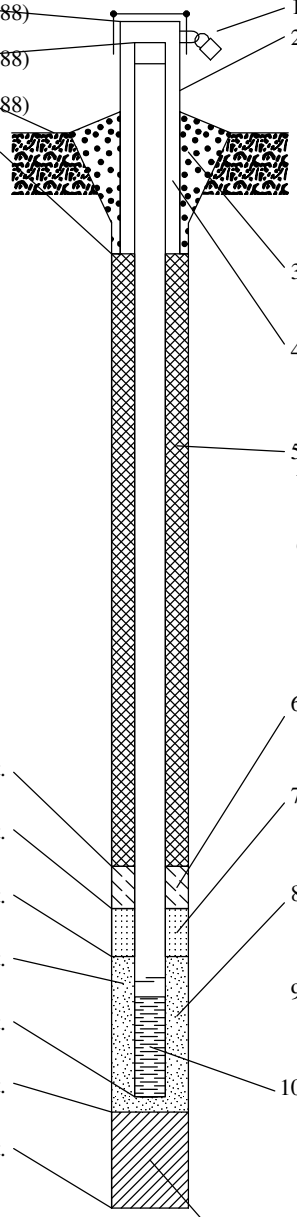
J. Filter pack, bottom 385.2 ft. (NAVD88) or 71.5 ft.

K. Borehole, bottom 379.7 ft. (NAVD88) or 77.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
   a. Inside diameter: 4.0 in.
   b. Length: 5.0 ft.
   c. Material: Steel ☒ ____ Other ☐
   d. Additional protection? ☒ Yes ☐ No
   If yes, describe: Steel bollards (3), 6" PVC casing to 25' bgs
3. Surface seal: Bentonite ☐ Concrete ☒ ____ Other ☐
4. Material between well casing and protective pipe: Bentonite ☒ Sand Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☐
   b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
   c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐
   d. 30 % Bentonite . . . Bentonite-cement grout ☒
   e. ____ Ft^3 volume added for any of the above
   f. How installed: Tremie ☐ Tremie pumped ☒ Gravity ☐
6. Bentonite seal: a. Bentonite granules ☐
   b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
   c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
   a. ____
   b. Volume added ____ ft^3
8. Filter pack material: Manufacturer, product name & mesh size
   a. Unimin Corporation, FILTERSIL
   b. Volume added ____ ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ ____ Other ☐
10. Screen material: Schedule 40 PVC
    a. Screen Type: Factory cut ☒ Continuous slot ☐ ____ Other ☐
    b. Manufacturer ____
    c. Slot size: 0.010 in.
    d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☐ 0.5' of bentonite chips, 5' of bedrock drill cuttings Other ☒

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Date Modified: 2/4/2016

Signature: Brad Rucker

Firm: Natural Resource Technology
234 W. Florida Street, Floor 5, Milwaukee, WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

NATURAL RESOURCE TECHNOLOGY

MONITORING WELL CONSTRUCTION

Facility/Project Name: Baldwin Energy Complex	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: PZ-174
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 38° 11' 22.855" Long. -89° 52' 37.952" or St. Plane 554,666.23 ft. N, 2,379,774.23 ft. E. E/Ⓦ	
Facility ID		Date Well Installed: 08/04/2015
Type of Well	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐ E ☐ W	Well Installed By: (Person's Name and Firm) Chad Dutton, Bulldog Drilling
Distance from Waste/Source ft. / State: Illinois	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☒ Downgradient n ☐ Not Known	Gov. Lot Number: ____

A. Protective pipe, top elevation ____ ft. (NAVD88)

B. Well casing, top elevation 401.92 ft. (NAVD88)

C. Land surface elevation 398.97 ft. (NAVD88)

D. Surface seal, bottom 398.0 ft. (NAVD88) or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☒ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ Hollow Stem Auger ☒ ____ Other ☐

15. Drilling fluid used: Water ☒ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required): Village of Baldwin

E. Bentonite seal, top 398.0 ft. (NAVD88) or 1.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 386.5 ft. (NAVD88) or 12.5 ft.

H. Screen joint, top 384.5 ft. (NAVD88) or 14.5 ft.

I. Well bottom 374.5 ft. (NAVD88) or 24.5 ft.

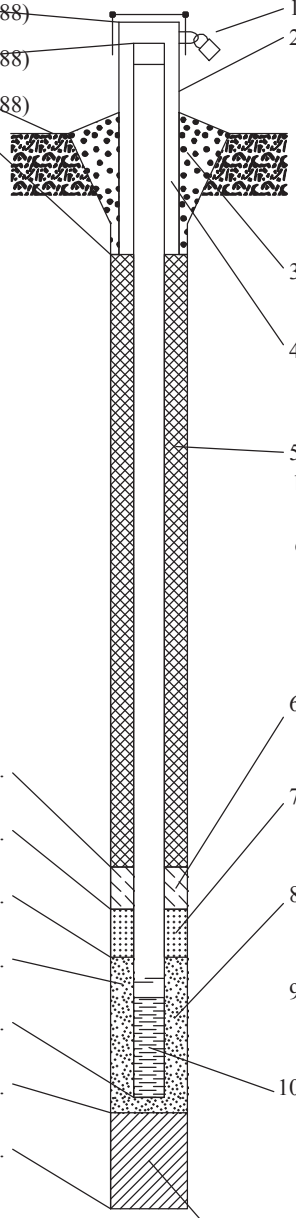
J. Filter pack, bottom 374.5 ft. (NAVD88) or 24.5 ft.

K. Borehole, bottom 374.5 ft. (NAVD88) or 24.5 ft.

L. Borehole, diameter 8.3 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
   a. Inside diameter: 4.0 in.
   b. Length: 5.0 ft.
   c. Material: Steel ☒ ____ Other ☐
   d. Additional protection? ☒ Yes ☐ No
   If yes, describe: Three steel bollards
3. Surface seal: Bentonite ☐ Concrete ☒ ____ Other ☐
4. Material between well casing and protective pipe: Bentonite ☒ Sand Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☒
   b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
   c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐
   d. ____ % Bentonite . . . Bentonite-cement grout ☐
   e. ____ Ft^3 volume added for any of the above
   f. How installed: Tremie ☒ Tremie pumped ☐ Gravity ☐
6. Bentonite seal: a. Bentonite granules ☐
   b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
   c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
   a. ____
   b. Volume added ____ ft^3
8. Filter pack material: Manufacturer, product name & mesh size
   a. Unimin Corporation, FILTERSIL
   b. Volume added ____ ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ ____ Other ☐
10. Screen material: Schedule 40 PVC
    a. Screen Type: Factory cut ☒ Continuous slot ☐ ____ Other ☐
    b. Manufacturer ____
    c. Slot size: 0.010 in.
    d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☒ ____ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Date Modified: 11/6/2015

Signature: Pam M. Hafl

Firm: Natural Resource Technology
234 W. Florida Street, Floor 5, Milwaukee, WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

NATURAL RESOURCE TECHNOLOGY

MONITORING WELL CONSTRUCTION

Facility/Project Name: Baldwin Energy Complex	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: PZ-176
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. 38° 11' 18.834" Long. -89° 52' 17.843" or	
Facility ID	St. Plane 554,264.76 ft. N, 2,381,381.02 ft. E. E/Ⓦ	Date Well Installed: 08/06/2015
Type of Well	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐ E ☐ W	Well Installed By: (Person's Name and Firm) Chad Dutton, Bulldog Drilling
Distance from Waste/Source ft. / State Illinois	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☒ Downgradient n ☐ Not Known / Gov. Lot Number	

A. Protective pipe, top elevation ____ ft. (NAVD88)

B. Well casing, top elevation 406.44 ft. (NAVD88)

C. Land surface elevation 403.46 ft. (NAVD88)

D. Surface seal, bottom 402.5 ft. (NAVD88) or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ Hollow Stem Auger ☒ ____ Other ☐

15. Drilling fluid used: Water ☒ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required): Village of Baldwin

E. Bentonite seal, top 392.5 ft. (NAVD88) or 11.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top 387.5 ft. (NAVD88) or 16.0 ft.

H. Screen joint, top 385.4 ft. (NAVD88) or 18.1 ft.

I. Well bottom 375.4 ft. (NAVD88) or 28.1 ft.

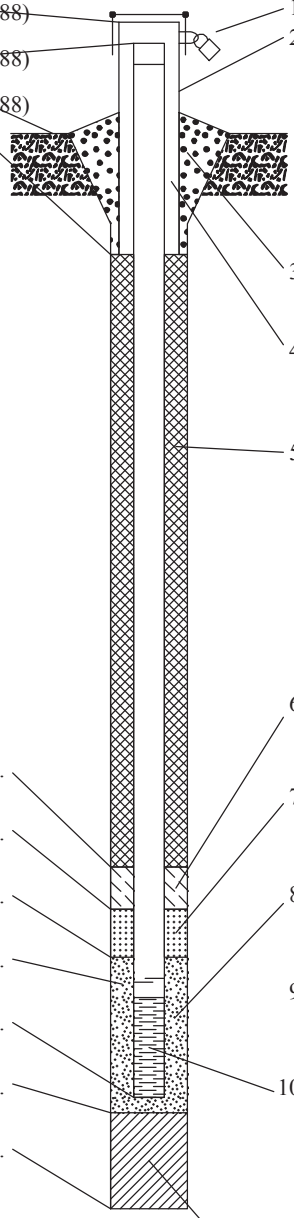
J. Filter pack, bottom 374.9 ft. (NAVD88) or 28.6 ft.

K. Borehole, bottom 374.9 ft. (NAVD88) or 28.6 ft.

L. Borehole, diameter 8.3 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
   a. Inside diameter: 4.0 in.
   b. Length: 5.0 ft.
   c. Material: Steel ☒ ____ Other ☐
   d. Additional protection? ☒ Yes ☐ No
   If yes, describe: Three steel bollards
3. Surface seal: Bentonite ☐ Concrete ☒ ____ Other ☐
4. Material between well casing and protective pipe: Bentonite ☒ Sand Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☐
   b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
   c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐
   d. 30 % Bentonite . . . Bentonite-cement grout ☒
   e. ____ Ft^3 volume added for any of the above
   f. How installed: Tremie ☐ Tremie pumped ☒ Gravity ☐
6. Bentonite seal: a. Bentonite granules ☐
   b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
   c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
   a. ____
   b. Volume added ____ ft^3
8. Filter pack material: Manufacturer, product name & mesh size
   a. Unimin Corporation, FILTERSIL
   b. Volume added ____ ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ ____ Other ☐
10. Screen material: Schedule 40 PVC
    a. Screen Type: Factory cut ☒ Continuous slot ☐ ____ Other ☐
    b. Manufacturer ____
    c. Slot size: 0.010 in.
    d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☒ ____ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Date Modified: 11/6/2015

Signature	Firm	
Pam M. Hufl	Natural Resource Technology 234 W. Florida Street, Floor 5, Milwaukee, WI 53204	Tel: (414) 837-3607 Fax: (414) 837-3608

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Baldwin Power Plant	Local Grid Location of Well: _____ ft. ☐ N. ☐ S. _____ ft. ☐ E. ☐ W.	Well Name: MW-253R
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. ___ ° ___ ' ___ " Long. ___ ° ___ ' ___ " or	
Facility ID	St. Plane _____ ft. N, _____ ft. E. E / W	Date Well Installed: 05/01/2024
Type of Well: Well Code 12/pz	Section Location of Waste/Source: ___ 1/4 of ___ 1/4 of Sec. ___, T. ___ N, R. ___ ☐ E ☐ W	Well Installed By: (Person's Name and Firm) Ethan Orange, Cascade Drilling LP
Distance from Waste/Source ft. / State IL	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number: _____

A. Protective pipe, top elevation _____ ft. (NAVD88)

B. Well casing, top elevation _____ ft. (NAVD88)

C. Land surface elevation _____ ft. (NAVD88)

D. Surface seal, bottom _____ ft. (NAVD88) or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☒

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ Hollow Stem Auger ☐ Sonic Other ☒

15. Drilling fluid used: Water ☒ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☒ Yes ☐ No

Describe N

17. Source of water (attach analysis, if required):
Town of Baldwin

E. Bentonite seal, top _____ ft. (NAVD88) or 23.0 ft.

F. Fine sand, top _____ ft. (NAVD88) or ___ ft.

G. Filter pack, top _____ ft. (NAVD88) or 27.0 ft.

H. Screen joint, top _____ ft. (NAVD88) or 29.5 ft.

I. Well bottom _____ ft. (NAVD88) or 34.5 ft.

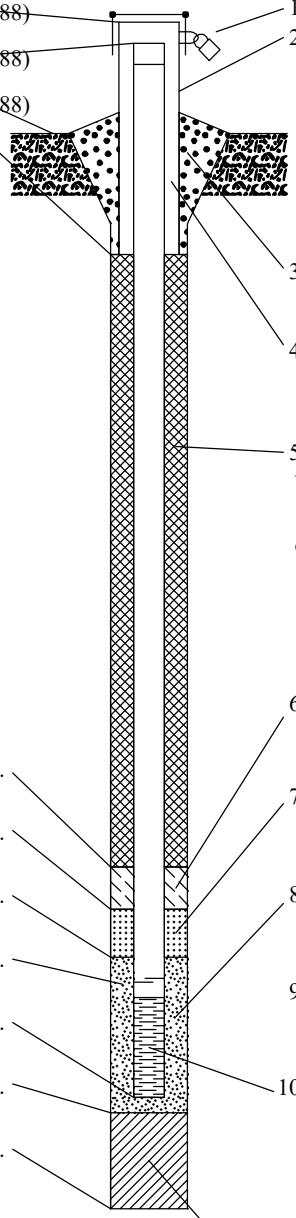
J. Filter pack, bottom _____ ft. (NAVD88) or 35.0 ft.

K. Borehole, bottom _____ ft. (NAVD88) or 35.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
   a. Inside diameter: 4.0 in.
   b. Length: 5.0 ft.
   c. Material: Steel ☒ Other ☐
   d. Additional protection? ☒ Yes ☐ No
   If yes, describe: 4 bollards
3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ Other ☐
5. Annular space seal: a. Granular/Chipped Bentonite ☐
   b. ___ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
   c. ___ Lbs/gal mud weight . . . Bentonite slurry ☐
   d. 5 % Bentonite . . . Bentonite-cement grout ☒
   e. 3.5 Ft^3 volume added for any of the above
   f. How installed: Tremie ☐ Tremie pumped ☒ Gravity ☐
6. Bentonite seal: a. Bentonite granules ☐
   b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
   c. _____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
   a. _____
   b. Volume added _____ ft^3
8. Filter pack material: Manufacturer, product name & mesh size
   a. #2 K&E Well Gravel
   b. Volume added _____ ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐
10. Screen material: Schedule 40 PVC
    a. Screen Type: Factory cut ☒ Continuous slot ☐ Other ☐
    b. Manufacturer _____
    c. Slot size: 0.010 in.
    d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☒ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Date Modified: 7/9/2024

Signature

Firm Ramboll
234 W. Florida St., Fifth Floor, Milwaukee, WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Baldwin Power Plant	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: MW-350R
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. ___ ° ___ ' ___ " Long. ___ ° ___ ' ___ " or	
Facility ID	St. Plane ____ ft. N, ____ ft. E. E / W	Date Well Installed: 05/03/2024
Type of Well: Well Code 12/pz	Section Location of Waste/Source: ___ 1/4 of ___ 1/4 of Sec. ___, T. ___ N, R. ___ ☐ E ☐ W	Well Installed By: (Person's Name and Firm) Ethan Orange
Distance from Waste/Source ft. / State IL	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number ____ / Cascade Drilling LP

A. Protective pipe, top elevation ____ ft. (NAVD88)

B. Well casing, top elevation ____ ft. (NAVD88)

C. Land surface elevation ____ ft. (NAVD88)

D. Surface seal, bottom ____ ft. (NAVD88) or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☒

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ Hollow Stem Auger ☐ Sonic Other ☒

15. Drilling fluid used: Water ☒ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☒ Yes ☐ No

Describe N

17. Source of water (attach analysis, if required):
Town of Baldwin

E. Bentonite seal, top ____ ft. (NAVD88) or 27.0 ft.

F. Fine sand, top ____ ft. (NAVD88) or ____ ft.

G. Filter pack, top ____ ft. (NAVD88) or 37.0 ft.

H. Screen joint, top ____ ft. (NAVD88) or 42.0 ft.

I. Well bottom ____ ft. (NAVD88) or 47.0 ft.

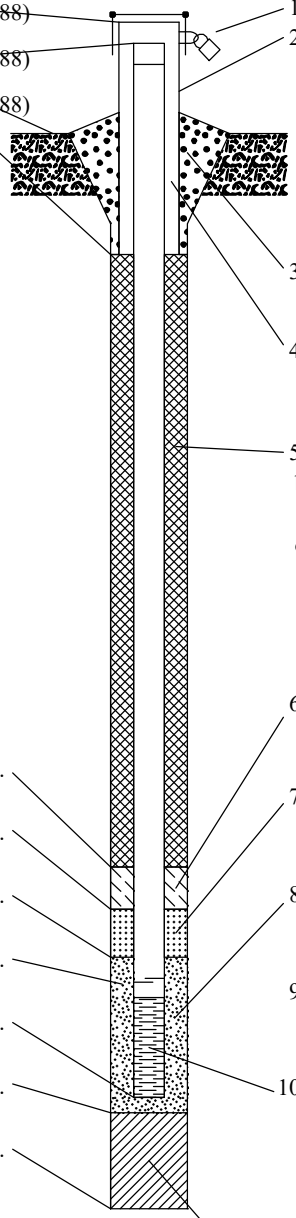
J. Filter pack, bottom ____ ft. (NAVD88) or 47.0 ft.

K. Borehole, bottom ____ ft. (NAVD88) or 47.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
   a. Inside diameter: 4.0 in.
   b. Length: 5.0 ft.
   c. Material: Steel ☒ Other ☐
   d. Additional protection? ☒ Yes ☐ No
   If yes, describe: 4 bollards
3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐
4. Material between well casing and protective pipe: Bentonite ☐ Other ☐
5. Annular space seal: a. Granular/Chipped Bentonite ☐
   b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
   c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐
   d. 5 % Bentonite . . . Bentonite-cement grout ☒
   e. 4 Ft^3 volume added for any of the above
   f. How installed: Tremie ☐ Tremie pumped ☒ Gravity ☐
6. Bentonite seal: a. Bentonite granules ☐
   b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
   c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
   a. ____
   b. Volume added ____ ft^3
8. Filter pack material: Manufacturer, product name & mesh size
   a. #2 K&E Well Gravel
   b. Volume added ____ ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐
10. Screen material: Schedule 40 PVC
    a. Screen Type: Factory cut ☒ Continuous slot ☐ Other ☐
    b. Manufacturer ____
    c. Slot size: 0.010 in.
    d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☒ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Date Modified: 7/9/2024

Signature

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APPENDIX B
35 I.A.C. § 845 MULTI-SITE STATISTICAL ANALYSIS PLAN

Date
April 1, 2025

Project No.
1940110241

35 I.A.C § 845 MULTI-SITE STATISTICAL ANALYSIS PLAN

RAMBOLL Bright ideas. Sustainable change.

35 I.A.C § 845 MULTI-SITE STATISTICAL ANALYSIS PLAN

Project no.	**1940110241**
Recipient	**Vistra Corp**
Document type	**Statistical Analysis Plan**
Revision	**FINAL**
Date	**April 1, 2025**
Prepared by	**Rachel Banoff and Alison O'Connor**
Checked by	**Eric J. Tlachac, PE**
Approved by	**Brian G. Hennings, PG**

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LICENSED PROFESSIONAL CERTIFICATIONS

This certification is based on the description of the statistical methods selected to evaluate groundwater as presented in the following 35 I.A.C. § 845 Multi-Site Statistical Analysis Plan. The procedures described in the plan will be used to establish background conditions and implement compliance and corrective action monitoring as necessary and required by 35 I.A.C. § 845.640, § 845.650, and § 845.680. The 35 I.A.C. § 845 Multi-Site Statistical Analysis Plan was prepared in accordance with the requirements of 35 I.A.C. § 845.640(f), with reference to the acceptable statistical procedures provided in the United States Environmental Protection Agency (USEPA)'s *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (*Unified Guidance,* USEPA 2009), and is intended to provide a logical process and framework for conducting the statistical analysis of the data obtained during groundwater monitoring. In accordance with 35 I.A.C. § 845.640(f)(1), the statistical method chosen for analysis of background groundwater quality is the tolerance interval procedure for each constituent listed in 35 I.A.C. § 845.600(a)(1) at this CCR unit per 35 I.A.C. § 845.640(f)(1)(C). Groundwater Protection Standards (GWPS) will be established in accordance with 35 I.A.C. § 845.600(a) (greater of the background concentration or numerical limit specified in 35 I.A.C. § 845.600(a)(1)). The GWPS will be compared to the appropriate confidence interval for the observed concentrations for each constituent in each compliance well. Consistent with the *Unified Guidance*, the same general statistical method of confidence interval testing against a fixed GWPS is recommended in compliance and corrective action programs. Confidence intervals provide a flexible and statistically accurate method to test how a parameter estimated from a single sample compares to a fixed numerical limit. Confidence intervals explicitly account for variation and uncertainty in the sample data used to construct them.

Description of the statistical methods chosen for analysis of groundwater monitoring data and application of these methods for determining exceedances of the GWPS identified in 35 I.A.C. § 845.600(a) is provided in this 35 I.A.C. § 845 Multi-Site Statistical Analysis Plan.

35 I.A.C. § 845.640 Statistical Analysis (PE)

I, Eric J. Tlachac, a qualified professional engineer in good standing in the State of Illinois, certify that the statistical methods summarized above and described in this document (35 I.A.C. § 845 Multi-Site Statistical Analysis Plan) are appropriate for evaluating the groundwater monitoring data collected as described in the attached document and are in substantial compliance with 35 I.A.C. § 845.640.

Eric J. Tlachac
Qualified Professional Engineer
062-063091
Illinois
Date: April 1, 2025

35 I.A.C. § 845.640 Statistical Analysis (PG)

I, Brian G. Hennings, a qualified professional geologist in good standing in the State of Illinois, certify that the statistical methods described in this document (35 I.A.C. § 845 Multi-Site Statistical Analysis Plan) are appropriate for evaluating the groundwater monitoring data collected as described in the attached document and are in substantial compliance with 35 I.A.C. § 845.640.

Brian G. Hennings
Professional Geologist
196.001482
Illinois
Date: April 1, 2025

35 I.A.C. § 845.640 Statistical Analysis

I, Rachel A. Banoff, a qualified professional, certify that the statistical methods described in this document (35 I.A.C. § 845 Multi-Site Statistical Analysis Plan), are appropriate for evaluating the groundwater monitoring data collected as described in the attached document and are in substantial compliance with 35 I.A.C. § 845.640.

Rachel A. Banoff, EIT
Project Statistician
Date: April 1, 2025

DOCUMENT REVISION RECORD

Issue No.	Date	Details of Revisions
Revision 0	April 1, 2025	• Original Document

DOCUMENT APPLICABILITY BY FACILITY OWNER

Table A. Document Applicability by Facility Owner

Facility & Owner	Unit ID	Unit Name
Baldwin Power Plant Dynegy Midwest Generation, LLC	601	Bottom Ash Pond
	605	Fly Ash Pond System
Coffeen Power Plant Illinois Power Generating Company	101	Ash Pond No. 1
	102	Ash Pond No. 2
	103	GMF Gypsum Stack Pond
	104	GMF Recycle Pond
Duck Creek Power Plant Illinois Power Resources Generating, LLC	201/202	Ash Pond No. 1 Ash Pond No. 2
	203	GMF Pond
	205	Bottom Ash Basin
Edwards Power Plant Illinois Power Resources Generating, LLC	301	Ash Pond
Hennepin Power Plant Dynegy Midwest Generation, LLC	802	Ash Pond No. 2
	803	East Ash Pond
	804	Old West Ash Pond
	802/805	Ash Pond No. 2 Ash Pond No. 4
Joppa Power Plant Electric Energy, Inc.	401	East Ash Pond
	403	West Ash Pond
Kincaid Power Plant Kincaid Generation, LLC	141	Ash Pond
Newton Power Plant Illinois Power Generating Company	501	Primary Ash Pond
Vermilion Power Plant Dynegy Midwest Generation, LLC	910	North Ash Pond
	911/912	Old East Ash Pond New East Ash Pond

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Figure 1 Flow chart illustrating the statistical methods used for calculating background under Compliance Monitoring

Figure 2 Flow chart illustrating the statistical methods used for calculating confidence intervals in Compliance Monitoring

ACRONYMS AND ABBREVIATIONS

%	percent
35 I.A.C.	Title 35 of the Illinois Administrative Code
CCR	coal combustion residuals
CI	confidence interval
DQR	Double Quantification Rule
GMP	Groundwater Monitoring Plan
GWPS	groundwater protection standard
IEPA	Illinois Environmental Protection Agency
LCL	lower confidence limit
LTL	lower tolerance limit
MDL	method detection limit
PQL	practical quantitation limit
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RL	reporting limit
SAP	Sampling and Analysis Plan
SI	surface impoundment
UCL	upper confidence limit
Unified Guidance	Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Unified Guidance (USEPA, 2009)
USEPA	United States Environmental Protection Agency
UTL	upper tolerance limit

1. INTRODUCTION

In April 2021, the Illinois Environmental Protection Agency (IEPA) issued a final rule for the regulation and management of coal combustion residuals (CCR) in surface impoundments (SIs) under the Standards for the Disposal of CCR in Surface Impoundments: Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845. Facilities regulated under 35 I.A.C. § 845 are required to develop and sample a groundwater monitoring well system to evaluate whether impounded CCR materials are impacting groundwater quality. The groundwater quality evaluation must include certification from a qualified professional engineer that the selected statistical method is appropriate for evaluating groundwater monitoring data for the CCR surface impoundment. The procedures described in the evaluation will be used to establish background conditions and implement Compliance and Corrective Action Monitoring as necessary and required by 35 I.A.C. § 845.640, § 845.650, § 845.680, and § 845.780. This Statistical Analysis Plan was prepared in accordance with the requirements of 35 I.A.C. § 845.640(f), with reference to the acceptable statistical procedures provided in United States Environmental Protection Agency's (USEPA's) Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance (Unified Guidance) (USEPA, 2009).[1]

1.1 Statistical Analysis Objectives

This Multi-Site Statistical Analysis Plan provides a framework for conducting the statistical analyses of groundwater data collected during operation, post-closure care, and corrective action monitoring (if required). This Multi-Site Statistical Analysis Plan does not include procedures for groundwater sample collection and analysis conducted in accordance with the Multi-Site Sampling and Analysis Plan (SAP; Ramboll, 2022) or data quality evaluation conducted in accordance with the Multi-Site Quality Assurance Project Plan (QAPP; Ramboll, 2022).[2]

1.2 Statistical Analysis Plan Approach

The analyses described in this document are intended to support monitoring programs described in detail in the CCR unit-specific Operating Permit Groundwater Monitoring Plans (GMPs), Closure Construction Permit GMPs, and Corrective Action GMPs. When necessary and contingent upon equivalent statistical power, an alternative test consistent with the performance standards in 35 I.A.C. § 845.640(g), not included in this Statistical Analysis Plan, may be chosen due to site-specific data requirements.

35 I.A.C. § 845 outlines three phases of groundwater monitoring:

- Baseline Monitoring in accordance with 35 I.A.C. § 845.650(b)(1)
- Compliance Monitoring in accordance with 35 I.A.C. § 845.650 and 35 I.A.C. § 845.780(b)
- Corrective Action Monitoring in accordance with 35 I.A.C. § 845.680(a)

Each phase of the groundwater monitoring program requires specific statistical procedures to accomplish the intended purpose. During the first phase, background groundwater quality will be established, utilizing upgradient and background wells. Compliance Monitoring, which

[1] Despite being currently archived on USEPA's website, the Unified Guidance remains a valid reference for developing a statistical analysis plan (personal communication with Alison O'Connor, February 11, 2025).

[2] The Multi-Site Sampling and Analysis Plan and Multi-Site Quality Assurance Project plan are living documents which are subject to routine evaluation and updates in accordance with USEPA recommended best practices (USEPA 2020; USEPA 2023).

encompasses data collection and statistical evaluation conducted during unit operation and the post-closure care period, will then evaluate whether exceedances occur for 20 required constituents (per 35 I.A.C. § 845.600(a)(1)) relative to the groundwater protection standard (GWPS) established by 35 I.A.C. § 845.600. Corrective Action Monitoring evaluates remedy progress and completion and will be initiated upon implementation of the Corrective Action GMP.

2. GROUNDWATER DATA EVALUATION AND STATISTICAL ASSUMPTIONS

The following subsections outline the statistical tests and procedures utilized to evaluate data collected for consistency with statistical assumptions and evaluate data distribution. These methods may be used in any phase of groundwater monitoring.

2.1 Sample Independence

Independence of sample results is a major assumption for most statistical analyses. To ensure physical independence of groundwater sampling results, the minimum time between sampling events must be longer than the time required for groundwater to move through the monitoring well. Therefore, the minimum time interval between sampling events is a function of the groundwater velocity and well bore volume (diameter of the well and surrounding filter pack). The sampling schedules for Baseline Monitoring, Compliance Monitoring, and Corrective Action Monitoring are specified in 35 I.A.C. § 845 and may conflict with the statistical assumption of independence of sample results.

2.2 Non-Detect Data Processing

Groundwater sample analysis results below the reporting limit (RL), also referred to as the practical quantitation limit (PQL), will not be used in statistical calculations due to the inherent uncertainty in results that are estimated between the method detection limit (MDL) and RL/PQL, and error assumptions inherent to the statistical calculations. Results below the RL/PQL will be considered non-detect data. For statistical characterization evaluations (*e.g.*, distribution testing, and trend analysis), non-detects were replaced with the half of the RL for the analysis. For statistical test procedures that involve the calculation of a mean and standard deviation (as described in **Section 3**):

- If the frequency of non-detect data are less than or equal to 15 percent (%), half of the RL will be substituted for these data.
- If the non-detect frequency is greater than 15% and less than or equal to 50% and the data are normally or log-normally distributed (**Section 2.3**), the Kaplan-Meier method will be used to estimate the mean and standard deviation adjusted for the presence of left-censored values.
- If the non-detect frequency is greater than 50% or data are not normally or log-normally distributed (**Section 2.3**), a non-parametric test or calculation will be used.

2.3 Testing for Normality

In accordance with 35 I.A.C. § 845.640(g)(1), "the statistical method used to evaluate groundwater monitoring data must be appropriate for the distribution of constituents". The Unified Guidance document recommends the Shapiro-Wilk normality test for sample sizes of 50 or less, and the Shapiro-Francia normality test for sample sizes greater than 50. Log-transformation of datasets to achieve normal distributions is preferred to using non-parametric methods. However, if data normality cannot be achieved through log transformation, a non-parametric method is used.

2.4 Outlier Evaluation and Management

Groundwater analytical data may be screened for the existence of outliers using methods described by the Unified Guidance. Outliers are extreme data points that may represent an anomaly or erroneous data point. To test for outliers, one or more of the following outlier tests will be utilized:

- Dixon's test, for well-constituent pairs with less than 25 samples, assumes normally distributed data.
- Rosner's test, for well-constituent pairs with more than 20 samples, assumes normally distributed data.
- Grubb's test for well-constituent pairs with seven or more samples, assumes normally distributed data.

In addition, time series, box-whisker plots, and probability plots will be used to provide visual tools to identify potential outliers, and evaluation of seasonal, spatial, or temporal variability for both normally and non-normally distributed data.

When necessary, a confirmatory sample will be collected to allow the facility to distinguish between an outlier and a true release from the facility (35 I.A.C. § 845.650(d)). If re-sampling is necessary, this sample will be collected within 60 days following outlier identification. Rigorous data validation and review is preferred to formal outlier testing and exclusion to ensure that all data used in statistical evaluations is representative of field conditions. Quality control/quality assurance data are collected and data verification is completed in accordance with the QAPP. Project staff familiar with the site and historical data will review the data generated each quarter and facilitate additional validation as needed. Data quality control, groundwater geochemistry, and sampling procedures will be evaluated as potential sources of error leading to an outlier result. Exclusion of potential outliers without an identified source of error may be considered only for data that could cause extremely elevated background concentrations.

2.5 Trend Analysis

Statistical analyses confirming the lack of trend are a fundamental step to confirm the assumption that groundwater quality values (*i.e.,* constituent means) are stationary or constant over time. These analyses allow for evaluation of variation in the background and compliance data for each constituent over time. A statistically significant increasing trend in the background data could indicate an existing release from the CCR unit or alternative source, requiring further investigation. In addition, statistically significant trending background data can result in increased standard deviation and, therefore, greater prediction or tolerance limits. Consequently, the increased prediction or tolerance limit will have less statistical power or ability to identify a release from a CCR unit.

A linear regression, coupled with a t-test for slope significance at a 95% confidence level (or 0.05 significance level), may be used on datasets for each constituent with few non-detects and a normally distributed variance of the mean to evaluate time trends. The Theil-Sen trend line, coupled with the Mann-Kendall test for slope significance at a 95% confidence level (or 0.05 significance level), may be used for datasets with frequent non-detects or non-normal variance. Similarly, trend analyses could also be used on compliance data to evaluate a possible release from the CCR unit.

2.6 Spatial Variation

Spatial trends and/or variation between background wells could indicate an existing release from a CCR unit. If the spatial variability is not due to an existing release, intrawell comparisons in compliance wells may be used to account for spatial variability and monitor for a future release. However, the CCR units being monitored have been placed into service prior to the start of groundwater monitoring and it is unknown whether a previous release has occurred. Accordingly, intrawell comparisons in compliance wells cannot be used to determine the occurrence of a future release, and interwell comparisons between compliance wells and background wells will be used.

2.7 Temporal Variation

Time series plots can be used to identify temporal dependence. Potentially significant temporal components of variability can be identified by graphing single constituent data from multiple wells together on a time series plot. With temporal dependence, the time series plot has a pattern of parallel traces, in which the individual wells will tend to rise and fall together across the sequence of sampling dates. Time series plots can be helpful by plotting multiple constituents over time for the same well, or averaging values for each constituent across wells on each sampling event and then plotting the averages over time. In either case, the plots can signify whether the general concentration pattern over time is simultaneously observed for different constituents. If so, it may indicate that a group of constituents is highly correlated in groundwater or that the same artifacts of sampling and/or lab analysis impacted the results of several monitoring parameters.

2.8 Updating Background

Updating the background dataset periodically by adding recent results to an existing background dataset can improve the statistical power and accuracy of the statistical analysis, especially for non-parametric prediction intervals. The Unified Guidance recommends updating statistical limits (background) when at least four to eight new measurements (every 2 to 4 years under a semiannual monitoring program or 1 to 2 years under a quarterly monitoring program) are available for comparison to historical data. Methods discussed in **Section 2.4** and professional judgement will be used to evaluate whether any individual data points appear to drive an anomalously high background level. A t-test for equal means (if normal data distribution) or a Mann-Whitney or Wilcoxon test for equal medians (if non-normal data distribution) will be conducted to verify that the two groups of background sample populations are statistically different prior to updating any background datasets. A 0.05 significance level will be utilized when evaluating the two populations, with the null hypothesis that the two populations have equal means or medians. In addition, time series graphs or other trend evaluation statistics (such as a Mann-Kendall test) will be conducted on the new background dataset to verify the absence of a release or changing groundwater quality. If the tests indicate that there are no statistical differences between the two background populations, the new data will be combined with the existing dataset. If the two populations are found to be different, the data will be reviewed to evaluate the cause of the difference. If the differences appear to be caused by a release (*i.e.,* if the new data are significantly higher, or lower for pH), then the previous background dataset may continue to be used. Furthermore, verified outliers will not be added to an existing background dataset. Spatial variability among background wells will also be assessed when background datasets are updated to determine whether pooling data is appropriate.

3. COMPLIANCE MONITORING PROGRAM

Compliance Monitoring encompasses data collection and statistical evaluation conducted during unit operation (35 I.A.C. § 845.640 and 845.650) and the post-closure care period (35 I.A.C. § 845.780). Compliance Monitoring is designed to evaluate whether concentrations of constituents listed in 35 I.A.C. § 845.600(a)(1) in compliance wells exceed GWPS or background in a statistically significant manner.

3.1 Monitoring Program Outline

3.1.1 Establish Background and GWPS

A site-specific GWPS will be established for constituents listed in 35 I.A.C. § 845.600(a)(1) for each CCR unit. The GWPS will be the concentration specified in 35 I.A.C. § 845.600(a)(1), unless the background concentration is greater. For this exception, background concentrations will be used to define the GWPS. Background concentrations will be calculated using a parametric or non-parametric upper tolerance limit (UTL), depending on the data distribution, consistent with 35 I.A.C. § 845.640(f)(1)(C). The procedure for calculating a UTL is outlined in **Figure 1** and described in **Section 3.2**. If only one background result is detected, that value will be used as the UTL.

3.1.2 Evaluate Background and GWPS Exceedances

Per 35 I.A.C. § 845.610(b)(3), groundwater monitoring data from compliance monitoring wells will be evaluated for statistically significant exceedances over background and the site-specific GWPS. In accordance with recommendation in the Unified Guidance for compliance monitoring, exceedances are evaluated by comparing a confidence interval (CI) to a fixed standard. The null hypothesis of this comparison is that compliance well groundwater concentrations do not exceed the standard unless the statistical test indicates otherwise.

GWPS exceedances will be determined by comparing the lower confidence limit (LCL) of the compliance well concentrations to the GWPS, except for pH where the LCL will be compared to the upper end of the GWPS range, and the upper confidence limit (UCL) compared to the low end of the GWPS range. A GWPS exceedance is determined if the LCL is greater than the GWPS, and, for pH, either the LCL is greater than the upper end of the GWPS range or the UCL is less than the low end of the GWPS range. The method of calculating the CI (outlined in **Figure 2** and described in **Section 3.3**) will be determined by sample size, trends in the data, and data normality. The significance level (alpha) for this calculation will be fixed at 0.01 (99% confidence) as recommended by Unified Guidance. If there are too few data points to calculate an LCL (a minimum of four data points is typically required), the most recent data point will be compared to the GWPS.

In the event that statistical analyses identify an exceedance of the GWPS for one or more parameters, the exceedance parameters and wells of concern may be immediately re-sampled. Compliance Monitoring statistics will be updated using the verification resample. If the Compliance Monitoring statistics using the compliance verification resample data result in an exceedance of the GWPS, the exceedance is confirmed.

Comparison of groundwater monitoring data to background is required by 35 I.A.C. § 845.610(3)(B), but these background "exceedances" do not carry any compliance implications.

Background exceedances will be determined by comparing the LCL of the compliance well concentrations to the background UTL, with the exception of pH where the UCL of the compliance well concentrations will also be compared to the background lower tolerance limit (LTL). A background exceedance is determined if the LCL is greater than the background UTL, or, for pH, either the LCL is greater than the UTL or the UCL is less than the LTL. If there are too few data points to calculate an LCL (a minimum of four data points is required), the most recent data point will be compared to the background UTL (and LTL for pH).

Additionally, an exceedance of either background or GWPS will be identified if the constituent monitored was not detected in all previous samples at a compliance well and the two most recent samples have both detections and exceed the GPWS (or are less than the low end of the GWPS range for pH) or background UTL (or are less than the LTL for pH).

3.2 Upper Tolerance Limit

The method for calculating a UTL depends primarily on the proportion of non-detects and the data distribution (**Figure 1**). A parametric UTL will be used to calculate the GWPS when the background data are normally distributed and have a non-detect frequency of 50% or less. The Unified Guidance recommends 95% confidence level and 95% coverage (95/95 tolerance interval). When the non-detect frequency is 15% or less, half the RL will be substituted for non-detects (simple substitution), and the normal mean and standard deviation will be calculated. The Kaplan-Meier method will be used when the detection frequency is between 15% and 50%. The Kaplan-Meier method assesses the linearity of a censored probability plot to determine whether the background sample can be approximately normalized. If so, then the Kaplan-Meier method will be used to compute estimates of the mean and standard deviation adjusted for the presence of left-censored values. The Kaplan-Meier estimate of the mean and standard deviation will be substituted for the sample mean and standard deviation.

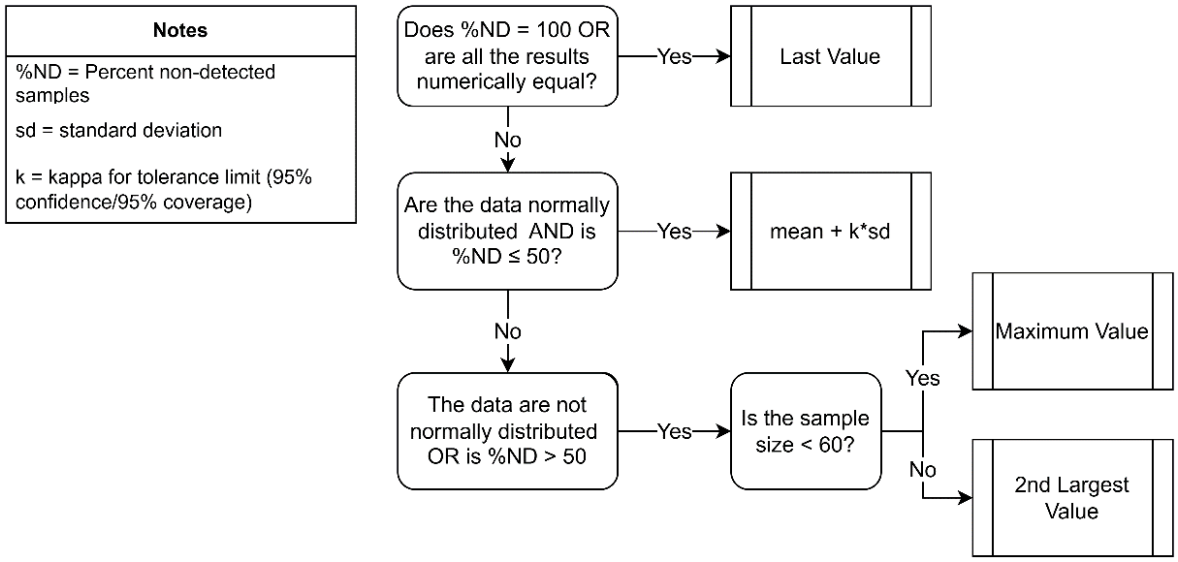

Figure 1. Flow chart illustrating the statistical methods used for calculating background under Compliance Monitoring.

The parametric UTL on a future mean will be calculated from the background dataset as follows:

$$UTL = \overline{x} + \kappa\,(n, \gamma, \alpha - 1) \cdot s$$

$\overline{x}$ = background sample mean

s = background sample standard deviation

$\kappa\,(n, \gamma, \alpha - 1)$ = one-sided normal tolerance factor based on the chosen coverage (γ) and confidence level (α -1) and the size of the background dataset (n). Values may be calculated per Millard (2013) or looked up in Table 17-3 in Appendix D of the Unified Guidance.

If the UTL is constructed on the logarithms of original observations to achieve normality, where $\overline{y}$ and s_y are the log-mean and log-standard deviation, the limit will be exponentiated for back-transformation to the concentration scale as follows:

$$TL = \exp\left[\overline{y} + \kappa\,(n, \gamma, \alpha - 1) \cdot s_y\right]$$

$\overline{y}$ = background sample log-mean

s_y = background sample log-standard deviation

If the background data set is non-parametric or has a non-detect frequency greater than 50%, a non-parametric UTL is used. The maximum concentration is used as the non-parametric UTL for sample sizes less than 60 and the second largest concentration is used as the non-parametric UTL for sample sizes greater than or equal to 60. As described in the Unified Guidance, the advantages include the resulting UTL reflecting actual concentration magnitudes, and the UTL more likely representing a detected concentration (unless all the data were non-detect).

3.3 Confidence Intervals

The method for calculating a CI depends on whether or not there is a trend in the data, the proportion of non-detects, and the data distribution (**Figure 2**). The following sections describe the procedure for calculating the CI in each case.

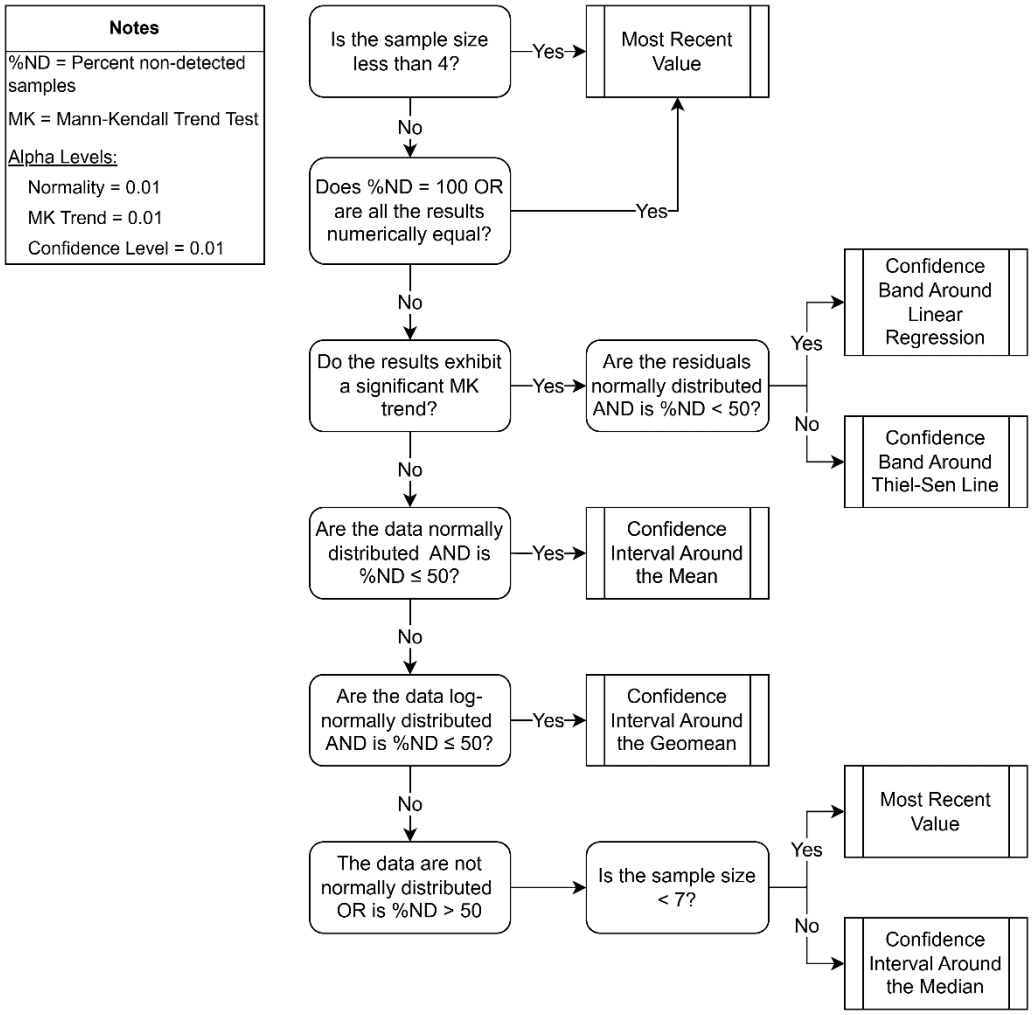

Figure 2. Flow chart illustrating the statistical methods used for calculating confidence intervals in Compliance Monitoring.

3.3.1 Confidence Intervals Around Trending Data

If compliance data exhibit a statistically significant trend based on results from a Mann-Kendall trend test and consists of a sufficient sample size (see below), CIs accounting for trends will be constructed to account for the trend-induced variation. If this is not accounted for, a wider CI will inevitably be calculated for a given confidence level and sample size (*n*). A wider CI will result in less statistical power, or ability to demonstrate an exceedance or return to compliance. When a linear trend line has been estimated, a series of CIs is estimated at each point along the trend. This creates a simultaneous confidence band that follows the trend line. As the underlying population mean increases or decreases, the confidence band also increases to reflect this change at that point in time.

Linear regression will be used when the compliance data set consists of at least eight samples, the frequency of non-detects is below 50%, and residuals around the trend line are normally distributed. The linear regression of concentration against sampling date (time) will be computed as follows:

$$\hat{b} = \sum_{i=1}^{n} (t_i - \bar{t}) \cdot x_i / (n-1) \cdot s_t^2$$

x_i = i^{th} concentration value and

t_i = i^{th} sampling date

$\bar{t}$ = sampling mean date

s_t^2 = variance of the sampling dates

This estimate leads to the following regression equation:

$$\hat{x} = \bar{x} + \hat{b} \cdot (\mathrm{t} - \bar{t})$$

$\bar{x}$ = mean concentration level

$\hat{x}$ = estimated mean concentration at time t

The regression residuals will also be computed at each sampling event to ensure uniformity and lack of significant skewness. Regression residuals will be computed at each sampling event as follows:

$$r_i = x_i - \hat{x}_i$$

The estimated variance around the regression line, or mean squared error, will be computed as follows:

$$s_e^2 = \frac{1}{n-2} \sum_{i=1}^{n} r_i^2$$

The CI around a linear regression trend line given confidence level (1-α) and a point in time (t_0), will be computed as follows:

$$LCL_{1-\alpha} = \hat{x}_0 - \sqrt{2 s_e^2 \cdot F_{1-2\alpha,2,\mathrm{n}-1} \cdot \left[\frac{1}{n} + \frac{(t_0 - \bar{t})^2}{(n-1) \cdot s_t^2}\right]}$$

$$UCL_{1-\alpha} = \hat{x}_0 - \sqrt{2 s_e^2 \cdot F_{1-2\alpha,2,\mathrm{n}-2} \cdot \left[\frac{1}{n} + \frac{(t_0 - \bar{t})^2}{(n-1) \cdot s_t^2}\right]}$$

$\hat{x}_0$ = estimated mean concentration from the regression equation at time t_0

$F_{1-2\alpha,2,\mathrm{n}-2}$ = upper (1-2α)th percentage point from an F-distribution with 2 and (n-2) degrees of freedom

If the compliance data set consists of at least seven samples but has a non-detect frequency greater than 50% or the residuals are not normally distributed, the Thiel-Sen trend line will be used as a non-parametric alternative to linear regression for calculation of the CI. The Thiel-Sen trend line estimates the median concentration over time by combining the median pairwise slope with the median concentration value and the median sample date. To compute the Thiel-Sen line,

the data will first be ordered by sampling event x_1, x_2, x_n. All possible distinct pairs of measurements (x_i, x_j) for $j > i$ will be considered and the simple pairwise slope estimate will be computed for each pair as follows:

$$m_{ij} = (x_j - x_i)/(j - i)$$

With a sample size of n, there will be a total of $N = n(n\text{-}1)/2$ pairwise estimates m_{ij}. If a given observation is a non-detect, half the RL will be substituted. The N pairwise slope estimates (m_{ij}) will be ordered from least to greatest (renamed $m_{(1)}$, $m_{(2)}$,..$m_{(N)}$). The Thiel-Sen estimate of slope (Q) will be calculated as the median value of the list depending on whether N is even or odd as follows:

$$Q = \begin{cases} m_{([N+1]/2)} \; if \; N \; is \; odd \\ (m_{(N/2)} + m_{([N+2]/2)})/2 \; if \; N \; is \; even \end{cases}$$

The sample concentration magnitude will be ordered from least to greatest, $x_{(1)}$, $x_{(2)}$, to $x_{(n)}$ and the median concentration will be calculated as follows:

$$\tilde{x} = \begin{cases} x_{([n+1]/2)} \; if \; n \; is \; odd \\ (x_{(n/2)} + x_{([n+2]/2)})/2 \; if \; n \; is \; even \end{cases}$$

The median sampling date ($\tilde{t}$) with ordered times ($t_{(1)}$, $t_{(2)}$, to $t_{(n)}$) will also be determined in this way. The Thiel-Sen trend line will then be computed for an estimate at any time (t) of the expected median concentration (x) as follows:

$$x = \tilde{x} + Q \cdot (\mathrm{t} - \tilde{t}) = (\tilde{x} - Q \cdot \tilde{t}) + Q \cdot \mathrm{t}$$

To construct a confidence band around the Thiel-Sen line, sample pairs (t_i, x_i) will be formed with a sample date (t_i) and the concentration measurement from that date (x_i). Bootstrap samples (B) will be formed by repeatedly sampling n pairs at random with replacement from the original sample pairs. This will be repeated 500 times. For each bootstrap sample, a Thiel-Sen trend line will be constructed using the equation above. A series of equally spaced t_j values will be identified along the range of sampling dates represented in the original sample, j=1 to m. The Thiel-Sen trend line associated with each bootstrap replicate will be used to compute an estimated concentration ($\hat{x}_j^B$). A CI will be constructed for the lower αth percentile $\hat{x}_j^{[\alpha]}$from the distribution of estimated concentrations at each time point (t_j). For a UCL, compute the upper (1-α)th percentile, $\hat{x}_j^{[1-\alpha]}$ at each t_j; for an LCL, compute the lower αth percentile, $\hat{x}_j^{[\alpha]}$ at each t_j.

3.3.2 Parametric Confidence Intervals around a Mean

If compliance data do not show a trend and are normal or log-normal, one-sided parametric CIs around a sample mean will be constructed for each constituent and well pair. The LCL will be calculated as:

$$LCL_{1-\alpha} = \overline{x} - t_{1-\alpha,n-1} \cdot \frac{s}{\sqrt{n}}$$

The UCL will be calculated as:

$$UCL_{1-\alpha} = \overline{x} + t_{1-\alpha,n-1} \cdot \frac{s}{\sqrt{n}}$$

$\overline{x}$ = compliance sample mean

s = compliance sample standard deviation

n = compliance sample size

$t_{1-\alpha,n-1}$ = obtained from a Student's t-table with (n–1) degrees of freedom at the chosen alpha level (0.01) (Table 16-1 in Appendix D of the Unified Guidance)

If compliance data are distributed lognormally, the LCL will be computed around the lognormal geometric mean as:

$$LCL_{1-\alpha} = \exp\left(\overline{y} - t_{1-\alpha,n-1} \cdot \frac{s_y}{\sqrt{n}}\right)$$

The UCL will be computed around the lognormal geometric mean as:

$$UCL_{1-\alpha} = \exp\left(\overline{y} + t_{1-\alpha,n-1} \cdot \frac{s_y}{\sqrt{n}}\right)$$

$\overline{y}$ = compliance sample log-mean

s_y = compliance sample log-standard deviation

3.3.3 Non-Parametric Confidence Intervals around a Median

Non-parametric confidence intervals around the median will be computed if the compliance data do not show a trend and contain greater than 50% non-detects or are non-normally distributed. The mathematical algorithm used to construct non-parametric CIs is based on the probability p that any randomly-selected measurement in a sample of n concentration measurements will be less than an unknown p x 100th percentile of interest (where P is between 0 and 1). Then the probability that the measurement will exceed the p x 100th percentile is (1–p). The number of sample values falling below the p x 100th percentile out of a set of n should follow a binomial distribution with parameters n and success probability p, where 'success' is defined as the event that a sample measurement is below the p x 100th percentile. The probability that the interval formed by a given pair of order statistics will contain the percentile of interest will then be determined by a cumulative binomial distribution *Bin(x;n,p)*, representing the probability of x or fewer successes occurring in n trials with success probability p. P will be set to 0.50 for an interval around the median. In accordance with the Unified Guidance, a confidence interval around the median will only be calculated if at least seven data points are available.

The sample size n will be ordered from least to greatest. Given p = 0.50, candidate interval endpoints will be chosen by ordered data values with ranks rounded upward to the next higher integers. The ranks of the endpoint will be denoted L^* and U* and are calculated using the following equations (Conover, 1999, p. 144):

$$L^* = np - Z_{1-\alpha}\sqrt{np(1-p)}$$

$$U^* = np + Z_{1-\alpha}\sqrt{np(1-p)}$$

4. CORRECTIVE ACTION MONITORING PROGRAM

Corrective Action Monitoring is performed after a corrective action remedy has been selected and implemented. 35 I.A.C. § 845.680(a)(1) specifies that the corrective action groundwater monitoring program must meet the requirements listed in 35 I.A.C. § 845.650 (*i.e.*, Compliance Monitoring), document the effectiveness of the selected remedy, and demonstrate compliance with the GWPS. Post-Closure Care monitoring as described in **Section 3** will operate concurrently with Corrective Action Monitoring, fulfilling the requirements of 35 I.A.C. § 845.650. This document describes the statistical methods used to document the progress of the selected remedy and demonstrate compliance with the GWPS.

Evaluation of corrective action remedy effectiveness will occur in three phases: remedy progress evaluation, stability evaluation, and attainment evaluation (USEPA, 1992).

1. Remedy progress evaluation occurs after implementation of corrective actions to assess if the remedy is functioning as anticipated.
2. The stability evaluation, which occurs after treatment has been concluded and a re-equilibration period has elapsed, assesses if a new post-treatment steady state in the groundwater has been reached.
3. Attainment evaluation occurs after a new steady state has been achieved and assesses if COC concentrations are below the GWPS.

In accordance with the Unified Guidance, these evaluations only apply to constituents which have previous exceedances of the GWPS. Constituents without previous GWPS exceedances continue to be evaluated according to Compliance Monitoring (per **Section 3**). The Corrective Action GMP for each unit describes the detailed approach to remedy effectiveness evaluation and reporting. Statistical evaluations used in each of these three phases are described below.

4.1 Remedy Progress Evaluation

The goal of remedy progress evaluation is to determine if a groundwater remedy is on track to achieve cleanup standards within the proposed time frame and to inform adaptive management decisions if performance metrics are not achieved. Evaluations of remedy effectiveness include:

- Comparison of the central tendency (*i.e.*, mean or median) of data from corrective action monitoring wells to the GWPS
- Trend analysis of average concentrations in individual wells and in a plume

Unlike Compliance Monitoring, remedy progress evaluation does not result in the determination of exceedances. Instead, the results from these analyses are used to evaluate performance metrics described in the site-specific Corrective Action GMP.

4.1.1 Central Tendency

The two most common central tendency measures of a data set are the sample mean and sample median. The sample mean best represents the central tendency of normally-distributed data; therefore, the mean will be used to represent the tendency if the data are approximately normally distributed and the frequency of non-detects is below 50%. The sample mean is given by the arithmetic average of each value in the sample:

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

$\bar{x}$ = sample mean

n = sample count

x_i = i^{th} observation of x

The sample median is the 50th percentile of values in a sample and represents the midpoint of the ordered list of values. Because it is based on rank-order, the sample median is insensitive to data distribution; therefore, the median will be used if the data are not normally distributed or the frequency of non-detects is 50% or greater. The sample median is determined by arranging all values in order and selecting the middle value (or, if an even number of values exists, the mean of the two middle values).

4.1.2 Trend of Average Concentration in Individual Wells and in a Plume

Insight into remedy progress can be gained by evaluating changes in concentration at both the individual well and plume levels.

Trends at the individual well level are evaluated according to **Section 2.5**. To evaluate trends at the plume level, the trend on quarterly average concentrations is evaluated (per **Section 4.1.1**). Quarterly average concentrations in the plume are generated by calculating the mean or median as appropriate based on distribution (**Section 4.1.1**) of concentrations collected during a single sample event. Trend is then evaluated as described in **Section 2.5**. The magnitude of the trend (*i.e.*, slope) may be evaluated according to methods in **Section 3.3.1**.

4.2 Stability Evaluation

In order to evaluate ultimate effectiveness of the remedy, it is critical to evaluate if a new stable equilibrium has been reached after the implementation of corrective action (e.g., completion of source control or conclusion of groundwater extraction). Stability evaluation will be completed using trend analysis as described in **Section 2.5**.

4.3 Attainment Evaluation

Per 35 I.A.C. § 845.680(c), corrective action is considered complete when compliance with the GWPS has been demonstrated "at all points within the plume of contamination that lies beyond the waste boundary […] for a period of three consecutive years". Accordingly, attainment of the GWPS will be evaluated for well-constituent pairs previously determined to exceed the GWPS. This evaluation will include data collected after groundwater conditions have stabilized (**Section 4.2**).

The Unified Guidance recommends comparing a CI to the fixed GWPS to evaluate attainment of corrective action. The null hypothesis of this test is the reverse of that in Compliance Monitoring: corrective action well groundwater concentrations are assumed to exceed the GWPS unless the statistical test indicates otherwise. The CI will be calculated according to methods presented in **Section 3.3**. For pH, the only parameter with an upper and lower background and GWPS, the GWPS will be attained (*i.e.*, the null hypothesis rejected) when the CI falls within the range of the GWPS (*i.e.*, if the LCL of the CI is above the lower limit and the UCL is below the upper limit). For all other parameters, the GWPS will be attained when the UCL is below the GWPS. Once this

statistical evaluation indicates that GWPS has been met for three years (*i.e.*, that the null hypothesis is rejected), corrective action will be concluded.

5. REFERENCES

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APPENDIX B.2
HYDROGEOLOGIC SITE CHARACTERIZATION REPORT

TECHNICAL MEMORANDUM

Date: **August 8, 2016**

To: **Tom Davis**

From: **Stuart Cravens**

Subject: **Baldwin Energy Complex Ash Pond Closure and Post-Closure Plan – Response to Illinois EPA Comments**

This technical memorandum is in response to the July 13, 2016 Illinois Environmental Protection Agency (Illinois EPA) correspondence regarding the Fly Ash Pond System Closure and Post Closure Care Plan (Plan) for the Baldwin Energy Complex. The Illinois EPA reviewed the Plan and provided comments for consideration and appropriate action by Dynegy Operating Company on behalf of Dynegy Midwest Generation, LLC, owner and operator of the Baldwin Energy Complex (BEC).

Responses to each of the Illinois EPA comments (italicized below) in the July 13, 2016 letter are provided below.

1. The bedrock formations were chosen to represent the uppermost aquifer material to be monitored under the 257 regulations. However, the geometric mean of the horizontal hydraulic conductivity for the bedrock is 5.0 X 10^{-06} centimeters per second (cm/sec) and the geometric mean of the horizontal hydraulic conductivity for the unconsolidated material is 3.2 X 10^{-05} cm/sec. Table 2 of the Model Report Addendum lists 13 farm/domestic wells of which 10 utilize the unconsolidated materials. Given the higher hydraulic conductivity and greater use of the resource, please provide further explanation of how the unconsolidated materials were eliminated as the uppermost aquifer.

Response: The predominant material underlying the Fly Ash Pond System and extending outward is clay and silty clay with randomly disseminated and discontinuous silt and sand seams. Conversely, the bedrock formation underlying the Fly Ash Pond System is laterally continuous and extends in all directions off-site of the BEC. Although the horizontal hydraulic conductivity of the shallow unconsolidated materials is higher than the underlying bedrock at some locations, the higher permeability lenses or seams of sand, silty sand, and clayey sand are not laterally continuous within the boundaries of the Fly Ash Pond System, nor are they laterally continuous outward from the Fly Ash Pond System to or beyond the property boundary of the BEC. Any sand seams or layers identified along the western side of the impoundment system, to the west of the Secondary and Tertiary Ponds, are localized and completely separated from the Fly Ash Pond System by the intervening bedrock low.

The geometric mean hydraulic conductivity of 3.2 X 10^{-05} cm/sec provided in the Plan was based on 12 field tested wells located around the BEC impoundment system. Five of those 12 tested wells[1] are distant from the Fly Ash Pond System (i.e., ranging in distance from 950 to 2,200 feet away from the nearest ash pond) and none are located downgradient. The geometric mean hydraulic conductivity measured at the seven wells in the shallow unconsolidated material closest to and immediately downgradient of the Fly Ash Pond System[2] is 8.7 X 10^{-06} cm/sec compared to a geometric mean of *5.0 X 10^{-06}* for the bedrock.

Table 2 of the Model Report Addendum listed 13 farm/domestic wells, 10 of which were identified as using the unconsolidated materials and two of which used the bedrock for water supply. However, looking at the well logs for those 10 wells, as included in the Water Well Survey report[3], shows that one of the 10 wells (Philip Cohen's 6-inch well drilled in 1950) was apparently a bedrock well and the remaining nine wells were all 33 to 42-inch diameter bored wells. Bored wells are generally installed at locations where there are low permeability unlithified deposits with no continuous saturated stratums to provide a continuous supply of groundwater to a conventional drilled well. In geologic materials which do not have sufficient hydraulic conductivity to produce a continuous supply of groundwater, bored wells essentially act as underground storage reservoirs that rely on slow seepage of water over a substantially larger surface area than conventional wells. The presence of a bored well in saturated materials does not constitute existence of an aquifer. Many bored wells are no longer utilized or have been long abandoned because they do not provide a "useable" quantity of groundwater, are subject to surface contamination, or go dry during extended dry periods or droughts.

Since the unlithified deposits at the Baldwin Fly Ash Pond System were previously recognized as being the uppermost water bearing zone and capable of locally transporting coal combustion residuals (CCRs), a groundwater monitoring network was established within the unlithified deposits at the BEC impoundment system, in addition to the uppermost bedrock aquifer, and is currently being monitored under Special Condition No. 17 of NPDES Permit No. IL0000043.

2. Figure No. 8 of the September 30, 2014 document, Prediction of Plume Stability by Groundwater Modeling, Model Report Addendum, projected boron impacted groundwater off site on private property. This projection was for the Base Case Scenario. The Groundwater Management Zone (GMZ) application

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[1] MW-104DR, OW-156, MW-161, OW-256, MW-262

[2] MW-151, MW-152, OW-157, TPZ-166, MW-252, MW-253, OW-257

[3] NRT and Kelron Environmental, 2010. "Water Well Survey, Baldwin Ash Pond System, Baldwin Energy Complex, Baldwin, Illinois". Prepared for Dynegy Midwest Generation, LLC, dated June 7, 2010.

states "Capping the Baldwin Fly Ash Ponds as proposed will result in very similar results to the baseline transport model. The proposed cap does not minimize impacts to offsite groundwater and must be revised.

Response: The prediction modeling performed for the entire Baldwin Ash Pond System, inclusive of the Baldwin Fly Ash Pond System, evaluated both baseline conditions where no corrective action is implemented and various cap scenarios. The initial model report[4] was used to predict changes over a period of 50 years (2015-2065) using a transport model calibrated to simulate boron transport assuming steady-state flow conditions. The addendum[5] quantified the time for concentrations of the CCR leachate indicator boron to reach a stable status or to decrease in monitoring wells, determine the maximum extent of the boron plume, and to predict potential or future impairments to groundwater usage off-site.

The purpose of the proposed cap on the Baldwin Ash Pond System is to decrease impacts to groundwater both spatially and temporally. Given the inherent uncertainties with predictive modeling, the spatial difference in offsite migration of impacted groundwater exceeding the boron groundwater standard of 2 milligrams per Liter (mg/L) for the proposed cap versus a lower permeability (i.e., geomembrane cap) is relatively minor relative to the temporal difference. The long-term spatial difference in impacts to groundwater under baseline conditions with no cap versus a geomembrane cap as predicted by the groundwater model is exhibited on Figure 1. The maximum extent of the predicted boron plume under baseline conditions is reached in 600 years versus 1,200 years with a geomembrane cap. With the proposed clay cap the maximum boron extent will be reached in a period greater than 600 years before the plume begins dissipating, but significantly earlier (i.e., hundreds of years) than with a geomembrane cap.

With a baseline scenario condition of no cap on the Baldwin Ash Pond System the modeled duration for leachate depletion from the fly ash ponds (i.e., equivalent to background boron concentration) is 92 years. Installing the lowest permeability cap such as a geomembrane, which reduces surface infiltration into the fly ash ponds and reduces percolation out of the base of the ponds, increases the modeled duration of leachate depletion from the fly ash ponds to 558 years, or approximately six times longer. A clay cap with maximum permeability of 1×10^{-5} centimeters per second as proposed will still reduce the infiltration and

[4] NRT, 2014a. "Groundwater Model and Simulation of Closure Alternatives, Baldwin Ash Pond System, Baldwin Energy Complex, Baldwin, Illinois". Prepared for Dynegy Midwest Generation, LLC, dated June 18, 2014.

[5] NRT, 2014b. "Model Report Addendum, Prediction of Plume Stability by Groundwater Modeling, Baldwin Ash Pond System, Baldwin Energy Complex, Baldwin, Illinois". Prepared for Dynegy Operating Company, dated September 30, 2014.

percolation rates while substantially shortening the time for the groundwater plume to dissipate relative to a lower permeability cap.

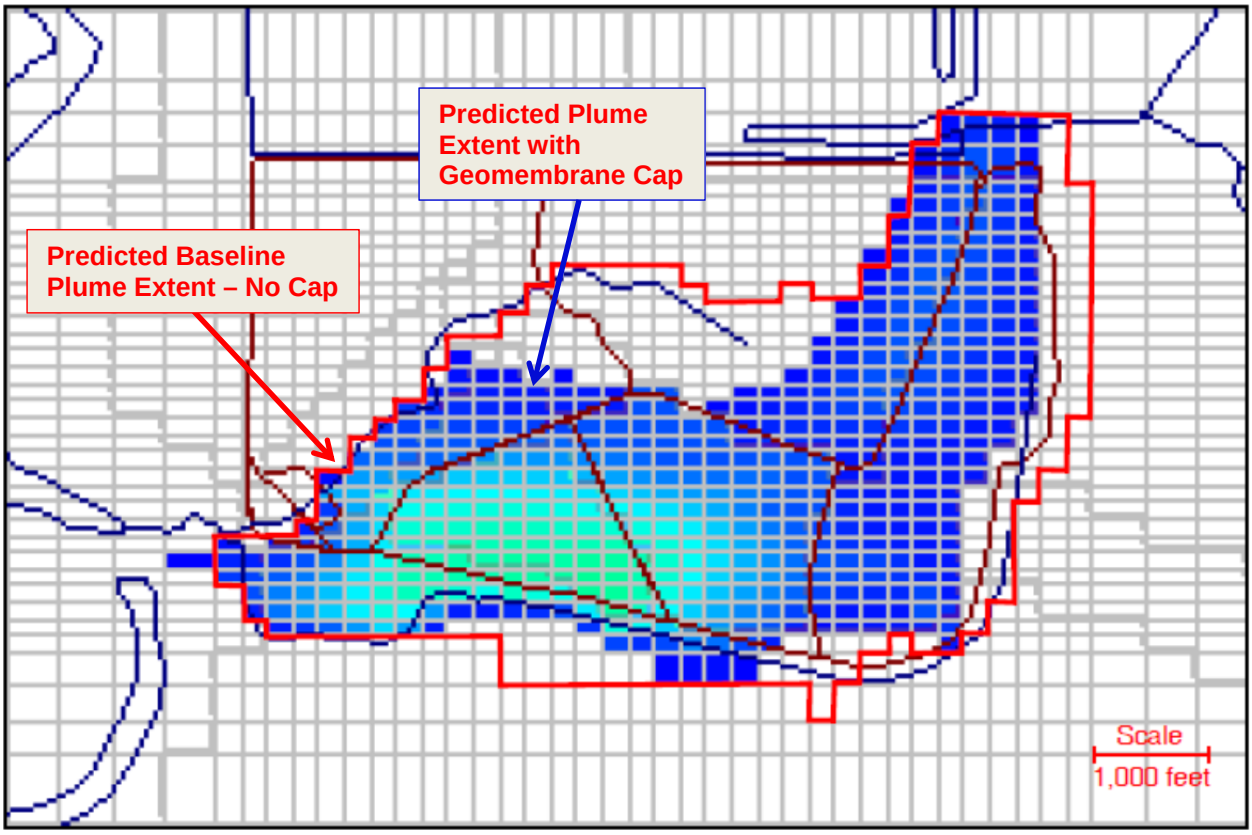

Figure 1. Baseline condition with no cap on the Baldwin ash ponds versus geomembrane cap

Predicted impacts to offsite groundwater quality based on groundwater modeling have been used to develop the initial corrective action of cap placement. The maximum plume extent as shown on Figure 1 will not occur because it is a modeled prediction based on current baseline conditions with no cap and no triggered corrective actions. The effects of the cap proposed in the closure plan on groundwater quality will be monitored in accordance with the groundwater monitoring plan. If concentrations of indicator parameters in groundwater show that there are statistically significant increasing trends attributable to the Baldwin Fly Ash Pond System then additional investigation and corrective actions appropriate to mitigate those exceedances, and prevent offsite migration of impacted groundwater exceeding groundwater standards, will be evaluated and proposed.

3. The GMZ application must specifically identify the corrective action which is proposed for the site.

Response: Section 2.3 of the GMZ application as submitted contains the three specific elements of the proposed corrective action, but has been modified slightly with the following underscored additions and strikeout deletions:

"The three ponds comprising the Baldwin Fly Ash Pond System are interconnected and are essentially three cells within one large pond. The Closure Plan for the Baldwin Fly Ash Pond System includes the following corrective action elements, preliminary designs of which are shown on Figure 4:

Closure will consist of pumping to remove surface water, redistributing and reshaping the existing CCR to fill in low areas and establish a subgrade for the final soil cover, and placing an earthen cover that complies with the CCR Rule.

The final cover system is comprised of a 6-inch vegetative support layer (topsoil) overlying 18-inch barrier soil.

Non-contact storm water runoff from the cover system will be collected and managed, with two new detention basins and channels directing water to the Secondary Pond.

The proposed corrective action elements will provide hydraulic control of surface water on the cover system and surrounding the Baldwin Fly Ash Pond System, will lower leachate levels and establish hydrostatic equilibrium within the ponds, and will decrease transport off-site both spatially and temporally."

4. The boundary of the proposed GMZ appears to follow the property boundary for the site and include impoundments which have not been proposed to undergo closure at this time. The GMZ boundary needs to be revised to identify the specific area where groundwater quality standards are exceeded at the site as wells as the area in which the proposed corrective action will mitigate impaired groundwater.

Response: The GMZ application figures 1 to 4 will be revised to show the revised GMZ boundary. Figure 3 will be modified to show the revised GMZ boundary, approximate extent of impacted groundwater above Class II groundwater quality standards, and the model predicted corrective action mitigation area.

5. Section 6.9, page 6-6 of the plan indicates compliance with the applicable groundwater quality standards will be achieved when there are no statistically significant increasing trends attributable to the Baldwin Fly Ash Pond System for the parameters detected at the compliance boundary for 4 consecutive years following the change to annual monitoring frequency. The compliance section of the Plan and the GMZ application must be revised to identify the compliance point pursuant to 620.240(e)(1) and compliance concentrations at 35 Ill. Adm. Code 620.450(a)(4).

Response Part 1: The compliance section of the Plan, Section 6.9, will be revised with the following underscored additions and strikeout deletions:

"In accordance with IAC 620 Section 620.240, the compliance boundary is a lateral distance of 25 feet outward from the outermost edge of the Baldwin Fly Ash Pond System berms. Following completion of the corrective action, the groundwater standard at the compliance boundary will be in accordance with IAC 620 Section 450(a)(4) for groundwater quality restoration such that the standard for each released chemical constituent will be the higher of either the Class II groundwater standard or the concentration determined by groundwater monitoring at the compliance boundary.

Compliance with on-site groundwater quality standards, as measured at the proposed monitoring well network (i.e., the modified NPDES monitoring well network), will be achieved when there are no statistically significant increasing trends that are attributed to the Baldwin Fly Ash Pond System for parameters detected at the compliance boundary ~~for~~ after a minimum 30 years of post-closure groundwater monitoring has been completed ~~four(4) consecutive years following the change to an annual monitoring frequency~~."

Response Part 2: The GMZ application will be revised with the following underscored additions and strikeout deletions:

"3.3 Compliance with Applicable On-Site Groundwater Quality Standards

In accordance with IAC 620 Section 620.240, the compliance boundary is a lateral distance of 25 feet outward from the outermost edge of the Baldwin Fly Ash Pond System berms. Following completion of the corrective action, the groundwater standard at the compliance boundary will be in accordance with IAC 620 Section 450(a)(4) for groundwater quality restoration such that the standard for each released chemical constituent will be the higher of either the Class II groundwater standard or the concentration determined by groundwater monitoring at the compliance boundary.

Compliance with on-site groundwater quality standards, as measured at the proposed monitoring well network (i.e., the modified NPDES monitoring well network), will be achieved when there are no statistically significant increasing trends that are attributed to the Baldwin Fly Ash Pond System for parameters detected at the compliance boundary ~~for~~ after a minimum 30 years of post-closure groundwater monitoring has been completed.

Evaluation of groundwater quality data under USEPA (2015) will be consistent with 40 CFR Part 257.93 and 257.94."

6. Figure No. 4 from Appendix A of the Plan indicates Boring PZ-171 has a 7.9 foot layer of sand. What is the extent of this sand layer, which is over 5 feet thick and therefore designated as Class I groundwater? Has the groundwater within the sand layer been analyzed to determine if it has been impacted by the ash impoundments? Does the sand layer extend off site?

Response: The 7.9 foot layer of sand observed at Boring PZ-171 may be either a localized lense or laterally continuous northward to Boring MW-161 and southward to Boring MW-262. However, based on six surrounding borings to the east and west (MW-154, MW-155, PZ-172, MW-388, MW-389, and TPZ-160) this layer is limited to the western edge of the Baldwin impoundments and is of limited lateral extent. Due to the presence of the bedrock valley, it is unlikely that this sand layer extends eastward beyond the western side of the Secondary Pond. The bedrock valley has a topographic elevation ranging from 366 to 390 feet and a land surface topographic elevation of 395 to 400 feet, both of which are close to or below the lowermost sand layer elevation of 395 feet. Surface topography between the Fly Ash Ponds and the

western end of the impoundments (i.e., west of the Secondary and Tertiary Ponds) effectively isolates any sand lenses or layers observed in the western end of the site from the Fly Ash Pond System.

The sand layer observed at Boring PZ-171 or any of the other borings cannot extend significantly westward because the surface topography decreases westward towards the Kaskaskia River, with surface topography decreasing below an elevation of 395 feet. Borings advanced west of the impoundments towards the Kaskaskia River (i.e., MW-154 and MW-155) have sand or clayey sand layers ranging from 0.3 to 3.5 feet in thickness between the elevations of 369 and 381 feet, or approximately 14 to 26 feet below the base of the sand observed at Boring PZ-171. The sand layer at Boring PZ-171 does not extend off-site.

No groundwater samples have been collected from piezometer PZ-171 to determine if it has been impacted by the ash impoundments. However, wells MW-161 and MW-262 located directly north and south of PZ-171, respectively, were sampled for groundwater quality on four occasions in 2013 – 2014, with all boron concentrations at both wells below the reporting limit of 0.020 milligrams per Liter (mg/L) and sulfate concentrations were all less than 45 mg/L. Based on observed groundwater quality at monitoring wells located both north and south of PZ-171, and given the disconnection between any sand layers west of the Secondary and Tertiary Ponds from the rest of the impoundments, there is little possibility of impacts from the Fly Ash Pond System.

In order to confirm that there are no groundwater impacts related to coal combustion residuals to the west of the impoundments, a groundwater sample will be collected from piezometer PZ-171 and analyzed for chloride, sulfate, boron, total dissolved solids, and field pH. The laboratory report will be submitted to the Illinois EPA.

7. Section 6.2, page 6-4 of the Plan indicates the sampling schedule could be accomplished in 15 years. This appears to contradict the required 257 Regs post closure sampling of 30 years. This sampling schedule must be revised.

Response: The existing text in Section 6.2 of the Groundwater Monitoring Plan will be revised with the following underscored additions:

"Groundwater monitoring <u>of the NPDES monitoring well network</u> may be discontinued upon Illinois EPA's approval of a certified post-closure care report <u>after a minimum 30 years of post-closure groundwater monitoring has been completed</u>. Specifically, when no statistically significant increase is detected in the concentration of any constituent above that measured and recorded during the immediately preceding scheduled sampling for four consecutive years after changing to an annual monitoring frequency.

Groundwater monitoring for the 40 CFR Part 257 well network will follow a schedule in accordance with the requirements of 40 CFR Part 257.94 and 257.95. <u>Post-closure care groundwater monitoring will continue for a minimum of 30 years in accordance with 40 CFR Part 257.104</u>".

8. Section 6.4, page 6-4 of the Plan should contain a list of all the chemical concentrations required for groundwater monitoring by the 257 Regs, and a list of inorganic parameters required pursuant to the 620 Regs, for sampling each permanent monitoring well. Specifically, the inorganic parametes monitoring list for testing should be from 35 IAC 620.410 (a) and pH.

Response: The Plan will be revised by adding two imbedded tables into Section 6.4 that include the following:

- Subset of parameters from 35 IAC620.420(a) to be monitored and pH; and,
- List of Appendix III and IV parameters required for groundwater monitoring by the 257 Regs.

SUPPLEMENTAL HYDROGEOLOGIC SITE CHARACTERIZATON AND GROUNDWATER MONITORING PLAN
Baldwin Fly Ash Pond System
Baldwin Energy Complex
Baldwin, Illinois
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Groundwater monitoring of the NPDES monitoring well network may be discontinued upon Illinois EPA's approval of a certified post-closure care report after a minimum 30 years of post-closure groundwater monitoring has been completed. Specifically, when no statistically significant increase is detected in the concentration of any constituent above that measured and recorded during the immediately preceding scheduled sampling for four consecutive years after changing to an annual monitoring frequency.

Groundwater monitoring for the 40 CFR Part 257 well network will follow a schedule in accordance with the requirements of 40 CFR Part 257.94 and 257.95. Post-closure care groundwater monitoring will continue for a minimum of 30 years in accordance with 40 CFR Part 257.104.

6.3 Groundwater Sample Collection

Groundwater samples will be collected consistent with the requirements of 35 IAC Part 620 and 40 CFR 257.93 as described in Appendix F. In addition to groundwater well samples, quality assurance samples will be collected as described in Section 6.5.

6.4 Laboratory Analysis

Laboratory analysis will be performed consistent with the requirements of 35 IAC Part 620 and 40 CFR 257.93 by a state-certified laboratory using methods approved by Illinois EPA and USEPA. The practical quantitation limit (PQL) for all parameters analyzed will be lower than the applicable groundwater quality standard. Concentrations lower than the PQL will be reported as less than the PQL. The laboratory analysis parameters for the two monitoring programs are listed below.

Laboratory Analysis Parameters from 35 IAC Part 620.420(a): Modified NPDES Monitoring Well Network		
Boron (dissolved)	Manganese (total)	Sulfate (dissolved)
Chloride (dissolved)	Nitrate (total)	Total Dissolved Solids (TDS)
Iron (total)		

Laboratory Parameters from Appendix III and Appendix IV of 40 CFR Part 257: 40 CFR Part 257 Monitoring Well Network		
Metals (totals)		
Antimony	Cadmium	Lithium
Arsenic	Calcium	Mercury
Barium	Chromium	Molybdenum
Beryllium	Cobalt	Selenium
Boron	Lead	Thallium
Inorganics (totals)		

Fluoride	Sulfate
Chloride	Total Dissolved Solids
Other (total)	
Radium 226 and 228 combined	

6.5 Quality Assurance Program

Consistent with the requirements of 35 IAC Part 620 and 40 CFR 257.93, the sampling and analysis program includes procedures and techniques for quality assurance and quality control. Additional quality assurance samples to be collected will include the following:

- Two blind duplicate groundwater samples from randomly selected monitoring wells
- One equipment blank sample will be collected and analyzed for each day of sampling. If dedicated sampling equipment is used, than equipment blank samples will not be collected.

The duplicate and equipment blank quality assurance samples will be supplemented by the laboratory QA/QC program, which typically includes:

- Regular generation of instrument calibration curves to assure instrument reliability
- Laboratory control samples and/or quality control check standards that have been spiked, and analyses to monitor the performance of the analytical method
- Matrix spike/matrix spike duplicate analyses to determine percent recoveries and relative percent differences for each of the parameters detected
- Analysis of replicate samples to check the precision of the instrumentation and/or methodology employed for all analytical methods
- Analysis of method blanks to assure that the system is free of contamination

6.6 Groundwater Monitoring System Maintenance Plan

Consistent with the requirements of 35 IAC Part 620 and 40 CFR 257.91, maintenance will be performed as needed to assure that the monitoring wells provide representative groundwater samples. Monitoring wells will be inspected during each groundwater sampling event. Monitoring well inspections will consist of the following:

- Visual inspection, clearing of vegetation, replacement of markers, and painting of protective casings as needed to assure that monitoring wells are clearly marked and accessible
- Visual inspection and repair or replacement of well aprons as needed to assure that they are intact, drain water away from the well, and have not heaved

- Visual inspection and repair or replacement of protective casings as needed to assure that they are undamaged, and that locks are present and functional
- Checks to assure that well caps are intact and vented, unless in flood-prone areas in which case caps will not be vented
- Annual measurement of monitoring well depths to determine the degree of siltation within the wells. Wells will be redeveloped as needed to remove siltation from the screened interval if it impedes flow of water into the well
- Checks that wells are clear of internal obstructions, and flow freely

If maintenance of a monitoring well cannot address an identified deficiency, a replacement well will be installed.

6.7 Annual Statistical Analysis

6.7.1 Proposed Modified NPDES Monitoring Well Network

Trend analysis will be performed annually for each of the monitored parameters. Sen's Estimate of Slope will be applied to a minimum of four consecutive quarterly monitoring results. If there are increasing trends during closure and post-closure care periods, they will be further investigated as described below.

- If the results of sampling and analysis show an increasing trend at any compliance monitoring well, a Mann-Kendall analysis will be performed at 95 percent confidence to determine whether or not the increasing trend is statistically significant.
- If a statistically significant increasing trend occurs during post-closure care, further investigation of monitored concentrations will be performed as well as more frequent inspections of the surface of the cover system.
- If the investigation attributes a statistically significant increasing trend to a source other than the Baldwin Fly Ash Pond System, then the Illinois EPA will be notified in writing, stating the cause of the increasing trend and providing the rationale used in such a determination.
- If there is not an alternative source causing the statistically significant increasing concentration and the sampling frequency had been reduced to semi-annual or annual sampling, a quarterly sampling schedule will be reestablished. The frequency of sampling will return to either semi-annual or annual, once four consecutive quarterly samples show no statistically significant increasing trend.

Notifications concerning statistically significant increasing trends and revisions of the sampling frequency will be reported to Illinois EPA in writing within 30 days after making the determinations.

6.7.2 40 CFR Part 257 Monitoring Well Network

As required in 40 CFR Part 257.93, statistical analysis will be performed to determine whether or not a statistically significant increase over a background value has occurred for each constituent and at each well. Appropriate statistical methods will be chosen from the list of methods provided and the test chosen

will be conducted separately for each constituent in each monitoring well. In addition, each statistical method chosen will comply with the performance standards, as appropriate, based on the test method used. If a statistically significant increase over background values is determined, procedures from 40 CFR Part 257 will be followed including 1) establishing an assessment monitoring program or 2) demonstrating that a source other than the Baldwin Fly Ash Pond System caused the increase or demonstrating another plausible reason for the increase (error in sampling, etc.).

6.8 Data Reporting

Sampling and analysis data from quarterly, semi-annual and/or annual groundwater monitoring for the modified NPDES monitoring well network will be reported to Illinois EPA within 60 days after completion of sampling. Statistical analysis of the laboratory analytical data will be reported to Illinois EPA with the annual report for the facility, as described in the closure plan.

Data reporting for the 40 CFR Part 257 monitoring well network will be consistent with recordkeeping, notification, and internet posting requirements described in 40 CFR 257.105 through 257.107.

6.9 Compliance with Applicable On-Site Groundwater Quality Standards

In accordance with IAC 620 Section 620.240, the compliance boundary is a lateral distance of 25 feet outward from the outermost edge of the the Baldwin Fly Ash Pond System berms. Following completion of the corrective action, the groundwater standard at the compliance boundary will be in accordance with IAC 620 Section 450(a)(4) for groundwater quality restoration such that the standard for each released chemical constituent will be the higher of either the Class II groundwater standard or the concentration determined by groundwater monitoring at the compliance boundary.

Compliance with on-site groundwater quality standards, as measured at the modified NPDES monitoring well network, will be achieved when there are no statistically significant increasing trends that are attributed to the Baldwin Fly Ash Pond System for parameters detected at the compliance boundary after a minimum 30 years of post-closure groundwater monitoring has been completed.

Evaluation of groundwater quality data under USEPA (2015) will be consistent with 40 CFR Part 257.93 and 257.94.

6.10 Corrective Action

If a statistically significant increasing trend is observed to continue over a period of two or more years in groundwater sampled at the modified NPDES monitoring well network, and a subsequent hydrogeologic

site investigation demonstrates that such exceedances are due to a release from the Baldwin Fly Ash Pond System and corrective actions are appropriate to mitigate such releases, a corrective action plan will be proposed as a modification to the post-closure care plan. A corrective action plan will be submitted to Illinois EPA within 180 days after completion of the investigation activities. The plan will propose corrective actions to be undertaken to mitigate the impacts associated with the constituents of concern which exceed applicable groundwater standards.

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Baldwin Fly Ash Pond System
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Figure 2 Aerial Photograph of Site and Ash Pond System
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Figure 4 Site Closure Plan

APPENDICES

Appendix A: Groundwater Management Zone Legal Description

2.3 Closure of the Baldwin Fly Ash Pond System

The Closure Plan for the Baldwin Fly Ash Pond System is being submitted under separate cover (AECOM, 2016). In November 2015, in accordance with 40 CFR Part 257 Subpart D, Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Final Rule. (CCR Rule), DMG submitted to Illinois EPA a notice of intent to close the East Fly Ash Pond and Old East Fly Ash Pond. A notice of intent to close the West Fly Ash Pond will be submitted by May 17, 2017. Because the East Fly Ash Pond and Old East Fly Ash Pond are inactive, the CCR Rule deadline for completing closure of these two ponds is November 2020.

The three ponds comprising the Baldwin Fly Ash Pond System are interconnected and are essentially three cells within one large pond. The Closure Plan for the Baldwin Fly Ash Pond System includes the following corrective action elements, preliminary designs of which are shown on Figure 4:

- Closure will consist of pumping to remove surface water, redistributing and reshaping the existing CCR to fill in low areas and establish a subgrade for the final soil cover, and placing an earthen cover that complies with the CCR Rule.
- The final cover system is comprised of a 6-inch vegetative support layer (topsoil) overlying 18-inch barrier soil.
- Non-contact storm water runoff from the cover system will be collected and managed, with two new detention basins and channels directing water to the Secondary Pond.

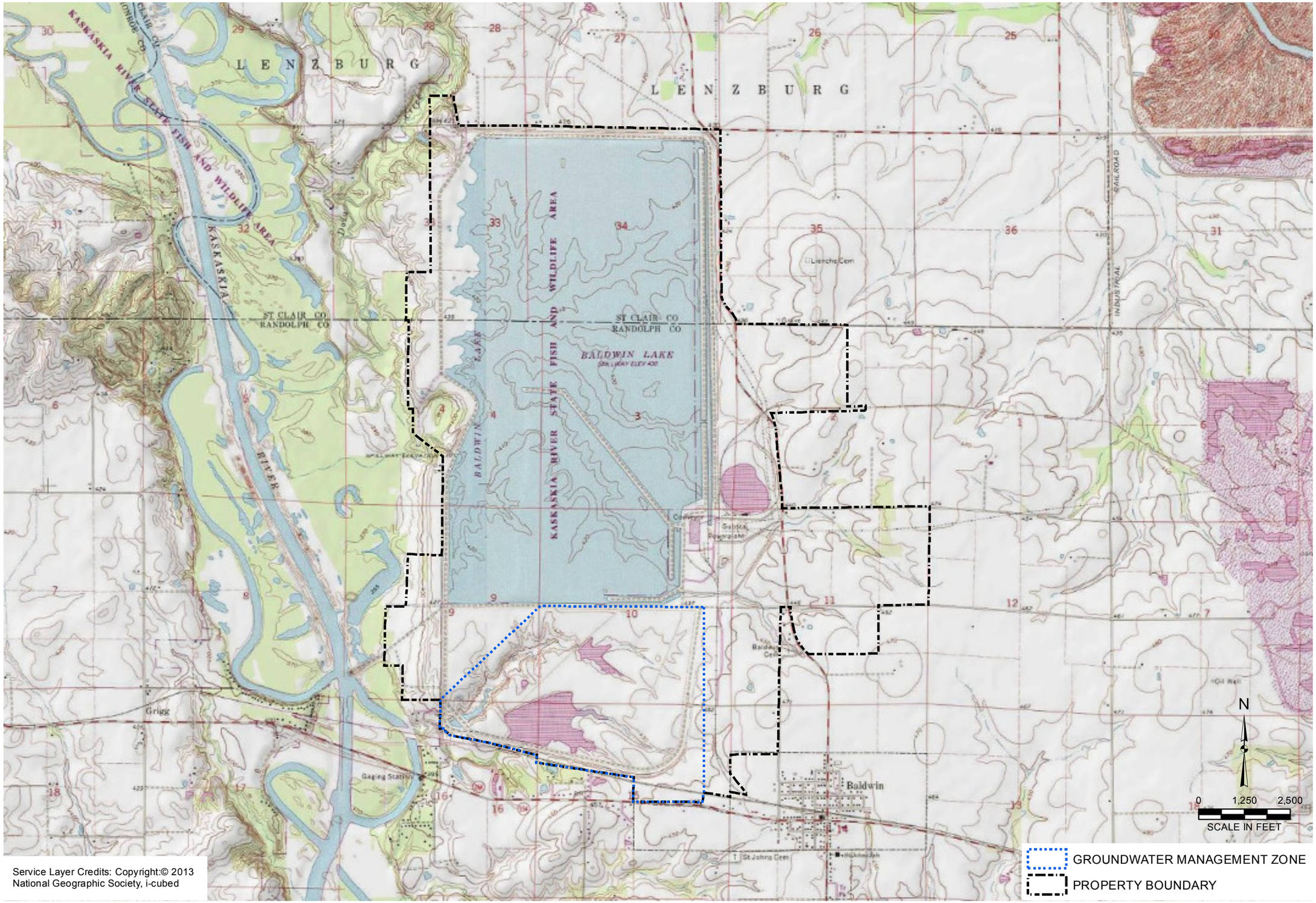
The proposed corrective action elements will provide hydraulic control of surface water on the cover system and surrounding the Baldwin Fly Ash Pond System, will lower leachate levels and establish hydrostatic equilibrium within the ponds, and will decrease transport off-site both spatially and temporally. There are no receptors off-site that would be potentially affected by the movement of impacted groundwater from the Baldwin Fly Ash Pond System.

3.3 Compliance with Applicable On-Site Groundwater Quality Standards

In accordance with IAC 620 Section 620.240, the compliance boundary is a lateral distance of 25 feet outward from the outermost edge of the the Baldwin Fly Ash Pond System berms. Following completion of the corrective action, the groundwater standard at the compliance boundary will be in accordance with IAC 620 Section 450(a)(4) for groundwater quality restoration such that the standard for each released chemical constituent will be the higher of either the Class II groundwater standard or the concentration determined by groundwater monitoring at the compliance boundary.

Compliance with on-site groundwater quality standards, as measured at the modified NPDES monitoring well network, will be achieved when there are no statistically significant increasing trends that are attributed to the Baldwin Fly Ash Pond System for parameters detected at the compliance boundary after a minimum 30 years of post-closure groundwater monitoring has been completed.

Evaluation of groundwater quality data under USEPA (2015) will be consistent with 40 CFR Part 257.93 and 257.94.



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REVIEWED BY/DATE: RJK 2/25/16
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SITE LOCATION MAP

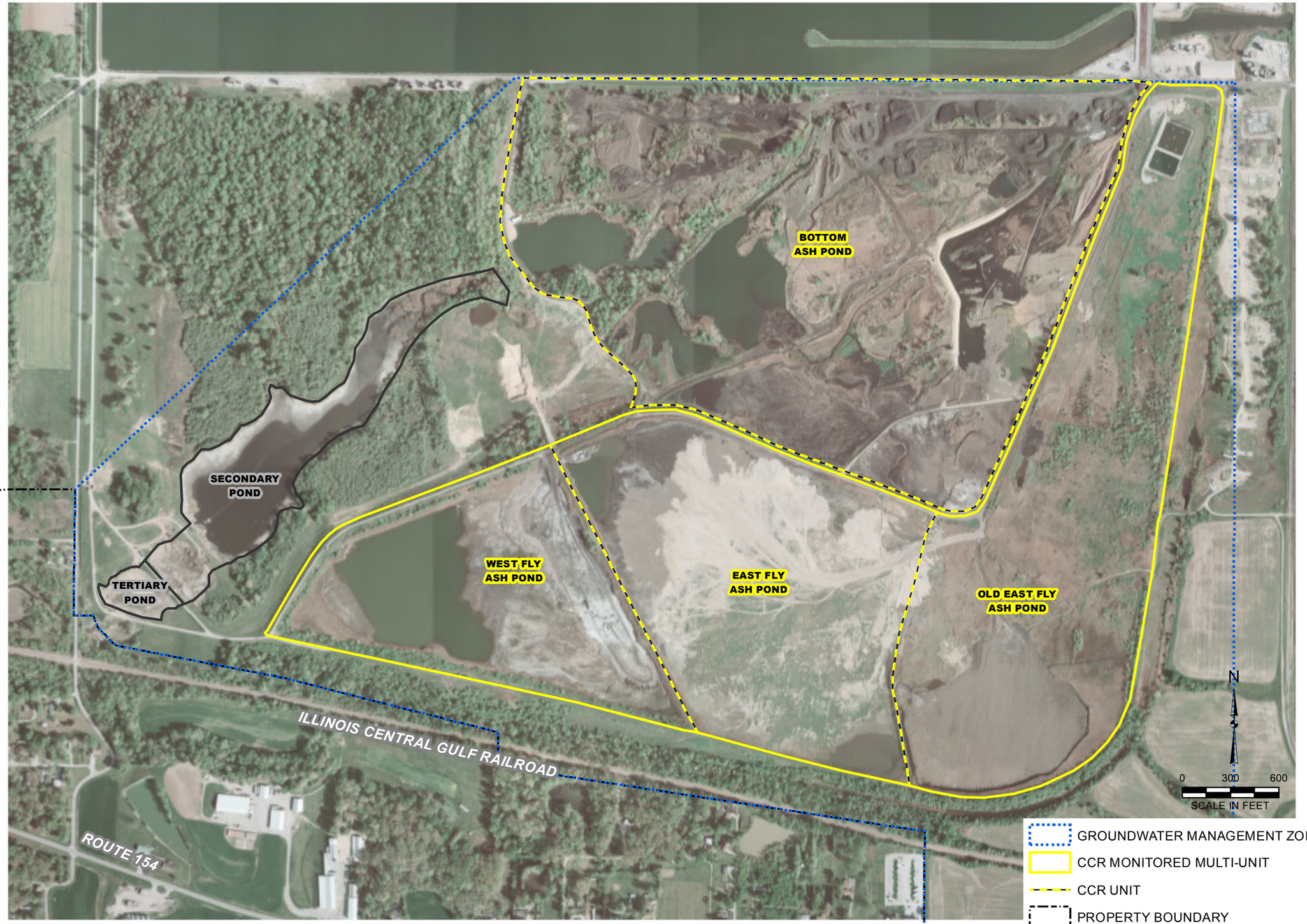
GROUNDWATER MANAGEMENT ZONE APPLICATION
BALDWIN ASH POND SYSTEM
BALDWIN ENERGY COMPLEX, BALDWIN, ILLINOIS

PROJECT NO: 2340

FIGURE NO: 1

NATURAL RESOURCE TECHNOLOGY

Y:\Mapping\Projects\23\2340\MXD\GMZ_Application\Figure 1_Site Location Map.mxd Author: sstotz Date/Time: 7/25/2016, 5:49:35 PM



AERIAL PHOTO SOURCE: HENDERSON AERIAL SURVEYS (4/2/2012).

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DETAILED SITE MAP WITH PARTIAL GMZ BOUNDARY

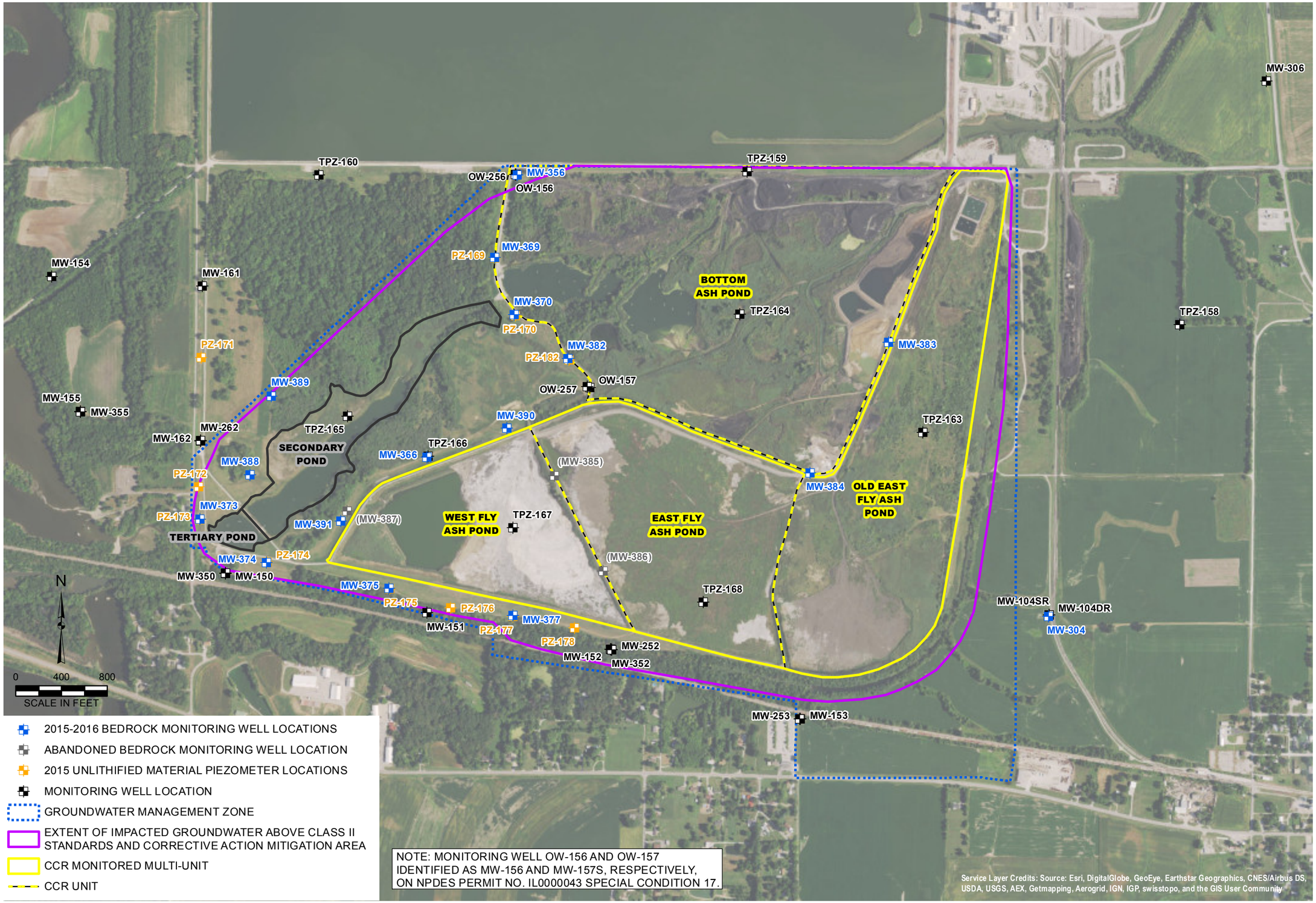
GROUNDWATER MANAGEMENT ZONE APPLICATION
BALDWIN ASH POND SYSTEM
BALDWIN ENERGY COMPLEX, BALDWIN, ILLINOIS

PROJECT NO: 2340

FIGURE NO: 2

NATURAL RESOURCE TECHNOLOGY

Y:\Mapping\Projects\23\2340\MXD\GMZ_Application\Figure 2_Detailed Site Map with GMZ Boundary.mxd Author: sstolz Date/Time: 7/25/2016, 5:47:48 PM



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REVIEWED BY/DATE: RJK 2/25/16
APPROVED BY/DATE: SJC 7/25/16

MONITORING WELL LOCATION MAP

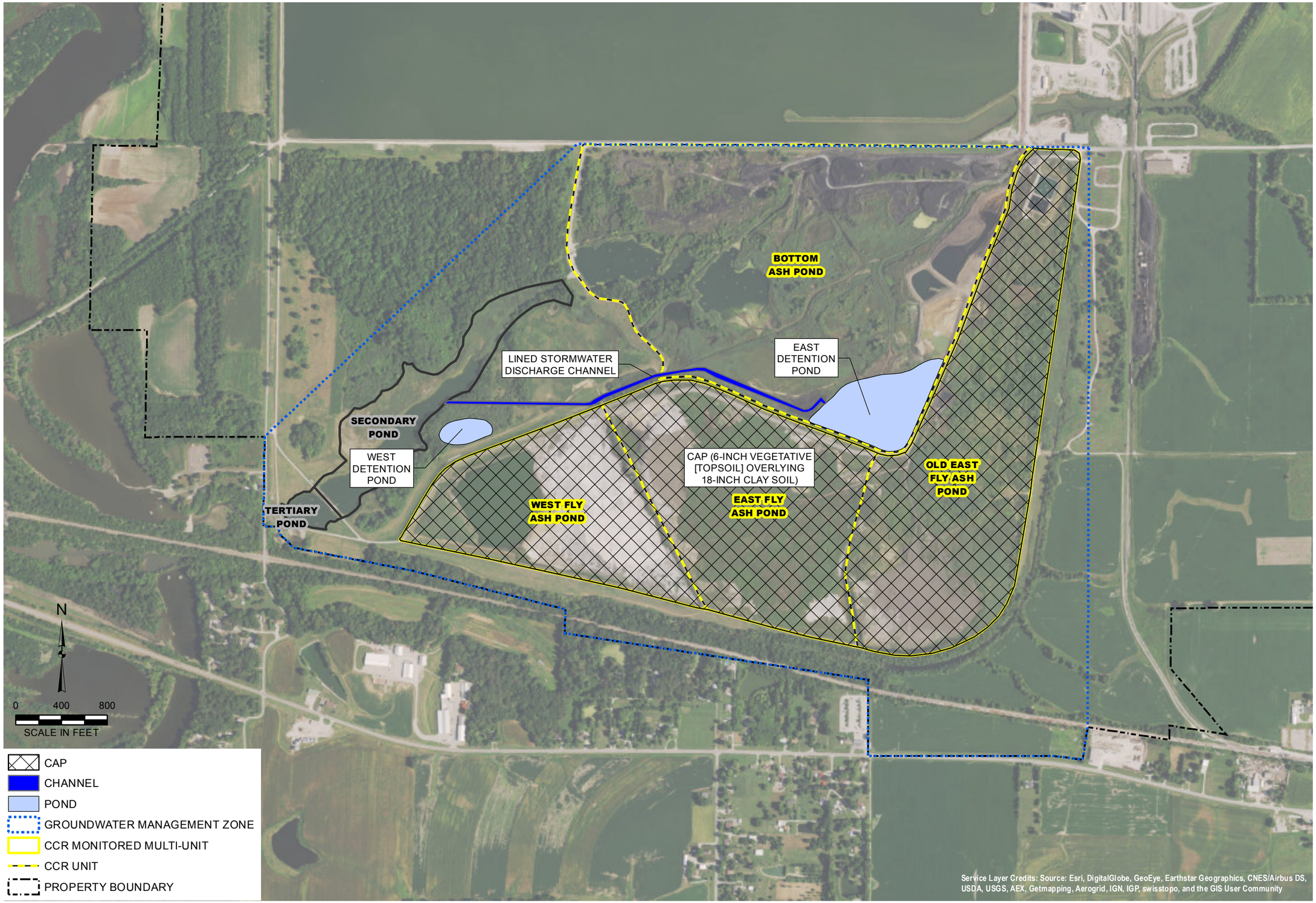
GROUNDWATER MANAGEMENT ZONE APPLICATION
BALDWIN ASH POND SYSTEM
BALDWIN ENERGY COMPLEX, BALDWIN, ILLINOIS

PROJECT NO: 2340

FIGURE NO: 3

NATURAL RESOURCE TECHNOLOGY

Y:\Mapping\Projects\23\2340\MXD\GMZ_Application\Figure 3_Monitoring Well Location Map.mxd Author: sstolz Date/Time: 7/25/2016, 5:52:06 PM



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REVIEWED BY/DATE: SJC 3/9/16
APPROVED BY/DATE: SJC 7/25/16

SITE CLOSURE PLAN

GROUNDWATER MANAGEMENT ZONE APPLICATION
BALDWIN ASH POND SYSTEM
BALDWIN ENERGY COMPLEX, BALDWIN, ILLINOIS

PROJECT NO: 2340

FIGURE NO: 4

NATURAL RESOURCE TECHNOLOGY

Y:\Mapping\Projects\23\2340\MXD\GMZ_Application\Figure 4_Site Closure Plan.mxd Author: sstolz Date/Time: 7/25/2016, 5:54:40 PM

APPENDIX A

GROUNDWATER MANAGEMENT ZONE LEGAL DESCRIPTION

LINE LEGEND

———	BOUNDARY
— — —	QUARTER SECTION LINES
—— — — —— — — ——	SECTION LINE

N

SCALE: 1" = 400'

0 200' 400' 800'

LAND DESCRIPTION OF PROPOSED GROUNDWATER MANAGEMENT ZONE

A TRACT OF LAND BEING PART OF SECTIONS 9, 10 ,15, AND 16 IN TOWNSHIP 4 SOUTH, RANGE 7 WEST OF THE THIRD PRINCIPAL MERIDIAN, RANDOLPH COUNTY, ILLINOIS, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT A CONCRETE MONUMENT AT THE EAST QUARTER-CORNER OF SECTION 10, TOWNSHIP 4 SOUTH, RANGE 7 WEST; THENCE NORTH 0 DEGREES 57 MINUTES 30 SECONDS WEST, A DISTANCE OF 837.22 FEET TO THE POINT OF BEGINNING OF THE TRACT DESCRIBED HEREIN SOUTH 00 DEGREES 00 MINUTES 00 SECONDS EAST, A DISTANCE OF 5102.20 FEET; THENCE SOUTH 08 DEGREES 36 MINUTES 19 SECONDS WEST, A DISTANCE OF 289.20 FEET TO THE NORTH RIGHT OF WAY LINE OF ROUTE 154 ALSO BEING A NON-TANGENT CURVE TO THE LEFT, HAVING A RADIUS OF 5769.63 FEET, WITH A CHORD BEARING OF NORTH 82 DEGREES 42 MINUTES 22 SECONDS WEST; THENCE NORTHWESTERLY ALONG SAID CURVE AND NORTH RIGHT OF WAY LINE, A DISTANCE OF 275.47 FEET TO THE SOUTH LINE OF THE NORTHEAST QUARTER OF SAID SECTION 15; THENCE NORTH 89 DEGREES 57 MINUTES 58 SECONDS WEST, ALONG SAID SOUTH LINE, A DISTANCE OF 1599.38 FEET TO THE WEST LINE OF THE NORTHEAST QUARTER OF SAID SECTION 15; THENCE NORTH 00 DEGREES 26 MINUTES 31 SECONDS EAST, ALONG SAID WEST LINE, A DISTANCE OF 673.45 FEET TO THE CENTERLINE OF THE PROPERTY NOW OR FORMERLY OWNED BY THE GULF MOBILE, AND OHIO RAILROAD; THENCE NORTH 81 DEGREES 04 MINUTES 38 SECONDS WEST, ALONG SAID CENTERLINE, A DISTANCE OF 2679.12 FEET TO THE WEST LINE OF SAID SECTION 15; THENCE NORTH 00 DEGREES 54 MINUTES 21 SECONDS EAST, ALONG SAID WEST LINE, A DISTANCE OF 216.85 FEET; THENCE NORTH 75 DEGREES 38 MINUTES 34 SECONDS WEST, A DISTANCE OF 1371.51 FEET; THENCE NORTH 78 DEGREES 35 MINUTES 08 SECONDS WEST, A DISTANCE OF 1065.00 FEET; THENCE NORTH 45 DEGREES 05 MINUTES 08 SECONDS WEST, A DISTANCE OF 150.00 FEET; THENCE NORTH 20 DEGREES 35 MINUTES 08 SECONDS WEST, A DISTANCE OF 83.42 FEET; THENCE NORTH 89 DEGREES 06 MINUTES 39 SECONDS WEST, A DISTANCE OF 124.98 FEET TO THE WEST LINE OF THE NORTHEAST QUARTER OF SECTION 16, TOWNSHIP 4 SOUTH, RANGE 7 WEST; THENCE NORTH 01 DEGREES 00 MINUTES 09 SECONDS EAST, ALONG SAID WEST LINE, A DISTANCE OF 788.07 FEET; THENCE NORTH 46 DEGREES 54 MINUTES 02 SECONDS EAST, A DISTANCE OF 3757.78 FEET; THENCE SOUTH 89 DEGREES 24 MINUTES 27 SECONDS EAST, A DISTANCE OF 4429.72 FEET TO THE POINT OF BEGINNING; CONTAINING 654.28 ACRES MORE OR LESS; SUBJECT TO ALL RIGHTS TO THE PUBLIC FOR ROAD AND RAILROAD RIGHTS OF WAY, AND EASEMENTS OF RECORD, IF ANY.

STATE OF ILLINOIS
MICHAEL J. GRAMINSKI
35-2901
REGISTERED LAND SURVEYOR

STATE OF ILLINOIS)
) SS
COUNTY OF MADISON)

I, MICHAEL J. GRAMINSKI, A PROFESSIONAL LAND SURVEYOR, DO CERTIFY THAT THIS DRAWING HAS BEEN PREPARED UNDER MY DIRECT SUPERVISION FOR THE CREATION OF A GMZ LIMITS LEGAL DESCRIPTION. ALL DIMENSIONS ARE IN FEET AND DECIMAL PARTS THEREOF.
DATED THIS 29th DAY OF JULY, 2016.

IPLS LICENSE NUMBER 035.002901, EXPIRES 11/30/2016
PROFESSIONAL DESIGN FIRM LICENSE NUMBER 184.004638, EXPIRES 4/30/2017
THIS SURVEY DOES NOT CONFORM TO THE CURRENT ILLINOIS STANDARD FOR A BOUNDARY SURVEY.

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PREPARED FOR:

DYNEGY

Project Name & Location:

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SUPPLEMENTAL HYDROGEOLOGIC SITE CHARACTERIZATION REPORT AND GROUNDWATER MONITORING PLAN

Baldwin Fly Ash Pond System
Baldwin Energy Complex
Baldwin, Illinois

Project No: 2340

March 31, 2016

Natural Resource Technology

Environmental Consultants

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SUPPLEMENTAL HYDROGEOLOGIC SITE CHARACTERIZATION AND GROUNDWATER MONITORING PLAN

BALDWIN FLY ASH POND SYSTEM
BALDWIN ENERGY COMPLEX
BALDWIN, ILLINOIS

Project No. 2340

Prepared For:

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Prepared By:

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March 31, 2016

Stuart J. Cravens, PG
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1 INTRODUCTION

1.1 Overview

This Supplemental Hydrogeologic Site Characterization Report and Groundwater Monitoring Plan was prepared by Natural Resource Technology, Inc. (NRT) in support of a Closure Plan for fly ash ponds located at the Baldwin Energy Complex (BEC) which is owned by Dynegy Midwest Generation, LLC (DMG).

This report and the Closure Plan will apply specifically to the East Fly Ash Pond, Old East Fly Ash Pond and West Fly Ash Pond, hereinafter referred to as the Baldwin Fly Ash Pond System, which are part of a system of six Coal Combustion Residuals (CCR) surface impoundments, as defined further below.

Numerous subsurface investigations have been performed concerning the ash pond system at BEC. The information presented in this report supplements comprehensive data collection and evaluations from the prior hydrogeologic investigation reports (recent to oldest), including, but not limited to, the following:

- ***NRT, June 11, 2014. Groundwater Quality Assessment and Phase II Hydrogeologic Investigation, Baldwin Ash Pond System*** A Phase II assessment to further assess the hydrogeology and groundwater quality in the vicinity of the ash pond system at BEC, following the proposed scope of work (March 22, 2013) approved, with clarifications, by Illinois EPA, June 18, 2013).

- ***Dynegy, March 22, 2013. Proposed Scope of Work – Baldwin Ash Impoundment System*** A plan for conducting a more comprehensive hydrogeologic investigation along with development of a groundwater model to evaluate various pond closure scenarios on groundwater quality in the vicinity of the ash pond system; accepted, with clarifications, by Illinois EPA August 31, 2011.

- ***Kelron Environmental, June 30, 2012. Groundwater Quality Assessment and Initial Hydrogeologic Investigation – Baldwin Ash Pond System*** Assessed the hydrogeology and groundwater quality in the vicinity of the ash pond system, but not beneath the ash ponds. Thirteen monitoring wells were installed around the perimeter of the ash pond system and sampled quarterly to assess upgradient and downgradient groundwater quality (full inorganic parameter list in IAC 35 Part 620.410). Submitted to Illinois EPA.

- ***Kelron Environmental, April 16, 2012. Off-Site Groundwater Quality Results – Baldwin Energy Complex*** Off-site groundwater quality investigation, south and southwest of the ash pond system, to assess shallow off-site groundwater quality for the presence of inorganic parameters related to CCRs. Submitted to Illinois EPA.

- ***Kelron Environmental and NRT, June 7, 2010. Water Well Survey – Baldwin Ash Pond System*** A survey identifying water wells located within 2,500 feet (ft) of the BEC's ash pond system. The water well survey was prepared in accordance with the "Right to Know" Potable Water Well Survey procedures of 35 IAC 1600.210(b)(1) and 1600.210(b)(2). Submitted to Illinois EPA.

- ***Kelron Environmental and NRT, May 26, 2010. Hydrogeologic Assessment and Groundwater Monitoring Plan – Baldwin Ash Pond System*** A plan for initial evaluation of groundwater quality in the vicinity of the ash pond system along with an initial hydrogeologic characterization; accepted, with clarifications, by Illinois EPA August 31, 2011.

This Supplemental Hydrogeologic Site Characterization and Groundwater Monitoring Plan provides a summary of additional data collected and site investigations performed since submittal of the Groundwater Quality Assessment and Phase II Hydrogeologic Investigation (NRT, June 11, 2014) in order to satisfy the following:

- Provide information to define hydrogeology and to assess the groundwater impacts related to the CCR surface impoundments.
- Provide information that could be used to perform a model to assess the groundwater impacts associated with closure of the Baldwin Fly Ash Pond System.
- Provide information to establish a groundwater monitoring program sufficient for long-term, post-closure monitoring.

In conjunction with the Groundwater Quality Assessment and Phase II Hydrogeologic Investigation (NRT, June 11, 2014), groundwater flow and transport models were developed to evaluate the effect of various ash pond closure scenarios on groundwater quality (NRT, June 18, 2014) and to predict the fate and transport of CCR leachate components (NRT, September 30, 2014). Additional groundwater modeling is being conducted to enable estimation of the time required for hydrostatic equilibrium of groundwater beneath the unit. The existing groundwater flow and transport model for the ash pond system is also being updated to develop predictions for closure of the Baldwin Fly Ash Pond System. These groundwater modeling reports will be submitted under separate cover.

1.2 Site Location and Background

The BEC is located in southwest Illinois in Randolph and St. Clair Counties. The Randolph County portion of the BEC is located within Sections 2, 3, 4, 9, 10, 11, 14, 15 and 16 of Township 4 South and Range West. The St. Clair County portion of the property is located within Sections 33, 34, and 35 of Township 3 South and Range 7 West. The Baldwin Fly Ash Pond System is approximately one-half mile west-northwest of the Village of Baldwin. The site location is shown on Figure 1. In general, the BEC property is bordered: on the west by the Kaskaskia River; on the east by Baldwin Road, farmland, and strip mining areas; on the southeast by the village of Baldwin; on the south by the Illinois Central Gulf railroad tracks and State Route 154; and, on the north by the St. Clair/Randolph County Line.

The BEC utilizes four active ash ponds with two inactive fly ash ponds, located at the eastern end of the ash pond system (Figure 2):

- Bottom Ash Pond (177 acres, active)

- East Fly Ash Pond (76 acres, inactive)
- Old East Fly Ash Pond (102 acres, inactive)
- West Fly Ash Pond (54 acres, active)
- Secondary Pond (25 acres, active), used for water clarification rather than direct management of CCRs, but does contain a small volume of CCR
- Tertiary Pond (3.1 acres, active), used for final water clarification and contains a very small volume of CCR

There is one outfall from the ash pond system at the Tertiary Pond that discharges to a tributary of the Kaskaskia River, south of the Cooling Pond intake structure. All six impoundments of the ash pond system have been evaluated as part of the previously conducted hydrogeologic investigations, groundwater quality assessments and modeling.

2 GEOLOGY AND HYDROGEOLOGY

The additional site characterization activities performed at BEC since the Groundwater Quality Assessment and Phase II Hydrogeologic Investigation (NRT, June 11, 2014) have included the following:

- Unlithified zone investigation
- Bedrock investigation
- Aquifer testing
- Geotechnical borings and soil laboratory testing

The results of these supplemental site investigations are discussed below.

2.1 Geology

Geologic units present at the ash pond system include fill, ash generated at BEC, unlithified geologic materials (i.e., Cahokia Alluvium, Equality Formation, and Vandalia Till Member) and Mississippian and Pennsylvanian bedrock.

2.1.1 Unlithified Material Investigations

Supplemental investigation within the unlithified materials was performed to further evaluate the potential presence of sand layers that could represent preferential migration pathways. Eleven borings (PZ-169 through PZ-178 and PZ-182) were performed during July-August 2015 as shown on Figure 3. Borings typically extended to bedrock where monitoring wells with 10 ft screens were installed. Boring depths ranged from 14 to 50 ft below ground surface (bgs). The boring logs and piezometer installation details are provided in Appendix C2.

The location of sand seams observed as well as their thickness and base elevation are shown on Figure 4, based on all borings performed within the unlithified materials. Sand seams appear randomly disseminated across the Site and range from one locally continuous unsaturated sand lens up to 7.9 ft in thickness to isolated, discontinuous thin seams 0.2 to 1 ft thick. No continuous sand seams were observed within or immediately adjacent to the Baldwin Fly Ash Pond System that represent significant preferential migration pathways.

Two overlapping sand seams that appear to be continuous between adjacent borings occur to the west of the Baldwin Fly Ash Pond System (Figure 4) and are vertically separated by at least 6 ft of clay. The shallower sand lens at elevations between 395 to 403 ft is not saturated. These sand lenses do not

extend to the Baldwin Fly Ash Pond System as evidenced by several borings in which no sand was observed.

AECOM (2015) completed a geotechnical investigation that included additional borings that were reported in the 30% design data package for the ash ponds. The geotechnical exploratory program included the following:

- 26 auger borings at the Baldwin Fly Ash Pond System and Bottom Ash Pond. In addition, 3 hand auger borings were completed.
- 82 Cone Penetrometer Testing (CPT) soundings at the Baldwin Fly Ash Pond System and the Secondary, Tertiary, and Bottom Ash Ponds
- 13 vibrating wire piezometers installed at selected boring locations

The geotechnical exploration locations are shown on AECOM Figure D-01 in Appendix A.

Representative samples from the borings were submitted to AECOM of Conshohocken, Pennsylvania and Terrasense of Totowa, New Jersey for laboratory testing on the soil samples for geotechnical properties. A summary of the AECOM geotechnical laboratory test results on the soil samples is provided in Appendix A. The falling head permeability tests results are discussed below. The boring logs and other geotechnical testing data are being submitted under separate cover for the Bladwin Fly Ash Pond System closure plan.

2.1.2 Bedrock Investigations

Bedrock at the site consists of predominantly shale and limestone with lesser amounts of sandstone. As noted in the Groundwater Quality Assessment and Phase II Hydrogeologic Investigation (NRT, June 11, 2014), the Mississippian and Pennsylvanian rocks in the vicinity of the BEC yield small amounts of water to wells from interconnected pores, cracks, fractures, crevices, joints, and bedding planes. Water-bearing openings are variable from place to place and are best developed near the bedrock surface in thin limestones. Shallow sandstone and creviced limestone may yield small supplies in some areas, but water quality becomes poorer (i.e., highly mineralized) with increasing depth.

Supplemental evaluation of bedrock hydraulic conductivity was performed that initially included three deeper holes (MW-304, MW-356, MW-373) extending 95 to 135 ft bgs (82 to 100 ft bgs below the bedrock surface). Packer testing was performed in these coreholes but is not reported herein because the test results were inconclusive. The bedrock was physically deformed by hydrofracking during the test and did not represent actual hydraulic conductivity. Consistent with the site geology and water wells in surrounding area, it was concluded that the most transmissive zone was near the bedrock surface.

Because there were an insufficient number of existing wells for monitoring groundwater in bedrock at the Baldwin Fly Ash Pond System, 16 additional monitoring wells were installed during September 2015

through March 2016. The base of the monitoring well screens were installed an average of approximately 21 ft below the top of bedrock. The additional bedrock monitoring wells installed at each surface impoundment (SI) unit are shown on Figure 3 and included the following.

- 1 monitoring well at an upgradient location (MW-304)
- 10 monitoring wells within and downgradient of the Baldwin Fly Ash Pond System, which is designated as an inactive SI multi unit
- 4 monitoring wells downgradient of the Secondary and Tertiary Ash Ponds, which are designated as an active SI multi unit
- 4 monitoring wells downgradient of the Bottom Ash Pond, which is designated as an active SI unit

Monitoring of upgradient groundwater quality in bedrock will be supplemented with the addition of an existing monitoring well, MW-306, located northeast of the Baldwin Fly Ash Pond System, Well numbers, locations and screened intervals for each SI unit are summarized on the following table and are shown on Figure 3.

Well Number	Depth to Bedrock (ft bgs)	Screened Interval (ft bgs)
Upgradient Monitoring Well		
MW-304*	41	45 - 55
MW-306	39	71 - 86
Inactive SI Multi-Unit: Baldwin Fly Ash Pond System		
MW-383	50	58 - 68
MW-384	56	61 - 71
MW-385**	64	80 - 90
MW-386**	64	76 - 86
MW-366	36	42 - 52
MW-375	50	57 - 67
MW-377	31	46 - 56
MW-387**	36	48 - 58
MW-390	40	50 - 65
MW-391	36	55 - 70
Active SI Multi-Unit: Secondary and Tertiary Ponds		
MW-373*	13	20 - 30
MW-374	24	30 - 40
MW-388	27	33 - 43
MW-389	36	42 - 52
Active SI Unit: Bottom Ash Pond		
MW-356*	37	56 - 66
MW-369	47	56 - 66
MW-370	28	53 - 63
MW-382	34	56 - 66

* Deep bedrock borings were partially backfilled to set the well screens at the specified depths
**Monitoring well scheduled to be abandoned (See section 4.3)

Bedrock boring logs and well construction details are in provided in Appendix C5.

Bedrock topography slopes generally to the west and southwest across the CCR surface impoundments. Topographic relief is approximately 45 ft and is shown on Figure 5.

2.2 Hydrogeology

In March 2015, NRT began an assessment of the existing monitoring well network(s) at BEC with respect to the existing CCR units. Included in the assessment was a review of the current placement and number of monitoring wells with respect to individual and contiguous CCR units as well as potential locations for new monitoring wells, as appropriate. Analytical data for the existing monitoring wells was reviewed to assure that the current well constructions were adequate to provide low turbidity samples during collection of unfiltered samples. None of the monitoring wells exhibited poor construction, evidence of damage or appeared to be otherwise compromised.

The discussion below summarizes the results of the supplemental well installations.

2.2.1 Uppermost Aquifer

The hydrogeology of the ash pond system was comprehensively addressed in the Groundwater Quality Assessment and Phase II Hydrogeologic Investigation (NRT, June 11, 2014). An uppermost aquifer within the area of the six impoundments at the BEC has not been previously designated. Off-site, immediately upgradient and downgradient of the site property boundaries, both the shallow glacial deposits and the shallow bedrock have served as a source of water supply. The shallow unlithified deposits off-site have yielded water through intermittent, discontinuous sand lenses and, in the bedrock, through fractured sandstone and limestone. However, within the area of the ash impoundment only thin and intermittent sand lenses are present. Based on the above, the bedrock is the only viable aquifer in the vicinity of the ash impoundments and is being designated the uppermost aquifer, consistent with the US Environmental Protection Agency (USEPA) definition in 40 CFR Part 257.53 (USEPA, 2015). Seventeen new monitoring wells, as described above, were installed in 2015 and 2016 for purposes of groundwater monitoring within bedrock to comply with the monitoring requirements of 40 CFR Part 257.

Groundwater flow in bedrock is generally to the west and southwest, based on elevation measurements collected on March 2, 2016 (Figure 6). Piezometric heads in bedrock range from less than 1 ft to about 29 ft bgs.

2.2.2 Other Monitorable Units

Other monitorable units representing potential ash constituent migration pathways include glacial deposits and the uppermost bedrock surrounding and within the ash impoundments. The glacial deposits and

uppermost bedrock are currently monitored in compliance with existing Illinois EPA permits. Groundwater in these existing wells will continue to be monitored to comply with 35 IAC Part 620 and BEC's existing NPDES permit.

Groundwater elevation measurements have been measured on a quarterly basis. Groundwater flow in the unlithified glacial materials is to the west, based on elevation measurements collected on November 10, 2015 (Figure 7). The westerly direction of flow is consistent with previous groundwater contour maps in the unlithified deposits (NRT, June 11, 2014). The depth to the potentiometric surface in the unlithified materials ranges from 3.2 to 17.7 ft bgs.

2.2.3 Hydraulic Conductivity

Field hydraulic conductivity tests performed on the unlithified geologic materials (i.e., Cahokia Alluvium, Equality Formation, and Vandalia Till Member) and Mississippian and Pennsylvanian bedrock at the Site were presented the Groundwater Quality Assessment and Phase II Hydrogeologic Investigation (NRT, June 11, 2014). The unlithified and bedrock geologic materials had geometric mean hydraulic conductivities of approximately $3x10^{-5}$ cm/s and $5x10^{-6}$ cm/s, respectively.

Six falling head permeability tests (ASTM D5084 Method F) were performed in the laboratory on undisturbed soil samples collected from the AECOM (2015) geotechnical borings BAL-B001, BAL-B008, BAL-B010, BAL-B011, BAL-B017 and BAL-B027. Sample locations are shown on AECOM Figure D-01 in Appendix A. Test methods and details are provided in Appendix B and the results are summarized below.

Laboratory Hydraulic Conductivity Test Results

Boring Number	Sample Description	Sample Depth (feet)	Hydraulic Conductivity (cm/sec)
BAL-B001	Medium stiff, moist, pale gray with orange mottling, medium plasticity Lean CLAY (CL), trace fine gravel. [TILL]	35.6	1.3×10^{-8}
BAL-B008	Very stiff, moist, light brown with orange and gray mottling, low plasticity Silty CLAY (CL). [FILL/FLY ASH]	10.8	5.5×10^{-9}
BAL-B010	Stiff, moist to wet, gray, Silty CLAY (CL), iron staining, trace sand and clay. [LOESS]	21.3	2.4×10^{-6}
BAL-B011	Stiff, moist, gray with faint orange mottling, low plasticity Silty CLAY (CL). [FILL/FLY ASH]	15.2	1.8×10^{-9}
BAL-B017	Stiff, gray, medium plasticity CLAY (CL). [RESIDUAL]	26.7	1.7×10^{-8}
BAL-B027	Stiff, moist to wet, gray, Lean CLAY (CL), with silt and fine sand, trace gravel, iron staining. [TILL]	26.9	5.0×10^{-9}

3 GROUNDWATER QUALITY

3.1 Summary of Groundwater Monitoring Activities

An initial six quarters of sampling and analysis of groundwater from monitoring wells at the Baldwin Fly Ash Pond System was conducted from November 2010 through March 2012. The groundwater quality data collected from 2010 through 2012 included field parameters and the full list of inorganic parameters listed in 35 IAC Part 620 Section 420 (Groundwater Quality Standards for Class II: General Resource Groundwater) except for vanadium and perchlorate. Based on the results of the initial 2010–2012 (Phase I) investigation (Kelron, June 30, 2012), additional monitoring wells and piezometers were installed upgradient, downgradient, and within the ash pond system as part of the Phase II investigation (NRT, June 11, 2014). Further, the list of monitoring parameters was reduced to boron, iron, manganese, chloride, sulfate, TDS, and pH commencing in September 2013.

Samples are currently collected quarterly from 14 monitoring wells in accordance with NPDES Permit No. IL0000043 (effective January 1, 2015) for the following laboratory and/or field parameters:

Laboratory Parameters		
Boron	Manganese (total)	Sulfate
Chloride	Nitrate	Total Dissolved Solids (TDS)
Iron (total)		
Field Parameters		
pH	Depth of Well (ft bgs)	
Specific Conductance	Elevation of measuring point (mp)	
Temperature	Depth to Water (ft below mp)	
	Groundwater Elevation (ft)	

Groundwater monitoring results from sampling of the 14 wells are reported to the Illinois EPA annually in accordance with the NPDES permit.

3.2 Groundwater Monitoring Results

Analytical results from November 2010 through November 2015, including non-NPDES permit required wells, are summarized in Appendix D. Statistics showing the minimum and maximum concentrations detected in the unlithified materials, bedrock and leachate wells is included. Also, a comparison of groundwater data from wells screened in unlithified materials relative to the Groundwater Quality Standards for Class II: General Resource Groundwater is shown. The well locations are shown on Figure 3.

Parameters that have been detected in groundwater at concentrations exceeding the Class II groundwater quality standards include the following:

Boron	Iron	Sulfate
Chloride*	Manganese	TDS
pH		

*exceeded in bedrock well only; background chloride concentration in bedrock to be determined

Class II parameters that have not been detected in groundwater include the following:

Beryllium	Chromium	Mercury
Cadmium	Cyanide	Thallium

All other Class II parameters that have been detected are typically well below their respective groundwater quality standards.

Quarterly groundwater sampling of the new bedrock well network commenced in January 2016.

3.3 Statistical Evaluation of Background Groundwater Data

A statistical evaluation was performed to determine the maximum background concentrations likely to occur upgradient of the Baldwin Fly Ash Pond System within the unlithified glacial materials. The groundwater quality data collected from upgradient monitoring wells MW-104S/SR and MW-104D/DR was evaluated using the Electric Power Research Institute (EPRI, March 2014) computer database and analysis program, MANAGES™ (Version 3.4.49). The statistical analysis procedures used here are consistent with procedures described in the document: 2009 Unified Guidance. “Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities—Unified Guidance,” March 2009, EPA 530/R-09-2007 (USEPA, 2009).

The statistical methodology is provided in Appendix E. Establishing the tolerance interval(s) for the groundwater constituents was accomplished by using either a parametric or non-parametric procedure based on the percentage of non-detects in the data sets and the distribution of the sample population. If the statistical data for a constituent had less than 50 percent non-detects and was normally or log-normally distributed, a parametric procedure was used. If the data was not normally or log-normally distributed or had more than 50 percent non-detects, a non-parametric procedure was used. Appendix E, Figure E-1 is a flow chart which illustrates the processes followed to determine the appropriate statistical procedure used for each constituent based on its statistical characteristics.

3.4 Statistical Analysis Results

The results of the statistical analyses for the groundwater in the unlithified materials are located in Appendix E. A statistical summary of the background water quality data from MW-104S/SR and MW-104D/DR is provided in Table E-2, and includes the mean, median, minimum, maximum, standard deviation, Sen Slope trend, normality determination, and percent non-detects for the background dataset. The statistical analysis procedure inputs and results are provided in Table E-3.

Calculated background values (upper and lower limits) for the tested inorganic constituents and pH are listed in Appendix E, Table E-1 along with the percent non-detects, normal or lognormal distribution, test method, and confidence level. The calculated background values are also shown on Table 1 and are compared to the groundwater quality standards for Class II: General Resource Groundwater. The higher of the two values is shown as the Applicable Groundwater Standard on Table 1 (see additional discussion provided in Section 5.2).

4 GROUNDWATER MONITORING SYSTEM

A groundwater monitoring system is proposed for the Baldwin Fly Ash Pond System to monitor groundwater, evaluate post-closure groundwater quality and trends, and to demonstrate compliance with the applicable groundwater quality standards identified in Section 5. The proposed groundwater monitoring well networks consist of a sufficient number of wells, installed at appropriate locations and depths to monitor post-closure compliance with groundwater quality standards for Class II: General Resource Groundwater.

The groundwater monitoring program is consistent with the requirements of 35 IAC Part 620 and 40 CFR Part 257 and includes two monitoring well networks. As discussed in Section 2.2, groundwater within the glacial deposits and uppermost bedrock will continue to be monitored to comply with 35 IAC Part 620 and BEC's existing NPDES permit. The second monitoring well network will monitor groundwater within bedrock, which is the only viable aquifer in the vicinity of the ash impoundments and is being designated the uppermost aquifer.

The monitoring wells are designed and constructed in accordance with applicable standards, including the following:

- All monitoring wells are cased in a manner that maintains the integrity of the boreholes
- Wells are screened to allow sampling only at the specified interval
- All wells are covered with vented caps, unless located in flood-prone areas, and equipped with devices to protect against tampering and damage

Both monitoring well networks described below fulfill the following goals:

- Enable the collection of groundwater samples that represent the quality of background water that has not been affected by the Baldwin Fly Ash Pond System
- Enable the collection of groundwater samples that represent the quality of downgradient groundwater
- Include wells that are located within the stratigraphic unit(s) that may serve as potential chemical migration pathways

4.1 Proposed Modified NPDES Monitoring Well Network

The proposed modified NPDES monitoring well network includes 17 monitoring wells. Thirteen wells will be sampled and analyzed for laboratory and field parameters which are equivalent to the current NPDES Permit parameters. These wells include MW-104SR, MW-104DR, MW-150, MW-350, MW-151, MW-152, MW-252, MW-352, MW-153, MW-253, MW-154, MW-155, and MW-355. Eleven of these wells are

screened in the unlithified materials and three wells are screened in the bedrock. Two background bedrock monitoring wells (MW-304, MW-306) will also be sampled and analyzed for an expanded laboratory parameter list and field parameters, as described in Section 6.1.1.

The above monitoring wells are supplemented by 2 locations (MW-156, and MW-157S) that will monitor specific conductance, temperature and groundwater elevations only.

The proposed modified NPDES monitoring well network goes beyond Special Condition 17 of the existing NPDES permit for the Baldwin groundwater sampling program with the addition of wells MW-151, MW-304 and MW-306 in the groundwater monitoring system,

Boring logs and monitoring well construction reports for the groundwater monitoring system are provided in Appendix C. The proposed modified NPDES monitoring well network locations are shown on Figure 8. The well depths, well screen intervals, depth to groundwater elevations and monitored units at the proposed monitoring well network locations are summarized below:

Well Number	Well Depth (ft bgs)	Well Screen Interval (ft bgs)	Depth To Groundwater (ft bgs)	Unit Monitored	Screened Interval Lithology
MW-104SR	15	5 - 15	10.5	Upgradient Shallow Unlithified	Clay
MW-104DR	35	23 - 28	10.6	Upgradient Deep Unlithified	Clay; Poorly Graded Sand
MW-304	135	45-55	10.6	Upgradient Bedrock	Limestone
MW-306	86	71-86	NM	Upgradient Bedrock	Limestone
MW-150	25	15 - 25	16.6	Downgradient Shallow Unlithified	Clay
MW-350	47	42 - 47	19.5	Downgradient Bedrock	Limestone
MW-151	16	6 - 16	NM	Downgradient Shallow Unlithified	Clay
MW-152	18	7 - 17	3.5	Downgradient Shallow Unlithified	Clay; Poorly Graded Sand
MW-252	50	44 - 49	2.7+	Downgradient Deep Unlithified	Clay
MW-352	74	68 - 73	3.7	Downgradient Bedrock	Shale and Limestone
MW-153	21	10 - 20	11.6	Downgradient Shallow Unlithified	Clay

Well Number	Well Depth (ft bgs)	Well Screen Interval (ft bgs)	Depth To Groundwater (ft bgs)	Unit Monitored	Screened Interval Lithology
MW-253	35	30 - 35	9.8	Downgradient Deep Unlithified	Clay
MW-154	13	7 - 12	10.7	Downgradient Shallow Unlithified	Clay
MW-155	21	10 - 20	17.7	Downgradient Shallow Unlithified	Clay; Clayey Sand
MW-355	33	27 - 32	20.9	Downgradient Bedrock	Limestone
MW-156*	18	8 - 18	4.6	Downgradient Shallow Unlithified	Clay
MW-157S*	18	8 - 18	3.2	Downgradient Shallow Unlithified	Clay

+ indicates groundwater elevation above ground surface
Groundwater depth elevations shown are from November 10, 2015; NM indicates groundwater elevation was not measured.
* MW-156 also known as OW-156, MW-157S also known as OW-157; monitored for specific conductance, temperature and groundwater elevations only

4.2 40 CFR Part 257 Monitoring Well Network

The 40 CFR Part 257 well network consists of 7 monitoring wells installed in bedrock adjacent to the Baldwin Fly Ash Pond System (MW-366, MW-375, MW-377, MW-383, MW-384, MW-390, MW-391) and 2 background monitoring wells (MW-304, MW-306). The bedrock wells monitor the uppermost aquifer. Boring logs and monitoring well construction reports for the groundwater monitoring system are provided in Appendix C5. Sampling of these wells commenced in January 2016, with the exception of MW-306, MW-390 and MW-391 (expected to commence in March 2016). The 40 CFR Part 257 groundwater monitoring network well locations are shown on Figure 8.

The well depths, well screen intervals, depth to groundwater and monitored units at the 40 CFR Part 257 monitoring well network locations are summarized below:

Well Number	Well Depth (ft bgs)	Well Screen Interval (ft bgs)	Depth To Groundwater (ft bgs)	Unit Monitored	Screened Interval Lithology
MW-304	135	45 - 55	8.0	Upgradient Bedrock	Shale and Limestone
MW-306	86	71-86	10.6	Upgradient Bedrock	Shale and Limestone
MW-366	52	42-52	10.5	Downgradient Bedrock	Shale and Limestone

Well Number	Well Depth (ft bgs)	Well Screen Interval (ft bgs)	Depth To Groundwater (ft bgs)	Unit Monitored	Screened Interval Lithology
MW-375	67	57-67	29.0	Downgradient Bedrock	Shale and Limestone
MW-377	56	46-56	0.3	Downgradient Bedrock	Shale and Limestone
MW-383	73	58 - 68	17.0	Downgradient Bedrock	Shale and Limestone
MW-384	94	61 - 71	6.9	Downgradient Bedrock	Shale and Limestone
MW-390	65	50 - 65	NM	Downgradient Bedrock	Shale and Limestone
MW-391	70	55 - 70	NM	Downgradient Bedrock	Shale and Limestone

Groundwater depth elevations shown are from March 2, 2016
NM indicates groundwater elevation was not measured.
Groundwater elevations may have not yet fully stabilized.

4.3 Abandoned Wells

Three piezometers (TPZ-163, TP-167 and TPZ-168) are located within the Baldwin Fly Ash Pond System. These former leachate monitoring wells will be properly abandoned prior to their being damaged or destroyed during the impoundment closure activities. Leachate data collected from these piezometers are provided in Appendix D for a limited set of parameters.

Two bedrock monitoring wells (MW-385 and MW-386) are located within the Baldwin Fly Ash Pond System along the berm separating the East and West Fly Ash Ponds. These monitoring wells will also be properly abandoned prior to their being damaged/destroyed during the impoundment closure activities.

Monitoring well MW-387 is located on the West Fly Ash Pond berm and does not provide sufficient water depth for sampling. This bedrock monitoring well will be properly abandoned and will be replaced with a new well, MW-391.

The locations of monitoring wells to be abandoned are shown on Figure 3.

5 APPLICABLE GROUNDWATER QUALITY STANDARDS

5.1 Groundwater Classification

The classification of groundwater at the Baldwin Fly Ash Pond System was addressed in the Groundwater Quality Assessment and Phase II Hydrogeologic Investigation (NRT, June 11, 2014). Field hydraulic conductivity tests performed on the unlithified geologic materials (i.e., Cahokia Alluvium, Equality Formation, and Vandalia Till Member) and Mississippian and Pennsylvanian bedrock at the Site had geometric mean hydraulic conductivities of approximately $3x10^{-5}$ cm/s and $5x10^{-6}$ cm/s, respectively.

Geologic material with a hydraulic conductivity of less than $1x10^{-4}$ cm/s which does not meet the provisions of Section 620.210 (Class I), Section 620.230 (Class III), or Section 620.240 (Class IV), meets the definition of a Class II – General Resource Groundwater. Based on the detailed geologic information provided for the unlithified materials and bedrock at BEC, along with the hydrogeologic data, the groundwater in both the unlithified deposits and underlying bedrock at the Site can be classified as Class II - General Resource Groundwater.

5.2 Applicable Groundwater Quality Standards

The groundwater quality standard for the proposed modified NPDES monitoring well network for wells screened in unlithified materials is the greater of either the background concentration or the groundwater quality standard for Class II General Resource Groundwater [35 IAC 620.420]. Based on the statistical evaluation of background groundwater data (Table 1), most background concentrations in the unlithified materials are below the groundwater quality standard for Class II General Resource Groundwater. Therefore, for these parameters, the groundwater quality standard for Class II General Resource Groundwater will apply to the proposed modified NPDES monitoring well network for wells screened within unlithified material. The exceptions include total iron, dissolved iron, dissolved manganese and pH (lower limit), where the background concentration is higher (or lower for pH lower limit) than the Class II standard. Therefore, for these parameters, the background concentration is the applicable groundwater standard.

Background groundwater quality in bedrock will be established through statistical evaluation following completion of 8 quarters of groundwater sampling of background wells MW-304 and MW-306 that commenced in January 2016. The groundwater quality standard for the proposed modified NPDES monitoring well network (bedrock wells) at the Baldwin Fly Ash Pond System will be the greater of either the background concentration or the groundwater quality standard for Class II General Resource

Groundwater. The list of applicable groundwater quality standards for the modified NPDES monitoring well network is shown on Table 1.

The groundwater quality standards (i.e., Groundwater Protection Standard) for the 40 CFR Part 257 well network will be established in accordance with the methods outlined in 40 CFR Part 257 following the collection of 8 independent samples from each of the upgradient and downgradient monitoring wells, with completion of the final sample event required by October 17, 2017.

5.3 Proposed Exceptions to the Groundwater Monitoring Parameters

Based on the results of groundwater monitoring performed at the site to date for the proposed modified NPDES monitoring well network, the following exceptions to the above applicable Class II: General Resource Groundwater standards are proposed:

- Analytical results (Appendix D) do not indicate exceedances of the groundwater quality standards for Class II General Resource Groundwater inorganic constituents listed in 35 IAC 620.420(a)(1). The analyzed constituents include antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, cyanide, fluoride, lead, mercury, nitrate, and thallium.[1] With the exception of nitrate, these constituents will not be monitored because they are well below the standards for Class II General Resource Groundwater and are not prevalent in groundwater associated with the Baldwin Fly Ash Pond System.

- Analytical results (Appendix D) do not indicate exceedances of the groundwater quality standards for Class II General Resource Groundwater for inorganic constituents copper, nickel, selenium, silver, and zinc listed in 35 IAC 620.420(a)(2). These constituents will not be monitored because they are well below the standards for Class II General Resource Groundwater and are not prevalent in groundwater associated with the Baldwin Fly Ash Pond System.

- Perchlorate is commonly used as an oxidizer in solid propellants, munitions, fireworks, airbag initiators for vehicles, matches and signal flares. It is also used in some electroplating operations and found in some disinfectants and herbicides (USEPA, 2014). Perchlorate is an inorganic constituent listed in 35 IAC 620.420(a)(1) but has not been previously analyzed. Perchlorate will not be monitored because it is not associated with the chemical characteristics of the Baldwin Fly Ash Pond System.

The proposed groundwater monitoring parameters for the proposed modified NPDES monitoring well network and 40 CFR Part 257 groundwater monitoring well network are discussed in Section 6.1.

[1] Perchlorate, vanadium and Ra-226/Ra-228 are parameters listed in 35 IAC 620.420(a)(1) but have not been analyzed.

6 GROUNDWATER MONITORING PLAN

The groundwater monitoring plan will monitor and evaluate groundwater quality to demonstrate compliance with the groundwater quality standards for Class II: General Resource Groundwater as well as USEPA parameters, as appropriate. As discussed in Section 4, the proposed post-closure groundwater sampling network consists of four background monitoring wells and 20 compliance monitoring wells as shown on Figure 8.

6.1 Monitoring Parameters

6.1.1 Proposed Modified NPDES Monitoring Well Network

The proposed modified NPDES monitoring well network includes 17 monitoring wells. Thirteen wells will continue to be sampled and analyzed for the laboratory and field parameters listed below which are equivalent to the current NPDES Permit parameters. These wells include MW-104SR, MW-104DR, MW-150, MW-350, MW-151, MW-152, MW-252, MW-352, MW-153, MW-253, MW-154, MW-155, and MW-355.

Laboratory Parameters		
Boron (dissolved)	Manganese (total)	Sulfate (dissolved)
Chloride (dissolved)	Nitrate (total)	Total Dissolved Solids (TDS)
Iron (total)		

Field Parameters	
pH	Depth of Well (ft bgs)
Specific Conductance	Elevation of measuring point (mp)
Temperature	Depth to Water (ft below mp)
	Groundwater Elevation (ft)

As discussed in Section 5, other constituents listed under 35 IAC 620 will not be monitored at the proposed modified NPDES monitoring well network because the groundwater monitoring results to date indicate that the inorganic constituents antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, cyanide, fluoride, lead, mercury, nickel, selenium, silver, thallium and zinc meet the Class II: General Resource Groundwater standards and are not associated with the chemical characteristics of the Baldwin Fly Ash Pond System.

Two monitoring wells, MW-156 and MW-157S, are monitored for specific conductance, temperature and groundwater elevation.

Two proposed background bedrock monitoring wells (MW-304, MW-306) will be sampled and analyzed for the following laboratory and field parameters:

Laboratory Parameters		
Boron (dissolved)	Manganese (total)	Sulfate (dissolved)
Chloride (dissolved)	Nitrate (total)	Total Dissolved Solids (TDS)
Iron (total)		

Field Parameters		
pH	Depth of Well (ft bgs)	
Specific Conductance	Elevation of measuring point (mp)	
Temperature	Depth to Water (ft below mp)	
	Groundwater Elevation (ft)	

As discussed in Section 5, perchlorate will not be monitored because this parameter is not associated with the chemical characteristics of the Baldwin Fly Ash Pond System.

6.1.2 40 CFR Part 257 Monitoring Well Network

The 40 CFR Part 257 well network consists of 7 monitoring wells installed in bedrock adjacent to the Baldwin Fly Ash Pond System (MW-366, MW-375, MW-377, MW-383, MW-384, MW-390, MW-391) and 2 background monitoring wells (MW-304, MW-306). Groundwater samples will be collected and analyzed for the following laboratory and field parameters:

Laboratory Parameters		
Metals (totals)		
Antimony	Cadmium	Lithium
Arsenic	Calcium	Mercury
Barium	Chromium	Molybdenum
Beryllium	Cobalt	Selenium
Boron	Lead	Thallium
Inorganics (totals)		
Fluoride	Sulfate	
Chloride	Total Dissolved Solids	
Other (total)		
Radium 226 and 228 combined		

Field Parameters	
pH	Temperature
Oxidation/Reduction Potential	Specific Conductivity
Dissolved Oxygen	Turbidity

All parameters listed above will be sampled a minimum of eight times by October 17, 2017 to establish background groundwater quality. Following the initial eight rounds of sampling, the parameters to be monitored will be in accordance with the requirements of 40 CFR Part 257.94 and 257.95.

6.2 Sampling Schedule

Groundwater sampling for the proposed modified NPDES monitoring well network will initially be performed quarterly according to the following schedule:

Frequency	Duration
Quarterly	Begins: upon approval of this plan.
	Ends: 5 years after completion of cap and upon demonstration that monitoring effectiveness is not compromised and that there are no increasing trends attributable to the Baldwin Fly Ash Pond System.
Semiannual	Begins: after IEPA approves that quarterly monitoring requirements have been satisfied.
	Ends: 5 years after initiation of semiannual monitoring and upon demonstration that monitoring effectiveness is not compromised and that there are no increasing trends attributable to the Baldwin Fly Ash Pond System.
Annual	Begins: after IEPA approves that semiannual monitoring requirements have been satisfied.
	Ends: upon IEPA approval of a certified post-closure care report.

Five years after approval of the Closure Plan, a request may be made to modify the post-closure care plan to reduce the frequency of groundwater monitoring to semi-annual sampling by demonstrating all of the following:

- Monitoring effectiveness will not be compromised by the reduced frequency of monitoring
- Sufficient data has been collected to characterize groundwater
- Concentrations of constituents monitored at the downgradient boundaries show no statistically significant increasing trends that can be attributed to the former ash ponds

If concentrations of parameters of concern at the downgradient boundaries of the site show no statistically significant increasing trends that can be attributed to the Baldwin Fly Ash Pond System for the five years after reducing the monitoring frequency to semi-annual, a request may be made to modify the post-closure care plan to reduce monitoring frequency to annual sampling by demonstrating the same items above as for the reduction to semi-annual monitoring.

Groundwater monitoring may be discontinued upon Illinois EPA's approval of a certified post-closure care report. Specifically, when no statistically significant increase is detected in the concentration of any constituent above that measured and recorded during the immediately preceding scheduled sampling for four consecutive years after changing to an annual monitoring frequency.

Groundwater monitoring for the 40 CFR Part 257 well network will follow a schedule in accordance with the requirements of 40 CFR Part 257.94 and 257.95.

6.3 Groundwater Sample Collection

Groundwater samples will be collected consistent with the requirements of 35 IAC Part 620 and 40 CFR 257.93 as described in Appendix F. In addition to groundwater well samples, quality assurance samples will be collected as described in Section 6.5.

6.4 Laboratory Analysis

Laboratory analysis will be performed consistent with the requirements of 35 IAC Part 620 and 40 CFR 257.93 by a state-certified laboratory using methods approved by Illinois EPA and USEPA. The practical quantitation limit (PQL) for all parameters analyzed will be lower than the applicable groundwater quality standard. Concentrations lower than the PQL will be reported as less than the PQL.

6.5 Quality Assurance Program

Consistent with the requirements of 35 IAC Part 620 and 40 CFR 257.93, the sampling and analysis program includes procedures and techniques for quality assurance and quality control. Additional quality assurance samples to be collected will include the following:

- Two blind duplicate groundwater samples from randomly selected monitoring wells
- One equipment blank sample will be collected and analyzed for each day of sampling. If dedicated sampling equipment is used, than equipment blank samples will not be collected.

The duplicate and equipment blank quality assurance samples will be supplemented by the laboratory QA/QC program, which typically includes:

- Regular generation of instrument calibration curves to assure instrument reliability
- Laboratory control samples and/or quality control check standards that have been spiked, and analyses to monitor the performance of the analytical method
- Matrix spike/matrix spike duplicate analyses to determine percent recoveries and relative percent differences for each of the parameters detected

- Analysis of replicate samples to check the precision of the instrumentation and/or methodology employed for all analytical methods
- Analysis of method blanks to assure that the system is free of contamination

6.6 Groundwater Monitoring System Maintenance Plan

Consistent with the requirements of 35 IAC Part 620 and 40 CFR 257.91, maintenance will be performed as needed to assure that the monitoring wells provide representative groundwater samples. Monitoring wells will be inspected during each groundwater sampling event. Monitoring well inspections will consist of the following:

- Visual inspection, clearing of vegetation, replacement of markers, and painting of protective casings as needed to assure that monitoring wells are clearly marked and accessible
- Visual inspection and repair or replacement of well aprons as needed to assure that they are intact, drain water away from the well, and have not heaved
- Visual inspection and repair or replacement of protective casings as needed to assure that they are undamaged, and that locks are present and functional
- Checks to assure that well caps are intact and vented, unless in flood-prone areas in which case caps will not be vented
- Annual measurement of monitoring well depths to determine the degree of siltation within the wells. Wells will be redeveloped as needed to remove siltation from the screened interval if it impedes flow of water into the well
- Checks that wells are clear of internal obstructions, and flow freely

If maintenance of a monitoring well cannot address an identified deficiency, a replacement well will be installed.

6.7 Annual Statistical Analysis

6.7.1 Proposed Modified NPDES Monitoring Well Network

Trend analysis will be performed annually for each of the monitored parameters. Sen's Estimate of Slope will be applied to a minimum of four consecutive quarterly monitoring results. If there are increasing trends during closure and post-closure care periods, they will be further investigated as described below.

- If the results of sampling and analysis show an increasing trend at any compliance monitoring well, a Mann-Kendall analysis will be performed at 95 percent confidence to determine whether or not the increasing trend is statistically significant.
- If a statistically significant increasing trend occurs during post-closure care, further investigation of monitored concentrations will be performed as well as more frequent inspections of the surface of the cover system.

- If the investigation attributes a statistically significant increasing trend to a source other than the Baldwin Fly Ash Pond System, then the Illinois EPA will be notified in writing, stating the cause of the increasing trend and providing the rationale used in such a determination.
- If there is not an alternative source causing the statistically significant increasing concentration and the sampling frequency had been reduced to semi-annual or annual sampling, a quarterly sampling schedule will be reestablished. The frequency of sampling will return to either semi-annual or annual, once four consecutive quarterly samples show no statistically significant increasing trend.

Notifications concerning statistically significant increasing trends and revisions of the sampling frequency will be reported to Illinois EPA in writing within 30 days after making the determinations.

6.7.2 40 CFR Part 257 Monitoring Well Network

As required in 40 CFR Part 257.93, statistical analysis will be performed to determine whether or not a statistically significant increase over a background value has occurred for each constituent and at each well. Appropriate statistical methods will be chosen from the list of methods provided and the test chosen will be conducted separately for each constituent in each monitoring well. In addition, each statistical method chosen will comply with the performance standards, as appropriate, based on the test method used. If a statistically significant increase over background values is determined, procedures from 40 CFR Part 257 will be followed including 1) establishing an assessment monitoring program or 2) demonstrating that a source other than the Baldwin Fly Ash Pond System caused the increase or demonstrating another plausible reason for the increase (error in sampling, etc.).

6.8 Data Reporting

Sampling and analysis data from quarterly, semi-annual and/or annual groundwater monitoring for the modified NPDES monitoring well network will be reported to Illinois EPA within 60 days after completion of sampling. Statistical analysis of the laboratory analytical data will be reported to Illinois EPA with the annual report for the facility, as described in the closure plan.

Data reporting for the 40 CFR Part 257 monitoring well network will be consistent with recordkeeping, notification, and internet posting requirements described in 40 CFR 257.105 through 257.107.

6.9 Compliance with Applicable On-Site Groundwater Quality Standards

Compliance with on-site groundwater quality standards, as measured at the modified NPDES monitoring well network, will be achieved when there are no statistically significant increasing trends that are attributed to the Baldwin Fly Ash Pond System for parameters detected at the compliance boundary for four (4) consecutive years following the change to an annual monitoring frequency.

Evaluation of groundwater quality data under USEPA (2015) will be consistent with 40 CFR Part 257.93 and 257.94.

6.10 Corrective Action

If a statistically significant increasing trend is observed to continue over a period of two or more years in groundwater sampled at the modified NPDES monitoring well network, and a subsequent hydrogeologic site investigation demonstrates that such exceedances are due to a release from the Baldwin Fly Ash Pond System and corrective actions are appropriate to mitigate such releases, a corrective action plan will be proposed as a modification to the post-closure care plan. A corrective action plan will be submitted to Illinois EPA within 180 days after completion of the investigation activities. The plan will propose corrective actions to be undertaken to mitigate the impacts associated with the constituents of concern which exceed applicable groundwater standards.

7 REFERENCES

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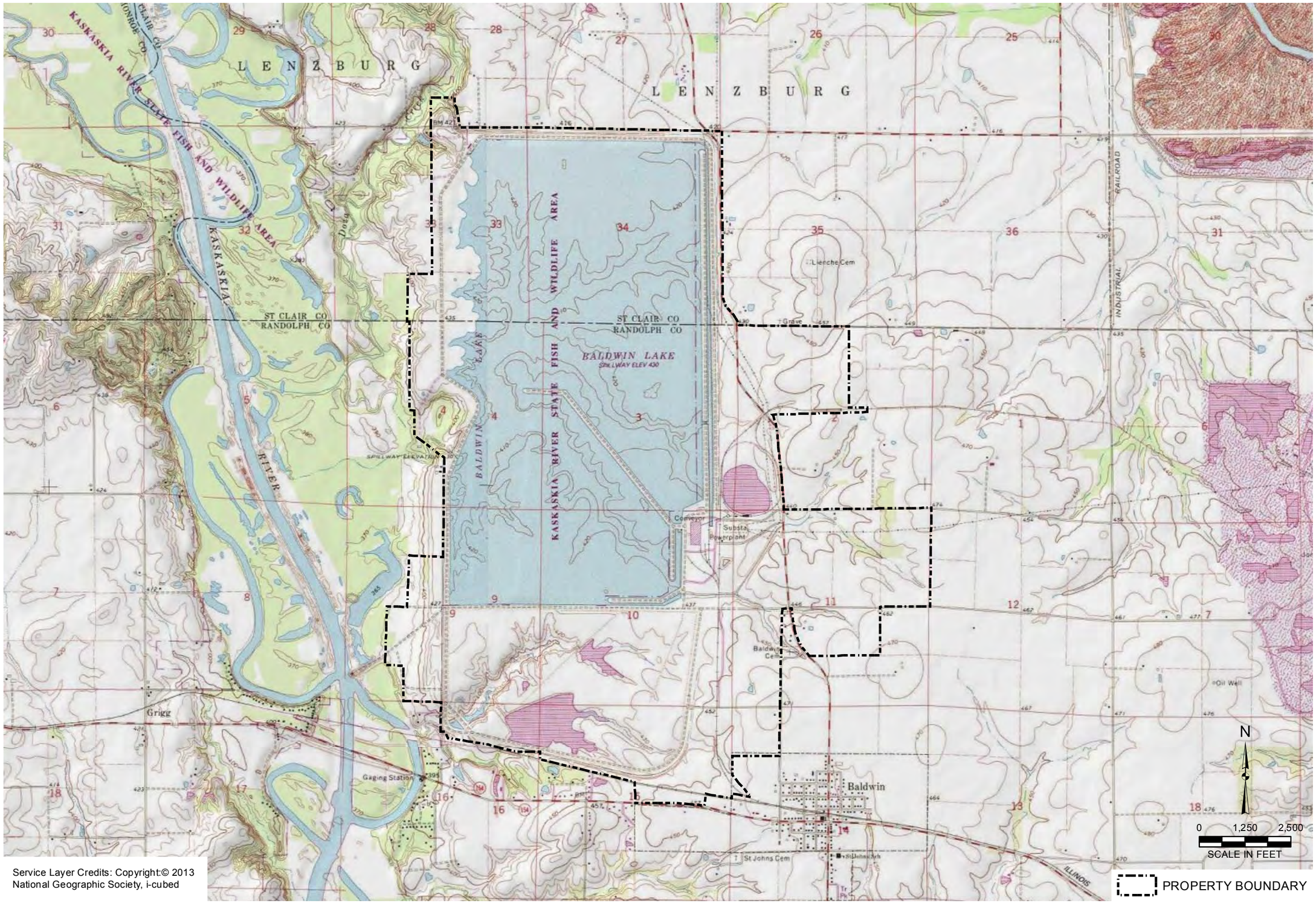
FIGURES



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DRAWN BY/DATE: TDC 2/25/16
REVIEWED BY/DATE: RJK 2/25/16
APPROVED BY/DATE: SJC 3/2/16

SITE LOCATION MAP

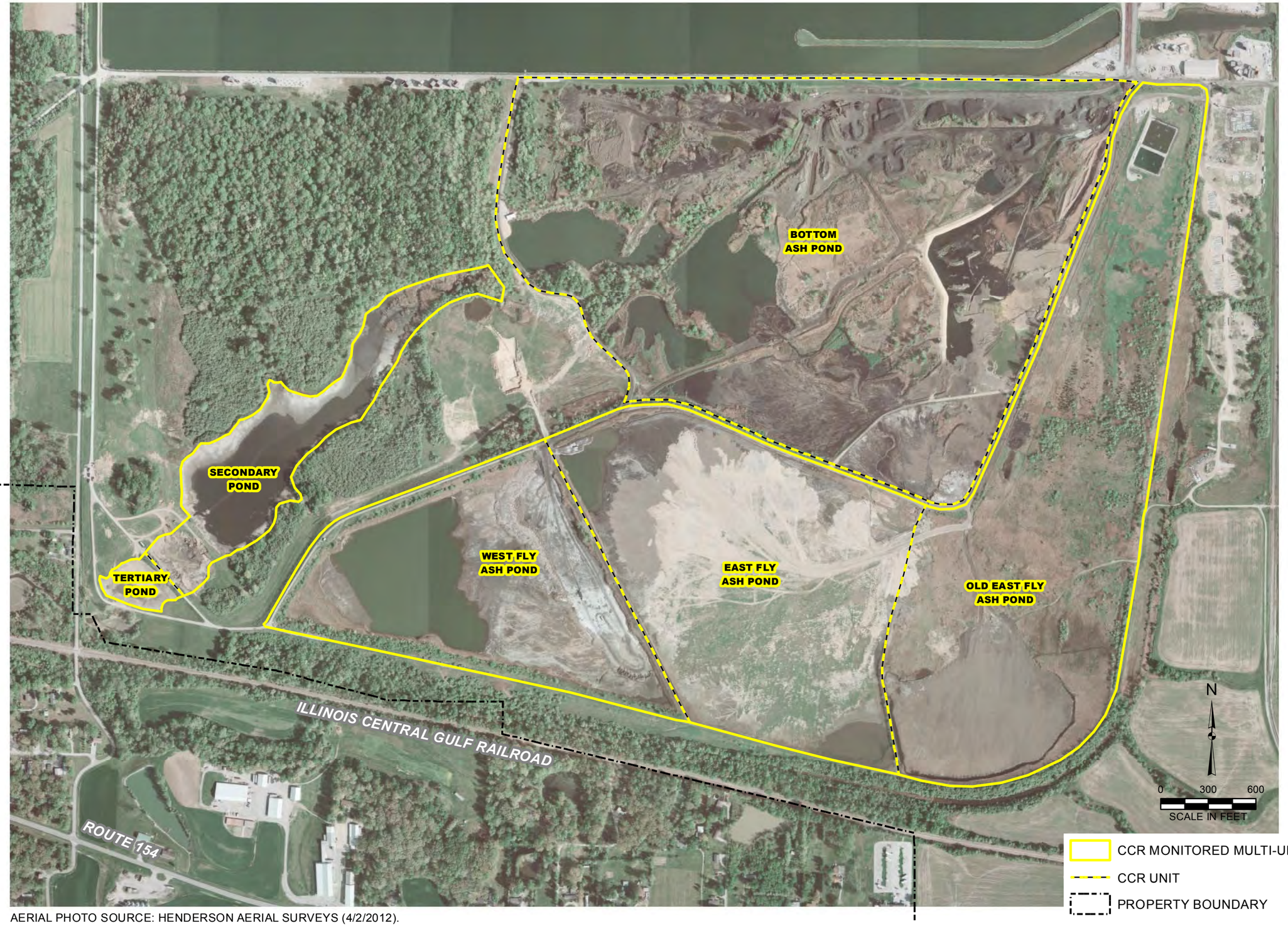
SUPPLEMENTAL HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
AND GROUNDWATER MONITORING PLAN
BALDWIN FLY ASH POND SYSTEM
BALDWIN ENERGY COMPLEX, BALDWIN, ILLINOIS

PROJECT NO: 2340

FIGURE NO: 1

NATURAL RESOURCE TECHNOLOGY

Y:\Mapping\Projects\23\2340\MXD\HydroGeo and GWMP_2015\Figure 1_Site Location Map.mxd Author: tcushman Date/Time: 3/2/2016, 2:03:31 PM



AERIAL PHOTO SOURCE: HENDERSON AERIAL SURVEYS (4/2/2012).

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REVIEWED BY/DATE: RJK 2/25/16
APPROVED BY/DATE: SJC 3/2/16

AERIAL PHOTOGRAPH OF SITE AND ASH POND SYSTEM

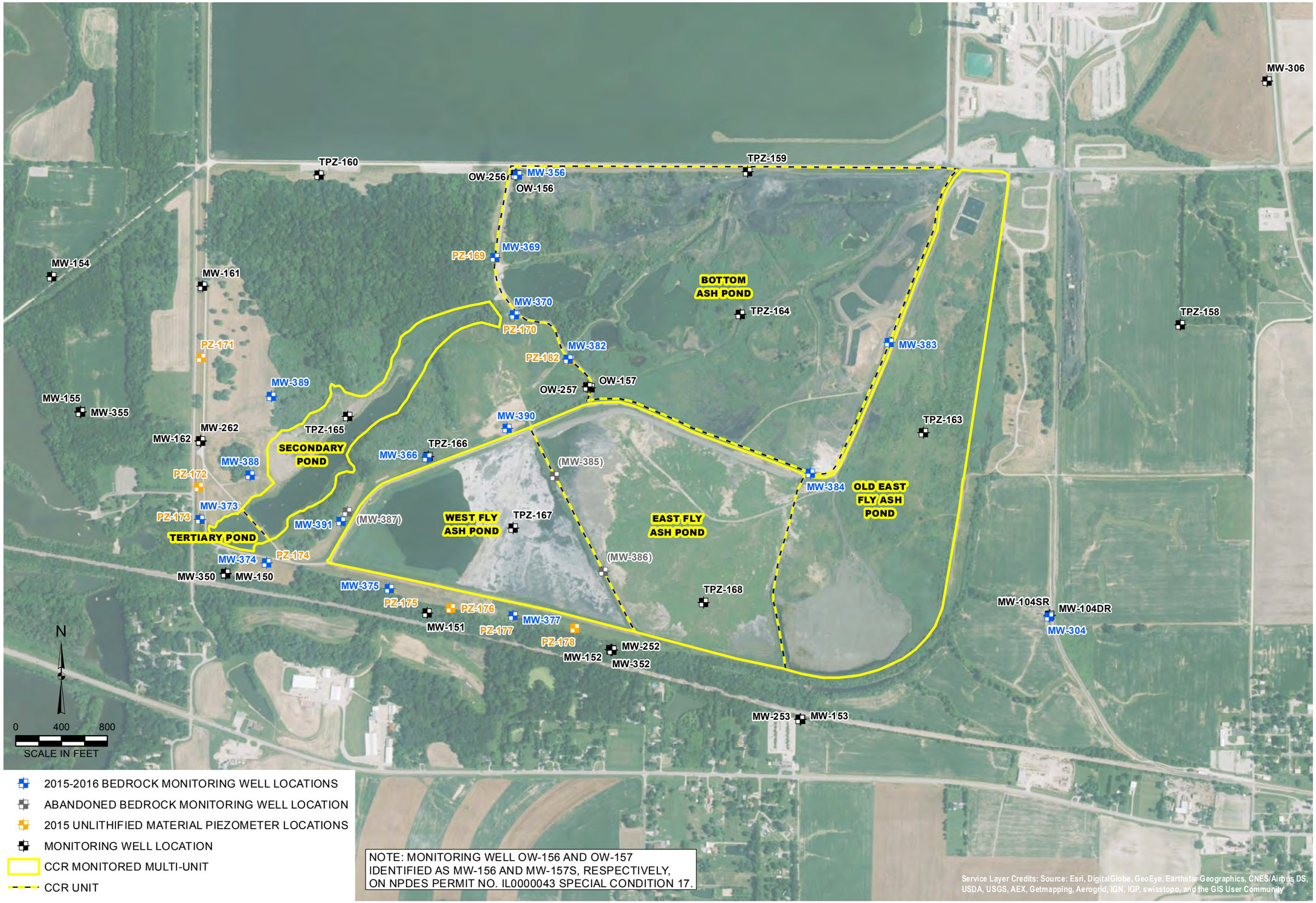
SUPPLEMENTAL HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
AND GROUNDWATER MONITORING PLAN
BALDWIN FLY ASH POND SYSTEM
BALDWIN ENERGY COMPLEX, BALDWIN, ILLINOIS

PROJECT NO: 2340

FIGURE NO: 2

NATURAL RESOURCE TECHNOLOGY

Y:\Mapping\Projects\23\2340\MXD\HydroGeo and GWMP_2015\Figure 2_Aerial Photograph of Ash Pond System.mxd Author: tcushman: Date/Time: 3/2/2016, 2:03:10 PM



DRAWN BY/DATE: TDC 2/25/16
REVIEWED BY/DATE: RJK 2/25/16
APPROVED BY/DATE: SJC 3/2/16

MONITORING WELL LOCATION MAP

SUPPLEMENTAL HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
AND GROUNDWATER MONITORING PLAN
BALDWIN FLY ASH POND SYSTEM
BALDWIN ENERGY COMPLEX, BALDWIN, ILLINOIS

PROJECT NO: 2340

FIGURE NO: 3

NATURAL RESOURCE TECHNOLOGY

Y:\Mapping\Projects\23\2340\MXD\HydroGeo and GWMP_2015\Figure 3_Monitoring Well Location Map.mxd Author: tcushman; Date/Time: 3/7/2016, 9:31:47 AM

BORING LOCATION WITH OBSERVED SAND SEAM > 0.5 FT

BORING LOCATION WITH OBSERVED SAND SEAM =< 0.5 FT

BORING LOCATION WITH NO OBSERVED SAND SEAM

CCR MONITORED MULTI-UNIT

CCR UNIT

BORING/WELL NUMBER
SEAM DESCRIPTION, SEAM THICKNESS (FT), SEAM BASE ELEVATION

AREAS OF POTENTIALLY INTERCONNECTED SAND SEAMS AND SEAM ELEVATION INTERVAL

UNSATURATED SAND SEAM

SATURATED SAND SEAM

NOTE: MONITORING WELL OW-156 AND OW-157 IDENTIFIED AS MW-156 AND MW-157S, RESPECTIVELY, ON NPDES PERMIT NO. IL0000043 SPECIAL CONDITION 17.

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APPROVED BY/DATE: SJC 3/2/16

SAND SEAM OBSERVATIONS, THICKNESS AND ELEVATIONS

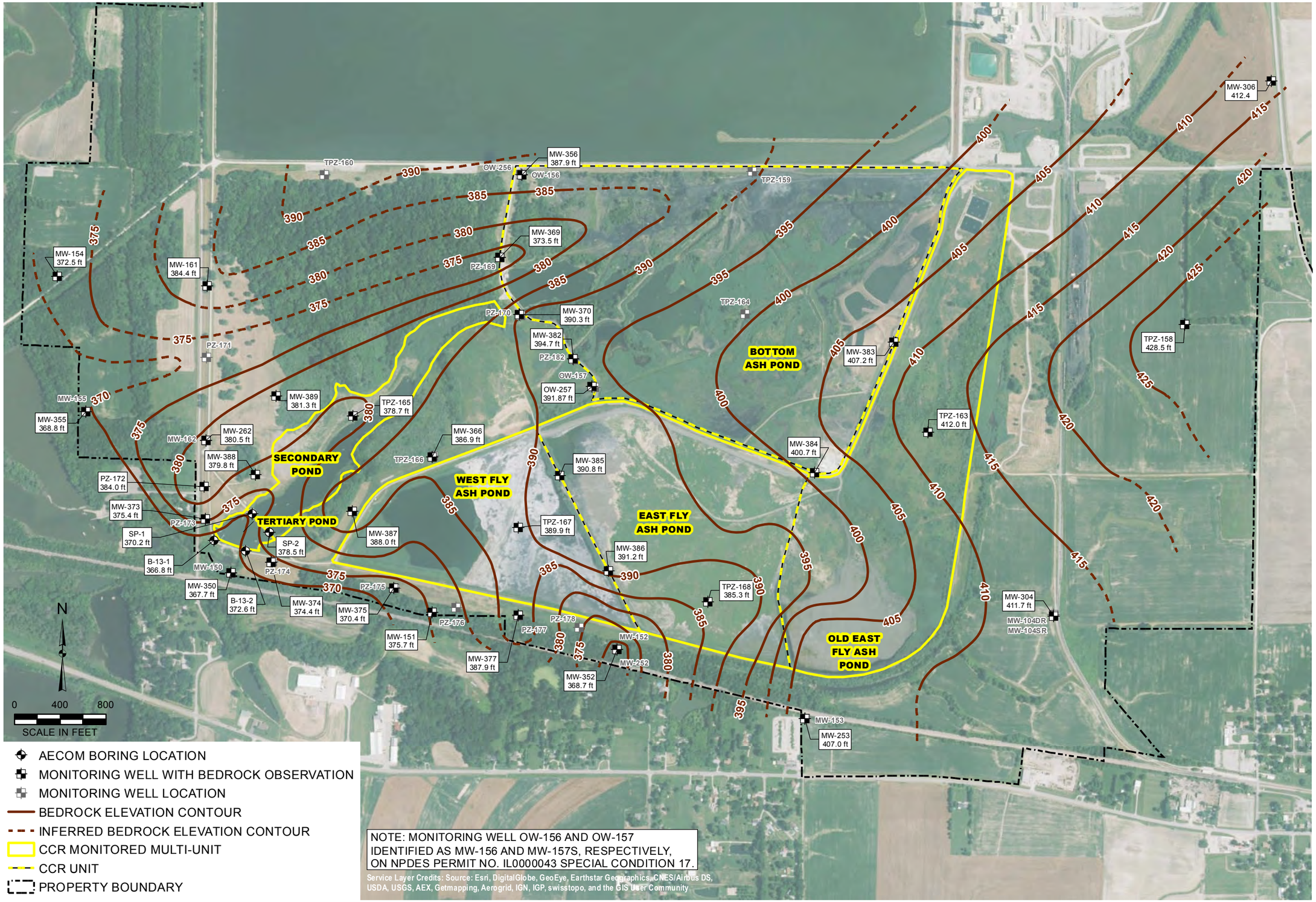
SUPPLEMENTAL HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
AND GROUNDWATER MONITORING PLAN
BALDWIN FLY ASH POND SYSTEM
BALDWIN ENERGY COMPLEX, BALDWIN, ILLINOIS

PROJECT NO: 2340

FIGURE NO: 4

NATURAL RESOURCE TECHNOLOGY

Y:\Mapping\Projects\23\2340\MXD\HydroGeo and GWMP_2015\Figure 4_Sand Seam Observations Thickness and Elevations.mxd Author: tcushman; Date/Time: 3/2/2016, 2:02:06 PM



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REVIEWED BY/DATE: JJW 2/26/16
APPROVED BY/DATE: SJC 3/2/16

BEDROCK TOPOGRAPHY

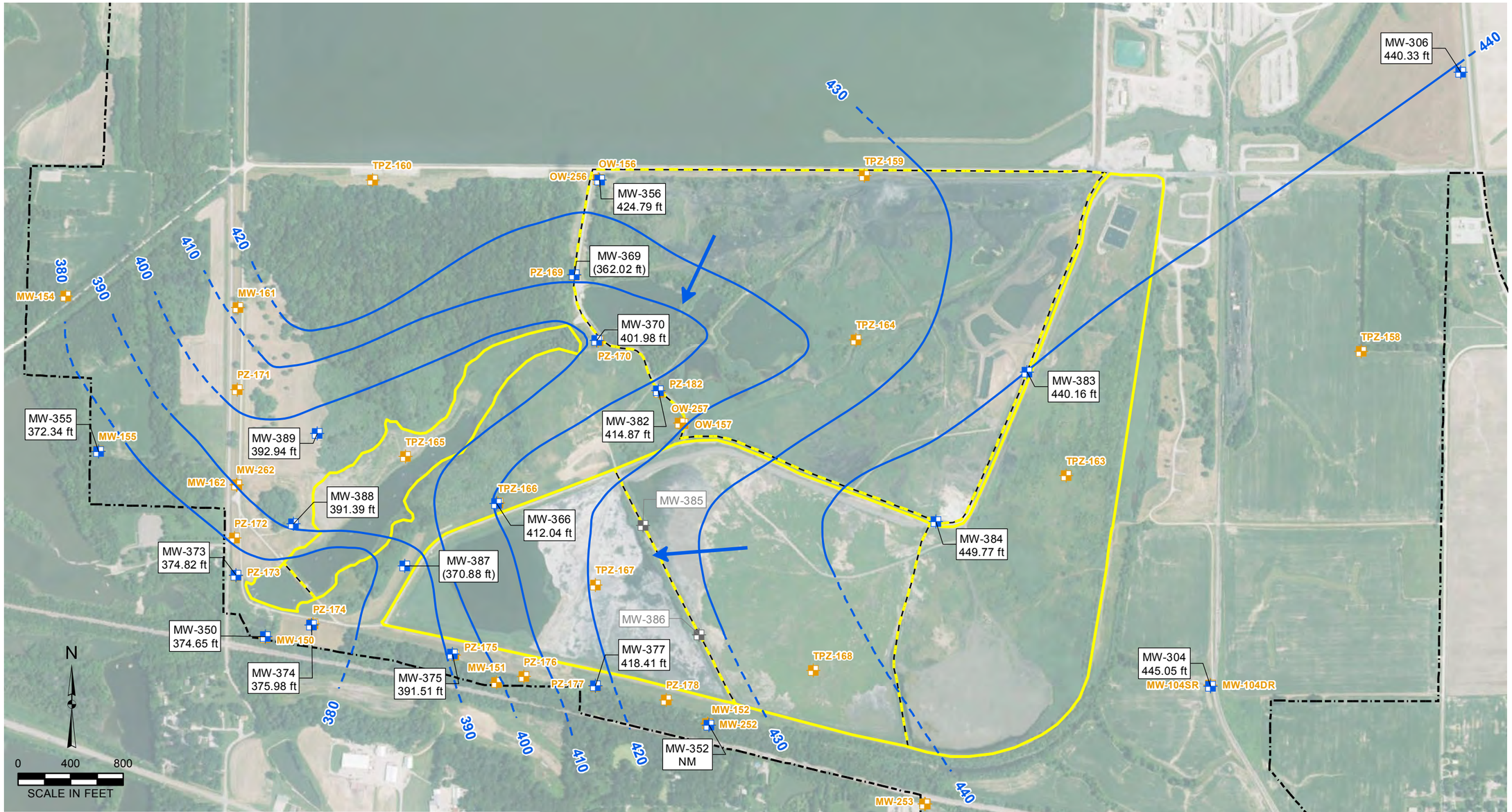
SUPPLEMENTAL HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
AND GROUNDWATER MONITORING PLAN
BALDWIN FLY ASH POND SYSTEM
BALDWIN ENERGY COMPLEX, BALDWIN, ILLINOIS

PROJECT NO: 2340

FIGURE NO: 5

NATURAL RESOURCE TECHNOLOGY

Y:\Mapping\Projects\23\2340\MXD\HydroGeo and GWMP_2015\Figure 5_Bedrock Topography.mxd Author: tcushman Date/Time: 3/2/2016, 2:01:23 PM



BEDROCK MONITORING WELL LOCATION
ABANDONED BEDROCK MONITORING WELL LOCATION
UNLITHIFIED MATERIAL / MONITORING WELL LOCATION
GROUNDWATER ELEVATION CONTOUR (10-FT CONTOUR INTERVAL)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION
CCR MONITORED MULTI-UNIT
CCR UNIT
PROPERTY BOUNDARY

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

NOTES:
- GROUNDWATER ELEVATION NOT MEASURED AT BEDROCK MONITORING WELL LOCATION MW-352 ON MARCH 2, 2016 DUE TO ACCESSIBILITY ISSUES CAUSED BY FLOODED WATER SURROUNDING WELL LOCATION.
- GROUNDWATER ELEVATIONS IN PARENTHESIS WERE NOT STABLE AT THE TIME OF MEASUREMENT AND NOT USED FOR CONTOURING.
- MONITORING WELL OW-156 AND OW-157 IDENTIFIED AS MW-156 AND MW-157S, RESPECTIVELY, ON NPDES PERMIT NO. IL0000043 SPECIAL CONDITION 17.

DRAWN BY/DATE: TDC 3/7/16
REVIEWED BY/DATE: JJW 3/7/16
APPROVED BY/DATE: SJC 3/7/16

POTENTIOMETRIC SURFACE IN BEDROCK CONTOUR MAP MARCH 2, 2016

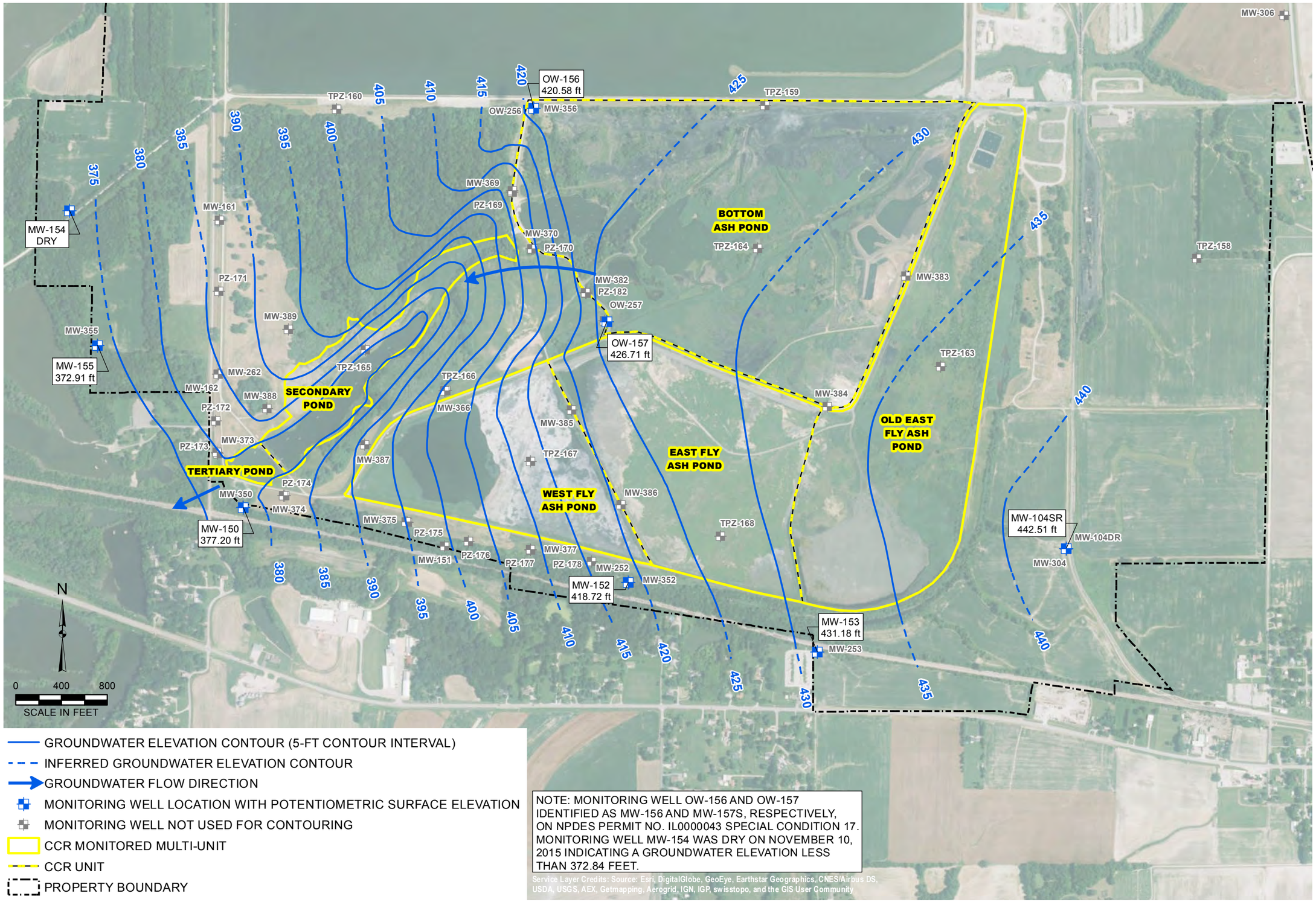
SUPPLEMENTAL HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
AND GROUNDWATER MONITORING PLAN
BALDWIN FLY ASH POND SYSTEM
BALDWIN ENERGY COMPLEX, BALDWIN, ILLINOIS

PROJECT NO: 2340

FIGURE NO: 6

NATURAL RESOURCE TECHNOLOGY

Y:\Mapping\Projects\23\2340\MXD\HydroGeo and GWMP_2015\Figure 6_Bedrock Groundwater Contour Map_Mar 2016.mxd Author: tcushman; Date/Time: 3/7/2016, 11:39:28 AM



DRAWN BY/DATE: TDC 2/25/16
REVIEWED BY/DATE: RJK 2/25/16
APPROVED BY/DATE: SJC 3/2/16

POTENTIOMETRIC SURFACE IN UNLITHIFIED DEPOSITS CONTOUR MAP NOVEMBER 10, 2015

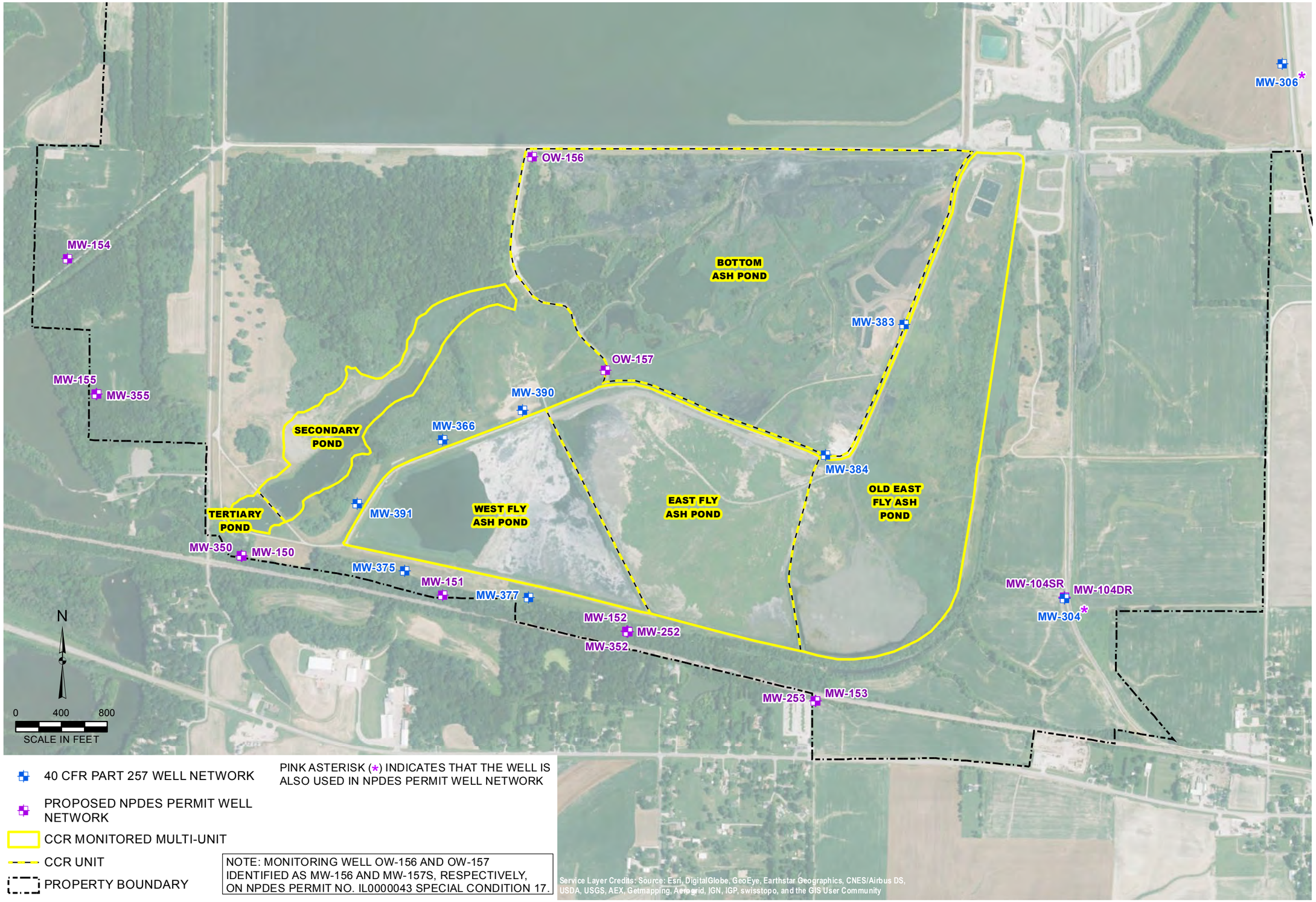
SUPPLEMENTAL HYDROGEOLOGIC SITE CHARACTERIZATION REPORT AND GROUNDWATER MONITORING PLAN
BALDWIN FLY ASH POND SYSTEM
BALDWIN ENERGY COMPLEX, BALDWIN, ILLINOIS

PROJECT NO: 2340

FIGURE NO: 7

NATURAL RESOURCE TECHNOLOGY

Y:\Mapping\Projects\23\2340\MXD\HydroGeo and GWMP_2015\Figure 7_Potentiometric Surface in Unlithified Deposits Contour Map_Nov 2015.mxd Author: sstolz; Date/Time: 3/23/2016, 11:22:03 AM



40 CFR PART 257 WELL NETWORK

PROPOSED NPDES PERMIT WELL NETWORK

CCR MONITORED MULTI-UNIT

CCR UNIT

PROPERTY BOUNDARY

PINK ASTERISK (*) INDICATES THAT THE WELL IS ALSO USED IN NPDES PERMIT WELL NETWORK

NOTE: MONITORING WELL OW-156 AND OW-157 IDENTIFIED AS MW-156 AND MW-157S, RESPECTIVELY, ON NPDES PERMIT NO. IL0000043 SPECIAL CONDITION 17.

DRAWN BY/DATE: TDC 2/25/16
REVIEWED BY/DATE: RJK 2/25/16
APPROVED BY/DATE: SJC 3/2/16

GROUNDWATER MONITORING NETWORK WELLS

SUPPLEMENTAL HYDROGEOLOGIC SITE CHARACTERIZATION REPORT
AND GROUNDWATER MONITORING PLAN
BALDWIN FLY ASH POND SYSTEM
BALDWIN ENERGY COMPLEX, BALDWIN, ILLINOIS

PROJECT NO: 2340

FIGURE NO: 8

NATURAL RESOURCE TECHNOLOGY

Y:\Mapping\Projects\23\2340\MXD\HydroGeo and GWMP_2015\Figure 8_Groundwater Monitoring Network Wells.mxd Author: tcushman Date/Time: 3/7/2016, 9:49:28 AM

TABLES

Table 1
Background Groundwater Quality and Applicable Groundwater Quality Standards
Supplemental Hydrogeologic Site Characterization Report and Groundwater Monitoring Plan
Baldwin Fly Ash Pond System
Baldwin Energy Center

		Unlithified[4]				Bedrock[5]			
Parameter	**IL Class II Std[1] (mg/L)**	**Background Concentration[2] (mg/L)**	**Applicable Groundwater Standard[3] (mg/L)**	**Maximum (mg/L)**	**Minimum (mg/L)**	**Background Concentration (mg/L)**	**Applicable Groundwater Standard (mg/L)**	**Maximum (mg/L)**	**Minimum (mg/L)**
Antimony	0.024	0.005	0.024	<0.005	<0.005	USEPA (t)	na	0.0075	<0.005
Arsenic	0.2	0.032	0.2	0.032	<0.005	USEPA (t)	na	0.011	<0.005
Barium	2.0	0.621	2.0	0.24	0.0094	USEPA (t)	na	1.6	0.098
Beryllium	0.5	0.004	0.5	<0.005	<0.004	USEPA (t)	na	<0.005	<0.004
Boron (t)	2.0	na	na	--	--	USEPA (t)	na	--	--
Boron (d)	2.0	0.237	2.0	**45.3**	<0.02	**tbd**	**tbd[3]**	1.88	<0.02
Calcium	NS	na	NS	289	54.17	USEPA (t)	na	533	45
Cadmium	0.05	0.002	0.05	<0.002	<0.002	USEPA (t)	na	<0.002	<0.002
Chloride (t)	200	na	na	--	--	USEPA (t)	na	--	--
Chloride (d)	200	58.7	200	140	4.1	**tbd**	**tbd[3]**	642	9
Chromium	1.0	0.005	1.0	<0.005	<0.005	USEPA (t)	na	<0.005	<0.005
Cobalt	1.0	0.005	1.0	0.01	<0.005	USEPA (t)	na	<0.005	<0.005
Copper	0.65	0.005	0.65	0.016	<0.005	na	na	<0.005	<0.005
Cyanide (t)	0.6	0.008	0.6	<0.008	<0.007	na	na	<0.008	<0.007
Fluoride	4.0	0.793	4.0	0.865	0.119	USEPA (t)	na	0.756	0.174
Iron (t)	5.0	**11**	11	**69.4**	<0.02	**tbd**	**tbd[3]**	3.82	0.02
Iron (d)	5.0	**18**	18	18	<0.01	na	na	1.6	0.011
Lead	0.1	0.005	0.1	0.005	<0.005	USEPA (t)	na	<0.005	<0.005
Lithium	NS	na	na	--	--	USEPA (t)	na	--	--
Manganese (t)	10	8.2	10	**24.4**	<0.003	**tbd**	**tbd[3]**	0.58	<0.003
Manganese (d)	10	**48.8**	48.8	6.8	<0.003	na	na	0.87	<0.003
Mercury	0.01	0.002	0.01	<0.002	<0.002	USEPA (t)	na	<0.002	<0.002
Molybdenum	NS	na	NS	--	--	USEPA (t)	na	--	--
Nickel	2.0	0.005	2.0	<0.005	<0.005	na	na	0.007	<0.005
Nitrate (as N) (t)	100	2.26	100	10.7	<0.05	**tbd**	**tbd[3]**	1.13	0.103
Nitrate (as N) (d)	100	2.25	100	18	<0.05	na	na	2.04	0.06
Selenium	0.05	0.01	0.05	0.016	<0.01	USEPA (t)	na	<0.01	<0.01
Silver	0.05	0.005	0.05	0.006	<0.005	na	na	0.01	<0.005
Sulfate (t)	400	na	na	--	--	USEPA (t)	na	--	--
Sulfate (d)	400	328	400	**2050**	23	**tbd**	**tbd[3]**	65	<10
Thallium	0.02	0.002	0.02	<0.002	<0.002	USEPA (t)	na	<0.002	<0.002
Vanadium	0.1	na	0.1	--	--	na	na	--	--
Zinc	10	0.009	10	0.014	<0.005	na	na	0.006	<0.005
TDS	1,200	999	1,200	**3470**	188	**tbd** / USEPA	**tbd[3]**	1709	375
Field pH	6.5 - 9.0	**6.06** - 7.55	6.06 - 9.0	**12.4**	**5.6**	**tbd** / USEPA	**tbd[3]**	12.9	6.5
Radium 226/228*	5.0 / 5.0	na	na	--	--	USEPA (t)	na	- -	- -

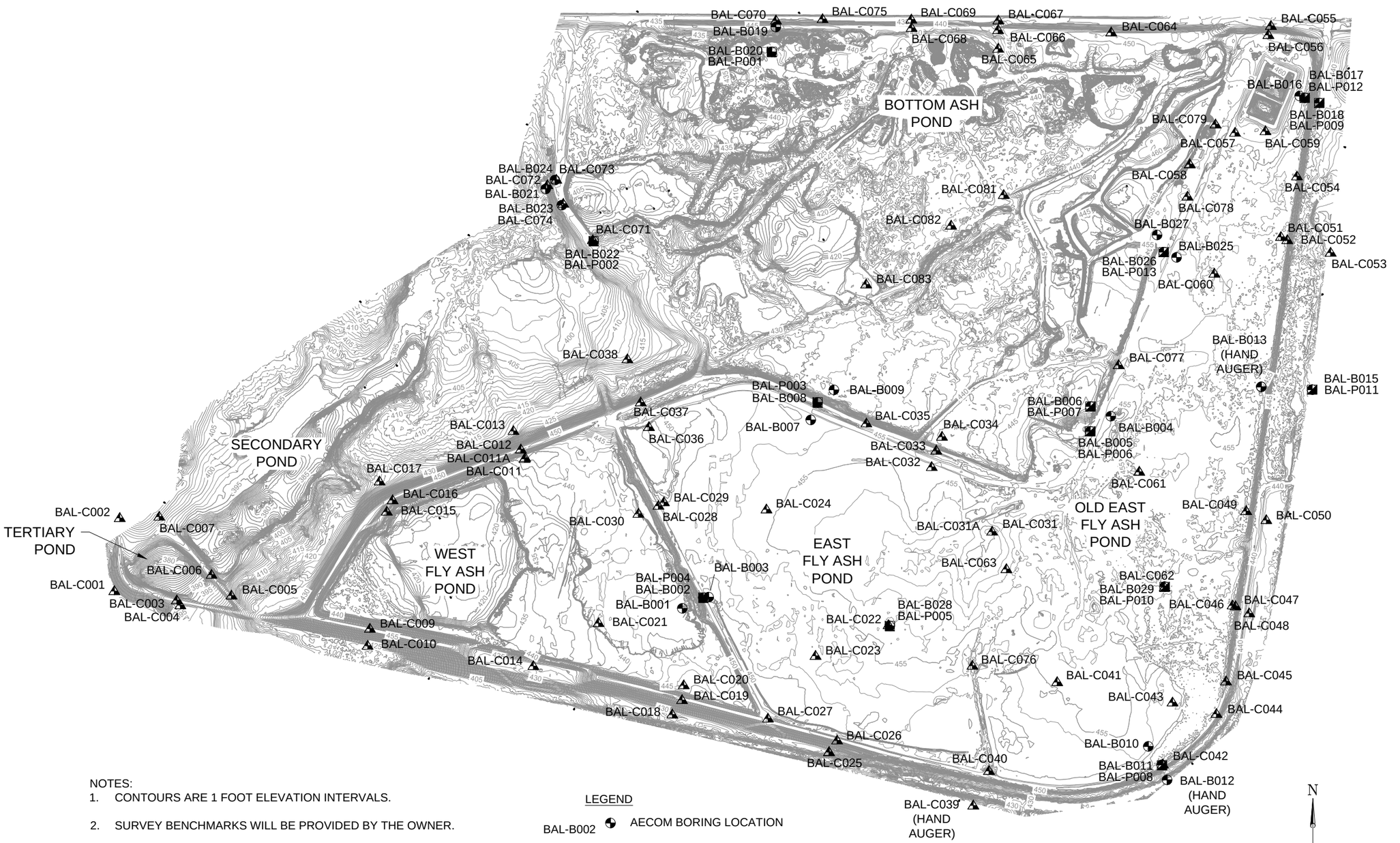
[O: JAZ 1/28/16, C:GFF 1/29/16, QA:SJC 3/2/16]

Notes:
All parameters are dissolved unless noted. Standards apply to dissolved or total concentration
(t) Total (d) Dissolved
tbd = To Be Determined for Illinois EPA monitoring program; based on future monitoring beginning January 2016
Bold = Background Concentration exceeds Class II Groundwater Standard
Red = Exceeds Applicable Groundwater Standard
-- = not analyzed prior to 2016
NS = No Class II Groundwater Standard
na = not applicable; parameter [dissolved and total] not proposed for Illinois EPA monitoring program under proposed modified NPDES Permi
USEPA (t) = background concentration for parameter [total] required under USEPA program (40 CFR Part 257

[1] IPCB 620 Class II: General Resource Groundwater Standard
[2] Background Concentration obtained from Appendix E - Statistical Procedure for Calculation of Background (Table E-1 Tolerance Limits for Background Monitoring Wells MW-104S/SR and MW-104D/DR using the Upper and Low
[3] Applicable Groundwater Standard is the higher of the Background Concentration and the Class II Groundwater Standard (or the lower if compared to the pH lower limit).
[4] Unlithified Wells used for maximum and minimum include those designated as upgradient or downgradient in Appendix D.
[5] Bedrock wells used for maximum and minimum include MW-350, MW352, and MW-355 (all downgradient) as listed in Appendix D.
* Radium 226 and 228 reported separately for IPCB Class II Groundwater Standard, reported combined for USEPA 40 CFR Part 257.

APPENDIX A

AECOM (2015) GEOTECHNICAL LABORATORY RESULTS



NOTES:

1. CONTOURS ARE 1 FOOT ELEVATION INTERVALS.
2. SURVEY BENCHMARKS WILL BE PROVIDED BY THE OWNER.
3. EXISTING CONTOURS SHOWN ARE FROM AERIAL SURVEY COMPLETED BY SURDEX ON AUGUST 17, 2015 AND BATHYMETRIC SURVEY COMPLETED BY WEAVER CONSULTANTS GROUP ON SEPTEMBER 22, 2015.

LEGEND

BAL-B002 — AECOM BORING LOCATION

BAL-P004 — AECOM PIEZOMETER LOCATION

BAL-C021 — AECOM CONE PENETRATION TEST (CPT) LOCATION

AECOM
1001 Highlands Plaza Drive, Suite 300
St. Louis, Mo. 63110
314 429-0100 (phone)
314-429-0462 (fax)

DYNEGY
Dynegy Inc.
1500 EastPort Plaza Drive
Collinsville, IL 62234

CCR RULE ASSESSMENT OF PLANTS

BALDWIN POWER PLANT
BALDWIN, IL

30% DESIGN DRAWINGS FOR CLOSURE OF EAST ASH POND, OLD EAST ASH POND, AND WEST ASH POND

ISSUED FOR BIDDING — DATE BY

ISSUED FOR CONSTRUCTION — DATE BY

REVISIONS

NO.	DESCRIPTION	DATE
△		
△		
△		
△		
△		

AECOM PROJECT NO:	60440742
DRAWN BY:	DJD
DESIGNED BY:	DJD
CHECKED BY:	SAV
DATE CREATED:	2015-10-13
PLOT DATE:	2015-10-13
SCALE:	1" = 300'
ACAD VER:	2014

SHEET TITLE

EXPLORATION LOCATIONS

D-01

SHEET 1 OF 3

AECOM DRAWING PATH: P:\Projects\Geotech\60428794_DynegyCCR\04Tasks\00 Program Tasks\01_Templates\CADD\DYNEGY CAD STANDARDS\7.04_Plan_Sheets\D-01 EXPLORATION LOCATIONS.dwg DEGUIRE, DAVID, 12/16/2015 10:15 AM

Summary of Laboratory Test Results

BORING NO.	SAMPLE NO.	DEPTH (ft)	CLASSIFICATION	IDENTIFICATION TESTS										PERMEA-BILITY (cm/sec)	STRENGTH			CONSOLIDATION INITIAL CONDITIONS		REMARKS/ TEST ID
				WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	HYDRO. % MINUS 2µm (%)	TOTAL UNIT WEIGHT (pcf)	DRY UNIT WEIGHT (pcf)	SPECIFIC GRAVITY (-)		Type Test @ STRESS (ksf)	PEAK SHEAR STRESS (ksf)	AXIAL STRAIN @ PEAK STRESS (%)	VOID RATIO (-)	SATUR-ATION (%)	
BAL-B001	S-4	7.5-9		66.9				SM	31.5	5										
BAL-B001	S-6	15-18		37.9				CL	93.9	6										
BAL-B001	ST-2	35-37									125.6									
BAL-B001	ST-2	35.35		23.1																
BAL-B001	ST-2A	35.6		23.8	63	15	48	CH			126.6	102.3		1.30E-08						P10576
BAL-B001	ST-2	35.9		23.2																
BAL-B001	ST-2	36.15		22.4				CH			128.4	104.9			UU@6.2	1.6	10.9			UU245g
BAL-B001	S-10	45.0-46.5	Brown silty CLAY, trace gravel	16.6																
BAL-B001	S-11	50.0-51.5	Brown silty, CLAY with gravel	12.4																
BAL-B001	S-14	65.0-66.5	Gray brown silty CLAY with fine gravel	19.0																
BAL-B001	S-16	75.0-75.5	Gray brown silty CLAY with fine gravel	12.5																
BAL-B002	S-1	0.0-1.5	Brown silty CLAY, trace sand and gravel	19.5																
BAL-B002	S-2	2.5-4.0	Brown silty CLAY, trace sand and gravel	16.5																
BAL-B002	S-3	5.0-6.5	Brown silty CLAY, trace sand and gravel	19.1	36	19														
BAL-B002	ST-1	8-10									120.5									
BAL-B002	ST-1A	8.25		19.1				CH	91.8	29										dispersion
BAL-B002	ST-1B	8.8		25.9	54	16	38	CH			120.1	95.4			UU@1.1	1	15			UU257i
BAL-B002	S-4	10.0-11.5	Brown silty CLAY, trace sand and gravel	21.0																
BAL-B002	ST-2	15-17									130.3									
BAL-B002	ST-2A	15.45		21.8	46	14	32	CL			123.3	101.2			UU@1.9	0.7	15			UU257j
BAL-B002	S-5	20.0-21.5	Brown silty CLAY, trace sand and gravel	21.7																
BAL-B002	S-6	25.0-26.5	Brown sandy silty CLAY	40.3																
BAL-B002	ST-3	27.5-30									113.5									
BAL-B002	ST-3A	27.75		34.8				ML			111.5	82.7			CIU@3.4	1.3	16.5			T3850
BAL-B002	ST-3B	28.1		26.4				ML			118.5	93.8						0.69	97	C15141
BAL-B002	ST-3C	28.45		32.1	21	21	NP	ML			114.9	87	2.491		CIU@3.5	2.9	19.6			T3851
BAL-B002	ST-3D	28.9		25.5				ML			122	97.2			CIU@3.6	10.1	24.8			T3852
BAL-B002	S-7	30.0-31.5	Brown sandy silty CLAY with gravel	47.9																
BAL-B002	S-8	35.0-36.5	Brown sandy silty CLAY with gravel	36.8																
BAL-B002	S-9	40-41.5		38.6				CL	94.3	5										
BAL-B002	S-10	45.0-46.5	Dark brown silty CLAY, trace sand	32.6																
BAL-B002	S-11	50.0-51.5	Dark brown silty CLAY, trace sand	25.0																
BAL-B002	S-12	55.0-56.5	Brown silty CLAY, trace sand	24.0	42	23														
BAL-B002	S-13	60.0-61.5	Dark brown silty CLAY with gravel, trace organics	33.3																
BAL-B002	S-14	70.0-71.5	Gray silty CLAY, trace sand	16.5																
BAL-B002	S-15	75.0-76.0	Gray silty CLAY, trace sand	17.4	45	24														
BAL-B003	S-4	10.0-11.5	Brown CLAY with fine gravel	22.3	39	17														
BAL-B003	ST-2	15-17									125.3									
BAL-B003	ST-2	15.35		25.4																
BAL-B003	ST-2A	15.6																		
BAL-B003	ST-2	15.95		23.4																
BAL-B003	ST-2B	16.2		24.7	58	15	43	CH			124.8	100.1			UU@1.9	0.8	15			UU230d
BAL-B003	S-6	30.0-31.5	Brown CLAY	40.7				CL	97	7										
BAL-B003	S-8	40.0-41.5	Brown sandy silty CLAY	43.6									2.43							
BAL-B003	S-10	50.0-51.5	Brown fat CLAY, trace sand and gravel	19.3	39	17														
BAL-B003	S-12	60.0-61.5	Light brown silty CLAY	26.9																
BAL-B003	S-13	65.0-66.5	Light gray silty CLAY	21.6	57	30														
BAL-B003	S-14	70.0-75.4	Light gray silty CLAY	18.7																
BAL-B004	S-2	2.5-4		10.3				SW-SM	5.4	0										
BAL-B004	ST-2	25-27									118.1									
BAL-B004	ST-2A	25.35		37.1				PT			115.8	84.5			CIU@3.0	1.4	12.1			T3892
BAL-B004	ST-2B	25.85		23.6	47	14	33	CL			127	102.7			CIU@3.1	1.4	12.3			T3893
BAL-B004	ST-2C	26.35		29.9				CL			119.2	91.8			CIU@3.2	1.8	19			T3894
BAL-B004	S-8	30-31.5		31.4	37	18	19	CL												
BAL-B004	S-9	35.0-36.5	Light gray silty CLAY, trace sand	19.4	38	15														
BAL-B004	S-11	45.0-46.5	Light brown silty CLAY with gravel	20.3																
BAL-B005	S-1	0.0-1.5	Dark brown silty coarse SAND with gravel	9.8																
BAL-B005	S-2	2.5-4.0	Brown silty CLAY	25.7																
BAL-B005	ST-1	5.0-7.0									108.7									
BAL-B005	ST-1	5.75		24.3																UU275A

Summary of Laboratory Test Results

BORING NO.	SAMPLE NO.	DEPTH (ft)	CLASSIFICATION	IDENTIFICATION TESTS										PERMEA-BILITY (cm/sec)	STRENGTH			CONSOLIDATION INITIAL CONDITIONS		REMARKS/ TEST ID
				WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	HYDRO. % MINUS 2µm (%)	TOTAL UNIT WEIGHT (pcf)	DRY UNIT WEIGHT (pcf)	SPECIFIC GRAVITY (-)		Type Test @ STRESS (ksf)	PEAK SHEAR STRESS (ksf)	AXIAL STRAIN @ PEAK STRESS (%)	VOID RATIO (-)	SATUR-ATION (%)	
BAL-B005	ST-1B	6		22	60	17	43	CH			126.5	103.7			UU@0.7	1.9	15			
BAL-B005	S-3	7.5-9.0	Brown silty CLAY	26.2																
BAL-B005	ST-2	10.0-12.0									115.1									
BAL-B005	ST-2A	10.3		25.8				CH			121.4	96.5			CIU@0.8	0.7	19.8			T3910
BAL-B005	ST-2B	10.85		24.8	60	16	44	CH			123.7	99.1			CIU@1.2	1.4	19.6			T3911
BAL-B005	S-4	15.0-16.5	Brown silty CLAY, trace sand	25.1																
BAL-B005	S-5	20.0-21.5	Brown gray silty CLAY	27.5																
BAL-B005	S-6	25.0-26.5	Brown silty CLAY	24.1																
BAL-B005	S-7	30.0-31.5	Brown silty CLAY	21.2	36	18														
BAL-B005	S-8	35.0-36.5	Brown silty CLAY	21.9																
BAL-B005	S-9	40.0-41.5	Brown silty CLAY	16.7																
BAL-B005	S-10	45.0-46.5	Gray silty CLAY	16.6																
BAL-B005	S-11	50.0-51.5	Gray silty CLAY	22.0																
BAL-B005	S-12	55.0-56.5	Gray silty CLAY, trace sand	16.6	44	25														
BAL-B005	S-13	60.0-60.4	Gray brown silty CLAY	18.8																
BAL-B006	S-1	0.0-1.5		11.6				SC	20.9	2										
BAL-B006	S-2	2.5-4.0		67.9				SC	44.4	4										
BAL-B006	S-3	5.0-6.5		31.6				SM	18.5	1										
BAL-B006	S-4	7.5-9.0		24.9				SC	12.8	0										
BAL-B006	S-5	10.0-11.5		19.9				CL	53.4	6										
BAL-B006	S-6	12.5-15	Gray brown silty CLAY, trace sand and fine gravel	21.2																
BAL-B006	ST-1	15.0-17.0									129									
BAL-B006	ST-1	15.15		25.2																
BAL-B006	ST-1	15.7		23.5																
BAL-B006	ST-1B	15.95		17.9				CL			135	114.5			UU@1.4	1.7	15			UU275G
BAL-B006	ST-1	16.25		15.9																
BAL-B006	S-7	20.0-21.5	Gray brown silty CLAY, trace sand and fine gravel	20.8																
BAL-B006	S-8	25.0-26.5	Light brown silty CLAY, trace sand and fine gravel	20	32	14														
BAL-B006	ST-2	30.0-32									139.5									
BAL-B006	ST-2A	30.25		13.4	29	15	14	CL			138.3	122			CIU@2.0	6.1	17.4			T3886
BAL-B006	ST-2B	30.6		13				CL			135.3	119.7	2.682					0.398	87	C15157
BAL-B006	ST-2C	31		13.3				CL			134.8	119			CIU@2.2	7.2	21.8			T3887
BAL-B006	ST-2D	31.5		14				CL			137	120.1			CIU@2.4	5	18.5			T3888
BAL-B006	S-9	35.0-36.5	Light brown silty CLAY, trace sand and fine gravel	29.6																
BAL-B006	S-10	40.0-41.5	Gray silty CLAY, trace sand	22.4																
BAL-B006	S-11	45.0-46.5	Gray CLAY, trace sand	19.1	56	23														
BAL-B006	S-12	50-51.5	Gray silty GRAVEL	9.1																
BAL-B007	S-3	5.5-7.0		65.4	NP	NP														
BAL-B007	ST-1	30-32									123									
BAL-B007	ST-1A	30.4		25				CL			125.8	100.6			CIU@3.6	2.2	15.2			T3857
BAL-B007	ST-1B	30.95		25.8	48	17	31	CL			126.6	100.6	2.609		CIU@3.7	2.9	14.7			T3859
BAL-B007	ST-1C	31.35		22.8				CL			123	100.1						0.661	92	C15142
BAL-B007	ST-1D	31.8		26				CL			125.8	99.8			CIU@3.8	2.5	16.7			T3858
BAL-B008	S-1	0.0-1.5	Brown silty CLAY, trace sand	15.4																
BAL-B008	S-2	2.5-4.0	Brown silty, CLAY, trace sand	21.8																
BAL-B008	S-3	5.0-6.5	Brown silty CLAY, trace sand and fine gravel	21.6	48	21														
BAL-B008	S-4	10.0-11.5	Brown silty CLAY, trace sand and fine gravel	19.6																
BAL-B008	ST-1	10-12																		
BAL-B008	ST-1A	10.35		25.7				CH	84.2	25										dispersion
BAL-B008	ST-1B	10.8		23.1	65	17	48	CH			127.5	103.6		5.50E-09						P10595
BAL-B008	S-5	20.0-21.5	Brown silty CLAY, trace sand and fine gravel	22.5																
BAL-B008	ST-2	20-22									119.5									
BAL-B008	ST-2	20.05		43.5																
BAL-B008	ST-2A	20.3		23.4	58	18	40	CH			125.7	101.9			UU@2.5	0.4	15			UU278e
BAL-B008	S-6	25.0-26.5	Brown silty CLAY, trace sand and fine gravel	20.8																
BAL-B008	S-7	30.0-31.5	Brown silty CLAY, trace sand and fine gravel	26.2	38	17														
BAL-B008	S-8	35.0-36.5	Brown silty CLAY, trace sand and fine gravel	22.9																
BAL-B008	S-9	40.0-41.5	Brown silty CLAY, trace sand and fine gravel	20.8																
BAL-B008	S-10	45.0-46.5	Brown silty CLAY, trace sand and fine gravel	22.1																
BAL-B008	S-11	50.0-51.5	Brown silty CLAY, trace sand and fine gravel	18.0																
BAL-B008	S-12	55.0-56.5	Light brown SILTY SAND	19.2				SM	16											

Summary of Laboratory Test Results

BORING NO.	SAMPLE NO.	DEPTH (ft)	CLASSIFICATION	IDENTIFICATION TESTS										PERMEA-BILITY (cm/sec)	STRENGTH			CONSOLIDATION INITIAL CONDITIONS		REMARKS/ TEST ID
				WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	HYDRO. % MINUS 2µm (%)	TOTAL UNIT WEIGHT (pcf)	DRY UNIT WEIGHT (pcf)	SPECIFIC GRAVITY (-)		Type Test @ STRESS (ksf)	PEAK SHEAR STRESS (ksf)	AXIAL STRAIN @ PEAK STRESS (%)	VOID RATIO (-)	SATUR-ATION (%)	
BAL-B008	S-13	60.0-61.5	Gray silty CLAY, trace sand	17.8	42	25														
BAL-B008	S-14	65.0-66.5	Gray silty CLAY, trace sand	14.0																
BAL-B009	S-1	0-1.5		85.3				MH	78.3	10										
BAL-B009	ST-2	10.5-12.5									122.5									
BAL-B009	ST-2A	10.65		4.3				CL												
BAL-B009	ST-2	10.9		24.9																
BAL-B009	ST-2B	11.15		25.2				CL			124.9	99.8			CIU@1.3	1.8	16.9			T3863
BAL-B009	ST-2	11.45		28																
BAL-B009	ST-2C	11.7		26.3				CL			124.1	98.3			CIU@1.4	1.6	14.6			T3889
BAL-B009	ST-2	12		24.1																
BAL-B009	ST-2D	12.25		26.3	40	19	21	CL	95.2	20	123.6	97.8			CIU@1.5	2.1	14.2			dispersion T3864
BAL-B009	ST-3	25-27									113.6									
BAL-B009	ST-3	25.25		22.1	49	14	35	CL			125.9	103.1			UU@3.1	0.7	15			UU278g
BAL-B009	ST-3	25.85		19.5																
BAL-B009	S-7	30.0-31.5	Brown POORLY GRADED GRAVEL	14.5				GP	3											
BAL-B009	S-8	35.0-36.5	Gray silty CLAY, trace sand	23.2	49	25														
BAL-B009	S-9	40.0-41.5	Gray silty CLAY, trace sand	21.2																
BAL-B010	S-2	2.5-4		50.2				SC	28.4	4										
BAL-B010	S-5	15-16.5		42.5				CL	98.3	7										
BAL-B010	ST-2	20-22									123.9									
BAL-B010	ST-2	20.5		24.7																
BAL-B010	ST-2	21.05		22.1																
BAL-B010	ST-2B	21.3		22.2	42	18	24	CL			124.2	101.7		2.40E-06						P10578
BAL-B010	ST-2	21.6		21.9																
BAL-B010	ST-2C	21.85		20.9				CL			124.9	103.3			UU@2.5	2	3.8			UU246d
BAL-B010	S-8	30.0-31.5	Light brown silty CLAY with sand and gravel	18.6	30	14														
BAL-B010	S-9	35.0-36.5	Brown silty CLAY with sand and gravel	15.0	22	14														
BAL-B010	S-11	45.0-46.5	Light brown silty CLAY with sand and gravel	21.7																
BAL-B010	S-12	50.0-51.5	Brown silty CLAY, trace sand	18.2																
BAL-B011	S-1	0.0-1.5	Brown silty CLAY, trace sand	13.0																
BAL-B011	S-2	2.5-4		23.0				CL	95.2	27										
BAL-B011	S-4	7.5-9.0	Brown silty CLAY, trace sand	18.8																
BAL-B011	S-5	10.0-11.5	Gray brown silty CLAY, trace sand	19.9																
BAL-B011	ST-1	15-17									122.8									
BAL-B011	ST-1A	15.2		25.8							123.3	98		1.80E-09						P10594
BAL-B011	ST-1B	15.7		24.8				CL			125.1	100.2			CIU@1.8	2.5	12.1			T3903
BAL-B011	ST-1C	16.2		24.9				CL			122.3	98			CIU@1.9	2.8	20.1			T3904
BAL-B011	ST-1	16.55		25.4																
BAL-B011	ST-1D	16.8		25.6	46	18	28	CL			121.3	96.6			CIU@2.0	1.7	19.2			T3905
BAL-B011	S-6	20.0-21.5	Gray brown silty CLAY, trace sand	21.7																
BAL-B011	S-7	30.0-31.5	Brown silty CLAY, trace sand	17.8																
BAL-B011	S-8	35.0-36.5	Brown silty sandy CLAY with gravel	8.8	19	11														
BAL-B011	S-9	42.5-44.0	Light brown silty CLAY, trace sand	18.2	49	24														
BAL-B011	S-10	47.5-49.0	Gray silty CLAY, trace sand	19.8																
BAL-B012	S-3	2.0-3.0	Brown silty CLAY, trace sand	22.0	54	24														
BAL-B012	S-7	6.0-7.0	Light brown silty CLAY	20.7	34	18														
BAL-B012	S-10	9.0-10.0	Light brown silty CLAY	21.3																
BAL-B015	S-1	0.0-1.5	Light brown sandy silty CLAY with find gravel and organics	12.5																
BAL-B015	S-2	2.5-4.0	Light brown sandy silty CLAY	21.5																
BAL-B015	ST-1	5.0-7.0									124.7									
BAL-B015	ST-1	5.6		24.8																
BAL-B015	ST-1	6.15		43																
BAL-B015	ST-1C	6.4		21.3	44	17	27	CL			129.1	106.4			UU@0.7	2.3	15			UU275D
BAL-B015	S-3	7.5-9.0	Light brown sandy silty CLAY	22.8																
BAL-B015	S-4	10.0-11.5	Light brown sandy silty CLAY, trace gravel	21.0																
BAL-B015	ST-2	11.5-13.5									128.6									
BAL-B015	ST-2	11.8		19.5																
BAL-B015	ST-2A	12.05		20.8				CH			129.5	107.2			CIU@1.0	1.8	18.7			T3912
BAL-B015	ST-2	12.35		20.8																
BAL-B015	ST-2B	12.6		20.1				CH			129.9	108.2			CIU@1.2	1.8	20.4			T3913
BAL-B015	ST-2	12.9		20.7																

Summary of Laboratory Test Results

BORING NO.	SAMPLE NO.	DEPTH (ft)	CLASSIFICATION	IDENTIFICATION TESTS										PERMEA-BILITY (cm/sec)	STRENGTH			CONSOLIDATION INITIAL CONDITIONS		REMARKS/ TEST ID
				WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	HYDRO. % MINUS 2µm (%)	TOTAL UNIT WEIGHT (pcf)	DRY UNIT WEIGHT (pcf)	SPECIFIC GRAVITY (-)		Type Test @ STRESS (ksf)	PEAK SHEAR STRESS (ksf)	AXIAL STRAIN @ PEAK STRESS (%)	VOID RATIO (-)	SATUR-ATION (%)	
BAL-B015	ST-2C	13.15		21.1	53	14	39	CH			128.8	106.4			CIU@1.4	1.9	20.1			T3914
BAL-B015	S-5	15.0-16.5	Light brown sandy silty CLAY, trace gravel	23.0																
BAL-B015	S-6	20.0-21.5	Light brown sandy silty CLAY with gravel	18.8																
BAL-B015	S-7	25.0-26.5	Light brown gray silty CLAY, trace sand and gravel	17.1	37	15														
BAL-B015	S-8	30.0-31.5	Light brown silty CLAY, with sand and gravel	23.7																
BAL-B015	S-9	35.0-36.5	Brown silty CLAY, trace sand	23.5																
BAL-B015	S-10	40.0-41.5	Gray brown silty CLAY	20.1																
BAL-B015	S-11	45.0-46.5	Light brown sandy silty CLAY with medium gravel	25.9																
BAL-B015	S-12	50.0-51.5	Gray fat CLAY	21.7	87	33														
BAL-B016	ST-1	4.0-6.0									114.6									
BAL-B016	ST-1	4.15		15.7																
BAL-B016	ST-1A	4.4		15				ML			128	111.3			CIU@0.5	0.8	21.2			T3825
BAL-B016	ST-1	4.7		19.8																
BAL-B016	ST-1B	4.95		27.6				ML			115.4	90.5			CIU@0.6	2.1	18			T3826
BAL-B016	ST-1	5.25		33.3																
BAL-B016	ST-1C	5.5		31.8	24	22	2	ML			107.7	81.7			CIU@0.7	1.9	11.1			T3827
BAL-B016	S-3B	7.5-9.0	Brown SILT	41.3				ML	96	6										
BAL-B016	ST-2	10.0-12.0									103.4									
BAL-B016	ST-2	10.15		44.3																
BAL-B016	ST-2	10.65		49.8																
BAL-B016	ST-2	11.15		54.9																
BAL-B016	ST-2B	10.9		62.1	-	29	NP	ML			96.8	59.7						1.562	97	C15119
BAL-B016	S-4	15.0-16.5		31.3																
BAL-B016	S-5	20.0-21.5	Dark brown SILT	29				ML	90	4										
BAL-B016	S-8	35.0-36.5		22.6																
BAL-B016	S-10	45.0-46.5		17.9																
BAL-B016	S-11	50.0-51.5		14.5	30	15														
BAL-B016	S-12	55.0-56.5		10.3	34	14														
BAL-B016	S-14	65.0-66.5		18.2																
BAL-B017	S-1	0.0-1.5		11.5				ML												
BAL-B017	S-2	2.5-4.0		14.7				ML	73.5	9										
BAL-B017	S-3	5.0-6.5		21.4				ML	67	4										
BAL-B017	S-4	7.5-9.0		28.9				ML	94.2	6										
BAL-B017	ST-1	10.0-12.0									108.5									
BAL-B017	ST-1	11.3		28.4																
BAL-B017	ST-1C	11.55		35	23	25	NP	ML	95.4	7	112.2	83.1			UU@0.8	0.4	15			UU278H
BAL-B017	S-5	15.0-16.5	Brown silty CLAY	30.5																
BAL-B017	S-6	20.0-21.5	Brown silty CLAY with fine gravel	21.4	33	15														
BAL-B017	ST-2	25.5-27.5									122.1									
BAL-B017	ST-2	25.9		30.3																
BAL-B017	ST-2A	26.15		22.6				CL			125.4	102.3			CIU@2.2	6.7	20.1			T3921
BAL-B017	ST-2	26.45		21.9																
BAL-B017	ST-2B	26.7		23.5	44	15	29	CL			124.5	100.8		1.70E-08	CIU@2.4	2	19.7			T3922
BAL-B017	ST-2	27		25																
BAL-B017	ST-2C	27.25		25.4				CL			124.4	99.2			CIU@2.6	1.8	12.9			T3923
BAL-B017	S-7	30.0-31.5	Brown silty CLAY with fine gravel	30.5																
BAL-B017	S-8	35.0-36.5	Brown silty CLAY with fine gravel	21.2	43	11														
BAL-B017	S-9	40.0-41.5	Gray brown sandy silty CLAY with fine gravel	18.1																
BAL-B017	S-10	45.0-45.1	Gray brown sandy silty CLAY with fine gravel	15.6																
BAL-B017	S-11	50.0-51.5	Gray brown sandy silty CLAY with fine gravel	22.6																
BAL-B017	S-12	55.0-56.5	Brown sandy silty CLAY with fine gravel	10.3	28	9														
BAL-B018	S-2	5.0-6.5	Light brown silty CLAY	30.0	37	20														
BAL-B018	ST-2	25-27									126.1									
BAL-B018	ST-2B	25.95		27.4				CH			123.3	96.8			CIU@3.0	0.9	22.7			T3890
BAL-B018	ST-2C	26.55		18.1	54	13	41	CH			129.7	109.9			CIU@3.2	2.2	18.2			T3865
BAL-B018	S-7	35.0-36.5	Light brown silty CLAY	23.6																
BAL-B018	S-8	40.0-41.5	Gray silty CLAY, trace sand	17.7	47	25														
BAL-B018	S-9	45.0-46.5	Gray silty CLAY, trace sand	18.4																
BAL-B019	S-1	0.0-1.5		15.3																
BAL-B019	S-3	5.0-6.5		22.4	40	19														
BAL-B019	S-7	15.0-16.5		17.5																

Summary of Laboratory Test Results

BORING NO.	SAMPLE NO.	DEPTH (ft)	CLASSIFICATION	IDENTIFICATION TESTS										PERMEA-BILITY (cm/sec)	STRENGTH			CONSOLIDATION INITIAL CONDITIONS		REMARKS/ TEST ID
				WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	HYDRO. % MINUS 2µm (%)	TOTAL UNIT WEIGHT (pcf)	DRY UNIT WEIGHT (pcf)	SPECIFIC GRAVITY (-)		Type Test @ STRESS (ksf)	PEAK SHEAR STRESS (ksf)	AXIAL STRAIN @ PEAK STRESS (%)	VOID RATIO (-)	SATUR-ATION (%)	
BAL-B019	ST-1	25-27.5									128.1									
BAL-B019	ST-1	25.45		24.3																
BAL-B019	ST-1	26		25.1																
BAL-B019	ST-1	26.55		23.9																
BAL-B019	ST-1C	26.8		24.5	38	17	21	CL			124.8	100.3			UU@3.1	1.5	14.6			UU231a
BAL-B019	ST-2	35-37.5									118.4									
BAL-B019	ST-2	35.35		34.7																
BAL-B019	ST-2	35.9		25.6																
BAL-B019	ST-2	36.5		22.3																
BAL-B019	ST-2C	36.8		22.1	55	15	40	CH			126.8	103.8			UU@4.1	2	8.8			UU231b
BAL-B019	S-11	45.0-46.5		16.7	33	16														
BAL-B019	S-13	55.0-56.5		18.6	40	18														
BAL-B019	S-14	60.0-61.5		21.9	43	26														
BAL-B019	S-16	70.0-71.0		15.4																
BAL-B019	S-18	80.0-80.8		17.5																
BAL-B020	S-2A	2.5-4		19.5				SP-SM	10.8	1										
BAL-B020	ST-2	9-11									121.1									
BAL-B020	ST-2A	9.4		30.8				CH			120.4	92.1			CIU@1.1	0.9	19			T3901
BAL-B020	ST-2B	9.9		25.6	51	17	34	CH			123.5	98.3			CIU@1.2	1.2	18.8			T3895
BAL-B020	ST-2C	10.4		24.7				CH			125.8	100.9			CIU@1.3	1.3	17.9			T3896
BAL-B020	S-5	20.0-21.5	Brown SANDY LEAN CLAY	22.6	38	16		CL	67											
BAL-B020	S-7B	30.0-31.5	Brown CLAY with SAND	18.7				CL	78											
BAL-B020	S-10	45.0-46.5	Gray silty sandy CLAY with fine gravel	11.2																
BAL-B020	S-13	60.0-61.5	Gray silty CLAY	21.6	73	36														
BAL-B020	S-17	80.0-81.5	Gray silty CLAY	21.3																
BAL-B021	ST-1	2.5-4.5									117.5									
BAL-B021	ST-1A	2.75		20.6				CL			125.8	104.3			CIU@0.3	0.6	18			T3834
BAL-B021	ST-1B	3.25		22.4	49	15	34	CL			124.9	102			CIU@0.54	0.9	20.5			T3835
BAL-B021	S-3	7.5-9.0		20.8	43	17														
BAL-B021	S-5	15.0-16.5		20.7																
BAL-B021	S-6	20.0-21.5		20.5																
BAL-B021	S-9	35.0-36.5		18.6	42	23														
BAL-B022	S-3	5.0-6.5	Brown silty CLAY, trace fine gravel	22.0	28	18														
BAL-B022	ST-1	10-12									130.3									
BAL-B022	ST-1	10.35		21.1																
BAL-B022	ST-1A	10.6		20.7				CL			129.4	107.2			CIU@1.2	2.2	20.1			T3906
BAL-B022	ST-1	10.9		19.9																
BAL-B022	ST-1B	11.15		19.1	40	15	25	CL	80.3	22	130.3	109.4			CIU@1.3	2	15.3			dispersion T3907
BAL-B022	ST-1	11.45		18.7																
BAL-B022	ST-1C	11.7		18.4				CL			130.7	110.4			CIU@1.4	2.5	20.2			T3908
BAL-B022	S-8	35.0-36.5	Gray silty CLAY, trace gravel	23.6	58	25														
BAL-B022	S-10	45.0-45.8	Gray silty CLAY, trace gravel	16.6																
BAL-B023	S-3	5.0-6.5		18.6	37	14														
BAL-B023	ST-1	10.0-12.5									129									
BAL-B023	ST-1	10.3		23.7																
BAL-B023	ST-1A	10.55		22.6	51	15	36	CH			127.7	104.1			UU@1.3	2.1	15			UU230b
BAL-B023	ST-1	10.85		22.3																
BAL-B023	ST-1B	11.1																		
BAL-B023	S-6	20.0-21.5		22.3	34	18														
BAL-B023	ST-2	25-27.5									132.8									
BAL-B023	ST-2B	25.65		17.9				CL			132.2	112.1			CIU@3.0	2.6	21.4			T3828
BAL-B023	ST-2C	26.05		16.2	36	14	22	CL			133.4	114.8			CIU@3.2	2.5	21			T3829
BAL-B023	S-7	30.0-31.5		26.7	59	30														
BAL-B023	S-8	35.0-36.5		17.8																
BAL-B023	S-11	50.0-50.8		16.1																
BAL-B024	S-4	7.5-9.0		18.7																
BAL-B024	S-6	15.0-16.5		24.1	41	19														
BAL-B024	ST-1	20.0-22.5									128									
BAL-B024	ST-1	20.45		28.1																
BAL-B024	ST-1A	20.7		19.4				CL			130	108.9			CIU@2.4	2.8	17.7			T3831
BAL-B024	ST-1	21.05		20.0																

Summary of Laboratory Test Results

BORING NO.	SAMPLE NO.	DEPTH (ft)	CLASSIFICATION	IDENTIFICATION TESTS										PERMEA-BILITY (cm/sec)	STRENGTH			CONSOLIDATION INITIAL CONDITIONS		REMARKS/ TEST ID
				WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	HYDRO. % MINUS 2µm (%)	TOTAL UNIT WEIGHT (pcf)	DRY UNIT WEIGHT (pcf)	SPECIFIC GRAVITY (-)		Type Test @ STRESS (ksf)	PEAK SHEAR STRESS (ksf)	AXIAL STRAIN @ PEAK STRESS (%)	VOID RATIO (-)	SATUR-ATION (%)	
BAL-B024	ST-1B	21.3		20.5	49	13	36	CL			129.6	107.6			CIU@2.5	2.8	11			T3832
BAL-B024	ST-1	21.6		20.6																
BAL-B024	ST-1C	21.9		19.4				CL			128.6	107.7			CIU@2.6	2.3	6.2			T3833
BAL-B024	S-7	25.0-26.5		18.1																
BAL-B024	S-10	40.0-41.5		14.5	45	23														
BAL-B024	S-12	50.0-51.5		22.6																
BAL-B025	ST-1	7.5-9.5									112.5									
BAL-B025	ST-1	7.75		22.4																
BAL-B025	ST-1A	8		22.0				CL	74.3	4										
BAL-B025	ST-1	8.3		25.6																
BAL-B025	ST-1	8.85		55.1																
BAL-B025	S-4	10.0-11.5		40.4									2.46							
BAL-B025	S-7	25.0-26.5		26.5	40	20														
BAL-B025	S-9B	40.0-41.5		19.3	32	16														
BAL-B025	S-11	50.0-51.5		24.2																
BAL-B025	S-12	55.0-56.5		16.7	43	21														
BAL-B026	S-4	7.5-9		9.4				SM	14.6											
BAL-B026	S-6	15-16.5		19.4				SW-SM	5.8											
BAL-B026	ST-1	20-22																		
BAL-B026	ST-1	20.45		37.3																
BAL-B026	ST-1	21		27.3																
BAL-B026	ST-1	21.55		23.5																
BAL-B026	ST-1C	21.8		20.1				CL	97.5	28	128	106.5			UU@2.6	2	8.7			UU257k
BAL-B026	S-7A	25-26.5		32.9				CL	78.9											
BAL-B026	ST-2	35-37									126.3									
BAL-B026	ST-2A	35.35		23.6				CH			125.4	101.4			CIU@4.2	2	19			T3860
BAL-B026	ST-2B	35.9		24.0				CH			125.9	101.6			CIU@4.3	2.1	19.2			T3861
BAL-B026	ST-2C	36.25		23.5	61	14	47	CH			124.3	100.6	2.675					0.649	96	C15144
BAL-B026	ST-2D	36.8		22.9				CH			126.4	102.9			CIU@4.4	1.9	15.9			T3862
BAL-B026	S-9	40.0-41.5	Brown silty CLAY, trace gravel	17.8	48	13														
BAL-B026	S-11	50.0-51.5	Brown silty CLAY, trace gravel	23.5	49	19														
BAL-B026	S-12	55.0-56.5	Brown silty CLAY, trace gravel	16.6	43	17														
BAL-B026	S-15	70.0-71.5	Gray silty CLAY, trace sand	16.5																
BAL-B027	S-1	0-1.5		17.7				SW-SM	5.3											
BAL-B027	S-7	20-21.5		16.7				SP	0.2											
BAL-B027	ST-1	25-27									124.6									
BAL-B027	ST-1	25.55		21.1																
BAL-B027	ST-1	26.1		21.8																
BAL-B027	ST-1C	26.35		21.4				CL			128.5	105.9			UU@3.1	3.3	11.9			UU275e
BAL-B027	ST-1	26.65		21.1																
BAL-B027	ST-1D	26.9		21.2	43	16	27	CL			127.7	105.4		5.00E-09						P10596
BAL-B027	ST-2	35-37									127.3									
BAL-B027	ST-2	35.3		19.1																
BAL-B027	ST-2	35.85		19.9																
BAL-B027	ST-2	36.4		19.8																
BAL-B027	ST-2C	36.65		20.3	47	15	32	CL			130	108			UU@4.3	1.6	15			UU275f
BAL-B027	S-10	45.0-46.5	Light brown silty CLAY	24.1																
BAL-B027	S-12	55.0-56.5	Gray silty CLAY, trace sand	17.4	47	21														
BAL-B027	S-13	60.0-61.5	Gray silty CLAY, trace sand	19.4																
BAL-B028	S-1	0-1.5		72.5																
BAL-B028	S-2	2.5-4.0		70.8				ML	67.5	11										
BAL-B028	ST-1	5.0-7.0									89.5									
BAL-B028	ST-1	5.4		104.4																
BAL-B028	ST-1	5.95		76.6																
BAL-B028	ST-1	6.55		114.3																
BAL-B028	ST-1C	6.8		90.7	47	53	NP	ML	81.4		90.7	47.6		CYCTRX@0.7						CTXS488
BAL-B028	S-3	7.5-9.0		103.7				ML	75.6	13										
BAL-B028	ST-2	9.0-11.0									89.5									
BAL-B028	ST-2A	9.3		48.5				ML	67.9		104.4	70.3		CYCTRX@1.0						CTXS487
BAL-B028	ST-2B	9.95		65	47	52	NP	ML			101.8	61.7	2.684					1.716	102	C15154
BAL-B028	S-4	15-17		39.6				ML	64.3	6										

Summary of Laboratory Test Results

BORING NO.	SAMPLE NO.	DEPTH (ft)	CLASSIFICATION	IDENTIFICATION TESTS										PERMEA-BILITY (cm/sec)	STRENGTH			CONSOLIDATION INITIAL CONDITIONS		REMARKS/ TEST ID
				WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	HYDRO. % MINUS 2µm (%)	TOTAL UNIT WEIGHT (pcf)	DRY UNIT WEIGHT (pcf)	SPECIFIC GRAVITY (-)		Type Test @ STRESS (ksf)	PEAK SHEAR STRESS (ksf)	AXIAL STRAIN @ PEAK STRESS (%)	VOID RATIO (-)	SATUR-ATION (%)	
BAL-B028	S-5	20-22		34.9				ML	97.7	8										
BAL-B028	S-6A&B	25-26.5		50.6				CL	89.4	9										
BAL-B028	S-7	30.0-31.5	Brown silty Clay	26.7																
BAL-B028	S-8	35.0-36.5	Brown silty CLAY with sand and gravel	20.3	40	18														
BAL-B028	S-9	40.0-41.5	Brown silty CLAY with sand and gravel	20.7																
BAL-B028	S-10	45.0-46.5	Brown silty CLAY with sand and gravel	16.5																
BAL-B028	S-11	50.0-51.5	Brown silty CLAY with sand and gravel	20.2																
BAL-B028	S-12	55.0-56.5	Gray silty CLAY, trace sand	21.0																
BAL-B028	S-13	60.0-61.5	Gray silty CLAY with sand and gravel	16.7																
BAL-B028	S-14	65.0-66.5	Gray silty CLAY, trace gravel	18.9	39	25														
BAL-B028	S-15	70.0-71.5	Gray silty CLAY, trace gravel	18.5																
BAL-B028	S-16	75.0-76.5	Gray silty CLAY, trace gravel	20.9																
BAL-B028	S-17	80.0-81.5	Gray silty CLAY, trace gravel	17.8																
BAL-B028	S-18	85.5-86.0	Gray silty CLAY, trace gravel	17.7																
BAL-B029	S-1	0.0-1.5		20.6	42	19	23	CL												
BAL-B029	S-2	2.0-4.0		31				CL	95.7	6										
BAL-B029	S-3	7.5-9.0		31.9				ML	86	7										
BAL-B029	S-4	10.0-11.5		34.1				ML	94.5	8										
BAL-B029	S-5	20.0-21.5	Gray sandy silty CLAY	22.1	32	16														
BAL-B029	S-6	25.0-26.5	Gray brown sandy silty CLAY	19.8																
BAL-B029	S-7	30.0-31.5	Gray brown sandy silty CLAY	21.9	47	22														
BAL-B029	S-8	35.0-56.5	Brown sandy CLAY with gravel	10.9																
BAL-B029	S-9	40.0-41.5	Brown sandy CLAY with gravel	26.3	56	20														
BAL-B029	S-11	50.0-51.5	Brown gray sandy silty CLAY	21.8																
BAL-C039	S-1	0.0-1.0	Brown silty CLAY, trace sand	34.0	52	26														
BAL-C039	S-2	2.0-3.0	Brown silty CLAY with organics	24.5	37	16														
BAL-C039	S-6	5.0-6.0	Brown silty CLAY with organics, trace sand and gravel	21.7																

NOTE: Laboratory tests were performed by AECOM, Conshoshocken, Pennsylvania and Terrasense, Totowa, New Jersey.

APPENDIX B

LABORATORY HYDRAULIC CONDUCTIVITY TEST RESULTS

PERMEABILITY TEST: FALLING HEAD - CONSTANT VOLUME U-TUBE
ASTM D 5084 - Method F

Project No.: T60428794 | BORING: BAL-B001 | Test No.: P10576

Project Name: Dynegy CCR - Baldwin | SAMPLE: ST-2A | DEPTH (ft): 35.6

Specimen - Apparatus set-up - Test Information | Cell No. E | Apparatus No. 1 | Stage No.: 5

Preliminary Length/Area Calculations

Lo =	3.991	in	Lo=	10.137	cm
dLc=	0.091	in	Ao =	41.93	cm^2
Lc=	3.900	in	Vo =	424.99	cm^3
			Lc=	9.905	cm
dVc = 3 Vo * (dLc/Lo)			dVc=	29.07	cm^3
			Vc =	395.92	cm^3
Sc =	0.248	cm^{-1}	Ac=	39.970	cm^2

1) Specimen Tested in :	x	Triaxial Cell or		Compaction Mold or	
	x	with stones or		Stones with filter paper or	top + bottom
2) Specimen orientation for:	x	Vertical or		Horizontal permeability determination	
3) During saturation: Water flushed up sides of specimen to remove air			x	No	Yes
4) During consolidation:	x	Top and bottom drainage or		Top	Bottom only
5) Direction of permeant :	x	Up during or		Down during permeation	
6) Permeant: water used	x	Tap		Distilled	
or		Demineralized		0.005 N calcium sulfate (CaSO4)	Permeability

Equations Used

Kt = - 0.0000757 * Sc/dT(min) * ln (ho/hf)

RT = (-0.02452*(ave. temp in C) + 1.495)

K @ 20 ºC = RT * Kt TubeC= 1.3127

Consol Stage-Trial No.	Temp. ºC	Date	Time hr	Time min	Time sec	Initial σ_c psi	Initial Ub psi	U-tube Reading Head (cm) (cc)	U-tube Reading Tail (cm) (cc)	Flow in/out gradient	Preliminary Final at 20ºC cm/sec Dev. from Ave.
initial	22.5	9/4/15	09	47	00	129.9	100.0	57.00	37.70	0.88	1.40E-08
final	23.1	9/4/15	11	34	00			55.87	38.10		1.30E-08
1	RT = 0.936	dT =	107.00 min			σ'_c =	4.3 ksf	0.085	0.096	io= 24.5	-1%
initial	23.1	9/4/15	11	35	00	129.9	100.0	59.27	37.04	1.00	1.49E-08
final	23.5	9/4/15	13	29	00			57.80	37.50		1.36E-08
2	RT = 0.924	dT =	114.00 min			σ'_c =	4.3 ksf	0.110	0.110	io= 28.2	4%
initial	23.5	9/4/15	13	30	00	129.9	100.0	59.65	36.90	0.97	1.48E-08
final	23.5	9/4/15	15	19	00			58.22	37.36		1.35E-08
3	RT = 0.919	dT =	109.00 min			σ'_c =	4.3 ksf	0.107	0.110	io= 28.9	2%
initial	23.5	9/4/15	15	20	00	129.9	100.0	60.00	36.78	1.02	1.37E-08
final	23.5	9/4/15	17	38	00			58.30	37.30		1.25E-08
4	RT = 0.919	dT =	138.00 min			σ'_c =	4.3 ksf	0.127	0.125	io= 29.5	-5%
initial											
final											
5		dT =				σ'_c =					
initial											
final											
6		dT =				σ'_c =					

TEST SUMMARY

Final Specimen and Test Conditions

Lc =	9.905	cm	ε_{axial} =	2.3%
Ac =	40.425	cm^2		
Vc=	400.43	cm^3	ε_{vol} =	5.8%
Sc =	0.245	cm^{-1}	Sc = Lc / Ac , final	

	w (%)	γ_τ (pcf)	γ_d (pcf)	S (%)
Initial	23.79	126.6	102.3	94.0
PreTest	21.79	132.2	108.6	100.0

HYDRAULIC CONDUCTIVITY SUMMARY

Averages for trials: 1-4

ave K @ 20 ºC: **1.31E-08** cm/sec

(i_o)ave = 27.8

Tested By: BB Reviewed By: G. Thomas

PERMEABILITY TEST: FALLING HEAD - CONSTANT VOLUME U-TUBE
ASTM D 5084 - Method F

Project No.: T60428794 | BORING: BAL-B008 | Test No.: P10595

Project Name: Dynegy CCR - Baldwin | SAMPLE: ST-1B | DEPTH (ft): 10.8

Specimen - Apparatus set-up - Test Information | Cell No. C | Apparatus No. 2 | Stage No.: 2

Preliminary Length/Area Calculations

Lo =	3.985	in	Lo=	10.121	cm
dLc=	0.010	in	Ao =	41.87	cm^2
Lc=	3.975	in	Vo =	423.74	cm^3
			Lc=	10.095	cm
dVc = 3 Vo * (dLc/Lo)			dVc=	3.19	cm^3
			Vc =	420.55	cm^3
Sc =	0.242	cm^{-1}	Ac=	41.657	cm^2

1) Specimen Tested in :	x	Triaxial Cell or		Compaction Mold or	
	x	with stones or		Stones with filter paper or	top + bottom
2) Specimen orientation for:	x	Vertical or		Horizontal permeability determination	
3) During saturation: Water flushed up sides of specimen to remove air			x	No		Yes
4) During consolidation:	x	Top and bottom drainage or		Top		Bottom only
5) Direction of permeant :	x	Up during or		Down during permeation	
6) Permeant: water used	x	Tap		Distilled	
or		Demineralized		0.005 N calcium sulfate (CaSO4)	

Equations Used

Kt = - 0.0000746 * Sc/dT(min) * ln (ho/hf)

RT = (-0.02452*(ave. temp in C) + 1.495)

K @ 20 ºC = RT * Kt TubeC= 1.3214

Consol Stage-Trial No.	Temp. ºC	Date	Time hr	Time min	Time sec	Initial σ_c psi	Initial Ub psi	U-tube Reading Head (cm) (cc)	U-tube Reading Tail (cm) (cc)	Flow in/out gradient	Preliminary Final at 20ºC cm/sec Dev. from Ave.
initial	22.3	10/3/15	15	11	00	105.0	100.0	58.00	43.50	1.16	6.53E-09
final	22.0	10/4/15	09	33	00			54.40	44.50		6.21E-09
6	RT = 0.952	dT =	1102.00 min			σ'_c =	0.7 ksf	0.268	0.231	io= 18.1	13%
initial	22.0	10/4/15	09	38	00	105.0	100.0	58.20	43.40	1.07	5.75E-09
final	23.6	10/4/15	14	32	00			57.20	43.70		5.38E-09
7	RT = 0.936	dT =	294.00 min			σ'_c =	0.7 ksf	0.074	0.069	io= 18.4	-2%
initial	23.6	10/4/15	14	36	00	105.0	100.0	58.15	43.50	1.61	5.39E-09
final	24.2	10/4/15	17	11	00			57.65	43.60		4.89E-09
8	RT = 0.909	dT =	155.00 min			σ'_c =	0.7 ksf	0.037	0.023	io= 18.2	-11%
initial	24.2	10/4/15	17	11	00	105.0	100.0	57.65	43.60	0.95	5.89E-09
final	22.6	10/5/15	08	49	00			54.85	44.55		5.43E-09
9	RT = 0.921	dT =	938.00 min			σ'_c =	0.7 ksf	0.208	0.220	io= 17.5	-1%
initial											
final											
10		dT =				σ'_c =					
initial											
final											
11		dT =				σ'_c =					

TEST SUMMARY

Final Specimen and Test Conditions

Lc =	10.095	cm	ε_{axial} =	0.3%
Ac =	41.674	cm^2		
Vc=	420.72	cm^3	ε_{vol} =	0.7%
Sc =	0.242	cm^{-1}	Sc = Lc / Ac , final	

	w (%)	γ_τ (pcf)	γ_d (pcf)	S (%)
Initial	23.07	127.5	103.6	94.9
PreTest	23.87	129.2	104.3	100.0

HYDRAULIC CONDUCTIVITY SUMMARY

Averages for trials: 6-9

ave K @ 20 ºC: **5.48E-09** cm/sec

(i_o)ave = 18.1

Tested By: BB Reviewed By: G. Thomas

PERMEABILITY TEST: FALLING HEAD - CONSTANT VOLUME U-TUBE
ASTM D 5084 - Method F

Project No.: T60428794 | BORING: BAL-B010 | Test No.: P10578

Project Name: Dynegy CCR - Baldwin | SAMPLE: ST-2B | DEPTH (ft): 21.3

Specimen - Apparatus set-up - Test Information | Cell No. B | Apparatus No. 2 | Stage No.: 4

Preliminary Length/Area Calculations

Lo =	4.006	in	Lo=	10.174	cm
dLc=	0.057	in	Ao =	42.20	cm^2
Lc=	3.949	in	Vo =	429.34	cm^3
			Lc=	10.029	cm
dVc = 3 Vo * (dLc/Lo)			dVc=	18.33	cm^3
			Vc =	411.01	cm^3
Sc =	0.245	cm^{-1}	Ac=	40.980	cm^2

1) Specimen Tested in :	x	Triaxial Cell or		Compaction Mold or	
	x	with stones or		Stones with filter paper or	top + bottom
2) Specimen orientation for:	x	Vertical or		Horizontal permeability determination	
3) During saturation: Water flushed up sides of specimen to remove air			x	No	Yes
4) During consolidation:	x	Top and bottom drainage or		Top	Bottom only
5) Direction of permeant :	x	Up during or		Down during permeation	
6) Permeant: water used	x	Tap		Distilled	
or		Demineralized		0.005 N calcium sulfate (CaSO4)	Permeability

Equations Used

Kt = - 0.0000746 * Sc/dT(min) * ln (ho/hf)

RT = (-0.02452*(ave. temp in C) + 1.495)

K @ 20 ºC = RT * Kt TubeC= 1.3214

Consol Stage-Trial No.	Temp. ºC	Date	Time hr	Time min	Time sec	Initial σ_c psi	Initial Ub psi	U-tube Reading Head (cm) (cc)	U-tube Reading Tail (cm) (cc)	Flow in/out gradient	Preliminary Final at 20ºC cm/sec Dev. from Ave.
initial	23.1	9/8/15	11	02	00	117.6	100.0	56.00	44.13	1.01	2.66E-06
final	23.1	9/8/15	11	15	00			48.37	46.55		2.44E-06
1	RT = 0.929	dT =	13.00 min			σ'_c =	2.5 ksf	0.568	0.560	io= 14.9	0%
initial	23.1	9/8/15	11	16	00	117.6	100.0	56.00	44.13	0.99	2.85E-06
final	23.2	9/8/15	11	31	00			47.88	46.77		2.62E-06
2	RT = 0.927	dT =	15.00 min			σ'_c =	2.5 ksf	0.604	0.611	io= 14.9	7%
initial	23.2	9/8/15	11	32	00	117.6	100.0	56.00	44.13	1.01	2.76E-06
final	23.2	9/8/15	11	40	00			49.70	46.13		2.53E-06
3	RT = 0.926	dT =	8.00 min			σ'_c =	2.5 ksf	0.469	0.463	io= 14.9	4%
initial	23.2	9/8/15	11	41	00	117.6	100.0	56.00	44.13	1.01	2.38E-06
final	23.2	9/8/15	12	02	00			47.60	46.80		2.18E-06
4	RT = 0.926	dT =	21.00 min			σ'_c =	2.5 ksf	0.625	0.618	io= 14.9	-11%
initial											
final											
5		dT =				σ'_c =					
initial											
final											
6		dT =				σ'_c =					

TEST SUMMARY

Final Specimen and Test Conditions

Lc =	10.029	cm	ε_{axial} =	1.4%
Ac =	41.453	cm^2		
Vc=	415.75	cm^3	ε_{vol} =	3.2%
Sc =	0.242	cm^{-1}	Sc = Lc / Ac , final	

	w (%)	γ_τ (pcf)	γ_d (pcf)	S (%)
Initial	22.15	124.2	101.7	88.4
PreTest	23.11	129.2	105.0	100.0

HYDRAULIC CONDUCTIVITY SUMMARY

Averages for trials: 1-4

ave K @ 20 ºC: **2.44E-06** cm/sec

(i_o)ave = 14.9

Tested By: BB Reviewed By: G. Thomas

PERMEABILITY TEST: FALLING HEAD - CONSTANT VOLUME U-TUBE
ASTM D 5084 - Method F

Project No.: T60428794 | BORING: BAL-B011 | Test No.: P10594

Project Name: Dynegy CCR - Baldwin | SAMPLE: ST-1A | DEPTH (ft): 15.2

Specimen - Apparatus set-up - Test Information | Cell No. D | Apparatus No. 1 | Stage No.: 3

Preliminary Length/Area Calculations

Lo =	3.998	in	Lo=	10.155	cm
dLc=	0.017	in	Ao =	42.08	cm^2
Lc=	3.981	in	Vo =	427.34	cm^3
			Lc=	10.112	cm
dVc = 3 Vo * (dLc/Lo)			dVc=	5.45	cm^3
			Vc =	421.89	cm^3
Sc =	0.242	cm^{-1}	Ac=	41.722	cm^2

1) Specimen Tested in :	x	Triaxial Cell or		Compaction Mold or	
	x	with stones or		Stones with filter paper or	top + bottom
2) Specimen orientation for:	x	Vertical or		Horizontal permeability determination	
3) During saturation: Water flushed up sides of specimen to remove air			x	No	Yes
4) During consolidation:	x	Top and bottom drainage or		Top	Bottom only
5) Direction of permeant :	x	Up during or		Down during permeation	
6) Permeant: water used	x	Tap		Distilled	
or		Demineralized		0.005 N calcium sulfate (CaSO4)	Permeability

Equations Used

Kt = - 0.0000757 * Sc/dT(min) * ln (ho/hf)

RT = (-0.02452*(ave. temp in C) + 1.495)

K @ 20 ºC = RT * Kt TubeC= 1.3127

Consol Stage-Trial No.	Temp. ºC	Date	Time hr	Time min	Time sec	Initial σ_c psi	Initial Ub psi	U-tube Reading Head (cm) (cc)	U-tube Reading Tail (cm) (cc)	Flow in/out gradient	Preliminary Final at 20ºC cm/sec Dev. from Ave.
initial	23.7	10/1/15	17	22	00	105.0	100.0	56.45	37.90	0.95	2.70E-09
final	21.9	10/2/15	09	04	49			54.62	38.50		2.54E-09
5	RT = 0.936	dT =	942.82 min			σ'_c =	0.7 ksf	0.137	0.144	io= 23.1	39%
initial	22.5	10/2/15	15	34	00	105.0	100.0	57.61	37.55	1.10	2.25E-09
final	22.0	10/3/15	11	47	00			55.50	38.15		2.15E-09
6	RT = 0.949	dT =	1213.00 min			σ'_c =	0.7 ksf	0.158	0.144	io= 24.9	18%
initial	22.0	10/3/15	12	05	00	105.0	100.0	57.00	37.75	1.09	1.43E-09
final	22.0	10/4/15	09	35	00			55.60	38.15		1.37E-09
7	RT = 0.956	dT =	1290.00 min			σ'_c =	0.7 ksf	0.105	0.096	io= 23.9	-25%
initial	22.0	10/4/15	09	40	00	105.0	100.0	56.30	37.95	1.02	1.28E-09
final	22.2	10/5/15	08	54	00			55.00	38.35		1.23E-09
8	RT = 0.953	dT =	1394.00 min			σ'_c =	0.7 ksf	0.097	0.096	io= 22.8	-32%
initial											
final											
9		dT =				σ'_c =					
initial											
final											
10		dT =				σ'_c =					

TEST SUMMARY

Final Specimen and Test Conditions

Lc =	10.112	cm	ε_{axial} =	0.4%
Ac =	41.467	cm^2		
Vc=	419.30	cm^3	ε_{vol} =	1.9%
Sc =	0.244	cm^{-1}	Sc = Lc / Ac , final	

	w (%)	γ_τ (pcf)	γ_d (pcf)	S (%)
Initial	25.83	123.3	98.0	94.5
PreTest	26.15	126.0	99.9	100.0

HYDRAULIC CONDUCTIVITY SUMMARY

Averages for trials: 5-8

ave K @ 20 ºC: **1.82E-09** cm/sec

(i_o)ave = 23.7

Tested By: BB Reviewed By: G. Thomas

PERMEABILITY TEST: FALLING HEAD - CONSTANT VOLUME U-TUBE
ASTM D 5084 - Method F

Project No.: T60440739 | Boring: BAL-B017 | Test No.: T3922
Project Name: Dynegy CCR - Baldwin | Sample: ST-2B | Depth: 26.7

Specimen - Apparatus set-up - Test Information | Cell No. H-6 | Apparatus No. 1 | Stage No.: 3

Preliminary Length/Area Calculations

Lo =	5.975	in	Lo=	15.178	cm
dLc=	0.064	in	Ao =	41.79	cm^2
Lc=	5.911	in	Vo =	634.27	cm^3
			Lc=	15.015	cm
dVc = 3 Vo * (dLc/Lo)			dVc=	20.38	cm^3
			Vc =	613.89	cm^3
Sc =	0.367	cm^{-1}	Ac=	40.885	cm^2

1) Specimen Tested in :	x	Triaxial Cell or		Compaction Mold or	
	x	with stones or		Stones with filter paper or	top + bottom
2) Specimen orientation for:	x	Vertical or		Horizontal permeability determination	
3) During saturation: Water flushed up sides of specimen to remove air			x	No	Yes
4) During consolidation:	x	Top and bottom drainage or		Top	Bottom only
5) Direction of permeant :	x	Up during or		Down during permeation	
6) Permeant: water used	x	Tap		Distilled	
or		Demineralized		0.005 N calcium sulfate (CaSO4)	Permeability

Equations Used

Kt = - 0.0000757 * Sc/dT(min) * ln (ho/hf)

RT = (-0.02452*(ave. temp in C) + 1.495)

K @ 20 ºC = RT * Kt TubeC= 1.3127

Consol Stage-Trial No.	Temp. ºC	Date	Time hr	Time min	Time sec	Initial σ_c psi	Initial Ub psi	U-tube Reading Head (cm) (cc)	U-tube Reading Tail (cm) (cc)	Flow in/out gradient	Preliminary Final at 20ºC cm/sec Dev. from Ave.
initial	22.5	10/13/15	09	21	00	116.7	100.0	61.98	36.20	0.99	2.38E-08
final	22.5	10/13/15	13	38	00			58.10	37.42		2.21E-08
1	RT = 0.943	dT =	257.00 min			σ'_c =	2.4 ksf	0.291	0.292	io= 21.6	30%
initial	22.5	10/13/15	13	40	00	116.7	100.0	61.78	36.30	1.05	2.05E-08
final	22.9	10/13/15	18	03	00			58.35	37.32		1.90E-08
2	RT = 0.939	dT =	263.00 min			σ'_c =	2.4 ksf	0.257	0.244	io= 21.3	11%
initial	22.9	10/13/15	18	12	00	116.7	100.0	61.48	36.35	1.00	1.74E-08
final	22.4	10/14/15	09	00	00			53.30	38.91		1.61E-08
3	RT = 0.940	dT =	888.00 min			σ'_c =	2.4 ksf	0.613	0.613	io= 21.0	-5%
initial	22.4	10/14/15	09	02	00	116.7	100.0	61.55	36.35	0.97	1.74E-08
final	24.0	10/14/15	12	31	00			59.20	37.11		1.58E-08
4	RT = 0.926	dT =	209.00 min			σ'_c =	2.4 ksf	0.176	0.182	io= 21.1	-7%
initial	24.0	10/14/15	12	37	00	116.7	100.0	62.20	36.18	1.07	1.90E-08
final	22.9	10/14/15	15	37	00			59.90	36.85		1.72E-08
5	RT = 0.920	dT =	180.00 min			σ'_c =	2.4 ksf	0.172	0.161	io= 21.8	1%
initial											
final											
6		dT =				σ'_c =					

TEST SUMMARY

Final Specimen and Test Conditions

Lc =	15.015	cm	ε_{axial} =	1.1%
Ac =	41.570	cm^2		
Vc=	624.17	cm^3	ε_{vol} =	1.6%
Sc =	0.361	cm^{-1}	Sc = Lc / Ac , final	

	w (%)	γ_τ (pcf)	γ_d (pcf)	S (%)
Initial	23.51	124.5	100.8	95.4
PreTest	23.66	126.6	102.4	100.0

HYDRAULIC CONDUCTIVITY SUMMARY

Averages for trials: 2-5

ave K @ 20 ºC: **1.70E-08** cm/sec

(i_o)ave = 21.3

Tested By: BB Reviewed By: GET

PERMEABILITY TEST: FALLING HEAD - CONSTANT VOLUME U-TUBE
ASTM D 5084 - Method F

Project No.: T60428794 | BORING: BAL-B027 | Test No.: P10596

Project Name: Dynegy CCR - Baldwin | SAMPLE: ST-1D | DEPTH (ft): 26.9

Specimen - Apparatus set-up - Test Information | Cell No. B | Apparatus No. 3 | Stage No.: 4

Preliminary Length/Area Calculations

Lo =	3.986	in	Lo=	10.125	cm
dLc=	0.018	in	Ao =	41.55	cm^2
Lc=	3.968	in	Vo =	420.72	cm^3
			Lc=	10.079	cm
dVc = 3 Vo * (dLc/Lo)			dVc=	5.70	cm^3
			Vc =	415.02	cm^3
Sc =	0.245	cm^{-1}	Ac=	41.176	cm^2

1) Specimen Tested in :	x	Triaxial Cell or		Compaction Mold or	
	x	with stones or		Stones with filter paper or	top + bottom
2) Specimen orientation for:	x	Vertical or		Horizontal permeability determination	
3) During saturation: Water flushed up sides of specimen to remove air			x	No		Yes
4) During consolidation:	x	Top and bottom drainage or		Top		Bottom only
5) Direction of permeant :	x	Up during or		Down during permeation	
6) Permeant: water used	x	Tap		Distilled	
or		Demineralized		0.005 N calcium sulfate (CaSO4)	

Equations Used

Kt = - 0.0000755 * Sc/dT(min) * ln (ho/hf)

RT = (-0.02452*(ave. temp in C) + 1.495)

K @ 20 ºC = RT * Kt TubeC= 1.3132

Consol Stage-Trial No.	Temp. ºC	Date	Time hr	Time min	Time sec	Initial σ_c psi	Initial Ub psi	U-tube Reading Head (cm) (cc)	U-tube Reading Tail (cm) (cc)	Flow in/out gradient	Preliminary Permeability Final at 20ºC cm/sec Dev. from Ave.
initial	22.9	10/5/15	11	34	00	121.5	100.0	65.60	46.90	1.05	9.40E-09
final	22.7	10/5/15	16	07	27			63.75	47.45		8.86E-09
1	RT = 0.936	dT =	273.45 min			σ'_c =	3.1 ksf	0.138	0.131	io= 23.3	79%
initial	22.7	10/5/15	16	43	00	121.5	100.0	65.65	46.85	0.27	7.28E-09
final	23.5	10/5/15	18	22	26			65.10	47.50		6.81E-09
2	RT = 0.929	dT =	99.43 min			σ'_c =	3.1 ksf	0.041	0.155	io= 23.4	37%
initial	23.5	10/5/15	18	24	00	121.5	100.0	66.40	46.65	1.01	5.93E-09
final	22.2	10/6/15	09	03	00			62.70	47.80		5.59E-09
3	RT = 0.935	dT =	879.00 min			σ'_c =	3.1 ksf	0.277	0.274	io= 24.6	13%
initial	22.2	10/6/15	09	07	00	121.5	100.0	65.85	46.80	1.01	5.07E-09
final	22.5	10/7/15	08	41	12			61.18	48.25		4.84E-09
4	RT = 0.947	dT =	1414.20 min			σ'_c =	3.1 ksf	0.349	0.346	io= 23.8	-2%
initial	22.6	10/7/15	08	57	00	121.5	100.0	65.58	46.85	1.04	5.18E-09
final	22.8	10/7/15	17	04	00			63.76	47.40		4.90E-09
5	RT = 0.938	dT =	487.00 min			σ'_c =	3.1 ksf	0.136	0.131	io= 23.4	-1%
initial	22.8	10/7/15	17	04	00	121.5	100.0	63.76	47.40	0.94	4.76E-09
final	22.8	10/8/15	09	16	00			61.00	48.32		4.49E-09
6	RT = 0.936	dT =	972.00 min			σ'_c =	3.1 ksf	0.206	0.220	io= 20.4	-9%

TEST SUMMARY

Final Specimen and Test Conditions

Lc =	10.079	cm	ε_{axial} =	0.5%
Ac =	40.862	cm^2		
Vc=	411.86	cm^3	ε_{vol} =	2.1%
Sc =	0.247	cm^{-1}	Sc = Lc / Ac , final	

	w (%)	γ_τ (pcf)	γ_d (pcf)	S (%)
Initial	21.16	127.7	105.4	90.0
PreTest	22.27	131.6	107.7	100.0

HYDRAULIC CONDUCTIVITY SUMMARY

Averages for trials: 3-6

ave K @ 20 ºC: **4.95E-09** cm/sec

(i_o)ave = 23.0

Tested By: BB Reviewed By: G. Thomas

APPENDIX C

BORING LOGS AND WELL DETAILS

APPENDIX C1

MW 100 SERIES BORING LOGS AND WELL DETAILS

KELRON ENVIRONMENTAL
INCORPORATED

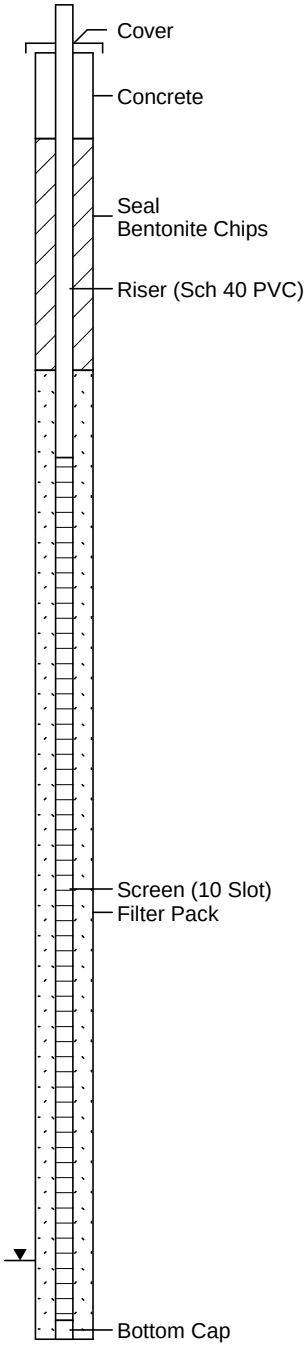
LOG OF BORING MW-104SR

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 10 SE, SE, SE

Date Completed	: 07/26/11	Driller	: Matt Cooper
Hole Diameter	: 7 3/4"OD; 3 3/4" ID	Geologist	: Stu Cravens (Kelron)
Drilling Method	: Hollow-Stem (CME-550)	Land Surface Elevation	: 452.52
Sampling Method	: MacroCore (60")	Top of Casing Elevation	455.54
Drilling Company	: Terra Drill, Inc.	X,Y Coordinates	: 2386609, 554205

Depth in Feet	DESCRIPTION	Surf. Elev. 452.52	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	Continuous boring - no soil sampling conducted Refer to boring log for adjacent nested well MW-104DR for a descriptionof subsurface materials						
		450					
5							
		445					
10	(Slotted screen interval = 9.40 ft)						
		440					
	- groundwater level at completion = 14.06' bls						
15	END BOREHOLE AT 15 FEET BLS						

Well: MW-104SR
Elev.: 455.54



KELRON ENVIRONMENTAL
INCORPORATED

LOG OF BORING MW-104DR

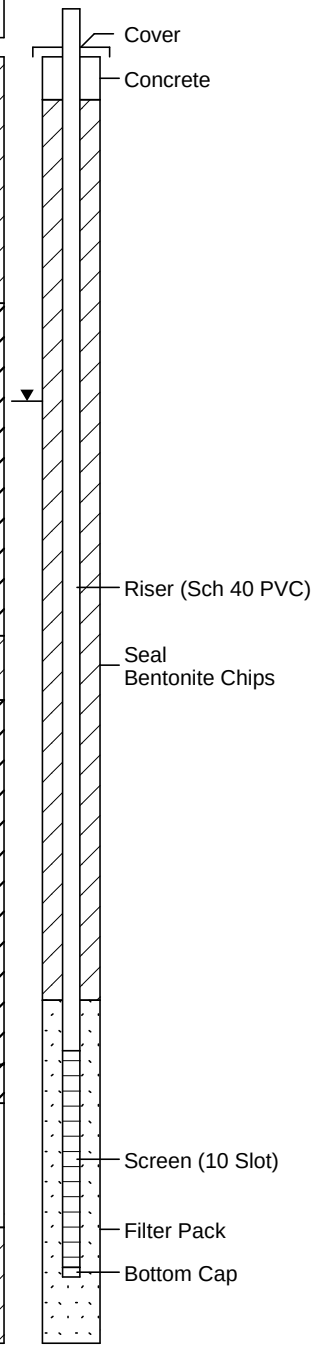
Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 10 SE, SE, SE

Date Completed	: 07/25/11	Driller	: Matt Cooper
Hole Diameter	: 7 3/4"OD; 3 3/4" ID	Geologist	: Stu Cravens (Kelron)
Drilling Method	: Hollow-Stem (CME-550)	Land Surface Elevation	: 452.62
Sampling Method	: MacroCore (60")	Top of Casing Elevation	455.62
Drilling Company	: Terra Drill, Inc.	X,Y Coordinates	: 2386609, 554201

Well: MW-104DR
Elev.: 455.62

Depth in Feet	DESCRIPTION	Surf. Elev. 452.62
0	SILTY CLAY, trace sand, med plasticity, organics and roots, dry hard, light gray (Gley1-7/1) with brown mottling (Fe-oxidation) (10YR 3/1), dry	
	- moist	450
5	CLAY (Fat) with Silt, high plasticity, soft to very soft, high organics and roots, dark gray grading to gray with brown mottling, moist	
	- groundwater level at completion = 8.03' bls	445
10	- medium hardness	
	- light gray (GLEY1-7/1) with yellow-brown Fe-oxid mottling (10%)	440
	CLAY (lean) with Silt, medium plasticity, light gray with yellow-brown mottling (10%)	
15	CLAY with Silt, trace sand and fine gravel, high plasticity, medium to stiff, light gray with brown mottling (20%)	
		435
20	- trace sand and gravel, medium to high plasticity, medium to stiff hardness, mottling 25 to 50%	
		430
	SANDY FAT CLAY, fine sand, trace fine gravel, high plasticity, greenish gray (GLEY-6/1), moist	
25	SAND (fine to medium), trace gravel, poorly graded, light gray, wet	
	- brown (Slotted screen interval = 4.52 ft)	
	SILTY CLAY, trace sand and gravel (angular), medium plasticity, very stiff, olive brown (2.5Y 4/4) with light gray mottling <20%, moist (TILL)	425
30		

Samples	Recovery inches	Qp TSF	USCS
1	60/60	>4.5	CL
2		>4.5	
3		3.5	
4		2.5	
5		2.5	
6		2.5	
7	60/60	2.5	CH
8		1	
9		1	
10		1	
11		1.75	
12		2.25	
13	60/60	2.25	
14		3.0	CL
15		2.5	
16	60/60	3.75	CH
17		2.75	
18		3.5	
19		3.5	
20		3	
21		3	
22		2.5	
23	60/60	2.5	
24		2.5	CH
25		2.5	SP
26			
27		2.5	
28	60/60		CL
29		4.0	
30		4.5	



KELRON ENVIRONMENTAL
INCORPORATED

LOG OF BORING MW-104DR

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 10 SE, SE, SE

Date Completed	: 07/25/11	Driller	: Matt Cooper
Hole Diameter	: 7 3/4"OD; 3 3/4" ID	Geologist	: Stu Cravens (Kelron)
Drilling Method	: Hollow-Stem (CME-550)	Land Surface Elevation	: 452.62
Sampling Method	: MacroCore (60")	Top of Casing Elevation	455.62
Drilling Company	: Terra Drill, Inc.	X,Y Coordinates	: 2386609, 554201

Well: MW-104DR
Elev.: 455.62

Depth in Feet	DESCRIPTION	Surf. Elev. 452.62	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
30	SHALE, highly weathered; Clay with Silt, platy /laminated, medium to high plasticity, very stiff, moist		31	60/60	3.0	CL	
			32				
		420	33			SH	
			34		3.5		
	- unweathered, light gray, fissile, dry		35				
35	END BOREHOLE AT 35 FEET BLS						
		415					
40							
		410					
45							
		405					
50							
		400					
55							
		395					
60							

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KELRON ENVIRONMENTAL
INCORPORATED

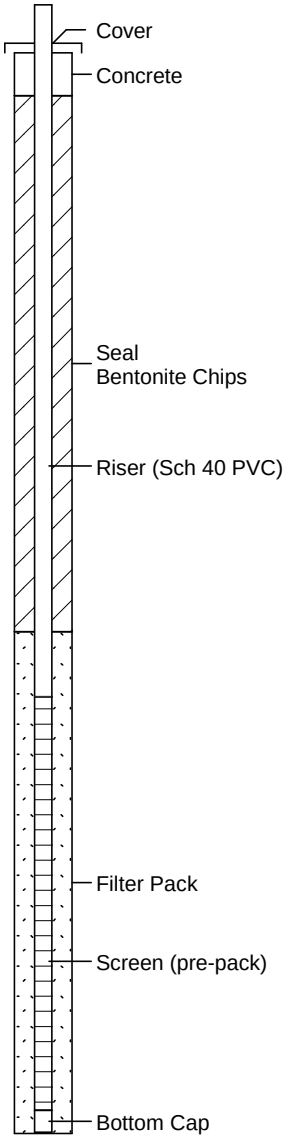
LOG OF BORING MW-150

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NW, NE

Date Completed	: 09/08/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD; 4 1/4" ID	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem (CME-550)	Land Surface Elevation	: 393.84
Sampling Method	: MacroCore (60")	Top of Casing Elevation	396.54
Drilling Company	: Terra Drill, Inc.	X,Y Coordinates	: 2379413, 554563

Depth in Feet	DESCRIPTION	Surf. Elev. 393.84	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	Continous boring - no soil sampling conducted.						
	Refer to boring log for adjacent nested well MW-350 for a description of subsurface materials	393					
5		388					
10		383					
15		378					
20		373					
25	END BOREHOLE AT 25.2 FEET BLS	368					
30							

Well: MW-150
Elev.: 396.54



KELRON ENVIRONMENTAL
INCORPORATED

LOG OF BORING MW-151

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NE, NE

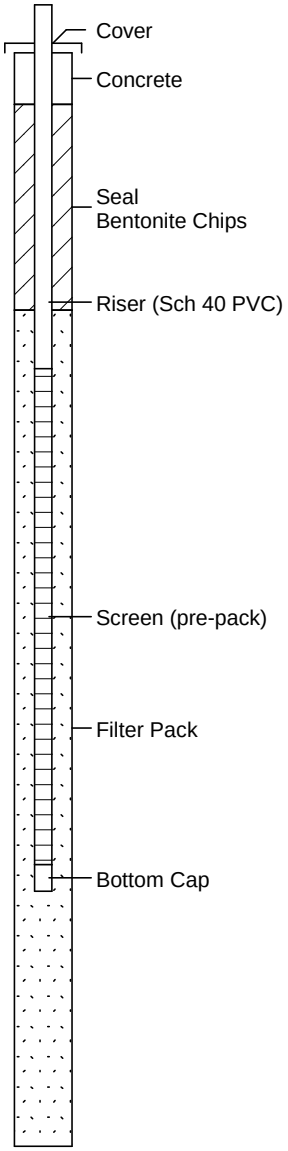
Date Completed	: 09/21/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD; 4 1/4" ID	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem (CME-550)	Land Surface Elevation	: 397.22
Sampling Method	: MacroCore (60")	Top of Casing Elevation	399.96
Drilling Company	: Terra Drill, Inc.	X,Y Coordinates	: 2381171, 554221

Depth in Feet	DESCRIPTION	Surf. Elev. 397.22
0	SILTY CLAY, light brown, dry	397
5	SANDY CLAY, dark gray (10YR 4/1) - moist - moist to wet - very dark gray-brown; grain size analysis @7.5-8 ft: 39% sand, 41.8% silt, 19.2% clay	392
10	SILTY CLAY, yellowish-brown (10YR 5/1) - two small light gray sandy seams - 2-inch layer of dusky red CLAY (10R 3/2)	387
15	CLAY, low plasticity, medium soft - shaley, light olive brown (2.5Y 5/4) grading to olive gray; grain size analysis @16-17 ft:: 1%sand, 28.5% silt, 70.5% clay - platy/laminated	382
20	Refusal in bedrock at 21.5 feet BLS END BOREHOLE AT 21.5 FEET BLS	377
	LIMESTONE, no recovery	
	Drove split-spoon to 21.75 feet BLS - no recovery	
25		

Samples	Recovery inches	Qp TSF	USCS
1	31/48		CL
2		1.5	
3		1.0	
4		1.5	
5	32/60		CL
6		1.0	
7		0.5	
8		1.0	
9		2.5	
10	46/60	2.5	CL
11		3.0	
12		2.75	
13		2.5	
14		2.75	
15	58/60	2.5	CH
16		2.5	
17		3.5	
18		2.75	
19		2.75	
20	24/27	2.5	
21		4.5+	
22			LS

GRAPHIC

Well: MW-151
Elev.: 399.96



KELRON ENVIRONMENTAL
INCORPORATED

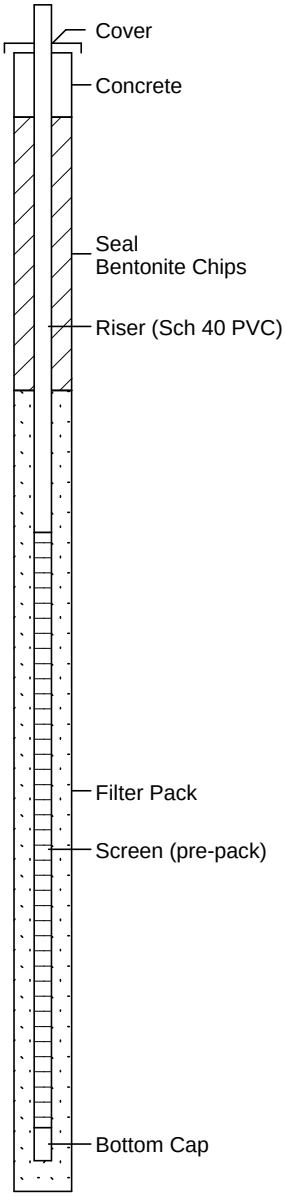
LOG OF BORING MW-152

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NE, NE

Date Completed	: 09/22/10	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 422.18
Sampling Method	: MacroCore (60")	Top of Casing Elevation	424.99
Drilling Company	: PSC	X,Y Coordinates	: 2382779, 553906

Depth in Feet	DESCRIPTION	Surf. Elev. 422.18	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	Continuous boring - no soil sampling conducted.	422					
	Refer to boring log for adjacent nested well MW-352 for a description of subsurface materials.						
5		417					
10		412					
15		407					
	END BOREHOLE AT 17.7 FEET BLS						
20							

Well: MW-152
Elev.: 424.99



KELRON ENVIRONMENTAL
INCORPORATED

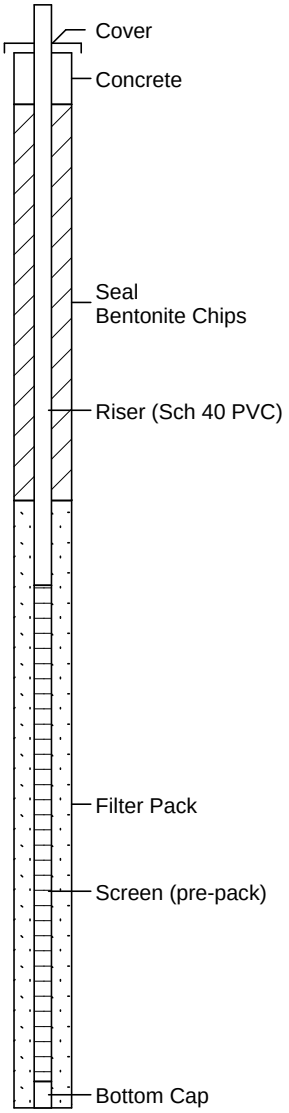
LOG OF BORING MW-153

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 15 SW, SW, NE

Date Completed	: 09/22/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 442.77
Sampling Method	: MacroCore (60")	Top of Casing Elevation	445.67
Drilling Company	: PSC	X,Y Coordinates	: 2384435, 553298

Depth in Feet	DESCRIPTION	Surf. Elev. 442.77	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	Continuous boring - no soil sampling conducted Refer to boring log for adjacent nested well MW-253 for a description of subsurface materials	442					
5		437					
10		432					
15		427					
20	END BOREHOLE AT 20.5 FEET BLS	422					
25							

Well: MW-153
Elev.: 445.67



KELRON ENVIRONMENTAL
INCORPORATED

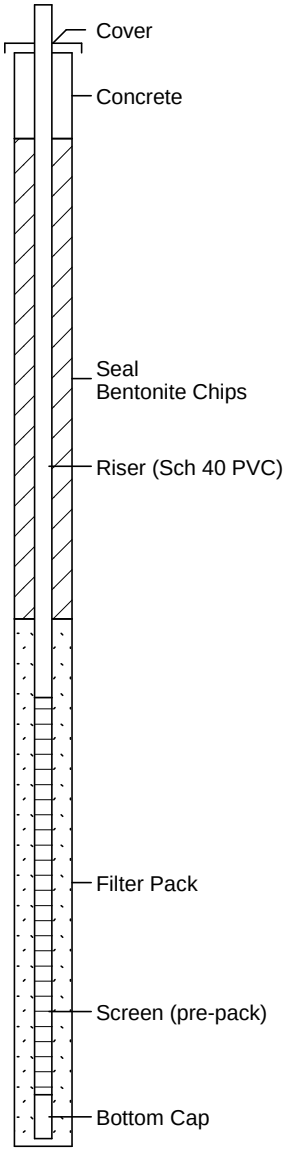
LOG OF BORING MW-154

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 09 SW, NE, SW

Date Completed	: 09/20/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD; 4 1/4" ID	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem (CME-550)	Land Surface Elevation	: 384.99
Sampling Method	: MacroCore (60")	Top of Casing Elevation	387.76
Drilling Company	: Terra Drill, Inc.	X,Y Coordinates	: 2377892, 557163

Depth in Feet	DESCRIPTION	Surf. Elev. 384.99	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	SILTY CLAY, hard, very dark gray (10YR 3/1), dry	384	1	35/48		CL	
	CLAY, black, moist	379	2	44/60		CH	
5							
	SANDY CLAY with gravel, very stiff to hard, low plasticity, dark gray with yellow-brown mottling, dry - grain size analysis @ 8-9.2 ft: 17.4% gravel, 30.5 %sand, 18.8% silt, 33.4% clay					CL	
10		374	3	24/42			
	CLAY, shaley, gray with light olive-brown mottling - grain size analysis @ 11-12 ft: 12.5% sand, 23% silt, 64.5% clay Refusal in bedrock at 12.5 feet BLS					CH	
	LIMESTONE		4	1/6		LS	
	Drove split-spoon to 12.75 feet BLS - 1-inch recovery END BOREHOLE AT 12.75 FEET BLS						
15							

Well: MW-154
Elev.: 387.76



KELRON ENVIRONMENTAL
INCORPORATED

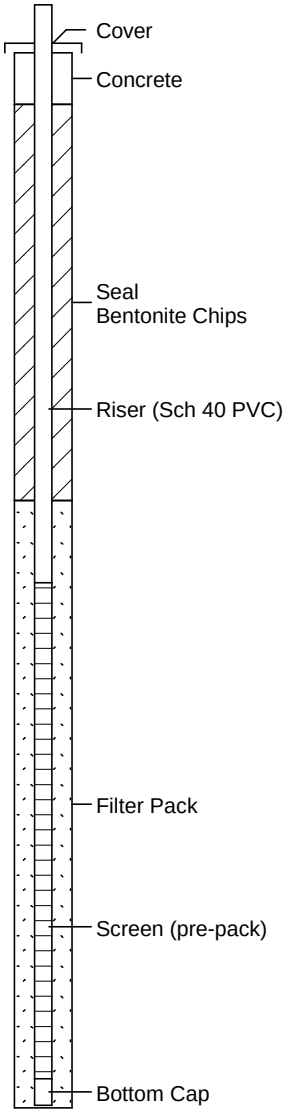
LOG OF BORING MW-155

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 09 SW, SE, SW

Date Completed	: 09/10/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD; 4 1/4" ID	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem (CME-550)	Land Surface Elevation	: 390.62
Sampling Method	: MacroCore (60")	Top of Casing Elevation	393.55
Drilling Company	: Terra Drill, Inc.	X,Y Coordinates	: 2378141, 555983

Depth in Feet	DESCRIPTION	Surf. Elev. 390.62	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	SILTY CLAY, hard, reddish brown, dry	390	1, 2, 3	40/48		CL	
	CLAY (lean), hard, low plasticity, pale brown (10YR 6/3), grading to Fat CLAY		4		4.5		
5	- grain size analysis @ 7 - 8 ft: 2.5% sand, 47.2% silt, 50.3% clay	385	5, 6, 7, 8	53/60	4.5+	CL/CH	
	SANDY CLAY, dry		9		0.75	CL	
	SAND, 4-inch seam, poorly graded, loose		10	44/60		SP	
10	CLAY with sand grading to SANDY CLAY, very soft, moist	380	11, 12, 13, 14, 15, 16, 17	50/60	1.5, 1.5, 0.5	CL	
15	CLAYEY SAND, poorly graded, dark yellow brown	375	18, 19, 20		1.5	SC	
	- grain size analysis @ 18.5 - 19.5 ft: 53.9 %sand, 28.1% silt, 18.0% clay						
20	END BOREHOLE AT 20.5 FEET BLS	370					
25							

Well: MW-155
Elev.: 393.55



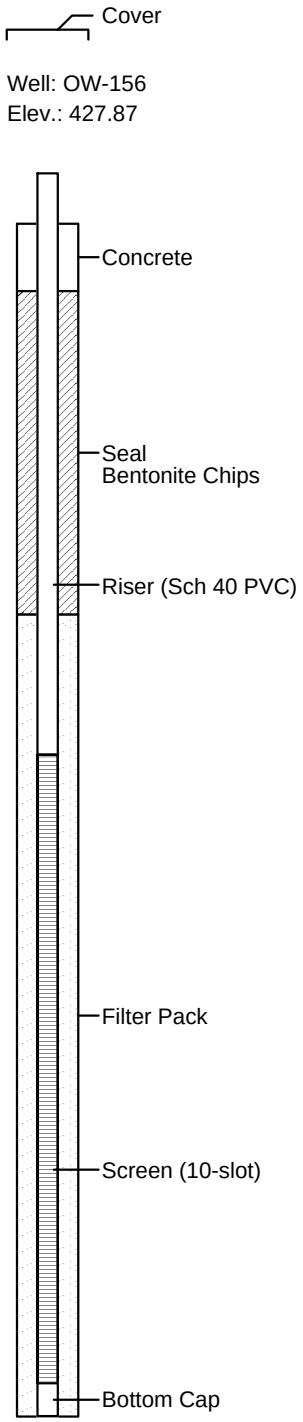
KELRON ENVIRONMENTAL
Incorporated

LOG OF BORING OW-156

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 10 NW, NW, SW

Date Completed	: 09/10/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD; 4 1/4" ID	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem (CME-550)	Land Surface Elevation:	425.14
Sampling Method	: MacroCore (60")	Top of Casing Elevation:	427.87
Drilling Company	: Terra Drill, Inc.	X,Y Coordinates	: 2378141, 555983

Depth in Feet	DESCRIPTION	Surf. Elev.425.15	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	SILTY CLAY, stiff, medium brown, dry	425	1	32/48	2.5	CL	
			2		1.5		
			3		3.5		
			4		1.75		
5	- stiff to very stiff, low plasticity	420	5	56/60	2.0		
			6		1.75		
	- dark gray-brown (10YR 3/3) with light brown mottling (10YR 6/3)		7		1.75		
			8		1.75		
			9		2.25		
10	CLAY (lean) with Sand, soft to medium, light brown (10YR 6/3) with brown-yellow mottling (10YR 6/6), moist	415	10	60/60	1.0		
			11		1.5		
			12		1.75		
			13		1.75		
			14		1.5		
15		410	15	50/60	2.25		
			16		2.0		
			17		2.5		
	END BOREHOLE AT 17.7 FEET BLS		18		1.25		
	Terminated probing with MacroCore at 19.5 feet bls		19				
20							



04-09-2014

KELRON ENVIRONMENTAL
INCORPORATED

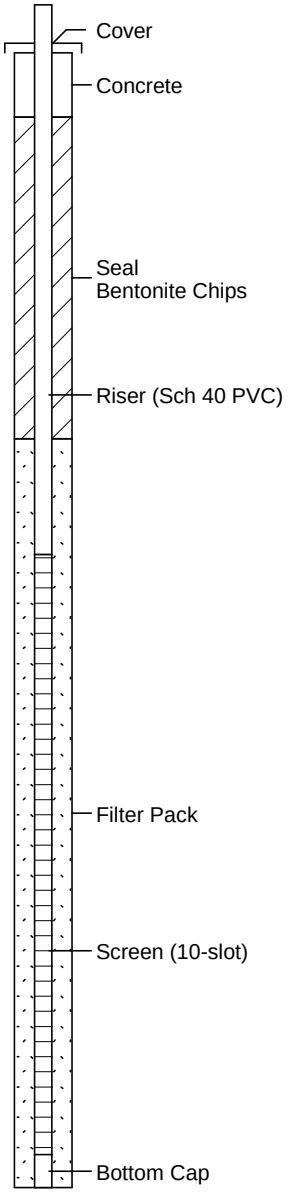
LOG OF BORING OW-157

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 10 SE, SW, SW

Date Completed	: 09/9/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD; 4 1/4" ID	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem (CME-550)	Land Surface Elevation	: 432.64
Sampling Method	: MacroCore (60")	Top of Casing Elevation	429.90
Drilling Company	: Terra Drill, Inc.	X,Y Coordinates	: 2382593, 556189

Depth in Feet	DESCRIPTION	Surf. Elev. 429.90	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	SILTY CLAY with Fly Ash, dark gray-brown, dry	429	1	48/48		CL/FL	
5	CLAY with Silt, hard, medium plasticity, light olive brown, moist	424	2	60/60		CH	
10	CLAY with Sand, stiff, wet	419				CL	
	CLAY, trace to some Sand, very stiff to hard, medium to high plasticity		3	60/60		CL/CH	
15	END BOREHOLE AT 17.5 FEET BLS	414	4	60/60			
	Terminated probing with MacroCore at 19.5 feet bls						
20							

Well: OW-157
Elev.: 432.64



KELRON ENVIRONMENTAL
Incorporated

LOG OF PROBEHOLE MW-161

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/21/2013	Driller	: John Gates
Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 428.74
Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 431.27
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2379206, 557078

Surf. Elev. 428.74

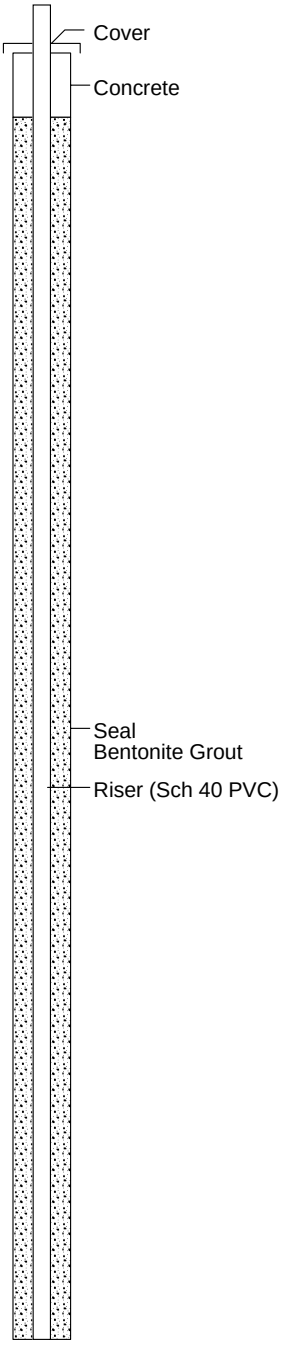
Depth in Feet	DESCRIPTION
0	FILL - Silt with clay, organics (roots), stiff, non-plastic, light yellowish brown (10YR 6/4), dry
	SILT with clay, roots, hard, brownish yellow (10YR 6/6)
	Silty CLAY with roots, very stiff, medium plasticity, with reddish-brown mottling and manganese staining, moist
5	- medium hardness, medium to high plasticity, light brownish gray (10YR 6/2) with mottling and manganese staining
	SILT, stiff, non-plastic, brownish yellow (10YR 6/6)
	- with clay, very soft, medium plasticity, wet
10	Silty CLAY, stiff to very stiff, high plasticity, light brownish gray (10YR 6/2) with reddish brown and black mottling grading to light gray, moist
	SILT, very soft, non-plastic, light brownish gray (10YR 6/2)
	- wet
	Silty CLAY, stiff, medium plasticity, gray (10YR 6/1), moist
15	- soft to medium hardness, high plasticity, yellowish brown (10YR 5/6)
	- <25% mottling
20	

Elevations: 425, 420, 415, 410

Samples	Recovery inches	Qp TSF	USCS
1	38/42	2.75	FL/CL
2		>4.5	
3		3.0	ML
4	60/60	2.0	CL
5		2.0	
6		2.25	
7		2.5	
8		1.75	
9	60/60	1.0	ML
10		2.5	CL
11		1.0	
12		0.75	ML
13		2.0	CL
14	60/60	1.5	
15		1.25	
16		1.5	
17		1.25	
18		2.25	
19	60/60	2.0	
20		1.0	

GRAPHIC

Well: MW-161
Elev.: 431.27



KELRON ENVIRONMENTAL
Incorporated

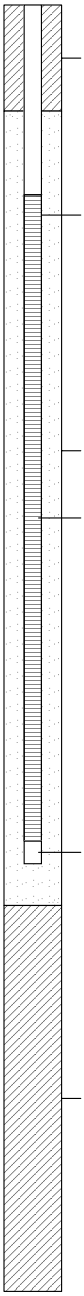
LOG OF PROBEHOLE MW-161

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/21/2013	Driller	: John Gates
Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 428.74
Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 431.27
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2379206, 557078

Well: MW-161
Elev.: 431.27

Depth in Feet	DESCRIPTION	Surf. Elev. 428.74	Samples	Recovery inches	Qp TSF	USCS
20			20		1.0	CL
	SILT with clay, stiff, low plasticity, brownish yellow (10YR 6/8)		21		2.0	ML
	- soft, yellowish brown (10YR 5/4), wet		22		2.0	
	Silty CLAY, stiff, low to medium plasticity, pale brown (10YR 6/3) with reddish-brown mottling, moist		23		1.0	CL
	- soft to very soft, high plasticity, light yellowish brown	405	24	60/60	0.75	
	- brown (10YR 5/3) with <10% reddish brown mottling					
25			25			
			26			
	- with fine sand		27		1.0	
			28			
	SAND with Silt, fine grained, gray-brown, wet	400	29	53/60		SP/SM
30			30			
	<Sample MC161-32 @ 31.5-32.5'> grain size analysis: 89.8% Sand, 10.2% Silt		31			
			32			
	- pale green (Gley1 5G 6/2)					
	CLAY (lean), trace fine-medium sand, hard, low plasticity, greenish-gray (10GY 5/1), moist [TILL]		33		3.0	CL
	- medium to stiff, medium to high plasticity	395	34	60/60	2.5	
35			35		1.25	
			36		1.5	
			37		1.75	
			38		3.0	
	- trace sand, stiff to hard	390	39	44/60	2.0	
40			40		1.5	



KELRON ENVIRONMENTAL
Incorporated

LOG OF PROBEHOLE MW-161

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/21/2013	Driller	: John Gates
Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 428.74
Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 431.27
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2379206, 557078

Well: MW-161
Elev.: 431.27

Depth in Feet	DESCRIPTION	Surf. Elev. 428.74	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
40			40		1.5		
			41		2.0	CL	
			42		1.5		
	Sandy SILT, medium hardness, non-plastic					ML	
	Silty CLAY with shale and fine-coarse limestone gravel (rounded to sub-rounded up to 1.5"), stiff to very stiff, greenish gray (Gley1 10Y 5/1)	385	43		2.0	CL	
	SHALE, laminated, hard, weathered (top of bedrock = 44.3' bls)		44	14/14	>4.5	SH	
45	END BOREHOLE AT 44.7 FEET BLS Refusal of Macrocore and Auger on top of competent bedrock						
		380					
50							
		375					
55							
		370					
60							

Seal
Bentonite Chips

11-08-2013 C:\Consulting A\Power Plants\Baldwin\Baldwin 2013 Hydrogeologic Study\Field Work Phase\Boring Logs\BEC161.BOR

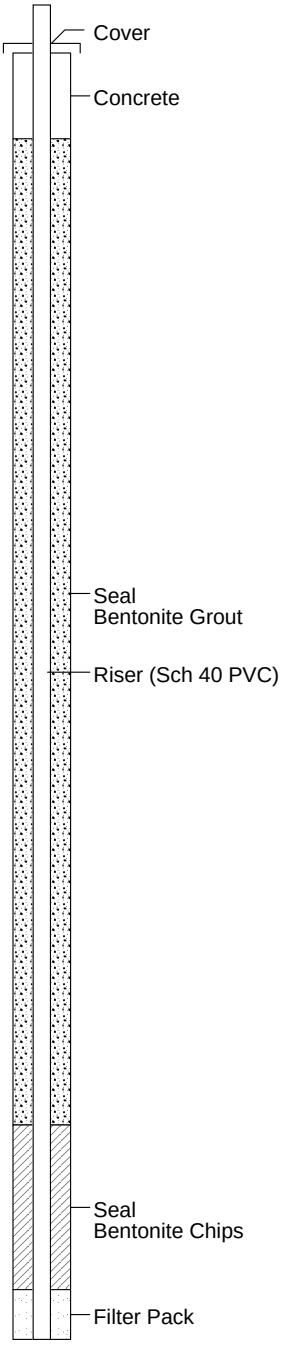
KELRON ENVIRONMENTAL Incorporated	LOG OF PROBEHOLE MW-162 (Page 1 of 2)

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/20/2013	Driller	: John Gates
Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 430.83
Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 433.20
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2379193, 555725

Depth in Feet	DESCRIPTION	Surf. Elev. 430.83	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	Continous Boring - no soil sampling conducted. Descriptions of subsurface materials on this log are from adjacent boring log for well MW-262.	430					
	Silty Clay with gravel, roots, stiff, non-plastic, pale brown (10YR 6/3), dry						
	- brownish yellow (10YR 6/6), moist						
						CL	
5	- medium stiff, high plasticity	425					
	SILT, very soft, non-plastic, light yellowish brown (10YR 6/4), moist [LOESS]						
	- clayey, soft to medium hardness, low to medium plasticity						
10		420					
						ML	
	- soft, yellowish brown (10YR 5/4)						
	- non-plastic						
15							

Well: MW-162
Elev.: 433.20



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KELRON ENVIRONMENTAL
Incorporated

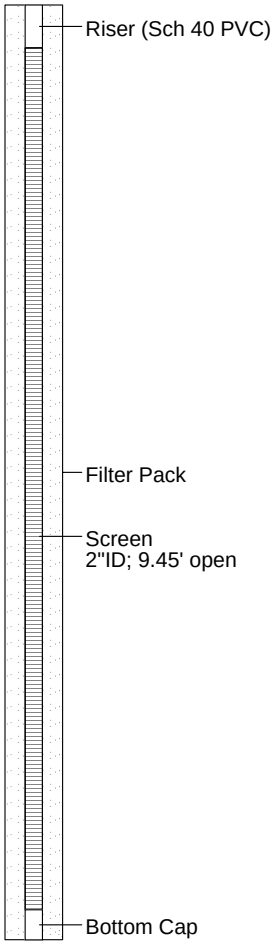
LOG OF PROBEHOLE MW-162

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/20/2013	Driller	: John Gates
Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 430.83
Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 433.20
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2379193, 555725

Depth in Feet	DESCRIPTION	Surf. Elev. 430.83	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
15		415				ML	
	Sandy CLAY (lean), medium hardness, low to medium plasticity, yellowish brown, moist					CL	
	SILT, very soft, non-plastic, brownish yellow (10YR 6/6), moist					ML	
20		410					
	Silty CLAY, very soft, low plasticity - medium plasticity, wet					CL	
25		405					
	END BOREHOLE AT 25.9 feet BLS						
30							

Well: MW-162
Elev.: 433.20



APPENDIX C2

PZ 100 SERIES BORING LOGS AND WELL DETAILS

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		PZ-169

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Chad Dutton Bulldog Drilling	7/27/2015	7/28/2015	hollow stem auger

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
PZ-169	Feet (NAVD88)	420.01 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 557,323.57 N, 2,381,764.94 E E /Ⓦ

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 49.0632"

Long -89° 52' 12.9108"

Local Grid Location

Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24 15.5	4 9 10 11	1	0 - 0.2' **SILT:** ML, dark grayish brown (10YR 4/2), trace roots and clay, very soft (<0.25 tsf), dry. 0.2 - 2' **SILTY CLAY** CL/ML, brown (10YR 5/3), cohesive, nonplastic to low plasticity, dry.	ML CL/ML								
2 ST	24 22		2 3	2 - 4' Shelby Tube Sample.									ST2: 24" push at 500lbs of pressure.
3 SS	24 21	2 3 6 6	4 5	4 - 10' **SILTY CLAY** CL/ML, dark yellowish brown (10YR 3/6), trace brown (10YR 5/3) and gray (10YR 6/1) mottling, cohesive, nonplastic to low plasticity, stiff to very stiff (1.0-2.5 tsf), dry to moist.									
4 SS	24 20	2 3 5 7	6 7		CL/ML								
5 SS	24 24	2 3 4 5	8 9	8' - 10' dark grayish brown (10YR 4/2), very dark brown (10YR 2/2) mottling, trace dark yellowish brown (10YR 6/3), cohesive, moist. 8.9' dark brown (10YR 3/3) mottling.									
6 SS	24 23	1 3 4 5	10 11	10 - 12' **SILTY CLAY** to **LEAN CLAY:** CL/ML, dark yellowish brown (10YR 3/6), trace yellowish brown (10YR 5/6) mottling, decreasing silt content with depth, moist. 10.3' trace wood pieces. 11.4' - 11.7' trace very dark brown (10YR 2/2) mottling.	CL/ML								
7 ST	24 24		12 13 14	12 - 14' Shelby Tube Sample.									ST7: 24" push at 400lbs of pressure.

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Natural Resource Technology
234 W. Florida St., Fifth Floor, Milwaukee, WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

NATURAL RESOURCE TECHNOLOGY

Boring Number PZ-169

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
8 SS	24 22	2 4 5 6	15	14 - 20' **LEAN CLAY:** CL, dark yellowish brown (10YR 3/6), grades to gray (10YR 6/1), yellowish brown (10YR 5/6) mottling, trace very dark brown (10YR 2/2) mottling, silt (5-30%), cohesive, low to medium plasticity, stiff to very stiff (1.5-3.5 tsf), moist.									
9 SS	24 22.5	2 3 5 5	16	16' - 19.9' dark yellowish brown (10YR 3/6) and yellowish brown (10YR 5/6) mottling.									
			17		CL								
10 SS	24 23	1 4 4 4	18	18' trace dark yellowish brown (10YR 6/3) mottling, trace silt, softer with depth.									
			19	18.8' trace very fine and coarse sand.									
11 SS	24 21	1 3 4 4	20	20 - 22' **SILTY CLAY** CL/ML, gray (10YR 6/1), dark yellowish brown (10YR 3/6) and trace very dark brown (10YR 2/2) mottling, trace to few very fine sand seams, cohesive, nonplastic to low plasticity, stiff to very stiff (1.75-2.5 tsf), moist.									
			21		CL/ML								
			22	21' trace very fine sand seams.									
12 ST	24 25		23	22 - 24' Shelby Tube Sample.									ST12: 24" push at 150lbs of pressure, wet tube (free water)
13 SS	24 24	1 2 3 5	24	24 - 28' **LEAN CLAY WITH SAND:** s(CL), pale brown (10YR 6/3), trace brownish yellow (10YR 6/6) mottling, very fine sand, trace coarse sand, trace silt, cohesive, soft, moist to wet.									
14 SS	24 24	1 1 2 4	25										
			26		s(CL)								
			27										
15 SS	24 21.5	4 6 8 10	28	28 - 30' **SILTY CLAY** CL/ML, gray (10YR 5/1), trace strong brown (7.5YR 5/6) and very dark brown (10YR 2/2) mottling, very fine sand (10-20%), trace coarse sand and fine gravel, stiff to hard (1.25->4.5 tsf), moist to wet (on bottom).									
			29		CL/ML								
16 SS	24 21	3 7 9 14	30	30 - 32' **LEAN CLAY:** to **SILTY CLAY** CL, yellowish brown (10YR 5/4), trace gray (10YR 5/1) and yellowish brown (10YR 5/6) mottling, silt (15-25%), trace very fine to fine gravel, cohesive, medium to high plasticity, very stiff (2.5-4.0 tsf), moist.									
			31		CL								
17 SS	24 20	4 6 10 13	32	30.2' small dark brown (10YR 3/3) fragments (possible shale).									
			33	32 - 38' **LEAN CLAY:** CL, yellowish brown (10YR 5/4), trace gray (10YR 5/1) mottling, silt (5-15%), trace fine to coarse sand, low to medium plasticity, medium to hard (0.75->4.5 tsf), dry to moist (increasing moisture content with depth).									
18 SS	24 17	4 6 13 16	34	33.1' - 33.3' dark gray (10YR 4/1).									
			35	34' - 35.4' no coarse sand, moist.	CL								
19 SS	11 11	5 50 for 5"	36	36' - 37' low plasticity, moist (decreasing moisture content with depth).									subangular gravel in shoe of sample SS19
			37										

NATURAL RESOURCE TECHNOLOGY

Boring Number PZ-169

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			38		CL								
20 SS	24 0	13 20 23 25		38 - 40' No Recovery.									
			39										
			40										
21 SS	18 6	16 35 50 for 6"		40 - 42' **LEAN CLAY:** CL, yellowish brown (10YR 5/4), trace gray (10YR 5/1) mottling, silt (0-10%), subrounded to subangular gravel (5-10%), trace fine to coarse sand, low to medium plasticity, medium to hard (0.75->4.5 tsf), moist to wet.	CL								
			41										
			42	42' End of Boring.									

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		PZ-170

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Chad Dutton Bulldog Drilling	7/29/2015	7/29/2015	hollow stem auger

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
PZ-170	Feet (NAVD88)	418.58 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 556,822.69 N, 2,381,944.92 E E /Ⓦ

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 44.106"

Long -89° 52' 10.6752"

Local Grid Location

Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24 8	4 5 6 9	1	0 - 2' **SILTY CLAY** CL/ML, yellowish brown (10YR 5/6), trace brown (10YR 5/3) and very dark brown (10YR 2/2) mottling, silt (15-25%), trace roots, grass, gravel, and coarse sand, cohesive, nonplastic to low plasticity, hard (>4.5 tsf), dry.	CL/ML								
2 ST	24 21		2 3	2 - 4' Shelby Tube Sample.									ST2: 24" push at 500lbs of pressure.
3 SS	24 15	2 3 5 7	4 5	4 - 8' **SILTY CLAY** CL/ML, yellowish brown (10YR 5/6), trace brown (10YR 5/3) and very dark brown (10YR 2/2) mottling, silt (5-15%), trace very fine sand and gravel, low plasticity, very stiff to hard (2.5->4.5 tsf), dry.	CL/ML								
4 SS	24 17	3 5 8 8	6 7	6' - 7.4' trace gray (10YR 5/1) mottling.									
5 SS	24 17	3 4 6 6	8 9	8 - 10' **SILTY CLAY** to **LEAN CLAY:** CL/ML, yellowish brown (10YR 5/6), trace brown (10YR 5/3) and very dark brown (10YR 2/2) mottling, silt (5-15%), trace very fine sand and gravel, silt content decreases with depth, clay content increases with depth, medium plasticity, very stiff (3.25 tsf), dry.	CL/ML								
6 SS	24 20	3 4 5 5	10 11	10 - 12' **LEAN CLAY:** CL, brown (5YR 4/3), trace very dark brown (10YR 2/2) mottling, trace silt, silt content increasing with depth, medium to high plasticity, stiff (1.75-2.0 tsf).	CL								
7 ST	24 24		12 13	12 - 14' Shelby Tube Sample.									ST7: 24" push at 250lbs of pressure.

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Natural Resource Technology
234 W. Florida St., Fifth Floor, Milwaukee, WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

NATURAL RESOURCE TECHNOLOGY

Boring Number PZ-170

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				12 - 14' Shelby Tube Sample. *(continued)*									
8 SS	24 21	3 5 7 8	14	14 - 24' **SILTY CLAY** CL/ML, yellowish brown (10YR 5/6), trace brown (10YR 5/3) and very dark brown (10YR 2/2) mottling, silt (10-20%), trace gravel, cohesive, low plasticity, stiff to very stiff (1.0-3.0 tsf), dry to moist.									
			15	14.9' - 15.3' very dark brown (10YR 2/2) mottling.									
9 SS	24 24	2 4 4 6	16	16' - 18.5' increaed very dark brown (10YR 2/2) mottling (5-15%), very fine sand (0-10%), trace fine gravel, subangular, cohesive, low to medium plasticity, dry to moist.									
			17	16.8' - 17.1' very dark brown (10YR 2/2) mottling.									
10 SS	24 24	1 3 3 3	18	18' - 20' silt (15-25%), very fine sand (0-10%), trace fine gravel, medium plasticity, moist.									
			19	19' layer of gravel (2" thick, subangular to subrounded).	CL/ML								
11 SS	24 20	1 2 5 7	20	19.8' very soft (0.25 tsf). 20' - 24' subangular to subrounded gravel, low plasticity, dry to moist.									
			21	20.8' increased gravel content (10-15%). 21.2' decrease in gravel content (5-15%).									
12 SS	24 20.5	3 6 8 10	22										
			23										
13 ST	24 24		24	24 - 26' Shelby Tube Sample.									ST13: 24" push at 650lbs of pressure.
			25										
14 SS	24 22	3 6 12 14	26	26 - 28.2' **SILTY CLAY** CL/ML, yellowish brown (10YR 5/6), trace brown (10YR 5/3) and very dark brown (10YR 2/2) mottling, silt (10-30%), very fine sand (0-15%), trace fine subangular to subrounded gravel, gravel decreases with depth to no gravel, trace <1mm thick very fine sand seams, cohesive, low to medium plasticity, plasticity increasing with depth, very stiff to hard (2.0->4.5 tsf), moist, decreasing silt and sand content with depth.	CL/ML								
			27										
15 SS	24 22	9 17 24 35	28										
			29	28.2 - 30' **LEAN CLAY:** CL, very dark gray (2.5Y 3/1), trace silt, cohesive, medium to high plasticity, hard (>4.5 tsf), dry.	CL								
16 SS	17 13	11 30 50 for 5"	30	28.5' black (2.5Y 2.5/1). 28.9' greenish gray (GLEY 1 6/1).									
			31	30 - 31.1' **SHALE:** to **LEAN CLAY:** BDX (SH), greenish gray (GLEY 1 6/1), trace silt, cohesive, medium to high plasticity, dry, shale (residual soil to highly decomposed, very weak, fissile).	BDX (SH)								
				31.1' End of Boring.									Hollow Stem Auger Refusal at 31.1 ft bgs on Shale Bedrock.

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		PZ-171

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Chad Dutton Bulldog Drilling	7/30/2015	7/31/2015	hollow stem auger

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
PZ-171	Feet (NAVD88)	431.54 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 556,453.57 N, 2,379,199.67 E E /W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 40.542"

Long -89° 52' 45.0804"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24 16	2 5 4 4	1	0 - 2' **SILT:** ML, brown (7.5YR 4/3), 5-15% clay, trace roots, cohesive, nonplastic, dry. 0.7' increase in clay content (15-25%).	ML								
2 ST	24 24		2 3	2 - 4' Shelby Tube Sample.									ST2: 24" push at 250lbs of pressure.
3 SS	24 18	1 3 3 3	4 5	4 - 10.8' **SILTY CLAY** CL/ML, brown (10YR 5/3), very dark brown (10YR 2/2) and dark yellowish brown (10YR 4/4) mottling, silt (10-20%), cohesive, low to medium plasticity, medium to stiff (0.5-1.75 tsf), moist.	CL/ML								
4 SS	24 24	1 3 3 5	6 7	6' low plasticity.									
5 SS	24 17	1 2 3 3	8 9	7.7' silt (25-35%), trace very fine sand, nonplastic to low plasticity. 8' silt (5-15%), medium plasticity.									
6 SS	24 24	2 2 3 4	10 11	10' silt (20-50%), silt content increasing with depth, moist. 10.8 - 12' **CLAYEY SILT** ML/CL, clay (30-50%), medium (0.5-0.75 tsf), moist.	ML/CL								
			12										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Natural Resource Technology
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NATURAL RESOURCE TECHNOLOGY

Boring Number PZ-171

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
7 ST	24 26		13	12 - 14' Shelby Tube Sample.									ST7: 24" push at 200lbs of pressure.
8 SS	24 24	2 3 3 5	14	14 - 20' **SILTY CLAY** CL/ML, brown (10YR 5/3), very dark brown (10YR 2/2) and dark yellowish brown (10YR 4/4) mottling, silt (30-40%), cohesive, low to medium plasticity, medium to stiff (0.75-2.0 tsf), moist.									
			15										
9 SS	24 24	2 3 5 5	16										
			17		CL/ML								
10 SS	24 20	1 3 5 8	18	17.4' - 19.7' dark yellowish brown (10YR 4/4), brown (10YR 5/3) mottling, clay (20-30%), cohesive, nonplastic, moist.									
			19										
11 ST	24 16		20	20 - 22' Shelby Tube Sample.									ST11: 24" push at 350lbs of pressure.
			21										
12 SS	24 21	1 1 2 2	22	22 - 26' **SILTY CLAY** CL/ML, brown (10YR 5/3), very dark brown (10YR 2/2) and dark yellowish brown (10YR 4/4) mottling, silt (10-20%), cohesive, low to medium plasticity, very soft to medium (0.25-1.0 tsf), moist.									
			23	22.8' - 23' sandy clay layer, very fine sand, wet.									
13 SS	24 17	WOR 1 2 3	24	24' - 26' silt (5-15%), medium to high plasticity, moist.	CL/ML								WOR = Weight of Rods
			25										
14 SS	24 24	1 1 2 2	26	26 - 28' **SILTY CLAY** to **SANDY LEAN CLAY:** CL/ML, yellowish brown (10YR 5/4), very fine sand (30-50%), increasing sand content with depth, silt (20-40%), decreasing silt content with depth, clay content decreasing with depth, cohesive, nonplastic to low plasticity, decreasing plasticity with depth, wet.	CL/ML								
			27										
15 SS	24 21.5	1 3 7 10	28	28 - 28.7' **CLAYEY SILT** to **POORLY-GRADED SAND:** ML/CL, yellowish brown (10YR 5/4), clay (10-20%), fine sand (10-20%), cohesive, nonplastic, wet.	ML/CL								
			29	28.7 - 36.6' **POORLY-GRADED SAND:** SP, yellowish brown (10YR 5/4), fine sand, silt (5-15%), clay (5-15%), medium and coarse grained sand (5-10%), wet.									
16 SS	24 24	4 4 3 4	30	30' trace clay, trace medium and coarse sand.	SP								
			31										
			32										

NATURAL RESOURCE TECHNOLOGY

Boring Number PZ-171

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
17 SS	24 21.5	5 9 15 20		28.7 - 36.6' **POORLY-GRADED SAND:** SP, yellowish brown (10YR 5/4), fine sand, silt (5-15%), clay (5-15%), medium and coarse grained sand (5-10%), wet. *(continued)*									
			33	32' - 33.8' sand grading from fine to very fine with depth.									
18 SS	24 22	5 15 19 22	34		SP								
			35										
19 SS	24 22	4 4 5 6	36	36' - 36.6' increase in silt content with depth (5-15%).									
			37	36.4' clay layer (2mm thick). 36.5' clay layer (2mm thick).									
			38	36.6 - 38' **LEAN CLAY:** CL, dark gray (2.5Y 4/1) to very dark gray (2.5Y 3/1), trace silt, trace fine sand seams, high plasticity, stiff (1.5-1.75 tsf), moist.	CL								
				38' End of Boring.									

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		PZ-172

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Chad Dutton Bulldog Drilling	7/31/2015	7/31/2015	hollow stem auger

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
PZ-172	Feet (NAVD88)	410.22 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 555,323.28 N, 2,379,176.11 E E /Ⓦ

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 29.3676"

Long -89° 52' 45.4188"

Local Grid Location ☐ N ☐ S Feet ☐ E ☐ W Feet

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24 17	3 6 5 4	1	0 - 0.5' **FILL, TOPSOIL:** ML, dark grayish brown (10YR 4/2), trace clay, gravel, roots, and grass, noncohesive, dry. 0.4' angular gravel.	(FILL) ML								
				0.5 - 2' **SILTY CLAY** CL/ML, yellowish brown (10YR 5/4), very dark brown (10YR 2/2) and strong brown (7.5YR 4/6) mottling, silt (5-15%), trace fine sand, cohesive, low plasticity, dry.	CL/ML								
2 ST	24 17		2 3	2 - 4' Shelby Tube Sample.									ST2: 24" push at 500lbs of pressure.
3 SS	24 19	2 3 4 6	4 5	4 - 9.2' **SILTY CLAY** CL/ML, yellowish brown (10YR 5/4), increased very dark brown (10YR 2/2) and strong brown (7.5YR 4/6) mottling, silt (5-15%), trace fine sand, cohesive, medium plasticity, very soft to very stiff (0.25-2.5 tsf), moist.									
4 SS	24 22	2 2 4 8	6 7	6' silt (10-20%), low to medium plasticity.	CL/ML								
5 SS	24 20	1 3 5 9	8 9	8' decreased mottling, trace brown silt seams, silt content increasing with depth (20-50%).									
				9.2 - 10' **SILT:** ML, brown (7.5YR 4/4), clay (5-15%), cohesive, nonplastic, moist.	ML								
6 ST	24 16		10 11 12	10 - 12' Shelby Tube Sample.									ST6: 24" push at 450lbs of pressure.

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

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NATURAL RESOURCE TECHNOLOGY

Boring Number PZ-172

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
7 SS	24 24	1 1 3 4		12 - 18' **SILTY CLAY** CL/ML, brown (7.5YR 4/4), cohesive, nonplastic to low plasticity, stiff to very stiff (1.25-2.75 tsf), moist.									
			13	13.3' soft (0.5 tsf).									
8 SS	24 24	2 3 4 7	14										
			15		CL/ML								
9 SS	24 22.5	2 4 4 6	16	15.8' hard (4.0 tsf).									
			17	16.6' - 16.8' increased very dark brown (10YR 2/2) mottling.									
10 ST	24 22		18	18 - 20' Shelby Tube Sample.									ST10: 24" push at 350lbs of pressure.
			19										
11 SS	24 23	1 3 3 3	20	20 - 21' **SANDY LEAN CLAY:** s(CL), dark gray (10YR 4/1), with clay seams, trace yellowish brown (10YR 5/8 mottling), cohesive, nonplastic, wet, clay seams (medium to high plasticity).	s(CL)								
			21	21 - 22' **SANDY LEAN CLAY WITH GRAVEL:** s(CL)g, mostly yellowish brown (10YR 5/8) with some dark gray (10YR 4/1), silt (>15%), cohesive, nonplastic.	s(CL)g								
12 SS	14 12	1 2 50 for 2"	22	22 - 24' **SILTY CLAY** CL/ML, yellowish brown (10YR 5/8) with dark gray (10YR 4/1) mottling, sand (5-15%), cohesive, low plasticity.	CL/ML								
			23										
13 SS	22 18	15 14 18 50 for 4"	24	24 - 26' **LEAN CLAY:** CL, trace gravel, hard (4.5 tsf), cohesive, dry.									
			25		CL								
14 SS	2 2	50 for 2"	26	26 - 26.2' **SHALE:** BDX (SH), clay (5-15%). 26.2' End of Boring.	BDX (SH)								

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		PZ-173

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Chad Dutton Bulldog Drilling	8/3/2015	8/3/2015	hollow stem auger

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
PZ-173	Feet (NAVD88)	388.43 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 555,035.38 N, 2,379,187.28 E E /Ⓦ

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 26.52"

Long -89° 52' 45.2892"

Local Grid Location

Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24 0		1	0 - 2' No Recovery. Gravel Pad.	(FILL)								
2 SS	24 13	2 2 2 3	2, 3	2 - 10.9' **SILTY CLAY** CL/ML, dark grayish brown (10YR 4/2), trace sand and wood, cohesive, medium plasticity, very stiff (2.5-3.5 tsf), moist.									
3 SS	24 7	2 5 4 5	4, 5	4' yellowish red (5YR 4/6) mottling.									
4 SS	24 20	2 4 8 9	6, 7	6' - 7.7' yellowish brown (10YR 5/6) with dark gray (10YR 4/1) mottling, hard, laminated, dry.	CL/ML								
5 SS	24 19	2 4 6 8	8, 9	8.2' very dark gray (10YR 3/1), trace dark yellowish brown (10YR 4/6) mottling, small hard nodules of clay in the matrix, dry to moist.									
6 SS	24 18	2 3 6 7	10, 11, 12	10.6' olive (5Y 5/6) with bluish gray (GLEY2 5/2) mottling. 10.9 - 13.8' **SILT:** ML, dark reddish gray (5YR 4/2), cohesive, nonplastic, stiff (2.0 tsf), moist.	ML								

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Patrick M Hafle

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NATURAL RESOURCE TECHNOLOGY

Boring Number PZ-173

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
7 SS	22 16	2 5 15 50 for 4"	13	10.9 - 13.8' **SILT:** ML, dark reddish gray (5YR 4/2), cohesive, nonplastic, stiff (2.0 tsf), moist. *(continued)* 12' - 13.3' trace brown (7.5YR 4/4) mottling, trace gravel, trace sand, increasing sand and gravel with depth. 12.6' wet.	ML								
8 SS	2 0	50 for 2" 50 for 1"	14	12.8' clay (0-15%). 13.8 - 14.1' **BEDROCK** BDX (SH), wet.	BDX (SH)								Hollow Stem Auger Refusal at 13.5 ft bgs on Bedrock. SS8: Rock chips in spoon.
9 SS	1 1			14.1' End of Boring.									Split Spoon Refusal at 14.1 ft bgs on Bedrock.

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		PZ-174

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Chad Dutton Bulldog Drilling	8/4/2015	8/4/2015	hollow stem auger

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
PZ-174	Feet (NAVD88)	398.97 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 554,666.23 N, 2,379,774.23 E E /W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 22.8552"

Long -89° 52' 37.9524"

Local Grid Location

Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24 5	2 3 5 3	1	0 - 2' **TOPSOIL:** ML, brown (10YR 4/3), trace grass and roots, cohesive, nonplastic, dry.	ML								
2 SS	24 0	2 2 2 4	2, 3	2 - 4' No Recovery.									
3 SS	24 6	2 2 4 5	4, 5	4 - 24.7' **LEAN CLAY:** CL, dark grayish brown (10YR 4/2), dark yellowish brown (10YR 4/4) mottling, silt (10-20%), cohesive, medium plasticity, moist.	CL								
4 SS	24 6	4 4 5 7	6, 7										
5 SS	24 23	3 4 5 5	8, 9	8' - 9.9' increased yellowish brown (10YR 4/4) mottling, increase in silt content with depth (50%).									
6 SS	24 20	2 4 8 6	10, 11, 12	10' - 11.7' decrease in silt content with depth (10-20%). 10.6' - 11.2' dark yellowish brown (10YR 4/4) and very dark brown (10YR 2/2) mottling (50%), dry to moist.									

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Patrick M Hoffe

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NATURAL RESOURCE TECHNOLOGY

Boring Number PZ-174

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
7 SS	24 21	2 3 5 7		4 - 24.7' **LEAN CLAY:** CL, dark grayish brown (10YR 4/2), dark yellowish brown (10YR 4/4) mottling, silt (10-20%), cohesive, medium plasticity, moist. *(continued)*									
			13	12' - 13.8' trace coarse sand, dry.									
8 SS	24 21	2 4 5 8	14	14' - 15.8' increased sand content, trace gravel, dry.									
			15										
9 SS	24 24	2 4 5 7	16	16' - 18' yellowish brown (10YR 5/4), moist.									
			17										
10 SS	24 24	3 7 9 12	18	18' - 20' coarse sand and gravel (5-15%), moist.	CL								
			19										
11 SS	24 24	3 7 9 15	20										
			21										
12 SS	24 24	4 7 8 10	22										
			23										
13 SS	8 8	11 50 for 2"	24	24' - 24.7' decreased moisture content with depth.									Hollow Stem Auger Refusal at 24.7 ft bgs on Shale Bedrock.
				24.7' End of Boring.									

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		PZ-175

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Chad Dutton Bulldog Drilling	8/7/2015	8/7/2015	hollow stem auger

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
PZ-175	Feet (NAVD88)	419.87 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 554,433.02 N, 2,380,846.31 E E /Ⓦ
1/4 of 1/4 of Section , T N, R

Lat 38° 11' 20.5152"
Long -89° 52' 24.5316"

Local Grid Location
Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24 17	4 7 5 4		0 - 0.9' **SILT:** ML, brown (10YR 5/3), trace roots and grass, noncohesive, nonplastic, hard (3.0->4.5 tsf), dry.	ML								
			1	0.9 - 5.4' **LEAN CLAY:** CL, brownish yellow (10YR 6/6), black (10YR 2/1) mottling, silt (5-15%), dry, cohesive, low plasticity, very stiff (2.5-3.0 tsf).									
2 SS	24 15	2 4 4 6	2	2' dry, increase in moisture content with depth, trace brown (10YR 5/3) silt seams.	CL								
			3										
3 SS	24 17	2 3 4 6	4	4' increased brown (10YR 5/3) and black mottling (10YR 2/1), moist.									
			5	5.4 - 13.5' **SILT:** ML, light yellowish brown (10YR 6/4), trace dark gray (10YR 4/1) mottling, clay (5-15%), moist, cohesive, nonplastic, medium to stiff (0.5- 1.5 tsf).									
4 SS	24 23	2 2 4 4	6										
			7										
5 SS	24 22	1 2 3 3	8	8' decreased mottling.									
			9		ML								
6 SS	24 24	1 2 2 2	10	10' brown (7.5YR 4/4), no mottling.									
			11										
7 SS	24 23	1 2 3 4	12	12' increasing clay content with depth, low plasticity.									
			13										
			14										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Patrick M Hafle

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NATURAL RESOURCE TECHNOLOGY

Boring Number PZ-175

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
8 SS	24 21	1 3 4 5	15	13.5 - 22.3' **LEAN CLAY:** CL, brown (7.5YR 4/4), silt (5-15%), moist, cohesive, low to medium plasticity, stiff to very stiff (1.5-4.0 tsf) increasing with depth. *(continued)*	CL								
			16	14' trace black (10YR 2/1) and dark gray (10YR 4/1) mottling, trace silt.									
9 SS	24 24	2 3 4 4		16' brown (7.5YR 5/4), silt (5-15%).									
			17										
			18										
10 SS	24 23	1 4 6 6		18' trace black (10YR 2/1) and dark gray (5-50% 10YR 4/1) mottling, trace silt, silt content decreasing with depth, wet.	CL								
			19										
			20										
11 SS	24 23	2 5 7 7		20' no black (10YR 2/1) mottling, yellowish brown (5-15% 10YR 5/8) mottling.									
			21										
			22										
12 SS	24 24	3 3 4 4		22.3 - 26' **SILT:** ML, clay (5-15%), trace coarse sand, decrease in clay content with depth, moist, cohesive, nonplastic, very soft to very stiff (<0.25-3.0 tsf) decreasing with depth.									
			23										
			24	23.9' sandy silt seam (2" thick), wet.									
13 SS	24 24	2 2 2 3		24' some sandy and clayey silt seams, trace coarse sand to fine gravel, moist to wet in sandy silt seams.	ML								
			25										
			26										
14 SS	24 24	11 8 9 10		26 - 28' **LEAN CLAY:** to **SILT:** CL, silt (40-60%), coarse sand to fine gravel (5-15%), trace fine sand seams, moist, cohesive, low plasticity, stiff (1.5-2.0 tsf).	CL								
			27										
			28										
15 SS	24 24	8 11 15 20		28 - 28.4' **SANDY SILT:** s(ML), yellowish brown (10YR 5/4), wet, cohesive, nonplastic, stiff (1.5 tsf).	s(ML)								
			29	28.4 - 31.3' **LEAN CLAY:** CL, yellowish brown (10YR 5/4), coarse sand to fine gravel (5-15%), trace fine sand seams, hard (>4.5 tsf), dry to moist.									
16 SS	24 24	9 19 20 23	30		CL								
			31										
			32	31.3 - 31.5' **WELL-GRADED SAND WITH GRAVEL:** (SW)g, dark yellowish brown (10YR 4/6), dry.	(SW)g								
17 SS	24 24	6 6 8 10		31.5 - 43.8' **LEAN CLAY:** CL, gray (10YR 5/1), dry, very stiff to hard (2.5->4.5 tsf), cohesive, nonplastic.									
			33	32' trace yellowish brown (10YR 5/6) seams and mottling, medium to high plasticity, increasing moisture content with depth.									
			34										
18 SS	24 24	7 5 6 8		34' trace mottling, moist, decreasing moisture content with depth.	CL								
			35										
			36										
19 SS	24 24	3 5 6 7		36' dry to moist, silty clay seam (4" thick, moist).									
			37										

NATURAL RESOURCE TECHNOLOGY

Boring Number PZ-175

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
20 SS	24 24	3 4 7 7	38 39	31.5 - 43.8' **LEAN CLAY:** CL, gray (10YR 5/1), dry, very stiff to hard (2.5->4.5 tsf), cohesive, nonplastic. *(continued)* 38' trace black (10YR 2/1) mottling. 38.3' yellowish brown (10YR 5/6) with gray (10YR 5/1) mottling.	CL								
21 SS	24 24	3 5 6 7	40 41										
22 SS	24 24	3 5 8 20	42 43	42' trace fine gravel.									
23 SS	24 20	3 11 12 14	44 45	43.8 - 45.7' **SANDY LEAN CLAY WITH GRAVEL:** s(CL)g, brown (10YR 5/3), mostly broken rock, moist. 44' black (10YR 2/1) mottling, seams of wet gravel, coarse sand to coarse gravel.	s(CL)g								
24 SS	24 24	3 5 7 11	46 47	45.7 - 50' **LEAN CLAY:** CL, light yellowish brown (10YR 6/4), brownish yellow (10YR 6/6) and dark gray (10YR 4/1) and black (10YR 2/1) mottling, trace fine gravel, some laminations, very stiff (2.5-3.5 tsf).	CL								
25 SS	24 24	4 7 12 20	48 49	48' moist to dry. 48.7' laminated, dry.									
26 SS	1 0	50 for 1"	50	50 - 50.2' **SHALE:** BDX (SH). 50.2' End of Boring.	BDX (SH)								Hollow Stem Auger Refusal at 50.2 ft bgs on Shale Bedrock.

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		PZ-176

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Chad Dutton Bulldog Drilling	8/6/2015	8/6/2015	hollow stem auger

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
PZ-176	Feet (NAVD88)	403.46 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 554,264.76 N, 2,381,381.02 E E /Ⓦ
1/4 of 1/4 of Section , T N, R

Lat 38° 11' 18.834"
Long -89° 52' 17.8428"

Local Grid Location
Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24 15	3 3 4 4		0 - 0.5' **TOPSOIL:** ML, dark grayish brown (10YR 4/2), clay (5-15%), trace grass and roots, cohesive, nonplastic, stiff (1.5 tsf), dry.	ML								
			1	0.5 - 2.4' **SILT:** ML, dark grayish brown (10YR 4/2), brownish yellow (10YR 6/6) and dark brown (10YR 3/3) mottling, clay (30-50%), trace roots, cohesive, low plasticity, very stiff (3.0 tsf), dry.	ML								
2 SS	24 16	3 3 5 5	2	2.4 - 6.3' **LEAN CLAY:** CL, dark yellowish brown (10YR 4/4), dark gray (10YR 4/1) mottling, silt (5-15%), trace roots, cohesive, medium plasticity, moist.									
3 SS	24 9	2 3 4 4	4	4' increase in silt content (40-60%), dry to moist.	CL								
4 SS	24 21	3 3 3 4	6	6.3 - 12' **SILT:** ML, dark gray (10YR 4/1), cohesive, nonplastic, moist.									
5 SS	24 12	1 1 1 2	8	8' sand (0-40%), sand content increasing with depth, moist to wet.	ML								
6 SS	24 13	1 1 1 2	10	10' increase in sand content (40-60%).									
			12										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Patrick M Hafle

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NATURAL RESOURCE TECHNOLOGY

Boring Number PZ-176

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
7 SS	24 / 20	1 2 3 5		12 - 12.3' **WELL-GRADED SAND:** SW, very dark grayish brown (10YR 3/2), fine gravel (>15%), moist.	SW								
			13	12.3 - 16' **LEAN CLAY:** CL, gray (10YR 5/1), brownish yellow (5-15% 10YR 6/6) and trace very dark brown (10YR 2/2) mottling, silt (5-15%), trace sand seams, cohesive, medium plasticity, stiff to very stiff (1.5-3.0 tsf).									
8 SS	24	2 3 3 5	14	14' increase in thickness of sand seams (1"-2" thick, moist, wet).	CL								
			15										
			16										
9 SS	24 / 17	2 4 7 10		16 - 28.6' **LEAN CLAY:** CL, dark gray (10YR 4/1), light yellowish brown (10YR 6/4) mottling, cohesive, low plasticity, very stiff to hard (3.5->4.5 tsf) dry.									
			17										
			18										
10 SS	24 / 18	4 6 8 12		18' increased mottling, mostly brown (10YR 5/3), brownish yellow (10YR 6/6), dark gray (10YR 4/1), and olive gray (5Y 5/2) mottling.									
			19										
			20										
11 SS	24 / 17	5 16 22 25		20' olive gray (5Y 5/2), brownish yellow (10YR 6/6) mottling.									
			21	20.3' dark gray (2.5Y 4/1), brownish yellow (10YR 6/6) mottling, clay becoming blocky and laminated.									
			22										
12 SS	11 / 7	7 50 for 5"		22' pale olive (5Y 6/3), dark gray (10YR 4/1) mottling, laminated.	CL								
			23										
			24										At 23.6' rock fragment on bottom of split spoon. Refusal of split spoon.
13 SS	24 / 24	13 21 31 43		24' brownish yellow (10YR 6/6) mottling.									
			25										
			26										
14 SS	24 / 24	14 12 17 19											
			27										
			28										
15 SS	8 / 8	9 50 for 2"		28' hard (4.5 tsf).									
16 SS	1 / 0	50 for 1"		28.6' End of Boring.									

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		PZ-177

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Chad Dutton Bulldog Drilling	8/5/2015	8/6/2015	hollow stem auger

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
PZ-177	Feet (NAVD88)	417.93 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 554,192.18 N, 2,381,923.59 E E /W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 18.0996"

Long -89° 52' 11.0496"

Local Grid Location

Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24 12	1 6 8 5	1	0 - 4' **TOPSOIL:** ML, dark yellowish brown (10YR 4/4), clay (5-15%), clay content increasing with depth, trace sand and roots, cohesive, nonplastic, dry.									
2 SS	24 4	4 4 6 7	2, 3		ML								
3 SS	24 17	2 3 4 5	4, 5	4 - 19.3' **LEAN CLAY:** CL, yellowish brown (10YR 5/4), trace black (10YR 2/1) and dark gray (10YR 4/1) mottling, silt (5-15%), moist, cohesive, medium plasticity, stiff to very stiff (1.0-3.5 tsf).									
4 SS	24 23	1 2 4 4	6, 7	6' dark yellowish brown (10YR 4/4), decreased mottling.									
5 SS	24 20	2 2 4 4	8, 9	8' trace black (10YR 2/1) and dark gray (10YR 4/1) mottling.									
6 SS	24 20	2 4 6 7	10, 11		CL								
7 SS	24 20	3 4 5 8	12, 13	12' yellowish brown (10YR 5/4), yellowish brown (10YR 5/8) mottling, trace coarse sand to fine gravel, no black mottling.									
8 SS	24 23	3 3 6 7	14, 15	14' trace black (10YR 2/1) mottling.									

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Patrick M Hafle

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NATURAL RESOURCE TECHNOLOGY

Boring Number PZ-177

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
9 SS	24 23	2 4 4 5	16 17	4 - 19.3' **LEAN CLAY:** CL, yellowish brown (10YR 5/4), trace black (10YR 2/1) and dark gray (10YR 4/1) mottling, silt (5-15%), moist, cohesive, medium plasticity, stiff to very stiff (1.0-3.5 tsf). *(continued)* 16' increased gravel content.	CL								
10 SS	24 24	1 2 3 2	18 19										
11 SS	24	2 2 3 4	20 21	19.3 - 22' **SILT:** ML, yellowish brown (10YR 5/4), brownish yellow (10YR 6/8) mottling, clay (5-15%), trace sand, cohesive, nonplastic, soft (0.5 tsf), wet. 20' increase in clay content with depth (30-50%), trace gravel.	ML								
12 SS	24 16	2 4 13 11	22 23	22 - 29.7' **LEAN CLAY:** CL, yellowish brown (10YR 5/4), strong brown (7.5YR 5/6) mottling, silt (5-15%), trace sand and gravel, stiff to hard (1.5->4.5 tsf) increasing with depth, moist to wet.	CL								
13 SS	24 24	3 4 7 9	24 25	24' sand (5-15%), moist. 24.5' - 25.3' black sand (0-15%).									
14 SS	24 24	4 6 11 13	26 27	26' no mottling, decreasing sand and gravel content with depth to trace, dry to moist, moisture content increases with depth, cohesive, low to medium plasticity, plasticity decreasing with depth.									
15 SS	24 22	5 7 15 50 for 5"	28 29	28' clay becoming laminated with depth. 28.7' brownish yellow (10YR 6/6), yellowish brown (10YR 5/4) mottling.									
16 SS	9 6	11 50 for 3"	30	29.7 - 30' **WELL-GRADED SAND:** SW, trace gravel and silt (noncohesive, nonplastic, rock flour), wet.	SW								
17 SS	1 1	50 for 1"		30 - 30.7' **SILTY GRAVEL:** GM, gravel is broken pieces of bedrock, silt is laminated, cohesive, and nonplastic. 30.7' End of Boring.	GM								Hollow Stem Auger Refusal at 30.7 ft bgs.

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		PZ-178

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Chad Dutton Bulldog Drilling	8/4/2015	8/5/2015	hollow stem auger

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
PZ-178	Feet (NAVD88)	428.45 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 554,089.94 N, 2,382,460.67 E E /Ⓦ

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 17.0736"

Long -89° 52' 4.3248"

Local Grid Location

Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24 16	2 7 5 5	1	0 - 6.3' **SILT:** ML, brown (10YR 5/3), clay (10-20%), noncohesive, nonplastic, stiff to hard (1.5->4.5 tsf) decreasing with depth, dry. 1' - 1.3' cohesive, moist.									
2 SS	24 19	2 7 8 6	2 3	2' yellowish brown (10YR 5/4), clay (0-15%), brown and gray mottling (30-50%), dry to moist.	ML								
3 SS	24 18	2 4 6 8	4 5	4' dark grayish brown (10YR 4/2), dark yellowish brown (10YR 4/6) mottling, increasing clay content, moist.									
4 SS	24 23	2 3 4 5	6 7	6.3 - 20' **LEAN CLAY:** CL, dark gray (10YR 4/1), dark brown (10YR 3/3) mottling, silt (5-15%), moist, cohesive, medium plasticity.	CL								
5 SS	24 23	1 3 3 4	8 9										
6 SS	24 24	2 2 3 5	10 11 12	10' increased silt content.									

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Patrick M Hafle

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NATURAL RESOURCE TECHNOLOGY

Boring Number PZ-178

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
7 SS	24 22	1 2 4 5		6.3 - 20' **LEAN CLAY:** CL, dark gray (10YR 4/1), dark brown (10YR 3/3) mottling, silt (5-15%), moist, cohesive, medium plasticity. *(continued)*									
			13										
8 SS	24 22	2 4 6 8	14										
			15										
9 SS	24 22	3 4 6 7	16	16' trace coarse sand.	CL								
			17										
10 SS	24 20	2 4 6 9	18										
			19										
11 SS	24 24	2 4 7 6	20	20 - 24.3' **LEAN CLAY:** to **SILT:** CL, dark gray (10YR 4/1), dark brown (10YR 3/3) mottling, clay (40-60%), silt (40-60%), trace coarse sand, cohesive, medium plasticity, moist.									
			21										
12 SS	24 24	1 2 5 4	22	21.7' - 22' sand seam (mostly sand with silt).	CL								
			23	23' interbedded sand (mostly fine to medium sand), silt and clay layers, wet.									
13 SS	24 18	1 12 17 20	24	24.3 - 26' **SANDY SILT:** s(ML), medium to coarse sand, moist, cohesive, nonplastic.	s(ML)								
			25										
14 SS	24 22	8 16 18 25	26	26 - 26.3' **POORLY-GRADED SAND:** SP, yellowish brown (10YR 5/4), mostly fine sand, trace medium sand and silt, wet.	SP								
			27	26.3 - 43.5' **LEAN CLAY:** CL, fine to coarse sand (5-15%), trace gravel, yellowish brown (10YR 5/4), very stiff to hard (2.5->4.5 tsf), moist.									
15 SS	24 22	7 8 9 11	28	26.6' dark gray (10YR 4/1) mottling, silt (5-15%), increase in silt content with depth, trace very thin sand seams, trace black fine gravel, cohesive, nonplastic, dry.									
			29	28' - 28.6' wet in sand seams. 28.6' trace sand and silt, cohesive, medium to high plasticity, moist.	CL								
16 SS	24 19	4 7 9 13	30	30' trace fine gravel, no sand.									
			31										
			32										

NATURAL RESOURCE TECHNOLOGY

Boring Number PZ-178

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
17 SS	24 17	4 5 16 22		26.3 - 43.5' **LEAN CLAY:** CL, fine to coarse sand (5-15%), trace gravel, yellowish brown (10YR 5/4), very stiff to hard (2.5->4.5 tsf), moist. *(continued)*									
			33	32' increased mottling, trace fine gravel, no sand. 33' brown (10YR 4/3), no mottling, no gravel, trace silt, cohesive, very stiff, dry.									
18 SS	24 20	10 21 25 37	34	34' brown (10YR 5/3), yellowish brown (10YR 5/6) mottling (5-15%).									
			35										
19 SS	24 22	12 20 24 24	36	36' increase to yellowish brown (10YR 5/6) mottling (30-50%), trace coarse sand, becoming laminated with depth.									
			37										
20 SS	24	5 11 14 16	38	38.3' silt seam (very soft, wet), trace sand.	CL								
			39										
21 SS	24 24	5 10 13 17	40	39.6' dark gray grading to black with depth, trace olive yellow (2.5Y 6/6) mottling, silt (5-15%), dry to moist. 40' trace dark gray (10YR 4/1) and brownish yellow (10YR 6/8) mottling, no laminations, silt (5-15%), moist. 40.1' black seam (<0.25" thick).									
			41										
22 SS	17 17	7 16 50 for 5"	42	42' silt (30-50%), moist to dry, cohesive, nonplastic to low plasticity. 42.2' - 42.5' mostly silt seams [brownish yellow (10YR 6/6), dry].									
			43										
23 SS	1 0	50 for 1"		43.4' becoming laminated with depth. 43.5' End of Boring.									Hollow Stem Auger Refusal at 43.5 ft bgs.

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		PZ-182

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Chad Dutton Bulldog Drilling	7/29/2015	7/30/2015	hollow stem auger

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
PZ-182	Feet (NAVD88)	428.47 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 556,433.70 N, 2,382,412.47 E E /W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 40.2432"

Long -89° 52' 4.836"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24 15	5 9 10 8	1	0 - 2' **SILTY CLAY** CL/ML, grayish brown (10YR 5/2), gravel (5-15%), cohesive, low to medium plasticity, dry. 0.9' - 2' yellowish brown (10YR 5/4), trace gray (10YR 6/1) mottling, silt (10-20%), medium to high plasticity.	CL/ML								
2 ST	24 23		2 3	2 - 4' Shelby Tube Sample.									ST2: 24" push at 550lbs.
3 SS	24 15.5	2 3 6 7	4 5	4 - 12' **SILTY CLAY** CL/ML, grayish brown (10YR 5/2), trace very dark brown (10YR 2/2) mottling, silt (5-15%) and gravel, trace sand, medium plasticity, medium to very stiff (0.75-2.75 tsf), moist.	CL/ML								
4 SS	24 20	3 4 5 6	6 7	6' - 7.7' low to medium plasticity. 7.2' increase in silt content (20-30%), increase in very fine sand content (5-15%).									
5 SS	24 23	1 3 3 4	8 9	9.3' sandy silt seams (sand is very fine).									
6 SS	24 20.5	1 3 4 4	10 11	9.9' sandy silt seams (sand is very fine). 10' - 12' medium plasticity.									
7 ST	24 21		12 13	12 - 14' Shelby Tube Sample.									ST7: 24" push.

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Natural Resource Technology
234 W. Florida St., Fifth Floor, Milwaukee, WI 53204
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Fax: (414) 837-3608

NATURAL RESOURCE TECHNOLOGY

Boring Number PZ-182

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				12 - 14' Shelby Tube Sample. *(continued)*									
8 SS	24 21	3 4 5 7	14	14 - 22' **SILTY CLAY** CL/ML, grayish brown (10YR 5/2), trace very dark brown (10YR 2/2) mottling, silt (10-20%), gravel (5-15%), trace sand, low to medium plasticity, medium to very stiff (0.75-3.0 tsf), moist.									
			15										
9 SS	24 22	3 4 6 7	16	16' color grades to grayish brown (10YR 5/2), dark yellowish brown (10YR 4/4) mottling, medium plasticity.									
			17	16.3' - 17.4' very dark brown (10YR 2/2) mottling.									
10 SS	24 24	3 4 6 7	18	18.4' trace coarse sand and subangular fine gravel.	CL/ML								
			19										
11 SS	24 17	1 4 5 7	20	20' 0-10% sand.									
			21	21.1' pocket of weak red (10R 5/4), medium sand (1" diameter).									
12 ST	24 20		22	22 - 24' Shelby Tube Sample.									ST12: 24" push at 200lbs.
			23										
13 SS	24 20	1 1 4 5	24	24 - 27' **SILTY CLAY** CL/ML, brown (10YR 5/3), trace very dark brown (10YR 2/2) mottling, silt (20-30%), gravel (5-15%), very fine to fine sand (10-20%), cohesive, medium to high plasticity, medium (0.5-0.75 tsf), moist to wet.									
			25										
14 SS	24 24	6 10 11 12 WOR 2 6 9	26	24.5' - 25.6' yellowish brown (10YR 5/6), grayish brown (10YR 5/2) mottling, trace subrounded gravel. 25.4' black (10YR 2/1) gravel (shale, 1" diameter), sand content increasing with depth.	CL/ML								
			27	26' decrease in very fine sand content 5-15%, medium plasticity, wet. 26.6' seam of coarse sand and fine gravel. 26.7' very stiff (3.0 tsf).									WOR = Weight of Rods.
15 SS	24 18		28	27 - 29.1' **WELL-GRADED SAND:** SW, yellowish brown (10YR 5/6), trace silt, clay, and fine gravel, wet.	SW								
			29	28' - 28.1' increase in very fine sand content.									
16 SS	24 16	6 12 15 19	30	29.1 - 30' **SANDY LEAN CLAY WITH GRAVEL:** s(CL)g, yellowish brown (10YR 5/6), well-graded sand (10-20%), subangular fine gravel (5-15%), trace silt, wet.	s(CL)g								
			31	30 - 34' **SILTY CLAY** CL/ML, brown (10YR 5/3), very dark brown (10YR 2/2) mottling, silt (20-30%), gravel (5-15%), very fine to fine sand (10-20%), cohesive, low to medium plasticity, stiff to very stiff (1.25-4.0 tsf), moist to wet.									
17 SS	24 10	16 15 19 26	32		CL/ML								
			33	30.8' - 31.1' layer of coarse sand and subangular fine gravel, clay (50%).									
			34	32' - 34' silt (10-20%), subangular gravel (5-10%), very fine sand (5-10%), sand and gravel content decreasing with depth, medium to low plasticity. 32.7' - 32.9' very dark gray (2.5Y 3/1), trace silt, high plasticity, dry.									
				34' End of Boring.									

APPENDIX C3

TPZ 100 SERIES BORING LOGS AND WELL DETAILS

KELRON ENVIRONMENTAL
Incorporated

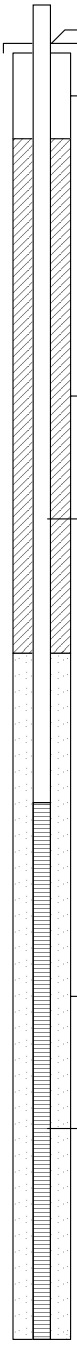
LOG OF PROBEHOLE TPZ-158

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/27/2013	Driller	: John Gates
Hole Diameter	: 4" OD	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: Solid Flight Auger (CME-55LC)	Ground Elevation	: 453.26
Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 456.26
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2387752, 556741

Depth in Feet	DESCRIPTION	Surf. Elev. 453.26	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	Silty Loam with roots, stiff, non-plastic, pale brown (10YR 6/3), dry		1	60/60	2	CL	
	- dark brown (10YR 3/3)		2		2.75		
	Silty CLAY, very stiff, low plasticity, gray (10YR 5/1) with yellowish-brown mottling, moist		3		3.75	CL	
		450	4		3.5		
	- 25-50% mottling w/ black oxidation staining		5		4.5		
5	- high plasticity, <25% mottling		6	60/60	2.5		
			7		2.5		
			8		1.25		
		445	9		1.25		
			10		1.75		
10			11	60/60	1.75		
			12		3.5		
	- trace fine-medium sand, brownish yellow mottling (10YR 6/8)		13		2.25		
	- trace fine-coarse sand and fine gravel (angular to sub-angular)	440	14		2.75		
	- few to little sand and gravel, very stiff, 50-75% mottling		15		2.5		
15	- high plasticity						

Well: TPZ-158
Elev.: 456.26

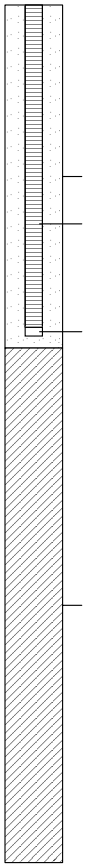


KELRON ENVIRONMENTAL Incorporated	LOG OF PROBEHOLE TPZ-158 (Page 2 of 2)

Phase II Hydrogeologic Investigation Baldwin Energy Complex Dynegy Midwest Generation, Inc.				
	Date Completed	: 08/27/2013	Driller	: John Gates
	Hole Diameter	: 4" OD	Geologist	: Stuart Cravens (Kelron)
	Drilling Method	: Solid Flight Auger (CME-55LC)	Ground Elevation	: 453.26
	Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 456.26
	Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2387752, 556741

Well: TPZ-158
Elev.: 456.26

Depth in Feet	DESCRIPTION	Surf. Elev. 453.26	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
15	- high plasticity		16	60/60	1.0	CL	
	- trace fine to medium sand, soft, light gray (10YR 6/1) with 50-75% brownish-yellow mottling		17		0.75		
	Sandy CLAY (fine to medium sand) with trace fine-coarse gravel (<1"), very soft		18		- -	SW	
	SAND, fine to coarse, well graded, brownish-yellow (10YR 6/8), wet	435	19		>4.5	CL	
	Sandy CLAY (fine-coarse sand) with gravel, hard, non-plastic, moist		20		>4.5		
20	Silty CLAY with trace sand and gravel, hard, medium to high plasticity, very pale brown (10YR 7/3) - very soft, high plasticity		21	60/60	<0.5		
	SAND, fine to coarse, well graded, yellowish-brown (10YR 5/8), wet		22		- -	SW	
			23		- -		
		430	24		- -		
			25		4.0	CL	
25	Silty CLAY with trace fine to coarse sand, hard, brownish-yellow (10YR 6/6), moist					SH	
	SHALE, weathered, gray (10YR 6/1), dry at 24.75' - platy/laminated, dark gray (10YR 4/1), at 24.9' - top of bedrock = 24.75' bls						
	END BOREHOLE AT 25 FEET BLS						
		425					
30							



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KELRON ENVIRONMENTAL
Incorporated

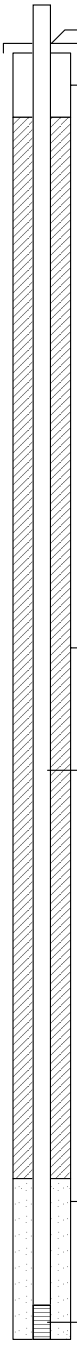
LOG OF PROBEHOLE TPZ-159

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/23/2013	Driller	: John Gates
Hole Diameter	: 4" OD	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: Solid Flight Auger (CME-55LC)	Ground Elevation	: 444.69
Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 447.64
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2383974, 558081

Depth in Feet	DESCRIPTION	Surf. Elev. 444.69	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	FILL - Bottom Ash with some clay and silt, soft, loose, dry					AR	
	FILL - Silty CLAY with some bottom ash, sand, and gravel, hard, low-medium plasticity, yellowish brown (10YR 5/4) with variable brown to gray mottling		1	49/60	- -	FL/CL	
5		440	2	7/42	- -		
			3	8/18	3.0		
10	- few bottom ash, very stiff, high plasticity, moist	435					
			4	0/60	- -		
15		430					
	Silty CLAY, trace fine-coarse sand, stiff, med plasticity, light yellowish brown (10YR 6/4), moist		5	60/60	2.5	CL	
			6		3.25		
			7		1.75		
	- high plasticity, gray (10YR 5/1) with <10% yellowish-brown mottling		8		2.0		
		425	9		3.0		
20							

Well: TPZ-159
Elev.: 447.64



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KELRON ENVIRONMENTAL
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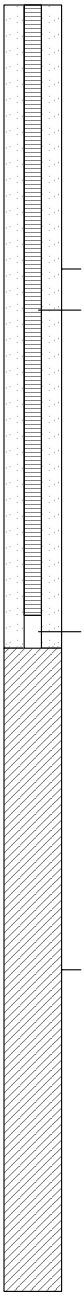
LOG OF PROBEHOLE TPZ-159

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/23/2013	Driller	: John Gates
Hole Diameter	: 4" OD	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: Solid Flight Auger (CME-55LC)	Ground Elevation	: 444.69
Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 447.64
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2383974, 558081

Depth in Feet	DESCRIPTION	Surf. Elev. 444.69	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
20	Silty CLAY, trace fine-coarse sand, stiff, med plasticity, light yellowish brown (10YR 6/4), moist						
			10	16/60	- -		
	- soft to medium hardness, yellowish-brown mottling with black manganese staining	420					
25			11	32/60	1.5		
			12		- -		
	- high plasticity, brown (10YR 5/3)		13		1.25		
			14		1.25		
	- trace fine-medium sand, very stiff, gray (10YR 6/1) with 10-25% yellowish-brown mottling (10YR 5/6)	415	15		2.75		
30			16	49/60	- -	CL	
	- no sand, brown		17		1.5		
			18		1.0		
	- trace sand, gray (10YR 6/1) with 10-25% yellowish-brown mottling		19		2.0		
	- trace fine-coarse sand and gravel (sub-angular to sub-rounded)	410	20		2.0		
35	- stiff, medium plasticity, pale brown (10YR 6/3) with <10% gray mottling		21	60/60	2.5		
			22		2.0		
			23		1.0		
			24		0.5		
	- few fine-coarse sand and fine gravel, very stiff, yellowish brown (10YR 5/8)		25		3.0		
	- hard, non-plastic, dry	405					
40							

Well: TPZ-159
Elev.: 447.64



KELRON ENVIRONMENTAL
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LOG OF PROBEHOLE TPZ-159

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/23/2013	Driller	: John Gates
Hole Diameter	: 4" OD	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: Solid Flight Auger (CME-55LC)	Ground Elevation	: 444.69
Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 447.64
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2383974, 558081

Well: TPZ-159
Elev.: 447.64

Depth in Feet	DESCRIPTION	Surf. Elev. 444.69	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
40	- trace sand and gravel, very stiff, high plasticity, brown (10YR 5/3) to pale brown (10YR 6/3)		26	50/60	2.75		
			27		- -	CL	
			28		<0.5		
	SAND, fine to coarse, well graded, greenish gray (Gley1 10Y 5/1), wet (2.4 inch seam)					SW	
		400	29		>4.5		
45	Silty CLAY, trace sand, hard grading to very stiff, low plasticity grading to high plasticity, dark gray (Gley1 4/N), moist [TILL]		30	5/60	- -	CL	
		395	31		3.25		
50	END BOREHOLE AT 50 FEET BLS						
		390					
55							
		385					
60							

Seal of MacroCore hole
Bentonite Chips

KELRON ENVIRONMENTAL
Incorporated

LOG OF PROBEHOLE TPZ-160

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/21/2013	Driller	: John Gates
Hole Diameter	: 4" OD	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: Solid Flight Auger (CME-55LC)	Ground Elevation	: 428.59
Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 431.49
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2380230, 558046

Surf. Elev. 428.59

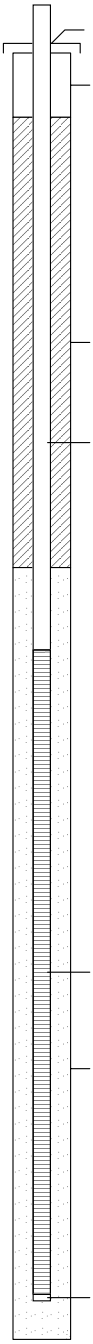
Depth in Feet	DESCRIPTION
0	Silty CLAY with grass / roots, hard, non-plastic, pale brown (10YR 6/3), dry
	- gray (10YR 6/1) with reddish-brown mottling and black oxidation staining
	- very stiff, low plasticity, brown (10YR 4/3), moist
	- high plasticity, grayish brown (10YR 5/2) with 10-25% reddish-brown mottling'
5	- gray (10YR 6/1), <10% mottling
	- 10-25% mottling, black organics
10	Sandy SILT, fine sand, very soft, non-plastic, light brownish gray (10YR 6/2), wet
	Clayey SILT, trace fine sand, very soft, medium plasticity, gray (10YR 6/1)
15	Silty CLAY, medium to high plasticity, gray with trace reddish-brown mottling, moist - 1-inch weathered zone with 75% yellowish-brown (10YR 5/8) mottling @ 14.5'
	SILT, gray (10YR 7/1), wet @ 14.9'
	CLAY, medium hardness,brown (10YR 5/3), moist - greenish gray (Gley1 10GY 5/1)
20	

Elevations: 425, 420, 415, 410

Samples	Recovery inches	Qp TSF	USCS
1	58/60	4.5	CL
2		3.25	
3		3.0	
4		3.0	
5		2.25	
6	58/60	1.5	
7		1.0	
8		1.0	
9		1.0	
10		1.0	ML
11	41/60	- -	
12		<0.5	
13		<0.5	
14		<0.5	
15		1.25	CL
16	16/60	- -	ML
17		1.25	CL
18		1.5	

GRAPHIC

Well: TPZ-160
Elev.: 431.49



KELRON ENVIRONMENTAL
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LOG OF PROBEHOLE TPZ-160

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/21/2013	Driller	: John Gates
Hole Diameter	: 4" OD	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: Solid Flight Auger (CME-55LC)	Ground Elevation	: 428.59
Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 431.49
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2380230, 558046

Well: TPZ-160
Elev.: 431.49

Depth in Feet	DESCRIPTION	Surf. Elev. 428.59	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
20			19	24/60	- -		
	- gray (10YR 6/1)						
	- very soft, brown (10YR 5/3)	405	20		<0.5		
	- soft, greenish gray		21		1.25		
25						CL	
			22	27/60	- -		
			23		0.75		
		400	24		1.0		
			25		1.5		
30	Silty CLAY with fine-coarse sand and fine gravel (sub-angular to sub-rounded), very stiff, greenish gray with reddish-brown mottling [TILL]		26		2.5		
			27	27/60	- -		
						CL	
	- very soft, high plasticity, yellowish-brown (10YR 5/4)		28		0.5		
	- medium plasticity, greenish gray with 50-75% yellowish-brown mottling, moist	395	29		0.5		
			30		1.5		
35	Sandy CLAY, stiff, dark yellowish-brown (10YR 4/4) with <25% greenish-gray mottling, dry					CL	
	END BOREHOLE AT 35 FEET BLS						
		390					
40							

Seal of MacroCore Hole
Bentonite Chips

KELRON ENVIRONMENTAL
Incorporated

LOG OF PROBEHOLE TPZ-163

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

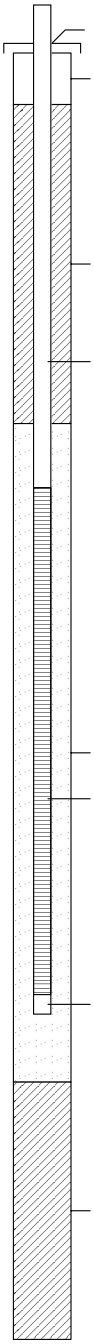
Date Completed	: 08/27/2013	Driller	: John Gates
Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 455.51
Sampling Method	: Split Spoon / Shelby Tube	Casing (MP) Elevation	: 458.41
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2385507, 555798

Surf. Elev. 455.51

Depth in Feet	DESCRIPTION	Samples	Blow Count	Recovery inches	Qp TSF	USCS
0	FILL - Silty clay loam with roots, loose, pale brown (10YR 6/3), dry (13" thick soil cover)					FL/CL
	FILL - Fly Ash, silty, loose very dark gray (10YR 3/1)					
	<Shelby Tube Sample ST163-3 @1.5-3.5'> grain size analysis (Ash - very dark brown): 51% Sand, 45.8% Silt, 3.2% Clay	1		9/24	- -	
5						
	- very soft, wet	2	1 0 1	18/18	<0.5	AR
10						
		3	1 0 1	18/18	<0.5	
15						
	Silty CLAY (lean to fat), trace fine sand, stiff, medium to high plasticity, gray (10YR 6/1) with 10-25% yellowish-brown mottling (10YR 6/8), moist	4	1 3 5	17/18	2.75	
20						CL/CH
	- very stiff	5	2 2 4	18/18	2.25	
25						

Surf. Elev. 455.51: 450, 445, 440, 435, 430

Well: TPZ-163
Elev.: 458.41



KELRON ENVIRONMENTAL
Incorporated

LOG OF PROBEHOLE TPZ-163

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/27/2013	Driller	: John Gates
Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 455.51
Sampling Method	: Split Spoon / Shelby Tube	Casing (MP) Elevation	: 458.41
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2385507, 555798

Well: TPZ-163
Elev.: 458.41

Depth in Feet	DESCRIPTION	Surf. Elev. 455.51	Samples	Blow Count	Recovery inches	Qp TSF	USCS	GRAPHIC
25	- dark yellowish brown <Shelby Tube Sample ST163-30 @ 28-30'> grain size analysis: 10.6% Sand, 51.2% Silt, 38.2% Clay		6		24/24	- -	CL/CH	
30		425						
	Silty CLAY with trace fine-coarse sand and fine gravel, stiff to very stiff, high plasticity, brownish-yellow (10YR 6/6), moist [TILL]		7	2 2 5	18/18	2.5		
35		420						
	- medium plasticity, pale brown (10YR 6/3) - brownish-yellow (10YR 6/6) with 10-25% light gray mottling (10YR 6/1)		8	5 5 7	18/18	3.5	CL	
40		415						
	SHALE, platy/laminated with weathered clay layers; hard, gray (10YR 5/1) with 25-50% olive yellow clayey layers (2.5Y 6/6) (top of bedrock = 43.5' bls)		9	5 7 8	18/18	>4.5	SH	
45	END BOREHOLE AT 45 FEET BLS	410						
50		405						

Seal of HSA hole
Bentonite Chips

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KELRON ENVIRONMENTAL
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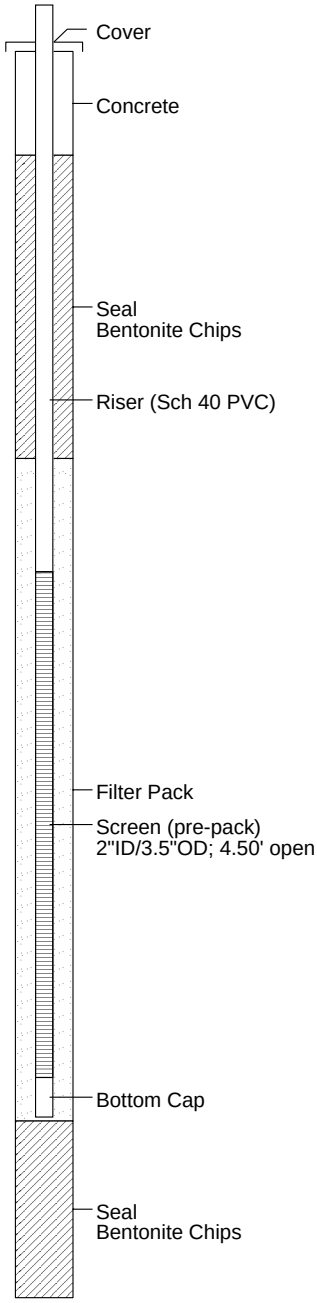
LOG OF PROBEHOLE TPZ-164

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/26/2013	Driller	: John Gates
Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 432.50
Sampling Method	: Split Spoon / Shelby Tube	Casing (MP) Elevation	: 435.10
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2383909, 556829

Depth in Feet	DESCRIPTION	Surf. Elev. 432.50	Samples	Blow Count	Recovery inches	Qp TSF	USCS	GRAPHIC
0	FILL - Bottom Ash, coarse, black (10YR 2/1), dry							
1								
2		430						
3	- moist <Shelby Tube Sample ST164-5 @ 3-5'> grain size analysis (Ash): 50% Sand, 42.9% Silt, 7.1% Clay	429						
4			1		17/24		AR	
5	- wet	428						
6		427						
7		426						
8		425						
9	CLAY (lean), stiff, medium to high plasticity, dark gray (10YR 4/1), moist - @8.9' - light yellowish brown (10YR 6/4) with <10% light gray mottling - @9.3' - gray (10YR 6/1) with 25-50% brownish-yellow mottling (10YR 6/6)	424	2	3 3 5	18/18		CL	
10	- light olive brown <Shelby Tube Sample ST164-12 @ 10-12'> grain size analysis: 7.2% Sand, 62.2% Silt, 30.6% Clay	423						
11		422	3		23/24		CL	
12	END BOREHOLE AT 10.3 FEET BLS END Split-Spoon Sampling at 12 feet BLS	421						
		420						
		419						

Well: TPZ-164
Elev.: 435.10



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KELRON ENVIRONMENTAL
Incorporated

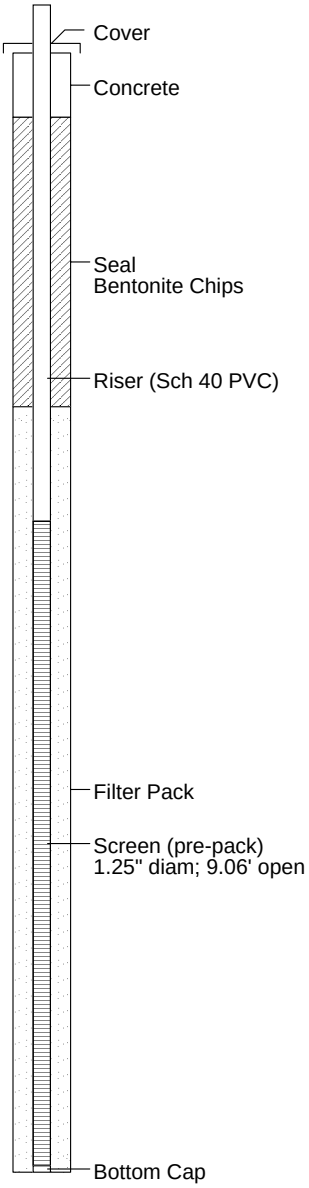
LOG OF PROBEHOLE TPZ-165

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/19/2013	Driller	: John Gates
Hole Diameter	: 4" OD	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: Solid Flight Auger (CME-55LC)	Ground Elevation	: 396.10
Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 398.85
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2380478, 555940

Depth in Feet	DESCRIPTION	Surf. Elev. 396.10	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	FILL - Fly Ash, silty, stiff, non-plastic to low plasticity, very dark grayish-brown (10YR 3/2), moist	395	1	41/60	1.75	AR	
			2		0.75		
	FILL - Silty Clay with Fly Ash, very soft, dark gray (10YR 4/1)		3		- -	FL/CL	
			4		- -		
			5		- -		
5	Silty CLAY (lean) with organics and roots, soft, high plasticity, dark gray	390	6	60/60	1.5	CL	
	- gray (10YR 5/1)		7		2.0		
			8		2.75		
	- trace sand, very dark gray brown <Shelby Tube Sample ST165-10 @ 8-10'> grain size analysis: 11.2% Sand, 59.2% Silt, 29.6% Clay		9		2.5		
			10		1.25		
10			11	49/60	2.0		
		385	12		0.5		
			13		0.5		
	Silty CLAY (lean) with trace fine-coarse sand and fine gravel, very soft, medium to high plasticity, dark gray (10YR 4/1), moist [TILL]		14		1.0	CL	
			15		0.5		
15			16	18/18	0.5		
		380	17		- -		
	LIMESTONE, hard, light gray, hammer refusal at 16.5', auger refusal at 17.4' bls (top of bedrock)					LS	
	END BOREHOLE AT 17.4 FEET BLS						
20							

Well: TPZ-165
Elev.: 398.85



KELRON ENVIRONMENTAL
Incorporated

LOG OF PROBEHOLE TPZ-166

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

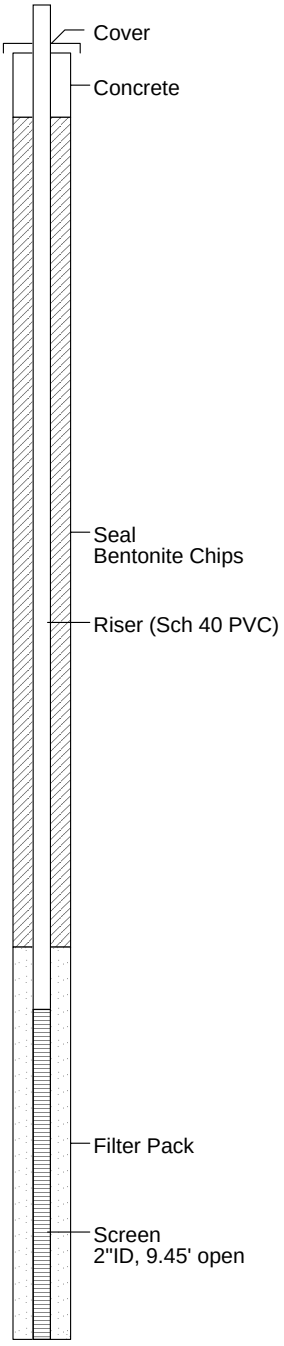
Date Completed	: 08/16/2013	Driller	: John Gates
Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 422.33
Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 425.18
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2381183, 555587

Well: TPZ-166
Elev.: 425.18

Depth in Feet	DESCRIPTION	Surf. Elev. 422.33
0	FILL - Silty CLAY, trace roots, very stiff, non-plastic, light brown gray (10YR 6/2), dry	
	- medium plasticity, pale brown (10YR 6/3) w/ trace manganese and iron oxide staining	
	- very stiff, yellowish brown (10YR 5/4) with 25% reddish-brown mottling	420
	- very stiff, low plasticity	
5	- gray mottling - 1-inch silt lense with high organics, trace roots	
	Silty CLAY, very stiff, medium plasticity, gray (10YR 6/1) with reddish-brown mottling and manganese staining	
	- medium to stiff, high plasticity, 25-50% manganese staining	415
	- no manganese staining	
10		
	- stiff, medium plasticity, yellowish brown (10YR 5/4) with 10-25% reddish-brown mottling, moist	410
15	- very soft, high plasticity	
	- very stiff, medium plasticity	
		405
	Silty CLAY with trace fine-coarse sand and fine gravel, very stiff, medium plasticity, yellowish brown (10YR 5/4) with <10% reddish-brown mottling, moist [TILL]	
	- hard, gray (10YR 6/1) with 10-25% reddish-brown mottling	
20		

Samples	Recovery inches	Qp TSF	USCS
1	60/60	2.75	FL/CL
2		2.75	
3		3.75	
4		1.5	
5		2.75	
6	60/60	1.5	CL
7		2.75	
8		1.75	
9		2.5	
10		2.5	
11	60/60	1.5	
12		1.5	
13		2.25	
14		2.0	
15		2.5	
16	60/60	1.0	
17		3.0	
18		3.0	CL
19		3.5	
20		3.25	

GRAPHIC



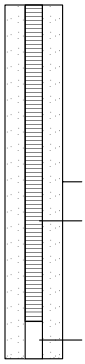
KELRON ENVIRONMENTAL Incorporated	LOG OF PROBEHOLE TPZ-166 (Page 2 of 2)

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/16/2013	Driller	: John Gates
Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 422.33
Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 425.18
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2381183, 555587

Depth in Feet	DESCRIPTION	Surf. Elev. 422.33	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
20	END BOREHOLE TPZ-166 AT 22' BLS.		21	24/24	>4.5	CL	
			22		>4.5		
	CONTINUE LOG USING URS BORINGS B-13-4 and B-13-5 FROM 08/01/2013	400					
25		395				CL	
30		390					
	SHALE, calcareous, fine grained, highly weathered, very weak, brown-gray to gray (top of bedrock = 32.53' bls; elevation = 389.8 ft NAVD88)						
35		385				SH	
	END URS LOGS AT 38 FEET BLS						
40							

Well: TPZ-166
Elev.: 425.18



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KELRON ENVIRONMENTAL
Incorporated

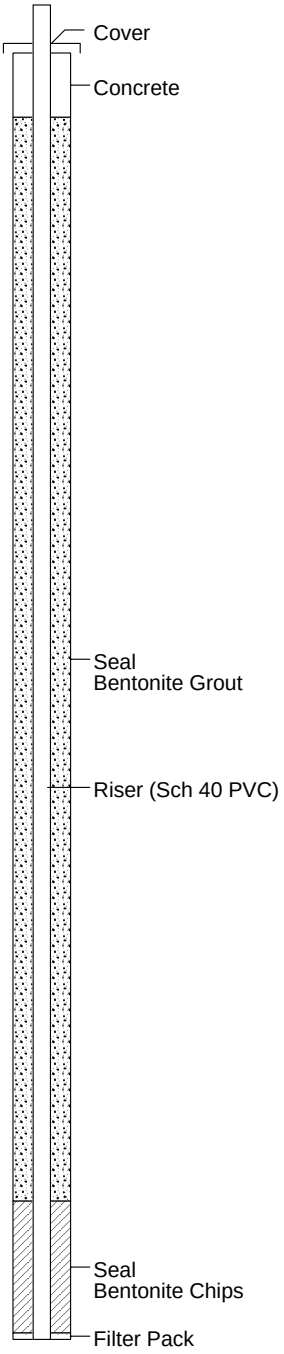
LOG OF PROBEHOLE TPZ-167

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/14/2013	Driller	: John Gates
Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 438.63
Sampling Method	: Split Spoon / Shelby Tube	Casing (MP) Elevation	: 441.38
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2381925, 554963

Depth in Feet	DESCRIPTION	Surf. Elev. 438.63	Samples	Blow Count	Recovery inches	Qp TSF	USCS	GRAPHIC
0	FILL - Fly Ash, silty to clayey with coarse sand grain size, soft, medium to high plasticity, dark gray (Gley 1 4/N), moist							
	- very soft, non-plastic, wet	435	1		18/18			
5								
	- dark greenish gray (10Y 4/1)	430	2	2 2 1	18/18		AR	
10								
	- silty with sand grain size, very dark greenish gray (10Y 3/1)	425	3	0 0 1	18/18			
15								
		420						
20								

Well: TPZ-167
Elev.: 441.38



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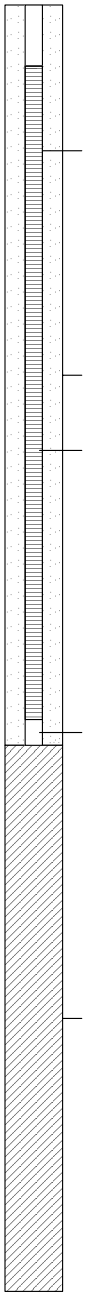
KELRON ENVIRONMENTAL Incorporated	LOG OF PROBEHOLE TPZ-167 (Page 2 of 3)			
Phase II Hydrogeologic Investigation Baldwin Energy Complex Dynegy Midwest Generation, Inc.	Date Completed	: 08/14/2013	Driller	: John Gates
	Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
	Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 438.63
	Sampling Method	: Split Spoon / Shelby Tube	Casing (MP) Elevation	: 441.38
	Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2381925, 554963

Depth in Feet	DESCRIPTION	Surf. Elev. 438.63	Samples	Blow Count	Recovery inches	Qp TSF	USCS	GRAPHIC
20								
	- dark greenish gray	415	4	0 0 1	18/18		AR	
25								
	- very dark gray brown <Sample SS167-30 @ 29-30'> grain size analysis (Ash): 1.5% Sand, 77.6% Silt, 20.8% Clay	410	5	0 0 0	18/18			
30								
	Silty CLAY (lean) with sand and trace fine gravel (chert, angular to sub-angular), very stiff, medium to high plasticity, light gray (10Y 7/N) with 15-50% reddish brown mottling, dry [TILL] <Shelby Tube Sample ST167-34 @ 32-34'> grain size analysis: 15.7% Sand, 52.6% Silt, 31.7% Clay	405	6		20/24		CL	
35								
		400	7	3 4 6	16/18	3.5		
40								

Well: TPZ-167
Elev.: 441.38



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KELRON ENVIRONMENTAL
Incorporated

LOG OF PROBEHOLE TPZ-167

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/14/2013	Driller	: John Gates
Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 438.63
Sampling Method	: Split Spoon / Shelby Tube	Casing (MP) Elevation	: 441.38
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2381925, 554963

Well: TPZ-167
Elev.: 441.38

Depth in Feet	DESCRIPTION	Surf. Elev. 438.63	Samples	Blow Count	Recovery inches	Qp TSF	USCS	GRAPHIC
40								
	- soft, brownish-yellow (10YR 6/6), moist	395	8	2 2 2	18/18	>4.5	CL	
45	- laminated, hard, non-plastic, black (3/4" thick organic-rich layer)						CL	
	CLAY (lean to fat) with sand, stiff to very stiff, medium to high plasticity, greenish gray (10YR 6/1), dry							
	- with sand and fine gravel (angular)		9	5 5 50	18/18	4.0	CL/CH	
		390	10	50	3/3			
	SHALE, weathered; clay (laminated) with platy and micaceous layer and limestone parting, dark gray (Gley1 4/N), dry (top of bedrock = 48.75' bls)		11	53	5/5		SH	
50	END BOREHOLE (Auger Refusal) at 48.75 feet BLS END Split-Spoon Sampling at 49.15 feet BLS							
		385						
55								
		380						
60								

Seal of HSA hole
Bentonite Chips

KELRON ENVIRONMENTAL
Incorporated

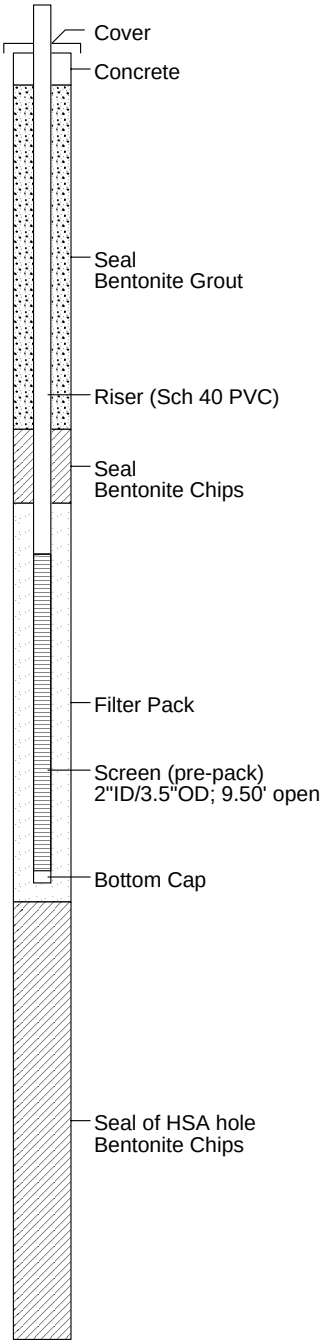
LOG OF PROBEHOLE TPZ-168

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/15/2013	Driller	: John Gates
Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 454.93
Sampling Method	: Split Spoon / Shelby Tube	Casing (MP) Elevation	: 457.53
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2383585, 554314

Depth in Feet	DESCRIPTION	Surf. Elev. 454.93	Samples	Blow Count	Recovery inches	Qp TSF	USCS	GRAPHIC
0	FILL - Fly Ash, silt size, greenish gray (10Y 5/1), moist							
	<Shelby Tube Sample ST168-5 @ 3-5'> grain size analysis: 29.4% Sand, 50.2% Silt, 20.4% Clay		1		21/24			
5		450						
	- wet		2	3 2 3	18/18			
10		445						
	- silty with coarse sand grain size, greenish black (10Y 2.5/1)		3	1 1 1	16/18		AR	
15		440						
			4		0/24			
20		435						
			5		3/18			
25		430						
	Silty CLAY, medium to stiff, high plasticity, light gray (10YR 7/1) with 10-50% reddish-brown mottling		6	3 3 5	18/18	2.0		
30		425						
							CL	
35		420						
			7	2 4 5	18/18	3.5	CL	
40		415						

Well: TPZ-168
Elev.: 457.53



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KELRON ENVIRONMENTAL
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LOG OF PROBEHOLE TPZ-168

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/15/2013	Driller	: John Gates
Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 454.93
Sampling Method	: Split Spoon / Shelby Tube	Casing (MP) Elevation	: 457.53
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2383585, 554314

Well: TPZ-168
Elev.: 457.53

Depth in Feet	DESCRIPTION	Surf. Elev. 454.93	Samples	Blow Count	Recovery inches	Qp TSF	USCS	GRAPHIC
40	Silty CLAY, trace sand and fine gravel (angular to sub-angular), stiff to very stiff, 10-25% reddish-brown mottling, moist [TILL]							
45		410						
	- light yellowish-brown (10YR 6/4) with <10% light gray mottling		8	3 7 10	18/18	3.5		
50	Clay, black (1/2" thick organic-rich layer) surrounded by highly weathered zone with >75% reddish-brown mottling	405						
55		400					CL	
	- medium to stiff, high plasticity, yellowish brown (10YR 5/4)		9	3 4 8	18/18	2.0		
60	- with 25-50% light gray mottling	395						
65		390						
	- with sand seams, very stiff, medium plasticity, dark gray (10YR 4/1)		10	10 16 18	18/18	>4.5		
70	SHALE, laminated, hard, dark gray (top of bedrock = 69.6' bls)	385					SH	
	END BOREHOLE AT 70 FEET BLS							
75		380						
80		375						

Seal of HSA hole
Bentonite Chips

APPENDIX C4

MW 200 SERIES BORING LOGS AND WELL DETAILS

KELRON ENVIRONMENTAL
INCORPORATED

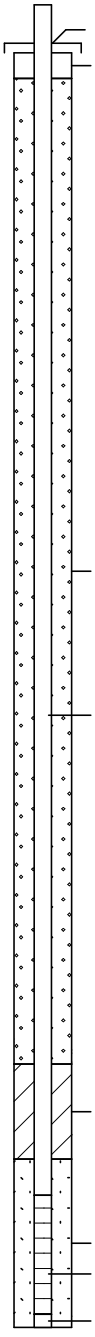
LOG OF BORING MW-252

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NE, NE

Date Completed	: 09/22/10	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 422.27
Sampling Method	: MacroCore (60")	Top of Casing Elevation	425.07
Drilling Company	: PSC	X,Y Coordinates	: 2382784, 553904

Depth in Feet	DESCRIPTION	Surf. Elev. 422.27	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	Continuous boring - no soil sampling conducted.	422					
	Refer to boring log for adjacent nested well MW-352 for a description of subsurface materials.						
5		417					
10		412					
15		407					
20		402					
25		397					
30		392					
35		387					
40		382					
45		377					
	END BOREHOLE AT 49.54 FEET BLS						
50							

Well: MW-252
Elev.: 425.07



KELRON ENVIRONMENTAL
INCORPORATED

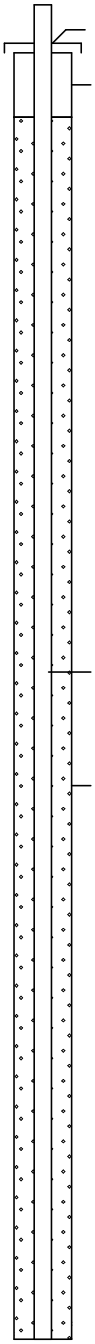
LOG OF BORING MW-253

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 15 SW, SW, NE

Date Completed	: 09/20/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 442.70
Sampling Method	: MacroCore (60")	Top of Casing Elevation	445.84
Drilling Company	: PSC	X,Y Coordinates	: 2384430, 553298

Depth in Feet	DESCRIPTION	Surf. Elev. 442.70	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	SILTY CLAY, trace gravel, hard, light brown, dry	442	1	25/48	4.5+	CL	
			2		4.5+		
5	- hard, medium plasticity, gray (2.5Y 6/1) with yellow-brown mottling (10YR 5/6), moist	437	3	47/60	4.5		
			4		4.5		
			5		4.5		
10		432	6	53/60	4.5		
	CLAY (fat) with SAND, trace gravel, dark yellow brown with light gray mottling, mottling decreases with depth - grain size analysis @ 11 - 12 ft: 0.7% gravel, 16.4% sand, 41.4% silt, 41.4% clay		7		4.0	CH	
			8		4.0		
			9		3.0		
15		427	10	52/60	4.5		
			11		3.5		
			12		3.5		
	- soft		13		2.0		
	CLAY (lean) with SAND, trace gravel, stiff to hard, medium plasticity, dark yellow brown		14	60/60		CL	
20							

Well: MW-253
Elev.: 445.84



KELRON ENVIRONMENTAL
INCORPORATED

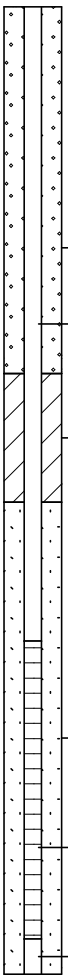
LOG OF BORING MW-253

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 15 SW, SW, NE

Date Completed	: 09/20/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 442.70
Sampling Method	: MacroCore (60")	Top of Casing Elevation	445.84
Drilling Company	: PSC	X,Y Coordinates	: 2384430, 553298

Well: MW-253
Elev.: 445.84

Depth in Feet	DESCRIPTION	Surf. Elev. 442.70	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
20	- grain size analysis @ 19 - 19.5 ft: 0.7% gravel, 26.9% sand, 38.1% silt, 34.3% clay	422	14	60/60		CL	
25	- small fine sand seams from 25 to 27 feet	417	15	60/60			
	CLAY (fat), shaley, platy/laminated, soft, low plasticity, light yellow brown (10YR 6/4)		16		3.5	CH	
	- stiff to very stiff, light olive brown (2.5Y 5/4) - grain size analysis @ 29 - 30 ft: 6.7% sand, 21.6% silt, 71.7% clay		17		3.0		
30		412	18	60/60	4.5		
			19		3.5		
	- Drove split-spoon 2-inches into bedrock: 34.5 to 34.7 feet bls		20		3.0		
	LIMESTONE with SHALE		21	2/2		LS/SH	
35	Auger refusal at 35.0 feet END BOREHOLE AT 35.0 FEET BLS	407					
40							



KELRON ENVIRONMENTAL
Incorporated

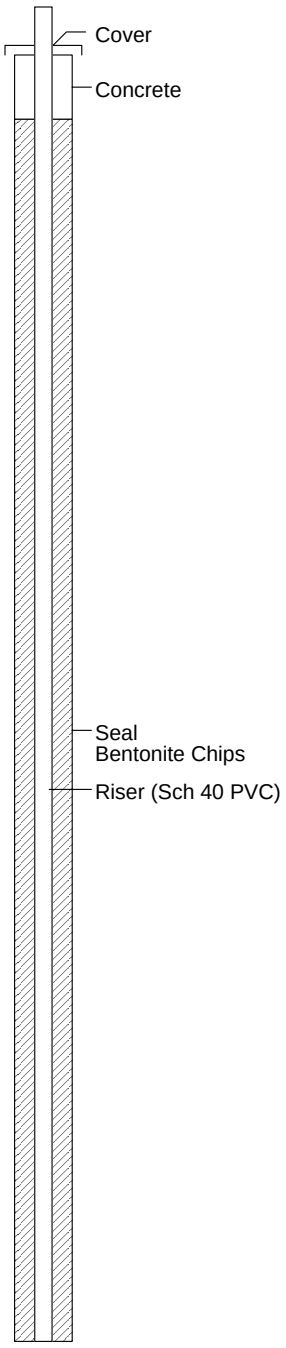
LOG OF PROBEHOLE OW-256

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/22/2013	Driller	: John Gates
Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 425.20
Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 427.70
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2381947, 558054

Depth in Feet	DESCRIPTION	Surf. Elev. 425.20	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	Continuous boring to 13.5 feet below ground surface. Refer to boring log for adjacent well OW-156.	425					
5		420				CL	
10		415					
15	CLAY (lean), very stiff, high plasticity, pale brown (10YR 6/3),moist - 25% reddish-brown mottling with black manganese staining - light gray (10YR 7/1) with 10-25% mottling	410	1	60/60	3.0	CL	
			2		2.25		
			3		2.0		
			4		2.0		
			5		1.75		
	Silty CLAY, trace fine to coarse sand [TILL]		6	60/60	2.5	CL	
20			7		1.0		

Well: OW-256
Elev.: 427.70



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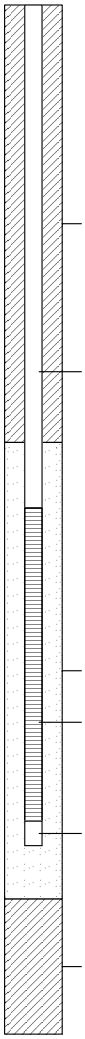
KELRON ENVIRONMENTAL Incorporated	LOG OF PROBEHOLE OW-256 (Page 2 of 2)

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/22/2013	Driller	: John Gates
Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 425.20
Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 427.70
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2381947, 558054

Well: OW-256
Elev.: 427.70

Depth in Feet	DESCRIPTION	Surf. Elev. 425.20	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
20	- trace fine-coarse gravel (angular to sub-angular; granite piece of 1 1/4"), 50-75% yellowish-brown (10YR 6/8) mottling - few sand and gravel, stiff, high plasticity, gray (10YR 6/1) with 25-75% mottling - <25% mottling - with sand (fine-medium)	405	7	60/60	1.0	CL	
			8		1.75		
			9		1.75		
			10		1.0		
			11		1.0		
25		400	12		2.0		
			13		1.0		
			14		1.0		
	SAND (fine-medium), well graded, brownish yellow (10YR 6/6), wet		15			SW	
	Silty CLAY (lean) with sand (fine-medium), medium plasticity, brownish yellow, wet		16	35/60		CL	
30		395	17				
	- hard, non plastic, light brownish gray (10YR 6/2), moist [Vandalia Till @ 31.5'] - little sand (fine-coarse) and gravel (fine-coarse, sub-angular to sub-rounded), low to non-plastic, gray (10YR 5/1)		18		>4.5		
			19				
			20				
	SHALE and CLAY, semi-competent, laminated clay with up to 1/2-inch thick layers of hard shale, dry [note: top of weathered bedrock at 33.9 feet below ground surface]		21	54/60	3.0	SH/CL	
35		390	22		4.0		
	SHALE with intermittent clay layers, hard, gray		23		>4.5	SH	
			24		>4.5		
			25		>4.5		
	END Sampling at 38.5 feet BLS END WELL BOREHOLE at 36.0 feet BLS						
40							



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KELRON ENVIRONMENTAL
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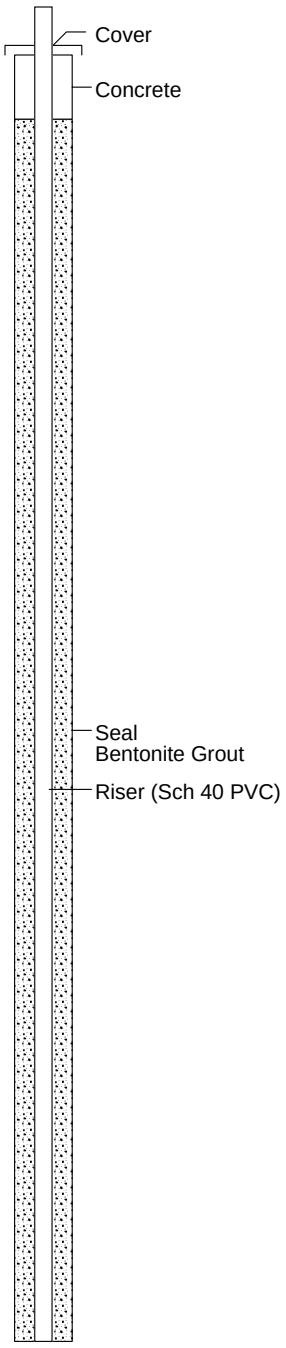
LOG OF PROBEHOLE OW-257

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/16/2013	Driller	: John Gates
Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 428.17
Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 431.02
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2382572, 556198

Depth in Feet	DESCRIPTION	Surf. Elev. 428.17	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	Continuous boring to 18.5 feet below ground surface. Refer to boring log for adjacent well OW-157.						
		425					
5							
		420				CL	
10							
		415					
15							
		410					
	Silty CLAY, trace sand and gravel, stiff, high plasticity, gray (10YR 6/1) with 25-50% reddish-brown mottling, moist [TILL]		1	56/60	3.0	CL	
20			2		2.75		

Well: OW-257
Elev.: 431.02



KELRON ENVIRONMENTAL
Incorporated

LOG OF PROBEHOLE OW-257

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

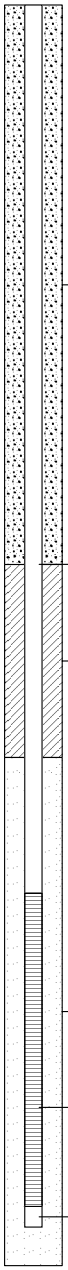
Date Completed	: 08/16/2013	Driller	: John Gates
Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 428.17
Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 431.02
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2382572, 556198

Well: OW-257
Elev.: 431.02

Depth in Feet	DESCRIPTION	Surf. Elev. 428.17
20	- >50% mottling	
	Sandy CLAY with gravel (fine-coarse, sub-angular; granite piece of 1.5"), brownish yellow (10YR 6/6), wet	
	Silty CLAY, trace sand and gravel, soft, high plasticity, yellowish brown (10YR5/6) with 10-25% light gray mottling	
		405
	- very soft, brownish yellow with <10% mottling	
25	- with trace pyrite crystals	
	- medium hardness grading to stiff	
		400
30	- stiff, high plasticity, gray with <10% reddish-brown mottling, moist	
	- very stiff, dark gray (10YR 4/1)	
		395
35	- low plasticity, very dark gray (10YR 3/1)	
	SHALE and CLAY (fat), intermittent lamination, hard, very dark gray, moist [note: top of weathered bedrock at 36.3 feet below ground surface]	
		390
40	END BOREHOLE at 39.6 feet BLS	

Samples	Recovery inches	Qp TSF	USCS
2		2.75	CL
3		2.5	CL
4		1.0	CL
5		1.5	
6	60/60	0.5	
7		1.0	
8		2.0	
9		2.0	
10		3.25	
11	60/60	1.5	
12		3.5	
13		2.75	
14		2.0	
15		3.5	
16	60/60	2.0	
17		2.0	
18		4.0	
19		3.0	SH/CL
20		>4.5	
21	13/13		

GRAPHIC



KELRON ENVIRONMENTAL
Incorporated

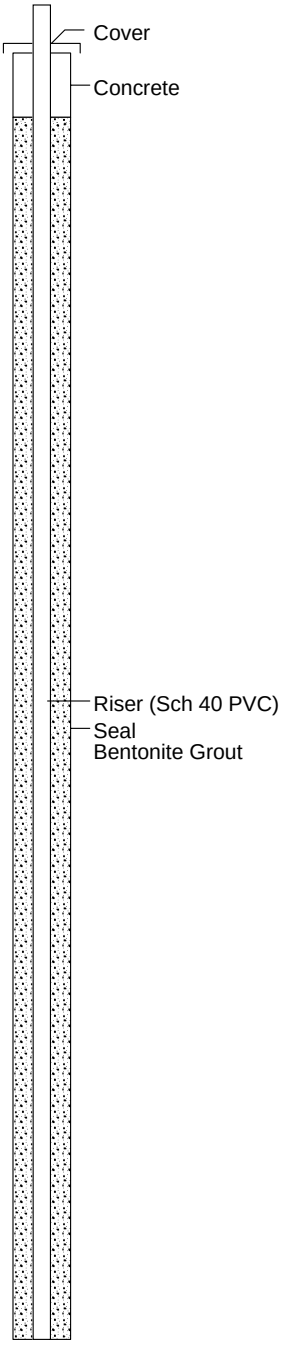
LOG OF PROBEHOLE MW-262

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/19/2013	Driller	: John Gates
Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 430.86
Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 433.21
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2379193, 555729

Depth in Feet	DESCRIPTION	Surf. Elev. 430.86	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	Silty Clay with gravel, roots, stiff, non-plastic, pale brown (10YR 6/3), dry	430	1	60/60	2.5	CL	
			2		>4.5		
	- brownish yellow (10YR 6/6), moist		3		3.25		
			4		2.5		
			5		2.25		
5	- medium stiff, high plasticity	425	6	42/42	1.5		
			7		1.75		
			8		2.0		
	SILT, very soft, non-plastic, light yellowish brown (10YR 6/4), moist [LOESS]		9	60/60	1.0	ML	
	- clayey, soft to medium hardness, low to medium plasticity		10		1.5		
10		420	11		1.25		
			12		1.5		
			13		1.5		
	- soft, yellowish brown (10YR 5/4)		14	60/60	1.0		
	- non-plastic						
15			15		1.25		
		415	16		1.25		
			17		1.5		
	Sandy CLAY (lean), medium hardness, low to medium plasticity, yellowish brown, moist		18		2.0	CL	
	SILT, very soft, non-plastic, brownish yellow (10YR 6/6), moist		19	60/60	2.0	ML	
20			20				

Well: MW-262
Elev.: 433.21



KELRON ENVIRONMENTAL
Incorporated

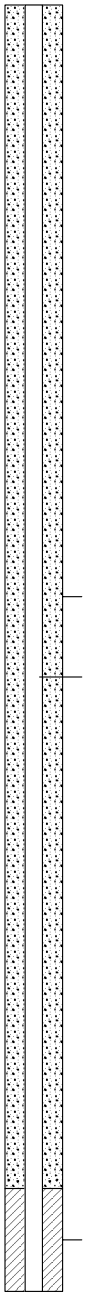
LOG OF PROBEHOLE MW-262

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/19/2013	Driller	: John Gates
Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 430.86
Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 433.21
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2379193, 555729

Well: MW-262
Elev.: 433.21

Depth in Feet	DESCRIPTION	Surf. Elev. 430.86	Samples	Recovery inches	Qp TSF	USCS
20		410	20, 21, 22			ML
	Silty CLAY, very soft, low plasticity		23		0.75	CL
	- medium plasticity, wet		24	60/60	0.75	
25			25		0.75	
		405	26		0.75	
	- high plasticity, yellowish brown (10YR 5/4)		27		0.5	
	- moist		28		1.25	
			29	53/60	1.0	
30	- with fine sand		30		0.75	
		400	31			
	SAND, fine to medium grained, with clay, yellowish brown (10YR 5/6), wet		32			SW/SC
	- light brownish gray		33			CH
	CLAY (fat), trace fine to medium sand, high plasticity, light brownish gray <Sample ST262-35 @ 33.5 - 35.5'> grain size analysis: 13.1% Sand, 33.2% Silt, 53.7% Clay		34	24/24		
35			35			
	- very stiff, greenish gray (Gley1 10Y 6/1)	395	36	16/36	2.75	
			37			
			38		2.75	
	- medium plasticity		39	56/60	1.0	
40			40		0.75	



11-08-2013 C:\Consulting A\Power Plants\Baldwin\Baldwin 2013 Hydrogeologic Study\Field Work Phase\Boring Logs\BEC262.BOR

KELRON ENVIRONMENTAL
Incorporated

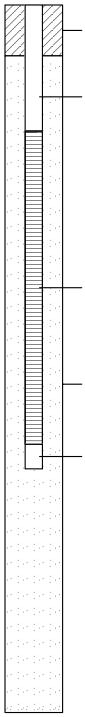
LOG OF PROBEHOLE MW-262

Phase II Hydrogeologic Investigation
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.

Date Completed	: 08/19/2013	Driller	: John Gates
Hole Diameter	: 8 1/2" OD / 4 1/4" ID	Geologist	: Stuart Cravens (Kelron)
Drilling Method	: HSA (CME-55LC)	Ground Elevation	: 430.86
Sampling Method	: MacroCore (60")	Casing (MP) Elevation	: 433.21
Drilling Company	: Bulldog Drilling, LLC	X,Y Coordinates	: 2379193, 555729

Depth in Feet	DESCRIPTION	Surf. Elev. 430.86	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
40	- with <10% reddish-brown mottling	390	40	60/60	0.75	CH	
			41		1.25		
	SAND with Silt, fine grained, poorly graded, light brown (10YR 6/4), wet		42		1.5	SP/SM	
	Sandy SILT		43			ML	
	Silty CLAY with fine sand, very soft, brownish yellow (10YR 6/6)		44		0.75	CL	
45			45		0.75		
	SAND, fine grained, poorly graded	385	46		1.25	SP	
	SAND, fine to coarse grained, well graded, trace gravel					SW	
	Silty CLAY with trace and and gravel, stiff, high plasticity, light yellowish brown (10YR 6/4), moist [TILL]		47		3.0	CL	
	- trace reddish-brown mottling		48		2.25		
			49	30/30	2.25		
50			50		2.25		
	SHALE, clay partings, laminated, gray, weathered, dry (top of bedrock = 50.4' bls)	380	51		3.5	SH	
	END BOREHOLE AT 51 feet BLS						
55		375					
60							

Well: MW-262
Elev.: 433.21



APPENDIX C5

MW 300 SERIES BORING LOGS AND WELL DETAILS

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		MW-304

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
John Gates Bulldog Drilling	10/9/2015	10/20/2015	4 1/4 HSA and rotary

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-304	Feet (NAVD88)	453.03 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 554,194.03 N, 2,386,608.77 E E /(W)

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 17.9952"

Long -89° 51' 12.39"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample: Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				0 - 5.8' **SILTY CLAY** CL/ML.	CL/ML								0-35.4' Blind Drilled. See log MW-104DR for soil description details.
			1										
			2										
			3										
			4										
			5										
			6	5.8 - 13.5' **FAT CLAY:** CH.	CH								
			7										
			8										
			9										
			10										
			11										
			12										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Natural Resource Technology
234 W. Florida St., Fifth Floor, Milwaukee, WI 53204

Tel: (414) 837-3607
Fax: (414) 837-3608

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-304

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				5.8 - 13.5' **FAT CLAY:** CH. *(continued)*	CH								
			13										
				13.5 - 15' **LEAN CLAY:** CL.	CL								
			14										
			15	15 - 23.5' **SILTY CLAY** CL/ML.	CL/ML								
			16										
			17										
			18										
			19										
			20										
			21										
			22										
			23										
				23.5 - 24.5' **SANDY FAT CLAY:** s(CH).	s(CH)								
			24										
				24.5 - 27.3' **POORLY-GRADED SAND:** SP.	SP								
			25										
			26										
			27										
				27.3 - 30' **SILTY CLAY** CL/ML.	CL/ML								
			28										
			29										
			30	30 - 35.4' **SHALE:** BDX (SH).	BDX (SH)								
			31										
			32										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-304

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				30 - 35.4' **SHALE**: BDX (SH). *(continued)*	BDX (SH)								
1 CORE	60 31		36	35.4 - 41.3' **LEAN CLAY:** CL, gray, 2" of wood on top of unit, stiff, dry. 36.3' stiff to very hard, dry. 36.7' trace chert gravel.	CL								
2 CORE	60 59.5		40	40.2' dry.									
			42	41.3 - 46.8' **SHALEY LIMESTONE:** BDX (LS/SH), thinly to medium bedded with shale, intensely to moderately fractured (extremely narrow apertures). 41.6' - 42' vertical fracture.	BDX (LS/SH)								
3 CORE	60 63		46	45.4' intensely fractured.									Core 3, RQD=75%
			47	46.8 - 55.6' **SHALE**: BDX (SH), gray, trace chert gravel, thickly bedded, highly to moderately decomposed, intensely fractured.	BDX (SH)								
4 CORE	60 65		51	50.4' moderately fractured.									Core 4, RQD=95%

Depth In Feet: 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-304

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				46.8 - 55.6' **SHALE:** BDX (SH), gray, trace chert gravel, thickly bedded, highly to moderately decomposed, intensely fractured. *(continued)*									
			53										
			54		BDX (SH)								
				54.4' intensely fractured.									
			55										
5 CORE	60 57			55.6 - 60.2' **LIMESTONE:** BDX (LS), shaley, thickly bedded, fossiliferous, unfractured to slightly fractured.									Core 5, RQD=95%
			56										
			57										
			58		BDX (LS)								
			59										Bedrock corehole reamed 6" in diameter to 59' for well installation.
			60										
6 CORE	60 64			60.2 - 81.6' **SHALEY LIMESTONE:** BDX (LS/SH), medium bedded, mostly fossiliferous limestone, highly decomposed dark gray shale beds, intensely to moderately fractured.									Core 6, RQD=73%
			61										
			62										
			63										
			64										
			65										
7 CORE	60 66												Core 7, RQD=64%
			66		BDX (LS/SH)								
			67										
			68										
			69										
			70										
8 CORE	60 63			70.3' thickly bedded with dark gray shale.									Core 8, RQD=88%
			71										
			72										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-304

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				60.2 - 81.6' **SHALEY LIMESTONE**: BDX (LS/SH), medium bedded, mostly fossiliferous limestone, highly decomposed dark gray shale beds, intensely to moderately fractured. *(continued)*									
			73										
			74										
			75	75' diagonal fracture (narrow aperture).									
9 CORE	60 60			75.3' intensely fractured.									Core 9, RQD=50%
			76										
			77		BDX (LS/SH)								
			78										
			79										
			80										
10 CORE	60 72			80.3' moderately fractured.									Core 10, RQD=43%
			81										
			82	81.6 - 91.9' **SHALE:** BDX (SH), gray, highly decomposed, intensely fractured.									
			83										
			84										
			85										
11 CORE	60 65			85.4' moderately to highly decomposed, intensely to moderately fractured.									Core 11, RQD=57%
			86										
			87		BDX (SH)								
			88										
			89										
			90										
12 CORE	60 61.5			90.5' extremely narrow to very narrow apertures.									Core 12, RQD=50%
			91										
			92										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-304

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			93	91.9 - 115.3' **SHALEY LIMESTONE:** BDX (LS/SH), thinly to medium bedded with shale, slightly to moderately decomposed shale, intensely to moderately fractured (extremely narrow to narrow apertures). *(continued)*									
			94										
			95										
13 CORE	60 62			95.3' tight to very narrow apertures.									Core 13, RQD=48%
			96										
			97										
			98										
			99										
			100										
14 CORE	60 65			100.4' thickly bedded, moderately fractured.									Core 14, RQD=65%
			101										
			102		BDX (LS/SH)								
			103										
			104										
			105										
15 CORE	60 60			105.3' medium bedded, slightly fractured (very narrow apertures).									Core 15, RQD=98%
			106										
			107										
			108										
			109										
			110										
16 CORE	60 72			110.3' moderately fractured.									Core 16, RQD=91%
			111										
			112										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-304

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			113	91.9 - 115.3' **SHALEY LIMESTONE:** BDX (LS/SH), thinly to medium bedded with shale, slightly to moderately decomposed shale, intensely to moderately fractured (extremely narrow to narrow apertures). *(continued)*	BDX (LS/SH)								
			114										
			115										
17 CORE	60 60.5		116	115.3 - 135.4' **LIMESTONE:** BDX (LS), fossiliferous, thinly to medium bedded, slightly fractured (narrow apertures).									Core 17, RQD=100%
			117										
			118										
			119										
			120										
18 CORE	60 59		121	120.4' trace cherty limestone, slightly to moderately fractured (extremely narrow to very narrow apertures).									Core 18, RQD=97%
			122										
			123										
			124		BDX (LS)								
			125										
19 CORE	60 60.5		126	125.3' slightly fractured (very narrow to narrow apertures).									Core 19, RQD=98%
			127										
			128										
			129										
			130										
20 CORE	60 60		131	130.4' very narrow apertures.									Core 20, RQD=98%
			132										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-304

Sample									Soil Properties					
Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram		Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			133 134 135	115.3 - 135.4' **LIMESTONE:** BDX (LS), fossiliferous, thinly to medium bedded, slightly fractured (narrow apertures). *(continued)*	BDX (LS)									
				135.4' End of Boring.										

LOG OF BORING MW-306

Project Name: SDR Landfill Project
Project Location: Baldwin Energy Complex, Baldwin, IL
Project Number: 6225
Elevation: 450.9 Feet

Date Drilled: 09/25/91
Drilling Contractor: Burlington Environmental
Drilling Method: H.S.A. & NX Rock Core
Logged By: Burlington Environmental

Elevation/ Depth (feet)	Graphic Log Sampler Symbols and SPT Blows	Rec. (in./in.)	USCS	Description	DD (pcf)	UCS (tsf)	MC (%)	Remarks
0				*Augered to 53.2 feet. No samples taken. See MW-124; BTB-39 for sample descriptions from 0-53.5 feet*				
450								
5								
445								
10								
440								
15								
435								
20								
430								
25								
425								
30				*(continued)*				

Notes: Data presented on this log has been transcribed from Boring Logs prepared by Burlington Environmental, presented in a report dated April 22, 1992.

GROUNDWATER

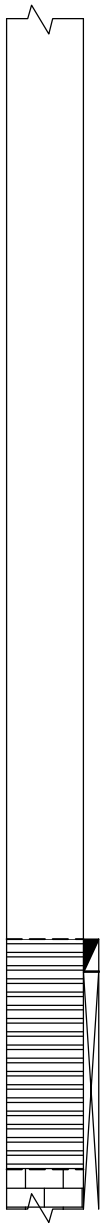
Piezometer Installed: No

Shively Geotechnical
A Division of Environmental Operations, Inc.
Missouri (314) 241-0900
Illinois (618) 398-1414

LOG OF BORING MW-306 (Cont.)

Project Name: SDR Landfill Project
Project Location: Baldwin Energy Complex, Baldwin, IL
Project Number: 6225
Elevation: 450.9 Feet

Date Drilled: 09/25/91
Drilling Contractor: Burlington Environmental
Drilling Method: H.S.A. & NX Rock Core
Logged By: Burlington Environmental

Elevation/ Depth (feet)	Graphic Log Sampler Symbols and SPT Blows	Rec. (in./in.)	USCS	Description	DD (pcf)	UCS (tsf)	MC (%)	Remarks
30, 420, 35, 415, 40, 410, 45, 405, 50, 400, 55, 395, 60				*Augered to 53.2 feet. No samples taken. See MW-124; BTB-39 for sample descriptions from 0-53.5 feet (continued)*				
		4/10		*Gray Clayey SHALE*				
		62/108		*Light Gray LIMESTONE* *(continued)*				

Notes: Data presented on this log has been transcribed from Boring Logs prepared by Burlington Environmental, presented in a report dated April 22, 1992.

GROUNDWATER

Piezometer Installed: No

Shively Geotechnical
A Division of Environmental Operations, Inc.

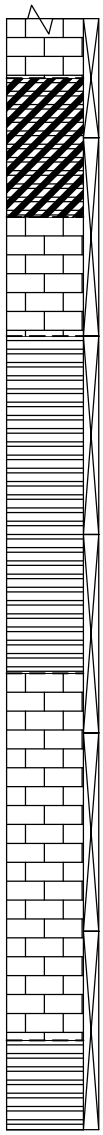
Missouri (314) 241-0900
Illinois (618) 398-1414

BORING LOG WITHOUT B DESIGNATION 6225 GINT LOGS.GPJ IL_DOT.GDT 2/19/10

LOG OF BORING MW-306 (Cont.)

Project Name: SDR Landfill Project
Project Location: Baldwin Energy Complex, Baldwin, IL
Project Number: 6225
Elevation: 450.9 Feet

Date Drilled: 09/25/91
Drilling Contractor: Burlington Environmental
Drilling Method: H.S.A. & NX Rock Core
Logged By: Burlington Environmental

Elevation/ Depth (feet)	Graphic Log Sampler Symbols and SPT Blows	Rec. (in./in.)	USCS	Description	DD (pcf)	UCS (tsf)	MC (%)	Remarks
60				*Light Gray LIMESTONE (continued)*				
390			CL	*Gray Shaley CLAY*				
65		60/60		*Light Gray LIMESTONE*				
385				*Olive Clayey SHALE*				
70		37/60		*-Dark Gray, Calcareous below 70.3 Feet*				
380								
75		60/60						
375				*Light Gray LIMESTONE*				
80		60/60						
370								
85		59/60						
365				*Dark Gray Clayey SHALE*				
				TD - 88.0 Feet				
90								

Notes: Data presented on this log has been transcribed from Boring Logs prepared by Burlington Environmental, presented in a report dated April 22, 1992.

GROUNDWATER

Piezometer Installed: No

Shively Geotechnical
A Division of Environmental Operations, Inc.
Missouri (314) 241-0900
Illinois (618) 398-1414

BORING LOG WITHOUT B DESIGNATION 6225 GINT LOGS.GPJ IL_DOT.GDT 2/19/10

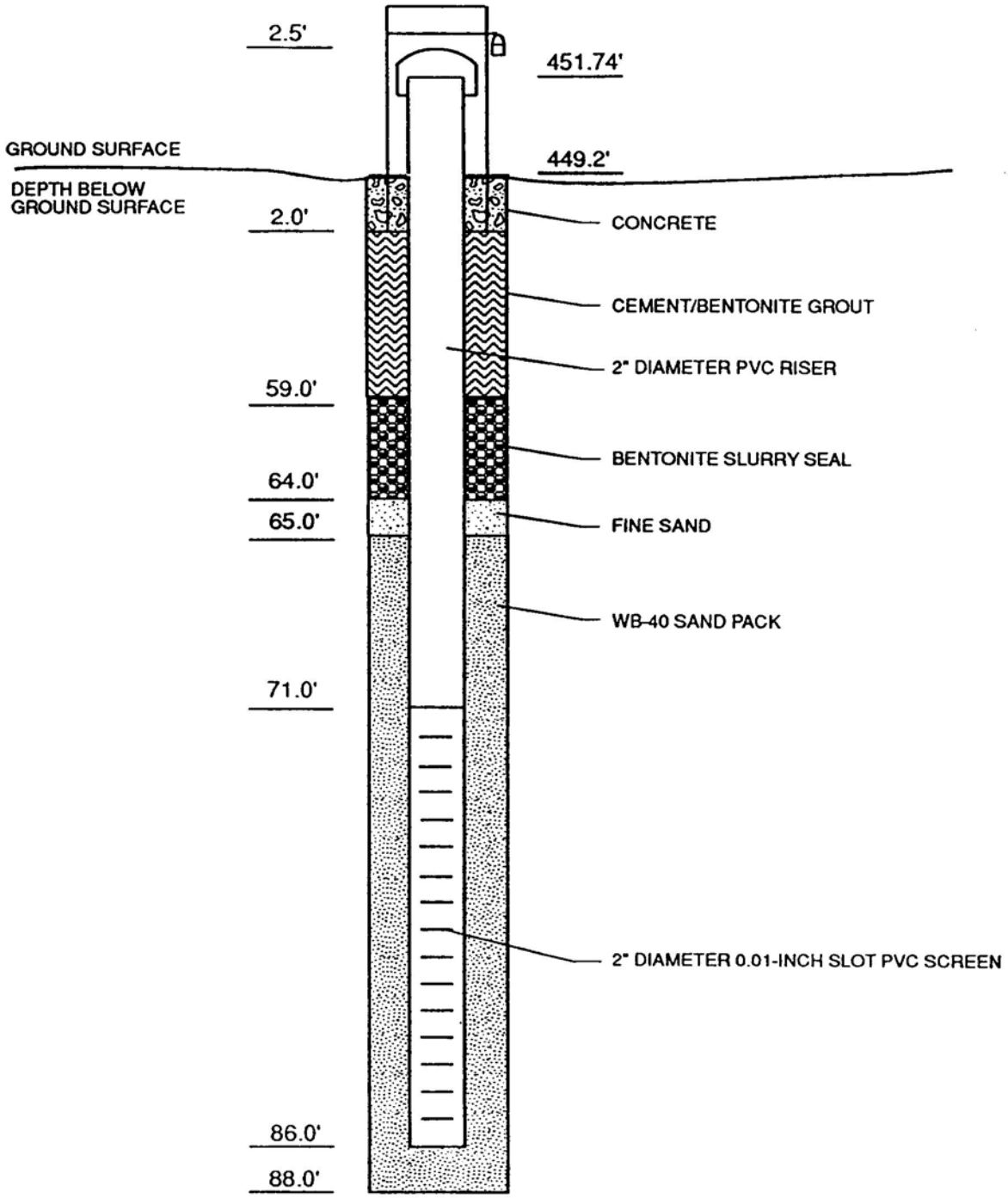
PROJECT MANAGER

PROJECT MANAGER

CHECKED BY

DRAWN BY

MH
REV. DATE 11/20/91



NOT TO SCALE

Burlington Environmental Inc.

BAMW - 306
MONITORING WELL
CONSTRUCTION DIAGRAM

BALDWIN FGD SOLID WASTE
BALDWIN, ILLINOIS
124081

BAMW-306

LOG OF BORING MW-124

Project Name: SDR Landfill Project
Project Location: Baldwin Energy Complex, Baldwin, IL
Project Number: 6225
Elevation: 451.0 Feet

Date Drilled: 09/19/91
Drilling Contractor: Burlington Environmental
Drilling Method: Hollow Stem Auger
Logged By: Burlington Environmental

Elevation/ Depth (feet)	Graphic Log Sampler Symbols and SPT Blows	Rec. (in./in.)	USCS	Description	DD (pcf)	UCS (tsf)	MC (%)	Remarks
0			CL	*Dark Brown Silty CLAY* *-2" Silt Seam at 0.2 Feet* *-Gray-Brown below 0.5 Feet*				
450		47/60						
5								
445			CH	*Gray-Brown CLAY, with Silt, Sand*				
		60/60						
10								
440		60/60						
15			CL	*Brown Silty CLAY*				
435		50/60						*Hit water at 17.0 feet.*
20				*-Gray-Brown from 19.5 to 20.0 Feet* *-Dark Gray-Brown with Sand, Trace Gravel below 20.0 Feet* *-1" Sand Seam at 21.3 Feet*				
430		60/60						
25								
425		60/60		*-2" Gravel Seam at 26.7 Feet*				
30				*(continued)*				

Notes: Data presented on this log has been transcribed from Boring Logs prepared by Burlington Environmental, presented in a report dated April 22, 1992.

GROUNDWATER

First Observed During Drilling - 17.0 Feet

Piezometer Installed: No

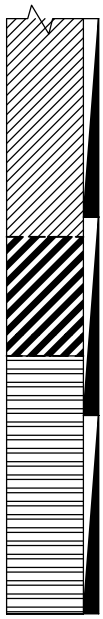
Shively Geotechnical
A Division of Environmental Operations, Inc.

Missouri (314) 241-0900
Illinois (618) 398-1414

LOG OF BORING MW-124 (Cont.)

Project Name: SDR Landfill Project
Project Location: Baldwin Energy Complex, Baldwin, IL
Project Number: 6225
Elevation: 451.0 Feet

Date Drilled: 09/19/91
Drilling Contractor: Burlington Environmental
Drilling Method: Hollow Stem Auger
Logged By: Burlington Environmental

Elevation/ Depth (feet)	Graphic Log Sampler Symbols and SPT Blows	Rec. (in./in.)	USCS	Description	DD (pcf)	UCS (tsf)	MC (%)	Remarks
30, 420		60/60	CL	*Dark Gray-Brown Silty CLAY, with Sand, Trace Gravel*				
35, 415		60/60	CH	*Dark Gray-Brown CLAY, with Silt, Sand*				
40, 410		60/60		*Dark Gray-Brown Weathered SHALE -Gray-Brown below 39.0 Feet*				
45, 405				*TD - 45.0 Feet*				
50, 400								
55, 395								
60								

Notes: Data presented on this log has been transcribed from Boring Logs prepared by Burlington Environmental, presented in a report dated April 22, 1992.

GROUNDWATER

First Observed During Drilling - 17.0 Feet

Piezometer Installed: No

Shively Geotechnical
A Division of Environmental Operations, Inc.
Missouri (314) 241-0900
Illinois (618) 398-1414

BORING LOG WITHOUT B DESIGNATION 6225 GINT LOGS.GPJ IL_DOT.GDT 2/19/10

KELRON ENVIRONMENTAL
INCORPORATED

LOG OF BORING MW-350

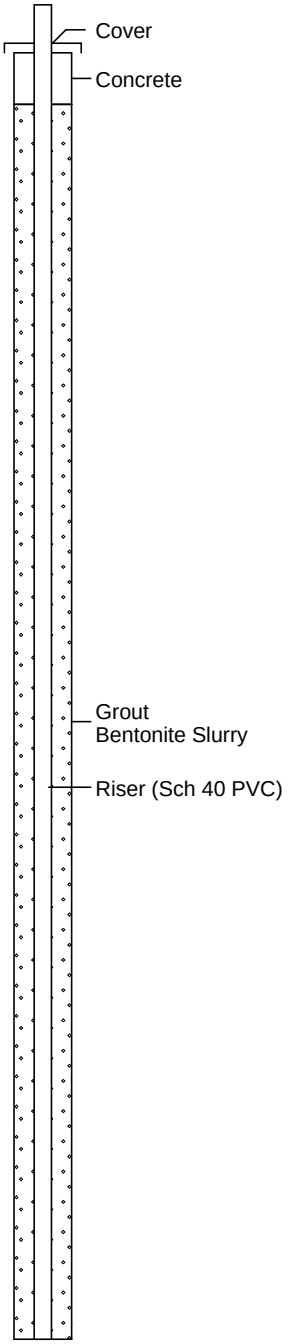
Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NW, NE

Date Completed	: 09/07/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID: 3 7/8" rock	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 394.11
Sampling Method	: MacroCore (60")/NX Core	Top of Casing Elevation	396.80
Drilling Company	: PSC	X,Y Coordinates	: 2379410, 554568

Depth in Feet	DESCRIPTION	Surf. Elev. 394.11	Samples	Recovery inches	Qp TSF	USCS
0	CLAY, very stiff to hard, brown, grayish-brown (10YR 5/2) mottled yellowish brown (10YR 5/8), dry	394	1	19/54	4.5	CH
			2		2.25	
			3			
5	- grain size analysis @ 5 - 6 ft: 2.3% sand, 42.4% silt, 55.3% clay	389	4	47/60	4.5	
			5		3.5	
			6		3.25	
			7		4.0	
10		384	8	60/60	2.75	
	CLAY, brown to olive brown, moist		9		2.75	CL/CH
	- grain size analysis @ 11 - 12 ft: 8.4% sand, 39.3% silt, 52.3% clay		10		2.75	
			11		1.75	
			12		2.0	
15		379				
	CLAY, soft, high plasticity, dark yellow brown, moist; 1-2" sand seams at 17' and 19'		13	45/60		CH
	- grain size analysis @ 18 - 20 ft: 1.8% sand, 21.9% silt, 76.3% clay					
	- very stiff to hard, high plasticity					
20		374	14	60/60		
25			15	23/23		

GRAPHIC

Well: MW-350
Elev.: 396.80



KELRON ENVIRONMENTAL
INCORPORATED

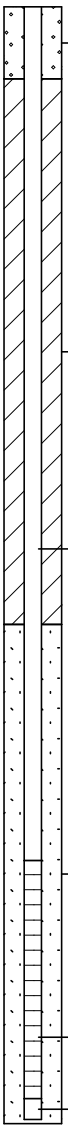
LOG OF BORING MW-350

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NW, NE

Date Completed	: 09/07/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID: 3 7/8" rock	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 394.11
Sampling Method	: MacroCore (60")/NX Core	Top of Casing Elevation	396.80
Drilling Company	: PSC	X,Y Coordinates	: 2379410, 554568

Well: MW-350
Elev.: 396.80

Depth in Feet	DESCRIPTION	Surf. Elev. 394.11	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
25	- Auger refusal at 26.4 feet bgs	369	15	23/23		CL	
	LIMESTONE and SHALE, interbedded, banded, solid, very soft, light to dark gray; slightly weathered					LS/SH	
	LIMESTONE, banded, medium bedded, solid, hard, medium gray; unweathered					LS	
	LIMESTONE and SHALE, interbedded; limestone is banded, medium bedded, hard, medium gray; shale is very soft to medium soft, dark gray						
30	Borehole diameter from 26.4 to 46.7 feet bgs = 3 7/8"	364	16	116/120		LS/SH	
	RQD for 26.4 - 36.4' = 72% (Fair) Recovery = 116/120"						
35	SHALE, banded, medium bedded, solid, soft to medium soft, dark gray	359				SH	
40	LIMESTONE, banded, massive, solid, hard to very hard, light to medium gray	354	17	118/120		LS	
45	RQD for 36.4 - 46.4' = 96% (Excellent) Recovery = 118/120"	349					
	END BOREHOLE AT 46.7 FEET BLS						
50							



KELRON ENVIRONMENTAL
INCORPORATED

LOG OF BORING MW-352

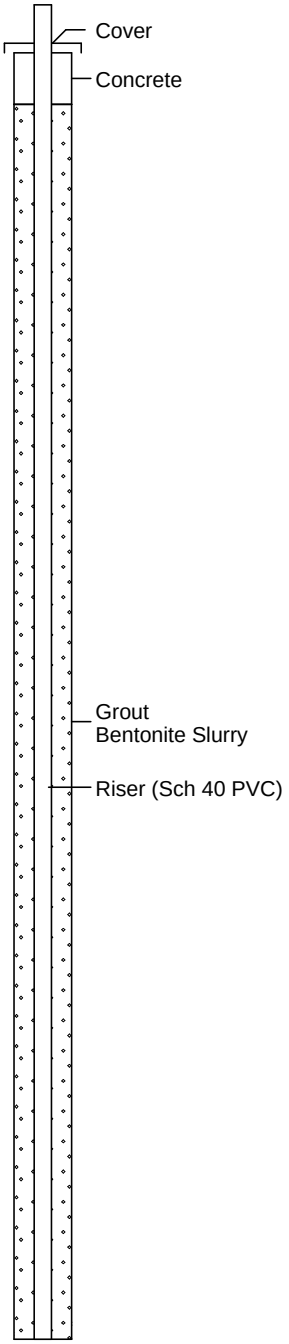
Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NE, NE

Date Completed	: 09/16/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID: 3 7/8" rock	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 422.36
Sampling Method	: MacroCore (60")/NX Core	Top of Casing Elevation	425.04
Drilling Company	: PSC	X,Y Coordinates	: 2382789, 553901

Well: MW-352
Elev.: 425.04

Depth in Feet	DESCRIPTION	Surf. Elev. 422.36
0	SILTY CLAY, very stiff to hard, yellow brown (10YR 5/6), dry	422
5	CLAY, trace sand and fine gravel, very stiff, high plasticity, few black organic material	417
10	- medium hard	412
	- soft	
15	- medium hard	407
	SAND, poorly graded, loose, wet (4-inch thick)	
	SANDY CLAY, trace fine gravel, yellow brown to olive brown (2.5Y 5/3)	
20		402
25		

Samples	Recovery inches	Qp TSF	USCS
1	46/48	4.5+	CL
2	60/60	3.5	
3		4.0	CL
4		2.75	
5		3.0	
6	60/60	2.75	
7		2.0	
8		1.0	
9		1.25	
10	60/60	1.5	
11		2.5	
12		2.75	SP
13		3.5	CL
14	60/60	4.5+	
15		2.5	
16		2.5	
17		2.75	
18	48/60	2.5	



KELRON ENVIRONMENTAL
INCORPORATED

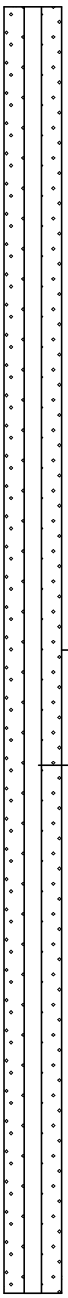
LOG OF BORING MW-352

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NE, NE

Date Completed	: 09/16/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID: 3 7/8" rock	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 422.36
Sampling Method	: MacroCore (60")/NX Core	Top of Casing Elevation	425.04
Drilling Company	: PSC	X,Y Coordinates	: 2382789, 553901

Well: MW-352
Elev.: 425.04

Depth in Feet	DESCRIPTION	Surf. Elev. 422.36	Samples	Recovery inches	Qp TSF	USCS
25		397				
	- grain size analysis @ 26.5 - 27.5 ft: 33.7% sand, 27.1% silt, 39.2% clay		18	48/60	2.5	CL
	SAND with few gravel, yellow brown					SP
	CLAY, some sand and fine gravel, hard to very hard, high plasticity, dark yellow brown (10YR 4/6)					CL
			19	60/60	3.0	
30	CLAY, lean to fat	392	20		3.0	CL/CH
	- grain size analysis @ 32 - 33 ft: 13.2% sand, 43.9% silt, 42.8% clay		21		3.5	
			22		3.0	
35		387	23	48/60	1.5	
	- medium hard, high plasticity, gray brown to light olive brown (2.5Y 5/2-5/3)		24		1.5	
	- trace silt, dark yellow brown (10YR 4/4)		25		1.75	
			26		1.5	
40		382	27	54/60	1.75	
			28		2.0	
			29		2.5	
			30		2.5	
			31	57/60	2.0	
45		377	32		1.75	
	CLAY, medium hard, low plasticity, olive brown (2.5Y 5/4)		33		1.75	CL
			34		2.5	
			35		1.75	
			36	3/3		
50						



KELRON ENVIRONMENTAL
INCORPORATED

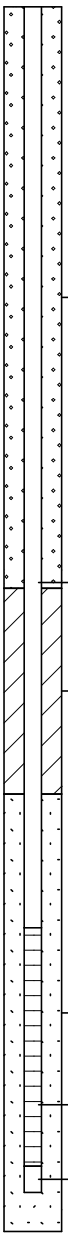
LOG OF BORING MW-352

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NE, NE

Date Completed	: 09/16/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID: 3 7/8" rock	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 422.36
Sampling Method	: MacroCore (60")/NX Core	Top of Casing Elevation	425.04
Drilling Company	: PSC	X,Y Coordinates	: 2382789, 553901

Depth in Feet	DESCRIPTION	Surf. Elev. 422.36	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
50		372				CL	
	- Auger refusal at 53.7 feet bgs						
	LIMESTONE, weathered, thinly laminated, medium hard to hard, gray		37	5/5		LS	
55		367	38	8/27			
	SHALE, clayey, gray					SH	
	LIMESTONE, occasional shale partings		39	19/60		LS	
60		362					
	- laminated, fossiliferous, medium gray		40	54/60			
	SHALE, soft, dark gray					SH	
65		357					
	LIMESTONE, medium hard to hard, light gray		41	59/60		LS	
70	Borehole diameter from 53.7 to 73.8 feet bgs = 3 7/8"	352					
	RQD for 53.8 - 73.8' = 57% (Fair) Recovery = 173/240"		42	33/34			
	END BOREHOLE AT 73.8 FEET BLS						
75							

Well: MW-352
Elev.: 425.04



KELRON ENVIRONMENTAL
INCORPORATED

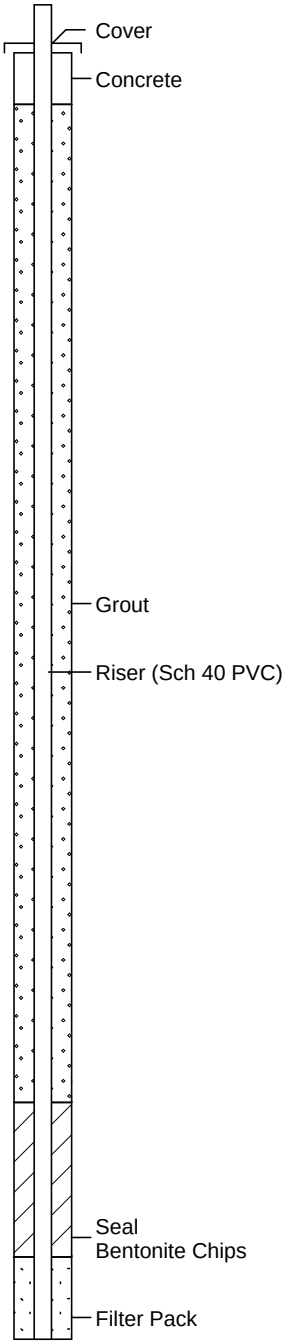
LOG OF BORING MW-355

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 09 SW, SE, SW

Date Completed	: 09/14/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID; 3 7/8" rock	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 390.82
Sampling Method	: MacroCore (60")/NX Core	Top of Casing Elevation	393.69
Drilling Company	: Terra Drill, Inc.	X,Y Coordinates	: 2378145, 555980

Depth in Feet	DESCRIPTION	Surf. Elev. 390.82	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	Continuous boring to 20 feet below ground surface. Refer to boring log for adjacent well MW-155 for description of subsurface materials to 20 feet.	390					
5		385					
10		380					
15		375					
20	CLAYEY SAND, poorly graded, dark yellow brown, wet	370	1	23/23	3.5	SC	
	CLAY, lean, very stiff, gray with yellow-brown mottling - Auger refusal at 22.1 feet bgs					CL	
	LIMESTONE, lightly weathered, fine grained, slightly fossiliferous, medium soft, light gray banded with light red staining along horizontal fractures; three small shale lenses within 31 inch interval - coarse grained, medium soft to hard		2	108/124		LS	
25							

Well: MW-355
Elev.: 393.69



KELRON ENVIRONMENTAL
INCORPORATED

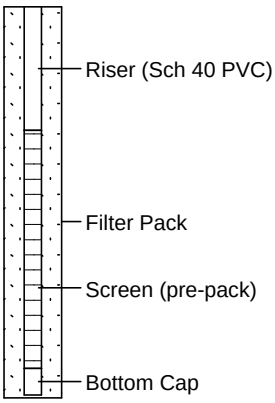
LOG OF BORING MW-355

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 09 SW, SE, SW

Date Completed	: 09/14/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID; 3 7/8" rock	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 390.82
Sampling Method	: MacroCore (60")/NX Core	Top of Casing Elevation	393.69
Drilling Company	: Terra Drill, Inc.	X,Y Coordinates	: 2378145, 555980

Depth in Feet	DESCRIPTION	Surf. Elev. 390.82	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
25		365	2	108/124		LS	
	- fine grained, slightly fossiliferous, light gray						
	Borehole diameter from 22.1 to 32.6 feet bls = 3 7/8"						
	RQD for 22.1 - 32.6' = 57% (Fair)						
30		360					
	END BOREHOLE AT 32.6 FEET BLS						
35		355					
40		350					
45		345					
50							

Well: MW-355
Elev.: 393.69



SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		MW-356

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
John Gates Bulldog Drilling	9/28/2015	10/1/2015	4 1/4 HSA and rotary

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-356	Feet (NAVD88)	425.18 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 558,050.37 N, 2,381,958.49 E E /W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 56.2662"

Long -89° 52' 10.4808"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample: Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				0 - 10' **SILTY CLAY** CL/ML.	CL/ML								0-37.3' Blind Drilled. See logs OW-156 and OW-256 for soil description.
			1										
			2										
			3										
			4										
			5										
			6										
			7										
			8										
			9										
			10	10 - 17.7' **LEAN CLAY WITH SAND:** (CL)s.	(CL)s								
			11										
			12										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Brad Rucker

Firm Natural Resource Technology
234 W. Florida St., Fifth Floor, Milwaukee, WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-356

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				10 - 17.7' **LEAN CLAY WITH SAND:** (CL)s. *(continued)*									
			13										
			14										
			15		(CL)s								
			16										
			17										
			18	17.7 - 27.3' **SILTY CLAY** CL/ML.									
			19										
			20										
			21										
			22		CL/ML								
			23										
			24										
			25										
			26										
			27										
				27.3 - 28.6' **POORLY-GRADED SAND:** SP.									
			28		SP								
				28.6 - 33.9' **SILTY CLAY** CL/ML.									
			29										
			30		CL/ML								
			31										
			32										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-356

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				28.6 - 33.9' **SILTY CLAY** CL/ML. *(continued)*	CL/ML								
			33										
			34	33.9 - 35.7' **LEAN CLAY:** to **SHALE:** CL.	CL								
			35										
			36	35.7 - 37.3' **SHALE:** BDX (SH).	BDX (SH)								
			37										
1 CORE	28 24.5		38	37.3 - 53.8' **SHALE:** BDX (SH), weathered shale and clay, brown to dark gray, soft, slightly fractured.									Core 1, RQD=92%
			39										
2 CORE	60 57		40	39.6' light to dark gray to tan.									Core 2, RQD = 58%
			41										
			42	42.3' - 43.2' limestone.									
			43	43.2' light to dark gray/tan, very weak.									
			44										
3 CORE	60 41		45	45' - 50' dark gray, intensely fractured.	BDX (SH)								Low recovery, possible washout. Core 3, RQD = 18%
			46										
			47										
			48										
			49										
4 CORE	36 36		50	50' - 53.1' thin beds of limestone, limestone is more competent, slightly fractured, wet.									Core 4, RQD=92%
			51										
			52										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-356

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				37.3 - 53.8' **SHALE:** BDX (SH), weathered shale and clay, brown to dark gray, soft, slightly fractured. *(continued)*									
			53		BDX (SH)								
5 CORE	24 21.5			53.1' - 53.8' intensely fractured.									Core 5, RQD=58%
			54	53.8 - 55.4' **LIMESTONE:** BDX (LS), white, thickly bedded, moderately fractured (moderately wide to very narrow apertures).	BDX (LS)								
6 CORE	60 60.5		55										Core 6, RQD=84%
				55.4 - 57.2' **SHALE:** BDX (SH), dark gray, trace limestone beds, moderately fractured.									
			56		BDX (SH)								
			57	56.8' soft, highly weathered bed, decomposed. 57.1' soft, highly weathered bed.									
				57.2 - 60' **LIMESTONE:** BDX (LS), trace shale beds, moderately fractured (moderately wide to very wide apertures).									
			58		BDX (LS)								
			59										
				59.4' - 59.7' vertical fractures with pyrite mineralization.									
			60	60 - 65.8' **SHALE:** BDX (SH), gray, moderately fractured.									
7 CORE	60 61												Core 7 RQD=75%
			61	61' -62' dark gray.									
			62	62' - 62.4' soft, clayey.									
			63		BDX (SH)								
			64										
			65	65' dark gray, narrow to moderately wide apertures. 65.3' - 65.8' fossiliferous.									
8 CORE	60 61.5												Core 8, RQD=67%
			66	65.8 - 68.8' **SHALEY LIMESTONE:** BDX (LS/SH), fossiliferous, slightly to moderately fractured.									
			67		BDX (LS/SH)								
			68										
			69	68.8 - 70' **SHALE:** BDX (SH), gray, fossiliferous, moderately fractured (moderately wide to narrow apertures).	BDX (SH)								Bedrock corehole reamed 6" in diameter to 69' for well installation.
9 CORE	60 61		70	70 - 75' **SHALEY LIMESTONE:** BDX (LS/SH), gray to dark gray, fossiliferous, medium bedded, moderately fractured (narrow apertures).									
			71		BDX (LS/SH)								Core 9, RQD=87%
			72										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-356

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				70 - 75' **SHALEY LIMESTONE:** BDX (LS/SH), gray to dark gray, fossiliferous, medium bedded, moderately fractured (narrow apertures). *(continued)*									
			73		BDX (LS/SH)								
			74										
			75	75 - 75.9' **SHALE:** BDX (SH), dark gray, soft, moderately fractured (narrow to moderately narrow apertures).	BDX (SH)								
10 CORE	60 60		76	75.9 - 76.2' **SHALEY LIMESTONE:** BDX (LS/SH), fossiliferous, narrow to moderately narrow apertures.	BDX (LS/SH)								Core 10, RQD=95%
			77	76.2 - 101.8' **LIMESTONE:** BDX (LS), light gray, fossiliferous, thickly bedded, narrow to moderately narrow apertures.									
			78										
			79										
11 CORE	60 60.5		80	80' light gray to gray, unfractured.									Core 11, RQD=100%
			81										
			82										
			83										
			84		BDX (LS)								
12 CORE	60 61.5		85										Core 12, RQD=100%
			86										
			87										
			88										
			89										
13 CORE	60 59.5		90										Core 13, RQD=100%
			91										
			92										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-356

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				76.2 - 101.8' **LIMESTONE:** BDX (LS), light gray, fossiliferous, thickly bedded, narrow to moderately narrow apertures. *(continued)*									
			93										
			94										
14 CORE	61 61		95										Core 14, RQD=100%
			96										
			97		BDX (LS)								
			98										
			99										
15 CORE	60 59.5		100	99.7' slightly weathered, decomposed. 100' gray, no fossils.									Core 15, RQD=100%
			101										
			102	101.8 - 106.5' **SHALE:** BDX (SH), dark gray, thickly bedded, slightly fractured.									
			103										
			104		BDX (SH)								
16 CORE	60 58.5		105										Core 16, RQD=56%
			106	106.2' weathered, decomposed.									
			107	106.5 - 108.4' **LIMESTONE:** BDX (LS), light gray to green, highly decomposed, intensely fractured.	BDX (LS)								
			108										
			109	108.4 - 109.8' **SHALE:** BDX (SH), dark reddish-brown, highly decomposed.	BDX (SH)								
17 CORE	60 55		110	109.8 - 111.1' **LIMESTONE:** BDX (LS), gray, highly disintegrated (healed dissolution cracks with green highly decomposed infilling).	BDX (LS)								Core 17, RQD=49%
			111	109.9' - 110.7' angular gravel-sized fragments. 110.7' moderately decomposed, very intensely fractured.	BDX (SH)								
			112										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-356

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			113	111.1 - 114' **SHALE:** BDX (SH), dark gray, moderately to highly decomposed, moderately fractured. *(continued)*	BDX (SH)								
			114	114 - 116.3' **LIMESTONE:** BDX (LS), gray, moderately fractured.									
18 CORE	60 61		115		BDX (LS)								Core 18, RQD=61%
			116										
			117	116.3 - 116.7' **SHALEY LIMESTONE:** BDX (LS/SH), intensely fractured.	BDX (LS/SH)								
				116.7 - 119.7' **SHALE:** BDX (SH), gray, slightly decomposed, intensely fractured.									
			118		BDX (SH)								
			119										
			120	119.7 - 120.9' **SHALEY LIMESTONE:** BDX (LS/SH), gray, slightly decomposed, intensely fractured.	BDX (LS/SH)								
19 CORE	60 64		121	120.9 - 122.2' **SHALE:** BDX (SH), dark gray, moderately fractured.	BDX (SH)								Core 19, RQD=86%
			122	122.2 - 126.1' **LIMESTONE:** BDX (LS), gray, moderately fractured.									
			123	123.3' - 123.4' fossiliferous.									
			124	124.1' - 124.1' fossiliferous.	BDX (LS)								
			125	124.7' - 124.8' fossiliferous.									
20 CORE	48 48												Core 20, RQD =88%
			126	126.1 - 127.6' **SHALE:** BDX (SH), dark gray, slightly decomposed.									
			127	126.7' - 127' limestone, gray. 127' moderately decomposed.	BDX (SH)								
			128	127.6 - 129.2' **LIMESTONE:** BDX (LS), slightly decomposed.	BDX (LS)								
21 CORE	12 12		129	129.2 - 130' **SHALE:** BDX (SH), gray, intensely fractured.	BDX (SH)								Core 21, RQD=0%
22 CORE	60 60		130	130 - 130.4' **SHALEY LIMESTONE:** BDX (LS/SH), fossiliferous, moderately fractured.	BDX (LS/SH)								Core 22, RQD=94%
			131	130.4 - 131' **LIMESTONE:** BDX (LS), gray, fossiliferous, moderately fractured.	BDX (LS)								
				131 - 134' **SHALEY LIMESTONE:** BDX (LS/SH), fossiliferous, moderately fractured.									
			132										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-356

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram		Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
				131 - 134' **SHALEY LIMESTONE:** BDX (LS/SH), fossiliferous, moderately fractured. *(continued)*										
			133		BDX (LS/SH)									The casing dropped 3" during drilling.
			134	134 - 135' **LIMESTONE:** BDX (LS), gray, thickly bedded, moderately fractured.	BDX (LS)									
			135	135' End of Boring.										

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		MW-366

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Jim Dittmaier Bulldog Drilling	12/3/2015	12/4/2015	4 1/4 HSA and rotary

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-366	Feet (NAVD88)	422.54 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 555,581.80 N, 2,381,171.15 E E /Ⓦ
1/4 of 1/4 of Section , T N, R

Lat 38° 11' 31.8876"
Long -89° 52' 20.4414"

Local Grid Location
Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0	0 - 5.6' **FILL, SILTY CLAY** CL/ML.	(FILL) CL/ML								0-33' Blind Drilled. See logs TPZ-166 and B-13-4 for soil description.
			5.6	5.6 - 33' **SILTY CLAY** CL/ML.	CL/ML								

Depth In Feet: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature [signature]

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NATURAL RESOURCE TECHNOLOGY

Boring Number MW-366

Sample									Soil Properties					
Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram		Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				5.6 - 33' **SILTY CLAY** CL/ML. *(continued)*										
			13											
			14											
			15											
			16											
			17											
			18											
			19											
			20											
			21											
			22		CL/ML									
			23											
			24											
			25											
			26											
			27											
			28											
			29											
			30											
			31											
			32											

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-366

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				5.6 - 33' **SILTY CLAY** CL/ML. *(continued)*	CL/ML								
1 SS	23 18	17 21 20 50	33	33 - 35.6' **LEAN CLAY:** to **SHALE:** CL, gray, residual soil, hard (>4.5 tsf).	CL								
			34										
			35										
1 CORE	60 54		36	35.6 - 39.3' **SHALE:** BDX (SH), gray, highly decomposed, moderately fractured.	BDX (SH)								Core 1, RQD=54%
			37										
			38	38.4' limestone layer (approximately 2.5").									
			39										
			40	39.3 - 42.3' **LIMESTONE:** BDX (LS), cherty, intensely fractured.	BDX (LS)								
2 CORE	60 47		41										Core 2, RQD=32%
			42										
			43	42.3 - 42.9' **SHALE:** BDX (SH), dark gray, intensely fractured.	BDX (SH)								
				42.9 - 43.7' **SHALEY LIMESTONE:** BDX (LS/SH), intensely fractured.	BDX (LS/SH)								
			44	43.7 - 49.8' **SHALE:** BDX (SH), dark gray, moderately fractured.									
			45										
3 CORE	60 63		46										Core 3, RQD=73%
			47		BDX (SH)								
			48										
			49										
			50	49.8 - 54.3' **SHALEY LIMESTONE:** BDX (LS/SH), fossiliferous, slightly fractured.									
4 CORE	60 49		51		BDX (LS/SH)								Core 4, RQD=96%
			52										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-366

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				49.8 - 54.3' **SHALEY LIMESTONE**: BDX (LS/SH), fossiliferous, slightly fractured. *(continued)*									
			53	52.8' - 53.1 shale bed. 53.1' fossiliferous.	BDX (LS/SH)								
			54										Bedrock corehole reamed 6" in diameter to 54' for well installation.
				54.3' End of Boring.									

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		MW-369

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Mark Baetje Bulldog Drilling	11/17/2015	11/18/2015	4 1/4 HSA and rotary

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-369	Feet (NAVD88)	420.49 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 557,329.71 N, 2,381,765.41 E E /W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 49.1496"

Long -89° 52' 12.9288"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample: Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				0 - 0.2' **SILT**: ML.	ML								0-43' Blind Drilled. See log PZ-169 for soil description.
			1	0.2 - 2' **SILTY CLAY** CL/ML.	CL/ML								
			2	2 - 4' Shelby Tube Sample.									
			3										
			4	4 - 10' **SILTY CLAY** CL/ML.									
			5										
			6										
			7		CL/ML								
			8										
			9										
			10	10 - 12' **SILTY CLAY** to **LEAN CLAY**: CL/ML.									
			11		CL/ML								
			12										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

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NATURAL RESOURCE TECHNOLOGY

Boring Number MW-369

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
				12 - 14' Shelby Tube Sample.									
			13										
			14	14 - 20' **LEAN CLAY:** CL.									
			15										
			16										
			17		CL								
			18										
			19										
			20	20 - 22' **SILTY CLAY** CL/ML.									
			21		CL/ML								
			22	22 - 24' Shelby Tube Sample.									
			23										
			24	24 - 28' **LEAN CLAY WITH SAND:** (CL)s.									
			25										
			26		(CL)s								
			27										
			28	28 - 30' **SILTY CLAY** CL/ML.									
			29		CL/ML								
			30	30 - 32' **LEAN CLAY:** to **SILTY CLAY** CL.									
			31		CL								
			32										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-369

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			33	32 - 38' **LEAN CLAY:** CL.	CL								
			34										
			35										
			36										
			37										
			38	38 - 40' No Recovery.									
			39										
			40	40 - 42' **LEAN CLAY:** CL.	CL								
			41										
			42	42 - 45' No Recovery.									
1 SS	24 0	10 18 30 40	43										
			44										
2 SS	5 9	50/5"	45	45 - 45.3' **LEAN CLAY:** CL, dark brown (10YR 3/3), 30-50% pale brown (10YR 6/4) and brown (10YR 4/3) mottling, trace subrounded fine gravel, cohesive, low plasticity, moist.	CL								
			46	45.3 - 48.7' **SHALE:** BDX (SH), dark grayish brown, highly decomposed.									
3 SS	5 8	50/5"	47	47' trace clay layers (< 1" thick), highly decomposed, very weak.	BDX (SH)								
			48										
1 CORE	66 30		49	48.7 - 50.8' **LIMESTONE:** BDX (LS), white, fossiliferous, intensely fractured (extremely narrow to narrow apertures), microcrystalline, slightly to moderately decomposed.	BDX (LS)								Core 1, RQD=17%
			50										
			51	50.8 - 53.4' **SHALE:** BDX (SH), dark gray, intensely fractured (extremely narrow to narrow apertures), highly decomposed, very weak.	BDX (SH)								
			52										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-369

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			53	50.8 - 53.4' **SHALE:** BDX (SH), dark gray, intensely fractured (extremely narrow to narrow apertures), highly decomposed, very weak. *(continued)*	BDX (SH)								
2 CORE	60 46		54	53.4 - 59.3' **LIMESTONE:** BDX (LS), white, moderately fractured (very narrow to narrow apertures), fossiliferous, microcrystalline, slightly decomposed, very strong, pitted, trace mineralization.									Core 2, RQD=83%
			55										
			56		BDX (LS)								
			57										
			58	58.4' mud in fracture.									
3 CORE	60 64		59	59.3 - 64.9' **SHALEY LIMESTONE:** BDX (LS/SH), dark gray, medium bedded shale, intensely fractured (extremely narrow to narrow apertures), fossiliferous, microcrystalline, decomposed, very weak to weak, weathered, highly weathered shale cementing segments together.									Core 3, RQD=63%
			60										
			61										
			62		BDX (LS/SH)								
			63										
4 CORE	60 62		64										Core 4, RQD=79%
			65	64.9 - 68.8' **LIMESTONE:** BDX (LS), white, slightly fractured (tight to narrow apertures), fossiliferous, microcrystalline, slightly decomposed, slightly disintegrated, pitted.									
			66										
			67		BDX (LS)								
			68										
			69	68.8 - 70.7' Overdrilled for Well Installation.									
			70										Bedrock corehole reamed 6" in diameter to 70.7' for well installation.
				70.7' End of Boring.									

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		MW-370

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Mark Baetje Bulldog Drilling	11/20/2015	11/24/2015	4 1/4 HSA and rotary

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-370	Feet (NAVD88)	418.67 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 556,826.50 N, 2,381,936.14 E E /W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 44.1702"

Long -89° 52' 10.8084"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample: Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			1	0 - 2' **SILTY CLAY** CL/ML.	CL/ML								0-28' Blind Drilled. See log PZ-170 for soil description.
			2	2 - 4' Shelby Tube Sample.									
			4	4 - 8' **SILTY CLAY** CL/ML.	CL/ML								
			8	8 - 10' **SILTY CLAY** to **LEAN CLAY:** CL/ML.	CL/ML								
			10	10 - 12' **LEAN CLAY:** CL.	CL								
			12										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

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NATURAL RESOURCE TECHNOLOGY

Boring Number MW-370

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				12 - 14' Shelby Tube Sample.									
			13										
			14	14 - 24' **SILTY CLAY** CL/ML.									
			15										
			16										
			17										
			18										
			19		CL/ML								
			20										
			21										
			22										
			23										
			24	24 - 26' Shelby Tube Sample.									
			25										
			26	26 - 28' **SILTY CLAY** CL/ML.									
			27		CL/ML								
			28										
1 SS	10 10	23 50/4"		28 - 28.4' **LEAN CLAY:** CL, yellowish brown (10YR 5/4), trace angular limestone gravel, soft, medium plasticity, moist.	CL								
1 CORE	60 18.5		29	28.4 - 28.9' **SHALE:** BDX (SH), gray, highly decomposed, very weak.	BDX (SH)								Core 1, RQD=51%
			30	28.9 - 38.1' **SHALEY LIMESTONE:** BDX (LS/SH), light gray to gray, intensely fractured (extremely narrow to moderately narrow apertures), medium to thickly bedded, microcrystalline, moderately decomposed, very strong.	BDX (LS/SH)								
			31										
			32										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-370

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			33	28.9 - 38.1' **SHALEY LIMESTONE**: BDX (LS/SH), light gray to gray, intensely fractured (extremely narrow to moderately narrow apertures), medium to thickly bedded, microcrystalline, moderately decomposed, very strong. *(continued)*									
2 CORE	51.5 12		34	33.9' - 38.1' gray, greenish gray in fractures, trace fossils, moderately to highly decomposed, slightly to moderately disintegrated, clay in shoe with a hard, reddish brown inclusion.	BDX (LS/SH)								Core 2, RQD=0%
			35										
			36	36' - 37.9' vertical fracture.									
			37										
			38										
3 CORE	24 25		39	38.1 - 44' **SHALE**: BDX (SH), bluish gray, intensely fractured (extremely narrow to narrow apertures), highly decomposed, weak.									Core 3, RQD=40%
			40										
4 CORE	24 11												Core 4, RQD=0%
5 CORE	36 32		41	40.6' - 40.8 shaley limestone layer, light gray to gray, microcrystalline, moderately decomposed, very strong. 41.1' - 43.2 gray, moderately to highly decomposed.	BDX (SH)								Core 5, RQD=78%
			42										
			43										
			44										
6 CORE	12 28			44 - 45.7' **SHALEY LIMESTONE:** BDX (LS/SH), light gray to gray, intensely fractured (extremely narrow to narrow apertures), thin to medium bedded, microcrystalline, slightly decomposed, clay cement in apertures, very strong.	BDX (LS/SH)								Core 6, RQD=29%
			45										
7 CORE	45 27			45' shale layer, bluish gray, moderately fractured (extremely narrow to narrow apertures), highly decomposed, weak.									Core 7, RQD=65%
			46										
			47	45.7 - 52.2' **SHALE:** BDX (SH), bluish gray, moderately fractured (tight to narrow), highly decomposed, weak.									
			48										
			49		BDX (SH)								
8 CORE	24 30												Core 8, RQD=78%
			50										
			51										
9 CORE	24 24		52										Core 9, RQD=0%

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-370

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				52' clay cement.									
			53	52.2 - 61.7' **SHALEY LIMESTONE:** BDX (LS/SH), light gray to gray, intensely fractured (very narrow to narrow), thin to medium bedded, microcrystalline, slightly decomposed, cemented clay in apertures, very strong.									
10 CORE	24 36		54	52.7' - 53' clayey sand in aperture. 53' - 53.1 shale bed, bluish gray, fossiliferous, moderately fractured (very narrow to narrow), highly decomposed, weak.									Core 10, RQD=0%
			55	53.1' white to bluish gray, gray in the fractures (extremely narrow to moderately narrow apertures), thinly to medium bedded, slightly to moderately disintegrated.									
11 CORE	24 30		56	55.7' moderately disintegrated.									Core 11, RQD=18%
			57		BDX (LS/SH)								
			58										
12 CORE	30 27			58.1' highly decomposed.									Core 12, RQD=39%
			59										
			60										
13 CORE	36 53		61										Core 13, RQD=89%
			62	61.7 - 65.3' **LIMESTONE:** BDX (LS).									
			63										
			64		BDX (LS)								
			65										
				65.3 - 66' Overdrilled for Well Installation.									
			66	66' End of Boring.									Bedrock corehole reamed 6" in diameter to 66' for well installation.

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		MW-373

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
John Gates Bulldog Drilling	10/21/2015	10/28/2015	4 1/4 HSA and rotary

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-373	Feet (NAVD88)	388.80 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 555,041.91 N, 2,379,186.06 E E /Ⓦ
1/4 of 1/4 of Section , T N, R

Lat 38° 11' 26.613"
Long -89° 52' 45.3282"

Local Grid Location
Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0	0 - 2' No Recovery. Gravel Pad.									0-13.4' Blind Drilled. See log PZ-173 for soil description detail.
			2	2 - 10.9' **SILTY CLAY** CL/ML.	CL/ML								
			11	10.9 - 13.4' **SILT:** ML.	ML								

Depth scale: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Brad Rucker

Firm Natural Resource Technology
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NATURAL RESOURCE TECHNOLOGY

Boring Number MW-373

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			13	10.9 - 13.4' **SILT:** ML. *(continued)*	ML								
1 CORE	23 23		14	13.4 - 14.7' **LIMESTONE:** BDX (LS), fossiliferous, extremely fractured, thickly bedded.	BDX (LS)								Core 1, RQD=65%
			15	14.7 - 15.5' **SHALE:** BDX (SH), gray, trace limestone, highly decomposed.	BDX (SH)								
2 CORE	58.2 42		16	15.5 - 16.6' **SHALEY LIMESTONE:** BDX (LS/SH), fossiliferous, intensely fractured.	BDX (LS/SH)								Core 2, RQD=52%
			17	16.6 - 17.3' **SHALE:** BDX (SH), gray, highly decomposed.	BDX (SH)								
			18	17.3 - 18.8' **LIMESTONE:** BDX (LS), thickly bedded.	BDX (LS)								
			19	18.8 - 20.2' **SHALE:** BDX (SH), highly decomposed.	BDX (SH)								
3 CORE	60 56		20	20.2 - 20.8' **SHALEY LIMESTONE:** BDX (LS/SH), intensely fractured, tight diagonal fracture.	BDX (LS/SH)								Core 3, RQD=57%
			21	20.8 - 21.5' **SHALE:** BDX (SH), gray, highly decomposed.	BDX (SH)								
			22	21.5 - 24.9' **SHALEY LIMESTONE:** BDX (LS/SH), intensely fractured, extremely narrow to narrow apertures.									
			23		BDX (LS/SH)								
			24										
4 CORE	60 55		25	24.9 - 29.1' **SHALE:** BDX (SH), highly decomposed. 25.1' - 25.4' limestone, fossiliferous. 25.4' gray, fossiliferous, thickly bedded, hard.									Core 4, RQD=65%
			26										
			27		BDX (SH)								
			28										
			29	29.1 - 48.3' **LIMESTONE:** BDX (LS), fossiliferous, thickly bedded.									
5 CORE	60 60		30	30' - 35.1' moderately fractured, extremely narrow apertures.	BDX (LS)								Core 5, RQD=95%
			31										
			32										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-373

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				29.1 - 48.3' **LIMESTONE:** BDX (LS), fossiliferous, thickly bedded. *(continued)*									
			33										Bedrock corehole reamed 6" in diameter to 33.3' for well installation.
			34										
			35										
6 CORE	60 58			35.1' - 40' slightly fractured, narrow apertures.									Core 6, RQD=96%
			36										
			37										
			38										
			39										
7 CORE	60 60		40	40' - 45.1' moderately fractured, extremely narrow to narrow apertures.	BDX (LS)								Core 7, RQD=100%
			41	41.3' - 41.6' vuggy.									
			42										
			43										
			44										
8 CORE	60 61.5		45	45.1' - 48.3' moderately fractured.									Core 8, RQD=63%
			46										
			47										
			48										
				48.3 - 57' **SHALE:** BDX (SH), gray, thin limestone beds.									
			49										
9 CORE	60 63		50	49.9' moderately decomposed.	BDX (SH)								Core 9, RQD=57%
			51										
			52										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-373

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				48.3 - 57' **SHALE:** BDX (SH), gray, thin limestone beds. *(continued)*									
			53										
			54										
			55	54.7' - 55' fossiliferous.	BDX (SH)								
10 CORE	60 46												Core 10, RQD=35%
			56										
			57	57 - 58.3' **LIMESTONE:** BDX (LS), intensely fractured, decomposed green infilling.	BDX (LS)								
			58										
			59	58.3 - 60' **LEAN CLAY:** CL, greenish gray to reddish brown. 58.7' reddish brown.	CL								
			60	60 - 65.2' **SHALE:** BDX (SH), intensely fractured, thickly bedded, decomposed.									
11 CORE	60 55												Core 11, RQD=51%
			61										
			62										
			63	62.8' gray.	BDX (SH)								
			64										
			65										
12 CORE	60 58			65.2 - 66.5' **SHALEY LIMESTONE:** BDX (LS/SH), intensely fractured, thinly bedded.									Core 12, RQD=67%
			66		BDX (LS/SH)								
			67	66.5 - 68.8' **SHALE:** BDX (SH), gray.									
			68		BDX (SH)								
			69	68.8 - 70.7' **SHALEY LIMESTONE:** BDX (LS/SH), moderately fractured, decomposed (greenish gray).									
			70		BDX (LS/SH)								
13 CORE	46 48												Core 13, RQD=60%
			71	70.7 - 80.1' **SHALE:** BDX (SH), dark gray, thickly bedded.	BDX (SH)								
			72										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-373

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				70.7 - 80.1' **SHALE:** BDX (SH), dark gray, thickly bedded. *(continued)*									
			73										
			74										
14 CORE	12 11												Core 14, RQD=91%
			75										
15 CORE	60 62												Core 15, RQD=61%
			76	76.1' dark to light gray, intensely fractured, highly decomposed.	BDX (SH)								
			77										
				77.5' dark gray, moderately fractured.									
			78										
			79	78.7' highly fractured, decomposed.									
16 CORE	60 64		80	80.1 - 83.3' **SHALEY LIMESTONE:** BDX (LS/SH), fossiliferous, moderately fractured.									Core 16, RQD=61%
			81										
			82		BDX (LS/SH)								
			83										
				83.3 - 85.4' **SHALE:** BDX (SH), dark gray, intensely fractured.									
			84		BDX (SH)								
			85										
17 CORE	60 60			85.4 - 88.4' **SHALEY LIMESTONE:** BDX (LS/SH), thickly bedded, fossiliferous.									Core 17, RQD=87%
			86										
			87		BDX (LS/SH)								
			88										
				88.4 - 88.8' **SHALE:** BDX (SH), dark gray, intensely fractured.	BDX (SH)								
			89	88.8 - 94' **LIMESTONE:** BDX (LS), thickly bedded.									
			90										
18 CORE	60 59				BDX (LS)								Core 18, RQD=88%
			91										
			92										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-373

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram		Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
				88.8 - 94' **LIMESTONE:** BDX (LS), thickly bedded. *(continued)*										
			93		BDX (LS)									
			94	94 - 95.1' **SHALEY LIMESTONE:** BDX (LS/SH), moderately fractured.	BDX (LS/SH)									
			95	95.1' End of Boring.										

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		MW-374

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Jim Dittmaier Bulldog Drilling	11/6/2015	11/9/2015	4 1/4 HSA and rotary

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-374	Feet (NAVD88)	398.41 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 554,663.65 N, 2,379,766.63 E E /(W)

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 22.8546"

Long -89° 52' 38.0706"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample: Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			1	0 - 2' **TOPSOIL**: ML.	ML								0-23.6' Blind Drilled. See log PZ-174 for soil description.
			2	2 - 4' No Recovery.									
			4	4 - 23.6' **LEAN CLAY**: CL.	CL								
			5										
			6										
			7										
			8										
			9										
			10										
			11										
			12										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Brad Rucker

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NATURAL RESOURCE TECHNOLOGY

Boring Number MW-374

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				4 - 23.6' **LEAN CLAY:** CL. *(continued)*									
			13										
			14										
			15										
			16										
			17										
			18		CL								
			19										
			20										
			21										
			22										
			23										
1 SS	24 0.4	50/5"	24	23.6 - 24.1' **SILTY CLAY** CL/ML, brown, 3" of shale at bottom of sample.	CL/ML								
1 CORE	18 16			24.1 - 27.5' **LIMESTONE:** BDX (LS), fossiliferous, thickly bedded, moderately fractured (very narrow to moderately narrow apertures).									Core 1, RQD=89%
2 CORE	60 44		25										
			26		BDX (LS)								Core 2, RQD=61%
			27										
			28	27.5 - 37.2' **SHALEY LIMESTONE:** BDX (LS/SH), decomposed, thickly bedded.									
			29										
3 CORE	38 30		30	29.7' moderately fractured.	BDX (LS/SH)								Core 3, RQD=67%
			31										
			32										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-374

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				27.5 - 37.2' **SHALEY LIMESTONE**: BDX (LS/SH), decomposed, thickly bedded. *(continued)*									
4 CORE	30 27		33										Core 4, RQD=56%
			34										
			35		BDX (LS/SH)								
5 CORE	59 59			35.4' - 36.2' fossiliferous.									Core 5, RQD=100%
			36	36.2' increase in shale content.									
			37										
				37.2 - 40.3' **SHALE:** to **LIMESTONE:** BDX (SH), gray, limestone content decreasing with depth, thickly bedded, moderately fractured.									
			38										
			39		BDX (SH)								
				39.6' dark gray, no limestone.									
			40										
6 CORE	25 25			40.3 - 42.3' **LIMESTONE:** BDX (LS), fossiliferous, slightly fractured.									Core 6, RQD=100%
			41		BDX (LS)								
			42	41.9' very narrow diagonal fracture.									
				42.3' End of Boring.									Bedrock corehole reamed 6" in diameter to 42' for well installation.

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		MW-375

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Jim Dittmaier Bulldog Drilling	11/3/2015	11/6/2015	4 1/4 HSA and rotary

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-375	Feet (NAVD88)	420.50 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 554,434.97 N, 2,380,838.70 E E /W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 20.562"

Long -89° 52' 24.6504"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample: Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				0 - 0.9' **SILT:** ML.	ML								0- 44.8' Blind Drilled. See log PZ-175 for soil description details.
			1	0.9 - 5.4' **LEAN CLAY:** CL.									
			2										
			3		CL								
			4										
			5										
				5.4 - 13.5' **SILT:** ML.									
			6										
			7										
			8										
			9		ML								
			10										
			11										
			12										
			13										
				13.5 - 22.3' **LEAN CLAY:** CL.									
			14		CL								
			15										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
Brad Rudes	Natural Resource Technology 234 W. Florida St., Fifth Floor, Milwaukee, WI 53204	Tel: (414) 837-3607 Fax: (414) 837-3608

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-375

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			16	13.5 - 22.3' **LEAN CLAY:** CL. *(continued)*									
			17										
			18										
			19		CL								
			20										
			21										
			22										
				22.3 - 26' **SILT:** ML.									
			23										
			24		ML								
			25										
			26	26 - 28' **LEAN CLAY:** to **SILT:** CL.									
			27		CL								
			28	28 - 28.4' **SANDY SILT:** s(ML).									
				28.4 - 31.3' **LEAN CLAY:** CL.	s(ML)								
			29										
			30		CL								
			31										
				31.3 - 31.5' **WELL-GRADED SAND WITH GRAVEL:** (SW)g.	(SW)g								
			32	31.5 - 43.8' **LEAN CLAY:** CL.									
			33										
			34										
			35										
			36		CL								
			37										
			38										
			39										
			40										
			41										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-375

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			42	31.5 - 43.8' **LEAN CLAY:** CL. *(continued)*	CL								
			43										
			44	43.8 - 44.8' **SANDY LEAN CLAY WITH GRAVEL:** s(CL)g.	s(CL)g								
1 CORE	60	50 for 5"	45	44.8 - 45.3' **WELL-GRADED GRAVEL:** GW, gray, mostly limestone cobbles.	GW								Core 1, RQD=86% Broken limestone in split spoon at 45'.
1 SS	42 5 5		46	45.3 - 49.3' **SILTY CLAY** CL/ML, dark yellowish brown (10YR 4/6).	CL/ML								
			47										
			48										
			49										
			50	49.3 - 50.1' **LEAN CLAY:** CL, dark gray (10YR 4/1).	CL								
2 CORE	24 18		51	50.1 - 51.3' **SHALE:** BDX (SH), highly decomposed.	BDX (SH)								Core 2, RQD=33%
			52	51.3 - 62.8' **SHALEY LIMESTONE:** BDX (LS/SH), gray, thickly bedded, fossiliferous, moderately fractured.									
3 CORE	36 30.5		53										Core 3, RQD=85%
			54										
			55										
4 CORE	60 55		56										Core 4, RQD=95%
			57		BDX (LS/SH)								
			58										
			59										
5 CORE	60 62		60	59.9' very narrow to narrow apertures.									Core 5, RQD=94%
			61										
			62										
			63	62.8 - 84.7' **LIMESTONE:** BDX (LS), fossiliferous, thickly bedded, slightly fractured (extremely narrow to moderately narrow apertures).									
			64										
6 CORE	60 55		65	64.9' very narrow apertures.	BDX (LS)								Core 6, RQD=100%
			66										
			67										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-375

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			68	62.8 - 84.7' **LIMESTONE:** BDX (LS), fossiliferous, thickly bedded, slightly fractured (extremely narrow to moderately narrow apertures). *(continued)*									
			69										
7 CORE	60 63		70	69.5' slightly to moderately fractured (very narrow to moderately narrow apertures).									Core 7, RQD=95% Bedrock corehole reamed 6" in diameter to 70' for well installation.
			71										
			72										
			73										
			74										
8 CORE	60 62		75	74.9' extremely narrow apertures.									Core 8, RQD=100%
			76		BDX (LS)								
			77										
			78										
			79										
			80										
9 CORE	60 56			80.2' unfractured, cherty.									Core 9, RQD=100%
			81										
			82										
			83										
			84										
				84.7' End of Boring.									

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		MW-377

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Jim Dittmaier Bulldog Drilling	10/29/2015	11/2/2015	4 1/4 HSA and rotary

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-377	Feet (NAVD88)	418.75 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 554,198.46 N, 2,381,923.68 E E /W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 18.1896"

Long -89° 52' 11.0712"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample: Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				0 - 4' **TOPSOIL:** ML.	ML								0-28.5' Blind Drilled. See log PZ-177 for soil description.
			1										
			2										
			3										
			4	4 - 19.3' **LEAN CLAY:** CL.	CL								
			5										
			6										
			7										
			8										
			9										
			10										
			11										
			12										
			13										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Natural Resource Technology
234 W. Florida St., Fifth Floor, Milwaukee, WI 53204

Tel: (414) 837-3607
Fax: (414) 837-3608

Template: ILLINOIS BORING LOG - Project: BALDWIN GINT.GPJ

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-377

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				4 - 19.3' **LEAN CLAY:** CL. *(continued)*	CL								
			14										
			15										
			16										
			17										
			18										
			19										
				19.3 - 22' **SILT:** ML.	ML								
			20										
			21										
			22	22 - 28.5' **LEAN CLAY:** CL.	CL								
			23										
			24										
			25										
			26										
			27										
			28										
1 SS	24	3 6 9 17	29	28.5 - 30.8' **LEAN CLAY:** CL, brownish yellow (10YR 6/6), gray (10YR 5/4) mottling, hard (4.5 tsf).	CL								
			30										
2 SS	24 12	12 20 27 30	31	30.8 - 34.9' **SHALE:** BDX (SH), gray, moderately to highly decomposed.	BDX (SH)								
1 CORE	41 51		32	31.7' grayish brown mottling, thickly bedded.									Core 1, RQD=92%
			33										
			34										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-377

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
2 CORE	55.8 16		35	34.9 - 35.3' **LIMESTONE:** BDX (LS), cherty, moderately decomposed, reddish gray mottling, moderately fractured.	BDX (LS)								Core 2, RQD=25%
			36	35.3 - 46.4' **SHALE:** BDX (SH), gray, moderately to highly decomposed.									
			37										
			38										
			39										
3 CORE	60 64.2		40	39.7' - 40.4' gray and brown mottling, highly decomposed, blocky structure.									Core 3, RQD=75%
			41	40.4' - 43.1' highly decomposed, moderately fractured.	BDX (SH)								
			42										
			43										
			44										
			45										
4 CORE	60 58												Core 4, RQD=12%
			46										
			47	46.4 - 51.1' **SHALEY LIMESTONE:** BDX (LS/SH), intensely fractured (narrow apertures).									
			48										
			49		BDX (LS/SH)								
			50	49.5 - 49.9' vertical fracture.									
5 CORE	60 50												Core 5, RQD=58%
			51	51.1 - 55.5' **SHALE:** BDX (SH), gray, thickly bedded.									
			52										
			53		BDX (SH)								
			54										
			55										
6 CORE	60 41												Core 6, RQD=61%
			56	55.5 - 58.2' **SHALEY LIMESTONE:** BDX (LS/SH), fossiliferous, moderately fractured.	BDX (LS/SH)								

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-377

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram		Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			57 58	55.5 - 58.2' **SHALEY LIMESTONE**: BDX (LS/SH), fossiliferous, moderately fractured. *(continued)*	BDX (LS/SH)									
				58.2' End of Boring.										Bedrock corehole reamed 6" in diameter to 58' for well installation.

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		MW-382

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Jim Dittmaier Bulldog Drilling	11/19/2015	11/24/2015	4 1/4 HSA and rotary

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-382	Feet (NAVD88)	428.67 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 556,440.86 N, 2,382,404.51 E E /W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 40.344"

Long -89° 52' 4.9578"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample: Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			1	0 - 2' **SILTY CLAY** CL/ML.	CL/ML								0-34' Blind Drilled. See log PZ-182 log for soil description details.
			2	2 - 4' Shelby Tube Sample.									
			4	4 - 12' **SILTY CLAY** CL/ML.	CL/ML								
			5										
			6										
			7										
			8										
			9										
			10										
			11										
			12										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signatur

Firm Natural Resource Technology
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Template: ILLINOIS BORING LOG - Project: BALDWIN GINT.GPJ

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-382

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				12 - 14' Shelby Tube Sample.									
			13										
			14	14 - 22' **SILTY CLAY** CL/ML.									
			15										
			16										
			17										
			18		CL/ML								
			19										
			20										
			21										
			22	22 - 24' Shelby Tube Sample.									
			23										
			24	24 - 27' **SILTY CLAY** CL/ML.									
			25										
			26		CL/ML								
			27	27 - 29.1' **WELL-GRADED SAND:** SW.									
			28		SW								
			29	29.1 - 30' **SANDY LEAN CLAY WITH GRAVEL:** s(CL)g.	s(CL)g								
			30	30 - 34' **SILTY CLAY** CL/ML.									
			31		CL/ML								
			32										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-382

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			33	30 - 34' **SILTY CLAY** CL/ML. *(continued)*	CL/ML								
1 SS	23 20	12 20 25 50 for 5"	34–35	34 - 36' **SILTY CLAY** CL/ML, dark gray (10YR 4/1), dark yellowish brown 10YR 4/6 mottling, highly decomposed shale at bottom of spoon, hard (>4.5 tsf).	CL/ML								
1 CORE	53 48.5		36–38	36 - 38.3' **SHALE:** BDX (SH), gray, highly decomposed.	BDX (SH)								Core 1, RQD=94%
			38–39	38.3 - 40' **LIMESTONE:** BDX (LS), thinly laminated, intensely fractured (extremely narrow apertures).	BDX (LS)								
2 CORE	60 24.5		40–44	40 - 44.5' **SHALE:** BDX (SH), gray, highly decomposed.	BDX (SH)								Core 2, RQD=51%
			44–45	44.5 - 45.4' **LIMESTONE:** BDX (LS), thinly bedded.	BDX (LS)								
3 CORE	54 35		45–49	45.4 - 58.4' **SHALE:** BDX (SH), gray, highly decomposed.	BDX (SH)								Core 3, RQD=51%
4 CORE	24 23.5		50–52	50.1' - 51.2' reddish brown and dark gray mottling. 51.2' - 52.1' limestone, intensely fractured.									Core 4, RQD=19%

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-382

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
5 CORE	41 41			45.4 - 58.4' **SHALE:** BDX (SH), gray, highly decomposed. *(continued)* 52.1' gray.									Core 5, RQD=63%
			53										
			54										
			55		BDX (SH)								
6 CORE	30 25		56	55.9' gray to dark gray, intensely fractured, few medium limestone beds.									Core 6, RQD=50%
			57										
			58										
7 CORE	30 30			58.4 - 62' **LIMESTONE:** BDX (LS), cherty, moderately fractured.									Core 7, RQD=53%
			59	59.5' - 59.9' vertical fracture.									
			60	60' shale (2" layer).	BDX (LS)								
8 CORE	60 59			60.4' - 61.4' shaley, intensely fractured.									Core 8, RQD=70%
			61										
			62	62 - 67.1' **SHALE:** BDX (SH), gray, hard, slightly fractured.									
			63										
			64		BDX (SH)								
			65										
9 CORE	60 59		66										Core 9, RQD=88%
			67	67.1 - 70.6' **SHALEY LIMESTONE:** BDX (LS/SH), fossiliferous, slightly fractured, (very narrow apertures).									
			68										
			69		BDX (LS/SH)								Bedrock corehole reamed 6" in diameter to 69' for well installation.
			70										
				70.6' End of Boring.									

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		MW-383

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Jim Dittmaier Bulldog Drilling	12/7/2015	12/21/2015	4 1/4 HSA and rotary

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-383	Feet (NAVD88)	457.18 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 556,586.04 N, 2,385,208.26 E E /W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 41.6862"

Long -89° 51' 29.8296"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24	4 2 2 4	1	0 - 16' **FILL, ASH (Coal):** black (10YR 2/1) and dark yellowish brown (10YR 4/4), mostly sand-sized ash, 30-50% cinders, >15% silt-sized ash, very soft (0 tsf).									
2 SS	24	1 3 2 3	2										
			3										
3 SS	24 18	1 2 3 7	4										
			5										
4 SS	24 18	2 11 11 7	6		(FILL)								
			7										
5 SS	24 17	7 4 3 2	8	8' mostly black (10YR 2/1).									
			9										
6 SS	24 18	2 4 4 4	10										
			11										
			12										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Natural Resource Technology
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NATURAL RESOURCE TECHNOLOGY

Boring Number MW-383

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
7 SS	24	2 3 4 1		0 - 16' **FILL, ASH (Coal):** black (10YR 2/1) and dark yellowish brown (10YR 4/4), mostly sand-sized ash, 30-50% cinders, >15% silt-sized ash, very soft (0 tsf). *(continued)*									
			13										
8 SS	24	1 2 1 2	14	14' clay (2" thick layer).	(FILL)								
			15										
9 SS	24 10	WOH WOH 2 2	16	16 - 18' **LEAN CLAY:** CL, gray (5Y 5/1), stiff (1.75 tsf).	CL								WOH=weight of hammer
			17										
10 SS	24 14	WOH 2 2 2	18	18 - 40' **SILTY CLAY** CL/ML, gray (10YR 6/1), yellowish brown (10YR 5/6) mottling, stiff to very stiff (1.0-3.0 tsf), low plasticity.									
			19										
11 SS	24	WOH 2 2 2	20										
			21										
			22										
			23										Blind drill 22-24' bgs during casing install. Permanent 6" PVC casing was installed to 22.5' bgs.
13 SS	24 13	1 1 3 3	24	24' gray (10YR 5/1), dark yellowish brown (10YR 4/6) mottling.									
			25		CL/ML								
14 SS	24 12	1 1 2 3	26	26' dark gray (10YR 5/6) mottling.									
			27										
15 SS	24 23	2 4 4 6	28										
			29										
16 SS	24 27	4 4 2 7	30										
			31	31' trace oxidation staining.									
			32										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-383

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
17 SS	24 27	4 4 5 5		18 - 40' **SILTY CLAY** CL/ML, gray (10YR 6/1), yellowish brown (10YR 5/6) mottling, stiff to very stiff (1.0-3.0 tsf), low plasticity. *(continued)*									
			33	32' light brownish gray (10YR 6/2), yellowish brown (10YR 5/6) mottling, very stiff (3.0 tsf).									
18 SS	24 26	2 3 5 6	34	34' gray (10YR 5/1), dark yellowish brown (10YR 4/6) mottling, very stiff (2.0 tsf).									
			35										
19 SS	24 14	WOH WOH 3 4	36	36' very soft to stiff (0-1.75 tsf).	CL/ML								
			37										
20 SS	24 12	3 4 3 5	38	38' strong brown (7.5YR 4/6), gray (10Y R5/1) mottling, trace sand, very stiff (3.5 tsf).									
			39										
21 SS	24 22	1 2 2 2	40	40 - 41' **LEAN CLAY WITH SAND:** (CL)s, gray (10YR 5/1), dark yellowish brown (10YR 4/6) mottling, moderately stiff (0.75 tsf).	(CL)s								
			41	41 - 42' **SILTY SAND:** SM, yellowish brown (10YR 5/6), mostly medium sand, trace coarse sand, soft.	SM								
22 SS	24 24	5 8 9 10	42	42 - 44' **SILTY CLAY** CL/ML, brown (10YR 5/3), >15% sand, moderately stiff (0.75 tsf), nonplastic.	CL/ML								
			43										
23 SS	24 20	4 6 8 7	44	44 - 50' **LEAN CLAY:** CL, yellowish brown (10YR 5/6), trace black oxidation staining, very stiff to hard (3.25-4.5+ tsf), plastic.									
			45										
24 SS	24 16	4 6 10 11	46										
			47		CL								
25 SS	24 19	6 18 21 21	48	48' brown (10YR 5/3), hard (4.25-4.5+), low plasticity.									
			49										
26 SS 1 CORE	24 60	8 16 22 32	50	50 - 53.1' **SHALE:** BDX (SH), light olive gray (5Y 6/2), hard, highly decomposed, dry.									Core 1, RQD=60%
			51		BDX (SH)								
			52										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-383

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
27 SS	24	8 10 15 50/4"		50 - 53.1' **SHALE:** BDX (SH), light olive gray (5Y 6/2), hard, highly decomposed, dry. *(continued)*	BDX (SH)								
			53	53.1 - 55.1' **SHALEY LIMESTONE:** BDX (LS/SH), moderately fractured.									
			54		BDX (LS/SH)								
			55										
2 CORE	60			55.1 - 58.6' **LIMESTONE:** BDX (LS), slightly fractured.									Core 2, RQD=82%
			56										
			57		BDX (LS)								
			58										
			59	58.6 - 59.5' **SHALE:** BDX (SH), thinly bedded with limestone, moderately fractured.	BDX (SH)								
			60	59.5 - 70.1' **SHALE:** BDX (SH), gray, moderately decomposed. 60' intensely to moderately fractured.									
3 CORE	60												Core 3, RQD=31%
			61										
			62										
			63	63' moderately fractured.									
			64										
			65		BDX (SH)								
4 CORE	60												Core 4, RQD=49%
			66										
			67										
			68										
			69										
			70	70.1 - 73' **LIMESTONE:** BDX (LS), unfractured.									
5 CORE	34												Core 5, RQD=100%
			71		BDX (LS)								
			72										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-383

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
				70.1 - 73' **LIMESTONE:** BDX (LS), unfractured. *(continued)*	BDX (LS)								
			73	73' End of Boring.									Bedrock corehole reamed 6" in diameter to 73' for well installation.

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		MW-384

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Chad Dutton Bulldog Drilling	12/7/2015	12/16/2015	4 1/4 HSA and rotary

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-384	Feet (NAVD88)	456.70 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 555,446.11 N, 2,384,518.72 E E /(W)

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 30.4398"

Long -89° 51' 38.5158"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24 8	2 3 4 6	1	0 - 2.5' **FILL, ASH (Coal):** very soft to moderately stiff (0-0.75 tsf).	(FILL)								
2 SS	24 19	2 4 3 6	2										
			3	2.5 - 4' **FILL, SILTY CLAY** CL/ML, strong brown (7.5YR 4/6), trace gravel, very soft to very stiff (0-3.5 tsf).	(FILL) CL/ML								
3 SS	24 10	1 2 3 4	4	4 - 18' **FILL, ASH (Coal):** yellowish red (5YR 4/6) to reddish black (10R 2.5/1), sand-sized ash and cinders, very soft to stiff (0-1.5 tsf).									
4 SS	24	2 2 2 2	5										
			6										
5 SS	24	1 2 1 1	7		(FILL)								
			8										
6 SS	24	1 2 1 1	9										
			10										
			11										
			12										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Natural Resource Technology
234 W. Florida St., Fifth Floor, Milwaukee, WI 53204
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NATURAL RESOURCE TECHNOLOGY

Boring Number MW-384

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
7 SS	24	1 5 10 10		4 - 18' **FILL, ASH (Coal)**: yellowish red (5YR 4/6) to reddish black (10R 2.5/1), sand-sized ash and cinders, very soft to stiff (0-1.5 tsf). *(continued)*									
			13										
8 SS	24 14	5 10 11 11	14	14' wet.									
			15		(FILL)								
9 SS	24 14	5 8 14 15	16										
			17										
10 SS	24 16	2 2 3 4	18	18 - 22' **SILTY CLAY** CL/ML, gray (5Y 6/1), organic odor, stiff to very stiff (1.25-3.75 tsf), wet.									
			19										
11 SS	24 18	2 2 6 4	20		CL/ML								
			21										
12 SS	24 16	4 4 5 4	22	22 - 24' **SILT**: ML, very dark gray (10YR 3/1), dark yellowish brown (10YR 3/6) mottling, hard (4.25-4.5 tsf).									
			23		ML								
13 SS	24 22	1 2 5 7	24	24 - 42.4' **SILTY CLAY** CL/ML, gray (10YR 5/1) with yellowish brown (10YR 5/8), oxidation staining, very soft to hard (<0.25-4.5+ tsf).									
			25										Permanent 6" PVC casing set at 25' bgs.
14 SS	24 21	3 4 5 7	26	26' yellowish brown (10YR 5/4), trace yellowish brown (10YR 5/8) and very dark gray (10YR 3/1) mottling, 15-30% silt, 5-15% fine sand, trace fine gravel, stiff to very stiff (1.25-2.5 tsf), low to medium plasticity, moist.									
			27										
15 SS	24 21	3 4 5 6	28	28' color grades to gray (10YR 5/1), 30-50% silt, soft to stiff (0.5-1.25 tsf).	CL/ML								
			29										
16 SS	24 17.5	1 5 5 7	30	30' yellowish brown (10YR 5/8) mottling (15-30%), trace very dark gray (10YR 3/1) mottling, no gravel, very soft to very stiff (<0.25-2.5 tsf), medium plasticity.									
			31										
			32										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-384

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
17 SS	24 20.5	4 4 4 6		24 - 42.4' **SILTY CLAY** CL/ML, gray (10YR 5/1) with yellowish brown (10YR 5/8), oxidation staining, very soft to hard (<0.25-4.5+ tsf). *(continued)*									
			33	32' trace yellowish brown (10YR 5/8) and very dark gray (10YR 3/1) mottling, 15-30% silt, stiff to very stiff (1.75-3.5 tsf).									
18 SS	24 22	3 4 5 7	34	34' yellowish brown (10YR 5/8) mottling (15-30%), trace very dark gray (10YR 3/1) mottling, stiff to very stiff (1.5-2.5), dry to moist.									
			35	35.3' yellowish brown (10YR 5/8), trace gray (10YR 5/1) and very dark gray (10YR 3/1) mottling.									
19 SS	24 21	4 3 3 4	36	36' gray (10YR 5/1) mottling (15-30%), silt content increasing with depth, moderately stiff to stiff (0.75-1.25 tsf), low plasticity, moist.									
			37		CL/ML								
20 SS	24 24	2 4 7 14	38	38' grayish brown (10YR 5/2), trace gray (10YR 5/1), trace strong brown (7.5YR 4/6) mottling, 30-50% silt, soft to very stiff (0.5-3.75 tsf).									
			39	38.7' - 40' very dark gray (10YR 3/1) mottling (5-15%), 5-15% fine gravel.									
21 SS	24 25	3 11 21 44	40	40' sand (5-15%), trace gravel, very stiff to hard (3.5-4.5+ tsf). 40.3' wet.									
			41	40.8' very stiff to hard (3.5-4.5+ tsf), moist.									
22 SS	24 20	13 11 15 17	42	41.8' fine sand seam (1/4" thick). 42' - 42.4' fine gravel, 30-50% clay, trace sand, wet.									
			43	42.4 - 44.3' **CLAYEY SILT** ML/CL, gray (10YR 5/1) to grayish brown (10YR 5/2), 30-50% clay, 5-15% fine sand, trace subrounded gravel, very stiff to hard (3.5-4.5+), nonplastic to low plasticity, moist.	ML/CL								
23 SS	24 17	6 8 10 14	44	43.5' - 44.3' very dark grayish brown (10YR 3/2), brownish yellow trace (10YR 6/6) mottling, trace coal.									
			45	44.3 - 56' **LEAN CLAY:** CL, brownish yellow trace (10YR 6/6), trace light brownish gray (10YR 6/2) mottling, 15-30% silt, 5-15% gravel, trace gravel-sized oxidation-stained nodules, very stiff (2.5-3.0 tsf), low to medium plasticity, moist to dry.									
24 SS	24 16	5 10 11 15	46	46' decreasing silt content, trace gravel, clay becoming laminated with depth, very stiff (2.25-3.0 tsf).									
			47										
25 SS	24 13.5	6 8 12 22	48	48' silt (5-15%), trace shale gravel, very stiff (3.0 tsf), medium plasticity, dry.	CL								
			49	49.2' gravel (2" diameter).									
26 SS	24 16	8 9 15 19	50	50' very dark grayish brown (10YR 3/2) to dark grayish brown (10YR 4/2), trace silt, very stiff (3.5 tsf), medium to high plasticity, highly weathered shale (residual soil).									
			51										
			52										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-384

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
27 SS	24 22	13 14 9 14	53	44.3 - 56' **LEAN CLAY:** CL, brownish yellow trace (10YR 6/6), trace light brownish gray (10YR 6/2) mottling, 15-30% silt, 5-15% gravel, trace gravel-sized oxidation-stained nodules, very stiff (2.5-3.0 tsf), low to medium plasticity, moist to dry. *(continued)*									
28 SS	24 24	12 12 14 22	54 55	52' - 54' clay is fractured, light brownish gray (10YR 6/2) to light yellowish brown (10YR 6/4) in fractures. 54' trace very dark brown (10YR 2/2) laminations, hard (>4.5 tsf).	CL								
29 SS	23 20	11 14 20 50/5"	56	56 - 58.2' **SHALE:** BDX (SH), very dark gray (10YR 3/1), highly weathered, fissile, totally healed fractures, very weak, highly decomposed [light brownish gray (10YR 6/2) in fractures], very intensely fractured (closed to narrow apertures). 57' light yellowish brown (10YR 6/4) to very dark gray (10YR 3/1) layers, thinly bedded, highly decomposed to residual soil.	BDX (SH)								3" steel casing set at 57.7 ft bgs.
1 CORE	24 40		57 58										Core 1, RQD=36%
2 CORE	60 64		59 60	58.2 - 60.8' **LIMESTONE:** BDX (LS), light greenish gray (GLEY 1 7/10Y), microcrystalline, trace fossils, moderately strong to strong, medium bedded, slightly to moderately decomposed, moderately fractured.	BDX (LS)								Core 2, RQD=73%
			61 62 63	60.8 - 64' **SHALEY LIMESTONE:** BDX (LS/SH), weak, thin to medium bedded, moderately decomposed, slightly to moderately disintegrated.	BDX (LS/SH)								
3 CORE	60 73		64 65 66 67	64 - 82.6' **SHALE:** BDX (SH), greenish gray (GLEY 1 5/10Y), very weak, thinly bedded, highly to moderately decomposed, slightly to moderately disintegrated, intensely fractured (very narrow to moderately narrow apertures).									Core 3, RQD= 58%
			68	67.9' - 68.8' shale clasts within decomposed shale matrix.	BDX (SH)								
4 CORE	60 63		69 70 71 72	68.8' - 69.2' light yellowish brown (10YR 6/4), trace dark yellowish brown (10YR 3/6) layers. 69.2' - 74' intensely fractured (extremely narrow to narrow aperture).									Core 4, RQD=46%

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-384

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			73	64 - 82.6' **SHALE**: BDX (SH), greenish gray (GLEY 1 5/10Y), very weak, thinly bedded, highly to moderately decomposed, slightly to moderately disintegrated, intensely fractured (very narrow to moderately narrow apertures). *(continued)*									
5 CORE	60 20		74	74' - 79' intensely to very intensely fractured.									Core 5, RQD=0%
			75										
			76										
			77		BDX (SH)								Bedrock corehole reamed 6" in diameter to 77' for well installation.
			78										
6 CORE	60 64		79	79' - 82.6' intensely fractured.									Core 6, RQD=64%
			80										
			81										
			82										
			83	82.6 - 83.9' **SHALEY LIMESTONE:** BDX (LS/SH), light greenish gray (GLEY 1 7/10Y), fossiliferous, intensely fractured (extremely narrow to narrow apertures), slightly decomposed.	BDX (LS/SH)								
7 CORE	60 37		84	83.9 - 85.6' **SHALE:** BDX (SH), greenish gray (GLEY 1 5/10Y), very weak, medium bedded, highly to moderately decomposed, slightly to moderately disintegrated, intensely fractured (extremely narrow to narrow apertures).	BDX (SH)								Core 7, RQD=15%
			85										
			86	85.6 - 88.7' **SHALEY LIMESTONE**: BDX (LS/SH), light greenish gray (GLEY 1 7/10Y), shaley, fossiliferous, intensely fractured (extremely narrow to narrow apertures), slightly decomposed.									
			87	86.4' - 87' SHALE layer, greenish gray (GLEY 1 5/10Y), very weak, medium bedded.	BDX (LS/SH)								
			88										
			89	88.7 - 94.1' **SHALE:** BDX (SH), greenish gray (GLEY 1 5/10Y), very weak, medium bedded, highly to moderately decomposed, slightly to moderately disintegrated, intensely fractured (extremely narrow to narrow apertures).									
8 CORE	60 50		90		BDX (SH)								Core 8, RQD=49%
			91										
			92										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-384

Sample									Soil Properties					
Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram		Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			93 94	88.7 - 94.1' **SHALE:** BDX (SH), greenish gray (GLEY 1 5/10Y), very weak, medium bedded, highly to moderately decomposed, slightly to moderately disintegrated, intensely fractured (extremely narrow to narrow apertures). *(continued)* 92.5' - 93.2' light greenish gray (GLEY 1 7/10Y), shaley, fossiliferous, intensely fractured, slightly decomposed.	BDX (SH)									
				94.1' End of Boring.										

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		MW-385

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Mark Baetje Bulldog Drilling	12/4/2015	12/16/2015	4 1/4 HSA and rotary

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-385	Feet (NAVD88)	454.82 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 555,417.12 N, 2,382,285.24 E E/W
1/4 of 1/4 of Section , T N, R

Lat 38° 11' 30.2244"
Long -89° 52' 6.492"

Local Grid Location
Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24 13	2 3 3 5		0 - 0.3' **FILL, ASH (Coal):** dark yellowish brown (10YR 4/6), sand and silt-sized ash, dark gray (10YR 4/1) slag pieces, dry to moist.	(FILL)								
			1	0.3 - 19.7' FILL, **LEAN CLAY:** CL, brown (10YR 5/3) to yellowish brown (10YR 5/4) inside, 10-30% silt, cohesive, stiff to hard (1.0-4.5 tsf), medium plasticity, moist.									
2 SS	24 9	1 2 2 3	2	2' dark gray (10YR 4/1) mottling (15-30%), moist.									
			3										
3 SS	24 15	1 3 4 5	4	4' trace sand, trace dark yellowish brown (10YR 4/6) oxidation staining, moist to dry.									
			5										
4 SS	24 16	1 3 5 6	6	6' dry to moist.	(FILL) CL								
			7										
5 SS	24 9	WOH 1 3 4	8	8' increased dark gray (10YR 4/1) mottling 20-30%, dry to moist.									WOH=weight of hammer
			9										
6 SS	24 13	1 2 3 5	10	10' moist.									
			11										
7 SS	24 18	WOH 2 5 7	12	12' moist to dry. 12.3' mostly dark gray (10YR 4/1), no mottling.									
			13										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Pat M. Hale

Firm Natural Resource Technology
234 W. Florida St., Fifth Floor, Milwaukee, WI 53204
Tel: (414) 837-3607
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NATURAL RESOURCE TECHNOLOGY

Boring Number MW-385

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				0.3 - 19.7' **FILL, LEAN CLAY:** CL, brown (10YR 5/3) to yellowish brown (10YR 5/4) inside, 10-30% silt, cohesive, stiff to hard (1.0-4.5 tsf), medium plasticity, moist. *(continued)*									
8 SS	24 12	WOH WOH 3 3	14	13' mostly brown (10YR 4/3), dark gray (10YR 4/1) mottling.									
			15	14' some dark gray (10YR 4/1) mottling, trace yellowish brown (10YR 5/6) oxidation staining, trace very dark grayish brown (10YR 3/2) mottling, moist.									
9 SS	24 16	WOH 1 3 4	16	16' moist.	(FILL) CL								
			17	16.5' dark gray (10YR 4/1) with dark yellowish brown (10YR 4/6) mottling, cohesive, medium to high plasticity.									
10 SS	24 24	WOH WOH 2 3	18	18' dark gray (10YR 4/1), dark yellowish brown (10YR 4/6) mottling, softer than above, moist to wet.									
			19										
			20	19.7 - 31.9' **FILL, ASH (Coal):** very dark grayish brown (10YR 3/2) to very dark brown (10YR 2/2), silt-sized ash, trace sand-sized ash, cohesive, very soft (0 tsf), non-plastic, wet.									
11 SS	24 24	WOH WOH WOH 1	21	20' very dark grayish brown (10YR 3/2), trace sand seams, wet.									
12 SS	48 24	WOH 1 WOH 1	22	22' trace fine-grained sand seams.									
			23										
			24										
			25										
13 SS	24 21	1 WOH 1 WOH	26	25.7' medium-grained sand seam (2" thick).	(FILL)								
			27										
14 SS	24 24	1 2 2 1	28										
			29										
15 SS	24 24	WOH WOH WOH WOH	30										
			31										
			32	31.9 - 38' **SILT:** to **LEAN CLAY:** ML, olive gray (5Y 5/2), cohesive, very soft to soft (0.25-0.5 tsf), low to medium plasticity, moist to wet.									
			33		ML								
16 SS	24 24	WOH WOH WOH	34										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-385

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
		WOH	35	31.9 - 38' **SILT**: to **LEAN CLAY**: ML, olive gray (5Y 5/2), cohesive, very soft to soft (0.25-0.5 tsf), low to medium plasticity, moist to wet. *(continued)*									
			36		ML								
			37										
			38	38 - 59' **LEAN CLAY:** CL, olive gray (5Y 5/2), dark yellowish brown (10YR 4/6) mottling, moist to dry.									
17 SS	24 24	2 4 6 6	39										
			40										
			41										
18 SS	24 14	WOH 2 3 4	42	42' medium plasticity, moist.									Augered with 8" plug to 42' bgs.
			43										
19 SS	24 23	1 3 4 6	44										Permanent 6"PVC casing set at 45' bgs.
			45										
20 SS	24 27	2 3 3 5	46										
			47		CL								
21 SS	24 16	WOH 2 4 4	48	48' gray (10YR 6/1), dark yellowish brown (10YR4/6), stiff (1.5 tsf), plastic.									
			49										
22 SS	24 24	WOH 3 4 4	50										
			51	51' trace sand, very stiff (2.5 tsf).									
23 SS	24 24	3 4 4 7	52										
			53										
24 SS	24 22	WOH 2 3 4	54	54' increase in sand content, stiff (1.75 tsf).									
			55										
25	24	WOH	56	56' trace root structures, oxidation staining.									

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-385

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
SS	21	3 3 4	57	38 - 59' **LEAN CLAY:** CL, olive gray (5Y 5/2), dark yellowish brown (10YR 4/6) mottling, moist to dry. *(continued)*	CL								
26 SS	24 23	WOH 5 11 27	58										
			59	59 - 60' **POORLY-GRADED SAND WITH CLAY:** SP-SC, fine-grained, trace coarse-grained sand, and trace gravel, very stiff (2.25 tsf).	SP-SC								
27 SS	24 22	6 8 13 13	60	60 - 61' **SILTY CLAY** to **POORLY-GRADED SAND:** CL/ML, yellowish brown (10YR 5/6), gray (10YR 5/1) mottling.	CL/ML								
			61	61 - 62' **LEAN CLAY:** to **SHALE:** CL, very dark gray (10YR 3/1), weathered, hard (>4.5 tsf), dry.	CL								
28 SS	24 22	9 13 15 50/4"	62	62 - 63.8' **SILTY CLAY** to **SHALE:** CL/ML, grayish brown (10YR 5/2), dark yellowish brown (10YR 4/6) mottling, weathered.	CL/ML								
			63										
			64	63.8 - 65' **SHALE:** BDX (SH), weathered.	BDX (SH)								
1 CORE	12 11		65	65 - 65.9' **SHALEY LIMESTONE:** BDX (LS/SH).	BDX (LS/SH)								Core 1, RQD=0%
2 CORE	60 48		66	65.9 - 76.3' **SHALE:** BDX (SH), gray, decomposed, intensely to moderately fractured.									Core 2, RQD=63%
			67										
			68										
			69										
			70										
3 CORE	60 55		71	71.2' - 72.5 vertical fracture (tight aperture).	BDX (SH)								Core 3, RQD=82%
			72										
			73										
			74										
			75										
4 CORE	60 60		76										Core 4, RQD=74%
				76.3 - 76.9' **LIMESTONE:** BDX (LS).	BDX (LS)								
			77	76.9 - 78.9' **SHALE:** BDX (SH), dark gray, moderately fractured.	BDX (SH)								
			78										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-385

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				76.9 - 78.9' **SHALE:** BDX (SH), dark gray, moderately fractured. *(continued)*	BDX (SH)								
			79	78.9 - 81.1' **LIMESTONE:** BDX (LS), cherty, slightly fractured.									
			80		BDX (LS)								
5 CORE	60 54.5		81										Core 5, RQD=62%
				81.1 - 82.2' **SHALEY LIMESTONE:** BDX (LS/SH), intensely fractured.	BDX (LS/SH)								
			82	82.2 - 82.9' **LIMESTONE:** BDX (LS), moderately fractured.	BDX (LS)								
			83	82.9 - 83.5' **SHALEY LIMESTONE:** BDX (LS/SH), intensely fractured.	BDX (LS/SH)								
				83.5 - 87.4' **SHALE:** BDX (SH), gray.									
			84										
			85										
6 CORE	60 65		86		BDX (SH)								Core 6, RQD=58%
			87										
				87.4 - 93' **SHALEY LIMESTONE:** BDX (LS/SH), fossiliferous, intensely to moderately fractured.									
			88										
			89										
			90		BDX (LS/SH)								
7 CORE	30 30		91										Core 7, RQD=100%
			92										
			93	93' End of Boring.									Bedrock corehole reamed 6" in diameter to 93' for well installation.

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		MW-386

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Mark Baetje Bulldog Drilling	12/1/2015	12/11/2015	4 1/4 HSA and rotary

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-386	Feet (NAVD88)	454.67 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 554,585.18 N, 2,382,713.22 E E/W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 21.9876"

Long -89° 52' 1.167"

Local Grid Location ☐N ☐S Feet ☐E ☐W Feet

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24 / 16	3 3 7 5		0 - 0.5' **FILL, WELL-GRADED SAND:** SW, dark brown (10YR 3/3) to black (10YR 2/1), fine to coarse sand-sized ash and slag, moist.	(FILL) SW								
			1	0.5 - 2.6' **FILL, SILT:** ML, dark yellowish brown (10YR 4/4), yellowish brown (10YR 5/8) mottling, 20-40% clay, cohesive, hard (4.5 tsf), nonplastic, dry.	(FILL) ML								
2 SS	24 / 16	2 4 4 6	2	2' - 2.6' clay content increases with depth to mostly clay at 2.6', dry.									
			3	2.6 - 24.5' **FILL, LEAN CLAY:** CL, dark yellowish brown (10YR 4/4), trace gray (10YR 5/1) mottling, 20-40% silt, cohesive, very stiff (2.0-4.0 tsf), high plasticity, moist.									
3 SS	24 / 17	2 4 4 5	4	4' gray (10YR 5/1), 20-30% yellowish brown (10YR 5/8) mottling, trace medium-grained sand, moist to dry.									
			5										
4 SS	24 / 12	3 2 3 4	6	6' trace sand, moist to dry.									
			7		(FILL) CL								
5 SS	24 / 14.5	2 2 4 5	8	8' moist.									
			9										
6 SS	24 / 12	2 2 3 4	10	10' stiff (1.75 tsf).									
			11										
			12										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Natural Resource Technology
234 W. Florida St., Fifth Floor, Milwaukee, WI 53204
Tel: (414) 837-3607
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NATURAL RESOURCE TECHNOLOGY

Boring Number MW-386

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
7 SS	24 16	2 2 3 7		2.6 - 24.5' **FILL, LEAN CLAY:** CL, dark yellowish brown (10YR 4/4), trace gray (10YR 5/1) mottling, 20-40% silt, cohesive, very stiff (2.0-4.0 tsf), high plasticity, moist. *(continued)*									
			13	13.2' dark gray (10YR 4/1), trace sand, stiff to hard (1.5-4.5+ tsf), high plasticity, dry.									
8 SS	24 17	2 3 3 5	14	14' dark gray (10YR 4/1), dark yellowish brown (10YR 4/6), high plasticity, dry to moist.									
			15										
9 SS	24 14	2 2 3 3	16	16' dark yellowish brown (10YR 4/6), decrease to 30% dark gray (10YR 4/1), soft to very stiff (1.0-4.0 tsf), dry, increasing moisture content with depth.									
			17										
10 SS	24 15	1 1 2 2	18	18' brownish yellow (10YR 6/8) mottling, silt content increases with depth to 30-50%, trace fine gravel, very soft to very stiff (0.0 to 3.0 tsf), moist to wet.	(FILL) CL								
			19										
11 SS	24 24	3 2 2 4	20	20' yellowish brown (10YR 5/6), 30% dark gray (10YR 4/1) mottling, 20-40% silt, trace sand, trace fine gravel, soft to stiff (0.5-1.5 tsf), moist.									
			21										
12 SS	24 5	2 1 2 2	22	22' trace yellowish red (5YR 4/6), 5-15% sand, stiff (1.5 tsf).									
			23										
13 SS	24 24	2 2 1 1	24										
			25	24.5 - 26' **FILL, SILT:** ML, very dark grayish brown (10YR 3/2), low to medium plasticity, wet.	(FILL) ML								
14 SS	24 6	WOH WOH WOH WOH	26	26 - 28.2' **FILL, LEAN CLAY:** CL, dark yellowish brown (10YR 4/6), 30-50% silt, cohesive, moderately stiff (0.75 tsf), medium to low plasticity, wet.	(FILL) CL								WOH=weight of hammer
			27										
15 SS	24 24	1 1 1 1	28	28.2 - 44.3' **FILL, ASH (Coal):** very dark grayish brown (10YR 3/2), mostly silt-sized ash, 15-30% sand-sized ash, sand-sized ash seams, noncohesive, nonplastic.									
			29										
16 SS	24 24	2 3 1 1	30	30' wet.	(FILL)								
			31										
			32										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-386

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
17 SS	24 24	WOH WOH WOH WOH	33	28.2 - 44.3' **FILL, ASH (Coal):** very dark grayish brown (10YR 3/2), mostly silt-sized ash, 15-30% sand-sized ash, sand-sized ash seams, noncohesive, nonplastic. *(continued)*									
18 SS	24 24	WOH WOH 2 1	34, 35	34' trace dark gray (10YR 4/1) mottling of silt-sized ash, trace black (10YR 2/1) mottling of sand-sized ash, trace dark yellowish brown (10YR 4/6) mottling of clay-sized ash, very soft (0 tsf), wet.									
19 SS	24 23	1 WOH WOH WOH	36, 37										
20 SS	24 19	2 WOH WOH WOH	38, 39	38' mostly fine to medium sand-sized ash, 15-30% silt-sized ash, wet. 38.5' very dark grayish brown (10YR 3/2), black (10YR 2/1) mottling, mostly silt-sized ash, sand-sized ash seams, cohesive, nonplastic, wet.	(FILL)								
21 SS	24 24	1 2 WOH WOH	40, 41	40' dark gray (10YR 4/1) and black (10YR 2/1) mottling, wet.									
22 SS	24 21	1 WOH WOH WOH	42, 43										
23 SS	24 18	WOH 2 3 3	44, 45	44.3 - 46' **SILT**: ML, grades from very dark gray (10YR 3/1) to dark gray (10YR 4/1) with depth, 15-30% clay, cohesive, low plasticity, moist to wet.	ML								
24 SS	24 24	WOH 2 2 5	46, 47	46 - 60' **SILTY CLAY** CL/ML, gray (10YR 5/1) with yellowish brown (10YR 4/5), 20-40% silt, cohesive, stiff (1.75 tsf), medium plasticity, moist.									
25 SS	24 24	WOH 2 4 6	48, 49	48' dry to moist.	CL/ML								Permanent 6" PVC casing set at 48.5' bgs.
26 SS	24 12	2 4 5 5	50, 51, 52	50' oxidation-stained nodules (15-30%), trace sand.									

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-386

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
27 SS	24 17	1 6 12 14		46 - 60' **SILTY CLAY** CL/ML, gray (10YR 5/1) with yellowish brown (10YR 4/5), 20-40% silt, cohesive, stiff (1.75 tsf), medium plasticity, moist. *(continued)* 52' trace oxidation staining, very stiff (>4.5 tsf).									
			53										
28 SS	24 17	25 24	54										
			55										
29 SS	24 12	8 16 33 24	56	56' laminated weathered shale, dry.	CL/ML								
			57										
30 SS	24 24	7 11 15 24	58										
			59										
31 SS	24 21	6 10 15 18	60	60 - 60.3' **GRAVELLY FAT CLAY:** g(CH), black. 60.3 - 63.5' **SILTY CLAY** CL/ML, gray (10YR 5/1), dark yellowish brown (10YR 4/6) mottling, hard (>4.5 tsf).	g(CH)								
			61										
32 SS	24 18	9 15 50/5"	62		CL/ML								
1 CORE	28 35		63	63' gravel (>15%).									Core 1, RQD=34%
			64	63.5 - 64.8' **SHALE:** BDX (SH), weathered.	BDX (SH)								
2 CORE	60 45		65	64.8 - 65.2' **SHALEY LIMESTONE:** BDX (LS/SH), moderately fractured. 65.2 - 71' **SHALE:** BDX (SH), gray, slightly to moderately fractured, highly decomposed, some material washed-out.	BDX (LS/SH)								Core 2, RQD=93%
			66										
			67										
			68		BDX (SH)								
			69										
			70										
3 CORE	60 28		71	71 - 76' **LIMESTONE:** BDX (LS), vertical fracture, intensely fractured.	BDX (LS)								Core 3, RQD=18%
			72										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-386

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				71 - 76' **LIMESTONE:** BDX (LS), vertical fracture, intensely fractured. *(continued)* 72.3' vertical fracture.									
			73										
			74		BDX (LS)								
			75										
4 CORE	60 57		76										Core 4, RQD=37%
				76 - 77.2' **SHALE:** BDX (SH), dark gray, moderately fractured.	BDX (SH)								
			77										
				77.2 - 81.3' **SHALEY LIMESTONE:** BDX (LS/SH), moderately fractured.									
			78	78.2' - 78.9 vertical fracture.									
			79		BDX (LS/SH)								
				79.6' - 79.8' vertical fracture.									
			80										
5 CORE	60 55			80.3' - 80.5' vertical fracture.									Core 5, RQD=69%
			81										
				81.3 - 82.2' **SHALE:** to **LIMESTONE:** BDX (SH), slightly fractured.	BDX (SH)								
			82										
				82.2 - 86.3' **SHALE:** BDX (SH), gray, slightly to moderately fractured.									
			83										
			84		BDX (SH)								
			85										
6 CORE	48 48												Core 6, RQD=65%
			86										
				86.3 - 89' **SHALEY LIMESTONE:** BDX (LS/SH), slightly fractured.									
			87										
			88		BDX (LS/SH)								
			89	89' End of Boring.									Bedrock corehole reamed 6" in diameter to 89' for well installation.

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		MW-387

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Jim Dittmaier Bulldog Drilling	11/13/2015	11/18/2015	4 1/4 HSA and rotary

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-387	Feet (NAVD88)	424.01 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 555,111.17 N, 2,380,474.78 E E /Ⓦ
1/4 of 1/4 of Section , T N, R

Lat 38° 11' 27.258"
Long -89° 52' 29.1828"

Local Grid Location
Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24 16	2 7 6 6	0	0 - 4' **FILL, SILTY CLAY** CL/ML, brown (10YR 5/3), trace roots, stiff to very stiff (2.5-4 tsf), low plasticity, dry.	(FILL) CL/ML								
2 SS	24 18	2 5 5 7	2										
			3	3' trace fine sand.									
3 SS	24 18	2 4 4 5	4	4 - 10.8' **SILTY CLAY** CL/ML, dark yellowish brown (10YR 4/4), stiff to hard (1.5-4.5 tsf), medium plasticity, moist.	CL/ML								
4 SS	24 21	3 4 4 5	6	6' dark yellowish brown (10YR 3/4), trace oxidation staining.									
5 SS	24 0		8										
6 SS	24 16	WOH 3 4 5	10										WOH=weight of hammer
			11	10.8 - 12' **CLAYEY SILT** ML/CL, dark yellowish brown (10YR 4/4), nonplastic.	ML/CL								
			12										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature [signature]

Firm Natural Resource Technology
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NATURAL RESOURCE TECHNOLOGY

Boring Number MW-387

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
7 SS	24 24	WOH 3 4 4		12 - 24' **SILTY CLAY** CL/ML, dark yellowish brown (10YR 3/4), stiff to very stiff (1.5-2.75 tsf). 12.5' - 12.6' black staining.									
			13	13' increased silt content, moist.									
8 SS	24 24	1 2 4 5	14	14' dark yellowish brown (10YR 4/6).									
			15	15' trace oxidation staining, medium plasticity, moist.									
9 SS	24 26	2 3 5 6	16										
			17										
10 SS	24 25	1 3 4 5	18	18' low plasticity.	CL/ML								
			19	19' medium plasticity.									
11 SS	24 23	1 2 3 3	20	20' dark yellowish brown (10YR 4/4), grayish brown (10YR 5/2) mottling.									
			21										
12 SS	24 24	1 4 5 7	22										
			23										
13 SS	24 26	1 4 5 6	24	24 - 27.4' **LEAN CLAY:** CL, gray (10YR 5/1), stiff to very stiff (1.5-2.5 tsf), high plasticity.									
			25										
14 SS	24 24	1 3 6 4	26	26' trace black oxidation staining.	CL								
			27										
15 SS	24 24	1 2 2 3	28	27.4 - 28.5' **SILTY SAND:** to **LEAN CLAY:** SM, mostly fine sand, wet.	SM								
			29	28.5 - 32.5' **SILTY CLAY** CL/ML, yellowish brown (10YR 5/4), trace sand, very soft to very hard (0-4.5+ tsf).									
16 SS	24 20	WOH 1 4 7	30	30' dark yellowish brown (10YR 3/4), oxidation-stained nodules (1" layer).	CL/ML								
			31	31' brown (10YR 4/3).									
			32										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-387

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
17 SS	24 16	1 1 1 2											
			33	32.5 - 34' **POORLY-GRADED SAND:** SP, yellowish brown (10YR 5/4), mostly medium sand, sand grain size decreasing with depth, silt and clay content increasing with depth.	SP								
18 SS	24	4 10 12 14	34	34 - 34.5' **SILTY SAND:** SM, yellowish brown (10YR 5/4), mostly fine sand.	SM								
			35	34.5 - 36' **SILTY CLAY** CL/ML, brown (10YR 4/3), very stiff to hard (2.5-4.5 tsf), low plasticity.	CL/ML								
19 SS 1 CORE	3 3 39 39	50 for 3"	36	36 - 40.6' **LIMESTONE:** BDX (LS), light gray, cherty, intensely fractured (fractures partly healed with shale).	BDX (LS)								Core 1, RQD=44%
			37										
			38										
			39										
			40										
2 CORE	60 49		41	40.6 - 43.9' **SHALE:** BDX (SH), dark gray, intensely fractured.	BDX (SH)								Core 2, RQD=61%
			42										
			43										
			44	43.9 - 45.3' **SHALEY LIMESTONE:** BDX (LS/SH), intensely fractured.	BDX (LS/SH)								
			45										
3 CORE	60 61		46	45.3 - 48.8' **LIMESTONE:** BDX (LS), fossiliferous, moderately fractured (fractures partly healed with shale).	BDX (LS)								Core 3, RQD=75%
			47										
			48										
			49	48.8 - 53.9' **SHALEY LIMESTONE:** BDX (LS/SH), moderately fractured.	BDX (LS/SH)								
			50										
4 CORE	64 64		51										Formation taking water during coring.
			52										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-387

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			53	48.8 - 53.9' **SHALEY LIMESTONE**: BDX (LS/SH), moderately fractured. *(continued)*	BDX (LS/SH)								Core 4, RQD=92%
			54	53.9 - 55' **SHALE:** BDX (SH), dark gray, moderately fractured, slightly decomposed.	BDX (SH)								
			55	55 - 56.3' **SHALEY LIMESTONE:** BDX (LS/SH), moderately fractured.	BDX (LS/SH)								
5 CORE	60 59		56										Core 5, RQD=100%
			57	56.3 - 60.1' **LIMESTONE:** BDX (LS), fossiliferous, slightly fractured to unfractured.									
			58		BDX (LS)								
			59										
			60	60.1 - 61.3' Overdrilled for Well Installation.									
			61										
				61.3' End of Boring.									Bedrock corehole reamed 6" in diameter to 61.3' for well installation.

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		MW-388

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Jim Dittmaier Bulldog Drilling	11/10/2015	11/12/2015	4 1/4 HSA and rotary

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-388	Feet (NAVD88)	406.28 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 555,429.08 N, 2,379,624.09 E E /W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 30.426"

Long -89° 52' 39.8274"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24 11	2 5 10 8		0 - 4' **FILL, SILTY CLAY** CL/ML, dark yellowish brown (10YR 3/4), 30-50% silt, organic material at surface, very soft to very stiff (0.0-4.0 tsf), moist.									
			1										
2 SS	24 18	3 6 8 9	2		(FILL) CL/ML								
			3										
3 SS	24 15	3 4 8 9	4	4 - 18' **SILTY CLAY** CL/ML, brown (10YR 5/3), 30-50% silt, very soft to very stiff (0.0-4.0 tsf), moist.									
			5										
4 SS	24 18	1 4 6 4	6	6' yellowish brown (7.5YR 5/6), 30-50% fine sand.									
			7										
5 SS	24 22	1 1 2 4	8	8' yellowish brown (10YR 5/4).	CL/ML								
			9										
6 SS	24 21	2 2 3 3	10	10' brown (10YR 4/3), yellow (10YR 7/8) mottling.									
			11										
			12										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature Brad Rucker

Firm Natural Resource Technology
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NATURAL RESOURCE TECHNOLOGY

Boring Number MW-388

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
7 SS	24 25	1 2 3 3		4 - 18' **SILTY CLAY** CL/ML, brown (10YR 5/3), 30-50% silt, very soft to very stiff (0.0-4.0 tsf), moist. *(continued)*									
			13	13.3' brown (10YR 5/3), trace sand.									
8 SS	24 20	1 2 4 7	14	14' grayish brown (10YR 5/2), increasing coarse sand content.									
			15		CL/ML								
9 SS	24 21	2 4 5 8	16	16' brownish yellow (10YR 6/8) mottling, very dark brown (10YR 2/2) stringers.									
			17	17 - 18' **SILTY CLAY WITH SAND** (CL/ML)S, yellowish brown (10YR 5/8).	(CL/ML)S								
10 SS	24 22	1 2 2 3	18	18 - 20' **SILTY CLAY** CL/ML, 30-50% silt, very soft to very stiff (0.0-4.0 tsf), slow dilatancy, wet.									
			19		CL/ML								
11 SS	24 14	WOH 2 4 7	20	20 - 23.5' **SILT WITH SAND:** (ML)s, yellowish brown (10YR 5/6), fine sand, rapid dilatancy, very soft (0.0 tsf), wet.									WOH=weight of hammer
			21										
12 SS	24 22	3 9 12 9	22	22' yellowish brown (10YR 5/4), with clay.	(ML)s								
			23										
13 SS	24 18	WOH 4 6 9	24	23.5 - 26.5' **SILTY CLAY WITH SAND** (CL/ML)S, grayish brown (10YR 5/2), fine sand, very stiff (2.5-3.0 tsf), wet. 24' gray (10YR 5/1), no fine sand.									
			25		(CL/ML)S								
14 SS	8 7	4 50 for 2"	26										
				26.5 - 27' **SHALE:** BDX (SH), gray, decomposed.	BDX (SH)								
1 CORE	35 31		27	27 - 30' **LIMESTONE:** BDX (LS), fossiliferous, thickly bedded, slightly fractured (narrow to moderately narrow apertures).									Core 1, RQD = 97%
			28		BDX (LS)								
			29										
2 CORE	60 40		30	30 - 45' **SHALEY LIMESTONE:** BDX (LS/SH), highly decomposed, intensely fractured.									Core 2, RQD = 68%
			31		BDX (LS/SH)								
			32										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-388

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				30 - 45' **SHALEY LIMESTONE:** BDX (LS/SH), highly decomposed, intensely fractured. *(continued)*									
			33										
			34										
3 CORE	60 57.5		35	34.9' moderately fractured.									Core 3, RQD = 93%
			36										
			37	37' - 43.5' fossiliferous.									
			38		BDX (LS/SH)								
			39										
			40	40.1' slightly fractured.									
4 CORE	60 60.5		41	40.9' fossiliferous.									Core 4, RQD = 100%
			42										
			43										
			44										
			45	45 - 45.2' Overdrilled for Well Installation.									
				45.2' End of Boring.									Bedrock corehole reamed 6" in diameter to 45.2' for well installation.

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		MW-389

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Tom Marlo Bulldog Drilling	11/25/2015	12/1/2015	4 1/4 HSA and rotary

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-389	Feet (NAVD88)	417.30 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 556,119.33 N, 2,379,809.87 E E /W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 37.2444"

Long -89° 52' 37.4736"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 SS	24 16	1 3 7 13		0 - 16' **SILTY CLAY** CL/ML, brown (7.5YR 4/4), stiff to very hard (1-4.5+ tsf), low plasticity.									
			1										
2 SS	24 18	2 6 9 9	2										
			3										
3 SS	24 19.5	1 3 3 3	4	4.5' moist.									
			5										
4 SS	24 17	1 2 3 1	6		CL/ML								
			7	7' trace root structures.									
5 SS	24 17	2 2 4 5	8	8' black (10YR 2/1) oxidation mottling.									
			9										
6 SS	24 20	2 2 4 4	10	10' decreasing mottling, increasing silt content.									
			11										
			12										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Natural Resource Technology
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Tel: (414) 837-3607
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NATURAL RESOURCE TECHNOLOGY

Boring Number MW-389

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
7 SS	24 21	2 3 2 3		0 - 16' **SILTY CLAY** CL/ML, brown (7.5YR 4/4), stiff to very hard (1-4.5+ tsf), low plasticity. *(continued)*									
			13	12' dark yellowish brown (10YR 4/4), wet.									
8 SS	24 20	2 3 3 5	14	14' brown (10YR 5/3), dark yellowish brown (10YR4/6) mottling.	CL/ML								
			15										
9 SS	24 24	1 3 5 6	16	16 - 23' **FAT CLAY:** CH, grayish brown (10YR 5/2), yellowish brown (10YR 5/6) mottling, trace sand, stiff to very stiff (1.75-3.0 tsf), medium plasticity.									
			17										
10 SS	24 24	1 3 4 4	18	18' black (10YR 2/1) oxidation nodules.									
			19		CH								
11 SS	24 24	2 3 4 5	20										
			21										
12 SS	24 27	1 3 3 4	22										
			23	23 - 28.3' **SILTY CLAY WITH SAND** (CL/ML)S, yellowish brown (10YR 5/4), grayish brown (10YR 5/2) mottling, trace fine gravel, stiff to hard (1.5-4.5 tsf), medium plasticity.									
13 SS	24 27	1 2 4 4	24										
			25		(CL/ML)S								
14 SS	24 26	1 3 5 10	26										
			27	27' low plasticity.									
15 SS	24	1 3 8 11	28										
				28.3 - 28.8' **POORLY-GRADED SAND WITH CLAY:** SP-SC, yellowish brown (10YR 5/6).	SP-SC								
			29	28.8 - 36' **SILTY CLAY** CL/ML, yellowish brown (10YR 5/4), trace sand, oxidation nodules, and fine gravel, very stiff to hard (2.5-4.5 tsf), wet.									
16 SS	24	1 3 5 10	30		CL/ML								
			31										
			32										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-389

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
17 SS	24 23	1 3 5 8		28.8 - 36' **SILTY CLAY** CL/ML, yellowish brown (10YR 5/4), trace sand, oxidation nodules, and fine gravel, very stiff to hard (2.5-4.5 tsf), wet. *(continued)*									
			33										
18 SS	24 26	1 3 8 13	34	34' increasing gravel content.	CL/ML								
			35										
19 SS	4 4	50 for 4"	36	36 - 37.3' **SHALEY LIMESTONE:** BDX (LS/SH), moderately fractured.	BDX (LS/SH)								Core 1, RQD=86%
1 CORE	46 45		37										
				37.3 - 37.7' **SHALE:** BDX (SH), decomposed, moderately fractured.	BDX (SH)								
			38	37.7 - 39.3' **LIMESTONE:** BDX (LS), shale at fractures, moderately fractured.	BDX (LS)								
			39										
2 CORE	13 12			39.3 - 46.8' **SHALEY LIMESTONE:** BDX (LS/SH), fossiliferous, decomposed, moderately fractured.									Core 2, RQD=67%
			40										
3 CORE	56 56			40.4' - 41' intensely fractured.									Core 3, RQD=65%
			41										
			42										
			43		BDX (LS/SH)								
			44										
			45	45.2' slightly fractured.									
4 CORE	63 63		46										Core 4, RQD=89%
			47	46.8 - 50.5' **LIMESTONE:** BDX (LS), fossiliferous, slightly fractured.									
			48										
			49		BDX (LS)								
			50										
5 CORE	60 59		51	50.5 - 52.1' **SHALEY LIMESTONE:** BDX (LS/SH), fossiliferous.	BDX (LS/SH)								Core 5, RQD=100%
			52										

SOIL BORING LOG INFORMATION SUPPLEMENT

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-389

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram		Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			53 54 55	52.1 - 55.7' **LIMESTONE:** BDX (LS), fossiliferous, slightly fractured.	BDX (LS)									Bedrock corehole reamed 6" in diameter to 55' for well installation.
				55.7' End of Boring.										

APPENDIX D

GROUNDWATER QUALITY DATA

Appendix D - Groundwater Quality Data
Supplemental Hydrogeologic Site Characterization Report and Groundwater Monitoring Plan
Baldwin Fly Ash Pond System
Baldwin Energy Center

Well		Sample Date	Temperature (deg. C)	Specific Cond (Field) (micromhos/cm)	pH (field) (SU)	Alkalinity, total (mg/L)	Total Dissolved Solids (mg/L)	Nitrite nitrogen, total (mg/L)	Nitrate nitrogen, diss (mg/L)	Nitrate nitrogen, total (mg/L)	Cyanide, total (mg/L)	Calcium, dissolved (mg/L)	Magnesium, dissolved (mg/L)	Sodium, dissolved (mg/L)	Potassium, dissolved (mg/L)	Chloride, dissolved (mg/L)	Sulfate, dissolved (mg/L)	Fluoride, dissolved (mg/L)	Arsenic, dissolved (mg/L)	Barium, dissolved (mg/L)	Beryllium, dissolved (mg/L)	Boron, dissolved (mg/L)	Cadmium, dissolved (mg/L)	Chromium, dissolved (mg/L)	Cobalt, dissolved (mg/L)	Copper, dissolved (mg/L)	Iron, total (mg/L)	Iron, dissolved (mg/L)	Lead, dissolved (mg/L)	Manganese, total (mg/L)	Manganese, dissolved (mg/L)	Thallium, dissolved (mg/L)	Nickel, dissolved (mg/L)	Silver, dissolved (mg/L)	Zinc, dissolved (mg/L)	Antimony, dissolved (mg/L)	Selenium, dissolved (mg/L)	Mercury, dissolved (mg/L)
Class II Standard			ns	ns	6.5-9.0	ns	1200	ns	100	100	0.6	ns	ns	ns	ns	200	400	4.0	0.2	2.0	0.5	2.0	0.05	1.0	1.0	0.65	5.0	5.0	0.1	10	10	0.02	2.0	0.05	10	0.024	0.05	0.01
Max (Unlithified)			27.5	3890	12.4	700	3470	0.16	18	10.7	<0.008	289	126	168	77.54	140	2050	0.865	0.032	0.24	<0.005	45.3	<0.002	<0.005	0.01	0.016	69.4	18	0.005	24.4	6.8	<0.002	<0.005	0.006	0.014	<0.005	0.016	<0.002
Min (Unlithified)			2	301	5.6	46	188	<0.05	<0.05	<0.05	<0.007	54.17	1.0	20	<1	4.1	23	0.119	<0.005	0.0094	<0.004	<0.02	<0.002	<0.005	<0.005	<0.005	<0.02	<0.01	<0.005	<0.003	<0.003	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
Max (Bedrock)			28.1	7057	12.9	808	1709	0.35	2.04	1.13	<0.008	533	46	207	89	642	65	0.756	0.011	1.6	<0.005	1.88	<0.002	<0.005	<0.005	<0.005	3.82	1.6	<0.005	0.58	0.87	<0.002	0.007	0.01	0.006	0.0075	<0.01	<0.002
Min (Bedrock)			5.8	600	6.5	16	375	0.33	0.06	0.103	<0.007	45	2.1	29	<1	9	<10	0.174	<0.005	0.098	<0.004	<0.02	<0.002	<0.005	<0.005	<0.005	0.02	0.011	<0.005	<0.003	<0.003	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
Max (Leachate)			17.7	6240	11.9		5120									109	2820					94.7					90.6	0.06		1.58	<0.005							
Min (Leachate)			13.3	1070	7.6		1130									12	495					36.3					0.57	<0.02		0.01	<0.005							
Upgradient Wells (Unlithified Materials)																																						
MW104D	(N)	11/16/2010	15	1226	7		785		0.07		<0.007					15.7	245	0.469	<0.005	0.03	<0.005	<0.02	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		0.02	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW104D		3/23/2011	16.7	1176	7	406	801		0.07		<0.007	143	58	63	<1	17	241	0.422	<0.005	0.0311	<0.005	0.021	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		0.04	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW104D		6/7/2011	16.8	1213	6.9	404	776		<0.05		<0.007	134	58	58	<1	19	250	0.379	<0.005	0.033	<0.005	0.019	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		0.013	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW104DR		9/13/2011	16	1164	6.7	418	768		0.07		<0.007	134	49	58	2.2	18	225	0.37	<0.005	0.042	<0.004	<0.05	<0.002	<0.005	<0.005	<0.005		0.024	<0.005		0.42	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW104DR		12/8/2011	13.7	1127	6.8	410	739		0.06		<0.007	137	52	51	1.5	18	222	0.4	<0.005	0.038	<0.004	<0.05	<0.002	<0.005	<0.005	<0.005		0.025	<0.005		0.28	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW104DR		3/8/2012	11.3	1094	7.6	416	724		0.55		<0.008	145	58	56	1.3	24	214	0.31	<0.005	0.035	<0.004	<0.05	<0.002	<0.005	<0.005	<0.005		0.011	<0.005		0.21	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW104DR		9/16/2013	15.5	1130	6.9		676																				4.82			0.93								
MW104DR		11/20/2013	13.6	1250	6.8		630									16	194					0.02						0.07			0.29							
MW104DR		2/18/2014	12.2	991	6.8		652									18	175					<0.02						<0.02			0.04							
MW104DR		6/11/2014	14.3	1060	7		676									18	186					<0.02						0.028			0.123							
MW104DR		3/25/2015	14.4	775	7.1		630	<0.05		0.955						21	179					<0.02					0.54	<0.02		0.177	0.092							
MW104DR		6/24/2015	14.8	1030	7		718	<0.05		0.673						23	187					<0.02					0.77	<0.02		0.206	0.13							
MW104DR		9/25/2015	15.4	1090	7.1		634	<0.05		0.847						24	178					<0.02					0.74	<0.02		0.224	0.15							
MW104DR		11/10/2015	15.2	997	6.8		644	<0.05		0.924						25	195					<0.02					0.33	<0.02		0.234	0.172							
MW104S	(N)	11/16/2010	11.8	1550	6.6		943		<0.05		<0.007					33.7	148	0.629	0.032	0.15	<0.005	0.16	<0.002	<0.005	<0.005	<0.005		18	<0.005		6.8	<0.002	<0.005	<0.005	0.009	<0.005	<0.01	<0.002
MW104S		3/23/2011	15.9	1142	6.5	446	742		<0.05		<0.007	106	42	104	<1	56	169	0.401	0.0082	0.0899	<0.005	0.146	<0.002	<0.005	<0.005	<0.005		1.85	<0.005		3.0	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW104S		6/7/2011	21.8	1290	6.5	550	824		0.07		<0.008	121	46	105	1.8	58.7	114	0.561	0.012	0.24	<0.005	0.22	<0.002	<0.005	<0.005	<0.005		14	<0.005		4.0	<0.002	<0.005	<0.005	0.009	<0.005	<0.01	<0.002
MW104SR		9/13/2011	19.9	1286	6.4	654	909		0.37		<0.007	157	65	92	<1	32	164	0.54	0.0058	0.059	<0.004	<0.05	<0.002	<0.005	<0.005	<0.005		0.08	<0.005		1.2	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW104SR		12/8/2011	12.3	1405	6.9	616	965		0.14		<0.007	167	70	84	<1	31	237	0.523	<0.005	0.076	<0.004	<0.05	<0.002	<0.005	<0.005	<0.005		0.19	<0.005		1.1	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW104SR		3/8/2012	10.1	1521	6.9	700	886		0.09		<0.008	168	77	85	<1	34	140	0.549	<0.005	0.097	<0.004	0.06	<0.002	<0.005	<0.005	<0.005		0.61	<0.005		1.9	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW104SR		9/16/2013	17	1310	6.7		724																				3.18			4.97								
MW104SR		11/20/2013	15.1	1320	6.7		770									19	134					0.04						1.44			2.2							
MW104SR		2/18/2014	12.8	809	6.7		792									18	138					0.05						<0.02			0.59							
MW104SR		6/11/2014	14.9	1260	6.5		792									16	68					0.147						0.806			1.7							
MW104SR		3/25/2015	10.9	1000	6.8		770	<0.05		0.058						14	100					0.086					0.48	0.207		2.66	2.1							
MW104SR		6/24/2015	15.4	1390	6.6		880	<0.05		<0.05						23	47					0.178					7.12	3.74		3.46	3.1							
MW104SR		9/25/2015	18.7	1330	6.7		744	<0.05		<0.05						19	23					0.237					3.62	3.35		2.54	2.52							
MW104SR		11/10/2015	17	1150	6.3		732	0.06		0.321						19	57					0.149					0.98	1.19		2.78	3.09							
TPZ158		9/17/2013	16.4	720	7.1		394																				6.93			0.12								
TPZ158		11/20/2013	14.9	984	7.3		976									81	39					<0.02						1.43			0.35							
TPZ158		2/18/2014	10.2	584	6.7		380									65	44					<0.02						<0.02			<0.005							
TPZ158		6/12/2014	14.8	645	6.1		408									62	37					0.03						0.085			<0.005							
Downgradient Wells (Unlithified Materials)																																						
MW150	(N)	11/15/2010	13.5	1467	7.3		1133		<0.05		<0.007					65.4	507	0.826	0.005	0.02	<0.005	0.31	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		<0.005	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW150		3/23/2011	15.3	1681	7.3	378	1205		0.06		<0.008	132	95	131	<1	65	555	0.841	0.006	0.0161	<0.005	0.473	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		<0.005	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW150		6/7/2011	16.7	1910	7.1	370	1396		0.06		<0.008	138	105	134	<1	57.7	696	0.791	<0.005	0.017	<0.005	0.4	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		<0.005	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW150		9/13/2011	14.4	1620	7.2	376	1162		0.05		<0.007	135	82	123	1.0	66	513	0.86	<0.005	0.017	<0.004	0.36	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		<0.005	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW150		12/7/2011	13.1	1744	7.1	390	1278		<0.05		<0.007	136	92	126	<1	77	585	0.865	0.0053	0.019	<0.004	0.47	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		<0.005	<0.002	<0.005	<0.005	<0.005	<0.005	0.01	<0.002
MW150		3/7/2012	16.1	1704	7.3	388	1334		<0.05		<0.007	128	108	134	<1	69	584	0.798	<0.005	0.015	<0.004	0.56	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		<0.005	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW150		9/16/2013	14.8	1350	7.5		1090																				20.1			0.32								
MW150		11/20/2013	13.3	1530	7.1		1090									51	502					0.65						0.07			0.03							
MW150		2/19/2014	12.7	1330	7		1200									51	521					0.8						<0.02			<0.005							
MW150		6/11/2014	13	1680	7.3		1300									49	552					0.98						<0.02			0.006							
MW150		3/25/2015	13.7	1290	7.4		1270	<0.05		0.134						47	550					1.19					14.5	<0.02		0.215	0.024							
MW150		6/24/2015	13.5	1650	7.2		1340	<0.05		<0.05						50	565					1.25					0.81	0.035		0.016	0.003							
MW150		9/25/2015	14	1710	7.2		1210	<0.05		<0.05						52	632					1.5					0.22	0.127		0.016	0.013							
MW150		11/10/2015	13.5	1550	7		1180	<0.05		0.057						54	584					1.47					0.08	0.0388		0.007	0.005							
MW151	(N)*	11/15/2010	15.3	1022	7.1		580		<0.05		<0.007					39.9	76.5	0.536	0.007	0.05	<0.005	0.25	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		0.14	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW151		3/23/2011	13.2	974	6.9	414	568		<0.05		<0.007	117	46	46	1.1	40	77	0.531	<0.005	0.0396	<0.005	0.226	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		0.064	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW151		6/7/2011	15	1001	6.9	410	539		<0.05		<0.007	97	45	45	1.0	38.7	82.3	0.483	<0.005	0.0396	<0.005	0.22	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		0.032	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW151		9/13/2011	22.8	1010	6.8	442	587		<0.05		<0.007	109	42	52	1.3	44	78	0.53	<0.005	0.041	<0.004	0.22	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		0.059	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW151		12/8/2011	9.2	953	7.8	430	576		<0.05		<0.007	114	45	48	1.0	40	77	0.54	0.006	0.049	<0.004	0.25	<0.002	<0.005	<0.005	<0.005		0.011	<0.005		0.021	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW151		3/7/2012	13.2	941	8.1	446	569		0.09		<0.007	119	48	48	<1	38	75	0.479	<0.005	0.039	<0.004	0.22	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		0.010	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW151		9/16/2013	17.3	855	7.2		526																				19.3			1.53								
MW151		11/20/2013	14.2	970	7.1		542									36	78					0.24						<0.02			<0.005							
MW151		2/19/2014	8.5	852	7.1		538									35	74					0.23						<0.02			<0.005							
MW151		6/12/2014	13.8	983	6.3		562									35	63					0.217						<0.02			0.005							
MW152	(N)	11/15/2010	15	2030	7		1759		0.17		<0.007					84.1	859	0.348	0.008	0.01	<0.005	12	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		0.05	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW152		3/23/2011	11.2	2128	7.4	360	1768		0.31		<0.007	249	104	131	1.4	75	914	0.268	0.0073	0.0109	<0.005	8.974	<0.002	<0.005	<0.005	<0.005		0.04	<0.005		0.021	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW152		6/7/2011	15.5	2103	7.3	408	1634		0.24		<0.007	205	100	148	1.0	53.7	772	0.274	<0.005	0.01	<0.005	3.6	<0.002	<0.005	<0.005	<0.005		0.026	<0.005		0.013	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW152		9/13/2011	17.6	2052	7.2	420	1607		0.09		<0.007	212	97	146	1.1	69	1000	0.3	<0.005	0.01	<0.004	7.8	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		0.072	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW152		12/6/2011	10.8	2299	6.5	420	1983		<0.05		<0.007	289	126	131	<1	140	1030	0.281	0.008	0.014	<0.004	18	<0.002	<0.005	<0.005	<0.005		0.012	<0.005		0.018	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW152		3/7/2012	13.7	2092	6.7	420	1511		0.25		<0.007	190	91	130	<1	52	700	0.258	<0.005	0.0094	<0.004	3.7	<0.002	<0.005	<0.005	<0.005		0.02	<0.005		0.0093	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW152		9/16/2013	16.2	1920	7		1620																				19.4			1.37								
MW152		11/20/2013	13.7	1950	7.2		1720									55	857					9.92						0.07			0.005							
MW152		2/19/2014	9.5	1880	6.4		1770									56	898					12.7						0.05			<0.005							
MW152		6/12/2014	12.9	1890	6.5		1530									32	636					2.36						0.456			0.102							
MW152		3/25/2015	10	1880	6.9		2150	<0.05		<0.05						71	1020					26.8					12.4	0.044		0.367	0.01							
MW152		6/24/2015	14	2580	6.8		2150	<0.05		0.207						68	978					19.5					16.6	0.118		0.639	0.091							
MW152		9/25/2015	16.3	2530	6.8		1920	<0.05		<0.05						63	949					17.7					2.65	0.033		0.105	0.019							
MW152		11/10/2015	15.2	2110	6.7		1920	<0.05		<0.05						27	965					16.9					3.93	0.076		0.158	0.040							
MW153	(N)	11/16/2010	14.8	730	7.1		462		13.2		<0.007					34.4	88.5	0.44	<0.005	0.03	<0.005	<0.02	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		<0.005	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW153		3/23/2011	21.2	736	7.4	192	430		14.91		<0.007	58	24	59	<1	30	93	0.383	<0.005	0.025	<0.005	<0.02	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		0.0091	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW153		6/7/2011	20.2	732	7.5	200	449		12		<0.007	56	24	56	<1	31.5	82.5	0.388	<0.005	0.025	<0.005	0.014	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		0.0053	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW153		9/14/2011	16.2	718	6.9	194	446		18		<0.007	55	23	65	<1	33	83	0.4	<0.005	0.025	<0.004	<0.05	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		0.011	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW153		12/8/2011	5.5	789	7	206	451		15		<0.007	61	26	61	<1	34	93	0.41	<0.005	0.028	<0.004	<0.05	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		0.015	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW153		3/8/2012	11.9	669	7.3	200	416		12.9		<0.007	57	24	57	<1	29	81	0.394	<0.005	0.024	<0.004	<0.05	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		0.0077	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW153		9/17/2013	15.5	778	7.3		448																				7.34			0.16								
MW153		11/21/2013	14.1	730	6.6		384									28	98					<0.02						<0.02			0.03							
MW153		2/19/2014	13.7	561	7.2		402									22	81					<0.02						<0.02			<0.005							
MW153		6/11/2014	13.2	686	7		426									21	80					<0.02						<0.02			0.009							
MW153		3/25/2015	12.9	491	7.3		354	<0.05		10.5						18	77					<0.02					0.64	<0.02		0.03	0.016							

Appendix D - Groundwater Quality Data
Supplemental Hydrogeologic Site Characterization Report and Groundwater Monitoring Plan
Baldwin Fly Ash Pond System
Baldwin Energy Center

Well		Sample Date	Temperature (deg. C)	Specific Cond (Field) (micromhos/cm)	pH (field) (SU)	Alkalinity, total (mg/L)	Total Dissolved Solids (mg/L)	Nitrite nitrogen, total (mg/L)	Nitrate nitrogen, diss (mg/L)	Nitrate nitrogen, total (mg/L)	Cyanide, total (mg/L)	Calcium, dissolved (mg/L)	Magnesium, dissolved (mg/L)	Sodium, dissolved (mg/L)	Potassium, dissolved (mg/L)	Chloride, dissolved (mg/L)	Sulfate, dissolved (mg/L)	Fluoride, dissolved (mg/L)	Arsenic, dissolved (mg/L)	Barium, dissolved (mg/L)	Beryllium, dissolved (mg/L)	Boron, dissolved (mg/L)	Cadmium, dissolved (mg/L)	Chromium, dissolved (mg/L)	Cobalt, dissolved (mg/L)	Copper, dissolved (mg/L)	Iron, total (mg/L)	Iron, dissolved (mg/L)	Lead, dissolved (mg/L)	Manganese, total (mg/L)	Manganese, dissolved (mg/L)	Thallium, dissolved (mg/L)	Nickel, dissolved (mg/L)	Silver, dissolved (mg/L)	Zinc, dissolved (mg/L)	Antimony, dissolved (mg/L)	Selenium, dissolved (mg/L)	Mercury, dissolved (mg/L)
Class II Standard			ns	ns	6.5-9.0	ns	1200	ns	100	100	0.6	ns	ns	ns	ns	200	400	4.0	0.2	2.0	0.5	2.0	0.05	1.0	1.0	0.65	5.0	5.0	0.1	10	10	0.02	2.0	0.05	10	0.024	0.05	0.01
Max (Unlithified)			27.5	3890	12.4	700	3470	0.16	18	10.7	<0.008	289	126	168	77.54	140	2050	0.865	0.032	0.24	<0.005	45.3	<0.002	<0.005	0.01	0.016	69.4	18	0.005	24.4	6.8	<0.002	<0.005	0.006	0.014	<0.005	0.016	<0.002
Min (Unlithified)			2	301	5.6	46	188	<0.05	<0.05	<0.05	<0.007	54.17	1.0	20	<1	4.1	23	0.119	<0.005	0.0094	<0.004	<0.02	<0.002	<0.005	<0.005	<0.005	<0.02	<0.01	<0.005	<0.003	<0.003	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
Max (Bedrock)			28.1	7057	12.9	808	1709	0.35	2.04	1.13	<0.008	533	46	207	89	642	65	0.756	0.011	1.6	<0.005	1.88	<0.002	<0.005	<0.005	<0.005	3.82	1.6	<0.005	0.58	0.87	<0.002	0.007	0.01	0.006	0.0075	<0.01	<0.002
Min (Bedrock)			5.8	600	6.5	16	375	0.33	0.06	0.103	<0.007	45	2.1	29	<1	9	<10	0.174	<0.005	0.098	<0.004	<0.02	<0.002	<0.005	<0.005	<0.005	0.02	0.011	<0.005	<0.003	<0.003	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
Max (Leachate)			17.7	6240	11.9		5120									109	2820					94.7					90.6	0.06		1.58	<0.005							
Min (Leachate)			13.3	1070	7.6		1130									12	495					36.3					0.57	<0.02		0.01	<0.005							
MW153		6/24/2015	14.3	648	7.2		442	<0.05		10.6						21	73					<0.02					0.18	<0.02		0.015	0.009							
MW153		9/25/2015	15.2	654	6.8		354	<0.05		10.5						22	75					<0.02					0.21	<0.02		0.014	0.0084							
MW153		11/10/2015	15.5	620	7.1		360	<0.05		10.7						22	75					<0.02					0.3	<0.02		0.017	0.0087							
MW154	(N)	3/23/2011	11.5	911	7.3	424	559		1.28		<0.007	110	40	53	1.2	12	94	0.623	0.0057	0.073	<0.005	0.026	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		<0.005	<0.002	<0.005	<0.005	<0.005	<0.005	0.0159	<0.002
MW154		6/7/2011	14.5	874	7.1	384	508		0.53		<0.007	106	38	28	<1	9.53	71.9	0.501	<0.005	0.076	<0.005	0.026	<0.002	<0.005	<0.005	<0.005		0.018	<0.005		0.18	<0.002	<0.005	<0.005	0.014	<0.005	<0.01	<0.002
MW154		9/12/2011																																				
MW154		12/7/2011	13.8	665	6.7	324	346		0.25		<0.007	89	25	22	<1	4.1	29	0.525	<0.005	0.1	<0.004	<0.05	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		0.0062	<0.002	<0.005	<0.005	0.007	<0.005	<0.01	<0.002
MW154		3/6/2012	12.9	861	7.1	406	476		4.49		<0.007	114	40	20	<1	5.5	38	0.516	<0.005	0.08	<0.004	<0.05	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		<0.005	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW154		9/17/2013	16	869	7.3		516																				7.1			0.19								
MW154		2/19/2014	11.3	713	7.4		454									8	48					0.02						<0.02			<0.005							
MW154		6/12/2014	13.3	825	6.9		492									12	30					<0.02						<0.02			<0.005							
MW154		3/25/2015	9.9	692	7.3		494	<0.05		0.957						7	39					<0.02					1.55	<0.02		0.019	<0.003							
MW154		6/30/2015	15	751	6.9		468	<0.05		<0.05						6	29					0.021					0.34	0.078		0.05	0.032							
MW154		9/25/2015	16.4	1040	6.9		550	<0.05		<0.05						9	49					<0.02					3.9	0.042		0.132	0.083							
MW155	(N)	11/16/2010	13.8	600	7.1		470		4.46		<0.007					6.55	61.8	0.39	<0.005	0.03	<0.005	<0.02	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		0.038	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW155		3/23/2011	15.5	763	7.1	360	455		1.98		<0.007	88	45	24	<1	10	53	0.398	<0.005	0.025	<0.005	<0.02	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		0.28	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW155		6/7/2011	16.1	806	7.1	400	487		1.4		<0.007	86	46	25	<1	8.58	49.6	0.385	<0.005	0.024	<0.005	0.012	<0.002	<0.005	<0.005	<0.005		0.016	<0.005		0.062	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW155		9/12/2011	19.3	526	6.8	376	470		2.1		<0.007	86	42	28	<1	9.3	50	0.38	<0.005	0.022	<0.004	<0.05	<0.002	<0.005	<0.005	<0.005		0.013	<0.005		0.37	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW155		12/7/2011	8.3	528	6.9	366	450		2		<0.007	91	44	26	<1	11	51	0.417	<0.005	0.023	<0.004	<0.05	<0.002	<0.005	<0.005	<0.005		0.015	<0.005		0.18	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW155		3/6/2012	16.3	774	6.9	392	446		1.85		<0.008	93	49	28	<1	8.8	49	0.401	<0.005	0.019	<0.004	<0.05	<0.002	<0.005	<0.005	0.016		<0.01	<0.005		0.081	<0.002	<0.005	<0.005	0.014	<0.005	<0.01	<0.002
MW155		9/17/2013	14.1	773	7.4		470																				48.3			24.4								
MW155		2/19/2014	13.7	3890	7		1080									8	54					<0.02						0.48			0.35							
MW155		6/12/2014	15	799	6.5		484									8	41					<0.02						<0.02			<0.005							
MW155		3/25/2015	13.6	588	7.3		402	<0.05		1.61						7	50					<0.02					0.09	<0.02		0.073	<0.003							
MW155		6/24/2015	13.5	796	7.2		498	<0.05		1.64						8	53					<0.02					0.23	<0.02		0.291	0.008							
MW155		9/25/2015	14.9	849	7.2		438	<0.05		1.82						9	50					<0.02					0.21	<0.02		0.132	0.0112							
MW155		11/10/2015	14.2	774	7		436	<0.05		2.13						9	51					<0.02					0.6	<0.02		0.273	<0.003							
MW252	(N)	11/15/2010	13.8	1730	7.8		1318		<0.05		<0.007					52.8	528	0.233	0.008	0.04	<0.005	0.97	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		1.7	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW252		3/23/2011	15.3	1845	7	534	1335		0.06		<0.007	232	90	100	5.3	61	559	0.25	0.006	0.039	<0.005	1.47	<0.002	<0.005	<0.005	0.0072		<0.01	<0.005		0.93	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW252		6/7/2011	14	1833	7.8	524	1341		0.05		<0.008	210	84	99	2.1	61.4	578	0.224	<0.005	0.04	<0.005	0.31	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		0.61	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW252		9/13/2011	14.9	1806	7.5	526	1301		<0.05		<0.007	206	78	104	3	52	510	0.22	0.0061	0.029	<0.004	0.32	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		0.97	<0.002	<0.005	<0.005	0.007	<0.005	<0.01	<0.002
MW252		12/6/2011	9.8	1745	6.8	524	1224		<0.05		<0.007	221	83	99	1.9	50	490	0.232	0.007	0.04	<0.004	0.29	<0.002	<0.005	0.01	<0.005		<0.01	<0.005		1.2	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW252		3/7/2012	21.6	1910	7	528	1286		<0.05		<0.007	225	91	99	1.4	49	576	0.21	<0.005	0.022	<0.004	0.19	<0.002	<0.005	<0.005	<0.005		0.026	<0.005		0.44	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW252		9/16/2013	14.1	1650	7		1260																				9.04			1.3								
MW252		11/20/2013	13.8	1670	7.1		1250									41	463					0.23						0.07			0.11							
MW252		2/19/2014	10.9	1320	8.1		1310									41	480					0.23						<0.02			0.01							
MW252		6/12/2014	14.3	1790	6.4		1390									38	447					0.223						<0.02			0.057							
MW252		3/25/2015	12.8	1350	7		1270	<0.05		<0.05						38	487					0.155					1.15	<0.02		0.324	0.053							
MW252		6/24/2015	13.7	1680	6.7		1320	<0.05		<0.05						41	488					0.132					12.3	0.1		0.585	0.198							
MW252		9/25/2015	14.5	1800	6.8		1250	<0.05		<0.05						38	459					0.14					2.09	<0.02		0.655	0.582							
MW252		11/10/2015	13.7	1600	6.6		1250	<0.05		<0.05						38	493					0.134					15.5	0.0221		0.717	0.152							
MW253	(N)	11/16/2010	13.4	765	6.9		1441		0.38		<0.007					27.4	806	0.408	0.008	0.02	<0.005	0.24	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		0.37	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW253		3/23/2011	25.9	1971	7.7	580	854		0.08		<0.008	54	1.0	168	78	26	262	0.119	0.0063	0.066	<0.005	0.124	<0.002	<0.005	<0.005	<0.005		<0.01	0.005		<0.005	<0.002	<0.005	0.006	<0.005	<0.005	<0.01	<0.002
MW253		6/7/2011	27.5	1564	11.3	187	698		0.06		<0.007	104	<5	108	18	22.2	411.4	0.369	<0.005	0.054	<0.005	0.064	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		<0.005	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW253		9/14/2011	17.5	958	9.8	46	639		0.12		<0.007	61	15	95	9.1	23	424	0.29	<0.005	0.031	<0.004	<0.05	<0.002	<0.005	<0.005	<0.005		0.013	<0.005		<0.005	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW253		12/8/2011	2	908	7.4	105	744		<0.05		<0.007	76	48	94	4.9	27	483	0.349	0.0064	0.026	<0.004	0.11	<0.002	<0.005	<0.005	<0.005		0.014	<0.005		0.0071	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW253		3/8/2012	9.6	1142	11	115	634		<0.05		<0.007	110	2.8	86	6.4	22	406	0.246	<0.005	0.036	<0.004	0.076	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		<0.005	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW253		9/17/2013	15.6	833	10.6		546																				0.16			0.02								
MW253		11/21/2013	13.9	735	8.6		602									18	405					0.09						<0.02			<0.005							
MW253		2/19/2014	14.4	833	7.8		564									16	368					0.06						<0.02			<0.005							
MW253		6/11/2014	14.1	1460	11.4		668									14	313					0.083						<0.02			<0.005							
MW253		3/25/2015	14.1	1910	12.4		820	<0.05		0.109						12	247					0.093					<0.02	<0.02		0.003	<0.003							
MW253		6/24/2015	14.8	3410	12.4		928	0.16		<0.05						10	142					0.05					0.09	<0.02		0.005	<0.003							
MW253		9/25/2015	14.6	631	11.1		346	<0.05		<0.05						12	241					0.044					<0.02	<0.02		<0.003	<0.003							
MW253		11/10/2015	14.8	589	10.1		300	<0.05		<0.05						12	216					0.033					<0.02	<0.02		<0.003	<0.003							
MW156	(N)	11/15/2010																																				
MW156		3/23/2011																																				
MW156		6/6/2011																																				
MW156		9/12/2011																																				
MW156		12/8/2011																																				
MW156		3/8/2012																																				
MW156		9/16/2013	16.4	814	6.7		480																				2.04			0.07								
MW156		11/21/2013	15.2	684	6.6		466									60	93					<0.02						0.06			0.05							
MW156		2/18/2014	13.3	662	6.8		470									55	88					0.03						<0.02			<0.005							
MW156		6/11/2014	15	825	6.8		506									60	86					0.024						<0.02			<0.005							
MW156		3/25/2015	11.8	611	7																																	
MW156		6/24/2015	15.9	794	6.8																																	
MW156		9/25/2015	18.3	848	7																																	
MW156		11/10/2015	16.6	778	6.8																																	
OW256		9/16/2013	15.1	862	7.1		520																				4.6			0.44								
OW256		11/21/2013	15.7	723	6.6		488									65	88					0.16						0.02			0.13							
OW256		2/18/2014	10.7	723	6.8		508									57	90					0.15						<0.02			<0.005							
OW256		6/11/2014	15.4	881	7.1		522									54	66					0.146						0.076			0.342							
MW157S	(N)	11/15/2010																																				
MW157S		3/23/2011																																				
MW157S		6/6/2011																																				
MW157S		9/12/2011																																				
MW157S		12/8/2011																																				
MW157S		3/8/2012																																				
MW157S		9/16/2013	16.4	3270	7.6		3170																				12.7			0.26								
MW157S		11/21/2013	15.1	2940	6.4		3160									121	1870					45.2						0.05			0.14							
MW157S		2/18/2014	13	3150	6.6		3180									124	2050					45.3						<0.02			0.13							
MW157S		6/11/2014	14.2	3560	6.3		3470									118	2000					44.6						0.03			0.13							

Appendix D - Groundwater Quality Data
Supplemental Hydrogeologic Site Characterization Report and Groundwater Monitoring Plan
Baldwin Fly Ash Pond System
Baldwin Energy Center

Well		Sample Date	Temperature (deg. C)	Specific Cond (Field) (micromhos/cm)	pH (field) (SU)	Alkalinity, total (mg/L)	Total Dissolved Solids (mg/L)	Nitrite nitrogen, total (mg/L)	Nitrate nitrogen, diss (mg/L)	Nitrate nitrogen, total (mg/L)	Cyanide, total (mg/L)	Calcium, dissolved (mg/L)	Magnesium, dissolved (mg/L)	Sodium, dissolved (mg/L)	Potassium, dissolved (mg/L)	Chloride, dissolved (mg/L)	Sulfate, dissolved (mg/L)	Fluoride, dissolved (mg/L)	Arsenic, dissolved (mg/L)	Barium, dissolved (mg/L)	Beryllium, dissolved (mg/L)	Boron, dissolved (mg/L)	Cadmium, dissolved (mg/L)	Chromium, dissolved (mg/L)	Cobalt, dissolved (mg/L)	Copper, dissolved (mg/L)	Iron, total (mg/L)	Iron, dissolved (mg/L)	Lead, dissolved (mg/L)	Manganese, total (mg/L)	Manganese, dissolved (mg/L)	Thallium, dissolved (mg/L)	Nickel, dissolved (mg/L)	Silver, dissolved (mg/L)	Zinc, dissolved (mg/L)	Antimony, dissolved (mg/L)	Selenium, dissolved (mg/L)	Mercury, dissolved (mg/L)
Class II Standard			ns	ns	6.5-9.0	ns	1200	ns	100	100	0.6	ns	ns	ns	ns	200	400	4.0	0.2	2.0	0.5	2.0	0.05	1.0	1.0	0.65	5.0	5.0	0.1	10	10	0.02	2.0	0.05	10	0.024	0.05	0.01
Max (Unlithified)			27.5	3890	12.4	700	3470	0.16	18	10.7	<0.008	289	126	168	77.54	140	2050	0.865	0.032	0.24	<0.005	45.3	<0.002	<0.005	0.01	0.016	69.4	18	0.005	24.4	6.8	<0.002	<0.005	0.006	0.014	<0.005	0.016	<0.002
Min (Unlithified)			2	301	5.6	46	188	<0.05	<0.05	<0.05	<0.007	54.17	1.0	20	<1	4.1	23	0.119	<0.005	0.0094	<0.004	<0.02	<0.002	<0.005	<0.005	<0.005	<0.02	<0.01	<0.005	<0.003	<0.003	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
Max (Bedrock)			28.1	7057	12.9	808	1709	0.35	2.04	1.13	<0.008	533	46	207	89	642	65	0.756	0.011	1.6	<0.005	1.88	<0.002	<0.005	<0.005	<0.005	3.82	1.6	<0.005	0.58	0.87	<0.002	0.007	0.01	0.006	0.0075	<0.01	<0.002
Min (Bedrock)			5.8	600	6.5	16	375	0.33	0.06	0.103	<0.007	45	2.1	29	<1	9	<10	0.174	<0.005	0.098	<0.004	<0.02	<0.002	<0.005	<0.005	<0.005	0.02	0.011	<0.005	<0.003	<0.003	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
Max (Leachate)			17.7	6240	11.9		5120									109	2820					94.7					90.6	0.06		1.58	<0.005							
Min (Leachate)			13.3	1070	7.6		1130									12	495					36.3					0.57	<0.02		0.01	<0.005							
MW157S		3/25/2015	12.6	3870	6.5																																	
MW157S		6/24/2015	15.1	3730	6.3																																	
MW157S		9/25/2015	18.4	3030	6.3																																	
MW157S		11/10/2015	17.3	3370	6.2																																	
OW257		9/16/2013	15.7	1430	7		960																				0.24			0.99								
OW257		11/21/2013	14.6	1180	7.1		958									21	312					3.28						0.02			0.68							
OW257		2/18/2014	13.1	1120	7.1		900									18	310					2.88						<0.02			0.01							
OW257		6/11/2014	15.8	1370	6.6		916									15	250					2.25						0.027			0.309							
MW161		9/16/2013	15.1	746	6.9		446																				11.8			1.84								
MW161		11/21/2013	13.2	625	7.1		756									6	44					<0.02						0.09			1.28							
MW161		2/18/2014	14.2	603	7		430									5	44					<0.02						<0.02			0.83							
MW161		6/11/2014	14.5	796	6.8		450									5	31					<0.02						0.047			0.272							
MW262		9/16/2013	14.8	448	7		318																				69.4			2.42								
MW262		11/21/2013	15.4	369	7.1		228									<5	40					<0.02						0.12			0.01							
MW262		2/19/2014	14.7	301	7.5		188									<5	24					<0.02						0.02			0.02							
MW262		6/11/2014	15.5	469	6.9		310									<5	44					<0.02						0.031			<0.005							
TPZ159		9/17/2013	17.9	849	6.6		588																				1.77			0.47								
TPZ159		11/21/2013	14.5	642	6.5		448									35	96					0.11						0.06			0.68							
TPZ159		2/18/2014	15.1	593	6.5		480									35	98					0.12						<0.02			0.51							
TPZ159		6/12/2014	18.6	674	5.6		460									34	92					0.087						0.069			0.387							
TPZ160		9/17/2013	17.7	880	7.2		490																				8.62			0.36								
TPZ160		11/21/2013	15.6	659	7.3		454									42	60					0.24						0.05			0.12							
TPZ160		2/18/2014	13.4	682	7		510									44	63					0.21						0.39			0.16							
TPZ160		6/11/2014	15.2	806	6.8		494									42	46					0.205						<0.02			0.215							
TPZ166		9/17/2013	16.5	612	7		396																				0.09			0.23								
TPZ166		11/20/2013	14.7	951	7.7		304									12	56					0.1						<0.02			0.02							
TPZ166		2/18/2014	13.5	423	7.2		306									12	38					0.06						<0.02			0.28							
TPZ166		6/12/2014	15.8	495	5.8		302									12	23					0.028						<0.02			0.431							
Downgradient Wells (Bedrock)																																						
MW350	(N)	11/15/2010	11.4	629	12.2		375		<0.05		<0.007					21.4	53.7	0.51	<0.005	0.23	<0.005	0.6	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		<0.005	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW350		3/23/2011	18.7	1268	11.7	307	885		<0.05		<0.007	108	<5	182	84	27	30	0.46	0.0079	0.46	<0.005	0.417	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		<0.005	<0.002	<0.005	0.009	<0.005	<0.005	<0.01	<0.002
MW350		6/7/2011	16.4	5144	12.2	561	1257		<0.05		<0.008	218	<5	207	89	25.8	42.5	0.365	<0.005	0.87	<0.005	0.26	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		<0.005	<0.002	<0.005	0.007	<0.005	<0.005	<0.01	<0.002
MW350		9/13/2011	18.4	4508	12.1	505	1196		<0.05		<0.007	202	<5	200	70	34	46	0.33	0.0064	0.76	<0.004	0.21	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		<0.005	<0.002	<0.005	0.005	<0.005	0.0075	<0.01	<0.002
MW350		12/7/2011	7	5529	12.6	778	1423		<0.05		<0.007	323	<5	166	57	31	41	0.289	0.011	1.2	<0.004	0.13	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		<0.005	<0.002	<0.005	0.006	<0.005	0.0069	<0.01	<0.002
MW350		3/7/2012	14	7057	12.9	808	1709		<0.05		<0.007	533	<5	149	43	32	62	0.174	0.005	1.6	<0.004	0.056	<0.002	<0.005	<0.005	<0.005		0.011	<0.005		<0.005	<0.002	<0.005	0.01	<0.005	0.0075	<0.01	<0.002
MW350		9/16/2013	14.6	5190	12.3		1640																				0.14			<0.005								
MW350		11/20/2013	13.5	4140	11.8		1370									34	11					0.03						<0.02			<0.005							
MW350		2/19/2014	13.3	4170	8.1		1420									33	<10					0.03						<0.02			<0.005							
MW350		6/11/2014	14.3	6120	12.4		1580									38	<50					0.021						<0.02			<0.005							
MW350		3/25/2015	14.4	6580	12.8		1430	0.35		<0.1						46	15					0.032					0.08	<0.02		<0.003	<0.003							
MW350		6/24/2015	14.4	5990	12.5		1430	0.33		0.103						48	11					0.034					0.1	<0.02		<0.003	<0.003							
MW350		9/25/2015	13.8	4200	12.6		1140	0.34		<0.05						43	27					0.103					0.04	<0.02		<0.003	<0.003							
MW350		11/10/2015	13.5	2790	12.2		690	<0.05		<0.05						40	38					0.191					0.03	<0.02		<0.003	<0.003							
MW352	(N)	11/15/2010	13.2	1102	10.6		779		<0.05		<0.007					521	12.6	0.692	0.005	0.18	<0.005	0.9	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		<0.005	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW352		3/23/2011	16.8	1877	11.6	102	783		<0.05		<0.007	93	<5	182	19	535	14	0.696	0.0066	0.27	<0.005	0.869	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		<0.005	<0.002	<0.005	0.007	<0.005	<0.005	<0.01	<0.002
MW352		6/7/2011	23.8	1922	11.2	70	862		<0.05		<0.007	79	<5	180	15	514.4	15.2	0.698	<0.005	0.29	<0.005	0.84	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		<0.005	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW352		9/13/2011	28.1	1704	11	39	735		0.06		<0.007	60	2.1	185	12	603	16	0.7	0.0082	0.19	<0.004	0.76	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		<0.005	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW352		12/8/2011	5.8	1426	10.7	20	706		<0.05		<0.007	70	6.2	190	9.6	642	14	0.652	0.0091	0.19	<0.004	0.76	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		<0.005	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW352		3/7/2012	20.1	1381	10.2	16	891		<0.05		<0.007	45	22	200	6.3	611	11	0.756	<0.005	0.11	<0.004	0.86	<0.002	<0.005	<0.005	<0.005		<0.01	<0.005		<0.005	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW352		9/16/2013	14.6	1740	9.4		1130																				0.17			0.007								
MW352		11/20/2013	13.3	1740	7.3		996									583	11					1.47						<0.02			<0.005							
MW352		2/19/2014	11.5	1530	6.5		768									390	18					0.82						<0.02			<0.005							
MW352		6/12/2014	14.3	1920	8.9		1090									569	<20					1.53						<0.02			<0.005							
MW352		3/25/2015	13.3	1350	9		874	<0.05		0.606						415	12					1.05					0.02	<0.02		0.004	<0.003							
MW352		6/24/2015	14.6	1870	8.6		1100	<0.05		<0.05						508	<10					1.23					0.09	<0.02		0.004	<0.003							
MW352		9/25/2015	15.3	2070	8		1210	<0.05		<0.05						597	<10					1.88					0.03	<0.02		0.007	0.007							
MW352		11/10/2015	13.8	1850	7.6		1100	<0.05		<0.05						567	<10					1.79					0.03	<0.02		0.007	0.005							
MW355	(N)	11/16/2010	13.6	934	7		532		0.95		<0.007					14	56	0.403	<0.005	0.1	<0.005	0.02	<0.002	<0.005	<0.005	<0.005		1.6	<0.005		0.87	<0.002	0.007	<0.005	<0.005	<0.005	<0.01	<0.002
MW355		3/23/2011	15.5	848	7.1	432	486		0.56		<0.007	96	45	32	<1	14	36	0.405	0.0061	0.10	<0.005	0.021	<0.002	<0.005	<0.005	<0.005		0.60	<0.005		0.45	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW355		6/7/2011	17	841	7.2	404	491		0.21		<0.007	85	43	30	<1	13.4	45.9	0.397	<0.005	0.12	<0.005	0.03	<0.002	<0.005	<0.005	<0.005		0.41	<0.005		0.2	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW355		9/12/2011	17	824	6.7	396	490		1.6		<0.007	87	41	34	<1	12	53	0.41	0.0074	0.11	<0.004	<0.05	<0.002	<0.005	<0.005	<0.005		0.55	<0.005		0.34	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW355		12/7/2011	8.2	812	6.8	412	486		0.82		<0.007	105	46	33	<1	14	48	0.412	<0.005	0.14	<0.004	<0.05	<0.002	<0.005	<0.005	<0.005		0.59	<0.005		0.43	<0.002	<0.005	<0.005	0.006	<0.005	<0.01	<0.002
MW355		3/6/2012	16.3	879	6.8	396	447		2.04		<0.008	88	46	29	<1	12	50	0.42	<0.005	0.098	<0.004	<0.05	<0.002	<0.005	<0.005	<0.005		0.26	<0.005		0.13	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
MW355		9/17/2013	14.1	811	7.4		468																				3.82			0.58								
MW355		11/21/2013	13.1	682	7.2		450									11	61					0.03						0.62			0.06							
MW355		2/19/2014	13.5	691	7		458									11	65					0.02						0.03			0.05							
MW355		6/12/2014	14.8	797	6.8		532									10	51					0.024						0.071			0.024							
MW355		3/25/2015	14.2	600	7.5		418	<0.05		0.63						9	61					0.024					0.3	0.072		0.031	0.015							
MW355		6/24/2015	14.2	781	7.2		526	<0.05		1.13						9	58					0.024					0.51	0.022		0.042	0.01							
MW355		9/25/2015	14.2	826	7.1		422	<0.05		0.28						10	56					0.025					0.3	0.056		0.073	0.062							
MW355		11/10/2015	13.7	772	7		438	<0.05		1.06						10	57					<0.02					0.18	0.033		0.031	0.043							

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Baldwin Energy Center

Well	Sample Date	Temperature (deg. C)	Specific Cond (Field) (micromhos/cm)	pH (field) (SU)	Alkalinity, total (mg/L)	Total Dissolved Solids (mg/L)	Nitrite nitrogen, total (mg/L)	Nitrate nitrogen, diss (mg/L)	Nitrate nitrogen, total (mg/L)	Cyanide, total (mg/L)	Calcium, dissolved (mg/L)	Magnesium, dissolved (mg/L)	Sodium, dissolved (mg/L)	Potassium, dissolved (mg/L)	Chloride, dissolved (mg/L)	Sulfate, dissolved (mg/L)	Fluoride, dissolved (mg/L)	Arsenic, dissolved (mg/L)	Barium, dissolved (mg/L)	Beryllium, dissolved (mg/L)	Boron, dissolved (mg/L)	Cadmium, dissolved (mg/L)	Chromium, dissolved (mg/L)	Cobalt, dissolved (mg/L)	Copper, dissolved (mg/L)	Iron, total (mg/L)	Iron, dissolved (mg/L)	Lead, dissolved (mg/L)	Manganese, total (mg/L)	Manganese, dissolved (mg/L)	Thallium, dissolved (mg/L)	Nickel, dissolved (mg/L)	Silver, dissolved (mg/L)	Zinc, dissolved (mg/L)	Antimony, dissolved (mg/L)	Selenium, dissolved (mg/L)	Mercury, dissolved (mg/L)
Class II Standard		ns	ns	6.5-9.0	ns	1200	ns	100	100	0.6	ns	ns	ns	ns	200	400	4.0	0.2	2.0	0.5	2.0	0.05	1.0	1.0	0.65	5.0	5.0	0.1	10	10	0.02	2.0	0.05	10	0.024	0.05	0.01
Max (Unlithified)		27.5	3890	12.4	700	3470	0.16	18	10.7	<0.008	289	126	168	77.54	140	2050	0.865	0.032	0.24	<0.005	45.3	<0.002	<0.005	0.01	0.016	69.4	18	0.005	24.4	6.8	<0.002	<0.005	0.006	0.014	<0.005	0.016	<0.002
Min (Unlithified)		2	301	5.6	46	188	<0.05	<0.05	<0.05	<0.007	54.17	1.0	20	<1	4.1	23	0.119	<0.005	0.0094	<0.004	<0.02	<0.002	<0.005	<0.005	<0.005	<0.02	<0.01	<0.005	<0.003	<0.003	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
Max (Bedrock)		28.1	7057	12.9	808	1709	0.35	2.04	1.13	<0.008	533	46	207	89	642	65	0.756	0.011	1.6	<0.005	1.88	<0.002	<0.005	<0.005	<0.005	3.82	1.6	<0.005	0.58	0.87	<0.002	0.007	0.01	0.006	0.0075	<0.01	<0.002
Min (Bedrock)		5.8	600	6.5	16	375	0.33	0.06	0.103	<0.007	45	2.1	29	<1	9	<10	0.174	<0.005	0.098	<0.004	<0.02	<0.002	<0.005	<0.005	<0.005	0.02	0.011	<0.005	<0.003	<0.003	<0.002	<0.005	<0.005	<0.005	<0.005	<0.01	<0.002
Max (Leachate)		17.7	6240	11.9		5120									109	2820					94.7					90.6	0.06		1.58	<0.005							
Min (Leachate)		13.3	1070	7.6		1130									12	495					36.3					0.57	<0.02		0.01	<0.005							
Leachate Wells in Old East, East and West Fly Ash Ponds (Screened in Fill/CCRs to be Abandoned)																																					
TPZ163	9/17/2013	15.6	1650	9.7		1410																				7.86			0.13								
TPZ163	11/20/2013	13.3	1350	8.8		1130									19	626					37.2						<0.02			<0.005							
TPZ163	2/18/2014	13.4	1070	7.6		1160									15	610					37.8						<0.02			<0.005							
TPZ163	6/12/2014	14.9	1340	9.5		1150									12	495					36.3						<0.02			<0.005							
TPZ167	9/17/2013	17.7	3830	9.9		3250																				0.57			0.01								
TPZ167	11/20/2013	16	2920	8.2		3010									100	1850					53						<0.02			<0.005							
TPZ167	2/18/2014	14.3	3540	7.7		3040									100	1840					54.5						<0.02			<0.005							
TPZ167	6/11/2014	17.2	4240	10		3590									101	1650					60						<0.02			<0.005							
TPZ168	9/17/2013	16.4	5330	10.8		3910																				90.6			1.58								
TPZ168	11/20/2013	14.4	5140	9.2		3680									109	2760					87.2						<0.02			<0.005							
TPZ168	2/18/2014	15.3	6020	8.1		5120									103	2820					78.8						0.06			<0.005							
TPZ168	6/11/2014	16.2	6240	11.9		4610									101	2240					94.7						0.055			<0.005							

[Cr By: JAZ 1/28/16, Chd By:GFF 1/29/16]

Notes:
(N) = NPDES permit monitoring well; * = added to NPDES well network
Red = Exceedance of Class II Groundwater Standard in wells screened in Unlithified Materials

APPENDIX E

STATISTICAL PROCEDURE FOR BACKGROUND

APPENDIX E
STATISTICAL PROCEDURE FOR CALCULATION OF BACKGROUND
Baldwin Fly Ash Pond System Closure
Groundwater Monitoring Plan
Baldwin Energy Complex, Baldwin, Illinois

Introduction

The purpose of the statistical calculations documented in this appendix is to determine the maximum background concentrations likely to occur upgradient of the Baldwin Old East and East Fly Ash ponds in the upper water bearing zone, which typically corresponds to the unlithified glacial materials. High predicted background concentrations relative to the Illinois Class II groundwater quality standards may suggest that downgradient concentrations for those parameters in the upper water bearing zone are due to a background source.

The statistical analysis procedures used here are consistent with procedures described in the document: 2009 Unified Guidance. "Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities—Unified Guidance," March 2009, EPA 530/R-09-2007 (USEPA, 2009).

Compliance Data Operations - Limit Calculations

The range of potential background concentrations was statistically determined using parametric and non-parametric tolerance intervals. Tolerance intervals were chosen rather than prediction intervals because a tolerance interval makes no assumption about the future number of samples, while a prediction interval assumes a finite, and known, future number of samples.

The flow diagram (Figure E-1) outlines the logic flow for calculation of limits. Background values were calculated using parametric tolerance intervals for normally distributed data, and non-parametric tolerance intervals for data with no underlying distribution or with non-detect frequencies greater than 50 percent. Parametric tolerance intervals were calculated at a 95 percent coverage rate and a Type I individual comparison error level of 0.01 (i.e., false positive rate). Parameters with 100 percent non-detects were handled with the upper tolerance limit being set to the last Reporting Limit (RL).

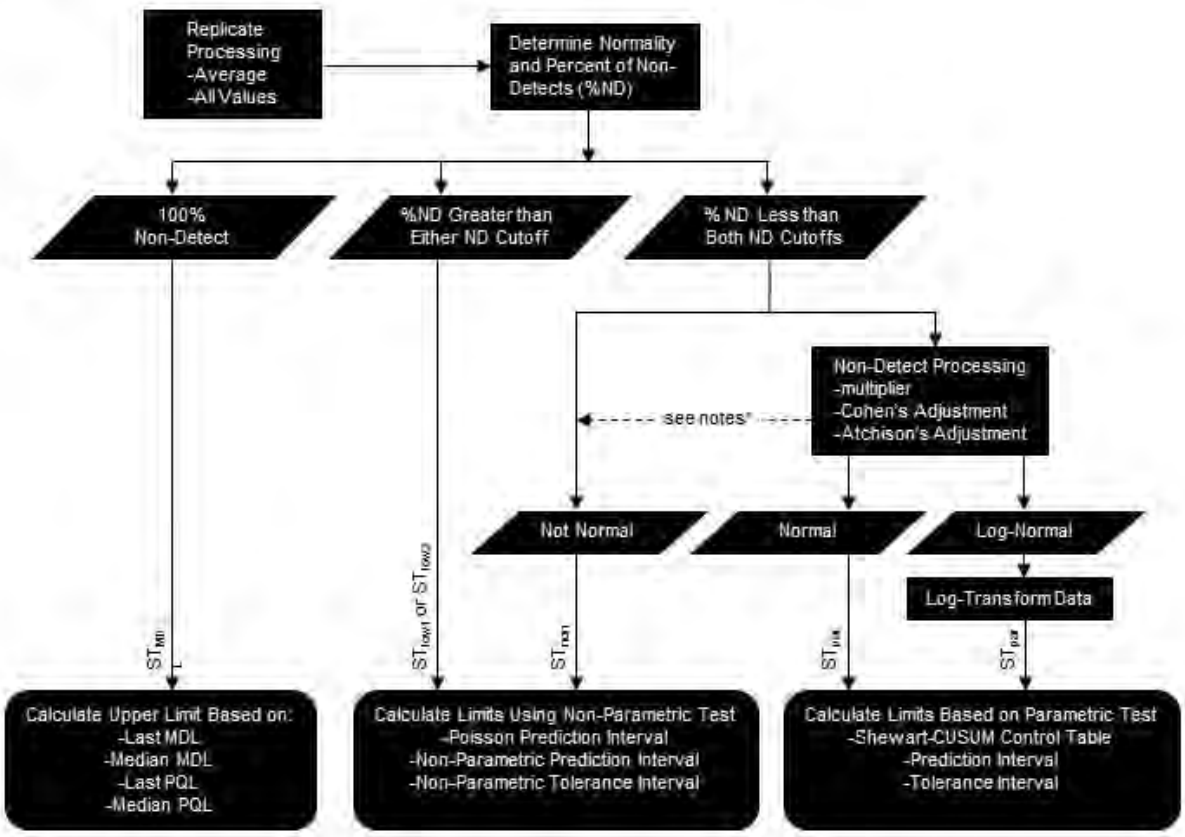
Statistical Data Evaluation and Results

The input dataset (Appendix E-1) for background calculations were evaluated for the quarterly data from monitoring wells MW-104S/SR and MW-104D/DR, collected from November 2010 through December 2015, for the inorganic parameters listed in 35 IAC 620.410(a) and excluding vanadium, radium-226, radium-228, and perchlorate. All water quality data were stored, prepared, and statistically analyzed using MANAGES™ Version 3.4.49 software (EPRI, March 2014).

A statistical summary of the background water quality data from MW-104S/SR and MW-104D/DR is provided in Appendix E-2, and includes the mean, median, minimum, maximum, standard deviation, Sen Slope trend, normality determination, and percent non-detects for the background dataset. The statistical analysis procedure inputs and results are provided in Appendix E-3.

Calculated background values for the tested inorganic constituents and pH are listed in the following Table E-1 along with the percent non-detects, normal or lognormal distribution, test method, and confidence level.

Figure E-1. Statistical Analysis Flowchart



Notes

** If the option for Cohen's or Atchison's adjustment is selected and neither is appropriate, then the non-normal comparison test will be used.*

Table E-1. Tolerance Limits for Background Monitoring Wells MW-104S/SR and MW-104D/DR

Parameter	Count of Backround Results	Percent of Non Detects	Normal/ Lognormal	Test	Confidence Level	Upper Limit	Lower Limit
Ag, diss, mg/L	12	100.00	No/No	STmdl	N/A	0.005	
As, diss, mg/L	12	66.67	No/No	STlow2	N/A	0.032	
Ba, diss, mg/L	12	0.00	No/Yes	Stpar	99.00	0.621	
Be, diss, mg/L	12	100.00	Yes/No	STmdl	N/A	0.004	
B, diss, mg/L	26	46.20	No/No	Stnon	73.65	0.237	
Cd, diss, mg/L	12	100.00	No/No	STmdl	N/A	0.002	
Cl, diss, mg/L	28	0.00	No/No	STnon	76.22	58.7	
CN, total, mg/L	12	100.00	No/No	STmdl	N/A	0.008	
Co, diss, mg/L	12	100.00	No/No	STmdl	N/A	0.005	
Cu, diss, mg/L	12	100.00	No/No	STmdl	N/A	0.005	
Cr, diss, mg/L	12	100.00	No/No	STmdl	N/A	0.005	
F, diss, mg/L	12	0.00	Yes/Yes	STpar	99.00	0.793	
Hg, diss, mg/L	12	100.00	No/No	STmdl	N/A	0.002	
Fe, diss, mg/L	26	34.62	No/No	STnon	73.65	18.0	
Fe, tot, mg/L	10	0.00	Yes/Yes	STpar	99.00	11.0	
Mn, diss, mg/L	26	0.00	No/Yes	STpar	99.00	48.8	
Mn, tot, mg/L	10	0.00	Yes/Yes	STpar	99.00	8.2	
Ni, diss, mg/L	12	100.00	No/No	STmdl	N/A	0.005	
NO3, diss, mg/L	12	25.00	No/Yes	STpar	99.00	2.25	
Pb, diss, mg/L	12	100.00	No/No	STmdl	N/A	0.005	
pH (field), std	28	0.00	Yes/Yes	Stpar	99.00	7.55	6.06
Sb, diss, mg/L	12	100.00	No/No	STmdl	N/A	0.005	
Se, diss, mg/L	12	100.00	No/No	STmdl	N/A	0.010	
SO4, diss, mg/L	28	0.00	Yes/Yes	STpar	99.00	328	
TDS, mg/L	28	0.00	Yes/Yes	STpar	99.00	999	
Tl, diss, mg/L	12	100.00	No/No	STmdl	N/A	0.002	
Zn, diss, mg/L	12	83.33	No/N9o	STlow2	45.96	0.009	

* Key to Tests

STmdl = Comparison method if all background results are non-detect = Last MDL
STpar = Parametric Tolerance Interval on background
STlow1 = Non-Parametric Tolerance Interval on background (ND Frequency > 50%)
STnon = Non-Parametric Tolerance Interval on background

Baldwin Ash Ponds - Upgradient Monitoring Wells: Upper Water-Bearing Zone (Unlitified Materials)

Date Range: 11/01/2010 to 12/31/2015

Well Id	Date Sampled	Lab Id	Arsenic, dissolved, mg/L	Barium, dissolved, mg/L	Beryllium, dissolved, mg/L	Boron, dissolved, mg/L	Cadmium, dissolved, mg/L	pH (field), SU
MW104D	11/16/2010		<0.005	0.030	<0.005	<0.020	<0.002	6.980
	03/23/2011		<0.005	0.031	<0.005	0.021	<0.002	7.010
	06/07/2011		<0.005	0.033	<0.005	0.019	<0.002	6.880
MW104DR	09/13/2011		<0.005	0.042	<0.004	<0.050	<0.002	6.710
	12/08/2011		<0.005	0.038	<0.004	<0.050	<0.002	6.790
	03/08/2012		<0.005	0.035	<0.004	<0.050	<0.002	7.650
	09/16/2013							6.900
	11/20/2013					0.020		6.820
	02/18/2014					<0.020		6.750
	06/11/2014					<0.020		6.990
	03/25/2015					<0.020		7.110
	06/24/2015					<0.020		6.990
	09/25/2015					<0.020		7.090
	11/10/2015					<0.020		6.800
MW104S	11/16/2010		0.032	0.150	<0.005	0.160	<0.002	6.580
	03/23/2011		0.008	0.090	<0.005	0.146	<0.002	6.550
	06/07/2011		0.012	0.240	<0.005	0.220	<0.002	6.500
MW104SR	09/13/2011		0.006	0.059	<0.004	<0.050	<0.002	6.440
	12/08/2011		<0.005	0.076	<0.004	<0.050	<0.002	6.900
	03/08/2012		<0.005	0.097	<0.004	0.060	<0.002	6.880
	09/16/2013							6.720
	11/20/2013					0.040		6.710
	02/18/2014					0.050		6.730
	06/11/2014					0.147		6.500
	03/25/2015					0.086		6.790
	06/24/2015					0.178		6.650
	09/25/2015					0.237		6.740
	11/10/2015					0.149		6.320

Baldwin Ash Ponds - Upgradient Monitoring Wells: Upper Water-Bearing Zone (Unlitified Materials)

Date Range: 11/01/2010 to 12/31/2015

Well Id	Date Sampled	Lab Id	Chloride, dissolved, mg/L	Chromium, dissolved, mg/L	Cobalt, dissolved, mg/L	Copper, dissolved, mg/L	Cyanide, total, mg/L	Fluoride, dissolved, mg/L
MW104D	11/16/2010		15.700	<0.005	<0.0050	<0.005	<0.007	0.469
	03/23/2011		16.749	<0.005	<0.0050	<0.005	<0.007	0.422
	06/07/2011		18.500	<0.005	<0.0050	<0.005	<0.007	0.379
MW104DR	09/13/2011		18.000	<0.005	<0.0050	<0.005	<0.007	0.370
	12/08/2011		18.000	<0.005	<0.0050	<0.005	<0.007	0.400
	03/08/2012		24.000	<0.005	<0.0050	<0.005	<0.008	0.310
	09/16/2013		20.000					
	11/20/2013		16.000					
	02/18/2014		18.000					
	06/11/2014		18.000					
	03/25/2015		21.000					
	06/24/2015		23.000					
	09/25/2015		24.000					
	11/10/2015		25.000					
MW104S	11/16/2010		33.700	<0.005	<0.0050	<0.005	<0.007	0.629
	03/23/2011		56.480	<0.005	<0.0050	<0.005	<0.007	0.401
	06/07/2011		58.700	<0.005	<0.0050	<0.005	<0.008	0.561
MW104SR	09/13/2011		32.000	<0.005	<0.0050	<0.005	<0.007	0.540
	12/08/2011		31.000	<0.005	<0.0050	<0.005	<0.007	0.523
	03/08/2012		34.000	<0.005	<0.0050	<0.005	<0.008	0.549
	09/16/2013		19.000					
	11/20/2013		19.000					
	02/18/2014		18.000					
	06/11/2014		16.000					
	03/25/2015		14.000					
	06/24/2015		23.000					
	09/25/2015		19.000					
	11/10/2015		19.000					

Baldwin Ash Ponds - Upgradient Monitoring Wells: Upper Water-Bearing Zone (Unlitified Materials)

Date Range: 11/01/2010 to 12/31/2015

Well Id	Date Sampled	Lab Id	Iron, dissolved, mg/L	Iron, total, mg/L	Lead, dissolved, mg/L	Manganese, dissolved, mg/L	Manganese, total, mg/L	Mercury, dissolved, mg/L
MW104D	11/16/2010		<0.010		<0.005	0.020		<0.0020
	03/23/2011		<0.010		<0.005	0.040		<0.0020
	06/07/2011		<0.010		<0.005	0.013		<0.0020
MW104DR	09/13/2011		0.024		<0.005	0.420		<0.0020
	12/08/2011		0.025		<0.005	0.280		<0.0020
	03/08/2012		0.011		<0.005	0.210		<0.0020
	09/16/2013			4.820			0.930	
	11/20/2013		0.070			0.290		
	02/18/2014		<0.020			0.040		
	06/11/2014		0.028			0.123		
	03/25/2015		<0.020	0.542		0.092	0.177	
	06/24/2015		<0.020	0.767		0.130	0.206	
	09/25/2015		<0.020	0.744		0.150	0.224	
	11/10/2015		<0.020	0.333		0.172	0.234	
MW104S	11/16/2010		18.000		<0.005	6.800		<0.0020
	03/23/2011		1.852		<0.005	3.014		<0.0020
	06/07/2011		14.000		<0.005	4.000		<0.0020
MW104SR	09/13/2011		0.080		<0.005	1.200		<0.0020
	12/08/2011		0.190		<0.005	1.100		<0.0020
	03/08/2012		0.610		<0.005	1.900		<0.0020
	09/16/2013			3.180			4.970	
	11/20/2013		1.440			2.200		
	02/18/2014		<0.020			0.590		
	06/11/2014		0.806			1.690		
	03/25/2015		0.207	0.476		2.100	2.660	
	06/24/2015		3.740	7.120		3.100	3.460	
	09/25/2015		3.350	3.620		2.520	2.540	
	11/10/2015		1.190	0.979		3.090	2.780	

Baldwin Ash Ponds - Upgradient Monitoring Wells: Upper Water-Bearing Zone (Unlitified Materials)

Date Range: 11/01/2010 to 12/31/2015

Well Id	Date Sampled	Lab Id	Nickel, dissolved, mg/L	Nitrate nitrogen, diss, deg. C	Residue, total filtrable, mg/L	Selenium, dissolved, mg/L	Silver, dissolved, mg/L	Sulfate, dissolved, mg/L
MW104D	11/16/2010		<0.005	0.07	785	<0.010	<0.005	245.000
	03/23/2011		<0.005	0.07	801	<0.010	<0.005	241.400
	06/07/2011		<0.005	<0.05	776	<0.010	<0.005	250.300
MW104DR	09/13/2011		<0.005	0.07	768	<0.010	<0.005	225.000
	12/08/2011		<0.005	0.06	739	<0.010	<0.005	222.000
	03/08/2012		<0.005	0.55	724	<0.010	<0.005	214.000
	09/16/2013				676			198.000
	11/20/2013				630			194.000
	02/18/2014				652			175.000
	06/11/2014				676			186.000
	03/25/2015				630			179.000
	06/24/2015				718			187.000
	09/25/2015				634			178.000
	11/10/2015				644			195.000
MW104S	11/16/2010		<0.005	<0.05	943	<0.010	<0.005	148.000
	03/23/2011		<0.005	<0.05	742	<0.010	<0.005	168.800
	06/07/2011		<0.005	0.07	824	<0.010	<0.005	114.400
MW104SR	09/13/2011		<0.005	0.37	909	<0.010	<0.005	164.000
	12/08/2011		<0.005	0.14	965	<0.010	<0.005	237.000
	03/08/2012		<0.005	0.09	886	<0.010	<0.005	140.000
	09/16/2013				724			43.000
	11/20/2013				770			134.000
	02/18/2014				792			138.000
	06/11/2014				792			68.000
	03/25/2015				770			100.000
	06/24/2015				880			47.000
	09/25/2015				744			23.000
	11/10/2015				732			57.000

Baldwin Ash Ponds - Upgradient Monitoring Wells: Upper Water-Bearing Zone (Unlitified Materials)

Date Range: 11/01/2010 to 12/31/2015

Well Id	Date Sampled	Lab Id	Thallium, dissolved, mg/L	Zinc, dissolved, mg/L
MW104D	11/16/2010		<0.002	<0.005
	03/23/2011		<0.002	<0.005
	06/07/2011		<0.002	<0.005
MW104DR	09/13/2011		<0.002	<0.005
	12/08/2011		<0.002	<0.005
	03/08/2012		<0.002	<0.005
MW104S	11/16/2010		<0.002	0.009
	03/23/2011		<0.002	<0.005
	06/07/2011		<0.002	0.009
MW104SR	09/13/2011		<0.002	<0.005
	12/08/2011		<0.002	<0.005
	03/08/2012		<0.002	<0.005

Appendix E-2

Baldwin Ash Ponds: Statistical Summary for Pooled Upgradient Monitoring Well Locations

User Supplied Information

Date Range: 11/01/2010 to 12/31/2015 **Option for LT Pts: x 0.5**

Pooled Locations: MW104D,MW104DR,MW104S,MW104SR

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope Units/yr	Normal / Log Normal	% of Non-Detects
Antimony, dissolved	mg/L	12	0.003	0.003	0.003	0.003	0.000	0.000	No / No	100.00
Arsenic, dissolved	mg/L	12	0.006	0.003	0.032	0.003	0.009	0.000	No / No	66.67
Barium, dissolved	mg/L	12	0.077	0.051	0.240	0.030	0.063	0.023	No / Yes	0.00
Beryllium, dissolved	mg/L	12	0.002	0.002	0.003	0.002	0.000	0.000	No / No	100.00
Boron, dissolved	mg/L	26	0.066	0.025	0.237	0.010	0.073	0.010	No / No	46.15
Cadmium, dissolved	mg/L	12	0.001	0.001	0.001	0.001	0.000	0.000	No / Yes	100.00
Chloride, dissolved	mg/L	28	23.887	19.000	58.700	14.000	10.977	0.263	No / No	0.00
Chromium, dissolved	mg/L	12	0.003	0.003	0.003	0.003	0.000	0.000	No / No	100.00
Cobalt, dissolved	mg/L	12	0.0025	0.0025	0.0025	0.0025	0.0000	0.0000	No / No	100.00
Copper, dissolved	mg/L	12	0.003	0.003	0.003	0.003	0.000	0.000	No / No	100.00
Cyanide, total	mg/L	12	0.004	0.004	0.004	0.004	0.000	0.000	No / No	100.00
Fluoride, dissolved	mg/L	12	0.463	0.446	0.629	0.310	0.097	0.019	Yes / Yes	0.00
Iron, dissolved	mg/L	26	1.758	0.049	18.000	0.005	4.349	0.046	No / No	34.62
Iron, total	mg/L	10	2.258	0.873	7.120	0.333	2.331	0.401	No / Yes	0.00
Lead, dissolved	mg/L	12	0.003	0.003	0.003	0.003	0.000	0.000	No / No	100.00
Manganese, dissolved	mg/L	26	1.357	0.505	6.800	0.013	1.651	0.476	No / Yes	0.00
Manganese, total	mg/L	10	1.818	1.735	4.970	0.177	1.697	1.139	Yes / No	0.00
Mercury, dissolved	mg/L	12	0.0010	0.0010	0.0010	0.0010	0.0000	0.0000	No / Yes	100.00
Nickel, dissolved	mg/L	12	0.003	0.003	0.003	0.003	0.000	0.000	No / No	100.00
Nitrate nitrogen, diss	deg. C	12	0.130	0.068	0.554	0.025	0.163	0.076	No / Yes	25.00
pH (field)	SU	28	6.803	6.790	7.650	6.320	0.258	-0.049	Yes / Yes	0.00
Residue, total filtrable	mg/L	28	761.643	756.000	965.000	630.000	92.687	0.000	Yes / Yes	0.00
Selenium, dissolved	mg/L	12	0.005	0.005	0.005	0.005	0.000	0.000	No / No	100.00
Silver, dissolved	mg/L	12	0.003	0.003	0.003	0.003	0.000	0.000	No / No	100.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

Baldwin Ash Ponds: Statistical Summary for Pooled Upgradient Monitoring Well Locations

User Supplied Information

Date Range: 11/01/2010 to 12/31/2015 **Option for LT Pts: x 0.5**

Pooled Locations: MW104D,MW104DR,MW104S,MW104SR

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope Units/yr	Normal / Log Normal	% of Non-Detects
Sulfate, dissolved	mg/L	28	159.711	176.500	250.300	23.000	65.781	-35.529	Yes / No	0.00
Thallium, dissolved	mg/L	12	0.001	0.001	0.001	0.001	0.000	0.000	No / Yes	100.00
Zinc, dissolved	mg/L	12	0.004	0.003	0.009	0.003	0.003	0.000	No / No	83.33

Shapiro-Wilk Normality test performed at 0.05 significance level.

Appendix E-3

Baldwin Ash Pond System: Background Statistics- Upper Water Bearing Zone (Unlithified Materials)

Background Date Range: 11/01/2010 to 12/31/2015
Background Locations: MW104D,MW104DR,MW104S,MW104SR

Compliance Date Range: 11/01/2010 to 04/01/2015
Compliance Locations: MW104SR

Comparison Method if all Background Results are Non-Detect:	STmdl = Last MDL
Statistical Test for Parametric Background Data Distributions:	STpar = Parametric Tolerance Interval on Background
Statistical Test for Cases with High Percentage of Non-Detect Background Data:	STlow1 = Non-Parametric Prediction Interval on Background (ND Frequency > 50%)
Statistical Test for Cases with High Percentage of Non-Detect Background Data:	STlow2 = Non-Parametric Tolerance Interval on background (ND Frequency > 50%)
Statistical Test for Non-Parametric Background Data Distributions:	STnon = Non-Parametric Tolerance Interval on background
Background Comparison:	Interwell
Number of Verification Samples:	0
Default Type 1 Individual Comparison Error Level (False Positive Rate) for tests other than Prediction Interval	0.01
Non-Detect Processing (Parametric Tests):	<=15% using MDL * 0.5 >15% using MDL * 0.5
Non-Detect Processing (All Other):	<=50% using MDL * 0.5 >50% using MDL * 0.5

Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
MW104SR	Antimony, dissolved, mg/L	09/13/2011	12	100.00	No/No	STmdl	N/A	0.005		<0.005	No	
		12/08/2011	12	100.00	No/No		N/A	0.005		<0.005	No	
		03/08/2012	12	100.00	No/No		N/A	0.005		<0.005	No	
MW104SR	Arsenic, dissolved, mg/L	09/13/2011	12	66.67	No/No	STlow2	45.96	0.032		0.006	No	
		12/08/2011	12	66.67	No/No		45.96	0.032		<0.005	No	
		03/08/2012	12	66.67	No/No		45.96	0.032		<0.005	No	
MW104SR	Barium, dissolved, mg/L	09/13/2011	12	0.00	No/Yes	STpar	99.00	0.621		0.059	No	
		12/08/2011	12	0.00	No/Yes		99.00	0.621		0.076	No	
		03/08/2012	12	0.00	No/Yes		99.00	0.621		0.097	No	
MW104SR	Beryllium, dissolved, mg/L	09/13/2011	12	100.00	No/No	STmdl	N/A	0.004		<0.004	No	
		12/08/2011	12	100.00	No/No		N/A	0.004		<0.004	No	
		03/08/2012	12	100.00	No/No		N/A	0.004		<0.004	No	
MW104SR	Boron, dissolved, mg/L	09/13/2011	26	46.15	No/No	STnon	73.65	0.237		<0.050	No	
		12/08/2011	26	46.15	No/No		73.65	0.237		<0.050	No	
		03/08/2012	26	46.15	No/No		73.65	0.237		0.060	No	
		11/20/2013	26	46.15	No/No		73.65	0.237		0.040	No	
		02/18/2014	26	46.15	No/No		73.65	0.237		0.050	No	
		06/11/2014	26	46.15	No/No		73.65	0.237		0.147	No	
		03/25/2015	26	46.15	No/No		73.65	0.237		0.086	No	

Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
MW104SR	Cadmium, dissolved, mg/L	09/13/2011	12	100.00	No/No	STmdl	N/A	0.002		<0.002	No	
		12/08/2011	12	100.00	No/No		N/A	0.002		<0.002	No	
		03/08/2012	12	100.00	No/No		N/A	0.002		<0.002	No	
MW104SR	Chloride, dissolved, mg/L	09/13/2011	28	0.00	No/No	STnon	76.22	58.700		32.000	No	
		12/08/2011	28	0.00	No/No		76.22	58.700		31.000	No	
		03/08/2012	28	0.00	No/No		76.22	58.700		34.000	No	
		09/16/2013	28	0.00	No/No		76.22	58.700		19.000	No	
		11/20/2013	28	0.00	No/No		76.22	58.700		19.000	No	
		02/18/2014	28	0.00	No/No		76.22	58.700		18.000	No	
		06/11/2014	28	0.00	No/No		76.22	58.700		16.000	No	
		03/25/2015	28	0.00	No/No		76.22	58.700		14.000	No	
MW104SR	Chromium, dissolved, mg/L	09/13/2011	12	100.00	No/No	STmdl	N/A	0.005		<0.005	No	
		12/08/2011	12	100.00	No/No		N/A	0.005		<0.005	No	
		03/08/2012	12	100.00	No/No		N/A	0.005		<0.005	No	
MW104SR	Cobalt, dissolved, mg/L	09/13/2011	12	100.00	No/No	STmdl	N/A	0.0050		<0.0050	No	
		12/08/2011	12	100.00	No/No		N/A	0.0050		<0.0050	No	
		03/08/2012	12	100.00	No/No		N/A	0.0050		<0.0050	No	
MW104SR	Copper, dissolved, mg/L	09/13/2011	12	100.00	No/No	STmdl	N/A	0.005		<0.005	No	
		12/08/2011	12	100.00	No/No		N/A	0.005		<0.005	No	
		03/08/2012	12	100.00	No/No		N/A	0.005		<0.005	No	

Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
MW104SR	Cyanide, total, mg/L	09/13/2011	12	100.00	No/No	STmdl	N/A	0.008		<0.007	No	
		12/08/2011	12	100.00	No/No		N/A	0.008		<0.007	No	
		03/08/2012	12	100.00	No/No		N/A	0.008		<0.008	No	
MW104SR	Fluoride, dissolved, mg/L	09/13/2011	12	0.00	Yes/Yes	STpar	99.00	0.793		0.540	No	
		12/08/2011	12	0.00	Yes/Yes		99.00	0.793		0.523	No	
		03/08/2012	12	0.00	Yes/Yes		99.00	0.793		0.549	No	
MW104SR	Iron, dissolved, mg/L	09/13/2011	26	34.62	No/No	STnon	73.65	18.000		0.080	No	
		12/08/2011	26	34.62	No/No		73.65	18.000		0.190	No	
		03/08/2012	26	34.62	No/No		73.65	18.000		0.610	No	
		11/20/2013	26	34.62	No/No		73.65	18.000		1.440	No	
		02/18/2014	26	34.62	No/No		73.65	18.000		<0.020	No	
		06/11/2014	26	34.62	No/No		73.65	18.000		0.806	No	
		03/25/2015	26	34.62	No/No		73.65	18.000		0.207	No	
MW104SR	Iron, total, mg/L	09/16/2013	10	0.00	Yes/Yes	STpar	99.00	10.986		3.180	No	
		03/25/2015	10	0.00	Yes/Yes		99.00	10.986		0.476	No	
MW104SR	Lead, dissolved, mg/L	09/13/2011	12	100.00	No/No	STmdl	N/A	0.005		<0.005	No	
		12/08/2011	12	100.00	No/No		N/A	0.005		<0.005	No	
		03/08/2012	12	100.00	No/No		N/A	0.005		<0.005	No	
MW104SR	Manganese, dissolved, mg/L	09/13/2011	26	0.00	No/Yes	STpar	99.00	48.767		1.200	No	
		12/08/2011	26	0.00	No/Yes		99.00	48.767		1.100	No	

Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
MW104SR	Manganese, dissolved, mg/L	03/08/2012	26	0.00	No/Yes	STpar	99.00	48.767		1.900	No	
		11/20/2013	26	0.00	No/Yes		99.00	48.767		2.200	No	
		02/18/2014	26	0.00	No/Yes		99.00	48.767		0.590	No	
		06/11/2014	26	0.00	No/Yes		99.00	48.767		1.690	No	
		03/25/2015	26	0.00	No/Yes		99.00	48.767		2.100	No	
MW104SR	Manganese, total, mg/L	09/16/2013	10	0.00	Yes/Yes	STpar	99.00	8.173		4.970	No	
		03/25/2015	10	0.00	Yes/Yes		99.00	8.173		2.660	No	
MW104SR	Mercury, dissolved, mg/L	09/13/2011	12	100.00	No/No	STmdl	N/A	0.0020		<0.0020	No	
		12/08/2011	12	100.00	No/No		N/A	0.0020		<0.0020	No	
		03/08/2012	12	100.00	No/No		N/A	0.0020		<0.0020	No	
MW104SR	Nickel, dissolved, mg/L	09/13/2011	12	100.00	No/No	STmdl	N/A	0.005		<0.005	No	
		12/08/2011	12	100.00	No/No		N/A	0.005		<0.005	No	
		03/08/2012	12	100.00	No/No		N/A	0.005		<0.005	No	
MW104SR	Nitrate nitrogen, diss, deg. C	09/13/2011	12	25.00	No/Yes	STpar	99.00	2.25		0.37	No	
		12/08/2011	12	25.00	No/Yes		99.00	2.25		0.14	No	
		03/08/2012	12	25.00	No/Yes		99.00	2.25		0.09	No	
MW104SR	Nitrate nitrogen, total, mg/L	03/25/2015	8	25.00	Yes/Yes	STpar	99.00	2.264		0.058	No	
MW104SR	pH (field), SU	09/13/2011	28	0.00	Yes/Yes	STpar	99.00	7.547	6.059	6.440	No	

Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
MW104SR	pH (field), SU	12/08/2011	28	0.00	Yes/Yes	STpar	99.00	7.547	6.059	6.900	No	
		03/08/2012	28	0.00	Yes/Yes		99.00	7.547	6.059	6.880	No	
		09/16/2013	28	0.00	Yes/Yes		99.00	7.547	6.059	6.720	No	
		11/20/2013	28	0.00	Yes/Yes		99.00	7.547	6.059	6.710	No	
		02/18/2014	28	0.00	Yes/Yes		99.00	7.547	6.059	6.730	No	
		06/11/2014	28	0.00	Yes/Yes		99.00	7.547	6.059	6.500	No	
		03/25/2015	28	0.00	Yes/Yes		99.00	7.547	6.059	6.790	No	
MW104SR	Residue, total filtrable, mg/L	09/13/2011	28	0.00	Yes/Yes	STpar	99.00	999		909	No	
		12/08/2011	28	0.00	Yes/Yes		99.00	999		965	No	
		03/08/2012	28	0.00	Yes/Yes		99.00	999		886	No	
		09/16/2013	28	0.00	Yes/Yes		99.00	999		724	No	
		11/20/2013	28	0.00	Yes/Yes		99.00	999		770	No	
		02/18/2014	28	0.00	Yes/Yes		99.00	999		792	No	
		06/11/2014	28	0.00	Yes/Yes		99.00	999		792	No	
		03/25/2015	28	0.00	Yes/Yes		99.00	999		770	No	
MW104SR	Selenium, dissolved, mg/L	09/13/2011	12	100.00	No/No	STmdl	N/A	0.010		<0.010	No	
		12/08/2011	12	100.00	No/No		N/A	0.010		<0.010	No	
		03/08/2012	12	100.00	No/No		N/A	0.010		<0.010	No	
MW104SR	Silver, dissolved, mg/L	09/13/2011	12	100.00	No/No	STmdl	N/A	0.005		<0.005	No	
		12/08/2011	12	100.00	No/No		N/A	0.005		<0.005	No	
		03/08/2012	12	100.00	No/No		N/A	0.005		<0.005	No	
MW104SR	Sulfate, dissolved, mg/L	09/13/2011	28	0.00	Yes/No	STpar	99.00	327.885		164.000	No	

Compliance Location	Parameter	Sample Date	Count Of Bkg Results	Percent of Non detects	Normal / Lognormal	Test	Confidence Level	Upper Limit	Lower Limit	Analysis Result	Exceedance	Trend
MW104SR	Sulfate, dissolved, mg/L	12/08/2011	28	0.00	Yes/No	STpar	99.00	327.885		237.000	No	
		03/08/2012	28	0.00	Yes/No		99.00	327.885		140.000	No	
		09/16/2013	28	0.00	Yes/No		99.00	327.885		43.000	No	
		11/20/2013	28	0.00	Yes/No		99.00	327.885		134.000	No	
		02/18/2014	28	0.00	Yes/No		99.00	327.885		138.000	No	
		06/11/2014	28	0.00	Yes/No		99.00	327.885		68.000	No	
		03/25/2015	28	0.00	Yes/No		99.00	327.885		100.000	No	
MW104SR	Thallium, dissolved, mg/L	09/13/2011	12	100.00	No/No	STmdl	N/A	0.002		<0.002	No	
		12/08/2011	12	100.00	No/No		N/A	0.002		<0.002	No	
		03/08/2012	12	100.00	No/No		N/A	0.002		<0.002	No	
MW104SR	Zinc, dissolved, mg/L	09/13/2011	12	83.33	No/No	STlow2	45.96	0.009		<0.005	No	
		12/08/2011	12	83.33	No/No		45.96	0.009		<0.005	No	
		03/08/2012	12	83.33	No/No		45.96	0.009		<0.005	No	

APPENDIX F

GROUNDWATER SAMPLING PROTOCOL

Groundwater Sampling Protocol

The following procedures shall be used in sampling groundwater at the site. This sampling protocol shall apply to the routine quarterly (or modified semi-annual or annual) sampling events. A sample collector's worksheet, comparable to the one located in Exhibit 1, may be used for noting relevant information in regard to each well.

Water Levels

Water levels shall be taken in each well prior to purging and/or sampling. Water levels should be taken as close together as practical, to prevent any time distortion of the water surface data. The following steps shall be followed to obtain accurate water level readings:

1. Note the general condition of the monitoring well on the worksheet. This shall include, but is not limited to the condition of the casing, the lock, evidence of tampering, condition of the pad, and any standing water.
2. Remove the lock and open the monitoring well. Note the condition of the interior of the casing and the condition of the well cap and riser. Open the cap, taking care not to allow dirt or foreign material into the monitoring well.
3. The technician shall rinse the probe and cable of the water level meter with decon water.
4. Slowly lower the probe into the monitoring well until the meter indicates the water surface has been reached.
5. Note the depth to water (to the nearest 0.01 ft) and the time on the worksheet.
6. Lower the probe to the bottom of well. (If a dedicated pump is installed in the well, skip this step). Note the well depth on the worksheet. The depth of the well will be measured on an annual basis, at wells that do not contain dedicated pumps. The depth of wells with dedicated pumps will be measured at least once every 5 years, or whenever the pump is removed.
7. Slowly remove the probe from the well. Rinse the probe and line with decon water.
8. Replace cap. Close and lock the well. Proceed to the next well, and repeat.

Purging of Monitoring Well – Pump Method

After all water level measurements have been taken, the monitoring wells shall be purged to provide a representative sample. Each groundwater monitoring well shall be purged by using a dedicated pump. The pump construction shall consist of inert materials consistent with the monitoring well construction (e.g., stainless steel pump bodies installed in stainless steel wells).

Purging shall be conducted utilizing a "low-flow" or minimal drawdown technique. Flow rates for this technique will typically fall below 0.5 liters/minutes, with an overall goal of not reducing the water level in the monitoring well by more than 0.3 ft during purging. Water levels should be checked frequently to ensure that the drawdown in the well does not exceed the 0.3-ft limits. Every 3 minutes to 5 minutes, readings shall be taken on the following water quality indicators to determine if a representative water sample is available.

- pH (in SU),
- Specific Conductance (in µmhos/cm or µS/cm),
- Temperature (in ºF),
- And, it is suggested, at least one of the following:
  - Redox Potential (in mV);
  - Dissolved Oxygen (in mg/L); and/or
  - Turbidity (in NTU).

The water quality indicators will be considered stabilized when the following tolerances are reached after three consecutive readings:

- pH..... ±0.05 SU
- Specific Conductance ..... ±5 percent
- Temperature..... ±0.5ºF
- Redox Potential .....±10 percent
- Dissolved Oxygen.....±10 percent
- Turbidity.....±10 percent

Slow recovering wells require special consideration. If a well is dry, or is purged below the bottom of the pump intake, the well will be allowed to recharge for at least 12 hours. Samples shall be collected until all sample containers have been filled or the well becomes dry. Notes shall be kept on the worksheet with regard to water levels, times, volume of water removed, and any other parameters considered to be relevant.

Purging of Monitoring Well – Bailer Method

Purging and sample collection with a bailer shall be performed in the event of a non-functioning pump or from a well that does not have a dedicated pump installed. A sample shall be collected utilizing a factory packaged, clean, disposable bailer with an appropriate length of new, clean rope attached.

Calculate the number of bailer volumes of water needed to remove one (1) well volume of water.

<u>Well Volume Calculations (2-inch well):</u>

Schedule 40 PVC has an inside diameter of 2.067 inches.

$\therefore$ $((2.067 \text{ inches}/12 \text{ inches/ft})/2)^2 \bullet \pi \bullet 1 \text{ ft of water} = 0.0233 \text{ ft}^3\text{/ft of water.}$

$0.0233 \text{ ft}^3\text{/ft} \bullet 7.48 \text{ gallons/ft}^3 = 0.174 \text{ gallon/ft}$

Schedule 5 Stainless Steel (304 or 316) has an inside diameter of 2.245 inches.

$\therefore$ $((2.245 \text{ inches}/12 \text{ inches/ft})/2)^2 \bullet \pi \bullet 1 \text{ ft of water} = 0.0275 \text{ ft}^3\text{/ft of water.}$

$0.0275 \text{ ft}^3\text{/ft} \bullet 7.48 \text{ gallons/ft}^3 = 0.206 \text{ gallon/ft}$

Volume of well (in gallons) = well type gallon/ft • (DTB - DTW); where,
DTB ≡ depth to bottom of well (from measuring point), and
DTW ≡ depth to water (from measuring point)

<u>Bailer Volumes:</u>

Disposable bailer volumes will vary by type and manufacturer. Volume information should be obtained before going to the site. For comparison, a 3 ft stainless steel bailer has a volume of approximately 1220 cc or 0.322 gallon and a 5 ft PVC bailer of approximately 1085 cc or 0.287 gallon.

Open monitoring well, being careful that no potential contaminant enters the well.

Remove one (1) bailer volume of water from the monitoring well. Test pH, specific conductance and temperature. Note values on worksheet. (Turbidity, redox potential and dissolved oxygen will vary considerably due to the agitation a bailer will cause in the well. Testing for these parameters is not recommended with this method.)

Remove one-half (½) gallon of water from the monitoring well. Test pH, specific conductance and temperature. Note values on worksheet.

Remove ½ to 1 gallon of water. Test pH, specific conductance and temperature. Record data on worksheet.

Repeat until pH, specific conductance and temperature stabilize or three (3) well volumes of water have been removed.

If the monitoring well becomes dry, or there is insufficient water to obtain all necessary samples, the monitoring well will be allowed to recharge for 24 hours. Samples shall be collected until all sample containers are filled or the well becomes dry. Notes shall be kept on the worksheet regarding water levels, times, volume of water removed, and any other parameters considered by the technician to be relevant.

If there is sufficient water volume in the monitoring well to obtain all samples, sample collection shall begin at this time.

Sample Collection Order

Samples shall be collected starting at the monitoring well with the least likelihood for contamination. Sampling shall proceed from the well with the lowest potential for contamination to the well with the highest potential for contamination.

Field Measurements

General

Upon arrival at each groundwater monitoring well, the technician shall note on the sampler's worksheet or in a field notebook the date, time, ambient air temperature, general weather conditions, and individuals present, including sample team members and any observers. (Note: Any observers shall need at a minimum, the same personal protective gear as the members of the sample team.)

Establish a "clean area" near the monitoring well where the sample containers and equipment can be stored while not in use. Every effort should be made to keep the sampling equipment and containers from contacting the ground surface. If necessary, a disposable, plastic tarp can be used as a ground cover to prevent potential contamination of the sample containers and equipment. Typically, the back of the field vehicle will be used as the "clean area".

Any non-dedicated sampling equipment (meter probes, thermometers, etc.) shall be washed in a commercial, laboratory cleaner (Alconox®, Liquinox®, or equivalent), and thoroughly rinsed in decon water before each use. Calibration shall be performed at each new monitoring location after the initial decontamination. After use, each device shall be powered down (if necessary) decontaminated, and stored in its manufacturer-approved container.

Temperature

Obtain a water sample from the well. Place the sample aliquot in a disposable container, insert the thermometer (or electronic probe), wait until the readings have stabilized, and record the temperature on the worksheet. Temperature for a glass thermometer should be noted to the nearest degree Fahrenheit (1ºF). For electronic thermometers (thermocouples), temperature should be noted to the nearest tenth degree Fahrenheit (0.1ºF). The thermometer or probe shall be cleaned and rinsed with decon water after use.

pH

Confirm calibration of the instrument by comparing with an appropriate buffer solution. Adjust for temperature compensation (if meter is not self-compensating). Rinse probe with decon water. Obtain a sample from the well and place the probe in sample aliquot. Note the pH and record on the sample worksheet. Note pH readings to the nearest tenth unit (0.1).

Specific Conductance

Confirm calibration of the instrument by comparing against an appropriate buffer solution. Adjust for temperature compensation (if meter is not self-compensating). Rinse the probe with decon water. Obtain a sample from the well and place the probe in sample aliquot. Note the specific conductance and record on the sample worksheet. Specific conductance should be noted to the nearest micromhos per centimeter (µmhos/cm) or microSiemens per centimeter (µS/cm).

Sample Collection Procedures

Jars and vials may ship pre-labeled from the laboratory, identifying the analysis and preservative for each type of sample. Dependent upon circumstances, sample containers may be prepared by non-laboratory personnel. If so, this should be noted on the sample worksheet or in the field notebook.

A technician shall remove a sample container from the cooler, affix a label, and in indelible, waterproof ink write the well number and/or sample I.D., the facility name, the sample collection date and time, the type of sample in the container, and the sample collector's name. A technician shall organize the containers in the following sampling order:

- Metals and Minerals (dissolved)
- Anions (dissolved)
- Total Dissolved Solids (TDS)
- Cyanides (total)

Dissolved parameters include dissolved metals and minerals, total dissolved solids (TDS), and nitrogen should be field filtered. Samples should be filtered using a 0.45-micron filter attached to the sample pump line. Other filter apparatus may be utilized as long as Illinois EPA guidelines are followed. Filters should be replaced no less frequently than at each new well, and may need to be replaced more often if flow is restricted due to particulate matter in the sample water.

Transportation of Monitoring Samples

Sample Preservation Techniques

The preservation techniques utilized in the groundwater samples will typically adhere to those listed in *Handbook for Sampling and Sample Preservation of Water and Wastewater*, U.S. EPA, EPA-600/4-82-029, September 1982 and/or *Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods*, EPA/530/SW-846, 3rd. Edition, Final Update IV (January 2008).

Transportation of Samples

Samples shall be transported to the laboratory in sealed, insulated shipping containers, ice chests, or coolers. The shipping containers should be sturdy, and if samples are contained in glass bottles, dividers and/or bubble wrap should be used to restrict potential breakage. All samples will be packed in ice or a packaged refrigerant as necessary for proper preservation. Samples should be packed to maintain sample temperatures as close to 4ºC (degrees Celsius) or 39ºF as possible from the time the samples are collected to the time the samples are received by the laboratory. The samples should be shipped/delivered to the laboratory as soon as practical, preferably within 24 hours of sample collection.

All samples shall be accompanied by a chain-of-custody record. The sampler shall retain a copy of the record and forward the original with the samples to the analytical laboratory. Once the laboratory has received the samples, a representative from the laboratory is to complete the record, retain the original and return a copy with the chemical analysis reports to the sampler. The chain-of-custody shall contain the facility name, the wells sampled, time and date of sampling, members of the sampling party, type of samples (i.e. water, soil, leachate, etc.), number of sample bottles, requested analysis, overnight courier, etc. A sample chain-of-custody record is provided in Exhibit 2.

Attachments
Exhibit 1: Groundwater Sampling Worksheet
Exhibit 2: Example Chain-of-Custody Record

APPENDIX C
HISTORY OF CONSTRUCTION REPORT (845.220(a)(1))

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October 13, 2021

Dynegy Midwest Generation, LLC
10901 Baldwin Rd
Baldwin, Illinois 62217

Subject: Periodic History of Construction Report Update Letter
USEPA Final CCR Rule, 40 CFR §257.73(c)
Baldwin Power Plant
Baldwin, Illinois

At the request of Dynegy Midwest Generation, LLC (DMG), Geosyntec Consultants (Geosyntec) has prepared this Letter to documents updates to the Initial History of Construction (HoC) report for the Baldwin Power Plant (BPP), also known as the Baldwin Energy Complex (BEC). The Initial HoC report was prepared by AECOM in October of 2016 [1] in accordance with 40 Code of Federal Regulations (CFR) §257.73(c) of the United States Environmental Protection Agency (USEPA) Coal Combustion Residuals Rule, known as the CCR Rule [2]. This letter also includes information required by Section 845.220(a)(1)(B) (Design and Construction Plans) of the state-specific Illinois Environmental Protection Agency (IEPA) Part 845 CCR Rule [3] that is not expressly required by §257.73(c).

Baldwin

BACKGROUND

The CCR Rule required that, by October 17, 2016, Initial HoC reports to be compiled for existing CCR surface impoundments with: (1) a height of five feet or more and a storage volume of 20 acre-feet or more, or (2) a height of 20 feet or more. The Initial HoC report was required to contain, to the extent feasible, the information specified in 40 CFR §257.73(c)(1)(i)-(xii). The Initial HoC report for BPP, which included the existing CCR surface impoundment, the Bottom Ash Pond (BAP), was prepared and subsequently posted to DMG's CCR Website prior to October 17, 2016.

The CCR Rule requires that Initial HoC to be updated if there is a significant change to any information complied in the Initial HoC report, as listed below:

§ 257.73(c)(2): If there is a significant change to any information complied under paragraph (c)(1) of this section, the owner or operator of the CCR unit must update the relevant information and place it in the facility's operating record as required by § 257.105(f)(9).

DMG retained Geosyntec to review the Initial HoC report, review reasonably and readily available information for the BAP generated since the Initial HoC report was prepared, and perform a site visit to BPP to evaluate if significant changes may have occurred since the Initial HoC report was prepared. This Letter contains the results of Geosyntec's evaluation and documents significant changes that have occurred at the BAP and BPP, as they pertain the requirements of §257.73(c)(1)(i)-(xii)

UPDATES TO HISTORY OF CONSTRUCTION REPORT

Geosyntec's evaluation for the BPP BAP determined that no known significant changes requiring updates to the information in the Initial HoC report pertaining to §257.73(c)(1)(ii),(iv)-(v), (vii) and §257.73(c)(1)(xi)-(xii) of the CCR Rule had occurred since the Initial HoC report was developed.

However, Geosyntec's evaluation determined that significant changes at the BPP BAP pertaining to §257.73(c)(1)(i), (iii), (vi), (viii)-(x) of the CCR Rule had occurred since the Initial HoC report had been developed. Additionally, information how long the CCR surface impoundments have been operating and the types of CCR in the surface impoundments, as required by Section 845.220(a)(1)(B) of the Part 845 Rule were not included in the Initial HoC report, as this information is not required by the CCR Rule. Each change and the subsequent updates to the Initial HoC report is described within this section.

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Section 845.220(a)(1)(B): A statement of ... how long the CCR surface impoundment has been in operation, and the types of CCR that have been placed in the surface impoundment.

Bottom Ash Pond

The BAP operational starting date is readily and reasonable unavailable [1]. The BAP is being used to store and dispose of sluiced bottom ash and to store and dispose of fly ash.

Old East Fly Ash Pond, East Fly Ash Pond and West Fly Ash Pond

The Old East Ash Pond (OEAP), East Ash Pond (EAP), and West Fly Ash Pond (WFAP) were in operation from 1969 to 2020, for a total of approximately 51 years [1]. The OEAP, EAP, and WFAP were used to store and dispose of fly ash [1].

§ 257.73(c)(1)(i): The name and address of the person(s) owning or operating the CCR unit; the name associated with the CCR unit; and the identification number of the CCR unit if one has been assigned by the state.

State identification numbers (IDs) for the OEAP, EAP, WFAP, and BAP have been assigned by the Illinois Environmental Protection Agency (IEPA). Each ID is listed in **Table 1**.

Table 1 – IEPA ID Numbers

CCR Surface Impoundment	State ID
Old East Fly Ash Pond (OEAP)	W1578510001-01
East Fly Ash Pond (EAP)	W1578510001-02
West Fly Ash Pond (WFAP)	W1578510001-03
Bottom Ash Pond (BAP)	W1578510001-06

§ 257.73(c)(1)(iii): A statement of the purpose for which the CCR unit is being used.

The OEAP, EAP, and WFAP were closed in 2020, in substantial compliance with the written closure plans posted to DMG's CCR Website ([4], [5], [6]), and as documented by certified Notification of Completion of Closures posted to DMG's CCR Website ([7], [8]). Therefore, the OEAP, EAP, and WFAP are no longer capable of storing additional CCR or free liquids.

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§ 257.73(c)(1)(vi): A statement of the type, size, range, and physical and engineering properties of the materials used in constructing each zone or stage of the CCR unit; the method of site preparation and construction of each zone of the CCR unit; and the approximate dates of construction of each successive stage of construction of the CCR unit.

The table summarizing successive stage of construction in the initial HoC is updated to also reflect the dike raise construction for BAP in October 2021:

Table 2 –Updated table for successive stage of constructions at BPP

Year	Event
1969	Construction of Old East Fly Ash Pond, East Fly Ash Pond, and West Fly Ash Pond external perimeter embankment.
1979	Construction of East Fly Ash Pond and West Fly Ash Pond northern embankment

Year	Event
1989	Inboard perimeters raise of the entire East Fly Ash Pond and West Fly Ash Pond
1995	Construction of interior dike between the East Fly Ash Pond and West Fly Ash Pond
1999	Raise of interior dike between the East Fly Ash Pond and West Fly Ash Pond; replacement of outlet pipe from the West Fly Ash Pond to the Secondary Pond
2012	Modification of Bottom Ash Pond embankment (original construction date unknown)
2021	Dike raise in Bottom Ash Pond in October 2021 to a crest elevation of 420 ft (up to 2 ft of material placement).

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§ 257.73(c)(1)(viii): A description of the type, purpose, and location of existing instrumentation.

Instrumentation monitoring at the OEAP, EAP, and WFAP is no longer required as these CCR surface impoundments were closed in accordance with §257.102 ([7], [8]), and the instrumentation network was modified at that time. Therefore, the instrumentation locations shown in Appendix C of the Initial HoC report are no longer applicable to the OEAP, EAP, and WFAP. Only piezometers BAL-P001, BAL-P002, and BAL-P007 remain active.

§ 257.73(c)(1)(ix): Area-capacity curves for the CCR unit.

An updated area-capacity curve was prepared for the BAP in 2021. This curve is provided in **Figure 1**.

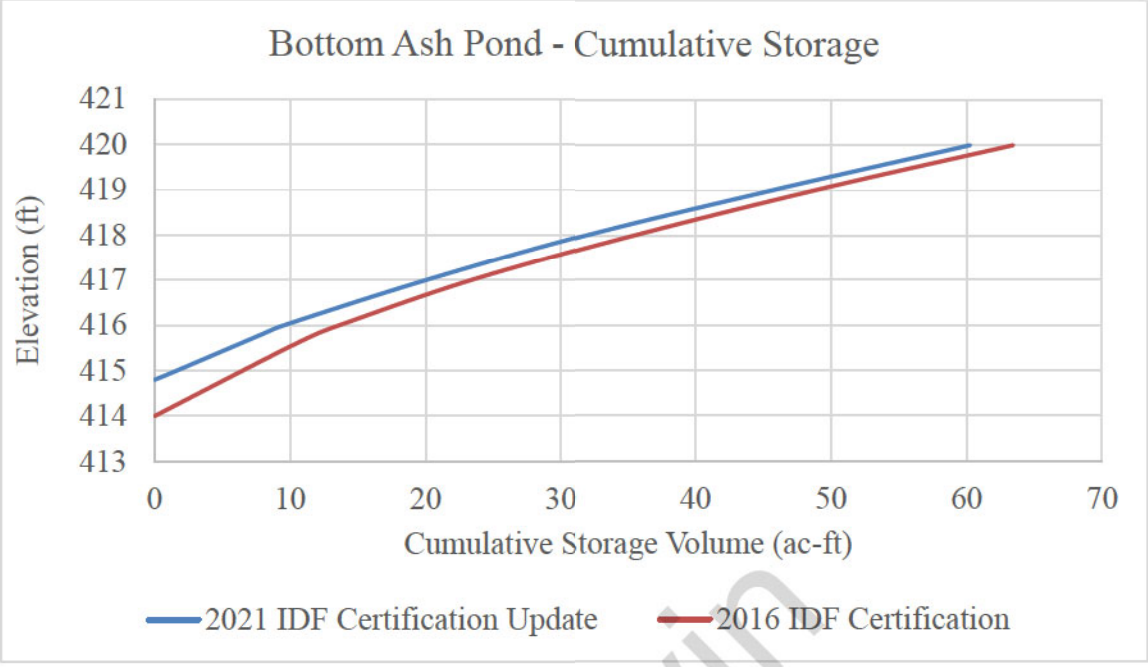

Figure 1 – Area-Capacity Curve for Bottom Ash Pond

§ 257.73(c)(1)(x): A description of each spillway and diversion design features and capacities and calculations used in their determination.

Updated discharge capacity calculations for the existing spillways were prepared in 2021 using HydroCAD 10 modeling software. The calculations indicate that the BAP spillways have sufficient storage capacity and overtopping is not expected during the 1,000-year, 24-hour storm event. The results of these calculations are provided in **Table 3**.

Table 3 – Results of Updated Discharge Capacity Calculations

	Bottom Ash Pond
Approximate Berm Minimum Elevation[1,2], ft	420.0
Approximate Emergency Spillway Elevation[1], ft	417.7
Starting Water Surface Elevation[1] (SWSE), ft	415.2
IDF Peak Water Surface Elevation[1] (PWSE), ft	419.2
Time to Peak, hr	16.9
Surface Area[3], ac	14.1
Storage[4], ac-ft	47.5

Notes:
[1]Elevations are based on the NAVD88 datum
[2]Approximate Berm Minimum Elevation confirmed by DMG
[3]Surface Area is defined as the water surface area at the PWSE
[4]Storage is defined as the volume between the SWSE and PWSE

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CLOSING

This letter has been prepared to document Geosyntec's evaluation of changes that have occurred at the BAP at the BPP since the Initial HoC was developed, based on reasonably and readily available information provided by DMG, observed by Geosyntec during the site visit, or generated by Geosyntec as part of subsequent calculations.

Sincerely,

Thomas Ward, P.E.
Senior Engineer

John Seymour, P.E.
Senior Principal

Baldwin

REFERENCES

[1] AECOM, "History of Construction, USEPA 40 CFR § 257.73(c), Baldwin Power Plant, Baldwin, Illinois," October 2016.

[2] United Stated Environmental Protection Agency, "40 CFR Parts 257 and 261, Hazardous and Solid Waste Management System, Disposal of Coal Combustion Residuals from Electric Utilities, Final Rule, 2015," 2015.

[3] Illinois Environmental Protection Agency, "35 Ill. Adm. Code Part 845, Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments," Springfield, IL, 2021.

[4] V. Modeer, "Closure Plan for Existing CCR Surface Impoundment, 40 CFR 257.102(b), Baldwin Power Plant, Dynegy Midwest Generation, LLC, Old East Fly Ash Pond," October 17, 2016.

[5] V. Modeer, "Closure Plan for Existing CCR Surface Impoundment, 40 CFR 257.102(b), Baldwin Power Plant, Dynegy Midwest Generation, LLC, East Fly Ash Pond," October 17, 2020.

[6] V. Modeer, "Closure Plan for Existing CCR Surface Impoundment, 40 CFR 257.102(b), Baldwin Power Plant, Dynegy Midwest Generation, LLC, West Fly Ash Pond," October 17, 2016.

[7] Tickner, Diana, "Baldwin Energy Complex; Old East Fly Ash Pond, East Fly Ash Pond, West Ash Pond; Notification of Completion of Closure," Luminant, December 17, 2020.

[8] P. Morris, "Baldwin Power Plant; Old East Fly Ash Pond, East Fly Ash Pond, West Ash Pond, Notification of Completion of Closure," Luminant, December 17, 2020.

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APPENDIX D
TYPES OF CCR AND CHEMICAL CONSTITUENTS
(845.220(a)(2)(A)

Baldwin Power Plant - Fly Ash Pond System's Chemical Constituents

In accordance with 35 I.A.C. 845.220(a)(2)(A), EEI is submitting an available/existing description of "the types of CCR expected in the CCR surface impoundment, including a chemical analysis of each type of expected CCR" in the closed CCR impoundment, Fly Ash Pond System.

A list of the chemical constituents' analyses contained in the EEI surface impoundment can be found in Appendix A. Appendix A contains chemical constituents found in the surface free liquid and the subsurface free liquids as determined through antidegradation studies. EEI is also including a list of chemical additives, sorbent materials and waste streams that were submitted in the facility's NPDES permit applications to IEPA within the past ten years at a minimum and/or listed in the current NPDES permit (IL0000043) in Appendix B.

Appendix A: Chemical Constituents Contained in the Fly Ash Pond System

Parameter	Units	Surface Free Liquids Average Concentration	Subsurface Free Liquids Average Concentration
Ammonia	mg/L	3.34	4.66
Arsenic	mg/L	<0.025	0.036
Barium	mg/L	0.0510	0.085
Boron	mg/L	14.4	63.7
Cadmium	mg/L	<0.002	<0.001
Chloride	mg/L	88.75	38.5
Chromium	mg/L	0.0064	0.0159
Chromium (hexavalent)	mg/L	0.0064	<0.005
Copper	mg/L	<0.005	0.0046
Cyanide	mg/L	<0.005	<0.005
Fluoride	mg/L	3.62	0.3
Iron	mg/L	0.168	1.84
Lead	mg/L	<0.0150	<0.015
Manganese	mg/L	0.0132	0.0184
Mercury	mg/L	0.000123	0.0000167
Nickel	mg/L	<0.0050	0.0088
Nitrate - Nitrite	mg/L	<0.05	<0.05
Oil and Grease	mg/L	<6	3.3
pH	SU	10.0	10.0
Phenols	mg/L	0.005	<0.005
Phosphorus	mg/L	0.357	0.303
Selenium	mg/L	0.0672	0.0034
Silver	mg/L	<0.0050	<0.003
Sulfate	mg/L	2413	1454
Total K Nitrogen	mg/L	3.7	1.3
Total Suspended Solids (TSS)	mg/L	23.8	109
Zinc	mg/L	0.01	0.0576

Appendix B: List of Chemical Additives, Waste Streams and Sorbent Materials

Chemical Additives
Aqua Ammonia
Bulab 6002 (Biocide - Bryozoan control)
Caustic Soda
Chlorine
Citric Acid (50%)
Corrshield NT4201 (Sodium Nitrite)
GE Biomate MBC2881 (Biocide)
GE Hypersperse MDL 150 (Anti-scalant)
GE MDC714 (Antiscalant)
GE KLEEN MCT 103 (Low pH RO Cleaner)
GE KLEEN MCT 405 (High pH RO Cleaner)
Hydrated Lime
Hydrogen Peroxide (30%)
Klairaid IC1173 (Coagulant)
Oxamine: Bulab 6004 (Sodium Hydroxide/Sodium Hypochlorite) and Oxamine 6150 (Ammonium Sulfate)
Sodium Aluminate
Sodium Bisulfite
Sodium Hydroxide (25%)
Sodium Hydroxide (50%)
Sodium Hypochlorite (12.5)
Spectrus NX1100 (Biocide)
Spectrus NX1106 (Biocide)
Spectrus NX1100/NX1103 (2-Bromo-2 Nitropropane-1,3-diol Magnesium Chloride)
Spectrus OX1201 (Sodium Bromide)
Sulfuric Acid (93%)

Waste Streams and Sorbent Materials*
Bottom Ash Transport Water
Ash Hopper Systems Waste (Air Heater, Economizer, & SCR)
Demineralizer Regenerate Wastewater
Unit 1 Boiler Sump
Unit 1 Low Point Drains
Water Treatment System Wastewater
O/W Separator (Stack #1)
Dredge Spoils
Air Heater Rinse Water
Units 1, 2, and 3 Spray Dryer (Absorber Slurry Water)
Chemical and Non-Chemical Metal Cleaning Wastes,
Aerated Lagoon Sewage
Low Volume SDA Sump and Other Miscellaneous Floor Drainage
Bottom Ash Transport Water

*No sorbent materials

DYNEGY

Safety Data Sheet

Section 1
Identification of the Substance and of the Supplier

1.1 Product Identifier

Product Name/Identification:	ASTM Class C Fly Ash
Synonyms:	Coal Fly Ash, Pozzolan
Formula:	UVCB Substance

1.2 Relevant Identified Uses of the Substance or Mixture and Uses Advices Against

Relevant Identified Uses:	Component of wallboard, concrete, roofing material, bricks, cement kiln feed.
Uses Advised Against:	None known.

1.3 Details of the Supplier of the SDS

Manufacturer/Supplier:	Dynegy, Inc.
Street Address:	601 Travis Street, Suite 1400
City, State and Zip Code:	Houston, TX 77002
Customer Service Telephone:	800-633-4704

Section 2
Hazards Identification

2.1 Classification of the Substance

GHS Classification(s) according to OSHA Hazard Communication Standard (29 CFR 1910.1200):

- Eye Irritant, Category 2A
- STOT-SE, Category 3 (Respiratory Irritation)
- Carcinogen, Category 1A
- STOT-RE, Category 1 (Lungs)
- Toxic to Reproduction, Category 2

2.2 Label Elements

Labelling according to 29 CFR 1910.1200 Appendices A, B and C*	
Hazard Pictogram(s):	
Signal word:	**DANGER**
Hazard Statement(s):	*Causes serious eye irritation.* *May cause damage to lungs after repeated/prolonged exposure via inhalation.* *May cause respiratory irritation.* *May cause cancer of the lung.* *Suspected of damaging fertility or the unborn child.*
Precautionary Statement(s):	*Obtain special instructions before use.* *Do not handle until all safety precautions have been read and understood.* *Avoid breathing dust.* *Wear protective gloves/protective clothing/eye protection/face protection.* *Wash thoroughly after handling.* *Do not eat drink or smoke when using this product.* *Use outdoors or in a well-ventilated area.* *If exposed or concerned: Get medical advice/attention.* *Store in a secure area.* *Dispose of product in accordance with local/national regulations.*

** Fly ash and other coal combustion products (CCPs) are UVCB substances (unknown or variable composition or biological). Various CCPs, noted as ashes/ash residuals; Ashes, residues, bottom; Bottom ash; Bottom ash residues; Waste solids, ashes under TSCA are defined as: "The residuum from the burning of a combination of carbonaceous materials. The following elements may be present as oxides: aluminum, calcium, iron, magnesium, nickel, phosphorus, potassium, silicon, sulfur, titanium, and vanadium." Ashes including fly ash and fluidized bed combustion ash are identified by CAS number 68131-74-8. The exact composition of the ash is dependent on the fuel source and flue additives composed of many constituents. The*

classification of the final substance is dependent on the presence of specific identified oxides as well as other trace elements.

2.3 Other Hazards

Listed Carcinogens:

-Respirable Crystalline Silica

IARC: [Yes] **NTP:** [Yes] **OSHA:** [Yes] **Other:** **(ACGIH)** [Yes]

Section 3
Composition/Information on Ingredients

Substance	***CAS No.***	***Percentage (%)***	***GHS Classification***
Crystalline Silica	*14808-60-7*	*30 - 60%*	*Repeat Dose STOT, Category 1* *Carcinogen, Category 1A*
Silica, crystalline respirable (RCS)	*14808-60-7*	***See Footnote 1***	*Repeat Dose STOT, Category 1* *Carcinogen, Category 1A*
Aluminosilicates	*71243-67-9* *1327-36-2*	*30 - 60%*	*Single Exposure STOT, Category 3*
Iron oxide	*1309-37-1*	*1 - 10%*	*Not Classified*
Calcium oxide (CaO)	*1305-78-8*	*20 - 30%*	*Skin Irritant, Category 2* *Eye Irritant, Category 1* *Single Exposure STOT, Category 3*
Magnesium oxide	*1309-48-4*	*2 - 10%*	*Not Classified*
Phosphorus pentoxide (P_2O_5)	*1314-56-3*	*≤2%*	*Skin Irritant, Category 2* *Eye Irritant, Category 2B*
Sodium oxide	*1313-59-3*	*1-8%*	*Not Classified*
Potassium oxide (K_2O)	*12136-45-7*	*≤1%*	*Skin Irritant, Category 2* *Eye Irritant, Category 2B*
Titanium dioxide (TiO_2)	*13463-67-7*	*<3%*	*Not Classified*
Bromide salt (calcium)	*7789-41-5*	*See Footnote 2*	*Toxic to Reproduction, Category 2*

Footnote 1: *The percentage of respirable crystalline silica has not been determined. Therefore, a GHS classification of Carcinogen, Category 1A has been assigned.*

Footnote 2: *Analytical data are not available to demonstrate that the concentration of bromide salt is <0.1%; therefore, a GHS classification of Toxic to Reproduction, Category 2 has been assigned.*

Section 4
First Aid Measures

4.1 Description of First Aid Measures

Inhalation:	If product is inhaled and irritation of the nose or coughing occurs, remove person to fresh air. Get medical advice/attention if respiratory symptoms persist.
Skin Contact:	If skin exposure occurs, wash with soap and water.
Eye Contact:	If product gets into the eye, rinse copiously with water for several minutes. Remove contact lenses, if present and easy to do. Seek medical attention/advice if irritation occurs or persists.
Ingestion:	No specific first aid measures are required.

4.2 Most Important Health Effects, Both Acute and Delayed

Acute Effects: Direct exposure may cause respiratory irritation, eye irritation and skin irritation. The product dust can dry and irritate the skin and cause dermatitis and can irritate eyes and skin through mechanical abrasion.

Chronic Effects: Chronic exposure may cause lung damage from repeated exposure. Prolonged inhalation of respirable crystalline silica above certain concentrations may cause lung diseases, including silicosis and lung cancer. Repeated exposure to dusts containing inorganic bromide salts may affect fertility and/or result in effects to the unborn child.

4.3 Indication of Any Immediate Medical Attention and Special Treatment Needed

Seek first aid or call a doctor or Poison Control Center if contact with eyes occurs and irritation remains after rinsing. Get medical advice if inhalation occurs and respiratory symptoms persist.

Section 5
Firefighting Measures

5.1 Extinguishing Media

Suitable Extinguishing Media:	Product is not flammable. Use extinguishing media appropriate for surrounding fire.
Unsuitable Extinguishing Media:	Not applicable, the product is not flammable.

5.2 Special Hazards Arising from the Substance or Mixture

Hazardous Combustion Products:	None known.

5.3 Advice for Firefighters

Special Protective Equipment and Precautions for Firefighters:	As with any fire, wear self-contained breathing apparatus (NIOSH approved or equivalent) and full protective gear.

Section 6
Accidental Release Measures

6.1 Personal Precautions, Protective Equipment and Emergency Procedures

Personal precautions/Protective Equipment:	See Section 8.2.2 Individual Protective Measures. For concentrations exceeding Occupational Exposure Levels (OELs), use a self-contained breathing apparatus (SCBA).
Emergency procedures:	Use scooping, water spraying/flushing/misting or ventilated vacuum cleaning systems to clean up spills. Do not use pressurized air.

6.2 Environmental Precautions

Environmental precautions:	Prevent contamination of drains or waterways and dispose according to local and national regulations.

6.3 Methods and Material for Containment and Cleaning Up

Methods and materials for containment and cleaning up:	Do not use brooms or compressed air to clean surfaces. Use dust collection vacuum and extraction systems. Large spills of dry product should be removed by a vacuum system. Dampened material should be removed by mechanical means and recycled or disposed of according to local and national regulations.

See Sections 8 and 13 for additional information on exposure controls and disposal.

Section 7
Handling and Storage

7.1 Precautions for Safe Handling

Practice good housekeeping. Use adequate exhaust ventilation, dust collection and/or water mist to maintain airborne dust concentrations below permissible exposure limits (note: respirable crystalline silica dust may be in the air without a visible dust cloud).

Do not permit dust to collect on walls, floors, sills, ledges, machinery, or equipment. Maintain and test ventilation and dust collection equipment. In cases of insufficient ventilation, wear a NIOSH approved respirator for silica dust when handling or disposing dust from this product. Avoid contact with skin and eyes. Wash or vacuum clothing that has become dusty. Avoid eating, smoking, or drinking while handling the material.

7.2 Conditions for Safe Storage, Including any Incompatibilities

Minimize dust produced during loading and unloading.

Section 8
Exposure Controls/Personal Protection

8.1 Control Parameters

OCCUPATIONAL EXPOSURE LIMITS					
SUBSTANCE		**OSHA PEL TWA (mg/m^3)**	**NIOSH REL TWA (mg/m^3)**	**ACGIH TLV TWA (mg/m^3)**	**CA - OSHA PEL (mg/m^3)**
Calcium oxide		5	2	2	2
Particulates Not Otherwise Regulated	Total	15	15	10	10
	Respirable	5	5	3	5
Respirable Crystalline Silica	Respirable Crystalline Silica	0.05	0.05	0.025	0.05
Titanium dioxide	Total	15	2.4 (fine) 0.3 (ultrafine)	10	10
Manganese dioxide (as manganese compounds)	Total	5 (Ceiling)	1 3 (STEL)	0.1	0.2
	Respirable	-	-	0.02	-

8.2 Exposure Controls

8.2.1 Engineering Controls

Provide ventilation to maintain the ambient workplace atmosphere below the occupational exposure limit(s). Use general and local exhaust ventilation and dust collection systems as necessary to minimize exposure.

8.2.2 Personal Protective Equipment (PPE)

Respiratory protection:	Wear a NIOSH approved particulate respirator if exposure to airborne particulates is unavoidable and where occupational exposure limits may be exceeded. If airborne exposures are anticipated to exceed applicable PELs or TLVs, a self-contained breathing apparatus or airline respirator is recommended.
Eye and face protection:	If eye contact is possible, wear protective glasses with side shields. Avoid contact lenses.
Hand and skin protection:	Wear gloves and protective clothing. Wash hands with soap and water after contact with material.

Section 9
Physical and Chemical Properties

9.1 Information on Basic Physical and Chemical Properties

Property: Value	Property: Value
Appearance (physical state, color, etc.): Fine tan/ gray particulate	**Upper/lower flammability or explosive limits:** Not applicable
Odor: Odorless[1]	**Vapor Pressure (Pa):** Not applicable
Odor threshold: Not applicable	**Vapor Density:** Not applicable
pH (25 °C) (in water): Not Determined	**Specific gravity or relative density:** 2.2 – 2.9
Melting point/freezing point (°C): Not applicable	**Water Solubility:** Slight
Initial boiling point/boiling range (°C): NA	**Partition coefficient: n-octane/water:** NA
Flash point (°C): Not determined	**Auto ignition temperature (°C):** Not applicable
Evaporation rate: Not applicable	**Decomposition temperature (°C):** Not determined
Flammability (solid, gas): Not combustible	**Viscosity:** Not applicable

[1] The use of urea or aqueous ammonia injected into the flue gas to reduce nitrogen oxides (NOx) emissions may result in the presence of ammonium sulfate or ammonium bisulfate in the ash at less than 0.1%. When ash containing these substances becomes wet under high pH (>9), free ammonia gas may be released resulting in objectionable/nuisance ammonia odor and potential exposure to ammonia gas especially in confined spaces.

Section 10
Stability and Reactivity

10.1 Reactivity:	The material is an inert, inorganic material primarily composed of elemental oxides.
10.2 Chemical stability:	The material is stable under normal use conditions.
10.3 Possibility of hazardous reactions:	The material is a relatively stable, inert material; however, when ash containing ammonia becomes wet under high pH (>9), free ammonia gas may be released resulting in an objectionable/nuisance ammonia odor and potential exposure to ammonia gas especially in confined spaces. Polymerization will not occur.
10.4 Conditions to avoid:	Product can become airborne in moderate winds. Dry material should be stored in silos. Materials stored out of doors should be covered or maintained in a damp condition.
10.5 Incompatible materials:	None known.
10. 6 Hazardous decomposition products:	None known.

Section 11
Toxicological Information

11.1 Information on Toxicological Effects

Endpoint	Data
Acute oral toxicity	LD50 > 2000 mg/kg
Acute dermal toxicity	LD50 > 2000 mg/kg
Acute inhalation toxicity	LD50 > 5.0 mg/L
Skin corrosion/irritation	Does not meet the classification criteria but may cause slight skin irritation. Product dust can dry the skin which can result in irritation.
Eye damage/irritation	Causes serious eye irritation. Positive scores for conjunctiva irritation and chemosis in 2/3 animals based on average of 24, 48 and 72-hour scores with irritation clearing within 21 days; No corneal or iritis effects observed.
Respiratory/skin sensitization	Not a respiratory or dermal sensitizer.
Germ cell mutagenicity	Not mutagenic in in-vitro and in-vivo assays with or without metabolic activation.
Carcinogenicity	Not available. Respirable crystalline silica has been identified as a carcinogen by OSHA, NTP, ACGIH and IARC.
Reproductive toxicity	No developmental toxicity was observed in available animal studies. Reproductive studies on CCPs showed either no reproductive effects, or some effects on male and female reproductive organs and parameters but without a clear dose response. Inorganic bromide salts have been shown to have adverse effects on reproductive parameters in some animal studies.
STOT-SE	CCPs when present as a nuisance dust may result in respiratory irritation.
STOT-RE	In a 180-day inhalation study with fly ash dust, no effects were observed at the highest dose tested. NOEC = 4.2 mg/m^3; it is not possible to assess the level at which toxicologically significant effects may occur. Repeated inhalation exposures to high levels of respirable crystalline silica may result in lung damage (i.e., silicosis).
Aspiration Hazard	Not applicable based product form.

Section 12
Ecological Information

12.1 Toxicity

Fly Ash C (CAS# 68131-74-8)	
Toxicity to Fish	LC50 > 100 mg/L
Toxicity to Aquatic Invertebrates	Data indicates that the test substance is not toxic to *Daphnia magna* (EC50 undetermined).
Toxicity to Aquatic Algae and Plants	EC50 = 10 mg/L

Calcium oxide CAS# 1305-78-8	
Toxicity to Fish	LC50 = 50.6 mg/L The findings were closely related to the pH of the test solutions; therefore, pH is considered to be the main reason for the effects.
Toxicity to Aquatic Invertebrates	EC50 = 49.1 mg/L The findings were closely related to the pH of the test solutions; therefore, pH is considered to be the main reason for the effects.
Toxicity to Aquatic Algae and Plants	NOEC =48 mg/L @ 72 hours based on $Ca(OH)_2$ The initial pH of the test medium was not directly related to the biologically relevant effects. The formation of precipitates is likely the result of the reaction between CO_2 dissolved in the medium.

12.2 Persistence and Degradability

Not relevant for inorganic materials.

12.3 Bioaccumulative Potential

This material does not contain any compounds that would bioaccumulate up the food chain.

12.4 Mobility in Soil

No data available.

12.5 Results of PBT and vPvB Assessment

This material does not contain any compounds classified as “persistent, bioaccumulative or toxic” nor as “very persistent/very bioaccumulative”.

12.6 Other Adverse Effects

None known.

Section 13

Disposal Considerations

See Sections 7 and 8 above for safe handling and use, including appropriate industrial hygiene practices.

Dispose of all waste product and containers in accordance with federal, state and local regulations.

Section 14
Transport Information

Regulatory entity: U.S. DOT	Shipping Name:	Not Regulated
	Hazard Class:	Not Regulated
	ID Number:	Not Regulated
	Packing Group:	Not Regulated

Section 15
Regulatory Information

15.1 Safety, Health and Environmental Regulations/Legislation Specific for the Mixture

- TSCA Inventory Status

  All components are listed on the TSCA Inventory.

- California Proposition 65.

  The following substances are known to the State of California to be carcinogens and/or reproductive toxicants:

  - Respirable crystalline silica

- State Right-to-Know (RTK)

Component	CAS	MA[1,2]	NJ[3,4]	PA[5]	RI[6]
Ammonium bisulfate	7803-63-6	No	Yes	No	No
Ammonium sulfate	7783-20-2	Yes	No	Yes	No
Calcium oxide	1305-78-8	Yes	Yes	Yes	No
Iron oxide	1309-37-1	Yes	Yes	Yes	No
Magnesium oxide	1309-48-4	No	Yes	No	No
Manganese oxide-as manganese compounds	1313-13-9; Various	No	No	Yes	Yes
Phosphorus pentoxide (or phosphorus oxide)	1314-56-3	Yes	Yes	Yes	No
Potassium oxide	12136-45-7	No	Yes	No	No
Silica-crystalline (SiO2), quartz	14808-60-7	Yes	Yes	Yes	No
Sodium oxide	1313-59-3	No	Yes	No	No
Titanium dioxide	13463-67-7	Yes	Yes	Yes	Yes

[1] Massachusetts Department of Public Health, no date
[2] 189th General Court of The Commonwealth of Massachusetts, no date
[3] New Jersey Department of Health and Senior Services, 2010a
[4] New Jersey Department of Health, 2010b
[5] Pennsylvania Code, 1986
[6] Rhode Island Department of Labor and Training, no date

Section 16
Other Information, Including Date of Preparation or Last Revision

16.1 Indication of Changes

Date of preparation or last revision: February 23, 2018

16.2 Abbreviations and Acronyms

- ACGIH: American Conference of Industrial Hygienists
- CA: California
- CAS: Chemical Abstract Services
- CCP: Coal Combustion Product
- CFR: Code of Federal Regulations
- EPA: Environmental Protection Agency

- GHS: Globally Harmonized System of Classification and Labelling
- IARC: International Agency for Research on Cancer
- LC50: Concentration resulting in the mortality of 50 % of an animal population
- LD50: Dose resulting in the mortality of 50 % of an animal population
- MA: Massachusetts
- NA: Not Applicable
- NJ: New Jersey
- NOEC: No observed effect concentration
- NIOSH: National Institute of Occupational Safety and Health
- NOx: Nitrogen oxides
- NTP: US National Toxicology Program
- OEL: Occupational Exposure Limit
- OSHA: Occupational Safety and Health Administration
- PA: Pennsylvania
- PBT: Persistent, Toxic and Bioaccumulative
- PEL: Permissible exposure limit
- PPE: Personal Protective Equipment
- REL: Recommended exposure limit
- RI: Rhode Island
- RCS: Respirable Crystalline Silica
- RTK: Right-to-Know
- SCBA: Self-contained breathing apparatus
- SDS: Safety Data Sheet
- STEL: Short-term exposure limit
- STOT-RE: Specific target organ toxicity-repeated exposure
- STOT-SE: Specific target organ toxicity-single exposure
- TLV: Threshold limit value
- TSCA: Toxic Substances Control Act
- TWA: Time-weighted average
- UEL: Upper explosive limit
- UVCB: Unknown or Variable Composition/Biological
- U.S.: United States
- U.S. DOT: United States of Department of Transportation

16.3 Other Hazards

Hazardous Materials Identification System (HMIS) Degree of hazard (0= low, 4 = extreme)							
Health:	2*	**Flammability:**	0	**Physical Hazards:**	0	**Personal protection:****	

** Chronic Health Effects*
*** Appropriate personal protection is defined by the activity to be performed.*
See Section 8 for additional information.

DISCLAIMER:

This SDS has been prepared in accordance with the Hazard Communication Rule 29 CFR 1910.1200. Information herein is based on data considered to be accurate as of date prepared. No warranty or representation, express or implied, is made as to the accuracy or completeness of this data and safety information. No responsibility can be assumed for any damage or injury resulting from abnormal use, failure to adhere to recommended practices, or from any hazards inherent in the nature of the product.

APPENDIX E
SITE PLAN MAP AND ON-SITE TRANSPORTATION PLAN
((845.220(a)(4) AND 845.220(a)(2)(E))

Y:\Mapping\Projects\22\2285\MXD\Construction_Permit\BAL\CP_BAL.aprx\Appendix E. Site Plan Map and Transportation Plan

PROJECT: 169000XXXX | DATED: 4/15/2025 | DESIGNER: GALARNMC

MONITORING WELL
PORE WATER WELL
ONSITE TRANSPORTATION ROUTE
HIGH VOLTAGE OVERHEAD ELECTRIC
RAILROAD
CCR UNIT BOUNDARY
SITE FEATURE
CAPPED AREA
PROPERTY BOUNDARY

0 1,250 2,500 Feet

NOTES:
THE PROPERTY LINES ARE APPROXIMATE. ALL PRIVATE AND PUBLIC SITE UTILITIES INCLUDING, BUT NOT LIMITED TO, SERVICE ELECTRIC LINES, GAS LINES, HAZARDOUS LIQUID LINES, WATER AND SEWER LINES, TELECOMMUNICATION LINES, PLANT UTILITIES, AND/OR PRIVATE UTILITIES ARE NOT SHOWN ON THIS FIGURE AND SHALL BE VERIFIED IN THE FIELD PRIOR TO ANY SITE WORK.

SITE PLAN MAP AND TRANSPORTATION PLAN

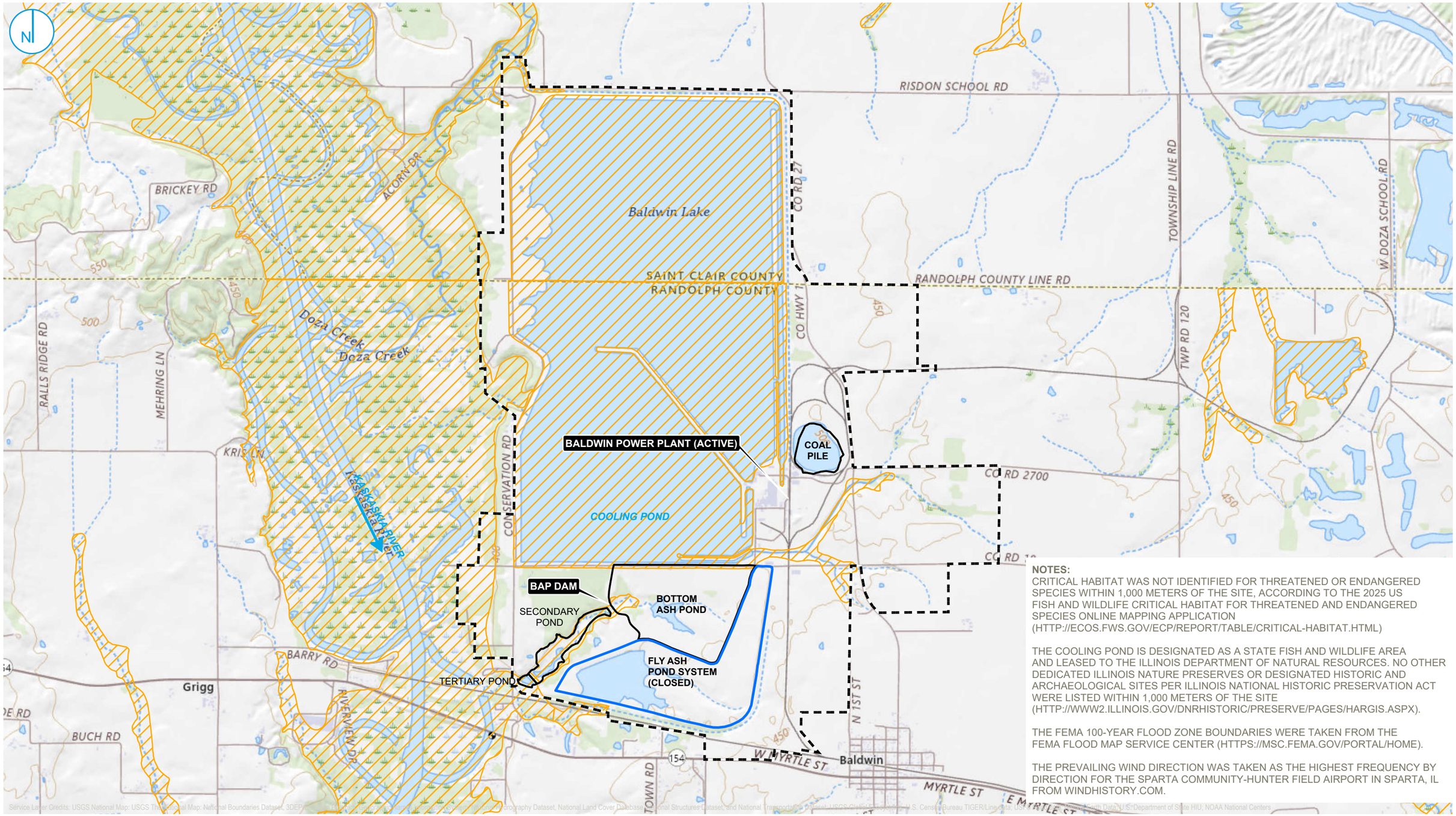
CONSTRUCTION PERMIT APPLICATION
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

APPENDIX E

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

APPENDIX F
SITE LOCATION MAPS (845.220(a)(3))



NOTES:
CRITICAL HABITAT WAS NOT IDENTIFIED FOR THREATENED OR ENDANGERED SPECIES WITHIN 1,000 METERS OF THE SITE, ACCORDING TO THE 2025 US FISH AND WILDLIFE CRITICAL HABITAT FOR THREATENED AND ENDANGERED SPECIES ONLINE MAPPING APPLICATION (HTTP://ECOS.FWS.GOV/ECP/REPORT/TABLE/CRITICAL-HABITAT.HTML)

THE COOLING POND IS DESIGNATED AS A STATE FISH AND WILDLIFE AREA AND LEASED TO THE ILLINOIS DEPARTMENT OF NATURAL RESOURCES. NO OTHER DEDICATED ILLINOIS NATURE PRESERVES OR DESIGNATED HISTORIC AND ARCHAEOLOGICAL SITES PER ILLINOIS NATIONAL HISTORIC PRESERVATION ACT WERE LISTED WITHIN 1,000 METERS OF THE SITE (HTTP://WWW2.ILLINOIS.GOV/DNRHISTORIC/PRESERVE/PAGES/HARGIS.ASPX).

THE FEMA 100-YEAR FLOOD ZONE BOUNDARIES WERE TAKEN FROM THE FEMA FLOOD MAP SERVICE CENTER (HTTPS://MSC.FEMA.GOV/PORTAL/HOME).

THE PREVAILING WIND DIRECTION WAS TAKEN AS THE HIGHEST FREQUENCY BY DIRECTION FOR THE SPARTA COMMUNITY-HUNTER FIELD AIRPORT IN SPARTA, IL FROM WINDHISTORY.COM.

Service Layer Credits: USGS National Map: USGS Thematic Map: National Boundaries Dataset, 3DEP Elevation Plane Layer, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Ecosystem Data; U.S. Department of State HIU; NOAA National Centers

PROJECT: 169000XXXX | DATED: 4/15/2025 | DESIGNER: GALARNMC

Y:\Mapping\Projects\22\2285\MXD\Construction_Permit\BAL\CP_BAL.aprx\Appendix F. Site Location Map

CCR UNIT BOUNDARY
SITE FEATURE
PROPERTY BOUNDARY
FEMA 100-YEAR FLOOD ZONE

PREVAILING WIND

0 1,250 2,500 Feet

SITE LOCATION MAP

CONSTRUCTION PERMIT APPLICATION
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

APPENDIX F

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

APPENDIX G
CORRECTIVE ACTION PLAN AND PROPOSED SCHEDULE (845.670), INCLUDING THE CORRECTIVE ACTION ALTERNATIVES ANALYSIS (845.670(e))

Intended for
Dynegy Midwest Generation, LLC
10901 Baldwin Road
Baldwin, IL 62217

Date
April 22, 2025

Project No.
1940110241-004

CORRECTIVE ACTION PLAN

BALDWIN POWER PLANT FLY ASH POND SYSTEM, IEPA ID NO. W1578510001-01/02/03

RAMBOLL Bright ideas. Sustainable change.

CORRECTIVE ACTION PLAN
BALDWIN POWER PLANT FLY ASH POND SYSTEM, IEPA ID NO. W1578510001-01/02/03

Project name	**Baldwin Power Plant Fly Ash Pond System**
Project no.	**1940110241-005**
Recipient	**Dynegy Midwest Generation, LLC**
Document type	**Corrective Action Plan**
Revision	**FINAL**
Date	**April 22, 2025**
Prepared by	**Christopher R. Glidden**
Checked by	**J. Austin Bond, PE**
Approved by	**Brian G. Hennings, PG**
Description	**Corrective Action Plan for 35 I.A.C. § 845**

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Table 1 Proposed Milestone Schedule for Implementing Corrective Action Remedy (Groundwater Management System)

APPENDICES

Appendix A Corrective Action Alternatives Analysis (845.670(e)), including Corrective Measures Assessment (845.660)
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ACRONYMS AND ABBREVIATIONS

%	percent
35 I.A.C.	Title 35 of the Illinois Administrative Code
40 C.F.R.	Title 40 of Code of Federal Regulations
amp	amperage
BEC	Baldwin Energy Complex
BPP	Baldwin Power Plant
bgs	below ground surface
CA GMP	Corrective Action Groundwater Monitoring Plan
CAAA	Corrective Action Alternatives Analysis
CAAA-SIR	Corrective Action Alternatives Analysis Supporting Information Report
CAP	Corrective Action Plan
CCR	coal combustion residuals
CCR Rule	40 C.F.R. § 257 Subpart D
CIP	closure-in-place
CMA	Corrective Measures Assessment
COC	constituent of concern
CP	Construction Permit
CY	cubic yards
DMG	Dynegy Midwest Generation, LLC
EQ	equalization
FAPS	Fly Ash Pond System, also referred to as site
GMS	groundwater management system
Gradient	Gradient Corporation
GWE	groundwater extraction
GWP	groundwater polishing
GWPS	groundwater protection standard(s)
HCR	Hydrogeologic Site Characterization Report
HDPE	high-density polyethylene
HHERA	Human Health and Ecological Risk Assessment
ID	identification
IEPA	Illinois Environmental Protection Agency
IPCB	Illinois Pollution Control Board
ISGS	Illinois State Geological Survey
ISWS	Illinois State Water Survey
No.	number
NPDES	National Pollutant Discharge Elimination System
NRT	National Resource Technology, Inc.
OMM	operation, maintenance, and monitoring
PMP	potential migration pathway
PVC	polyvinyl chloride
UA	uppermost aquifer
UU	upper unit
USEPA	United States Environmental Protection Agency
VAC	volt alternating current

1. INTRODUCTION

1.1 Plant and Site Information

Dynegy Midwest Generation, LLC (DMG) is the owner of the active coal-fired Baldwin Energy Complex (BEC), also referred to as the Baldwin Power Plant (BPP), in Baldwin, Randolph County, Illinois. This Corrective Action Plan (CAP) has been prepared for the Fly Ash Pond System (FAPS) at the BPP (site). Groundwater corrective action for the BPP FAPS will be performed under the requirements of Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845, Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments [1] and the requirements of Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257, herein referred to as the Federal coal combustion residuals (CCR) Rule [2]. The FAPS is identified by Illinois Environmental Protection Agency (IEPA) identification (ID) numbers (Nos.) W1578510001-01, W1578510001-02, W1578510001-03, also referred to as Vistra Identification ID No. 605, and National Inventory of Dams No. IL50720.

1.2 Organization of the Corrective Action Plan

This CAP is organized in the following manner:

- **Section 1** includes an introduction to the FAPS, lists the status of other 35 I.A.C. § 845 permit applications submitted to IEPA, identifies the selected remedy, and provides a narrative of remedy construction;
- **Section 2** includes an overview of the corrective action process, including the results of the Corrective Measures Assessment (CMA) and Corrective Action Alternatives Analysis (CAAA);
- **Section 3** provides the CAP requirements, the selected remedy, an evaluation of effectiveness, and an implementation schedule, as required by 35 I.A.C. § 845.670; and
- **Section 4** includes reference documents used in the development of this CAP.

This CAP was prepared as an attachment to a Construction Permit (CP) application, to support obtaining a permit for Groundwater Corrective Action Construction at the FAPS, as required by 35 I.A.C. § 845.220(a) and (c).

1.3 Permit Status

The following 35 I.A.C. § 845 permit applications have been previously submitted to IEPA along with this CAP for the FAPS:

- An operating permit (OP), as required by 35 I.A.C. § 845.230, was submitted on October 25, 2021 [3].

1.4 Closure and Source Control Status

DMG completed significant source control efforts in 2020 as part of final closure of the FAPS [4]. The final closure was performed in accordance with the Closure and Post-Closure Care Plan [5] that was developed in accordance with Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257 and submitted to IEPA for review. IEPA found "*…that the plan…represent an appropriate means by which to close the Baldwin Fly Ash Pond System which is comprised of the East Fly Ash Pond, the Old East Fly Ash Pond and the West Fly Ash Pond*" [6]. The final closure was completed in accordance with the IEPA Water Pollution Control permit 2020-EA-65016.

The FAPS closure construction included closure-in-place (CIP) of the entire FAPS. This was accomplished by removing impounded water and constructing a final cover system in accordance with 40 C.F.R. § 257.102 to minimize water infiltration into the closed FAPS and improve surface water drainage off the cover system, thus reducing generation of potentially impacted water and ultimately reducing the extent of potential CCR impacts to groundwater. The source control was predicted to lower water levels, decrease the potential transport of CCR constituents off-site and prevent groundwater protection standards (GWPS) from being exceeded in any water supply wells [7]. These completed source control activities serve as the primary groundwater corrective measure at the FAPS. The remedy presented within this Corrective Action Plan is intended to be supplementary to the primary remedy, which is the completed source control.

1.5 Selected Corrective Action Remedy

A groundwater management system (GMS), combined with the completed source control described in Section 1.4, [4] has been identified as the most appropriate remedy for the FAPS, based on the CAAA provided in **Appendix A**. Potential remedies evaluated in the CAAA included Source Control with Groundwater Polishing (GWP), Source Control with a Cutoff Wall, and Source Control with a GMS.

The CAAA, which was prepared by Gradient Corporation (Gradient), was based on a CAAA Supporting Information Report (CAAA-SIR) that was prepared by Ramboll and is attached to the CAAA. The CAAA-SIR includes the results of groundwater modeling and feasibility-level design information for each remedy.

A Groundwater Polishing Evaluation Report [8] is also attached to the CAAA. This report presents results from geochemical modeling of exceedance parameters addressed at the FAPS by the CAP. Geochemical modeling supports the assessment of GWP as a component of the proposed corrective action by evaluating the potential for chemical attenuation of constituents of concern (COC) before and after source control as a means of contextualizing the times to meet groundwater protection standards (GWPS) estimated in the flow and transport model.

1.5.1 Narrative Description of Selected Corrective Action Remedy

Corrective action consists of the completed source control (see Section 1.4) and the operation of a new GMS, which will serve to remove liquids that may accumulate from beneath the existing FAPS cover system. The GMS system will control the source to reduce to the maximum extent feasible further releases of constituents listed in 845.600 in accordance with 845.670(d)(3).

The GMS will include the construction of groundwater management extraction trenches within the footprint of the closed FAPS, which will remove liquids from the base of the CCR within the FAPS. The trenches will extend vertically through the entire observed thickness of CCR and will be terminated in the underlying native soils. Any liquids collected by the GMS will be transferred to an appropriate location for discharge in accordance with applicable permits that will be obtained after approval of the Corrective Action Plan.

The GMS will be continuously operated during the corrective action period, outside of routine shutdowns for system maintenance and/or power outages. Groundwater corrective action performance will be monitored in accordance with the Corrective Action Groundwater Monitoring Plan (CA GMP). The system operation will cease when the FAPS monitoring well network achieves the GWPS and other considerations have been evaluated as described in the CA GMP Section 3.1.

Estimated timelines for GMS operation and times to reach the GWPS will be periodically reviewed and updated based on observed corrective action performance via an adaptive site management strategy. These periodic updated estimates will be communicated to IEPA and the public within Annual Corrective Action Monitoring Reports in accordance with the CA GMP.

Corrective action will be considered complete when a demonstration that GWPS compliance beyond the waste boundary has been achieved for at least three years after remedy operations have ceased and a Corrective Action Completion Report and Certification have been submitted to IEPA in accordance with 35 I.A.C. § 845.680(e).

1.5.1.1 Narrative Discussion of Remedy Design and Function

The GMS design includes an approximately 8,700-foot collection trench alignment within the limits of the existing FAPS. Collection sumps will be installed approximately every 500 ft along the alignment. The location of the system was targeted to correspond to the portions of the FAPS where CCR is present at the lowest elevations, which generally correspond with pre-construction surface drainage features that were identified in pre-construction site drawings and available geotechnical exploration data [9]. This approach will allow the system to collect the maximum amount of liquids that may be present, thereby proactively preventing an accumulation of hydraulic head within the FAPS. Permit-level engineering drawings depicting the proposed remedy are provided in **Appendix B**, and a list of key design components includes the following:

- The trenches will be approximately 2 to 3 feet wide with a maximum depth of approximately 50 to 60 feet bgs; backfilled will consist of permeable drainage media surrounding a perforated collection pipe installed near the base of the trench.
- High-density polyethylene (HDPE) air supply and water conveyance piping will be buried within the top 3 feet of an adjacent trench during trench installation.
- Collection sumps will be spaced approximately 500 feet apart and installed down to the base of the CCR. Collection sumps will consist of a pit to collect any liquids, a pneumatic pump, and a discharge pipe that will carry any extracted liquids to a nearby compressor shed. The collection sump pits will be backfilled with gravel around slotted screens, which will house the pneumatic pump, and piezometers, which will be used to monitor the presence of liquids within the collection sumps.
- Areas of the final cover system damaged by installation of the GMS will be repaired after installation, consistent with the specifications for the completed FAPS closure.

Electrical infrastructure to support the GMS will be installed prior to delivery and placement of the GMS. Additional system infrastructure will consist of compressor sheds that will be installed approximately every 1,000 to 2,000 feet along the trench alignment. Each compressor shed is expected to contain the following equipment:

- An air compressor, air receiver tank, and a manifold consisting of control valves and pulse counters that will be used to monitor pneumatic pump air usage.
- A groundwater collection manifold consisting of control valves and flow meters to totalize any extracted liquids from each collection sump.
- An EQ tank that will temporarily store any extracted liquids.

- A transfer pump that will transfer any extracted liquids to the discharge location in accordance with applicable permits.
- Miscellaneous electrical controls to support data collection and system operation.

1.5.2 Narrative Description of Proposed Remedy Operations

Operations, maintenance, and monitoring (OMM) will be conducted on the GMS on a routine basis. OMM will consist of system-wide data collection to track water recovery and discharge rates, system-wide inspections and associated maintenance, and routine monitoring and compliance activities associated with the treatment and discharge of water via the site's NPDES permit. Waste streams associated with the GMS and its management may include:

- Accumulated sediment/solids that collect at the bottom of the EQ tanks will be intermittently removed, dried, and disposed of at a non-hazardous landfill, as needed based on accumulation rates.
- Conveyance piping will be flushed on an as-needed basis in the event organic or inorganic solids accumulation is observed on the inner wall of the conveyance pipe during routine OMM inspections.

Routine equipment maintenance will be conducted per at regular frequencies. Additionally, faulty equipment will be replaced, as needed, to keep the GMS operating in accordance with the design intent. Equipment maintenance and/or replacements may require temporary shutdown of the GMS.

1.5.3 Narrative Description of Proposed Groundwater Monitoring

Corrective action groundwater monitoring will be conducted during remedy operation to evaluate the effectiveness of the corrective action remedy and whether groundwater concentrations are achieving the GWPS as predicted by the groundwater model. Groundwater data collected as part of the monitoring program will be analyzed to determine if the remedy is on track to meet GWPS and to inform adaptive management decisions if performance metrics are not achieved.

- Regular groundwater monitoring will be conducted utilizing a corrective action groundwater monitoring network designed in accordance with 35 I.A.C. § 845.680(a)(1).
- Samples will be collected for each constituent required by 35 I.A.C. § 845.600(a)(1). Samples will be collected on a quarterly basis initially and potentially reduced to a semiannual basis once five years of monitoring have occurred, in accordance with 35 I.A.C. § 845.650(b)(4). Monitoring results will be submitted to IEPA for each monitoring event, in addition to an Annual Groundwater Monitoring and Corrective Action Report, in accordance with 35 I.A.C. § 845.610(e).
- Routine maintenance of the monitoring well network will include inspecting the wells, making repairs to the wells (as needed) and rehabilitating and/or replacing wells to improve performance (as needed).

- Adaptive site management will include updates to geochemical models for each location with GWPS exceedances[1].
  - The available solid-phase data from the aquifer and these models will be used to identify potential mobilization of other COCs as groundwater returns to background conditions.
  - Groundwater monitoring results will be evaluated for consistency with modeled concentrations and documented in the monitoring reports submitted to IEPA, in accordance with 35 I.A.C. § 845.610(e).
  - If groundwater does not match expected conditions, additional methods or techniques to achieve compliance with GWPS will be evaluated and, if feasible, implemented in accordance with 35 I.A.C. § 845.680(b). These actions could include, for example, the installation of additional collection sumps to enhance liquid recovery, and the installation of additional monitoring wells to obtain groundwater data necessary to support decisions made under the adaptive management strategy.
- Corrective Action Confirmation Monitoring and Completion
  - Per 35 I.A.C. § 845.680(c), corrective action is considered complete when compliance with the GWPS has been demonstrated "at all points within the plume of contamination that lies beyond the waste boundary […] for a period of three consecutive years". At that time, an attainment evaluation will be implemented. This will include monitoring each well for three additional years to confirm that GWPS have been achieved, in accordance 35 I.A.C. § 845.680(c).
  - After completion of the corrective action confirmation monitoring period, a Corrective Action Completion Report and Certification will be prepared and submitted to IEPA, in accordance with 35 I.A.C. § 845.680(e).

[1] Throughout this document, "exceedance" or "exceedances" is intended to refer only to potential exceedances of proposed applicable background statistics or GWPSs as described in the proposed groundwater monitoring program, which was submitted to the IEPA on October 25, 2021 as part of DMG's operating permit application for the BAL FAPS. That operating permit application, including the proposed groundwater monitoring program, remains under review by the IEPA and, therefore, DMG has not identified any actual exceedances.

2. CORRECTIVE ACTION OVERVIEW

This CAP is based on the tiered assessment and analysis of alternative remedial technologies and remedies that were completed via the CMA and CAAA (**Appendix A**). The objective of these assessments was to determine the most appropriate alternative for the FAPS that, when coupled with the source control completed in the Final Closure Plan [10], would reduce the future potential footprint of COCs in groundwater and eventually attain the GWPS specified under 35 I.A.C. § 845.600.

2.1 Corrective Measures Assessment

The CMA [11] was performed for the FAPS and submitted to the IEPA on April 24, 2024, after the exceedances of the GWPS were identified. The CMA considered four corrective measures for the FAPS, including:

- Source Control with GWP;
- Source Control with GMS[2] (groundwater pumping wells or collection trenches);
- Source Control with Groundwater Cutoff Wall; and
- Source Control with In-Situ Treatment (permeable reactive barrier or in-situ chemical treatment).

Based on the CMA, three corrective measures, including Source Control-GWP, Source Control-GWE, and Source Control-Cutoff Wall, were identified as potentially viable for the FAPS and were included for further evaluation, design advancement, and comparative assessment within the CAAA for the FAPS. The In-Situ Treatment corrective measure was determined by the CMA to be unlikely to be effective for the FAPS and was not retained for further evaluation within the CAAA.

2.2 Analysis of Corrective Action Alternatives

2.2.1 Corrective Action Alternatives Analysis Supporting Information Report

The CAAA for the FAPS was prepared by Gradient based on the CAAA-SIR prepared by Ramboll. The CAAA-SIR, which is included as Attachment B of the CAAA provided in **Appendix A**, included additional evaluation, design advancement, and comparative assessment of the Source Control-GWP, Source Control-Deep Cutoff Wall, and Source Control-GMS corrective measures identified as potentially viable for the FAPS by the CMA. The evaluation included the completion of feasibility-level design activities for each alternative and incorporated the following tasks:

- Performing predictive groundwater modeling to evaluate the scope (*i.e.,* location and extents) of each alternative and the corresponding estimated time to achieve GWPS;
- Developing feasibility-level design drawings showing the extent in plan and elevation view of each engineered remedy;
- Estimating the time required to design, construct, and implement each remedy, in addition to ongoing operational and maintenance requirements;

[2] This corrective measure is referred to as groundwater extraction in the April 2024 CMA.

- Developing conceptual plans for the storage, treatment, and discharge of any liquids for applicable remedies;
- Identifying future tasks required to implement each alternative, including permitting, investigation, and design efforts; and
- Estimating relevant material quantities, labor hours, delivery miles, equipment miles, and daily commuting miles associated with constructing and operating/maintaining each remedy.

Consistent with the results of previous modeling efforts that supported the IEPA approved closure of the FAPS, the results of predictive groundwater modeling in support of the CAAA determined that the GWPS would not be attained within the 1,000 year timeline simulated. For comparative purposes, a model simulation of closure by removal (removal of all CCR from the FAPS) was also simulated and the GWPS also would not be attained within the 1,000 year timeline. This is due to the low hydraulic conductivity of the native soils (UU) and bedrock (UA); and, low groundwater flow velocities at the site. As discussed in Section 6.4 of the groundwater modeling technical memorandum, included as Appendix B of the CAAA-SIR, the following applies to these long-term model results:

- Prediction modeling of Source Control with GMS indicates significantly greater progress toward attaining the GWPS than the other alternatives or closure by removal.
- As with all models, the groundwater flow and transport model is limited by the data used for calibration, which adequately define the local groundwater flow system and the source and extent of the plume. Since data used for calibration are near the BAP and FAPS, model predictions of transport distant spatially and temporally from the calibrated conditions at the CCR units will not be as reliable as predictions closer to the CCR units and groundwater concentrations observed between 2015 and 2024.
- Simulated post-construction heads in the FAPS monitoring wells reached equilibrium at approximately 106 years following implementation of corrective action alternatives and was used as a representative simulated time period for estimating future flux reductions from the FAPS. Considering models become increasingly less reliable as the length of time increases for predictions and the model simulations indicate the groundwater flow system approaches equilibrium approximately 106 years after implementation, discussion of model results beyond 106 years should be more qualitative, such as comparison between observed future trends and predicted trends, and as a tool for comparison between model simulations.
- Following implementation of corrective action, progress toward attainment of the GWPS will be routinely monitored and updated following the adaptive site management actions provided in the Corrective Action Groundwater Monitoring Plan, Baldwin Power Plant, Fly Ash Pond System [12]. Groundwater corrective action will include monitoring and adaptive site management (**Section 1.5.3**), which includes routine review of the CSM and decision points for making updates to the CSMs and the groundwater fate and transport models as appropriate in the future.
- Corrective action alternatives were also evaluated spatially using maps of maximum simulated boron concentration and relative area in acres, including comparison of off-site simulated plume extents.

2.2.2 Corrective Action Alternatives Analysis

The CAAA (**Appendix A**) included a detailed analysis of each of the corrective action alternatives presented in the CAAA-SIR, including an evaluation of:

- Long and short-term effectiveness and protectiveness;
- Ease or difficulty of implementation;
- Degree to which community concerns are addressed; and,
- Relative amount of contamination removed from the environment.

The CAAA identified Source Control-GMS as the most appropriate corrective action for the FAPS and this remedy was selected for further design development as part of this CAP.

It should be noted that the permit-level engineering assessments, groundwater modeling, and other information contained within this CAP were developed to a higher level of design and detail than those assessments performed in the CAAA; therefore, information on items such as permitting, remedy scope, estimated time to reach GWPS, implementation schedule, etc. may differ between this CAP and the information included in the CAAA-SIR and CAAA. Information for the Source Control-GMS contained within the CAP should be considered to superseded information contained within the CAAA and CAAA-SIR.

3. CORRECTIVE ACTION PLAN

The 35 I.A.C. § 845 requirements for the CAP and corresponding demonstrations that the proposed corrective measures meet these requirements are discussed individually in this section. Many of the CAP requirements are discussed within the CMA and CAAA documents that have been prepared to support the CAP. Therefore, the demonstrations will also refer to those documents.

3.1 General Requirements

35 I.A.C. § 845.670(c): The corrective action plan must meet the following requirements:

(1) Be based on the results of the corrective measures assessment conducted under 35 I.A.C. § 845.660;

(2) Identify a selected remedy that at a minimum, meets the standards listed in subsection (d);

(3) Contain the corrective action alternatives analysis specified in subsection (e); and

(4) Contain proposed schedules for implementation, including an analysis of the factors in subsection (f).

This CAP is based on the results of the CMA and CAAA, which are included within **Appendix A**. The proposed schedule for implementing Source Control-GMS is provided in **Table 1.**

3.2 Remedy Selection

35 I.A.C. § 845.670(d): The selected remedy in the corrective action plan must:

(1) Be protective of human health and the environment;

No unacceptable risks to human or ecological receptors resulting from CCR exposures associated with the FAPS were identified [13]. Potential releases of CCR-derived constituents will decline over time and, consequently, potential exposures to CCR-derived constituents in the environment will also decline. The GMS is intended to reduce the accumulation of hydraulic head beneath the FAPS cover system which reduces the potential for liquids which may be from the FAPS to mix with groundwater.

(2) Attain the groundwater protection standards specified in 35 I.A.C. § 845.600;

Groundwater modeling used to support design of the GMS (Appendix B of the CAAA-SIR) estimates the selected remedy of source control with the GMS will attain the GWPS in greater than 100 years. This is due to the low hydraulic conductivity associated with the underlying soil and bedrock. Corrective action alternatives were also evaluated spatially using maps of maximum simulated boron concentration and relative area in acres, including, comparison of off-site simulated plume extents. Source control with GMS was the most effective remedy at reducing predicted concentrations of CCR derived constituents in groundwater and minimizing the footprint of impacted groundwater.

(3) Control the sources of releases to reduce or eliminate, to the maximum extent feasible, further releases of constituents listed in 35 I.A.C. § 845.600 into the environment;

Source control with GMS was selected as the most appropriate remedy for the FAPS to best minimize the expanse of the plume beyond the FAPS boundary. The FAPS was closed using a capping approach which acts as the main control mechanism to prevent further releases of CCR-derived constituents. The GMS will reduce to the maximum extent feasible further releases and minimize further off-site migration of CCR-derived constituents in groundwater until the GWPS are achieved. Adaptive site management action will be taken as described within the CA GMP if the actual remedy performance does not correspond with the expected performance described in this CAP.

(4) Remove from the environment as much of the contaminated material that was released from the CCR surface impoundment as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems; and

No known releases of CCR due to a structural integrity issue have occurred at the FAPS.

(5) Comply with standards for management of wastes as specified in 35 I.A.C. § 845.680(d).

The CCR managed as part of the closure will be done in accordance with all 35 I.A.C. § 845 requirements and the submitted Closure Plan [10].

3.3 Schedule for Implementation

Groundwater corrective action will begin within 90 days following approval of the Corrective Action Plan. This will include pre-construction activities, followed by corrective action construction, and then followed by corrective action operation and maintenance.

GWE is effective as an engineered control as it is intended to reduce the accumulation of hydraulic head beneath the FAPS cover system and has been demonstrated as a reliable and applicable ex-situ remedial technology by the USEPA [14]. Human and ecological receptors beyond the FAPS boundary will be protected until the GWPS are attained.

The GMS remedy was evaluated to determine if it can minimize impacts beyond the FAPS boundary and achieve GWPS at the FAPS monitoring well network. The GMS remedy improves on the time to achieve GWPS when compared to source control alone and is, therefore, in accordance with the requirements of 35 I.A.C. § 845.670.

35 I.A.C. § 845.670(f): The owner or operator must specify, as part of the corrective action plan, a schedule for implementing, of and completing, remedial activities. The schedule must require the completion of remedial activities within a reasonable time, taking into consideration the factors in this subsection (f). The owner or operator of the CCR surface impoundment must consider the following factors in determining the schedule of remedial activities:

The schedule for implementing the Source Control-GMS remedy at the FAPS is included in **Table 1**. The GMS remedy will be continuously operated during the corrective action period.

The schedule was developed considering the factors required by 35 I.A.C. § 845.670(f)(1) through (5), as summarized below.

35 I.A.C. § 845.670(f)(1): Extent and nature of contamination, as determined by the characterization required under 35 I.A.C. § 845.650(d);

The Nature and Extent Report [15], which was submitted to the IEPA in April 2024 and is included as Appendix D to the CAAA report (**Appendix A)**, details exceedances of GWPS. Site investigation activities and data collected after April of 2024 have been compiled and will be provided in the same appendix to the CAAA report as an addendum to the Nature and Extent Report. Groundwater modeling and geochemical analysis were performed by Ramboll as part of the CAAA-SIR to design the remedy, and the modeling considered the nature and extent of contamination. Exceedances of the GWPS attributable to the FAPS in the UA are limited to sulfate detected in well MW-366, which is located approximately 2,000 feet upgradient of the property boundary and defined in the downgradient direction by UA wells MW-350, MW-375, and MW-391.

Exceedances of the GWPS attributable to the FAPS in the UU include boron and/or sulfate detected in wells MW-150 and MW-252. Boron and sulfate have also been observed at concentrations greater than the GWPS from individual samples collected at well MW-196, which is located approximately 200 feet south of the BPP property boundary and 75 feet south of the railroad tracks present along the southern property boundary; and MW-253R which is located on property and was installed as a replacement for well MW-253 in 2024 located approximately 300 feet south of the limits of the FAPS and 30 feet south of the railroad tracks. Sulfate concentrations of individual samples collected from the replacement well MW-253R continue to be evaluated and are further discussed in the Addendum to the Nature and Extent Report. The limits of boron and sulfate concentrations observed above the GWPS in the UU have not been detected more than 200 feet from the southern property boundary and are defined by the creek present along the southern BPP property boundary and monitoring wells including MW-195, MW-197, and MW-198 (see Figure 2.3 of the CAAA). Further discussion is provided in the Addendum to the Nature and Extent Report (in progress) provided in Appendix D of the CAAA (**Appendix A**).

35 I.A.C. § 845.670(f)(2): Reasonable probabilities of remedial technologies achieving compliance with the GWPS established by 35 I.A.C. § 845.600 and other objectives of the remedy;

Several remedies were evaluated in the CAAA and it was determined that the selected remedy (Source Control–GMS) is the most appropriate remedy to reduce, to the maximum extent feasible, further releases of constituents listed in 845.600 in accordance with 845.670(d)(3).

Groundwater modeling was performed to evaluate future groundwater quality in the vicinity of the FAPS impoundment. As noted in **Section 2.2.1**, the results of predictive groundwater modeling determined that the GWPS would not be attained for all wells within the timeline simulated for any of the groundwater corrective actions (this was also true for simulation of closure by removal). However, Source Control – GMS is the only simulated corrective action that results in continuous plume contraction 25 years following implementation.

As discussed in the CMA, source control and groundwater extraction are proven methods for addressing groundwater contamination [11].

35 I.A.C. § 845.670(f)(3): Availability of treatment or disposal capacity for CCR managed during implementation of the remedy;

The selected remedy includes CIP with a GMS. The CCR will be managed within the footprint of the existing CCR unit as discussed in the Final Closure Plan [10]. Installation of the GMS is anticipated to generate approximately 50,000 cubic yards (CY) of CCR waste, through excavation of the extraction trenches, which must be managed and disposed of during remedy construction. The FAPS cap will be reworked to incorporate the CCR waste generated during construction of the remedy, however, multiple disposal facilities have been located in Illinois and Missouri that have capacity to receive CCR waste generated during installation of the GMS.

35 I.A.C. § 845.670(f)(4): Potential risks to human health and the environment from exposure to contamination before completion of the remedy;

A Human Health and Ecological Risk Assessment (HHERA) was completed and included as an attachment to the CAAA (**Appendix A**). The overall conclusion is that releases from the FAPS impoundment and potential groundwater contributions to surface water pose no unacceptable risks to human health or the environment. This conclusion is based on modeled and detected maximum concentrations of all COCs in surface water at the NPDES permitted discharge that were below conservative risk-based screening benchmarks. This conclusion was reached using methodology consistent with applicable USEPA risk assessment principles. The assessment relied on conservative assumptions meant to overestimate possible exposures and risks and provide an additional level of certainty in the conclusions.

35 I.A.C. § 845.670(f)(5): Resource value of the aquifer, including:

The resource value of the aquifer is discussed in the Hydrogeologic Site Characterization Report (HCR) [16], which is included as Attachment B.3 in the closure CP application. The shallow bedrock is the only water-bearing unit that is continuous across the BPP. Groundwater in the bedrock mainly occurs under semi-confined to confined conditions with the overlying unlithified unit behaving as the upper confining unit to the UA. Shallow sandstone and creviced limestone may yield small supplies in some areas, but water quality becomes poorer (i.e., highly mineralized) with increasing depth. The classification of groundwater at the Site was addressed in the Phase II investigation [7]. Field hydraulic conductivity tests performed on the Upper Groundwater Unit materials (*i.e.,* Cahokia Formation, Equality Formation, and Vandalia Till) and Bedrock Unit materials (*i.e.,* Mississippian and Pennsylvanian bedrock) at the Site had geometric mean hydraulic conductivities of 3.2×10^{-5} cm/s and 5.0×10^{-6} cm/s, respectively.

Geologic material with a hydraulic conductivity of less than 1×10^{-4} cm/s which does not meet the provisions of Section 620.210 (Class I), Section 620.230 (Class III), or Section 620.240 (Class IV), meets the definition of a Class II – General Resource Groundwater. Based on the detailed geologic information provided for the unlithified materials and bedrock at BPP, along with the hydrogeologic data, the groundwater in both the unlithified deposits and underlying bedrock at the Site is classified as Class II - General Resource Groundwater.

Although some thin sand seams and layers occur intermittently within the Vandalia Till in localized areas around the BPP, most groundwater supplies in upland areas are obtained from large diameter shallow bored wells. Typical water wells in the vicinity of the BPP are between 25 and 55 feet deep, 36 to 48 inches in diameter, and collect groundwater through slow percolation into the wells, which are large diameter to allow for greater water storage to compensate for the

low rate of groundwater infiltration [17]. The GMS remedy will operate until the GWPS are achieved. Paragraphs (A) through (F) from 35 I.A.C. § 845.670(f)(5) are further addressed, as summarized below.

35 I.A.C. § 845.670(f)(5)(A): Current and future uses, including potential residential, agricultural, commercial industrial and ecological uses; and

Current uses and future users of the groundwater are discussed in the previous paragraph and attachments and, were considered in the CAAA as part of the HHERA, which concluded that groundwater from the FAPS impoundment and potential groundwater contributions to surface water pose no unacceptable risks to human health or the environment. No changes in future residential, commercial, or ecological use are expected. However, if future uses are modified, the potential use of the impacted groundwater is expected to be minimal because potable water service (provided by the Village) is available in the location of these properties, and the UU and UA are not capable of providing large amounts of groundwater for use in agriculture or other uses. In the absence of changes to current and future uses, there is no applicable scheduling consideration.

35 I.A.C. § 845.670(f)(5)(B): Proximity and withdrawal rate of users;

As discussed in the HHERA [13] a receptor survey was performed in 2024 and identified four wells located downgradient of the FAPS. Analytical results from additional monitoring wells installed in 2024 indicate that exceedances do not extend beyond the monitoring wells and the private wells are not currently impacted. Future exceedances are unlikely based on the predicted extent determined by the model [17]. The withdrawal rate data for these four wells is not available but in general, bored wells rely on storage to provide water during periods of high demand [18]. Based on a depth of 30 ft, a bored well may provide up to 1,000 gallons per day.

35 I.A.C. § 845.670(f)(5)(C): Groundwater quantity and quality;

Per 35 I.A.C. § 620.210, groundwater within the uppermost aquifer at the FAPS meets the definition of Class 2 – General Resource Groundwater [16]. The HHERA [13] concluded that releases from the FAPS impoundment and potential groundwater contributions to surface water pose no unacceptable risks to human health or the environment.

35 I.A.C. § 845.670(f)(5)(D): The potential impact to the subsurface ecosystem, wildlife, other natural resources, crops, vegetation, and physical structures caused by exposure to CCR constituents;

Potential receptors are discussed in HCR Sections 5.2 and 5.3. Section 3.5 of the HHERA, included as Appendix A of the CAAA and CMA/CAAA Report, discusses the ecological risk evaluation.

- Ecological receptors exposed to surface water include aquatic and marsh plants, amphibians, reptiles, and fish. The risk evaluation showed that none of the COCs in surface water exceeded protective screening benchmarks.
- Ecological receptors exposed to sediment include benthic invertebrates. The modeled sediment COCs did not exceed the conservative screening benchmarks; therefore, none of the COCs evaluated in sediment are expected to pose an unacceptable risk to ecological receptors.
- Ecological receptors were also evaluated for exposure to bioaccumulative COCs. This evaluation considered higher trophic-level wildlife with direct exposure to surface water and

sediment and secondary exposure through the consumption of dietary items (*e.g.*, plants, invertebrates, small mammals, fish). None of the ecological COCs were identified as having potential bioaccumulative effects.

Overall, this evaluation demonstrated that none of the COCs evaluated are expected to pose an unacceptable risk to ecological receptors. In the absence of unacceptable risks to ecological receptors, there is no applicable scheduling consideration.

35 I.A.C. § 845.670(f)(5)(E): The hydrogeologic characteristic of the facility and surrounding land; and

In addition to the CCR present in the FAPS, there are two hydrostratigraphic units underlying the constructed CCR unit, described below in descending order:

- Upper unit (UU) – Predominantly clay with some silt and minor sand, silt layers, and occasional sand lenses. Includes the lithologic layers identified as the Cahokia Alluvium, Peoria Loess, Equality Formation, and Vandalia Till Member. Thin sand seams within the unit and the interface (contact) between the UU and bedrock have been identified as potential migration pathways (PMPs). No continuous sand seams were observed within or immediately adjacent to the FAPS; however, the sand seams on Site may act as a PMP due to relatively higher hydraulic conductivities.
- Uppermost aquifer (UA) (Bedrock Unit) – Pennsylvanian and Mississippian bedrock is composed of interbedded shale and limestone bedrock, which underlies and is continuous across the entire site.

The effects of these hydrostratigraphic units on schedule were considered by incorporating the geometry, hydraulic, and geochemical properties of these units into the groundwater modeling and groundwater polishing evaluation reports, attached to the CAAA-SIR and CAAA, respectively, included in **Appendix A**, which estimate the time to reach the GWPS for remedial alternatives.

The GMS remedy is intended to reduce the accumulation of hydraulic head within the CCR unit which reduces the potential for liquids that may be from the FAPS to mix with groundwater. The GMS remedy will operate until the GWPS are achieved.

35 I.A.C. § 845.670(f)(5)(F): The availability of alternative water supplies.

As discussed in subsection 35 I.A.C. § 845.670(f)(5)(B) above, there are no public water supply wells within 2,500 meters of the FAPS. There is currently no need for an alternative water supply well as there are no current unacceptable risks to human or ecological receptors at the site, and the GMS remedy will prevent off-site migration of FAPS CCR-derived constituents.

3.3.1 Other Relevant Factors

35 I.A.C. § 845.670(f)(6): Other relevant factors.

No additional factors were identified for consideration.

3.4 Necessity of Interim Measures

Source control using the closure-in-place approach was completed in 2020. Completion of the remedy is projected to be complete within 72 months (6 years) after approval of the CAP. 35 I.A.C § 845.680(a)(3) states the owner or operator must take any interim measures necessary to reduce the contaminants leaching from the CCR surface impoundment, and/or potential exposures to human or ecological receptors. Because source control has already been completed and current

conditions at the FAPS pose no risk to human health or the environment, no interim measures are required. Further, all subsections of this requirement are discussed as follows.

35 I.A.C. § 845.680(a)(3)(A): Time required to develop and implement a final remedy.

Completion of the GMS remedy is projected to be complete within 42 to 72 months after approval of the CAP.

35 I.A.C. § 845.680(a)(3)(B): Actual or potential exposure of nearby populations or environmental receptors to any of the constituents listed in 35 I.A.C. § 845.600.

There are no current unacceptable risks to human or ecological receptors at the site (**Appendix A**). As discussed above in response to 35 I.A.C. § 845.670(f)(5)(C), the HHERA [13] concluded that releases from the FAPS impoundment and potential groundwater contributions to surface water pose no unacceptable risks to human health or the environment.

35 I.A.C. § 845.680(a)(3)(C): Actual or potential contamination of sensitive ecosystems or current or potential drinking water supplies.

The nature and extent of exceedances have been evaluated in the Nature and Extent Report [15]. Although there are exceedances of GWPS, there are no impacts to current or potential drinking water supplies. As stated above, there are no current unacceptable risks to human or ecological receptors at the site. Additionally, an ecological risk assessment was completed, and no unacceptable risks were identified for ecological receptors exposed to surface water and sediment. No potential groundwater receptors are in the vicinity of the FAPS [13].

35 I.A.C. § 845.680(a)(3)(D): Further degradation of the groundwater that may occur if remedial action is not initiated expeditiously.

Source control, which consisted of the closure-in-place approach, was completed [4] and no unacceptable risks to human health or the environment have been identified. No interim measure is expected to prevent further degradation of the groundwater more expeditiously than implementation of the selected remedy.

35 I.A.C. § 845.680(a)(3)(E): Weather conditions that may cause any of the constituents listed in 35 I.A.C. § 845.600 to migrate or be released.

As stated above, source control which consisted of the closure-in-place approach was completed in 2020 [4], which isolate CCR contained within the FAPS from weather-related impacts that could cause CCR-related constituents to migrate or be released. There are no unacceptable risks presented by the FAPS under current conditions from weather-related phenomena.

35 I.A.C. § 845.680(a)(3)(F): Potential for exposure to any of the constituents listed in 35 I.A.C. § 845.600 as a result of accident or failure of a container or handling system.

There are no container or handling systems that pose a risk to receptors in the interim.

35 I.A.C. § 845.680(a)(3)(G): Other situations that may pose threats to human health and the environment.

No other situations have been identified where FAPS CCR leachate poses threats to human health and the environment.

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TABLES

Table 1. Proposed Milestone Schedule for Implementing Corrective Action Remedy (Groundwater Management System)

Corrective Action Plan

Baldwin Power Plant

Fly Ash Pond System

Baldwin, IL

Implementation Phase	Implementation Task	Timeframe (Preliminary Estimates)
1: Pre-Construction Activities	Agency Coordination, Approvals, and Permitting	6 to 12 months
	Final Design and Bid Process	24 to 36 months
	Timeframe to Complete Corrective Pre-Construction Activities	30 to 48 months after CAP Approval
2: Corrective Action Construction	Corrective Action Construction	12 to 24 months
	Timeframe to Complete Corrective Construction	12 to 24 months after completion of pre-construction activities
3: Corrective Action O&M and Closeout	Corrective Action Monitoring (Time to Meet GWPS)	>100 years
	Corrective Action Confirmation Monitoring	36 months
	Corrective Action Completion	6 months
	Timeframe to Complete Corrective Action O&M and Closeout	>100 years after completion of construction activities
	Total Timeline to Complete Corrective Action	>100 years

RAMBOLL

APPENDIX A
CORRECTIVE ACTION ALTERNATIVES ANALYSIS (845.670(E)), INCLUDING CORRECTIVE MEASURES ASSESSMENT (845.660)

Corrective Action Alternatives Analysis for the Fly Ash Pond System at the Baldwin Power Plant, Village of Baldwin, Illinois

April 22, 2025

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Abbreviations

BAP	Bottom Ash Pond
BCU	Bedrock Confining Unit
BEC	Baldwin Energy Complex
bgs	Below Ground Surface
BMP	Best Management Practice
BPP	Baldwin Power Plant
BU	Bedrock Unit
CAA	Closure Alternatives Analysis
CAAA	Corrective Action Alternatives Analysis
CCR	Coal Combustion Residual
CIP	Closure-in-Place
CMA	Corrective Measures Assessment
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CSM	Conceptual Site Model
CY	Cubic Yard
DMG	Dynegy Midwest Generation, LLC
FAPS	Fly Ash Pond System
GHG	Greenhouse Gas
GMP	Groundwater Monitoring Plan
GMS	Groundwater Management System
GWP	Groundwater Polishing
GWPS	Groundwater Protection Standard
IAC	Illinois Administrative Code
IDNR	Illinois Department of Natural Resources
IEPA	Illinois Environmental Protection Agency
MEP	Mechanical, Electrical, and Piping
N_2O	Nitrous Oxide
NO_x	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
PM	Particulate Matter
PMP	Potential Migration Pathway
QA	Quality Assurance
QC	Quality Control
SFWA	State Fish and Wildlife Area
SI	Surface Impound
Source Control-Cutoff Wall	Source Control with a Groundwater Cutoff Wall
Source Control-GMS	Source Control with Groundwater Management System
Source Control-GWP	Source Control with Groundwater Polishing
UA	Uppermost Aquifer
UGU	Upper Groundwater Unit
US DOT	United States Department of Transportation

US EPA	United States Environmental Protection Agency
UU	Upper Unit
VOC	Volatile Organic Compound

Summary of Findings

Title 35, Part 845 of the Illinois Administrative Code (IAC) (IEPA, 2021) requires that a Corrective Action Alternatives Analysis (CAAA) be performed as part of the remedy selection, prior to undertaking any corrective actions at certain coal combustion residual (CCR)-containing impoundments, where exceedances of groundwater protection standards (GWPSs) have been identified. This report presents a CAAA for the Fly Ash Pond System (FAPS) at the Baldwin Power Plant (BPP) pursuant to the requirements under IAC Section 845.670. The goal of performing a CAAA is to holistically evaluate the potentially viable corrective actions identified in the Corrective Measures Assessment (CMA; Appendix C; Ramboll, 2024a) in order to remediate groundwater and achieve compliance with the groundwater protection standards (GWPSs) specified under IAC Section 845.600 (IEPA, 2021). This analysis assesses potentially viable corrective action alternatives based on a wide range of factors, including the efficiency, reliability, and ease of implementation of a corrective action, its potential positive and negative short- and long-term impacts on human health and the environment, and its ability to address concerns raised by the community (IEPA, 2021).

It is important to note that many CCR sites are complex groundwater environments where remedial actions would inherently take many years to complete. While no formal definition of a complex groundwater environment exists, most would agree that there are a number of common characteristics at complex groundwater sites, including the following (National Research Council, 2013):

- Highly heterogeneous subsurface environments;
- Large source zones;
- Multiple, recalcitrant constituents; and
- Long timeframes over which releases occurred.

Each of these characteristics are common at CCR sites. Surface impoundments are often tens to hundreds of acres in size and many have operated for decades, leading to large source zones and prolonged releases. Furthermore, CCR impoundments are often located in alluvial geologic settings where sands are interbedded with silts and clays. This results in a heterogeneous environment where constituent mass may persist for many years in low-permeability deposits. Finally, the constituents that are most common at CCR sites include metals and inorganics that do not naturally biodegrade. The combination of these factors results in a complex groundwater environment where remediation, even under the best of circumstances, may take many years to achieve GWPSs. It is for these reasons that the United States Environmental Protection Agency (US EPA) refused to specify what is a reasonable *versus* an unreasonable timeframe for groundwater corrective actions at CCR sites, stating that it "was truly unable to establish an outer limit on the necessary timeframes – including even a presumptive outer bound" (US EPA, 2015a, p. 21,419).

In this CAAA, all corrective actions that have been evaluated consist of source control and residual plume management. Source control is generally considered to be one of the more effective remedial action approaches. Source control involves removing the hydraulic head from an impoundment (*i.e.*, unwatering and dewatering) and preventing further downward migration of constituents. US EPA has found that "releases from surface impoundments [to groundwater] drop dramatically after closure" (US EPA, 2014, pp. 5-18 to 5-19). US EPA has also stated that source control is the most effective means of ensuring the

timely attainment of remediation objectives (US EPA, 2015b). As a result, the implementation of source control often has a substantial and immediate effect on groundwater quality improvements.

The specific source control method that is the central component of all the corrective action alternatives evaluated in this CAAA is closure-in-place (CIP). This approach was approved by IEPA in 2016 and CIP was completed in 2020 (Morris, 2020). The source control included removing water and installation of a final cover system in accordance with CFR Part 257, Subpart D to "minimize water infiltration into the closed FAPS and improve surface water drainage off the cover system, thus reducing generation of potentially impacted water and ultimately reducing the extent of CCR impacts to groundwater" (Appendix C; Ramboll, 2024a). The final cover system includes a 6-inch (in) vegetative layer and an 18-in layer of overlying barrier soil. Groundwater modeling performed in support of the Closure Plan suggested that the source control approach would provide hydraulic control of surface water run-off from the cover system and a decrease in groundwater concentrations and the off-Site transport of CCR constituents (*i.e.*, reduction in plume extent) (NRT, 2014a,b; Burns & McDonnell, 2021). Due to the reduction in the hydraulic flux out of the FAPS, the mass flux out of the FAPS would also be controlled or minimized.

Three potential corrective actions are evaluated in this CAAA: Source Control with Groundwater Polishing (Source Control-GWP), Source Control with a Groundwater Cutoff Wall (Source Control-Cutoff Wall) and Source Control with Groundwater Management System (Source Control-GMS); all alternatives consist of source control and residual plume management and all were identified as viable approaches in the CMA (Appendix C; Ramboll, 2024a). The residual plume management portions of these corrective action alternatives include groundwater polishing (GWP), a groundwater cutoff wall, and a groundwater management system (GMS).

Under the Source Control-GWP alternative, constituent concentrations in groundwater over time would be actively monitored to ensure the improvement of downgradient groundwater quality resulting from physical and geochemical attenuation mechanisms. Site-specific evaluations demonstrated that groundwater polishing is appropriate at the FAPS because Site conditions are favorable for physical and geochemical processes of inorganic contaminants *via* adsorption (Appendix E; Geosyntec Consultants, Inc., 2025). Under the Source Control-Cutoff Wall alternative, a low-permeability barrier wall would be installed within the FAPS along the southern dike extending west to the tertiary pond. The cutoff wall would be approximately 7,000 feet (ft) in length, 2 to 3 ft in width, and have a maximum depth of 85 ft below ground surface (bgs). The cutoff wall would serve as a maintenance-free physical barrier reducing the potential for CCR constituents to migrate beyond the southern property boundary. Under the Source Control-GMS alternative, a groundwater extraction system would be constructed within the interior of the FAPS to remove impacted water, reduce hydraulic head beneath the existing cover system, and prevent the migration of CCR constituents in groundwater beyond the southern property boundary. The extraction trench would extend to a depth of 50 to 60 ft bgs and be 8,700 ft long, and 2 to 3 ft wide. The trench would be backfilled with clean granular fill and capped with compacted clay to reduce surface water infiltration. The collection pipes would drain to sumps spaced throughout the trench to extract liquids. Extracted liquids would be collected and sent to an on-Site pond and discharged through either a new or existing outfall managed under the National Pollutant Discharge Elimination System (NPDES) permit for the Site. As part of each corrective action alternative, an adaptive site management plan would be implemented in order to optimize the selected remedy based on real-time data that are collected.

Table S.1 evaluates all corrective actions alternatives (Source Control-GWP, Source Control-Cutoff Wall and Source Control-GMS) with regard to each of the factors specified under IAC Section 845.670(d) and IAC Section 845.670(e) (IEPA, 2021). Based on this evaluation and the details provided in Section 2 of this report, the most appropriate corrective action for this Site is Source Control-GMS. While the time to

achieve GWPSs for all three alternatives was predicted to be in excess of 100 years[1] due to the presence of native low-permeability lithological units, groundwater modeling suggests that Source Control-GMS would be most effective at reducing plume size and minimizing the risk of CCR constituents migrating beyond the Site's southern property boundary. Thus, Source Control-GMS is the most appropriate corrective action alternative for the FAPS.

[1] While the model simulation period for each corrective action alternative was 1,000 years, model predictions at such lengthy future timescales are inherently uncertain.

Table S.1 Comparison of Proposed Corrective Action Alternatives with Respect to Factors Specified in IAC Section 845.670(d) and IAC Section 845.670(e)

Evaluation Factor (Report Section; Part 845 Section)	Source Control-GWP	Source Control-Cutoff Wall	Source Control-GMS
Magnitude of Reduction of Existing Risks/Be Protective of Human Health and the Environment (Section 2.2.1; IAC Section 845.670(e)(1)(A)/ IAC Section 845.670(d)(1))	Because current conditions do not present a risk to human health or the environment at the FAPS, there will be no unacceptable risk to human health or the environment for future conditions since the unit was closed and source control was implemented. Concentrations of CCR-related constituents will decline over time, and consequently, potential exposures to CCR-related constituents in the environment will also decline. The magnitude of the reduction of existing risks is the same for all the potential corrective action alternatives, and all three corrective action alternatives are equally protective of human health and the environment.	Because current conditions do not present a risk to human health or the environment at the FAPS, there will be no unacceptable risk to human health or the environment for future conditions since the unit was closed and source control was implemented. Concentrations of CCR-related constituents will decline over time and, consequently, potential exposures to CCR-related constituents in the environment will also decline. The magnitude of the reduction of existing risks is the same for all of the potential corrective action alternatives, and all three corrective action alternatives are equally protective of human health and the environment.	Because current conditions do not present a risk to human health or the environment at the FAPS, there will be no unacceptable risk to human health or the environment for future conditions since the unit was closed and source control was implemented. Concentrations of CCR-related constituents will decline over time and, consequently, potential exposures to CCR-related constituents in the environment will also decline. The magnitude of the reduction of existing risks is the same for all of the potential corrective action alternatives, and all three corrective action alternatives are equally protective of human health and the environment.
Effectiveness of the Remedy in Controlling the Source (Section 2.2.2; IAC Section 845.670(e)(2))			
Extent to Which Containment Practices Will Reduce Further Releases/Control the Sources of Releases to Reduce or Eliminate, to the Maximum Extent Feasible (IAC Section 845.670(e)(2)(A)/ IAC Section 845.670(d)(3))	All three alternatives include source control (which is the primary remedial measure) and residual plume management. Source control (IEPA approved CIP approach) was implemented in 2020. These source control activities would control surface water run-off on the cover system and in the surrounding area, reduce leachate concentrations, and "decrease	All three alternatives include source control (which is the primary remedial measure) and residual plume management. Source control (IEPA approved CIP approach) was implemented in 2020. These source control activities would control surface water run-off on the cover system and in the surrounding area, reduce leachate concentrations, and "decrease transport	All three alternatives include source control (which is the primary remedial measure) and residual plume management. Source control (IEPA approved CIP approach) was implemented in 2020. These source control activities would control surface water run-off on the cover system and in the surrounding area, reduce leachate concentrations, and "decrease transport

Evaluation Factor (Report Section; Part 845 Section)	Source Control-GWP	Source Control-Cutoff Wall	Source Control-GMS
	transport [of CCR constituents] off-[S]ite both spatially and temporally" (Burns & McDonnell, 2021), controlling to the maximum extent feasible, the migration of CCR constituents in groundwater. Under the residual plume management for this alternative, physical and geochemical attenuation mechanisms would mitigate impacts to downgradient groundwater quality and control the residual plume (Appendix E; Geosyntec Consultants, Inc., 2025). If necessary, remedy optimizations would be implemented under the adaptive site management program.	[of CCR constituents] off-[S]ite both spatially and temporally" (Burns & McDonnell, 2021), controlling to the maximum extent feasible, the migration of CCR constituents in groundwater. Under the residual plume management for this alternative, a cutoff wall would be at constructed to reduce potential CCR-constituents in groundwater from migrating off-Site. Physical and geochemical attenuation would also help control impacts to downgradient groundwater quality (Appendix E; Geosyntec Consultants, Inc., 2025). If necessary, remedy optimizations would be implemented under the adaptive site management program.	[of CCR constituents] off-[S]ite both spatially and temporally" (Burns & McDonnell, 2021), controlling to the maximum extent feasible, the migration of CCR constituents in groundwater. Under the residual plume management for this alternative, groundwater extraction trenches would remove impacted groundwater and control migration of impacted groundwater off-Site. Physical and geochemical attenuation mechanisms would also help mitigate impacts to the downgradient groundwater quality and control the residual plume (Appendix E; Geosyntec Consultants, Inc., 2025). If necessary, remedy optimizations would be implemented under the adaptive site management program.
Extent to Which Treatment Technologies May Be Used (IAC Section 845.670(e)(2)(B))	Source Control-GWP would rely on physical and geochemical attenuation processes. If necessary, remedy optimizations would be implemented under the adaptive site management program.	The Source Control-Cutoff Wall alternative focuses on preventing groundwater migration using an engineered physical barrier. No additional treatment technologies would be required once the cutoff wall has been constructed. The remedy also relies on physical and geochemical attenuation processes. If necessary, remedy optimizations would be implemented under the adaptive site management program.	The Source Control-GMS alternative would require utilization of an on-Site settling pond to settle solids from extracted groundwater, prior to discharge *via* an NPDES permitted outfall. Additional methods for treating extracted groundwater may be evaluated at later phases of designs. The remedy would also rely on physical and geochemical attenuation processes. If necessary, remedy optimizations would be implemented under the adaptive site management program.

Evaluation Factor (Report Section; Part 845 Section)	Source Control-GWP	Source Control-Cutoff Wall	Source Control-GMS
Likelihood of Future Releases of CCR (Section 2.2.3; IAC Section 845.670(e)(1)(B))	All three corrective action alternatives include source control using CIP; the CIP source control installation was approved by IEPA and completed in 2020. A new cover system consisting of a 6-in vegetative layer and an 18-in layer of overlying barrier soil was installed over the FAPS in compliance with 40 CFR Part 257, Subpart D. Relative to pre-closure conditions, this cover system provides increased protection against berm and surface erosion, precipitation infiltration, and other adverse effects that could potentially trigger a release of CCR. There would be minimal risk of accidental CCR releases occurring post-closure under any of the alternatives.	All three corrective action alternatives include source control using CIP; the CIP source control installation was approved by IEPA and completed in 2020. A new cover system consisting of a 6-in vegetative layer and an 18-in layer of overlying barrier soil was installed over the FAPS in compliance with 40 CFR Part 257, Subpart D. Relative to pre-closure conditions, this cover system provides increased protection against berm and surface erosion, precipitation infiltration, and other adverse effects that could potentially trigger a release of CCR. There would be minimal risk of accidental CCR releases occurring post-closure under any of the alternatives.	All three corrective action alternatives include source control using CIP; the CIP source control installation was approved by IEPA and completed in 2020. A new cover system consisting of a 6-in vegetative layer and an 18-in layer of overlying barrier soil was installed over the FAPS in compliance with 40 CFR Part 257, Subpart D. Relative to pre-closure conditions, this cover system provides increased protection against berm and surface erosion, precipitation infiltration, and other adverse effects that could potentially trigger a release of CCR. There would be minimal risk of accidental CCR releases occurring post-closure under any of the alternatives.
Type and Degree of Long-Term Management, Including Monitoring, Operation, and Maintenance (Section 2.2.4; IAC Section 845.670(e)(1)(C))	Minimal long-term O&M efforts would be required under Source Control-GWP because it would not require the installation, operation, or maintenance of any engineered systems or structures other than maintenance of the monitoring wells. Corrective action groundwater monitoring would continue until GWPSs have been achieved. Post-closure care groundwater monitoring would continue for a minimum of 30 years, as required by IAC Section 845.780(c). Additionally, corrective action groundwater monitoring would continue for 3 years	Construction of the cutoff wall would occur in three phases. Once the cutoff wall has been installed, no O&M efforts would be required because it is a passive and below-grade structure. However, post-construction quality assurance (QA) programs may be required to validate the quality of the constructed cutoff wall. Corrective action groundwater sampling would continue until GWPSs have been achieved. Post-closure care groundwater monitoring will continue for a minimum of 30 years, as required by IAC Section. 845.780(c). Additionally, corrective action groundwater	Construction of the GMS would occur in three phases. Once the GMS has been installed, corrective action O&M would require regular inspection and maintenance of the extraction trench system, which includes maintaining pumps, conveyance lines, air compressors, *etc*., which are essential components of the Mechanical, Electrical, and Piping (MEP) system. Routine monitoring and compliance associated with extracted groundwater discharge *via* a new or existing NPDES outfall to Kaskaskia River would also be required.

Evaluation Factor (Report Section; Part 845 Section)	Source Control-GWP	Source Control-Cutoff Wall	Source Control-GMS
	after GWPS have been achieved. Based on the adaptive site management approach, remedy optimizations (additional methods or techniques) might be implemented to ensure achievement of the GWPSs.	monitoring would continue for 3 years after GWPS have been achieved. Based on the adaptive site management approach, remedy optimizations (additional methods or techniques) may be implemented to ensure achievement of the GWPSs.	Post-closure care groundwater monitoring will continue for a minimum of 30 years, as required by IAC Section. 845.780(c). Additionally, corrective action groundwater monitoring would continue for 3 years after GWPS have been achieved. Based on the adaptive site management approach, remedy optimizations (additional methods or techniques) may be implemented to ensure achievement of the GWPSs.
Short-Term Risks to the Community or the Environment During Implementation of Remedy (Section 2.2.5; IAC Section 845.670(e)(1)(D))			
Safety Impacts	Source control (IEPA approved CIP approach) was implemented in 2020. Thus, there is no further risk of accidents and injuries occurring during the implementation of the source control remedy. Overall, no worker accidents or injuries would be expected under the Source Control-GWP alternative because no installation, operation, and maintenance of engineered systems or structures would be required. Similarly, no off-Site impacts on nearby residents would be expected under the Source Control-GWP alternative.	Source control (IEPA approved CIP approach) was implemented in 2020. Thus, there is no further risk of accidents and injuries occurring during the implementation of the source control remedy. Overall, considering worker accidents occurring during residual plume management both on- and off-Site, 0.37 worker injuries and 0.015 worker fatalities would be expected under the Source Control-Cutoff Wall alternative. In total, an estimated 0.22 injuries and 1.7×10^{-3} fatalities would be expected to occur among community members due	Source control (IEPA approved CIP approach) was implemented in 2020. Thus, there is no further risk of accidents and injuries occurring during the implementation of the source control remedy. Overall, considering worker accidents occurring during residual plume management both on- and off-Site, 0.72 worker injuries and 0.021 worker fatalities would be expected under the Source Control-GMS alternative, which is the highest among the three alternatives.

Evaluation Factor (Report Section; Part 845 Section)	Source Control-GWP	Source Control-Cutoff Wall	Source Control-GMS
		to off-Site activities under the Source Control-Cutoff Wall alternative, which is higher than the injuries and fatalities expected under the Source Control-GWP alternative.	In total, an estimated 0.28 injuries and 2.2×10^{-3} fatalities would be expected to occur among community members due to off-Site activities under the Source Control-GMS alternative, which is the highest among the three alternatives.
Cross-Media Impacts to Air	Source control (IEPA approved CIP approach) was implemented in 2020. No further air impacts associated with the implementation of the source control remedy are expected. Cross-media impacts to air associated with residual plume management can result from the emission of air pollutants and greenhouse gases (GHGs) from construction vehicles and equipment. These emissions are proportional to the use of construction vehicles and equipment that are required for residual plume management. Residual plume management for the Source Control-GWP alternative would be expected to have minimal air impacts, because it would not require the construction of any engineered systems or structures.	Source control (IEPA approved CIP approach) was implemented in 2020. No further air impacts associated with the implementation of the source control remedy are expected. Cross-media impacts to air associated with residual plume management can result from the emission of air pollutants and GHGs from construction vehicles and equipment. These emissions are proportional to the use of construction vehicles and equipment that are required for residual plume management. Residual plume management for the Source Control-Cutoff Wall alternative would have greater air impacts than the Source Control-GWP alternative due to the increased construction activity required for this alternative.	Source control (IEPA approved CIP approach) was implemented in 2020. No further air impacts associated with the implementation of the source control remedy are expected. Cross-media impacts to air associated with residual plume management can result from the emission of air pollutants and GHGs from construction vehicles and equipment. These emissions are proportional to the use of construction vehicles and equipment that are required for residual plume management. Residual plume management for the Source Control-GMS alternative would have greatest air impacts among all three alternatives due to the highest vehicle and equipment travel miles under this alternative.
Cross-Media Impacts to Surface Water and Sediments	Source control was implemented in 2020; as a result, constituent mass flux from groundwater into surface water will decline over time (OBG, 2019). The source control approach included dewatering, which removed hydraulic head within the impoundment, and has	Source control was implemented in 2020; as a result, constituent mass flux from groundwater into surface water will decline over time (OBG, 2019). The source control approach included dewatering, which removed hydraulic head within the impoundment, and has	Source control was implemented in 2020; as a result, constituent mass flux from groundwater into surface water will decline over time (OBG, 2019). The source control approach included dewatering, which removed hydraulic head within the impoundment, and has

Evaluation Factor (Report Section; Part 845 Section)	Source Control-GWP	Source Control-Cutoff Wall	Source Control-GMS
	"significantly reduced infiltration rates relative to pre-closure conditions" (Appendix C, Ramboll, 2024a). Due to the reduction in the hydraulic flux out of the FAPS, the mass flux out of the FAPS would also be controlled or minimized. Groundwater modeling performed in support of the Closure Plan suggested that the source control would control surface water run-off on the cover system, lower water levels in the FAPS, reduce groundwater concentrations, and decrease the potential off-Site transport of CCR constituents (NRT, 2014a,b; Burns & McDonnell, 2021). Under the Source Control-GWP alternative, minimal surface water and sediment impacts would be expected, because this alternative would not require the construction of any engineered systems or structures.	"significantly reduced infiltration rates relative to pre-closure conditions" (Appendix C, Ramboll, 2024a). Due to the reduction in the hydraulic flux out of the FAPS, the mass flux out of the FAPS would also be controlled or minimized. Groundwater modeling performed in support of the Closure Plan suggested that the source control would control surface water run-off on the cover system, lower water levels in the FAPS, reduce groundwater concentrations, and decrease the potential off-Site transport of CCR constituents (NRT, 2014a,b; Burns & McDonnell, 2021). Under residual plume management for the Source Control-Cutoff Wall alternative, surface water and sediment impacts would be higher than the Source Control-GWP alternative due to the construction of the cutoff wall. Any associated impacts would be addressed through best management practices (BMPs) in accordance with Site land disturbance permits.	"significantly reduced infiltration rates relative to pre-closure conditions" (Appendix C, Ramboll, 2024a). Due to the reduction in the hydraulic flux out of the FAPS, the mass flux out of the FAPS would also be controlled or minimized. Groundwater modeling performed in support of the Closure Plan suggested that the source control would control surface water run-off on the cover system, lower water levels in the FAPS, reduce groundwater concentrations, and decrease the potential off-Site transport of CCR constituents (NRT, 2014a,b; Burns & McDonnell, 2021). Under residual plume management for the Source Control-GMS alternative, surface water and sediment impacts would be higher than the Source Control-GWP alternative due to construction of the GMS. Any associated impacts would be addressed through BMPs in accordance with Site land disturbance permits.
Control of Exposure to Any Residual Contamination During Implementation of the Remedy	Source control (IEPA approved CIP approach) was implemented in 2020. Thus, there are no further risks of CCR exposure associated with source control implementation. Risks to workers arising from potential contact with residual contamination during construction activities associated	Source control (IEPA approved CIP approach) was implemented in 2020. Thus, there are no further risks of CCR exposure associated with source control implementation. Risks to workers arising from potential contact with residual contamination during construction activities associated	Source control (IEPA approved CIP approach) was implemented in 2020. Thus, there are no further risks of CCR exposure associated with source control implementation. Risks to workers arising from potential contact with residual contamination during construction activities associated

Evaluation Factor (Report Section; Part 845 Section)	Source Control-GWP	Source Control-Cutoff Wall	Source Control-GMS
	with residual plume management would be minimal under the Source Control-GWP alternative, which would not involve exposure to soil or groundwater waste streams.	with residual plume management would be higher for the Source Control-Cutoff Wall alternative than for the Source Control-GWP alternative because the Source Control-Cutoff Wall alternative would involve excavation and disposal of excavated spoils from trenching. Any potential CCR-exposures during the Source Control-Cutoff Wall alternative would be managed through the use of rigorous safety protocols and personal protective equipment.	with residual plume management would be higher for the Source Control-GMS alternative than for the Source Control-GWP alternative, because the Source Control-GMS alternative would involve the production, management, and treatment of extracted groundwater, as well as off-Site disposal of excavated spoils generated during extraction trench. Any potential CCR-exposures during the Source Control-GMS alternative would be managed through the use of rigorous safety protocols and personal protective equipment.
Other Identified Impacts	Source control (IEPA approved CIP approach) was implemented in 2020. Thus, there are no further impacts associated with the implementation of source control. The energy demands of construction equipment and vehicles associated with residual plume management would be lowest under the Source Control-GWP alternative, because this alternative would not require any significant construction or maintenance activity. Traffic and noise impacts associated with residual plume management are expected to be higher under the Source Control-Cutoff Wall and Source Control-GMS alternatives than the Source Control-GWP alternative, due to the construction activities that would be	Source control (IEPA approved CIP approach) was implemented in 2020. Thus, there are no further impacts associated with the implementation of source control. The energy demands of construction equipment and vehicles associated with residual plume management would be greater under the Source Control-Cutoff Wall compared to the Source Control-GWP alternative, because the Source Control-Cutoff Wall alternative would involve the construction of the barrier wall. Traffic and noise impacts associated with residual plume management are expected to be higher under the Source Control-Cutoff Wall alternative than the Source Control-GWP alternative due to	Source control (IEPA approved CIP approach) was implemented in 2020. Thus, there are no further impacts associated with the implementation of source control. The energy demands of construction equipment and vehicles associated with residual plume management would be greater under the Source Control-GMS compared to the Source Control-GWP alternative, because the Source Control-GMS alternative would involve construction activity and operation associated with the extraction trench and the settling pond. Traffic and noise impacts associated with residual plume management are expected to be higher under the Source Control-GMS alternative than the

Evaluation Factor (Report Section; Part 845 Section)	Source Control-GWP	Source Control-Cutoff Wall	Source Control-GMS
	required to construct the cutoff wall and the GMS. Traffic and noise impacts associated with residual plume management from the Source Control-GWP are expected to be minimal due to the limited amount of construction required. There would be no impacts to natural resources and habitat under the Source Control-GWP alternative, because no additional construction activities would be required.	the construction activities required to construct the barrier wall. Under the Source Control-Cutoff Wall alternative, some negative impacts on scenic and recreational value may occur along the Kaskaskia River, which is located approximately 0.5 mile west of the outer perimeter of the FAPS within the Kaskaskia River Watershed. A campground, the Wood Duck Marina, and the Baldwin Cemetery are in the vicinity of the Site. Given the proximity of these areas to the expected construction, it is likely that they would experience some adverse impacts such as visual disturbances, obstruction of views, and noise during the construction period. However, these impacts are expected to diminish once the construction is completed in 12 to 24 months. In addition, the construction of the cutoff wall under the Source Control-Cutoff Wall alternative is expected to use a significant amount of cement or bentonite, which would be introduced into the Upper Unit (UU) and Bedrock Unit (BU). Adding substantial quantities of these materials into the subsurface environment may cause alteration in groundwater pH levels and affect geochemical conditions in the subsurface.	Source Control-GWP alternative due to the construction activities required for the GMS. Under the Source Control-Cutoff Wall alternative, some negative impacts on scenic and recreational value may occur along the Kaskaskia River, which is located approximately 0.5 mile west of the outer perimeter of the FAPS within the Kaskaskia River Watershed. A campground, the Wood Duck Marina, and the Baldwin Cemetery are in the vicinity of the Site. Given the proximity of these areas to the expected construction, it is likely that they would experience some adverse impacts such as visual disturbances, obstruction of views, and noise during the construction period. However, these impacts are expected to diminish once the construction is completed in 12 to 24 months. The construction activities would also likely result in some short-term negative impacts to the ecosystem in the vicinity, including disturbance of habitat near the construction areas by causing alarm and escape behavior in nearby wildlife (*e.g.*, due to noise disturbances).

Evaluation Factor (Report Section; Part 845 Section)	Source Control-GWP	Source Control-Cutoff Wall	Source Control-GMS
		The construction activities would also likely result in some short-term negative impacts to the ecosystem in the vicinity, including disturbance of habitat near the construction areas by causing alarm and escape behavior in nearby wildlife (*e.g.*, due to noise disturbances).	
Time Until Groundwater Protection Standards Are Achieved/Attain the Groundwater Protection Standards Specified in Section 845.600 (Section 2.2.6; IAC Section 845.670(e)(1)(E); IAC Section 845.670(d)(2))	Groundwater modeling in support of the Closure Plan suggested that the source control would lower water levels in the FAPS, reduce leachate concentrations, and decrease the potential transport of CCR constituents off-Site (NRT, 2014a; Burns & McDonnell, 2021). Additional modeling was conducted for each of the corrective action alternatives to evaluate future groundwater quality in the vicinity of the FAPS as a result of residual plume management. The results of the modeling indicate that time to achieve GWPSs for all compliance wells is in excess of 100 years for all three corrective action alternatives (Appendix B; Ramboll, 2025a). This is attributed to the underlying native lithological units beneath the CCR unit, *i.e.*, the UU and BU, which consist of low-permeability soils and underlying low-permeability shale and limestone bedrock. These conditions result in extended times to	Groundwater modeling in support of the Closure Plan suggested that the source control would lower water levels in the FAPS, reduce leachate concentrations, and decrease the potential transport of CCR constituents off-Site (NRT, 2014a; Burns & McDonnell, 2021). Additional modeling was conducted for each of the corrective action alternatives to evaluate future groundwater quality in the vicinity of the FAPS as a result of residual plume management. The results of the modeling indicate that time to achieve GWPSs for all compliance wells is in excess of 100 years for all three corrective action alternatives (Appendix B; Ramboll, 2025a). This is attributed to the underlying native lithological units beneath the CCR unit, *i.e.*, the UU and BU, which consist of low-permeability soils and underlying low-permeability shale and limestone bedrock. These conditions result in extended times to attain GWPS, regardless of the remedy (Appendix B; Ramboll, 2025a).	Groundwater modeling in support of the Closure Plan suggested that the source control would lower water levels in the FAPS, reduce leachate concentrations, and decrease the potential transport of CCR constituents off-Site (NRT, 2014a; Burns & McDonnell, 2021). Additional modeling was conducted for each of the corrective action alternatives to evaluate future groundwater quality in the vicinity of the FAPS as a result of residual plume management. The results of the modeling indicate that time to achieve GWPSs for all compliance wells is in excess of 100 years all three corrective action alternatives (Appendix B; Ramboll, 2025a). This is attributed to the underlying native lithological units beneath the CCR unit, *i.e.*, the UU and BU, which consist of low-permeability soils and underlying low-permeability shale and limestone bedrock. These conditions result in extended times to attain GWPS, regardless of the remedy (Appendix B; Ramboll, 2025a).

Evaluation Factor (Report Section; Part 845 Section)	Source Control-GWP	Source Control-Cutoff Wall	Source Control-GMS
	attain GWPS, regardless of the remedy (Appendix B; Ramboll, 2025a). In addition, modeling indicated that the Source Control-GWP alternative would not cause the groundwater plume to contract within the model simulation period following the implementation of the corrective action alternative.	In addition, modeling indicated that the Source Control-Cutoff Wall alternative would not cause the groundwater plume to contract within the model simulation period following the implementation of the corrective action alternative.	In addition, modeling indicated that plume extents would contract over time following the implementation of Source Control-GMS alternative from 420 acres to 193 acres during the model simulation period.
Potential for Exposure of Humans and Environmental Receptors to Remaining Wastes, Considering the Potential Threat to Human Health and the Environment Associated with Excavation, Transportation, Re-disposal, Containment, or Changes in Groundwater Flow (Section 2.2.7; IAC Section 845.670(e)(1)(F))	Source control (IEPA approved CIP approach) was implemented in 2020. Therefore, all three corrective action alternatives are equally and fully protective with regard to exposure to residual CCR. As a result of the source control, there are no risks of CCR releases. The Source Control-GWP alternative would not involve exposure to the soil or groundwater waste streams and thus, there is no potential for exposure of humans and environmental receptors to wastes.	Source control (IEPA approved CIP approach) was implemented in 2020. Therefore, all three corrective action alternatives are equally and fully protective with regard to exposure to residual CCR. As a result of the source control, there are no risks of CCR releases. For construction workers, risks arising from potential contact with residual contamination during construction, operation, and maintenance activities associated with residual plume management would be higher for the Source Control-Cutoff Wall than for the Source Control-GWP alternative, because the Source Control-Cutoff Wall alternative would involve the excavation and subsequent management of Site spoils. Any potential CCR exposures occurring under the Source Control-Cutoff Wall alternative during the installation of the cutoff wall would be managed through the use of rigorous safety protocols, personal protective	Source control (IEPA approved CIP approach) was implemented in 2020. Therefore, all three corrective action alternatives are equally and fully protective with regard to exposure to residual CCR. As a result of the source control, there are no risks of CCR releases. For construction workers, risks arising from potential contact with residual contamination during construction, operation, and maintenance activities associated with residual plume management would be higher for the Source Control-GMS alternative than for the Source Control-GWP alternative because the Source Control-GMS alternative would involve the excavation and subsequent management of Site soils, as well as the production, management, and potential treatment of extracted groundwater. Any potential CCR exposures occurring under the Source Control-GMS alternative during the installation of the

Evaluation Factor (Report Section; Part 845 Section)	Source Control-GWP	Source Control-Cutoff Wall	Source Control-GMS
		equipment, and appropriate disposal practices. Hydrogeological changes would be expected under the Source Control-Cutoff Wall alternative due to the installation of a low-permeability barrier wall into the UU and BU. These changes include altering flow patterns in the UU, redirecting groundwater flow around the cutoff wall, and causing changes to normal hydraulic gradients.	remedy would be managed through the use of rigorous safety protocols, personal protective equipment, and appropriate disposal practices. Some changes in groundwater flow (*i.e.*, controlled discharge into Kaskaskia River) may occur under the Source Control-GMS alternative, due to the operation of the GMS. Hydrogeological changes would also be expected under the Source Control-GMS alternative, such as lowering groundwater table in the vicinity of the extraction trench and altering flow patterns in the UU. However, changes to groundwater flow would not be expected to have an effect on the potential for the exposure of humans and environmental receptors to remaining wastes.
Long-Term Reliability of the Engineering and Institutional Controls (Section 2.2.8; IAC Section 845.670(e)(1)(G))	Source control (IEPA approved CIP approach) was implemented in 2020. Thus, the long-term reliability of source control would be same for all three corrective action alternatives. Residual plume management under the Source Control-GWP alternative would be reliable because it would rely on physical and geochemical attenuation processes and active monitoring. If necessary, remedy optimizations would be implemented under the adaptive site management program.	Source control (IEPA approved CIP approach) was implemented in 2020. Thus, the long-term reliability of source control would be same for all three corrective action alternatives. Cutoff walls are proven remedies that have been implemented at many sites. Thus, residual plume management under the Source Control-Cutoff Wall alternative would be reliable provided it is constructed in accordance with standard design specifications. The remedy consists of a passive, below-grade structure, which would not require	Source control (IEPA approved CIP approach) was implemented in 2020. Thus, the long-term reliability of source control would be same for all three corrective action alternatives. Groundwater extraction and treatment systems are proven remedies that has been implemented at many sites. Thus, residual plume management under the Source Control-GMS alternative would be expected to be reliable provided it is constructed in accordance with standard design specifications. Under this alternative, the extraction trench

Evaluation Factor (Report Section; Part 845 Section)	Source Control-GWP	Source Control-Cutoff Wall	Source Control-GMS
		any O&M activities once it is installed. Some challenges are expected during construction, necessitating specialized equipment deployment. Quality control (QC) and quality assurance (QA) programs would be required during the construction to ensure the effectiveness of the cutoff wall. If necessary, remedy optimizations would be implemented under the adaptive site management program.	system would require engineering design and installation for groundwater extraction and treatment. Routine and non-routine maintenance of the system is required to ensure reliable operation of the extraction trench and pumps, as well as other MEP system components. Active groundwater monitoring would be in place, similar to those required under the Source Control-GWP alternative. If necessary, remedy optimizations would be implemented under the adaptive site management program.
Potential Need for Replacement of the Remedy (Section 2.2.9; IAC Section 845.670(e)(1)(H))	Replacement of the residual plume management remedy under the Source Control-GWP alternative would likely be unnecessary, because it would not require the installation, operation, and maintenance of engineered systems or structures. Adaptive site management strategies would be used to implement remedy optimizations, if necessary, to ensure that remedial goals are achieved.	Replacement of the residual plume management remedy under the Source Control-Cutoff Wall alternative would likely be unnecessary, because the cutoff wall is a robust, engineered, and maintenance-free subsurface structure. Adaptive site management strategies would be used to implement remedy optimizations, if necessary, to ensure that remedial goals are achieved.	Replacement of the residual plume management remedy under the Source Control-GMS alternative would likely be unnecessary within its standard 50-year design lifespan because the system is anticipated to be highly reliable. However, ongoing maintenance and potential replacement of system components are expected over time; these include: ▪ Periodic maintenance, such as jetting or redevelopment of the perforated drainpipe in the extraction trench. ▪ MEP components like pumps and instrumentation would likely require servicing or replacement every 10 to 20 years, resulting in multiple replacements over the long-term operational life of the remedy.

Evaluation Factor (Report Section; Part 845 Section)	Source Control-GWP	Source Control-Cutoff Wall	Source Control-GMS
			▪ Long-term degradation or fouling of the extraction trench components, including the perforated collection pipe and backfill media, may eventually necessitate replacement. Data on the performance of such systems over a timespan in excess of 100 years is limited, as these types of systems have only been in use for about 100 years. ▪ Any future replacement of the extraction trench would be evaluated through ongoing adaptive site management activities.
Degree of Difficulty Associated with Constructing the Remedy (Section 2.3.1; IAC Section 845.670 (e)(3)(A))	Source control (IEPA approved CIP approach) was implemented in 2020. Thus, there would be no further construction difficulties associated with the implementation of source control. Residual plume management under the Source Control-GWP alternative would rely on physical and geochemical attenuation processes, and therefore would not pose any significant construction challenges.	Source control (IEPA approved CIP approach) was implemented in 2020. Thus, there would be no further construction difficulties associated with the implementation of Source Control. Residual plume management under the Source Control-Cutoff Wall alternative would rely on a barrier wall to prevent groundwater migration off-Site, as well as physical and geochemical attenuation. Some challenges may be encountered during the construction of the cutoff wall, including the following: ▪ Implementing the remedy entails the mobilization of specialized equipment to the Site, including large cranes, clamshells, slurry cutters, and/or one-pass trenching equipment, *etc*. Supporting equipment such as batch	Source control (IEPA approved CIP approach) was implemented in 2020. Thus, there would be no further construction difficulties associated with the implementation of Source Control. Residual plume management under the Source Control-GMS alternative would utilize an extraction trench and a settling pond to extract and treat contaminated groundwater to achieve reductions in contaminant plume sizes, as well as physical and geochemical attenuation. However, there may be challenges during the implementation of the GMS, including the following: ▪ Implementing the remedy entails the mobilization of specialized equipment to the Site, including large cranes, clamshells, slurry cutters,

Evaluation Factor (Report Section; Part 845 Section)	Source Control-GWP	Source Control-Cutoff Wall	Source Control-GMS
		plants, excavation, and grading equipment may also be used. ▪ Although cutoff walls are commonly constructed to similar depths in comparable geologic environments, challenges during construction may still arise. These challenges may involve encountering highly permeable layers (leading to slurry loss), obstructions that necessitate specialized techniques and/or equipment for progression, or sidewall instability. ▪ The effectiveness of the cutoff wall relies on the construction techniques employed to prevent gaps, voids, or other discontinuities in the structure. Ongoing QC/QA activities are essential to prevent such defective features. Additionally, QA programs, such as coring and testing, may be necessary to validate the quality of the constructed barrier. ▪ The performance of the wall is contingent on its actual hydraulic conductivity. This necessitates ongoing monitoring and QA/QC testing for slurry mixing, placement, or soil-bentonite mixing. The goal is to ensure adherence to the designed mix and involves routine testing of samples from the wall material.	and/or one-pass trenching equipment, *etc*. Supporting equipment such as batch plants, excavation, and grading equipment may also be used. ▪ While trenches of similar depth and geology are routinely built, challenges such as encountering obstructions may necessitate specialized techniques and/or equipment. ▪ The construction may require detailed geotechnical design for the working platform. ▪ The MEP components are commonly handled by regional or local contractors and are not expected to pose construction challenges.

Evaluation Factor (Report Section; Part 845 Section)	Source Control-GWP	Source Control-Cutoff Wall	Source Control-GMS
Expected Operational Reliability of the Remedy (Section 2.3.2; IAC Section 845.670 (e)(3)(B))	Source control (IEPA approved CIP approach) was implemented in 2020. The operational reliability of the source control would be the same for all three corrective action alternatives. Residual plume management under the Source Control-GWP alternative would have high operational reliability, because this alternative would rely on natural processes and active monitoring. Adaptive site management strategies would be used to implement remedy optimizations, if necessary.	Source control (IEPA approved CIP approach) was implemented in 2020. The operational reliability of the source control would be the same for all three corrective action alternatives. Residual plume management under the Source Control-Cutoff Wall alternative would have high operational reliability because it is an established technology, as long as the cutoff wall is constructed in accordance with standard design specifications. No O&M would be required after its installation. Adaptive site management strategies would be used to implement remedy optimizations, if necessary.	Source control (IEPA approved CIP approach) was implemented in 2020. The operational reliability of the source control would be the same for all three corrective action alternatives. Residual plume management under the Source Control-GMS alternative would also have high operational reliability because it is an established technology as long as the GMS (the extraction trench and the MEP system) is constructed in accordance with standard design specifications. In addition, the remedy would require routine and non-routine maintenance of the mechanical system to ensure reliable operation. Adaptive site management strategies would be used to implement remedy optimizations, if necessary.
Need to Coordinate with and Obtain Necessary Approvals and Permits from Other Agencies (Section 2.3.3; IAC Section 845.670 (e)(3)(C))	Specific permits and approvals associated with source control were the same for all corrective action alternatives and were discussed in the Closure Plan (AECOM, 2016a). Residual plume management under the Source Control-GWP alternative would not need additional permits from other agencies, other than the approval of the Corrective Action Plan.	Specific permits and approvals associated with source control were the same for all corrective action alternatives and were discussed in the Closure Plan (AECOM, 2016a). Residual plume management under the Source Control-Cutoff Wall alternative would require permits from the IEPA for construction of stormwater controls and BMPs. Due to modification of the FAPS embankment, an Illinois Department of Natural Resources (IDNR) Office of Water Resources, Dam Safety modification	Specific permits and approvals associated with source control were the same for all corrective action alternatives and were discussed in the Closure Plan (AECOM, 2016a). Residual plume management under the Source Control-GMS alternative would require permits from the IEPA for construction of stormwater controls, BMPs, in addition to a joint water pollution control construction and operation permit. Groundwater extracted from the extraction trench

Evaluation Factor (Report Section; Part 845 Section)	Source Control-GWP	Source Control-Cutoff Wall	Source Control-GMS
		permit would need to be obtained. It is estimated permitting, and approval will typically take 6 to 12 months to obtain.	would require a modified NPDES permit. The NPDES permit would likely require renewals depending on the timeline of corrective action implementation, and typically take 18 to 24 months to obtain. Due to modification of the FAPS embankment, an IDNR Office of Water Resources, Dam Safety modification permit would need to be obtained.
Availability of Necessary Equipment and Specialists (Section 2.3.4; IAC Section 845.670 (e)(3)(D))	Source control (IEPA approved CIP approach) was implemented in 2020. Thus, there are no further equipment and specialist needs associated with the implementation of the source control remedy. Residual plume management under the Source Control-GWP alternative would require standard environmental monitoring equipment and groundwater professionals. Specialists such as geologists, hydrogeologists, statisticians (*i.e.*, statistical analysis), and geochemists would be available to collect and evaluate the data.	Source control (IEPA approved CIP approach) was implemented in 2020. Thus, there are no further equipment and specialist needs associated with the implementation of the source control remedy. Residual plume management under the Source Control-Cutoff Wall alternative would require specialists and specialty equipment for the construction of the cutoff wall. ▪ Excavation and construction of the cutoff wall would require a specialized contractor with experience excavating similar size trenches in similar geologic environments and constructing barrier walls with similar design specifications. Specialized and often custom-built equipment including large cranes, slurry cutters, batch plants and/or one-pass construction equipment would be needed.	Source control (IEPA approved CIP approach) was implemented in 2020. Thus, there are no further equipment and specialist needs associated with the implementation of the source control remedy. Residual plume management under the Source Control-GMS alternative would require specialists to install and manage the GMS system throughout its operational period. ▪ Construction of the groundwater extraction system would require a specialized contractor with experience constructing similar size trenches in similar geologic environments. The contractor would probably need specialized and often custom-built equipment including one-pass construction equipment. ▪ Specialists such as design engineers, construction managers, and contractor staff with expertise in

Evaluation Factor (Report Section; Part 845 Section)	Source Control-GWP	Source Control-Cutoff Wall	Source Control-GMS
		▪ Specialists such as design engineers, construction managers, and contractor staff with expertise in cutoff wall construction and equipment operation, would be essential. ▪ The types of equipment and specialists should have been employed for projects similar to designing and building cutoff walls. However, there may be backlogs associated with the equipment and specialists, due to the high existing demand for specialty ground improvement contractors and design specialists who are engaged with similar projects in sectors like electric utilities, dams/levees, and other areas. ▪ This alternative would also require the use of equipment and the expertise of specialists for tasks such as field data collection, groundwater sampling, groundwater sample analysis, and periodic corrective action groundwater monitoring and reporting. Similar to those in the Source Control-GWP alternative, these activities are already being conducted as part of routine groundwater monitoring in accordance with IAC Section 845.220(c)(4).	trench construction and equipment operation would be essential. ▪ The types of equipment and specialists should have been employed for projects similar to designing and installing extraction trenches. However, there may be backlogs associated with the equipment and specialists, due to the high existing demand for specialty ground improvement contractors and design specialists who are engaged with similar projects in sectors like electric utilities, dams/levees, and other areas. ▪ This alternative would necessitate the use of equipment and the expertise of specialists for tasks such as regular groundwater system O&M, field data collection, groundwater sampling, analysis, and periodic corrective action groundwater monitoring and reporting. Similar to those in the GWP alternative, some of these activities are already being conducted as part of routine groundwater monitoring in accordance with IAC Section 845.220(c)(4).

Evaluation Factor (Report Section; Part 845 Section)	Source Control-GWP	Source Control-Cutoff Wall	Source Control-GMS
Available Capacity and Location of Needed Treatment, Storage, and Disposal Services/Comply with Standards for Management of Wastes as Specified in Section 845.680(d) (Section 2.3.5; IAC Section 845.670 (e)(3)(E)/ IAC section 845.670(d)(5))	No treatment, storage, or disposal services would be required for residual plume management under Source Control-GWP alternative, as GWP would not generate any significant volume of waste or wastewater.	Residual plume management for the Source Control-Cutoff Wall would generate CCR-containing spoils during the construction phase. The CCR spoils would be transported to an off-Site landfill for disposal. An evaluation would be completed to determine the best location for disposal. Excavated non-CCR spoils would be disposed at an appropriate on-Site location. No wastes would be expected to be generated during operations of the cutoff wall, and consequently, no additional treatment, storage, or disposal services would be necessary for this remedy.	Residual plume management for the Source Control-GMS alternative would generate waste during construction of the extraction trench system and management of wastewater *via* a settling pond on-Site: ▪ The construction of the extraction trench would generate spoils, and the waste materials consisting of predominantly CCR would be dried and disposed at an appropriate on-Site location. ▪ The extraction trench system would send extracted groundwater to an on-site settling pond, which collects solids removed during groundwater recovery *via* the pneumatic extraction pumps and transfer piping. The location of settling pond would need to be evaluated at a later phase. ▪ Discharge from the settling pond would be conveyed to an NPDES permitted outfall. Renewal of the NPDES permits may be necessary to continue operations, depending on the timeline of the corrective action implementation in relation to the remedy completion.
The Degree to Which Community Concerns Are Addressed by the Remedy (Section 2.4; IAC Section 845.670(e)(4))	Some communities have expressed concerns over groundwater quality at CCR surface impoundments. The combination of source control (IEPA approved CIP approach) and residual	Some communities have expressed concerns over groundwater quality at CCR surface impoundments. The combination of source control (IEPA approved CIP approach) and residual	Some communities have expressed concerns over groundwater quality at CCR surface impoundments. The combination of source control (IEPA approved CIP approach) and residual

Evaluation Factor (Report Section; Part 845 Section)	Source Control-GWP	Source Control-Cutoff Wall	Source Control-GMS
	plume management would cause groundwater concentrations to decline over time under all of the corrective action alternatives, as suggested by the groundwater modeling (NRT, 2014a; Burns & McDonnell, 2021), thus addressing these concerns. The CCR constituents impacts to off-Site groundwater are being monitored and will be addressed by residual plume management under the three corrective action alternatives. A public meeting was held on March 20, 2025, pursuant to requirements under IAC Section 845.710(e). Questions raised by attendees were addressed at the meeting; a written summary of the questions and responses was prepared.	plume management would cause groundwater concentrations to decline over time under all of the corrective action alternatives, as suggested by the groundwater modeling (NRT, 2014a; Burns & McDonnell, 2021), thus addressing these concerns. The CCR constituents impacts to off-Site groundwater are being monitored and will be addressed by residual plume management under the three corrective action alternatives. A public meeting was held on March 20, 2025, pursuant to requirements under IAC Section 845.710(e). Questions raised by attendees were addressed at the meeting; a written summary of the questions and responses was prepared.	plume management would cause groundwater concentrations to decline over time under all of the corrective action alternatives, as suggested by the groundwater modeling (NRT, 2014a; Burns & McDonnell, 2021), thus addressing these concerns. The CCR constituents impacts to off-Site groundwater are being monitored and will be addressed by residual plume management under the three corrective action alternatives. A public meeting was held on March 20, 2025, pursuant to requirements under IAC Section 845.710(e). Questions raised by attendees were addressed at the meeting; a written summary of the questions and responses was prepared.
Remove from the Environment as Much of the Contaminated Material That Was Released from the CCR Surface Impoundment as Is Feasible, Taking into Account Factors Such as Avoiding Inappropriate Disturbance of Sensitive Ecosystems (Section 2.5; IAC Section 845.670(d)(4))	There have been no known releases of CCR at the FAPS. All potential corrective action alternatives include source control and residual plume management efforts. The source control was an IEPA approved CIP approach to control, minimize or eliminate, post closure infiltration of liquids into the impounded CCR. Additionally, residual plume management under the Source Control-GWP alternative would address impacted groundwater by relying on natural physical and geochemical attenuation processes to reduce the	There have been no known releases of CCR at the FAPS. All potential corrective action alternatives include source control and residual plume management efforts. The source control was an IEPA approved CIP approach to control, minimize or eliminate, post closure infiltration of liquids into the impounded CCR. Additionally, residual plume management under the Source Control-Cutoff Wall alternative would employ an engineered system to prevent the migration of impacted groundwater off-Site. Groundwater quality would also be	There have been no known releases of CCR at the FAPS. All potential corrective action alternatives include source control and residual plume management efforts. The source control was an IEPA approved CIP approach to control, minimize or eliminate, post closure infiltration of liquids into the impounded CCR. Residual plume management under the Source Control-GMS alternative would utilize an engineered extraction system to actively remove constituent mass from the environment. Groundwater quality would also be improved as a

Evaluation Factor (Report Section; Part 845 Section)	Source Control-GWP	Source Control-Cutoff Wall	Source Control-GMS
	residual concentrations of CCR-related constituents in groundwater. Site-specific evaluations demonstrated that conditions are favorable for the attenuation of inorganic contaminants *via* adsorption. Some desorption is predicted to occur as groundwater returns to background conditions, but the changes are expected to be minimal (Appendix E; Geosyntec Consultants, Inc., 2025). No ecosystems would be disturbed because no construction activities are expected under the Source Control-GWP alternative.	improved as a result of physical and geochemical attenuation processes. The construction activities would likely result in some negative impacts to the ecosystem, including disturbance of habitat near the construction areas by causing alarm and escape behavior in nearby wildlife (*e.g.*, due to noise disturbances). Short-term impacts could also occur to sensitive aquatic and wetland species in Kaskaskia River and other wetlands and surface waters near the FAPS (see Section 1.1.3) due to sediment runoff during construction.	result of physical and geochemical attenuation processes. The construction activities would likely result in some negative impacts to the ecosystem, including disturbance of habitat near the construction areas by causing alarm and escape behavior in nearby wildlife (*e.g.*, due to noise disturbances). Short-term impacts could also occur to sensitive aquatic and wetland species in Kaskaskia River and other wetlands and surface water near the FAPS (see Section 1.1.3) due to sediment runoff during construction.

Notes:

CAA = Closure Alternatives Analysis; CCR = Coal Combustion Residual; CIP = Closure-in-Place; FAPS = Fly Ash Pond System; GMS = Groundwater Management System; GWP = Groundwater Polishing; GWPS = Groundwater Protection Standard; IAC = Illinois Administrative Code; IEPA = Illinois Environmental Protection Agency; NPDES = National Pollutant Discharge Elimination System; O&M = Operations and Maintenance; Source Control-Cutoff Wall = Source Control with a Groundwater Cutoff Wall; Source Control-GMS = Source Control with Groundwater Management System; Source Control-GWP = Source Control with Groundwater Polishing.

1 Introduction

1.1 Site Description and History

1.1.1 Site Location and History

The Baldwin Power Plant (BPP) (also referred to as Baldwin Energy Complex, or BEC) is a coal-fired power generating facility owned and operated by Dynegy Midwest Generation, LLC (DMG). The facility is located approximately 1.5 miles west-northwest of the Village of Baldwin, within Randolph and St. Clair Counties, Illinois. The plant began operating its first generating unit in 1970 (Ramboll, 2024b). The BPP is currently scheduled to retire by the end of 2027.

1.1.2 CCR Impoundment

A part of its operations, BPP produces and stores coal combustion residuals (CCRs). The BPP has several surface impoundments for storage of CCR: the Bottom Ash Pond (BAP) (Vistra identification [ID] number [No.] 601, Illinois Environmental Protection Agency [IEPA] ID No. W1578510001-06), the Fly Ash Pond System (FAPS, an IEPA closed CCR Unit) (Vistra ID No. 605; IEPA ID Nos. W1578510001-01, W1578510001-02, and W1578510001-03), the Secondary Pond, Tertiary Pond, and Cooling Pond (Ramboll, 2021). The FAPS is a closed multi-unit CCR surface impound (SI) and is the subject of this report.

The FAPS (Figure 1.1) is comprised of three closed unlined SIs: the East Fly Ash Pond (76 acres), the Old East Fly Ash Pond (102 acres), and the West Fly Ash Pond (54 acres) encompassing a total surface area of 232 acres (Appendix C; Ramboll, 2024a). The FAPS external perimeter embankments were constructed in 1969 followed by embankment enhancements and expansion in 1979 and 1989, respectively. In 1995, an interior dike was constructed between East Fly Ash Pond and West Fly Ash Pond, and the dike was subsequently raised in 1999 (Ramboll, 2021). During operation, the FAPS discharged into the BAP, followed by the Secondary Pond and the Tertiary Pond, which eventually discharges *via* a National Pollutant Discharge Elimination System (NPDES)-permitted outfall to a tributary of the Kaskaskia River, located south of Baldwin Lake Cooling Pond intake structure (Ramboll, 2021). In 2016, a Closure Plan for the FAPS was developed and approved by IEPA; and closure with a final cover system was completed in November 2020 (Appendix C; Ramboll, 2024a).

Figure 1.1 Site Location Map. Adapted from Ramboll (2024b).

1.1.3 Surface Water Hydrology

The FAPS is located at the northern edge of the Baldwin Lake-Kaskaskia River Watershed (Hydrologic Unit Code 071402040908) (AECOM, 2016b). There are 28 surface water features within 1,000 meters of the Site (Ramboll, 2021). The most significant water bodies in the vicinity of the FAPS are Baldwin Lake, also known as the Baldwin Power Plant Cooling Pond, and the Kaskaskia River (Figure 1.1; Ramboll, 2024b).

The Kaskaskia River is located approximately 0.5 mile west of the outer perimeter of the FAPS within the Kaskaskia River Watershed (Google LLC, 2022; AECOM, 2016b). The segment of the Kaskaskia River adjacent to the Site (Section IL_O-97) is included on the 2022 Illinois Section 303(d) List as being impaired for aquatic life due to abnormal flow, degraded habitat, low oxygen, and sedimentation/siltation; impaired for fish consumption due to mercury and pesticides; and impaired for public and food processing water supply due to pesticides (IEPA, 2022; US EPA, 2022). The 2,018-acre Baldwin Lake, which borders the Site to the north, was constructed between 1967 and 1970. Baldwin Lake is filled by pumping water from the Kaskaskia River and is supplemented by natural precipitation. The discharge from the lake into the Kaskaskia River is regulated by a Site NPDES permit (NPDES Permit No. IL0000043) (Ramboll, 2021). As a perched lake, it is hydrologically isolated from natural surface water bodies (Ramboll, 2021).

1.1.4 Hydrogeology

The geology underlying the Site in the vicinity of the FAPS consists of unlithified materials (predominantly clay with some silt and intermittent sand seams and lenses) underlain by Pennsylvanian and Mississippian bedrock (NRT, 2016; Ramboll, 2021, 2024b). There are two distinct hydrostratigraphic units underlying the CCR at the FAPS:

- **Upper Unit (UU)[2]:** The UU, composed of unlithified materials, is directly beneath the FAPS. It consists of four lithologic layers – Cahokia Formation (sandy clay and clayey sand), Peoria Loess (silt and silty clay), Equality Formation (sandy clay with occasional sand seams), and Vandalia Till (clay with discontinuous sand lenses) (Ramboll, 2021a). The thickness of the UU underneath the FAPS varies between 17 ft in the eastern part of the FAPS to 56 ft in the northern and western part of the FAPS[3] (Ramboll, 2024b). The unlithified materials within the UU do not represent a continuous aquifer unit (Ramboll, 2024b).
- **Bedrock Unit (BU):** The BU underlies the UU and is composed of interbedded shale and limestone bedrock, which is continuous across the entire BPP Site (Ramboll, 2021).

Thin sand lenses in the UU and the interface between the UU and the BU have both been identified as potential migration pathways (PMPs) (Ramboll, 2021a, 2024b). The BU is the uppermost aquifer (UA) (Ramboll, 2024b).

The Kaskaskia River, located to the west of FAPS, is the principal surface drainage for the region. Throughout most of the area near the FAPS, groundwater flows (both in the UU and the BU) to the west and southwest towards the bedrock valley underlying the Secondary and Tertiary Ponds (located west of FAPS) and Kaskaskia River. In the northeastern part of the FAPS, groundwater flows in a northwesterly direction and eventually discharges into the Kaskaskia River. Some groundwater in the UU may flow into the Secondary and Tertiary Ponds which drain into the Kaskaskia River. Thus, Kaskaskia River is the receiving surface water body for groundwater in the UU and the BU (Ramboll, 2021, 2024b).

1.1.5 Site Vicinity

The BPP Site is located in a predominantly agricultural area (Ramboll, 2021). It is bordered by the Kaskaskia River to the west, farmland and strip-mining areas to the north and east, and scattered residences and the Illinois Central Gulf railroad trucks to the south (Ramboll, 2024b). The village of Baldwin is approximately 1.5 miles south-southeast of the BPP.

Scenic, recreational, and historical areas near the Site include the greater Kaskaskia River State Fish and Wildlife Area (SFWA). The Kaskaskia River SFWA, which spans over 20,000 acres, is popular for fishing, boating, picnicking and wildlife viewing (IDNR, 2022). A campground is located approximately 300 ft south of the southern perimeter of the FAPS. The Wood Duck Marina is located approximately 2,000 ft west of the western perimeter of the FAPS. The Baldwin Cemetery is located approximately 2,500 ft east of the FAPS (Google LLC, 2024). Based on a review of the Illinois Department of Natural Resources (IDNR) Historic Preservation Division database and the Illinois State Archaeological Survey database, there are no historic sites located within 1,000 meters of the FAPS (Ramboll, 2021).

[2] The UU was referred to as the Upper Groundwater Unit (UGU) in previous reports (Ramboll, 2024b).
[3] The thickness of the UU at MW-150 (to the west of the FAPS) is 13 ft (Ramboll, 2024b).

1.2 Part 845 Regulatory Review and Requirements

Title 35, Part 845 of the Illinois Administrative Code (IAC) (IEPA, 2021) requires that a Corrective Action Alternatives Analysis (CAAA) be performed as part of the remedy selection, prior to undertaking any corrective actions at certain CCR-containing impoundments where exceedances of groundwater protection standards (GWPSs) have been identified. Because exceedances[4] of GWPSs in groundwater associated with the FAPS have been identified for boron, sulfate, and pH (Appendix D; Ramboll, 2024b), this report presents a CAAA for the FAPS pursuant to the requirements under IAC Section 845.670. The goal of a CAAA is to holistically evaluate a range of factors for the various corrective actions being considered at an impoundment, including the efficiency, reliability, and ease of implementation of the corrective action; its potential positive and negative short- and long-term impacts on human health and the environment; and its ability to address concerns raised by the community (IEPA, 2021). A CAAA is a decision-making tool that is designed to aid in the selection of a corrective action alternative.

[4] Throughout this document, "exceedance" or "exceedances" is intended to refer only to potential exceedances of proposed applicable background statistics or Groundwater Protection Standards (GWPS) as described in the proposed groundwater monitoring program, which was submitted to IEPA on October 25, 2021 as part of Dynegy Midwest Generation's operating permit application for the FAPS (Burns & McDonnell, 2021). The operating permit application, including the proposed groundwater monitoring program, remains under review by IEPA and therefore Dynegy Midwest Generation has not identified any actual exceedances.

2 Corrective Action Alternatives Analysis

This section presents the CAAA pursuant to requirements under IAC Section 845.670 (IEPA, 2021a). The goal of a CAAA is to fully evaluate proposed viable corrective measures that were identified in the CMA. The CAAA evaluates potential corrective actions with respect to a wide range of factors, including the performance, reliability, and ease of implementation of the corrective action; its potential impacts on human health and the environment; and its ability to address concerns raised by the community (IEPA, 2021a).

Per IAC Section 845.670(d) (IEPA, 2021a), any corrective actions selected under a Corrective Action Plan must:

1. Be protective of human health and the environment;
2. Attain the groundwater protection standards specified in Section 845.600;
3. Control the sources of releases to reduce or eliminate, to the maximum extent feasible, further releases of constituents listed in Section 845.600 into the environment;
4. Remove from the environment as much of the contaminated material that was released from the CCR surface impoundment as is feasible, considering factors such as avoiding inappropriate disturbance of sensitive ecosystems; and
5. Comply with standards for management of wastes as specified in Section 845.680(d).

At the FAPS, a CAAA is required because groundwater monitoring associated with the FAPS identified exceedances of the GWPSs. Groundwater monitoring was conducted in accordance with the proposed groundwater monitoring plan (GMP) between 2015 to 2023 (Appendix D; Ramboll, 2024b). The groundwater samples collected from groundwater compliance monitoring wells were used to evaluate compliance with the groundwater quality standards listed in IAC Section 845.600(a). As of the date of this report, boron, sulfate, and pH were identified as constituents/parameters with concentrations in excess of their corresponding GWPSs (Appendix D; Ramboll, 2024b).

Three potentially viable corrective actions for the FAPS were selected in the CMA for further consideration in this CAAA. These corrective action alternatives include source control which was previously approved by IEPA. The corrective actions alternatives that are considered in this CAAA are Source Control with Groundwater Polishing (Source Control-GWP), Source Control with a Groundwater Cutoff Wall (Source Control-Cutoff Wall), Source Control with Groundwater Management System (Source Control-GMS).[5] The corrective actions are described below in Section 2.1.

2.1 Corrective Action Alternative Descriptions

For all corrective actions evaluated in this CAAA, source control is the primary remedy. US EPA has stated that source control is the most effective means of ensuring the timely attainment of remediation objectives (US EPA, 2015b). The source control for the FAPs consisted of an IEPA approved CIP approach, which

[5] It should be noted that the GMS system evaluated in this report is a slightly different, more robust groundwater extraction alternative compared to the system that was considered in the CMA (Ramboll, 2024a).

was completed in November 2020 and subsequently approved by IEPA in December 2020 (Morris, 2020). Specific elements of this approach included (AECOM, 2016a; Burns & McDonnell, 2021):

- Removal of water *via* pumping;
- Dewatering of CCR;
- Redistributing and reshaping existing CCR as well as contouring and grading beneath the final cover system to fill low areas;
- Construction of a final cover system consisting of a 6-in vegetative layer and an 18-in layer of overlying barrier soil, in compliance with 40 CFR Part 257, Subpart D; and
- The installation of two new detention basins and channels directing non-contact stormwater from the cover system to be collected and managed in the Secondary Pond.

The source control included removing water and installation of a final cover system in accordance with CFR Part 257, Subpart D to "minimize water infiltration into the closed FAPS and improve surface water drainage off the cover system, thus reducing generation of potentially impacted water and ultimately reducing the extent of CCR impacts to groundwater" (Appendix C; Ramboll, 2024a). Groundwater modeling performed in support of the Closure Plan suggested that the source control would provide hydraulic control of surface water on the cover system, reduce both water levels in the FAPS and groundwater contaminant concentrations, and decrease the potential for off-Site transport of CCR constituents (*i.e.*, shrink of CCR-constituent plume; NRT, 2014a,b; Burns & McDonnell, 2021). The final cover system helped establish hydrostatic equilibrium with the FAPS, and decreased off-Site migration of CCR constituents. Due to the reduction in the hydraulic flux out of the FAPS, the mass flux out of the FAPS is controlled and minimized.

In addition to source control, the corrective actions evaluated in this CAAA include residual plume management. Three potential corrective actions, identified as viable in the CMA, are evaluated in this CAAA for the FAPS:

- **Alternative 1:** Source control with Groundwater Polishing (Source Control-GWP);
- **Alternative 2:** Source control with a Groundwater Cutoff Wall (Source Control-Cutoff Wall);
- **Alternative 3:** Source control with a Groundwater Management System (Source Control-GMS).

For all three potential corrective action alternatives, adaptive site management strategies would be integrated into residual plume management. This approach ensures the timely incorporation of new Site information throughout the corrective action process in order to optimize the remediation and expedite achievement of the GWPSs. As part of the adaptive site management approach, system performance and residual plume conditions would be monitored throughout the implementation of the selected corrective action. If groundwater concentrations do not respond as expected to the corrective action, the adaptive site management approach would enable prompt adjustments, optimizations, or replacement of the remedy to ensure overall effectiveness.

2.1.1 Alternative 1: Source Control-GWP

The first corrective action alternative is Source Control-GWP. This remedy includes source control (IEPA approved CIP approach), and residual plume management based on natural physical and geochemical processes that would reduce groundwater concentrations downgradient of the FAPS. Groundwater polishing mechanisms were evaluated using geochemical speciation and reaction models. The primary

objective of the geochemical model was to support the evaluation of groundwater polishing as a potential remedy for the Site. The model focused on evaluating the dominant geochemical reactions that may occur at time scales relevant to groundwater flow, including adsorption and mineral dissolution/precipitation reactions (*i.e.*, iron and aluminum hydroxides, carbonates, and some sulfates) (Appendix E; Geosyntec Consultants, Inc., 2025). Model inputs included geochemically reactive solid mineral phases, downgradient groundwater composition, and background groundwater composition derived from site-specific data. Speciation models analyzed the distribution of chemical constituents between solid and aqueous phases, while reaction models assessed how these distributions may shift in response to changing site conditions (US EPA, 2015). Components of residual plume management for remedy alternative include:

- Groundwater concentrations would be reduced in the downgradient plume as a result of physical and geochemical attenuation processes. Site-specific evaluations have shown that groundwater polishing would reduce the groundwater concentrations and mobility of inorganic contaminants. Specifically, the results indicate that boron and sulfate attenuation *via* sorption onto mineral surfaces such iron and aluminum oxides, would occur. Some desorption is predicted to occur as groundwater returns to background conditions, but the changes are expected to be minimal. This attenuation process would reduce the flux of CCR constituents in downgradient groundwater, and constituent concentrations should decrease (Appendix E; Geosyntec Consultants, Inc., 2025).
- Corrective action groundwater monitoring using a groundwater monitoring system designed in accordance IAC Section 845.680(c) would be performed within the plume that lies beyond the waste facility boundary.
- Adaptive site management strategies for this alternative would include geochemical modeling. Groundwater monitoring results would be evaluated and compared to the model-predicted concentrations. In situations in which observed groundwater concentrations deviate significantly from modeled conditions, alternative methods or techniques to achieve the GWPSs would be evaluated, and if viable, incorporated as per IAC Section 845.680(b).
- Confirmation groundwater sampling would be performed for 3 years after GWPS are met, in accordance with IAC Section 845.680 (c). In the event that GWPSs are not met, corrective action groundwater monitoring would continue, with potential future changes to sampling parameters and monitoring frequency. Corrective action confirmation monitoring would not be performed under such circumstances.
- Following the completion of the corrective action confirmation monitoring period, a report and certification for Corrective Action Completion would be prepared and submitted to IEPA as per IAC Section 845.680(e).

The overall corrective action implementation duration for this alternative is going to take in excess of 100 years[6] (Appendix B; Ramboll, 2025b), including:

- Corrective action monitoring until GWPSs have been achieved;
- At least 3 years (36 months) of corrective action confirmation monitoring[7] and
- 6 months associated with post-closure reporting.

[6] While the model simulation period for each corrective action alternative was 1,000 years, model predictions at such lengthy future timescales are inherently uncertain.
[7] It should be noted that post-closure care groundwater monitoring will continue for a minimum of 30 years as required by IAC Section. 845.780(c).

Although source control (*i.e.*, control-in-place [CIP]) is a primary component of the corrective action, it was completed in 2020, and therefore, the labor time, equipment usage, and mileage linked to source control are not included in this analysis. There is no labor and mileage incurred with the residual plume management under the Source Control-GWP alternative, because no construction would be required under this alternative. Mileage and labor associated with corrective action monitoring was not included in this analysis (Appendix B; Ramboll, 2025b).

2.1.2 Alternative 2: Source Control-Cutoff Wall

The second corrective action alternative is Source Control with a Groundwater Cutoff Wall. This remedy includes source control (IEPA approved CIP approach) and a cutoff wall as the residual plume management approach. The residual plume management approach would include the construction of a cutoff wall comprised of a mixture of soil and bentonite or a mixture of cement and bentonite. It would extend from the existing perimeter berm ground surface into the UU/PMP. The cutoff wall would be about 7,000 ft long, 2 to 3 ft wide, and have a maximum depth of about 85 ft below ground surface (bgs). The cutoff wall would have a low hydraulic conductivity providing a long-term, maintenance-free barrier to reduce potential impacted groundwater from migrating past the Site's southern property boundary.

Implementation of residual plume management for Source Control-Cutoff Wall is expected to include various tasks across three major phases: pre-construction activities (Phase 1), corrective action construction (Phase 2), and corrective action operations, maintenance, and closeout (Phase 3). The activities associated with each of these phases are summarized below:

- Phase 1: Pre-construction activities including obtaining permits from agencies and completing Site investigations and engineering designs.
- Phase 2: Construction of the cutoff wall and minor Site restoration of disturbed areas.
    - Mobilization of equipment and materials to the Site, and preparation for Site construction.
    - The wall would be constructed using one-pass trenching methods by excavating subgrade soils and backfilling the trench with the selected low permeability material (soil-bentonite or cement-bentonite) generated by an on-Site batch plant.
    - Excavated spoils containing CCR would be disposed of at an off-Site landfill, while construction spoils that do not contain CCR would be disposed of at an appropriate on-Site location.
    - Site restoration would be completed following the construction of the cutoff wall, including repair of the final cover system over disturbed areas and removal of construction infrastructure.
- Phase 3: Operations, Maintenance, and Closeout. Details pertaining to each of these activities are outlined below.
    - Corrective Action O&M: Because the cutoff wall is a passive, below-grade structure, no O&M would be needed following its installation.
    - Groundwater concentrations would be also reduced in the downgradient plume as a result of physical and geochemical attenuation processes.
    - Adaptive site management strategies would be employed to track remediation progress and incorporate new Site information to assure the achievement of the GWPSs. Additional investigation to update the conceptual site model (CSM), groundwater, and geochemical models may be included as part of remedy progress evaluation. If remedy progress does not

meet expectations, additional methods or techniques to achieve GWPS would be evaluated and incorporated in compliance with IAC Section 845.680 (b).

- Corrective action monitoring using a corrective action groundwater monitoring network designed in accordance with IAC Section 845.680(c) would be performed within the plume that lies beyond the waste facility boundary. If the GWPSs are met for all corrective action monitoring wells in the future, corrective action confirmation groundwater sampling would be performed for 3 years, in accordance with IAC Section 845.680 (c). If GWPSs are not met in the future, corrective action groundwater monitoring would continue, with potential future changes to sampling parameters and monitoring frequency. Corrective action confirmation monitoring would not be performed under such circumstances.
- Following the completion of the corrective action confirmation monitoring period, a report and certification for Corrective Action Completion would be prepared and submitted to IEPA as per IAC Section 845.680(e).

The overall corrective action implementation duration is going to take in excess of 100 years[8] (Appendix B; Ramboll, 2025b), including:

- Three to four years (30 to 48 months) of pre-construction activities (Phase 1).
- One to two years (12 to 24 months) of corrective action construction (Phase 2).
- Corrective action O&M will continue until GWPS have been met, which is estimated to take in excess of 100 years[9]. Once GWPSs have been achieved, at least 3 years (36 months) of corrective action confirmation monitoring,[10] and 6 months associated with post-closure reporting would be required (Appendix B; Ramboll, 2025b).

[8] While the model simulation period for each corrective action alternative was 1,000 years, model predictions at such lengthy future timescales are inherently uncertain.
[9] While the model simulation period for each corrective action alternative was 1,000 years, model predictions at such lengthy future timescales are inherently uncertain.
[10] It should be noted that post-closure care groundwater monitoring would continue for a minimum of 30 years or until such time as GWPSs are achieved, whichever is longer, as required by IAC Section 845.780(c).

Key parameters for the Source Control-Cutoff Wall corrective action alternative are shown in Table 2.1, below.

Table 2.1 Key Parameters for the Source Control-Cutoff Wall Corrective Action Alternative[a]

Parameter[b]	Value[c]
Labor Hours	
Total On-Site Labor	18,100
Total Off-Site Labor	0
40% Contingency	7,260
Total Labor Hours:	25,400
Vehicle and Equipment Travel Miles	
Vehicles On-Site	48,700
On-Site Haul Trucks (Unloaded + Loaded)	9,060
Labor Mobilization	7,750
Equipment Mobilization (Unloaded + Loaded)	57,300
Off-Site Haul Trucks (Unloaded + Loaded)	674,000
Material Deliveries (Unloaded + Loaded)	115,000
Total On-Site Vehicle and Equipment Travel Miles:	57,800
Total Off-Site Vehicle and Equipment Travel Miles:	854,000
Total Vehicle and Equipment Travel Miles:	912,000

Notes:
Source Control-Cutoff Wall = Source Control with a Groundwater Cutoff Wall.
(a) Although source control (*i.e.*, control-in-place [CIP]) is a primary component of the corrective action, the source control was previously completed in 2020 and the associated labor time, equipment usage, and mileage associated with source control are not discussed in this analysis.
(b) Mileage and labor related to sampling and monitoring is not included for this analysis in any of the three alternatives.
(c) Values reported in this table were rounded to reflect 3 significant figures.
Source: Appendix B; Ramboll, 2025b.

2.1.3 Alternative 3: Source Control-GMS

The third corrective action alternative is Source Control with GMS. This remedy includes source control (IEPA approved CIP approach) and a groundwater management system as the residual plume management approach. The residual plume management would include the construction of a system to remove liquids from the interior of the FAPS. The GMS would include the construction of an extraction trench, a collection and conveyance system, and a collection pond, described below:

- The trench would be about 8,700 ft long, 2 to 3 ft wide, and extend to a depth of about 50 to 60 ft bgs with collection sumps spaced at approximately every 500 ft along the trench alignment. The trench is designed to remove liquids from low-lying areas near the base of the CCR within the interior of the FAPS.
- A mechanical, electrical and piping (MEP) system would convey extracted liquids to an on-Site settling pond. After settling, the liquids would be discharged to the Kaskaskia River to the west, either *via* an existing or a new NPDES outfall.

It should be noted that the GMS system evaluated in this report is a slightly different, more robust groundwater extraction alternative compared to the system that was considered in the CMA (Ramboll, 2024a).

The GMS would provide long-term removal of liquids from the FAPS, reducing hydraulic head beneath the existing cover system and minimizing the potential for liquids to mix with groundwater and migrate beyond the Site's southern property boundary.

Implementation of the Source Control with GMS alternative is expected to include various tasks across three major phases: pre-construction activities (Phase 1), corrective action construction (Phase 2), and corrective action operations, maintenance, and closeout (Phase 3). The activities associated with each of these phases are summarized below:

- **Phase 1:** Pre-construction activities including obtaining permits from agencies and completing Site investigations and engineering designs.
- **Phase 2:** Construction of the extraction trench system and minor Site restoration of disturbed areas.
  - Mobilization of equipment and materials to the Site, and preparation for Site construction.
  - The extraction trench would be installed utilizing specialized trenching equipment (*i.e.*, one-pass trenching methods). Collection pipes and sumps would be installed. The trench would be backfilled with granular fill and capped with low-permeability clay and topsoil.
  - Excavated soils would contain primarily CCR materials, and therefore would be dried and disposed at an appropriate on-Site location.
  - Installation of the MEP system for the conveyance of extracted groundwater. This system would include a pneumatic pump and a discharge pipe to carry extracted liquids to an equalization tank, before transferring to the settling pond.
  - The location of the settling pond would evaluated at a later phase. Additional water treatment technologies may be considered in a subsequent design phase.
  - Site restoration would be completed following the construction of the GMS, including repair of the final cover system over disturbed areas and removal of construction infrastructure.
- **Phase 3:** Operations, Maintenance, and Closeout. Details pertaining to each of these activities are outlined below:
  - The operation of the GMS would require routine and non-routine maintenance, such as totalizer data collection, maintenance of extraction pumps and other system components, and replacement of MEP components, *etc*.
  - Routine monitoring and compliance of the Site's NPDES permit associated with the treatment and discharge of extracted fluids would be required.
  - Groundwater concentrations would also be reduced in the downgradient plume as a result of physical and geochemical attenuation processes.
  - Adaptive site management strategies would be employed to track remediation progress and incorporate new Site information to assure the achievement of the GWPSs. Additional investigation to update the conceptual site model (CSM), groundwater, and geochemical models may be included as part of remedy progress evaluation. If remedy progress does not meet expectations, additional methods or techniques to achieve GWPS would be evaluated and incorporated in compliance with IAC Section 845.680 (b).
  - Corrective action monitoring using a corrective action groundwater monitoring network designed in accordance with IAC Section 845.680(c) would be performed within the plume that lies beyond the waste facility boundary. If the GWPSs are met for all corrective action monitoring wells in the future, corrective action confirmation groundwater sampling would be

performed for 3 years, in accordance with IAC Section 845.680 (c). If GWPSs are not met in the future, corrective action groundwater monitoring would continue, with potential future changes to sampling parameters and monitoring frequency. Corrective action confirmation monitoring would not be performed under such circumstances.

- Following the completion of the corrective action confirmation monitoring period, a report and certification for Corrective Action Completion would be prepared and submitted to IEPA as per IAC Section 845.680(e).

The overall corrective action implementation duration is going to take in excess of 100 years (Appendix B; Ramboll, 2025b), including:

- Three to four years (30 to 48 months) of pre-construction activities (Phase 1).
- One to two years (12 to 24 months) of corrective action construction (Phase 2).
- Corrective action O&M is estimated to take in excess of 100 years[11] (*i.e.*, the time to meet GWPSs). Once GWPSs are achieved, at least 3 years (36 months) of corrective action confirmation monitoring[12] and 6 months associated with post-closure reporting would be required.

Key parameters for the Source Control-GMS alternative are shown in Table 2.2, below.

Table 2.2 Key Parameters for the Source Control-GMS Corrective Action Alternative[a]

Parameter[b]	Value[c]
Labor Hours	
Total On-Site Labor	45,600
Total Off-Site Labor	0
40% Contingency	18,200
Total Labor Hours:	63,800
Vehicle and Equipment Travel Miles	
Vehicles On-Site	64,100
On-Site Haul Trucks (Unloaded + Loaded)	8,580
Labor Mobilization	50,800
Equipment Mobilization (Unloaded + Loaded)	66,200
Off-Site Haul Trucks (Unloaded + Loaded)	874,000
Material Deliveries (Unloaded + Loaded)	72,400
Total On-Site Vehicle and Equipment Travel Miles:	72,700
Total Off-Site Vehicle and Equipment Travel Miles:	1,060,000
Total Vehicle and Equipment Travel Miles:	1,140,000

Notes:
Source Control-GMS = Source Control with Groundwater Management System.
(a) Although source control (*i.e.*, control-in-place [CIP]) is a primary component of the corrective action, the source control was previously completed in 2020 and the associated labor time, equipment usage, and mileage linked to source control are not discussed in this analysis.
(b) Mileage and labor related to sampling and monitoring is not included for any of the three alternatives.
(c) Values reported in this table were rounded to reflect 3 significant figures.
Source: Appendix B; Ramboll, 2025b.

[11] While the model simulation period for each corrective action alternative was 1,000 years, model predictions at such lengthy future timescales are inherently uncertain.
[12] It should be noted that post-closure care groundwater monitoring would continue for a minimum of 30 years or until such time as GWPSs are achieved, whichever is longer, as required by IAC Section 845.780(c).

2.2 Long- and Short-Term Effectiveness and Protectiveness of Corrective Action Alternative (IAC Section 845.670(e)(1))

2.2.1 Magnitude of Reduction of Existing Risks/Be Protective of Human Health and the Environment (IAC Section 845.670(e)(1)(A)/IAC Section 845.670(d)(1))

There are no current unacceptable risks to human or ecological receptors at this Site associated with the FAPS (Appendix A; Gradient, 2025). Because current conditions do not present a risk to human health or the environment at the FAPS, there will be no unacceptable risk to human health or the environment for future conditions since the unit was already closed and source control was implemented. Concentrations of CCR-related constituents will decline over time and, consequently, potential exposures to CCR-related constituents in the environment will also decline. As a result of this, the magnitude of the reduction of existing risks is the same for each corrective action alternative (IAC Section 845.670(e)(1)(A)), and each corrective action alternative is equally protective of human health and the environment (IAC Section 84.670(d)(1)).

2.2.2 Effectiveness of the Remedy in Controlling the Source (IAC Section 845.670(e)(2)/IAC Section 845.670(d)(3))

Extent to Which Containment Practices Will Reduce Further Releases/Control the Sources of Releases to Reduce or Eliminate, to the Maximum Extent Feasible (IAC Section 845.670(e)(2)(A)/IAC Section 845.670(d)(3))

Source control was implemented for all three corrective action alternatives in 2020. Source control (IEPA approved CIP approach) which included dewatering of CCR and installing a final cover system. These source control activities would provide control of surface run-off on the cover system and in the surrounding area, reduce leachate concentrations, and decrease off-Site transport of CCR constituents (Burns & McDonnell, 2021). The final cover system consisting of a 6-in vegetative layer and an 18-in layer of overlying barrier soil was installed in 2020; this cover system is helping to establish hydrostatic equilibrium in the FAPS and decrease off-Site transport of CCR constituents. Due to the reduction in the hydraulic flux out of the FAPS, the mass flux out of the FAPS also is also being controlled and minimized. Therefore, all three corrective action alternatives would be equally protective with regard to source control.

The effectiveness of residual plume management for each of the corrective action alternatives is summarized below.

- Under the Source Control-GWP alternative, the attenuation of dissolved constituent concentrations remaining after source control would be achieved through natural physical and geochemical processes. Site-specific evaluations have shown that groundwater polishing would reduce the groundwater concentrations and mobility of inorganic contaminants. Specifically, the results indicate that boron and sulfate attenuation *via* sorption onto mineral surfaces such iron and aluminum oxides, would occur under current conditions (*i.e.*, post-closure). Some desorption is predicted to occur as groundwater returns to background conditions, but the changes are expected to be minimal. By monitoring groundwater concentrations and, if necessary, optimizing the remedy, the Source Control-GWP alternative would be effective at controlling residual plume areas and downgradient groundwater impacts (Appendix E; Geosyntec Consultants, Inc., 2025). In cases in which observed groundwater concentrations deviate significantly from modeled conditions,

alternative methods or techniques would be evaluated under the adaptive site management plan, and if viable, incorporated as per IAC Section 845.680(b).

- Under the Source Control-Cutoff Wall alternative, residual plume management would be achieved by creating a physical barrier to reduce potential CCR-constituents in groundwater from migrating off the Site's southern property boundary. Physical and geochemical attenuation would also help control the residual plume and prevent downgradient migration. Cutoff walls are a frequently used corrective measure that have been determined to be an effective approach in preventing dissolved-phase groundwater plume migration at many sites. In cases in which observed groundwater concentrations deviate significantly from modeled conditions, alternative methods or techniques to achieve the GWPSs would be evaluated under the adaptive site management plan, and if viable, incorporated as per IAC Section 845.680(b).
- Under the Source Control-GMS alternative, residual plume management would be achieved by construction of a groundwater management system to remove liquids from the interior of the FAPS and reduce potential CCR-constituents in groundwater from migrating off-Site. The GMS includes an extraction trench and an MEP system. Groundwater extraction is a widely used corrective measure that has been effectively implemented at many sites to contain and capture dissolved-phase groundwater plumes. Physical and geochemical attenuation would also help control the residual plume and prevent downgradient migration. In cases in which observed groundwater concentrations deviate significantly from modeled conditions, alternative methods or techniques to achieve the GWPSs would be evaluated under the adaptive site management plan, and if viable, incorporated as per IAC Section 845.680(b).

Because all corrective action alternatives include source control, and residual plume management, all potential corrective action alternatives would be equally effective at reducing, to the maximum extent feasible, releases from both primary and residual sources (IAC Section 845.670(e)(2)(A)/IAC Section 845.670(d)(3)).

Extent to Which Treatment Technologies May Be Used (IAC Section 845.670(e)(2)(B))

Because Source Control-GWP would rely on physical and geochemical processes, no additional treatment technologies would be required under this alternative. No additional treatment technologies would be required for the Source Control-Cutoff Wall alternative once the cutoff wall has been constructed, because this approach focuses on preventing groundwater from migrating away from the FAPS using an engineered physical barrier. For the Source Control-GMS alternative, in addition to physical and geochemical, extracted liquids would be managed and treated by an on-Site settling pond, although additional methods for treating extracted groundwater may be evaluated at later phases of designs (Appendix B; Ramboll, 2025b). For all corrective action alternatives, remedy optimizations would be implemented, if necessary, under the adaptive site management program.

2.2.3 Likelihood of Future Releases of CCR (IAC Section 845.670(e)(1)(B))

All corrective action alternatives include source control using an IEPA approved CIP approach. A new cover system consisting of a 6-in vegetative layer and an 18-in layer of overlying barrier soil, was installed over the FAPS in 2020 in compliance with 40 CFR Part 257, Subpart D, and new stormwater control structures were also implemented. This cover system provides increased protection against berm and surface erosion, precipitation infiltration, and other adverse effects that could potentially trigger a release of CCR. During the construction phases of the Source Control-Cutoff Wall and Source Control-GMS alternatives, the previously installed cover system would be temporarily disturbed, while the disturbed areas would be repaired after the construction is complete. Any CCR-contact stormwater generated during this

time would be managed through a contact stormwater management system. There would be minimal risk of accidental CCR releases occurring post-closure under any of the corrective action alternatives.

2.2.4 Type and Degree of Long-Term Management, Including Monitoring, Operation, and Maintenance (IAC Section 845.670(e)(1)(C))

The type and degree of long-term residual groundwater plume management associated with each corrective action alternative is summarized below.

- Residual plume management for the Source Control-GWP alternative would not require the installation, operation, or maintenance of any engineered systems or structures, other than maintenance of the monitoring well network. The only long-term management activity required under this alternative would be corrective action groundwater monitoring and routine maintenance of the monitoring wells, which would continue for at least 3 years after GWPSs have been achieved for all wells, in accordance with IAC Section 845.680(c)(2). Post-closure care groundwater monitoring would continue for a minimum of 30 years as required by IAC Section 845.780(c). Based on the adaptive site management approach, remedy optimization (additional methods or techniques) may be implemented to ensure the achievement of the GWPSs.
- Residual plume management for the Source Control-Cutoff Wall alternative requires the installation of a physical subgrade barrier. After installation, the cutoff wall does not require maintenance. The only long-term management activity required under this alternative would be corrective action groundwater monitoring and routine maintenance of the monitoring wells, which would continue for at least 3 years after GWPSs have been achieved for all wells, in accordance with IAC Section 845.680(c)(2). Post-closure care groundwater monitoring would continue for a minimum of 30 years as required by IAC Section 845.780(c). If GWPSs are not met in the future, corrective action groundwater monitoring would continue, with potential future changes to sampling parameters and monitoring frequency. Corrective action confirmation monitoring would not be performed under such circumstances. Based on the adaptive site management approach, remedy optimization (additional methods or techniques) may be implemented to ensure the achievement of the GWPSs.
- Residual plume management for the Source Control-GMS would require multiple tasks to be completed over three phases: pre-construction activities (Phase 1), corrective action construction (Phase 2), and corrective action O&M, and closeout (Phase 3). Corrective action O&M would require regular inspection and maintenance of the mechanical system which includes maintaining pumps, conveyance lines, air compressors, *etc*., which are important components of the MEP system. Routine monitoring and compliance associated with extracted groundwater discharge *via* a new or existing NPDES outfall to Kaskaskia River would be required. Additionally, corrective action groundwater sampling and routine maintenance of the monitoring well network would continue for at least 3 years after GWPSs have been achieved at all wells, in accordance with IAC Section 845.680(c)(2). If GWPSs are not met in the future, corrective action groundwater monitoring would continue, with potential future changes to sampling parameters and monitoring frequency. Corrective action confirmation monitoring would not be performed under such circumstances. Post-closure care groundwater monitoring would continue for a minimum of 30 years as required by IAC Section 845.780(c). Based on the adaptive site management approach, remedy optimization (additional methods or techniques) may be implemented to ensure the achievement of the GWPSs.

2.2.5 Short-Term Risks to the Community or the Environment During Implementation of Remedy (IAC Section 845.670(e)(1)(D))

2.2.5.1 Safety Impacts

Best practices would be employed during construction in order to ensure worker safety and comply with all relevant regulations, permit requirements, and safety plans. However, it is impossible to completely eliminate risks to workers during construction and/or other corrective action activities. For example, injuries and fatalities can occur due to truck accidents or equipment malfunctions. Truck accidents that occur off-Site can also result in injuries or fatalities to community members. Because the source control was implemented in 2020, there is no further risk of accidents and injuries occurring during the implementation of the corrective action alternatives. The safety impacts associated with residual plume management (*i.e.*, construction and O&M) for each corrective action alternative are described below.

- The Source Control-GWP alternative would not include installation, operation, and maintenance of engineered systems or structures, and therefore no safety impacts are expected.
- The Source Control-Cutoff Wall alternative would include the construction of a groundwater cutoff wall to prevent contaminant migration from the FAPS beyond the Site's southern property boundary. Because the cutoff wall is a passive, subsurface structure, no O&M would be needed following installation. Therefore, potential safety concerns are only associated with the construction of the cutoff wall and groundwater monitoring.
- The Source Control-GMS alternative would include the construction of an extraction trench, a MEP system, and settling pond to collect, extract, and treat CCR-impacted liquids. Potential safety concerns would be related to construction and O&M of the extraction trenches and GMS.

Worker Risks

On-Site accidents include injuries and deaths arising from the use of heavy equipment and/or earthmoving operations during Site activities. Off-Site accidents include injuries and deaths due to vehicle accidents during labor and equipment mobilization/demobilization, as well as materials/supplies hauling and deliveries.

As discussed in Section 2.1.1, there are no construction activities or operational requirements associated with residual plume management for the Source Control-GWP alternative. Ramboll estimates that residual plume management for the Source Control-Cutoff Wall corrective action alternative would require 18,100 on-Site labor hours and residual plume management for the Source Control-GMS corrective action alternative would require 45,600 on-Site labor hours (Appendix B; Ramboll, 2025b). The US Bureau of Labor Statistics (US DOL, 2020a,b) provides an estimate of the hourly fatality and injury rates for construction workers. Based on the accident rates reported by the US Bureau of Labor Statistics and the on-Site labor hours reported in Appendix B, we estimate approximately 0.19 worker injuries and 1.6×10^{-3} worker fatalities would occur on-Site under the Source Control-Cutoff Wall corrective action alternative; and approximately 0.47 worker injuries and 4.1×10^{-3} worker fatalities would occur on-Site under the Source Control-GMS corrective action alternative (Table 2.3). No worker injuries and fatalities are expected under the Source Control-GWP alternative. The number of on-Site worker accidents is therefore expected to be highest under the Source Control-GMS alternative.

Table 2.3 Expected Number of On-Site Worker Accidents Under Each Corrective Action Alternative[a,b]

Corrective Action Alternative	Injuries	Fatalities
Source Control-GWP	0	0
Source Control-Cutoff Wall	0.19	1.6×10^{-3}
Source Control-GMS	0.47	4.1×10^{-3}

Notes:
Source Control-GMS = Source Control with Groundwater Management System; Source Control-GWP = Source Control with Groundwater Polishing.
(a) Although source control (*i.e.*, closure-in-place [CIP]) is a primary component of the corrective action, source control was completed in 2020 and the worker accidents associated with source control are not included in this analysis.
(b) Worker accidents associated with groundwater sampling and monitoring are not included in this analysis for any of the alternatives.

Off-Site, a greater number of haul truck miles, labor and equipment mobilization/demobilization miles, and material delivery miles would be required under the Source Control compared to the Source Control-GWP alternative (Tables 2.1 and 2.2). For residual plume management under the Source Control-Cutoff Wall corrective action alternative, 854,000 total off-Site vehicle and equipment travel miles would be required. For residual plume management under the Source Control-GMS corrective action alternative, 1,060,000 total off-Site vehicle and equipment travel miles would be required. In contrast, for residual plume management under the Source Control-GWP alternative, no off-Site vehicle and mileage would be required (Appendix B; Ramboll, 2025b). The United States Department of Transportation (US DOT) provides estimates of the expected number of fatalities and injuries "per vehicle mile driven" for drivers and passengers of large trucks and passenger vehicles (US DOT, 2023a224-2988). Table 2.4 shows the expected number of off-Site accidents under each corrective action alternative due to all categories of off-Site vehicle usage. For these calculations, it was assumed that labor mobilization/demobilization would rely upon passenger vehicles (cars or light trucks, including pickups, vans, and sport utility vehicles) and that hauling, equipment mobilization/demobilization, and material deliveries would rely upon large trucks. Based on US DOT's accident statistics and the mileage estimates in Appendix B, an estimated 0.18 worker injuries and 0.013 worker fatalities would be expected to occur due to off-Site activities under the Source Control-Cutoff Wall alternative; and an estimated 0.24 worker injuries and 0.016 worker fatalities would be expected to occur due to off-Site activities under the Source Control-GMS alternative. No off-Site worker accidents would be expected to occur under the Source Control-GWP alternative.

Table 2.4 Expected Number of Off-Site Worker Accidents Related to Off-Site Car and Truck Use Under Each Corrective Action Alternative[a, b]

Off-Site Vehicle Use Category	Source Control-GWP		Source Control-GMS		Source Control-Cutoff Wall	
	Injuries	Fatalities	Injuries	Fatalities	Injuries	Fatalities
Hauling	0	0	0.14	0.011	0.18	0.014
Labor Mobilization/Demobilization	0	0	4.6×10^{-3}	7.4×10^{-5}	3.0×10^{-2}	4.8×10^{-4}
Equipment Mobilization/Demobilization	0	0	1.2×10^{-2}	9.0×10^{-4}	1.4×10^{-2}	1.0×10^{-3}
Material Deliveries	0	0	0.024	1.8×10^{-3}	1.5×10^{-2}	1.1×10^{-3}
Total:	0	0	0.18	0.013	0.24	0.016

Notes:
Source Control-GWP = Source Control with Groundwater Polishing; Source Control-GMS = Source Control with Groundwater Management System.
(a) Although source control (*i.e.*, closure-in-place [CIP]) is a primary component of the corrective action, source control was completed in 2020 and the worker accidents associated with source control are not included in this analysis.
(b) Worker accidents associated with groundwater sampling and monitoring are not included in this analysis for any of the alternatives.

Overall, considering accidents occurring both on- and off-Site, no worker injuries and worker fatalities would be expected to occur for residual plume management under the Source Control and GWP alternative; 0.37 worker injuries and 0.015 worker fatalities would be expected to occur for residual plume management under the Source Control-Cutoff Wall alternative; and 0.72 worker injuries and 0.021 worker fatalities would be expected to occur for residual plume management under the Source Control-GMS alternative. Thus, overall risks to workers would be highest under the Source Control-GMS alternative and lowest under the Source Control-GWP alternative.

Community Risks

Vehicle accidents that occur off-Site can result in injuries or fatalities among community members as well as workers. Based on the accident statistics reported by US DOT (2023b) and the off-Site travel mileages reported in Appendix B (and summarized in Tables 2.1-2.2), off-Site vehicle accidents could result in an estimated 0.22 injuries and 1.7×10^{-3} fatalities among community members (*e.g.*, people involved in haul truck accidents that are neither haul truck drivers nor passengers, including pedestrians, drivers of other vehicles, *etc*.) for residual plume management under the Source Control-Cutoff Wall alternative (Table 2.5). For residual plume management under the Source Control-GMS alternative, off-Site vehicle accidents could result in an estimated 0.28 community injuries and 2.2×10^{-3} community fatalities. No off-Site mileage is expected under the Source Control-GWP alternative. Therefore, off-Site impacts on nearby residents, including injuries or fatalities, would be highest under the Source Control-GMS alternative, and lowest under the Source Control-GWP alternative.

Table 2.5 Expected Number of Community Accidents Under Each Corrective Action Alternative[a, b]

Off-Site Vehicle Use Category	Source Control-GWP		Source Control-GMS		Source Control-Cutoff Wall	
	Injuries	Fatalities	Injuries	Fatalities	Injuries	Fatalities
Hauling	0	0	0.18	1.3×10^{-3}	0.23	1.7×10^{-3}
Labor Mobilization/Demobilization	0	0	1.9×10^{-3}	3.0×10^{-5}	0.01	2.0×10^{-4}
Equipment Mobilization/Demobilization	0	0	0.02	1.1×10^{-4}	0.02	1.3×10^{-4}
Material Deliveries	0	0	0.03	2.2×10^{-4}	0.02	1.4×10^{-4}
Total:	0	0	0.22	1.7×10^{-3}	0.28	2.2×10^{-3}

Notes:
Source Control-GMS = Source Control with Groundwater Management System; Source Control-GWP = Source Control Groundwater Polishing.
(a) Although source control (*i.e.*, closure-in-place [CIP]) is a primary component of the corrective action, source control was completed in 2020, and the worker accidents associated with source control are not included in this analysis
(b) Worker accidents associated with groundwater sampling and monitoring are not included in this analysis for any of the alternatives.

2.2.5.2 Cross-Media Impacts to Air

Air pollution can occur both on-Site (*e.g.*, construction activities) and off-Site (*e.g.*, along transportation routes), potentially impacting workers as well as community members. Diesel emissions are a major source of air pollutants and greenhouse gas (GHG) emissions at construction sites. Diesel exhaust contains air pollutants, including nitrogen oxides (NO_x), particulate matter (PM), carbon monoxide (CO), and volatile organic compounds (VOCs) (Hesterberg *et al*., 2009; Mauderly and Garshick, 2009). Construction equipment also emits GHGs, including carbon dioxide (CO_2) and possibly nitrous oxide (N_2O). The potential impact of each corrective action alternative on GHG emissions is proportional to the potential impact of each alternative on other emissions from construction vehicles and equipment. On-Site emissions would be highest for residual plume management under the Source Control-GMS alternative due to the greatest amount of on-Site vehicle travel miles required under this corrective action alternative (72,700 total on-Site travel miles under the Source Control-GMS alternative *versus* 57,800 total on-Site travel miles under the Source Control-Cutoff Wall alternative and no on-Site travel miles under the source Control-GWP alternative; Section 2.1.1; Tables 2.1-2.2). Off-Site emissions would similarly be the highest for residual plume management under the Source Control-GMS alternative, due to the greatest amount of off-Site vehicle and equipment travel miles required under this alternative (1,060,000 total off-Site travel miles under the Source Control-GMS alternative *versus* 854,000 total off-Site travel miles under the Source Control-Cutoff Wall alternative, and no off-Site travel miles Source Control-GWP alternatives; Section 2.1.1; Tables 2.1-2.2). In summary, air impacts would be highest for the Source Control-GMS alternative due to greatest vehicle travel miles, and lowest for the Source Control-GWP alternative, because no construction activities would be expected under this alternative.

2.2.5.3 Cross-Media Impacts to Surface Water and Sediments

Under all corrective action alternatives, the source control was implemented in 2020 (IEPA approved CIP approach), and as a result, constituent mass flux from groundwater into surface water will decline over time (OBG, 201922). The source control approach included dewatering, which removed the hydraulic head within the impoundment, and has "significantly reduced infiltration rates relative to pre-closure conditions" (Appendix C, Ramboll, 2024a). This further reduces the hydraulic flux through the CCR. Due to the reduction in the hydraulic flux out of the FAPS, the mass flux out of the FAPS would also be controlled and minimized. Groundwater modeling performed in support of the Closure Plan suggested that the source control would provide control on surface run-off on the cover system and reduce groundwater contaminant

concentrations, and decrease the potential transport of CCR constituents off-Site (NRT, 2014a,b; Burns & McDonnell, 2021).

Under the Source Control-GWP alternative, minimal surface water and sediment impacts would be expected, because it would not require the construction of any engineered systems or structures (other than utilizing existing monitoring wells).

Under the Source Control-Cutoff Wall and Source Control-GMS alternatives, surface water and sediment impacts associated with residual plume management would be higher than the those of Source Control-GWP alternative due to the construction activities related to each of the required engineered systems. Construction can have short-term negative impacts on surface water and sediment quality immediately adjacent to a site due to erosion and sediment runoff. Any associated impacts would be addressed through best management practices (BMPs) in accordance with Site land disturbance permits.

2.2.5.4 Control of Exposure to Any Residual Contamination During Implementation of the Remedy

Source control (IEPA approved CIP approach) was implemented in 2020. Thus, there are no further risks of CCR exposure associated with source control implementation. However, impacted soils and groundwater can be a source of CCR-related constituent exposure for workers. Risks to workers arising from potential contact with residual contamination during construction, operation, and maintenance activities associated with residual plume management would be higher for the Source Control-Cutoff Wall and Source Control-GMS alternatives than for the Source Control-GWP alternative, because the Source Control-Cutoff Wall alternative would involve excavation and disposal of excavated spoils from trenching, and the Source Control-GMS alternative would involve the production, management, and treatment of extracted water, as well as off-Site disposal of excavated spoils generated during extraction trench construction. The Source Control-GWP alternative would not involve exposure to either of the soil or groundwater waste streams associated with residual plume management. Any potential CCR-exposures during the Source Control-GMS and Source Control-Cutoff Wall alternatives would be managed through the use of rigorous safety protocols and personal protective equipment.

2.2.5.5 Other Identified Impacts

Source control (IEPA approved CIP approach) was in 2020. Thus, there are no further risks associated with source control implementation.

In addition to safety impacts, cross-media impacts, and the potential for workers to be exposed to residual contamination, construction activities and remedial operations can have significant energy demands and can cause nuisance impacts such as traffic and noise. Energy consumption at a construction site is synonymous with fossil fuel consumption, because the energy to power construction vehicles and equipment comes from the burning of fossil fuels. Fossil fuel demands considered here include the burning of diesel fuel during construction equipment and vehicle travel miles. Because GHG emission impacts and energy consumption impacts both arise from the same sources at construction sites, the trends discussed in Section 2.2.5.2 with respect to GHG emissions also apply to the evaluation of energy demands. Specifically, the energy demands of construction equipment and vehicles associated with residual plume management would be greatest under the Source Control-GMS alternative, while the energy demands under the Source Control-Cutoff Wall alternative associated with residual plume management are expected to be lower, because the latter alternative would not require any significant operational activity. The Source Control-GWP would not require construction or maintenance, so the GHG emissions are expected to be the

least as compared to the other alternatives. Energy would also be required for the operation of the extraction system under the Source Control-GMS alternative, while there is no operational energy required under the Source Control-GWP or Source Control-Cutoff Wall alternatives, because Source Control-GWP would rely on natural physical and geochemical processes, while the Source Control-Cutoff Wall would rely on the constructed barrier wall.

Similarly, traffic and noise impacts associated with the construction phase of the residual plume management are also expected to be higher under the Source Control-GMS and Source Control-Cutoff Wall alternatives than the Source Control-GWP alternative, due to the construction activities that would be required to construct the groundwater management system and Cutoff Wall. Similarly, traffic may increase temporarily around the Site under the Source Control-GMS and Source Control-Cutoff Wall alternatives due to the daily arrival and departure of the workforce, equipment mobilization/demobilization, and material deliveries. However, these impacts would be expected to largely occur at the beginning or end of each workday (for the arrival/departure of the work force), at the beginning or end of the construction period (for equipment mobilization/demobilization), and at specific times throughout the construction period (for material deliveries). Traffic and noise impacts associated with residual plume management from the Source Control-GWP alternative is expected to be minimal, because no construction activities would be expected under the Source Control-GWP alternative.

Construction activities can negatively impact natural resources and habitat near the Site, as well as scenic, and recreational value. Based on a review of the IDNR Historic Preservation Division database and the Illinois State Archaeological Survey database, there are no historic sites located within 1,000 meters of the FAPS (Ramboll, 2021). There would be no impacts associated with residual plume management under the Source Control-GWP alternative because no additional construction activities would occur. However, negative impacts on scenic and recreational value may occur along the Kaskaskia River, which is located approximately 0.5 mile west of the outer perimeter of the FAPS within the Kaskaskia River Watershed (Google LLC, 2022; AECOM, 2016b). The Kaskaskia River SFWA, which spans over 20,000 acres, is popular for fishing and wildlife viewing (IDNR, 2022). A campground is located approximately 300 ft south of the southern perimeter of the FAPS. The Wood Duck Marina is located approximately 2,000 ft west of the western perimeter of the FAPS. The Baldwin Cemetery is located approximately 2,500 ft east of the FAPS (Google LLC, 2022). Under the Source Control-Cutoff Wall and Source Control-GMS alternatives, large cranes, batch plants, and other equipment could be utilized during construction phases. Given the proximity of these areas to the expected construction, it is likely that they would experience some adverse impacts such as visual disturbance, obstruction of view, and noise during the construction period. However, these impacts are expected to diminish once the construction is completed in 12- to 24 months for the Source Control-Cutoff Wall and Source Control-GMS alternatives.

In addition, the construction of the cutoff wall under the Source Control-Cutoff Wall alternative is expected to use a significant amount of cement or bentonite, which would be introduced into the UU and BU. The process would use bentonite-based drilling mud with various additives, similar to the methods employed in well drilling but on a notably larger scale. Adding substantial quantities of these materials into the subsurface environment may cause alteration in groundwater pH levels and affect geochemical conditions in the subsurface.

The construction activities would likely to result some negative impacts to the ecosystem in the vicinity, including disturbance of habitat near the construction areas by causing alarm and escape behavior in nearby wildlife (*e.g.*, due to noise disturbances). It is also possible that limited negative short-term impacts could occur to sensitive aquatic and wetland species in Kaskaskia River and surface water ponds located within the area (see Section 1.1.3) due to sediment runoff during construction.

2.2.6 Time Until Groundwater Protection Standards Are Achieved/Attain the Groundwater Protection Standards Specified in Section 845.600 (IAC Section 845.670(e)(1)(E)/IAC Section 845.680(d)(2))

This section of the report evaluates the time required to achieve GWPSs, pursuant to requirements under IAC Section 845.670(e)(1)(E) (IEPA, 2021a) and under IAC Section 845.680(d)(2).

For most of the FAPS, groundwater flow (both in the UU and the BU) is generally to the west and southwest towards the bedrock valley underlying the Secondary and Tertiary Ponds (located west of FAPS) and the Kaskaskia River. In the northeastern part of the FAPS, groundwater flows to the northwest and eventually discharges in the Kaskaskia River. Some groundwater in the UU may flow into the Secondary and Tertiary Ponds but these units also drain to the Kaskaskia River. Thus, Kaskaskia River is the receiving surface water body for groundwater in the UU and the BU at the Site (Ramboll, 2021, 2024b).

The source control activities were completed in 2020. Groundwater modeling in support of the Closure Plan suggested that the source control would lower water levels in the FAPS, reduce groundwater contaminant concentrations, and decrease the potential off-Site transport of CCR constituents (NRT, 2014a,b; Burns & McDonnell, 2021). Additional modeling was conducted for each of the corrective action alternatives to evaluate future groundwater quality in the vicinity of the FAPS as a result of residual plume management. The results of the modeling indicate that the time to achieve GWPSs for all compliance wells is in excess of 100 years[13] for all three corrective action alternatives[14] (Appendix B; Ramboll, 2025a). This is attributed to the underlying native lithological units beneath the CCR, *i.e.*, the UU and BU, which consist of low-permeability soils and underlying low-permeability shale and limestone bedrock. These conditions result in extended times to attain GWPS, regardless of the type of evaluated remedy (Appendix B; Ramboll, 2025a). Table 2.6 summarizes and compares timeline and overall implementation schedule for both alternatives (also discussed in Section 2.1.1 to 2.1.3). The updated model results are consistent with the modeling results presented in the Closure and Post-Closure Care Plan that was prepared in 2016 in support of the Closure Plan, which was subsequently approved by IEPA (Appendix B; Ramboll, 2025b).

In addition to predicting the time to reach GWPSs in the FAPS compliance wells, spatial analyses were conducted to evaluate each alternative's effectiveness in reducing the potential future footprint of contaminants in groundwater. This approach evaluated each alternative with regard CCR constituents that may be migrating beyond the Site's southern property boundary. The results suggest that both plume footprint would not be reduced during the model simulation period for the Source Control-GWP and Source Control-Cutoff Wall alternatives; however, the plume footprint for the Source Control-GMS alternative contracted over the model simulation period from 420 acres to 193 acres (Appendix B; Ramboll, 2025a). Additionally, the model results demonstrate that the Source Control-GMS alternative would be effective at reducing the off-Site transport of CCR constituents across the southern property boundary compared to the other two alternatives (Appendix B; Ramboll, 2025a).

[13] While the model simulation period for each corrective action alternative was 1,000 years, model predictions at such lengthy future timescales are inherently uncertain.

[14] Boron was selected as a surrogate for the contaminant fate and transport simulations to evaluate the effectiveness of each of the corrective action alternative. For modeling purposes, it was assumed that boron would not significantly sorb or chemically react with aquifer solids, which is a conservative estimate for predicting contaminant transport times in the model. Geochemical modeling results indicate that chemical attenuation of boron is feasible under current site conditions (Appendix E; Geosyntec Consultants, Inc., 2025).

Table 2.6 Estimated Timeline and Implementation Schedule Under Each Corrective Action Alternative

Implementation Phase	Implementation Task	Timeframe		
		Source Control-GWP	Source Control-Cutoff Wall	Source Control-GMS
1: Pre-Construction Activities[a]	Agency Coordination, Approvals, and Permitting	NA	6 to 12 months	6 to 12 months
	Final Design and Bid Process		24 to 36 months	24 to 36 months
	Total Timeframe to Complete Pre-Construction Activities		30 to 48 months (3-4 years)	30 to 48 months (3-4 years)
2: Corrective Action Construction	Corrective Action Construction	NA	12 to 24 months	12 to 24 months
	Total Timeframe to Complete Corrective Action Construction		12 to 24 months	12 to 24 months
3: Corrective Action O&M and Closeout	Corrective Action Monitoring (Time to Meet GWPS)	>100 years	>100 years	>100 years
	Corrective Action Confirmation Monitoring	36 months	36 months	36 months
	Corrective Action Completion Reporting	6 months	6 months	6 months
	Total Timeframe to Complete Corrective Action O&M and Closeout	> 100 years	> 100 years	> 100 years
Total Timeline to Complete Corrective Action (All Phases)		>100 years	>100 years	>100 years

Notes:
NA = Non-applicable; O&M = Operations and Management; Source Control-Cutoff Wall = Source Control with a Groundwater Cutoff Wall; Source Control-GMS = Source Control with Groundwater Management System; Source Control-GWP = Source Control with Groundwater Polishing.
(a) Pre-construction activities (Phase 1) are assumed to start after approval of the Corrective Action Construction Permit.
Source: Appendix B; Ramboll, 2025b.

2.2.7 Potential for Exposure of Humans and Environmental Receptors to Remaining Wastes, Considering the Potential Threat to Human Health and the Environment Associated with Excavation, Transportation, Re-disposal, Containment, or Changes in Groundwater Flow (IAC Section 845.670(e)(1)(F))

Section 2.2.1 describes the magnitude of reduction of existing risks under each corrective action alternative. Section 2.2.2 describes the effectiveness of the remedy in controlling the source, including the extent to which containment practices would reduce further releases. Section 2.2.3 describes the likelihood of future releases of CCR occurring under each corrective action alternative, and Section 2.2.5 describes the short-term risks to workers, the community, and the environment during implementation of the remedy, including

safety impacts and control of exposure to any residual contamination. In summary, source control measures (IEPA approved CIP approach) were completed in 2020. Thus, all corrective action alternatives would essentially eliminate the potential for a sudden CCR release (*e.g.*, due to flooding or a dike failure event) due to the absence of impounded water within the unit.

For construction workers, risks arising from potential contact with residual contamination during construction, operation, and maintenance activities associated with residual plume management would be higher for the Source Control-Cutoff Wall and Source Control-GMS alternatives than for the Source Control-GWP alternative, because the Source Control-Cutoff Wall and Source Control-GMS alternatives would both involve the excavation and subsequent management of Site spoils. The Source Control-GMS alternative would additionally involve the production, management, and treatment of extracted water. Any potential CCR exposures occurring under Source Control-Cutoff Wall and Source Control-GMS alternatives during groundwater extraction and treatment or soil excavation within the FAPS would be managed through the use of rigorous safety protocols, personal protective equipment, and appropriate disposal practice. The Source Control-GWP alternative would not involve exposure to either of these soil or groundwater waste streams.

Hydrogeological changes would be expected under the Source Control-Cutoff Wall alternative due to the installation of a low-permeability barrier wall that intersects with the UU and BU. These changes include altering flow patterns in the UU, redirecting groundwater flow around the cutoff wall, and causing changes to normal hydraulic gradients. Some changes in groundwater flow (*i.e.*, controlled discharge into Kaskaskia River) may occur under the Source Control-GMS alternative, due to the operation of the extraction trench. Hydrogeological changes would also be expected under the Source Control-GMS alternative, such as lowering groundwater table in the vicinity of the extraction trench and altering flow patterns in the UU. However, changes to groundwater flow would not be expected to have an effect on the potential for the exposure of humans and environmental receptors to remaining wastes.

2.2.8 Long-Term Reliability of the Engineering and Institutional Controls (IAC Section 845.670(e)(1)(G))

Source Control (IEPA approved CIP approach) was in 2020. Thus, the long-term reliability of source control would be the same for all corrective action alternatives (AECOM, 2016a). The long-term reliability of the engineering and institutional controls associated with residual plume management of each corrective alternative are summarized below.

- Residual plume management under the Source Control-GWP alternative would be reliable, because it would rely on natural physical and geochemical processes, rather than the installation, operation, and maintenance of engineered systems or structures. Under this alternative, engineering failure would not occur, and no O&M activities would be required to ensure the success of the alternative (other than those required for groundwater monitoring). Active groundwater monitoring would be in place to track the remediation progress. Should the predicted decrease in groundwater concentrations not occur, the adaptive site management approach would enable prompt adjustments or enhancements to the corrective action in accordance with IAC Section 845.680(b). This strategy would allow continuous improvement of the FAPS groundwater remediation in response to new Site information and/or the performance of the corrective action alternative.
- Cutoff walls are proven remedies that have been implemented at many sites. Thus, residual plume management under the Source Control-Cutoff Wall alternative would be reliable provided it is constructed in accordance with standard design and specifications. The remedy consists of a passive, below-grade structure, which would not require any O&M activities once it is installed. Some challenges are expected during construction, necessitating specialized equipment

deployment. Quality control (QC) and quality assurance (QA) programs would be required during the construction to ensure the effectiveness of the cutoff wall. Active groundwater monitoring would be in place, similar to the monitoring required under the Source Control-GWP alternative.

- For the Source Control-GMS alternative, groundwater extraction and treatment systems are proven remedies that has been implemented at many sites. Thus, residual plume management under the Source Control-GMS alternative would be expected to be reliable provided it is constructed in accordance with standard design and specifications. Under this alternative, the extraction trench system would require engineering design and installation for groundwater extraction and treatment. Routine and non-routine maintenance of the system is required to ensure reliable operation of the extraction trench and pumps, as well as other MEP system components. Active groundwater monitoring would be in place, similar to those required under the Source Control-GWP alternative.
- For all corrective action alternatives, remedy optimizations would be implemented, if necessary, under the adaptive site management plan.

2.2.9 Potential Need for Replacement of the Remedy (IAC Section 845.670(e)(1)(H))

The potential need for the eventual replacement of the residual plume management remedy under each corrective action alternative is summarized as follows:

- Residual plume management under Source Control-GWP would rely on natural physical geochemical processes to achieve reductions in groundwater concentrations to below the GWPSs. Because no installation, operation, and maintenance of engineered systems or structures would be required, it would be unlikely that the residual plume management remedy under the Source Control-GWP alternative would need to be replaced. Adaptive site management strategies would be used to implement remedy optimizations or replacement, as necessary based on data that are collected, to ensure that remedial goals are achieved.
- Residual plume management under Source Control-Cutoff Wall would rely on a cutoff wall as a physical barrier to achieve reductions in groundwater concentrations to below GWPSs. Because the cutoff wall is a robust, engineered, and maintenance-free subsurface structure, it is unlikely that the residual plume management remedy under the Source Control-Cutoff Wall alternative would need to be replaced. Adaptive site management strategies would be used to implement remedy optimizations or replacement, as necessary based on data that are collected, to ensure that remedial goals are achieved.
- Residual plume management under Source Control-GMS would utilize an extraction trench and a settling pond to extract and treat contaminated water to achieve reductions in contaminant plume sizes, as well as physical and geochemical attenuation. The GMS system is anticipated to be highly reliable with minimal need for replacement within its standard 50-year design lifespan. However, ongoing maintenance and potential replacement of system components are expected over time, including:
    - Periodic maintenance, such as jetting or redevelopment of the perforated drainpipe in the extraction trench.
    - MEP components like pumps and other instrumentation would likely require servicing or replacement every 10 to 20 years, resulting in multiple replacements over the long-term operational life of the remedy.
    - Long-term degradation or fouling of the extraction trench components, including the perforated collection pipe and backfill media, may eventually require replacement. However, data on the

performance of such systems over a timespan greater than 100 years is limited, as these types of systems have only been in use for about 100 years.

- Any future replacement of the extraction trench would be evaluated through ongoing adaptive site management activities.

2.3 The Ease or Difficulty of Implementing a Remedy (IAC Section 845.670 (e)(3))

2.3.1 Degree of Difficulty Associated with Constructing the Remedy (IAC Section 845.670(e)(3)(A))

Source control (IEPA approved CIP approach) was implemented in 2020 (AECOM, 2016a). Thus, there would be no further construction difficulties associated with source control. The expected degree of difficulty associated with residual plume management for each of the corrective action alternatives is summarized below.

- Residual plume management under the Source Control-GWP alternative would rely on physical and geochemical attenuation processes and therefore would not pose any significant construction challenges. Therefore, there would be minimal difficulty in constructing the Source Control-GWP remedy.
- Residual plume management under the Source Control-Cutoff Wall alternative would rely on a barrier wall to prevent groundwater migration off-Site, and physical and geochemical attenuation processes to address downgradient groundwater quality impacts. Some challenges may be encountered during the construction of the cutoff wall, including the following (Appendix B; Ramboll, 2025b):
  - Implementing the remedy entails the mobilization of specialized equipment to the Site, including large cranes, clamshells, slurry cutters, and/or one-pass trenching equipment, *etc*. Supporting equipment such as batch plants, excavation, and grading equipment may also be used.
  - Although cutoff walls are commonly constructed to similar depths in comparable geologic environments, challenges during construction may still arise. These challenges may involve encountering highly permeable layers (leading to slurry loss), obstructions that necessitate specialized techniques and/or equipment for progression, or sidewall instability.
  - The effectiveness of the cutoff wall relies on the construction techniques employed to prevent gaps, voids, or other discontinuities in the structure. Ongoing QC is essential during construction as part of QA activities to prevent such defective features. Additionally, QA programs, such as coring and testing, may be necessary to validate the quality of the constructed barrier.
  - The performance of the wall is contingent on its actual hydraulic conductivity. This necessitates ongoing monitoring and QA/QC testing for slurry mixing, placement, or soil-bentonite mixing. The goal is to ensure adherence to the designed mix and involves routine testing of samples from the wall material.
- Residual plume management under the Source Control-GMS would involve utilization of an extraction trench, settling pond and conveyance system to extract and treat contaminated groundwater, in addition to physical and geochemical attenuation processes to address

downgradient groundwater quality impacts. However, there may be challenges during the implementation of the GMS, including the following (Appendix B; Ramboll, 2025b):

- Implementing the remedy entails the mobilization of specialized equipment to the Site, including large cranes, clamshells, slurry cutters, and/or one-pass trenching equipment, *etc*. Supporting equipment such as batch plants, excavation, and grading equipment may also be used.
- While trenches of similar depth and geology are routinely built, challenges such as encountering obstructions may necessitate specialized techniques and /or equipment.
- The construction may require detailed geotechnical design for the working platform.
- The MEP components are commonly handled by regional or local contractors and are not expected to pose construction challenges.

2.3.2 Expected Operational Reliability of the Remedy (IAC Section 845.670(e)(3)(B))

Source control (IEPA approved CIP approach) was implemented in 2020 (AECOM, 2016a). Thus, the operational reliability of the remedy would be the same for all corrective action alternatives. All three corrective action alternatives would likely be highly reliable with respect to operational controls associated with residual plume management; specific details for each corrective action alternative are discussed below.

- Residual plume management under the Source Control-GWP alternative would have high operational reliability because it would rely on natural processes and active monitoring, rather than the installation, operation, and maintenance of engineered systems or structures (other than monitoring wells). Under the Source Control-GWP alternative, engineering failure would not occur, and no O&M activities would be required to ensure the success of the alternative.
- Residual plume management under the Source Control-Cutoff Wall alternative would also have high operational reliability, because it is an established remedial technology, as long as it is constructed in accordance with standard design specifications for barrier walls. The cutoff wall is a passive, continuous, and low-permeability barrier to groundwater and no O&M would be required after its installation.
- Residual plume management under the Source Control-GMS alternative would also have high operational reliability because it is an established technology as long as the GMS (*i.e.*, the extraction trench and the MEP system) is constructed in accordance with the design specifications. In addition, the remedy would require routine and non-routine maintenance of the mechanical system to ensure reliable operation.

2.3.3 Need to Coordinate with and Obtain Necessary Approvals and Permits from Other Agencies (IAC Section 845.670(e)(3)(C))

All corrective action alternatives would require regulatory approvals. Specific permits and approvals associated with source control were the same for all corrective action alternatives and were discussed in the Closure Plan (AECOM, 2016a). The specific approvals and permits associated with residual plume management for all corrective action alternatives are discussed below.

- Residual plume management under the Source Control-GWP alternative would not need additional permits from other agencies, other than the approval of the eventual Corrective Action Plan.

- Residual plume management under the Source Control-Cutoff Wall alternative would require permits from the IEPA for construction of stormwater controls and BMPs. Due to modification of the FAPS embankment, an Illinois Department of Natural Resources (IDNR) Office of Water Resources, Dam Safety modification permit would need to be obtained. It is estimated permitting, and approval will typically take 6 to 12 months to obtain (Appendix B; Ramboll, 2025b).
- Residual plume management under the Source Control-GMS alternative would require permits from the IEPA for construction of stormwater controls, BMPs, in addition to a joint water pollution control construction and operation permit. Groundwater extracted from the extraction trench would require a modified NPDES permit. The NPDES permit would likely require renewals depending on the timeline of corrective action implementation and typically take 18 to 24 months to obtain. Due to modification of the FAPS embankment, an IDNR Office of Water Resources, Dam Safety modification permit would need to be obtained (Appendix B; Ramboll, 2025b).

2.3.4 Availability of Necessary Equipment and Specialists (IAC Sections 845.670(e)(3)(D) and 845.660(c)(1), "Ease of Implementation")

Source control (IEPA approved CIP approach) was implemented in 2020 (AECOM, 2016a). Thus, there are no further equipment and specialist needs associated with the implementation of the source control remedy. Specialized equipment and personnel are essential for field data collection and groundwater sampling for residual plume management under all potential corrective action alternatives. Additionally, the assessment of groundwater concentrations for Site constituents would necessitate laboratory equipment and specialists for all alternatives. The availability of equipment and specialists associated with residual plume management for each corrective action alternative is summarized below.

- Residual plume management under the Source Control-GWP alternative would require groundwater professionals, such as geologists, hydrogeologists, statisticians (*i.e.*, statistical analysis), and geochemists to evaluate all monitoring data, ensuring that physical and geochemical processes function as anticipated for this alternative. The equipment and specialists needed for Site groundwater monitoring and analysis are currently engaged in these tasks as part of the routine groundwater monitoring program outlined in accordance with IAC Section 845.220(c)(4).
- Residual plume management under the Source Control-Cutoff Wall alternative would require specialists and specialty equipment for the construction of the cutoff wall.
    - Excavation and construction of the cutoff wall on the Site would require a specialized contractor with experience excavating similar size trenches in similar geologic environments and constructing barrier walls with similar design specification. The contractor would probably need specialized and often custom-built equipment including large cranes, slurry cutters, batch plants and/or one-pass construction equipment.
    - Specialists involved in the design and construction of cutoff walls would be essential during both phases. This team of specialists should involve design engineers, construction managers, and contractor staff with expertise in cutoff wall construction and equipment operation.
    - The types of equipment and specialists should have been employed for projects similar to designing and building cutoff walls. However, there may be backlogs associated with the equipment and specialists, due to the high existing demand for specialty ground improvement contractors and design specialists who are engaged with similar projects in sectors like electric utilities, dams/levees, and other areas.
    - This alternative would also require the use of equipment and the expertise of specialists for tasks such as field data collection, groundwater sampling, groundwater sample analysis, and

periodic corrective action groundwater monitoring and reporting. Similar to those in the Source Control-GWP alternative, these activities are already being conducted as part of routine groundwater monitoring in accordance with IAC Section 845.220(c)(4).

- Residual plume management under the Source Control-GMS alternative would require specialists to install and manage the GMS system throughout its operational period.
  - Construction of the extraction system on the Site would require a specialized contractor with experience constructing similar size trenches in similar geologic environments. The contractor would probably need specialized and often custom-built equipment including one-pass construction equipment.
  - Specialists involved in the design and construction of cutoff walls would be essential during both phases. This team of specialists should involve design engineers, construction managers, and contractor staff with expertise in trench construction and equipment operation. Geotechnical specialists may be required to design the working platform and monitor the FAPS embankment for any signs of distress during the one-pass trench installation.
  - The types of equipment and specialists should have been employed for projects similar to designing and installing extraction trenches. However, there may be backlogs associated with the equipment and specialists, due to the high existing demand for specialty ground improvement contractors and design specialists who are engaged with similar projects in sectors like electric utilities, dams/levees, and other areas.
  - This alternative would necessitate the use of equipment and the expertise of specialists for tasks such as regular groundwater system O&M, field data collection, groundwater sampling, analysis, and periodic corrective action groundwater monitoring and reporting. Similar to those in the GWP alternative, some of these activities are already being conducted as part of routine groundwater monitoring in accordance with IAC Section 845.220(c)(4).

2.3.5 Available Capacity and Location of Needed Treatment, Storage, and Disposal Services/Comply with Standards for Management of Wastes as Specified in Section 845.680(d) (IAC Section 845.670(e)(3)(E)/IAC Section 845.670(d)(5))

The available capacity and location of needed treatment, storage, and disposal services associated with residual plume management under each corrective action alternative is summarized below. All the practices employed in an alternative would comply with standards for the management of wastes as specified in IAC Section 845.670(e)(3)(E) and IAC Section 845.680(d)(5).

- Residual plume management for the Source Control-GWP remedy would not require any treatment, storage, or disposal services, because GWP is not anticipated to produce a substantial amount of waste or wastewater, aside from minor purge water volumes generated during routine groundwater sampling activities for residual plume management. This could be managed by a standard waste management contractor.
- Residual plume management for the Source Control-Cutoff Wall would generate CCR-containing spoils during the construction phase. The CCR spoils would be transported to an off-Site landfill for disposal. An evaluation would be completed to determine the best location for disposal. Excavated non-CCR spoils would be disposed of at an appropriate on-Site location. No wastes would be expected to be generated during operations of the cutoff wall, and consequently, no additional treatment, storage, or disposal services would be necessary for this remedy.

- Residual plume management for the Source Control-GMS alternative would generate waste during construction of the extraction trench system and management of wastewater through a settling pond on-Site:
  - The construction of the extraction trench would generate spoils, and the waste materials consisting of predominantly CCR would be dried and disposed at an appropriate on-Site location. An evaluation would be completed to determine the best location for disposal.
  - The extraction trench system would send extracted groundwater to an on-Site settling pond, which collects solids removed during groundwater recovery *via* the pneumatic extraction pumps and transfer piping. The location of the settling pond would be evaluated at a later phase. The siting of the settling pond would need to consider limiting impacts to existing Site infrastructure, wetlands, and floodplains.
  - Discharge from the settling pond would be conveyed to an NPDES permitted outfall. Renewal of the NPDES permits may be necessary to continue operations, depending on the timeline of the corrective action implementation in relation to the remedy completion.

2.4 The Degree to Which Community Concerns Are Addressed by the Remedy (IAC Section 845.670(e)(4))

Several nonprofit groups raised concerns regarding the potential impacts of the FAPS on groundwater and surface water quality including Earthjustice, the Prairie Rivers Network, and the Sierra Club (Earthjustice *et al*., 2018; Lydersen, 2017). The combination of source control (IEPA approved CIP approach) and residual plume management would cause groundwater concentrations to decline over time under all of the corrective action alternatives (NRT, 2014a; Burns & McDonnell, 2021), thus addressing community concerns. The CCR constituents impacts to off-Site groundwater are being monitored and will be addressed by residual plume management under the three corrective action alternatives.

A public meeting was held on March 20, 2025, pursuant to requirements under IAC Section 845.710(e). Questions raised by attendees were addressed at the meeting; a written summary of the questions and responses was prepared.

2.5 Remove From the Environment as Much of the Contaminated Material that Was Released from the CCR Surface Impoundment as Is Feasible, Taking into Account Factors such as Avoiding Inappropriate Disturbance of Sensitive Ecosystems (IAC Section 845.670(d)(4))

There have been no known releases of CCR at the FAPS (Ramboll, 2025c). All potential corrective action alternatives include source control (IEPA approved CIP approach). These source control activities are expected to "minimize water infiltration into the closed FAPS and improve surface water drainage off the cover system, thus reducing generation of potentially impacted water and ultimately reducing the extent of CCR impacts to groundwater" (Appendix C; Ramboll, 2024a). Groundwater modeling performed in support of the Closure Plan suggested that the source control would provide control of surface run-off on the cover system, lower water levels in the FAPS, reduce groundwater contaminant concentrations, and decrease the potential transport of CCR constituents off-Site (NRT, 2014a,b; Burns & McDonnell, 2021). Due to the reduction in the hydraulic flux out of the FAPS, the mass flux out of the FAPS would also be controlled and. Therefore, source control is preventing further releases of CCR constituents into the environment.

Moreover, residual plume management under each corrective action alternative will further result in the removal of contaminated material from the environment and/or the improvement of downgradient groundwater quality. Additional modeling was conducted for each of the corrective action alternatives to evaluate future groundwater quality in the vicinity of the FAPS as a result of residual plume management. The results predicted a reduction in size of the groundwater plume from 420 acres to 193 acres under the Source Control-GMS alternative (Appendix B; Ramboll, 2025b). Specific considerations for residual plume management for each alternative are provided below.

- Residual plume management under the Source Control-GWP alternative would address impacted groundwater by relying on natural physical and geochemical attenuation processes to reduce the residual concentrations of CCR. Site-specific evaluations have shown that groundwater polishing would reduce the groundwater concentrations and mobility of inorganic contaminants. Specifically, the results indicate that boron and sulfate attenuation *via* sorption onto mineral surfaces such iron and aluminum oxides, would occur under current conditions (*i.e.*, post-closure). Some desorption is predicted to occur as groundwater returns to background conditions, but the changes are expected to be minimal (Appendix E; Geosyntec Consultants, Inc., 2025). In cases in which observed groundwater concentrations deviate significantly from modeled conditions, alternative methods or techniques would be evaluated under the adaptive site management, and if viable, incorporated as per IAC Section 845.680(b). No sensitive ecosystems would be disturbed because no construction activities would be expected under the Source Control-GWP alternative.
- Residual plume management under the Source Control-Cutoff Wall would rely on an engineered system to prevent the horizontal migration of impacted groundwater away from the FAPS. Groundwater quality would also be improved as a result of physical and geochemical attenuation processes. The construction activities would likely result in some negative impacts to the ecosystem, including disturbance of habitat near the construction areas by causing alarm and escape behavior in nearby wildlife (*e.g.*, due to noise disturbances). Short-term impacts could also occur to sensitive aquatic and wetland species in Kaskaskia River and other wetlands and surface water near the FAPS (see Section 1.1.3) due to sediment runoff during construction.
- Residual plume management under the Source Control-GMS alternative would rely on an engineered extraction system to actively remove constituent mass from the environment. Residual concentrations of CCR constituents in groundwater would also be reduced as a result of physical and geochemical attenuation processes. The construction activities would likely result in some negative impacts to the ecosystem, including disturbance of habitat near the construction areas by causing alarm and escape behavior in nearby wildlife (*e.g.*, due to noise disturbances). Short-term impacts could also occur to sensitive aquatic and wetland species in Kaskaskia River and other wetlands and surface water near the FAPS (see Section 1.1.3) due to sediment runoff during construction.

2.6 Summary

This CAAA evaluates three corrective action alternatives identified as potentially viable in the CMA with regard to each of the factors specified in IAC Section 845.670(d) and 845.670(e) (IEPA, 2021). Based on this evaluation, the most appropriate corrective action for this Site is Source Control-GMS. While the time to achieve GWPSs for all three alternatives was predicted to be in excess of 100 years due to the presence of native low-permeability lithological units, groundwater modeling suggests that Source Control-GMS would be most effective at reducing plume size and minimizing the risk of CCR constituents migrating beyond the Site's southern property boundary. Thus, Source Control-GMS is the most appropriate corrective action alternative for the FAPS.

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Appendix A

Human Health and Ecological Risk Assessment

Human Health and Ecological Risk Assessment
Fly Ash Pond System
Baldwin Power Plant
Baldwin, Illinois

February 12, 2025

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Abbreviations

ADI	Acceptable Daily Intake
BAP	Bottom Ash Pond
BCF	Bioconcentration Factor
BCG	Biota Concentration Guide
BPP	Baldwin Power Plant
BU	Bedrock Unit
CAAA	Corrective Action Alternative Analysis
CCR	Coal Combustion Residuals
CEM	Conceptual Exposure Model
COI	Constituent of Interest
COPC	Constituent of Potential Concern
CSF	Cancer Slope Factor
CSM	Conceptual Site Model
CWS	Community Water Supply
ESV	Ecological Screening Value
FAPS	Fly Ash Pond System
GWPS	Groundwater Protection Standard
GWQS	Groundwater Quality Standard
HTC	Human Threshold Criteria
IAC	Illinois Administrative Code
ID	Identification
IEPA	Illinois Environmental Protection Agency
K_d	Equilibrium Partitioning Coefficient
MCL	Maximum Contaminant Level
NRWQC	National Recommended Water Quality Criteria
ORNL RAIS	Oak Ridge National Laboratory's Risk Assessment Information System
pCi/L	PicoCuries per Liter
PMP	Potential Migration Pathway
PRG	Preliminary Remediation Goal
RfD	Reference Dose
RME	Reasonable Maximum Exposure
RSL	Regional Screening Level
SFWA	State Fish and Wildlife Area
SWQS	Surface Water Quality Standard
UA	Uppermost Aquifer
UGU	Upper Groundwater Unit
US DOE	United States Department of Energy
US EPA	United States Environmental Protection Agency
UU	Upper Unit

1 Introduction

Dynegy Midwest Generation, LLC operates the Baldwin Power Plant (BPP or "the Site") in Baldwin, Illinois. BPP is an electric power generating facility with coal-fired units that began operation in 1970 (Ramboll, 2021a). The BPP has several surface impoundments for storage of coal combustion residuals (CCR): the Bottom Ash Pond (BAP) (Vistra identification [ID] number [No.] 601, Illinois Environmental Protection Agency [IEPA] ID No. W1578510001-06); the Fly Ash Pond System (FAPS, an IEPA closed CCR Unit) (Vistra ID No. 605; IEPA ID Nos. W1578510001-01, W1578510001-02, and W1578510001-03); the Secondary Pond, Tertiary Pond; and Cooling Pond (Ramboll, 2021a). The FAPS, the subject of this report, includes the East Fly Ash Pond (76 acres), Old East Fly Ash Pond (102 acres), and the West Fly Ash Pond (54 acres) (NRT, 2016).

This report presents the results of an evaluation that characterizes potential risk to human and ecological receptors that may be exposed to CCR constituents in environmental media originating from the FAPS. This risk evaluation was performed to support the Corrective Action Alternative Analysis (CAAA) for the FAPS in accordance with requirements in Title 35 Part 845 of the Illinois Administrative Code (IAC) (IEPA, 2021). Human and ecological risks were evaluated for Site-specific constituents of interest (COIs). The conceptual site model (CSM) assumed that Site-related COIs in groundwater may migrate to the Kaskaskia River and affect surface water and sediment in the vicinity of the Site.

Consistent with United States Environmental Protection Agency (US EPA) guidance (US EPA, 1989), this report used a tiered approach to evaluate potential risks, which included the following steps:

1. Identify complete exposure pathways and develop a conceptual exposure model (CEM).
2. Identify Site-related COIs: Constituents detected in groundwater were considered COIs if their maximum detected concentration over the period from 2019 to 2024 exceeded a groundwater protection standard (GWPS) identified in Part 845.600 (IEPA, 2021), or a relevant surface water quality standard (SWQS) (IEPA, 2019; US EPA Region IV, 2018).
3. Perform screening-level risk analysis: Compare maximum measured or modeled COI concentrations in surface water and sediment to conservative, health-protective benchmarks in order to determine constituents of potential concern (COPCs).
4. Perform refined risk analysis: If COPCs are identified, perform a refined analysis to evaluate potential risks associated with the COPCs.
5. Formulate risk conclusions and discuss any associated uncertainties.

This assessment relies on a conservative (*i.e.*, health-protective) approach and is consistent with the risk approaches outlined in US EPA guidance. Specifically, we considered evaluation criteria detailed in IEPA guidance documents (*e.g.*, IEPA, 2013, 2019), incorporating principles and assumptions consistent with the Federal CCR Rule (US EPA, 2015a) and US EPA's "Human and Ecological Risk Assessment of Coal Combustion Residuals" (US EPA, 2014).

US EPA has established acceptable risk metrics. Risks above these US EPA-defined metrics are termed potentially "unacceptable risks." Based on the evaluation presented in this report, no unacceptable risks to human or ecological receptors resulting from CCR exposures associated with the FAPS were identified. This means that the risks from the Site are likely indistinguishable from normal background risks. Specific risk assessment results include the following:

- For groundwater used as drinking water, based on recent investigations and data collected from off-Site monitoring wells, private wells on properties south of the BPP are unlikely to be impacted by groundwater constituents associated with the BPP in excess of the GWPSs. The other private wells identified in the vicinity of the Site are upgradient or side-gradient of the BPP, and are therefore also unlikely to be impacted by groundwater constituents from the BPP. Thus, no risks were identified related to the use of groundwater.
- For surface water used as a drinking water source, all modeled COI concentrations were below the conservative risk-based screening benchmarks. Thus, no risks were identified related to the use of surface water from the Kaskaskia River adjacent to the Site.
- No unacceptable risks were identified for recreators boating in the Kaskaskia River to the west of the Site.
- No unacceptable risks were identified for recreators exposed to sediment in the Kaskaskia River to the west of the Site.
- No unacceptable risks were identified for anglers consuming locally caught fish.
- No unacceptable risks were identified for ecological receptors exposed to surface water or sediment.
- No bioaccumulative ecological risks were identified.

It should be noted that this evaluation incorporates a number of conservative assumptions that tend to overestimate exposure and risk. Moreover, while this evaluation concluded that current conditions do not present a risk to human health or the environment, it should be noted that based on the location of current off-site groundwater wells and the results of groundwater modeling (Ramboll, 2025a), future conditions are also not expected to present a risk to human health or the environment.

2 Site Overview

2.1 Site Description

The BPP is located in southwest Illinois in Randolph and St. Clair Counties. The FAPS is located "approximately one-half mile west-northwest of the Village of Baldwin" (Figure 2.1) (Ramboll, 2021a). The FAPS (Vistra ID No. 605; IEPA ID Nos. W1578510001-01, W1578510001-02, and W1578510001-03) is a Part 845 regulated CCR Unit (Ramboll, 2021a). The FAPS was approved for closure by IEPA in August 2016, with the final cover system completed in November 2020 (Ramboll, 2021a).

"The BPP property is bordered to the west by the Kaskaskia River; to the east by Baldwin Road, farmland, and strip mining areas; to the southeast by the village of Baldwin; to the south by the Illinois Central Gulf railroad tracks, scattered residences, and State Route 154; and to the north by farmland. The St. Clair/Randolph County Line crosses east-west at approximately the midpoint of Baldwin Lake (Cooling Pond)" (Figure 2.1) (Ramboll, 2021a).

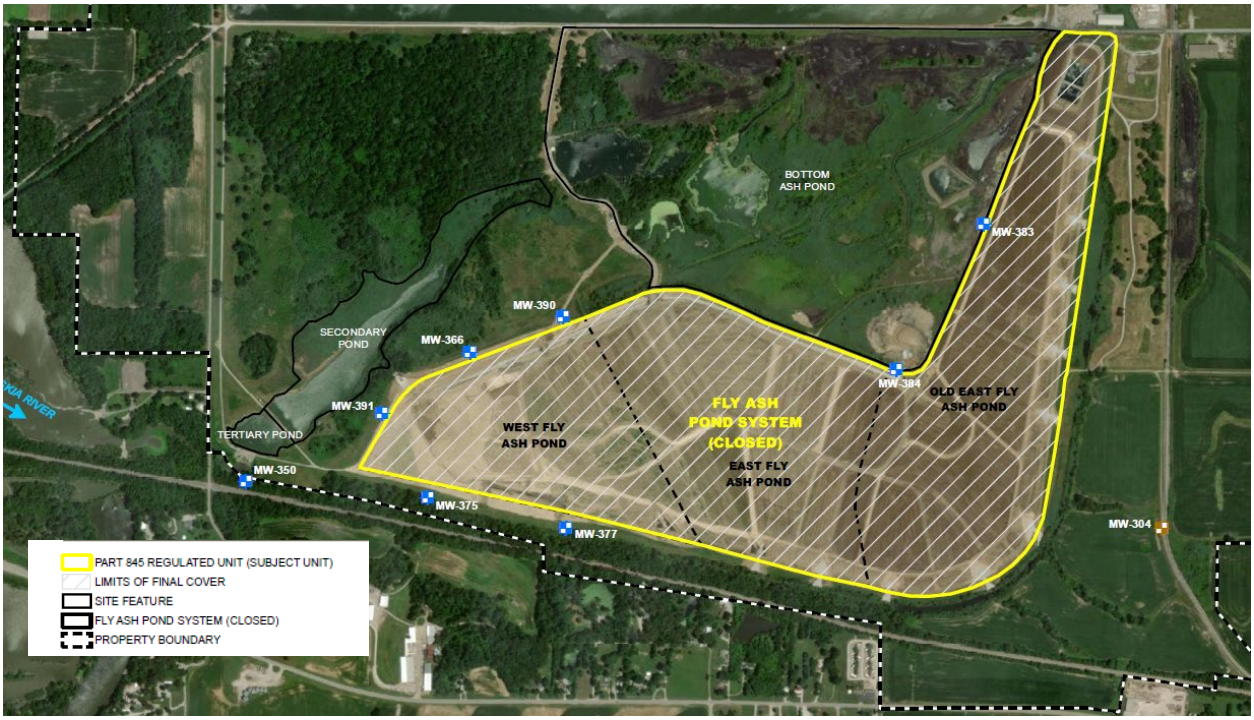

Figure 2.1 Site Location Map. Source: Ramboll (2021b).

2.2 Geology/Hydrogeology

The geology underlying the Site in the vicinity of the FAPS consists of unlithified materials (alluvium and glacial deposits) underlain by Pennsylvanian and Mississippian bedrock, which consists of shale and limestone, with lesser amount of sandstone (NRT, 2016; Ramboll, 2021a, 2024a). The unlithified materials

predominantly includes clay with some silt and intermittent sand seams and lenses. There are two distinct hydrostratigraphic units that underlie the CCR at the FAPS:

- **Upper Unit (UU)[1]:** The UU, composed of unlithified materials, is directly beneath the FAPS. It consists of four lithologic layers – Cahokia Formation (sandy clay and clayey sand), Peoria Loess (silt and silty clay), Equality Formation (sandy clay with occasional sand seams), and Vandalia Till (clay with discontinuous sand lenses) (Ramboll, 2021a). The thickness of the UU underneath the FAPS varies between 17 feet in the eastern part of the FAPS to 56 feet in the northern and western part of the FAPS[2] (Ramboll, 2024a). The unlithified materials within the UU do not represent a continuous aquifer unit (Ramboll, 2024a).
- **Bedrock Unit (BU):** The BU underlies the UU and is composed of interbedded shale and limestone bedrock, which is continuous across the entire BPP Site (Ramboll, 2021a). The geometric mean horizontal hydraulic conductivity for the uppermost aquifer (UA) is 5.0×10^{-6} cm/sec (Ramboll, 2021a, 2024a).

Thin sand lenses in the UU and the interface (area of contact) between the UU and the bedrock have both been identified as potential migration pathways (PMPs) (Ramboll, 2021a, 2024a). The BU is the UA (Ramboll, 2024a).

The Kaskaskia River, located to the west of FAPS, is the principal regional surface drainage. For most of the FAPS, lateral groundwater flow (both in the UU and the BU) is generally to the west and southwest toward the bedrock valley underlying the Secondary and Tertiary Ponds (located west of FAPS) and the Kaskaskia River. In the northeastern part of the FAPS, groundwater locally flows in the northwest direction but eventually flows toward the Kaskaskia River. Some groundwater in the UU may flow into the Secondary and Tertiary Ponds but subsequently drains to the Kaskaskia River. Thus, the Kaskaskia River is the receiving surface water body for groundwater in the UU and the BU (Ramboll, 2021a, 2024a).

2.3 Conceptual Site Model

A CSM describes sources of contamination, the hydrogeological units, and the physical processes that control the transport of water and solutes. In this case, the CSM describes how groundwater underlying the FAPS migrates and potentially interacts with surface water and sediment in the adjacent Kaskaskia River. The CSM was developed using site-specific hydrogeologic data (NRT, 2016; Ramboll, 2021a, 2024a), including information on groundwater flow and surface water characteristics. Groundwater (and CCR-related constituents originating from the FAPS) may migrate vertically downward through the UU into the BU (which is the UA). Groundwater flows laterally to the west and southwest through the UU and the BU and ultimately flows into the Kaskaskia River (Figure 2.2). Identified PMPs at the Site include the thin sand lenses in the UU adjacent to the FAPS, and the area of contact between the UU and the BU. Dissolved constituents in groundwater may partition between river sediments and Kaskaskia River surface water.

[1] The UU was referred to as the Upper Groundwater Unit (UGU) in previous reports (Ramboll, 2024a).
[2] The thickness of the UU at MW-150 (to the west of the FAPS) is 13 feet (Ramboll, 2024a).

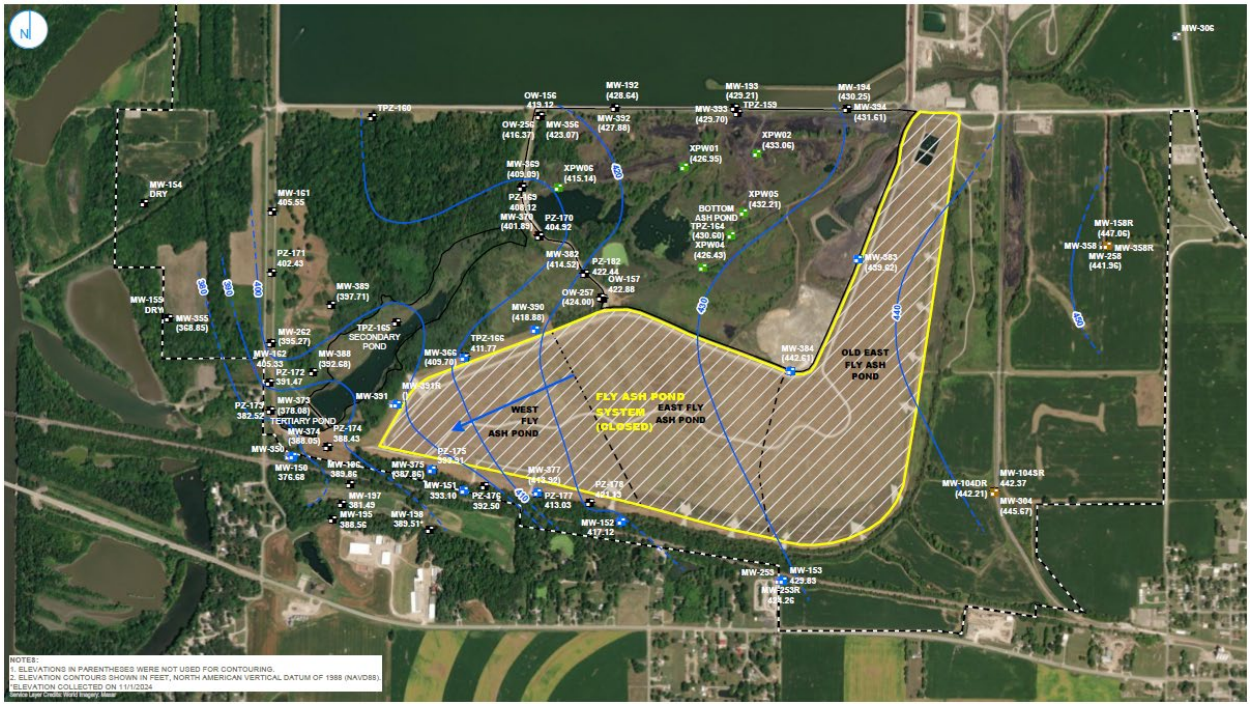

Figure 2.2 Shallow Potentiometric Surface Map and Groundwater Flow Direction. Source: Ramboll (2024b).

2.4 Groundwater Monitoring

Data from the following monitoring wells were included in this risk assessment, as they are used to monitor groundwater quality downgradient and upgradient of the FAPS in both the UU and BU (Figure 2.3):

- UU or PMP: MW-150, 151, 152, 153, 195, 196, 197, 198, 252, 253/253R
- BU or UA: MW-304, 306, 350/350R, 352, 358/358R, 366, 375, 377, 383, 384, 390, 391

The well construction details are presented in Table 2.1. The analyses presented in this report rely on the available data from these wells collected between 2019 and 2024. Groundwater samples were analyzed for a suite of total metals, specified in Illinois CCR Rule Part 845.600 (IEPA, 2021),[3] as well as general water quality parameters (chloride, fluoride, sulfate, and total dissolved solids). A summary of the groundwater data used in this risk evaluation is presented in Table 2.2. The use of groundwater data in this risk evaluation does not imply that detected constituents are associated with the FAPS or that they have been identified as potential groundwater exceedances.

[3] Samples were analyzed for a longer list of inorganic constituents and general water quality parameters (chloride, fluoride, sulfate, and total dissolved solids), but these constituents were not evaluated in the risk evaluation.

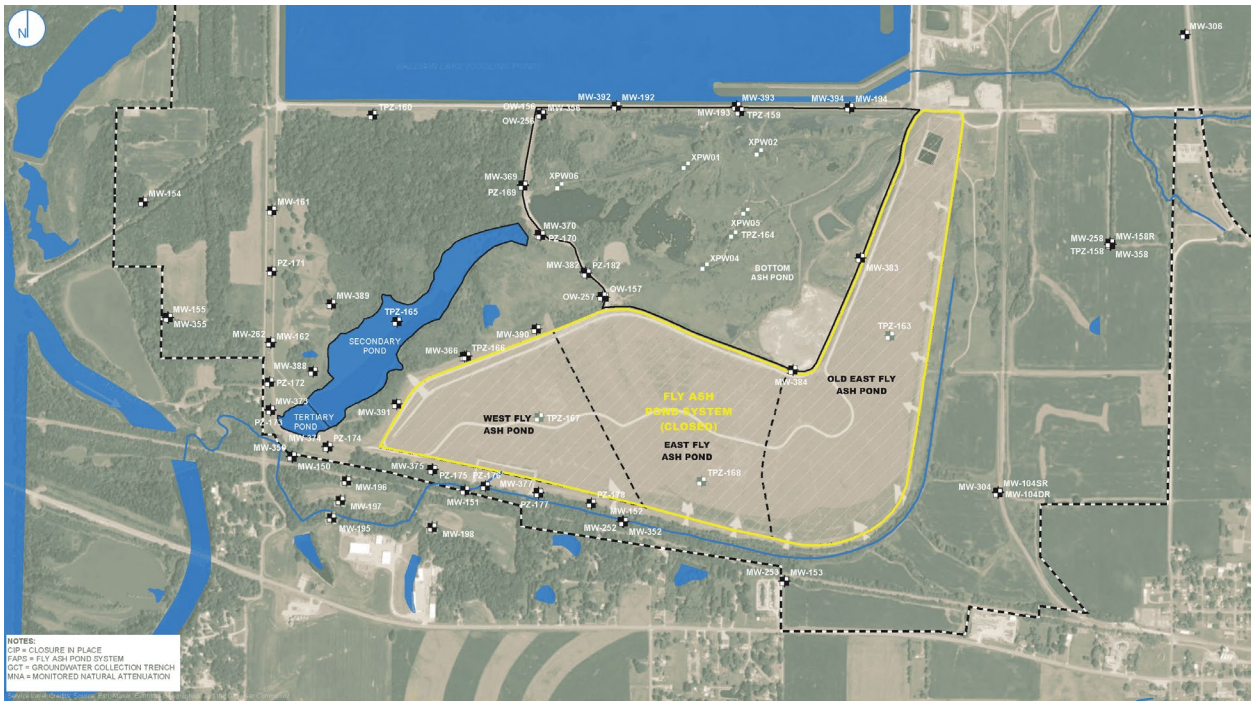

Figure 2.3 Monitoring Well Locations. Sources: Ramboll (2023, 2024b).

Table 2.1 Groundwater Monitoring Wells Related to the FAPS

Well	Date Constructed	Screen Top Depth (ft bgs)	Screen Bottom Depth (ft bgs)	Well Depth (ft bgs)	Hydrogeologic Unit
MW-150	9/1/2010	15.0	24.7	25.2	UU/PMP
MW-151	9/1/2010	6.1	15.8	16.3	UU/PMP
MW-152	9/1/2010	7.5	16.7	17.2	UU/PMP
MW-153	9/1/2010	10.4	20.0	20.5	UU/PMP
MW-195	5/7/2024	38.0	48.0	48.0	UU/PMP
MW-196	5/8/2024	8.0	18.0	20.0	UU/PMP
MW-197	5/8/2024	7.0	17.0	20.0	UU/PMP
MW-198	10/15/2024	8.0	18.0	18.0	UU/PMP
MW-252	9/1/2010	44.4	49.0	49.5	UU/PMP
MW-253/253R	9/1/2010, 5/1/24	29.9	34.5	35.0	UU/PMP
MW-304	10/20/2015	45.0	55.0	55.0	BU/UA
MW-306	9/25/1991	72.7	87.7	87.7	BU/UA
MW-350/350R	9/1/2010, 5/3/24	41.6	46.2	46.6	BU/UA
MW-352	9/1/2010	67.9	72.5	73.0	BU/UA
MW-358	10/8/22	80	90	90	BU/UA
MW-366	12/4/2015	42.0	52.0	52.0	BU/UA
MW-375	11/6/2015	57.0	67.0	67.0	BU/UA
MW-377	11/2/2015	46.0	56.0	56.0	BU/UA
MW-383	12/21/2015	58.0	68.0	68.0	BU/UA
MW-384	12/18/2015	60.5	70.5	70.5	BU/UA
MW-390	3/4/2016	50.0	65.0	65.0	BU/UA
MW-391	3/10/2016	55.0	70.0	70.0	BU/UA

Notes:
BU = Bedrock Unit; FAPS = Fly Ash Pond System; ft bgs = Feet Below Ground Surface; PMP = Potential Migration Pathway; UA = Uppermost Aquifer (Bedrock); UU = Upper Unit.
Wells MW-253R, MW-350R, and MW-358R are replacement wells.
Sources: Ramboll (2021a, 2024b,c).

Table 2.2 Groundwater Data Summary (2019-2024)

Constituent	Samples with Constituent Detected	Samples Analyzed	Minimum Detected Value	Maximum Detected Value	Maximum Laboratory Detection Limit
Total Metals (mg/L)					
Antimony	84	241	0.0005	0.005	0.0008
Arsenic	152	241	0.0004	0.0162	0.0087
Barium	241	241	0.0034	1.04	NA
Beryllium	19	205	0.0002	0.0018	0.0002
Boron	233	241	0.013	23	0.02
Cadmium	7	205	0.0002	0.0004	0.0005
Chromium	69	241	0.0007	0.0533	0.0028
Cobalt	87	234	0.0001	0.019	0.0008
Lead	49	227	0.0006	0.02	0.004
Lithium	240	244	0.0034	0.129	0.0019
Mercury	19	205	0.00006	0.00016	0.00012
Molybdenum	182	241	0.0006	0.142	0.0037
Selenium	45	241	0.0006	0.0062	0.0006
Thallium	6	226	0.001	0.0027	0.001
Dissolved Metals (mg/L)					
Antimony	1	3	0.0005	0.0005	0.0004
Arsenic	0	3	-	-	0.0087
Barium	3	3	0.033	0.093	NA
Beryllium	0	3	-	-	0.0002
Boron	216	234	0.015	21.8	0.0092
Cadmium	0	3	-	-	0.0005
Chromium	0	3	-	-	0.0028
Cobalt	0	3	-	-	0.0001
Lead	0	3	-	-	0.004
Lithium	3	3	0.0038	0.0945	NA
Mercury	0	3	-	-	0.00006
Molybdenum	0	3	-	-	0.0037
Selenium	1	3	0.0021	0.0021	0.0006
Thallium	0	3	-	-	0.001
Radionuclides (pCi/L)					
Radium 226 + Radium 228	147	241	0.0281	8.54	2
Other (mg/L or SU)					
pH	386	386	6.08	12.4	NA
Chloride	241	241	8	1370	NA
Fluoride	238	241	0.11	4.93	0.2
Sulfate	235	241	5	1450	31
Total Dissolved Solids	410	410	206	3260	NA
Other Dissolved (mg/L)					
Chloride	250	250	7	1300	NA
Fluoride	3	3	0.43	1.46	NA
Sulfate	233	250	5	1050	12

Notes:
mg/L = Milligrams per Liter; NA = Not Available; pCi/L = PicoCuries per Liter; SU = Standard Unit.
Blank cells indicate constituent not detected.
Source: Ramboll (2025b).

2.5 Surface Water Monitoring

Two surface water samples were collected from the same location in the Kaskaskia River in November, 2016 (Hanson Professional Services Inc., 2017). The sample location is shown as the dot labeled "KRU" in Figure 2.4, and the sampling results are summarized in Table 2.3.

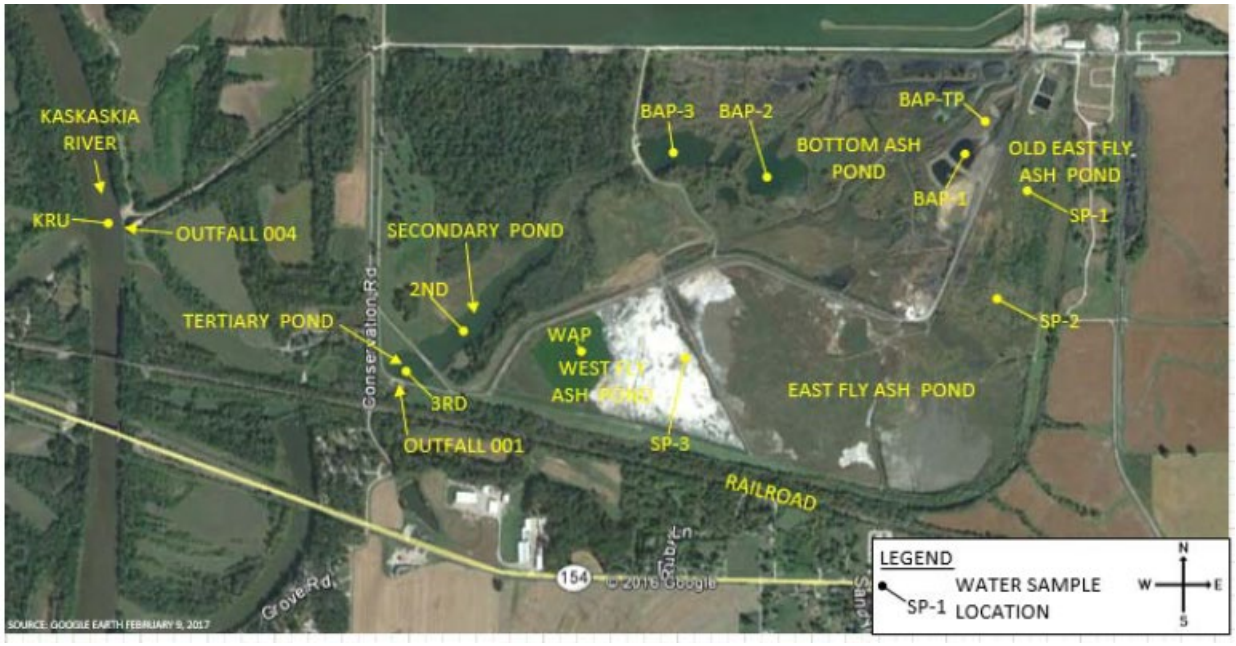

Figure 2.4 Surface Water Sample Location. Source: Hanson Professional Services Inc. (2017).

Table 2.3 Surface Water Data Summary

Constituent	Samples with Constituent Detected	Samples Analyzed	Minimum Detected Value	Maximum Detected Value	Maximum Laboratory Detection Limit
Total Metals (mg/L)					
Arsenic	0	2	-	-	2.5E-02
Barium	2	2	7.3E-02	7.4E-02	NA
Boron	2	2	4.0E-02	4.2E-02	NA
Cadmium	0	2	-	-	2.0E-03
Chromium	0	2	-	-	5.0E-03
Chromium (hexavalent)	0	2	-	-	1.0E-02
Copper	0	2	-	-	5.0E-03
Cyanide	0	2	-	-	5.0E-03
Iron	2	2	1.2E+00	1.2E+00	NA
Lead	0	2	-	-	1.5E-02
Manganese	2	2	2.2E-01	2.3E-01	NA
Mercury	2	2	2.0E-06	4.0E-06	NA
Nickel	0	2	-	-	5.0E-03
Phosphorus	2	2	2.6E-01	2.6E-01	NA
Selenium	0	2	-	-	4.0E-02
Silver	0	2	-	-	5.0E-03
Zinc	0	2	-	-	1.0E-02
Other (mg/L or SU)					
Chloride	2	2	1.9E+01	2.1E+01	NA
Fluoride	2	2	2.1E-01	2.2E-01	NA
pH	2	2	8.1E+00	8.2E+00	NA
Phenols	0	2	-	-	5.0E-03
Sulfate	2	2	2.3E+01	2.3E+01	NA
Total Suspended Solids	2	2	3.5E+01	4.9E+01	NA

Notes:
mg/L = Milligrams per Liter; NA = Not Available; SU = Standard Unit.
Blank cells indicate constituent was not detected.
Source: Hanson Professional Services Inc. (2017).

3 Risk Evaluation

3.1 Risk Evaluation Process

A risk evaluation was conducted to determine whether constituents present in groundwater underlying and downgradient of the FAPS have the potential to pose adverse health effects to human and ecological receptors. The risk evaluation is consistent with the principles of risk assessment established by US EPA and has considered evaluation criteria detailed in Illinois guidance documents (*e.g.*, IEPA, 2013, 2019).

The general risk evaluation approach is summarized in Figure 3.1 and discussed below.

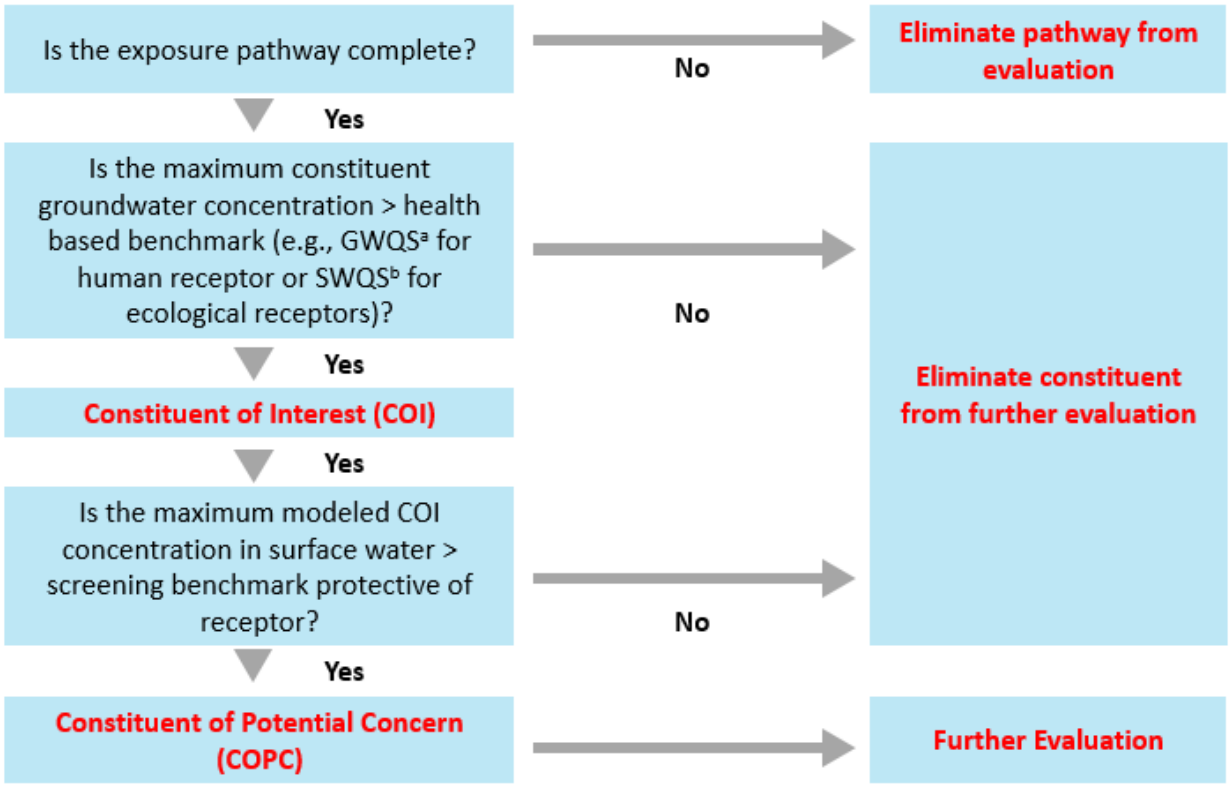

Figure 3.1 Overview of Risk Evaluation Methodology. IEPA = Illinois Environmental Protection Agency; GWQS = IEPA Groundwater Quality Standards; SWQS = IEPA Surface Water Quality Standards. (a) The IEPA Part 845 Groundwater Protection Standards (GWPS) were used to identify COIs. (b) IEPA SWQS protective of chronic exposures to aquatic organisms were used to identify ecological COIs. In the absence of an SWQS, US EPA Region IV Ecological Screening Values (ESVs) were used.

The first step in the risk evaluation was to develop the CEMs and identify complete exposure pathways. All potential receptors and exposure pathways based on groundwater use and surface water use in the vicinity of the Site were considered. Exposure pathways that are incomplete were excluded from the evaluation.

Groundwater data were used to identify COIs. COIs were identified as constituents with maximum concentrations in groundwater in excess of groundwater quality standards (GWQS)[4] for human receptors and SWQS for ecological receptors. Based on the CSM (Section 2.2), some groundwater underlying the FAPS has the potential to interact with surface water in the Kaskaskia River. Therefore, potential FAPS-related constituents in groundwater may potentially flow toward and into surface water in the Kaskaskia River.

Surface water samples have been collected from the Kaskaskia River adjacent to the Site; however, sediment samples have not been collected from the river. Gradient modeled the potential migration of COIs from groundwater to surface water and sediment to evaluate potential risks to receptors (see Section 3.3.3).

Gradient modeled the COI concentrations in surface water and sediment based on the groundwater data from the FAPS-related wells. The measured and modeled COI concentrations in surface water and sediment were compared to conservative, generic risk-based screening benchmarks for human health and ecological receptors. These generic screening benchmarks rely on default assumptions with limited consideration of site-specific characteristics. Human health benchmarks are receptor-specific values calculated for each pathway and environmental medium that are designed to be protective of human health. Ecological benchmarks are medium-specific values designed to be protective of all potential ecological receptors exposed to surface water. Ecological and human health screening benchmarks are inherently conservative because they are intended to screen out chemicals that are of no concern with a high level of confidence. Therefore, a measured or modeled COI concentration exceeding a screening benchmark does not indicate an unacceptable risk, but only that further risk evaluation is warranted. COIs with maximum concentrations exceeding a conservative screening benchmark are identified as COPCs requiring further evaluation.

As described in more detail below, this evaluation relied on the screening assessment to demonstrate that constituents present in groundwater underlying the FAPS do not pose an unacceptable human health or ecological risk. That is, after the screening step, no COPCs were identified and further assessment was not warranted.

3.2 Human and Ecological Conceptual Exposure Models

A CEM provides an overview of the receptors and exposure pathways requiring risk evaluation. The CEM describes the source of the contamination, the mechanism that may lead to a release of contamination, the environmental media to which a receptor may be exposed, the route of exposure (exposure pathway), and the types of receptors that may be exposed to these environmental media.

3.2.1 Human Conceptual Exposure Model

The human CEM for the Site depicts the relationships between the off-Site environmental media potentially impacted by constituents in groundwater and human receptors that could be exposed to these media. Figure 3.2 presents a human CEM for the Site. It considers a human receptor who could be exposed to COIs hypothetically released from the FAPS into groundwater, surface water, sediment, and fish. The following human receptors and exposure pathways were evaluated for inclusion in the Site-specific CEM.

[4] As discussed further in Section 3.3.2, GWQS are protective of human health and not necessarily of ecological receptors. While ecological receptors are not exposed to groundwater, groundwater can potentially enter into the adjacent surface water and impact ecological receptors. Therefore, two sets of COIs were identified: one for humans and another for ecological receptors.

- Residents – exposure to groundwater/surface water as drinking water;
- Residents – exposure to groundwater/surface water used for irrigation;
- Recreators in the river adjacent to the Site:
  - Boaters – exposure to surface water and sediment while boating;
  - Swimmers – exposure to surface water and sediment while swimming;
  - Anglers – exposure to surface water and sediment and consumption of locally caught fish.

All of these exposure pathways were considered to be complete. Section 3.2.1.1 discusses the residential drinking water and irrigation pathways. Section 3.2.1.2 provides additional description of the recreational exposures.

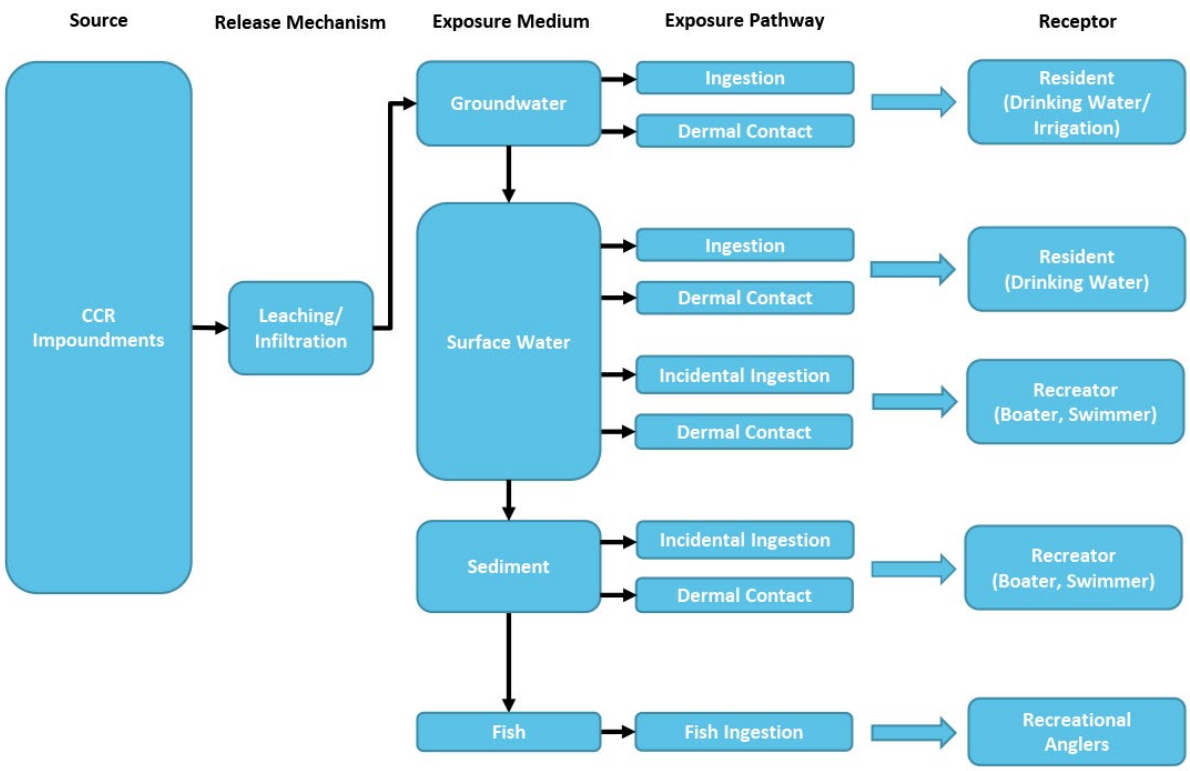

Figure 3.2 Human Conceptual Exposure Model. CCR = Coal Combustion Residuals.

3.2.1.1 Groundwater as a Drinking Water/Irrigation Source

A receptor survey was conducted in 2021 to identify potential users of groundwater in the vicinity of the FAPS (Ramboll, 2021a). Specific sources that were used in this survey include the Illinois State Geological Survey (ISGS), Illinois State Water Survey (ISWS), and the IEPA (Ramboll, 2021a). The well search was updated in 2024. A total of 19 wells were identified within 1,000 meters of the FAPS, which included 15 private water wells, and 4 monitoring wells (Table 3.1, Figure 3.3). The four monitoring wells, owned by Illinois Power, were installed in 1992 and are located north of the FAPS but within the BPP property. It should be noted that, based on their coordinates from the available databases, two of the private wells (Well 121572596900 and Well 121572592700) are located on the BPP property within the boundary of FAPS (Figure 3.3). These locations are likely incorrect and/or outdated. Because no private wells are located within the FAPS, there is no exposure to impacted groundwater at these locations.

Groundwater beneath the FAPS generally flows to the southwest towards the Kaskaskia River (Figure 2.2). One private well (121572531300) is upgradient of the FAPS and east of the BPP property boundary; it is 28 feet deep and was installed in 1984 (Figure 3.3). Since it is upgradient of the FAPS, it is not expected to be impacted by any CCR constituents in groundwater that originate from the FAPS.

Twelve (12) private wells are located south of the BPP (Figure 3.3). These wells range in depth from 24 to 72 feet and are screened in the UU and include wells that may provide water for both human and livestock uses (Table 3.1). Based on the groundwater flow direction to the southwest, seven of the private wells are side gradient of the FAPS (121570200300, 121570207100, 121570207200, 121572298400, 121572317500, 121572280600, 121572284200) and are not expected to be impacted by any CCR constituents in groundwater that originate from the FAPS. The other five private wells are on properties immediately south of the BPP (Figure 3.3). Based on an interview with the property owner, well 121572510000 was destroyed when a farmhouse was demolished. The potential groundwater impacts to the remaining four wells (1215720240900, 121572681800, A, and B) on properties south of the BPP have been investigated and are discussed below.

Four monitoring wells were installed on a property immediately to the south of the BPP in 2024 (MW-195, MW-196, MW-197, MW-198; Figure 2.3) to investigate whether the FAPS has impacted off-Site groundwater quality in this area. Wells MW-195, MW-196, and MW-197 were installed in May 2024 and MW-198 was installed in October 2024. Sampling, conducted in June, July, and October 2024, found that well MW-196 exceeded the GWPS for boron (2 mg/L) and sulfate (400 mg/L). No exceedances of the GWPSs were noted at MW-197 (sampled in June, July, and October 2024) or at MW-198 (sampled in October 2024), and as a result MW-195 was not sampled. Based on the results from MW-197 and MW-198, and the direction of groundwater flow to the southwest (Figure 2.2), private wells on properties to the south of the BPP (Figure 3.3) are unlikely to have any exceedances of the GWPSs.

Table 3.1 Summary of Water Wells Within 1,000 Meters of the FAPS

API Number	Type	Date Drilled	Owner	Depth (ft)	Formation	Latitude	Longitude
121570200300	Water	5/31/1961	Baldwin City (Private)	31	NA	38.183293	-89.881861
121570207100	Water	12/31/1946	Private	72	Shale	38.184918	-89.879621
121570207200	Water	12/31/1949	Private	67	Limestone	38.184918	-89.879621
121570240900	Water for livestock	4/16/1970	Private	32	Sand & gravel	38.185276	-89.869794
121572280600	Water	6/30/1974	Private	24	Red sand & gravel	38.183638	-89.864585
121572284200	Water	10/1/1974	Private	33	Sand & gravel	38.183638	-89.864585
121572298400	Water	5/31/1976	Private	35	Sandy clay	38.181330	-89.869991
121572317500	Water	4/5/1978	Private	NA	Sandy clay	38.183018	-89.865384
121572510000	Destroyed	3/12/1986	Private	37	Sand & gravel	38.185794	-89.877665
121572531300	Water	8/23/1984	Private	28	Clay & sand	38.187248	-89.846250
121572592700	Water	1992	Private	160	Limestone	38.190134	-89.872439
121572681800	Water	7/10/2021	Private	37	Orange sand	38.186389	-89.873611
121572596900	Water	3/19/1995	Illinois Power (Private)	27	Upper unit (UU)	38.190134	-89.872439
121572594000	Monitoring	8/23/1992	Illinois Power	23	Silty clay	38.205526	-89.857289
121572594100	Monitoring	8/25/1992	Illinois Power	18	Brown silty clay	38.205526	-89.857289
121572594200	Monitoring	8/25/1992	Illinois Power	18	Silty clay	38.205526	-89.857289
121572594300	Monitoring	8/25/1992	Illinois Power	18	Silty clay, med sand	38.205526	-89.857289
A	Water	NA	Private	40	NA	38.185849	-89.873981
B	Water for livestock	1980s	Private	NA	NA	38.186192	-89.870836

Notes:
FAPS = Fly Ash Pond System; ft = Feet; NA = Not Available.
Wells A and B are on private property to the south of the Baldwin plant, but do not have an API number (Ramboll, 2024d).

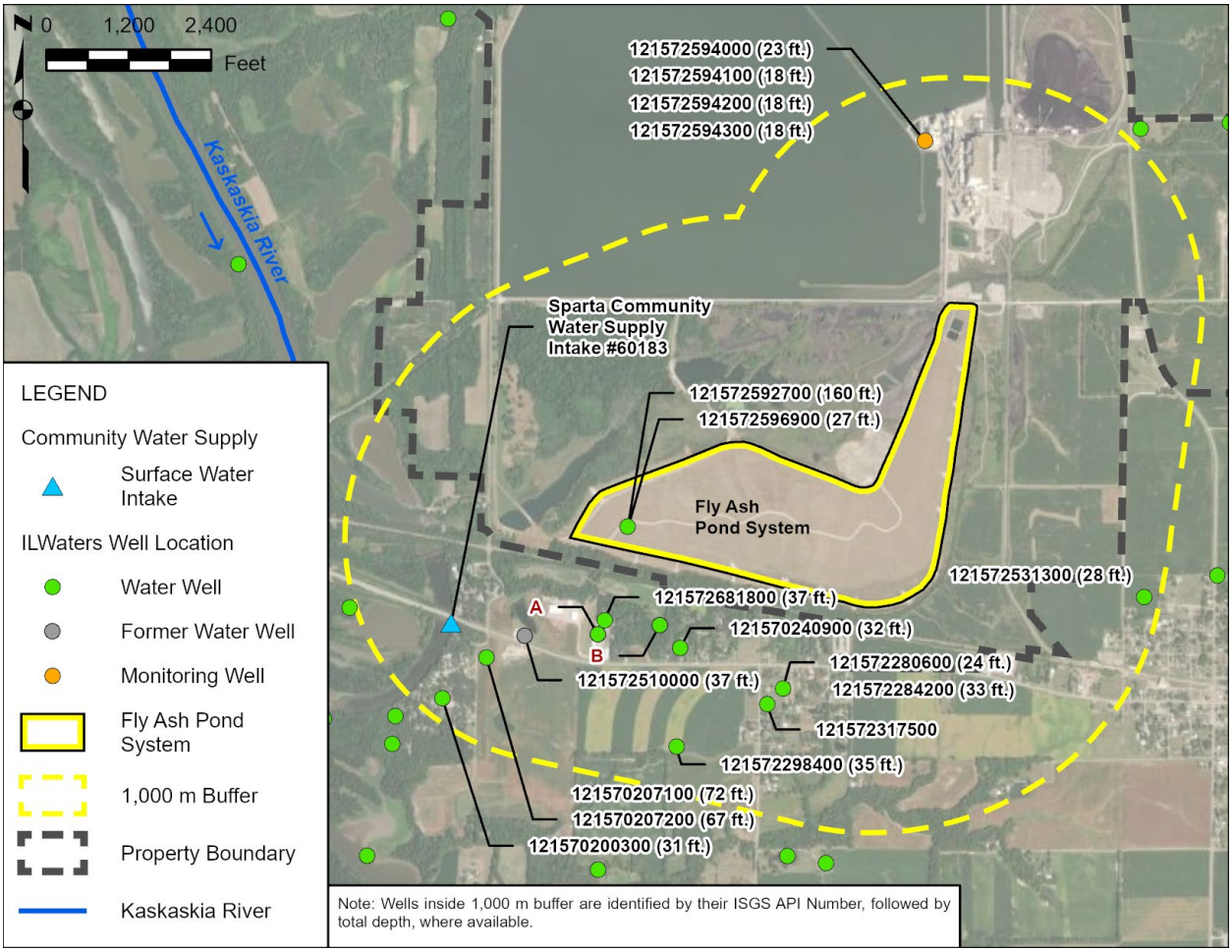

Figure 3.3 Water Wells Within 1,000 Meters of the FAPS. FAPS = Fly Ash Pond System; ISGS = Illinois State Geological Survey. Sources: Illinois State Geological Survey (2024); Ramboll (2021a); USGS (2022a); IEPA (2025).

3.2.1.2 Surface Water as a Drinking Water Source

The Sparta, Illinois, community water supply (CWS) has a surface water intake (IEPA #60183) on the Kaskaskia River 1,325 feet southwest of the BPP; the location of the intake is shown on Figure 3.3 (IEPA, 2012). Sparta CWS serves an estimated population of 6,455 people (IEPA, 2012).

3.2.1.3 Recreational Exposures

The Kaskaskia River is located to the west of the BPP. The river and its adjacent area to the west of the BPP are part of the Kaskaskia River State Fish and Wildlife Area (SFWA) (Figure 3.4) (Ramboll, 2021a). "The Illinois Department of Transportation owns the land along the river and leases most of the land to the Illinois Department of Natural Resources to manage for fish, wildlife and other recreational activities" (IDNR, 2022). The recreational uses of the SFWA include fishing, boating, hunting (IDNR, 2022). Recreational exposure to surface water and sediment may occur during activities such as boating or fishing in the river. Recreational anglers may also consume locally caught fish from the Kaskaskia River.

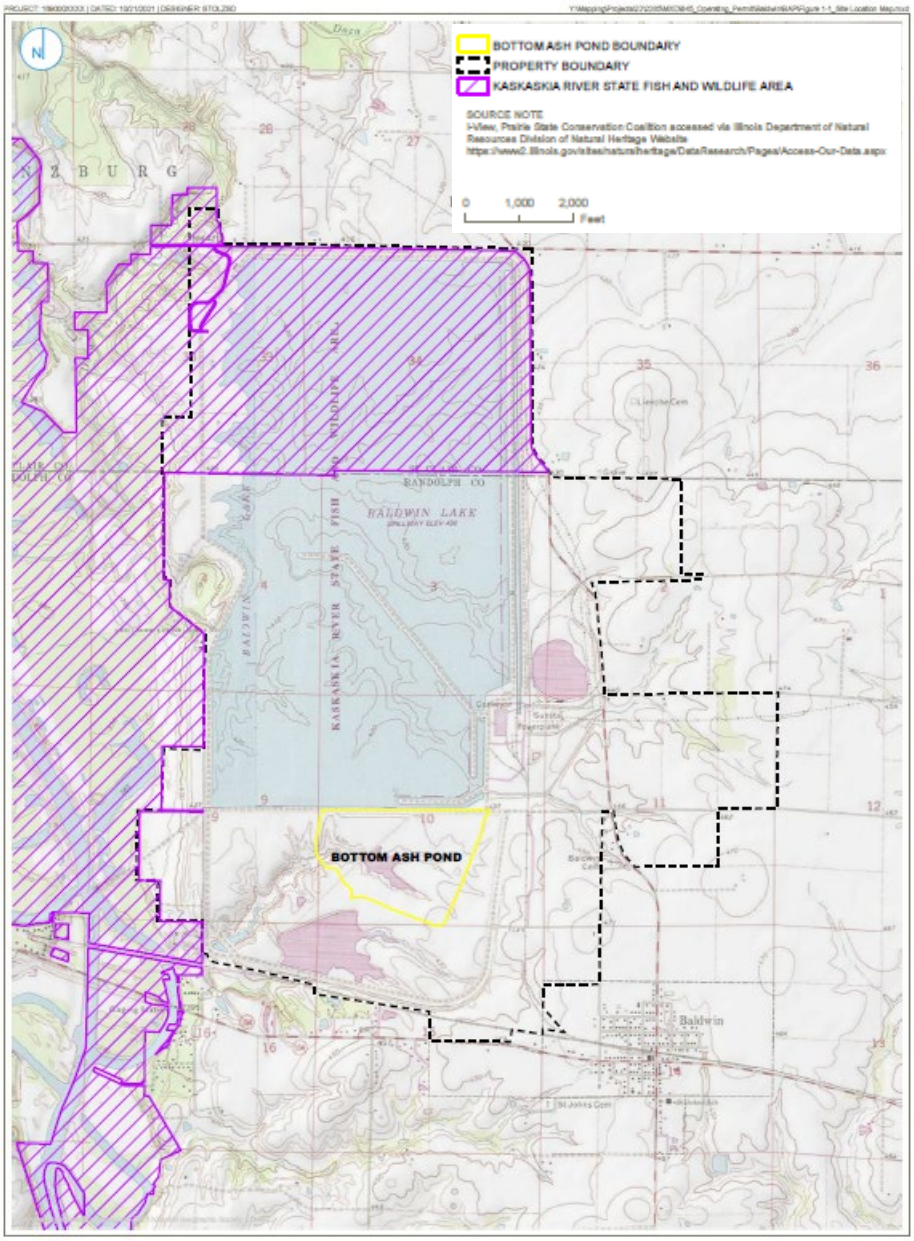

Figure 3.4 Kaskaskia River State Fish and Wildlife Area. Source: Ramboll (2021a).

3.2.2 Ecological Conceptual Exposure Model

The ecological CEM for the Site depicts the relationships between off-Site environmental media (surface water and sediment) potentially impacted by COIs in groundwater and ecological receptors that may be exposed to these media. The ecological risk evaluation considered both direct toxicity as well as secondary toxicity *via* bioaccumulation. Figure 3.5 presents the ecological CEM for the Site. The following ecological receptor groups and exposure pathways were considered:

- **Ecological Receptors Exposed to Surface Water:**
  - Aquatic plants, amphibians, reptiles, and fish.

- **Ecological Receptors Exposed to Sediment:**
  - Benthic invertebrates (*e.g.*, insects, crayfish, mussels).
- **Ecological Receptors Exposed to Bioaccumulative COIs:**
  - Higher trophic level wildlife (avian and mammalian) *via* direct exposures (surface water and sediment exposure) and secondary exposures through the consumption of prey (*e.g.*, plants, invertebrates, small mammals, fish).

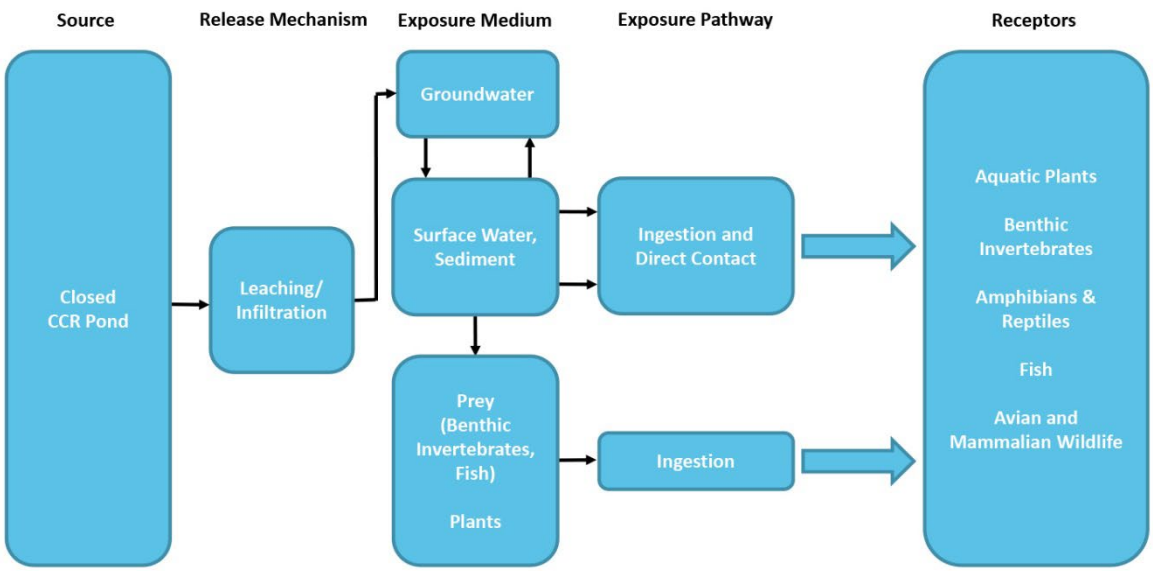

Figure 3.5 Ecological Conceptual Exposure Model. CCR = Coal Combustion Residuals.

3.3 Identification of Constituents of Interest

Risks were evaluated for COIs. A constituent was considered a COI if the maximum detected constituent concentration in groundwater exceeded a health-based benchmark. According to US EPA risk assessment guidance (US EPA, 1989), this screening step is designed to reduce the number of constituents carried through the risk evaluation that are anticipated to have a minimal contribution to the overall risk. Identified COIs are the constituents that are most likely to pose a risk concern in the surface water adjacent to the Site.

3.3.1 Human Health Constituents of Interest

For the human health risk evaluation, COIs were conservatively identified as constituents with maximum concentrations in groundwater above the GWPS listed in the Illinois CCR Rule Part 845.600 (IEPA, 2021). Gradient used the maximum detected concentrations from groundwater samples collected from all of the FAPS associated wells, regardless of hydrostratigraphic unit. The use of groundwater data in this risk evaluation does not imply that detected constituents are associated with the FAPS or that they have been identified as potential groundwater exceedances. Using this approach, the COIs that were identified for the human health risk evaluation *via* the surface water pathway include arsenic, boron, cobalt, lead, lithium, molybdenum, thallium, and radium 226 + 228 (Table 3.2).

The water quality parameters that exceeded the GWPS included pH, chloride, fluoride, sulfate, and total dissolved solids; however, these constituents were not included in the risk evaluation because the GWPS is based on aesthetic quality and there is an absence of studies regarding toxicity to human health. The US EPA secondary maximum contaminant levels (MCLs) for chloride, sulfate, and total dissolved solids are based on aesthetic quality. The secondary MCLs for chloride and sulfate (250 mg/L) are based on salty taste (US EPA, 2021). The secondary MCL for total dissolved solids (500 mg/L) is based on hardness, deposits, colored water, staining, and salty taste (US EPA, 2021). In addition, pH is a measure of the acidity of the water, and is not typically included in risk assessments. Given that these parameters are not likely to pose a human health risk concern in the event of exposure, they were not considered to be human health COIs.

Table 3.2 Human Health Constituents of Interest

Constituent[a]	Maximum Groundwater Concentration[b]	GWPS[c]	Human Health COI[d]
Total Metals (mg/L)			
Antimony	5.0E-03	6.0E-03	No
Arsenic	1.6E-02	1.0E-02	Yes
Barium	1.0E+00	2.0E+00	No
Beryllium	1.8E-03	4.0E-03	No
Boron	2.3E+01	2.0E+00	Yes
Cadmium	4.0E-04	5.0E-03	No
Chromium	5.3E-02	1.0E-01	No
Cobalt	1.9E-02	6.0E-03	Yes
Lead	2.0E-02	7.5E-03	Yes
Lithium	1.3E-01	4.0E-02	Yes
Mercury	1.6E-04	2.0E-03	No
Molybdenum	1.4E-01	1.0E-01	Yes
Selenium	6.2E-03	5.0E-02	No
Thallium	2.7E-03	2.0E-03	Yes
Dissolved Metals (mg/L)			
Antimony	5.0E-04	6.0E-03	No
Arsenic	-	1.0E-02	No
Barium	9.3E-02	2.0E+00	No
Beryllium	-	4.0E-03	No
Boron	2.2E+01	2.0E+00	Yes
Cadmium	-	5.0E-03	No
Chromium	-	1.0E-01	No
Cobalt	-	6.0E-03	No
Lead	-	7.5E-03	No
Lithium	9.5E-02	4.0E-02	Yes
Molybdenum	-	1.0E-01	No
Selenium	2.1E-03	5.0E-02	No
Thallium	-	2.0E-03	No
Radionuclides (pCi/L)			
Radium 226 + Radium 228	8.5E+00	5.0E+00	Yes
Other (mg/L or SU)			
pH	1.2E+01	9.0E+00	No[e]
Chloride	1.4E+03	2.0E+02	No[e]
Fluoride	4.9E+00	4.0E+00	No[e]

Constituent[a]	Maximum Groundwater Concentration[b]	GWPS[c]	Human Health COI[d]
Sulfate	1.5E+03	4.0E+02	No[e]
Total Dissolved Solids	3.3E+03	1.2E+03	No[e]
Other Dissolved (mg/L)			
Chloride	1.3E+03	2.0E+02	No[e]
Sulfate	1.1E+03	4.0E+02	No[e]

Notes:
COI = Constituent of Interest; GWPS = Groundwater Protection Standard; IL = Illinois; mg/L = Milligrams per Liter; pCi/L = PicoCuries per Liter; SU = Standard Unit.
Blank cells indicate constituent was not detected.
Shaded cell indicates a compound identified as a COI.
(a) The constituents are those listed in the IL Part 845.600 GWPS (IEPA, 2021).
(b) The maximum detected groundwater concentration was used to identify COIs.
(c) The IL Part 845.600 GWPS (IEPA, 2021) were used to identify COIs.
(d) COIs are constituents for which the maximum concentration exceeds the groundwater standard.
(e) Maximum exceeds the GWPS but is not considered to be COI because the GWPS is based on aesthetic quality.

3.3.2 Ecological Constituents of Interest

The Illinois GWPS, as defined in IEPA's guidance, were developed to protect human health but not necessarily ecological receptors. While ecological receptors are not exposed to groundwater, groundwater can potentially migrate into the adjacent surface water and impact ecological receptors. Therefore, to identify ecological COIs, the maximum concentrations of constituents detected in groundwater were compared to ecological surface water benchmarks protective of aquatic life.

The surface water screening benchmarks for freshwater organisms were obtained from the following hierarchy of sources:

- IEPA (2019) SWQS. IEPA SWQS are health-protective benchmarks for aquatic life exposed to surface water on a long-term basis (*i.e.*, chronic exposure). The SWQS for several metals are hardness dependent (cadmium, chromium, copper, lead, manganese, nickel, and zinc). Screening benchmarks for these constituents were calculated assuming US EPA's default hardness of 100 mg/L (US EPA, 2022).[5]
- US EPA Region IV (2018) surface water Ecological Screening Values (ESVs) for hazardous waste sites.

Benchmarks from the United States Department of Energy's (US DOE) guidance document ("A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota") were used for radium (US DOE, 2019). US DOE presents benchmarks for radium 226 and radium 228 (4 and 3 picoCuries per liter [pCi/L], respectively). Given that radium concentrations are expressed as total radium (radium 226+228, *i.e.*, the sum of radium 226 and radium 228), Gradient used the lower of the two benchmarks (3 pCi/L for radium 228) to evaluate total radium concentrations.

[5] Hardness data are available from the Kaskaskia River at Roots, Illinois (USGS Site No. 595400), 16 miles downstream of the BPP. Based on 130 samples collected from April 1980 to March 1997, the average hardness at this location was 173 mg/L (USGS, 2022b). Due to the age of the samples and the distance from the site, the US EPA (2022) default hardness of 100 mg/L was used. Use of a higher hardness value would result in less stringent screening values, thus, use of the US EPA default hardness is conservative.

Consistent with the human health risk evaluation, Gradient used the maximum detected concentrations from groundwater samples collected from all of the FAPS associated wells (regardless of hydrostratigraphic unit) without considering spatial or temporal representativeness for ecological receptor exposures. The use of the maximum constituent concentrations in this evaluation is designed to conservatively identify COIs that warrant further investigation. The COIs identified for ecological receptors include boron, radium 226+228, chloride, and fluoride (Table 3.3).

Table 3.3 Ecological Constituents of Interest

Constituent[a]	Maximum Detected Groundwater Concentration	Ecological Benchmark[b]	Basis	Ecological COI[c]
Total Metals (mg/L)				
Antimony	5.0E-03	1.9E-01	EPA R4 ESV	No
Arsenic	1.6E-02	1.9E-01	IEPA SWQC	No
Barium	1.0E+00	5.0E+00	IEPA SWQC	No
Beryllium	1.8E-03	6.4E-02	EPA R4 ESV	No
Boron	2.3E+01	7.6E+00	IEPA SWQC	Yes
Cadmium	4.0E-04	1.1E-03	IEPA SWQC	No
Chromium	5.3E-02	2.1E-01	IEPA SWQC	No
Cobalt	1.9E-02	1.9E-02	EPA R4 ESV	No
Lead	2.0E-02	2.0E-02	IEPA SWQC	No
Lithium	1.3E-01	4.4E-01	EPA R4 ESV	No
Mercury	1.6E-04	1.1E-03	IEPA SWQC	No
Molybdenum	1.4E-01	7.2E+00	EPA R4 ESV	No
Selenium	6.2E-03	1.0E+00	IEPA SWQC	No
Thallium	2.7E-03	6.0E-03	EPA R4 ESV	No
Dissolved Metals (mg/L)				
Antimony	5.0E-04	1.9E-01	EPA R4 ESV	No
Arsenic	-	1.9E-01	IEPA SWQC	No
Barium	9.3E-02	5.0E+00	IEPA SWQC	No
Beryllium	-	6.4E-02	EPA R4 ESV	No
Boron	2.2E+01	7.6E+00	IEPA SWQC	Yes
Cadmium	-	9.3E-04	IEPA SWQC	No
Chromium	-	1.8E-01	IEPA SWQC	No
Cobalt	-	1.9E-02	EPA R4 ESV	No
Lead	-	1.6E-02	IEPA SWQC	No
Lithium	9.5E-02	4.4E-01	EPA R4 ESV	No
Molybdenum	-	8.0E-01	EPA R4 ESV	No
Selenium	2.1E-03	1.0E+00	IEPA SWQC	No
Thallium	-	6.0E-03	EPA R4 ESV	No
Radionuclides (pCi/L)				
Radium 226 + Radium 228	8.5E+00	3.0E+00	US DOE	Yes
Other (mg/L or SU)				
pH	1.2E+01	NA	-	No
Chloride	1.4E+03	5.0E+02	IEPA SWQC	Yes
Fluoride	4.9E+00	4.0E+00	IEPA SWQC	Yes
Sulfate	1.5E+03	NA	-	No
Total Dissolved Solids	3.3E+03	NA	-	No
Other Dissolved (mg/L)				
Chloride	1.3E+03	5.0E+02	IEPA SWQC	Yes
Sulfate	1.1E+03	NA	-	No

Notes:
COI = Constituent of Interest; FAPS = Fly Ash Pond System; GWPS = Groundwater Protection Standard; IEPA SWQC = Illinois Environmental Protection Agency Surface Water Quality Criteria; IL = Illinois; mg/L = Milligrams per Liter; NA = Not Available; pCi/L = PicoCuries per Liter; US DOE = United States Department of Energy; US EPA R4 ESV = United States Environmental Protection Agency Region IV Ecological Screening Value.
Blank cells indicate constituent was not detected.
Shaded cell indicates a compound identified as a COI.
(a) The constituents are those listed in the IL Part 845.600 GWPS (IEPA, 2021) that were detected in at least one groundwater sample from the wells related to the FAPS.
(b) Ecological benchmarks are from the hierarchy of sources discussed in Section 3.3.2: IEPA SWQC (IEPA, 2019); US EPA R4 "Ecological Risk Assessment Supplemental Guidance" (US EPA Region IV, 2018); and US DOE's guidance document, "A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota" (US DOE, 2019).
(c) Constituents with maximum detected concentrations exceeding a benchmark protective of surface water exposure are considered ecological COIs.

3.3.3 Surface Water and Sediment Modeling

Surface water sampling has been conducted in the Kaskaskia River adjacent to the Site. However, to estimate the potential contribution to surface water (and sediment) from groundwater specifically associated with the FAPS, Gradient also modeled concentrations in the Kaskaskia River surface water and sediment from groundwater flowing into the river for the detected human and ecological COIs. This is because the constituents detected in groundwater above an ecological or health-based benchmark are most likely to pose a risk concern in the adjacent surface water. Gradient modeled human health and ecological COI concentrations in the surface water and sediment using a mass balance calculation based on the surface water and groundwater mixing. The model assumes a well-mixed groundwater-surface water location.

The maximum detected concentrations in groundwater (regardless of well location) from 2019 to 2024 were conservatively used to model COI concentrations in surface water and sediment. For COIs that were measured as both total and dissolved fractions, we used the maximum of the total and dissolved COI concentrations for the modeling. For most metals, the maximum concentration was from the total fraction. Use of the total metal concentration for these COIs may overestimate surface water concentrations because dissolved concentrations, which are lower than total concentrations, represent the mobile fractions of constituents that could likely flow into and mix with surface water.

The modeling approach does not account for geochemical transformations that may occur during groundwater mixing with surface water. Gradient assumed that predicted surface water concentrations were influenced only by the physical mixing of groundwater as it enters the surface water and were not further influenced by the geochemical reactions in the water and sediment, such as precipitation. In addition, the model only predicts surface water and sediment concentrations as a result of the potential migration of COIs in FAPS-related groundwater and does not account for background concentrations in surface water or sediment.

For this evaluation, Gradient adapted a simplified and conservative form of US EPA's indirect exposure assessment methodology (US EPA, 1998) that was used in US EPA's coal combustion waste risk assessment (US EPA, 2014). The model is a mass balance calculation based on surface water and groundwater mixing and the concept that the dissolved and sorbed concentrations can be related through an equilibrium partitioning coefficient (K_d). The model assumes a well-mixed groundwater-surface water location, with partitioning among total suspended solids, dissolved water column, sediment pore water, and solid sediments.

Sorption to soil and sediment is highly dependent on the surrounding geochemical conditions. To be conservative, we ignored the natural attenuation capacity of soil and sediment and estimated the surface

water concentration based only on the physical mixing of groundwater and surface water (*i.e.*, dilution) at the point where groundwater flows into surface water.

The aquifer properties used to estimate the volume of groundwater flowing into the Kaskaskia River and surface water concentrations are presented in Table 3.4 (for the UU) and Table 3.5 (for the UA or BU). The surface water properties used in the modeling are presented in Table 3.6. The COI concentrations in sediment were modeled using the COI-specific sediment-to-water partitioning coefficients and the sediment properties presented in Table 3.7. In the absence of Site-specific information for the Kaskaskia River, Gradient used default assumptions (*e.g.*, depth of the upper benthic layer and bed sediment porosity) to model sediment concentrations. The modeled surface water and sediment concentrations are presented in Table 3.8. These modeled concentrations reflect conservative contributions from groundwater. A description of the modeling and the detailed results are presented in Appendix A.

Table 3.4 Groundwater Properties Used in Modeling of the Upper Unit (UU)

Parameter	Value	Unit	Notes/Source
COI Concentration	Constituent specific	mg/L	Maximum detected concentration in groundwater.
Cross-Sectional Area for the UU[a]	5,944	m^2	Estimated thickness of the UU (about 4 m) multiplied by the length of FAPS intersecting the Kaskaskia River (about 1,500 m) (Ramboll, 2024a).
Hydraulic Gradient	0.016	m/m	Average horizontal hydraulic gradient across the FAPS for the UU (Ramboll, 2021a).
Hydraulic Conductivity of the UU	3.2×10^{-5}	cm/s	Geometric mean horizontal hydraulic conductivity determined for the UU wells (Ramboll, 2024a).

Notes:
COI = Constituent of Interest; FAPS = Fly Ash Pond System; UU = Upper Unit.
(a) The cross-sectional area represents the area through which groundwater flows from the UU to the Kaskaskia River.

Table 3.5 Groundwater Properties Used in Modeling of the Uppermost Aquifer (UA or BU)

Parameter	Value	Unit	Notes/Source
COI Concentration	Constituent specific	mg/L	Maximum detected concentration in groundwater.
Cross-Sectional Area for the UA[a]	9,144	m^2	Estimated thickness of the bedrock aquifer (about 6 m) multiplied by the length of FAPS intersecting the Kaskaskia River (about 1,500 m) (Ramboll, 2024a).
Hydraulic Gradient	0.016	m/m	Average horizontal hydraulic gradient across the FAPS for the bedrock aquifer (Ramboll, 2021a).
Hydraulic Conductivity of the UA	5.0×10^{-6}	cm/s	Geometric mean horizontal hydraulic conductivity determined for the bedrock aquifer wells (Ramboll, 2024a).

Notes:
BU = Bedrock Unit; COI = Constituent of Interest; FAPS = Fly Ash Pond System; UA = Uppermost Aquifer.
(a) The cross-sectional area represents the area through which groundwater flows from the UA to the Kaskaskia River.

Table 3.6 Surface Water Properties Used in Modeling

Parameter	Value	Unit	Notes/Source
Surface Water Flow Rate	5.4×10^{11}	L/year	Representative low-flow (10th percentile) discharge rate estimated at Kaskaskia River monitoring location USGS05595000 at New Athens, IL (2009-2022) (USGS, 2022c).
Total Suspended Solids (TSS)	84.5	mg/L	Median suspended solids concentration measured at the Kaskaskia River monitoring location USGS05595000 at New Athens, IL in 2015-2022 (USGS, 2022d).
Depth of the Water Column	2.74	m	Average water depth of the Kaskaskia River near BPP (Bist LLC, 2022).
Suspended Sediment to Water Partition Coefficient	Constituent specific	mg/L	Values based on US EPA (2014).

Notes:
BPP = Baldwin Power Plant; UA = Uppermost Aquifer; US EPA = United States Environmental Protection Agency; USGS = United States Geological Survey.

Table 3.7 Sediment Properties Used in Modeling

Parameter	Value	Unit	Notes/Source
Depth of Upper Benthic Layer	0.03	m	Default (US EPA, 2014).
Depth of Water Body	2.77	m	Depth of water column (2.74 m) in the Kaskaskia River (Bist LLC, 2022) plus depth of upper benthic layer (0.03 m) (US EPA, 2014).
Bed Sediment Particle Concentration	1	g/cm^3	Default (US EPA, 2014).
Bed Sediment Porosity	0.6	–	Default (US EPA, 2014).
Total Suspended Solids (TSS) Mass per Unit Area	0.23	kg/m^2	Depth of water column × TSS × conversion factors (10^{-6} kg/mg and 1,000 L/m^3).
Sediment Mass per Unit Area	30	kg/m^2	Depth of upper benthic layer × bed sediment particulate concentration × conversion factors (0.001 kg/g and 10^6 cm^3/m^3).
Sediment to Water Partitioning Coefficients	Constituent specific	mg/L	Values based on US EPA (2014).

Note:
US EPA = United States Environmental Protection Agency.

Table 3.8 Surface Water and Sediment Modeling Results

COI	Maximum Measured Concentration in UU (mg/L)	Maximum Measured Concentration in UA (mg/L)	Total Water Column Concentration (mg/L)	Concentration Sorbed to Bottom Sediments (mg/kg)
Arsenic	1.62E-02	1.14E-02	3.43E-08	5.16E-06
Boron	2.30E+01	6.77E+00	4.48E-05	1.69E-04
Cobalt	1.93E-02	1.69E-02	4.23E-08	8.41E-06
Lead	2.00E-02	1.62E-02	4.33E-08	3.98E-05
Lithium	7.88E-02	1.29E-01	1.98E-07	NA[a]
Molybdenum	7.10E-03	1.42E-01	7.32E-08	7.41E-06
Thallium	1.50E-03	2.70E-03	3.88E-09	3.75E-08
Radium 226 + 228[b]	2.92E+00	8.54E+00	8.94E-06	4.07E-02
Chloride	6.10E+01	1.37E+03	6.92E-04	NA[a]
Fluoride	8.50E-01	4.93E+00	3.64E-06	5.69E-04

Notes:
COI = Constituent of Interest; K_d = Equilibrium Partition Coefficient; pCi/kg = PicoCuries per Kilogram; pCi/L = PicoCuries per Liter; UA = Uppermost Aquifer; UU = Upper Unit.
(a) Lithium and chloride do not readily sorb to soil or sediment particles; a K_d value of 0 was used for the modeling.
(b) Concentration of Radium-226+228 is expressed in pCi/L for water, and pCi/kg for sediment.

3.4 Human Health Risk Evaluation

The section below presents the results of the human health risk evaluation for residential use of surface water, and recreational use (by boaters and anglers) of the Kaskaskia River adjacent to the Site. Risks were assessed using the maximum measured or modeled COIs in surface water.

3.4.1 Residential Use of Surface Water as Drinking Water

Sparta, Illinois, uses the Kaskaskia River as one source of its CWS (IL intake #60183). The maximum modeled concentrations in surface water were compared to the lower of two water quality standards (Table 3.9): the Illinois water quality standards for public water supplies (Title 35 Part 302.304 and 302.307) (IEPA, 2019), or the GWPS in Part 845.600 (IEPA, 2013). The modeled and measured surface water concentrations were well below the comparison criteria. Thus, none of the COIs evaluated would be expected to pose an unacceptable risk for the use of surface water from the Kaskaskia River as a drinking water source.

Table 3.9 Risk Evaluation for Residents Exposed to Surface Water

COI	Maximum Surface Water Concentration (modeled)	Maximum Surface Water Concentration (measured)	Drinking Water Criterion	COPC Based on Modeled Concentrations	COPC Based on Measured Concentrations
Metals (mg/L)					
Arsenic	3.4E-08	ND	1.6E-02	No	No
Boron	4.5E-05	4.2E-02	1.0E+00	No	No
Cobalt	4.2E-08	NT	1.9E-02	No	NA
Lead	4.3E-08	ND	2.0E-02	No	No
Lithium	2.0E-07	NT	1.3E-01	No	NA
Molybdenum	7.3E-08	NT	1.4E-01	No	NA
Thallium	3.9E-09	NT	2.7E-03	No	NA

COI	Maximum Surface Water Concentration (modeled)	Maximum Surface Water Concentration (measured)	Drinking Water Criterion	COPC Based on Modeled Concentrations	COPC Based on Measured Concentrations
Radionuclides (pCi/L)					
Radium 226 + 228	8.9E-06	NT	5	No	NA

Notes:
COI = Constituent of Interest; COPC = Constituent of Potential Concern; mg/L = Milligrams per Liter; NA = Not Applicable; ND = Not Detected; NT = Not Tested; pCi/L = PicoCuries per Liter.

3.4.2 Recreators Exposed to Surface Water

Screening Exposures: Recreators could be exposed to surface water *via* incidental ingestion and dermal contact while boating. In addition, anglers could consume fish caught in the Kaskaskia River. The maximum measured or modeled COI concentrations in surface water were used as conservative upper-end estimates of the COI concentrations to which a recreator might be exposed directly (incidental ingestion of COIs in surface water while boating) and indirectly (consumption of locally caught fish exposed to COIs in surface water).

Screening Benchmarks: Illinois surface water criteria (IEPA, 2019), known as human threshold criteria (HTC), are based on incidental exposure through contact or ingestion of small volumes of water while swimming or during other recreational activities, as well as the consumption of fish. The HTC values were calculated from the following equation (IEPA, 2019):

$$\mathrm{HTC} = \frac{\mathrm{ADI}}{\mathrm{W} + (\mathrm{F} \times \mathrm{BCF})}$$

where:

HTC = Human health protection criterion in milligrams per liter (mg/L)
ADI = Acceptable daily intake (mg/day)
W = Water consumption rate (L/day)
F = Fish consumption rate (kg/day)
BCF = Bioconcentration factor (L/kg tissue)

Illinois defines the acceptable daily intake (ADI) as the "maximum amount of a substance which, if ingested daily for a lifetime, results in no adverse effects to humans" (IEPA, 2019). US EPA defines its chronic reference dose (RfD) as an "estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure for a chronic duration (up to a lifetime) to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime" (US EPA, 2011a). Illinois lists methods to derive an ADI from the primary literature (IEPA, 2019). In accordance with Illinois guidance, Gradient derived an ADI by multiplying the MCL by the default water ingestion rate of 2 L/day (IEPA, 2019). In the absence of an MCL, Gradient applied the RfD used by US EPA to derive its Regional Screening Levels (RSLs) (US EPA, 2024a) as a conservative estimate of the ADI. The RfDs are given in mg/kg-day, while the ADIs are given in mg/day; thus, Gradient multiplied the RfD by a standard body weight of 70 kg to obtain the ADI in mg/day. The calculation of the HTC values is shown in Appendix B, Table B.1.

Gradient used bioconcentration factors (BCFs) from a hierarchy of sources. The primary BCFs were those that US EPA used to calculate the National Recommended Water Quality Criteria (NRWQC) for human health (US EPA, 2002). Other sources included BCFs used in the US EPA coal combustion ash risk assessment (US EPA, 2014) and BCFs reported by Oak Ridge National Laboratory's Risk Assessment Information System (ORNL RAIS) (ORNL, 2020).[6] Lithium did not have a BCF value available from any authoritative source; therefore, the water quality criterion for lithium was calculated assuming a BCF of 1. This is a conservative assumption, as lithium does not readily bioaccumulate in the aquatic environment (ECHA, 2020a,b; ATSDR, 2010).

Illinois recommends a fish consumption rate of 0.020 kg/day (20 g/day) for an adult weighing 70 kg (IEPA, 2019). Illinois recommends a water consumption rate of 0.01 L/day for "incidental exposure through contact or ingestion of small volumes of water while swimming or during other recreational activities" (IEPA, 2019). Appendix B, Table B.1 presents the calculated HTC for fish and water and for fish consumption only.

The HTC for fish consumption for radium 226+228 was calculated as follows:

$$\mathrm{HTC} = \frac{\mathrm{TCR}}{(\mathrm{SF} \times \mathrm{BAF} \times \mathrm{F})}$$

where:

HTC	=	Human health protection criterion in picoCuries per liter (pCi/L)
TCR	=	Target cancer risk (1×10^5)
SF	=	Food ingestion slope factor (risk/pCi)
BAF	=	Bioaccumulation factor (L/kg tissue)
F	=	Fish consumption rate (kg/day)

The food ingestion slope factor (lifetime excess total cancer risk per unit exposure, in risk/pCi) used to calculate the HTC was the highest value of those for radium 226 (Ra226), radium 228 (Ra228), and "Ra228+D" (US EPA, 2001). According to US EPA (2001), "+D" indicates that "the risks from associated short-lived radioactive decay products (*i.e.,* those decay products with radioactive half-lives less than or equal to 6 months) are also included."

Screening Risk Evaluation: The maximum modeled and measured COI concentrations in surface water were compared to the calculated Illinois HTC values (Table 3.10). All surface water concentrations were below their respective benchmarks. The HTC values are protective of recreational exposure *via* water and/or fish ingestion and do not account for dermal exposures to COIs in surface water while boating. However, given that the measured and modeled COI surface water concentrations are orders of magnitude below HTC protective of water and/or fish ingestion, dermal exposures to COIs are not expected to be a risk concern. Moreover, the dermal uptake of metals is considered to be minimal and only a small proportion of ingestion exposures. Thus, none of the COIs evaluated would be expected to pose an unacceptable risk to recreators exposed to surface water while boating and anglers consuming fish caught in the Kaskaskia River.

[6] Although recommended by US EPA (2015b), US EPA EpiSuite 4.1 (US EPA, 2019) was not used as a source of BCFs because inorganic compounds are outside the estimation domain of the program.

Table 3.10 Risk Evaluation for Recreators Exposed to Surface Water

COI	Maximum Surface Water Concentration		HTC			COPC	
	Modeled	Measured[a]	Water and Fish	Water Only	Fish Only	Based on Modeled Concentrations	Based on Measured Concentrations
Metals (mg/L)							
Arsenic	3.4E-08	ND	2.2E-02	2.0E+00	2.3E-02	No	No
Boron	4.5E-05	4.2E-02	4.7E+02	1.4E+03	7.0E+02	No	No
Cobalt	4.2E-08	NT	3.5E-03	2.1E+00	3.5E-03	No	NA
Lead	4.3E-08	ND	1.5E-02	1.5E-02	1.5E-02	No	No
Lithium	2.0E-07	NT	4.7E+00	1.4E+01	7.0E+00	No	NA
Molybdenum	7.3E-08	NT	3.9E+00	3.5E+01	4.4E+00	No	NA
Thallium	3.9E-09	NT	1.7E-03	4.0E-01	1.7E-03	No	NA
Radionuclides (pCi/L)							
Radium 226 + 228	8.9E-06	NT	1.0E+03	1.0E+03	8.7E+04	No	NA

Notes:
COI = Constituent of Interest; COPC = Constituent of Potential Concern; HTC = Human Threshold Criteria; mg/L = Milligrams per Liter; NA = Not Applicable; ND = Not Detected; NT = Not Tested; pCi/L = PicoCuries per Liter.
Blank cells indicate constituent was not detected.
(a) Measured concentrations are listed only for the constituents identified as COIs. Measured surface water concentrations may be different from modeled concentrations because measured data include the effects of background and other industrial sources. Modeled concentrations only represent the potential effect on surface water quality resulting from the measured groundwater concentrations.

3.4.3 Recreators Exposed to Sediment

Recreational exposure to sediment may occur during boating activity in the Kaskaskia River; exposure to sediment may occur through incidental ingestion and dermal contact.

Screening Exposures: COIs in impacted groundwater flowing into the river can sorb to sediments. In the absence of sediment data, sediment concentrations were modeled using maximum detected groundwater concentrations.

Screening Benchmarks: There are no established recreator RSLs that are protective of recreational exposures to sediment (US EPA, 2024a). Therefore, benchmarks that are protective of recreational exposures to sediment *via* incidental ingestion and dermal contact were calculated using US EPA's RSL guidance (US EPA, 2024b). These benchmarks were calculated using the recommended assumptions (*i.e.*, oral bioavailability, body weights, averaging time) and toxicity reference values (*i.e.*, RfD and cancer slope factor [CSF]). Recreators were assumed to be exposed to sediment while recreating 60 days a year (or two weekend days per week for 30 weeks a year, from April to October). The exposure duration was assumed for a child 6 years of age and an adult 20 years of age, per US EPA guidance (Stalcup, 2014). The daily recommended residential soil ingestion rates of 200 mg/day for a child and 100 mg/day for an adult are based on an all-day exposure to residential soils (Stalcup, 2014; US EPA, 2011b). Since recreational exposures to sediment are assumed to occur for less than four hours per day, one-third of the daily residential soil ingestion (67 mg/day for a child and 33 mg/day for an adult) was used as a conservative assumption. For dermal exposures, recreators were assumed to be exposed to sediment on their lower legs and feet (1,026 cm^2 for the child and 3,026 cm^2 for the adult, based on the age-weighted surface areas reported in US EPA, 2011b). While other body parts may be exposed to sediment, the contact time will likely be very short, as the sediment would wash off in the surface water. Gradient used US EPA's recommended adherence factor of 0.2 mg/cm^2 based on child exposure to wet soil (US EPA, 2004; Stalcup,

2014), which was used in the US EPA RSL User's Guide for a child recreator exposed to soil or sediment (US EPA, 2024b). The sediment screening benchmarks were calculated based on a target hazard quotient of 1, or a target cancer risk of 1×10^5. Appendix B, Table B.2 presents the calculation of screening benchmarks protective of recreational exposures to sediment. A recreator sediment screening benchmark for radium 226+228 was based on soil Preliminary Remediation Goals (PRGs) calculated for radium 226 and radium 228 using US EPA's PRG calculator (US EPA, 2020). The lower of the two values was used as the recreator sediment screening benchmark for radium 226+228 (Appendix B, Table B.3).

Screening Risk Evaluation: The modeled sediment concentrations were well below the recreational sediment screening benchmarks (Table 3.11). Therefore, exposure to sediment is not expected to pose an unacceptable risk to recreators while boating.

Table 3.11 Risk Evaluation for Recreators Exposed to Sediment

COI	Modeled Sediment Concentration (mg/kg)	Recreator Sediment Screening Benchmark (mg/kg)	COPC
Metals (mg/kg)			
Arsenic	5.2E-06	6.8E+01	No
Boron	1.7E-04	2.7E+05	No
Cobalt	8.4E-06	4.1E+02	No
Lead	4.0E-05	2.0E+02	No
Lithium[a]	NA[a]	2.7E+03	No
Molybdenum	7.4E-06	6.8E+03	No
Thallium	3.7E-08	1.4E+01	No
Radionuclides (pCi/kg)			
Radium 226 + 228	4.1E-02	7.9E+03	No

Notes:
COI = Constituent of Interest; COPC = Constituent of Potential Concern; K_d = Equilibrium Partition Coefficient; NA = Not Applicable; pCi/kg = PicoCuries per Kilogram.
(a) Lithium does not readily sorb to soil or sediment particles; a K_d value of 0 was used for the modeling.

3.5 Ecological Risk Evaluation

Based on the ecological CEM (Figure 3.5), ecological receptors could be exposed to surface water and dietary items (*i.e.*, prey and plants) potentially impacted by identified COIs (radium 226+228 and chloride).

3.5.1 Ecological Receptors Exposed to Surface Water

Screening Exposures: The ecological evaluation considered aquatic communities in the Kaskaskia River potentially impacted by identified ecological COIs. Measured and modeled surface water concentrations were compared to risk-based ecological screening benchmarks.

Screening Benchmarks: Surface water screening benchmarks protective of aquatic life were obtained from the following hierarchy of sources:

- IEPA SWQS (IEPA, 2019), regulatory standards that are intended to protect aquatic life exposed to surface water on a long-term basis (*i.e.*, chronic exposure). For cadmium, the surface water

benchmark is hardness dependent and calculated using a default hardness of 100 mg/L (US EPA, 2022);[7]

- US EPA Region IV (2018) surface water ESVs for hazardous waste sites; and
- US DOE benchmarks from the guidance document, "A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota" (US DOE, 2019).

Risk Evaluation: The maximum measured and modeled COI concentrations in surface water were compared to the benchmarks protective of aquatic life (Table 3.12). The measured and modeled surface water concentrations for the COIs were below their respective benchmarks. Thus, none of the COIs evaluated are expected to pose an unacceptable risk to aquatic life in the Kaskaskia River.

Table 3.12 Risk Evaluation for Ecological Receptors Exposed to Surface Water

COI	Maximum Surface Water Concentration		Ecological Freshwater Benchmark	Basis	COPC	
	Modeled	Measured[a]			Based on Modeled Concentration	Based on Measured Concentration
Total Metals (mg/L)						
Boron	4.5E-05	4.2E-02	7.6E+00	IEPA SWQC	No	No
Radionuclides (pCi/L)						
Radium 226 + 228	8.9E-06	NA	3.0E+00	US DOE	No	NA
Other (mg/L)						
Chloride	6.9E-04	2.1E+01	5.0E+02	IEPA SWQC	No	No
Fluoride	3.6E-06	2.2E-01	4.0E+00	IEPA SWQC	No	No

Notes:
COI = Constituent of Interest; COPC = Constituent of Potential Concern; IEPA = Illinois Environmental Protection Agency; mg/L = Milligrams per Liter; NA = Not Applicable; pCi/L = PicoCuries per Liter; SWQC = Surface Water Quality Criteria; US DOE = United States Department of Energy.
(a) COIs with no measured surface water data were listed as NA.

3.5.2 Ecological Receptors Exposed to Sediment

Screening Exposures: COIs in impacted groundwater flowing into Kaskaskia River can sorb to sediments *via* chemical partitioning. In the absence of sediment data, sediment concentrations were modeled using maximum detected groundwater concentrations. Therefore, the modeled COI sediment concentrations reflect the potential maximum Site-related sediment concentration originating from groundwater.

Screening Benchmarks: Sediment screening benchmarks were obtained from US EPA Region IV (2018). The majority of the sediment ESVs are based on threshold effect concentrations (TECs) from MacDonald *et al.* (2000), which provide consensus values that identify concentrations below which harmful effects on sediment-dwelling organisms are unlikely to be observed. In the absence of an ESV for radium 226+228, a sediment screening value of 90,000 pCi/kg was used, based on the biota concentration guide (BCG) for radium 228 (US DOE, 2019).[8] Chloride and fluoride are not expected to sorb to sediment; therefore, risk to ecological receptors exposed to sediment was not evaluated for these constituents. The benchmarks used in this evaluation are listed in Table 3.13.

[7] Conservatisms associated with using a default hardness value are discussed in Section 3.6.
[8] The BCG for sediment is 90 pCi/g for Ra-228 and 100 pCi/g for Ra-226; the lower of the two values was used for Ra-226+228, and converted to pCi/kg (US DOE, 2019).

Screening Risk Results: The maximum modeled COI sediment concentrations were below their respective sediment screening benchmarks (Table 3.13). The modeled sediment concentrations attributed to potential contributions from Site groundwater for all COIs were less than 1% of the sediment screening benchmark. Therefore, the modeled sediment concentrations attributed to potential contributions from Site groundwater are not expected to significantly contribute to ecological exposures in the Kaskaskia River adjacent to the Site.

Table 3.13 Risk Evaluation for Ecological Receptors Exposed to Sediment

COI[a]	Modeled Sediment Concentration	ESV[a]	COPC	% of Benchmark
Metals (mg/kg)				
Boron	1.7E-04	3.8E+01[b]	No	0.0004%
Radionuclides (pCi/kg)				
Radium 226 + 228	4.1E-02	9.0E+04[c]	No	0.00005%
Other (mg/kg)				
Chloride	NA[d]	NA	No	NA
Fluoride	5.7E-04	NA	No	NA

Notes:
COI = Constituent of Interest; COPC = Constituent of Potential Concern; ESV = Ecological Screening Value; K_d = Equilibrium Partition Coefficient; mg/kg = Milligrams per Kilogram; NA = Not Available; NOEC = No Observable Effect Concentration; pCi/kg = PicoCuries per Kilogram; US DOE = United States Department of Energy; US EPA = United States Environmental Protection Agency.
(a) ESV from US EPA Region IV (2018).
(b) Boron NOEC of 38 mg/kg was used as a conservative benchmark for boron in the absence of an ESV (ECHA, 2019).
(c) ESV from US DOE (2019); value converted from 90 pCi/g to 90,000 pCi/kg.
(d) Chloride does not readily sorb to soil or sediment particles; a K_d value of 0 was used for the modeling.

3.5.3 Ecological Receptors Exposed to Bioaccumulative Constituents of Interest

Screening Exposures: COIs with bioaccumulative properties can impact higher trophic level wildlife exposed to these COIs *via* direct exposures (surface water and sediment exposure) and secondary exposures through the consumption of dietary items (*e.g.*, plants, invertebrates, small mammals, and fish).

Screening Benchmark: US EPA Region IV (2018) guidance and IEPA SWQS (IEPA, 2019) guidance were used to identify constituents with potential bioaccumulative effects.

Risk Evaluation: The ecological COIs (boron, radium 226+228, chloride, fluoride) were not identified as having potential bioaccumulative effects. Therefore, these COIs are not considered to pose an ecological risk *via* bioaccumulation. IEPA (2019) identifies mercury as the only metal with bioaccumulative properties, however, mercury was not considered an ecological COI.[9]

3.6 Uncertainties and Conservatisms

A number of uncertainties and their potential impact on the risk evaluation are discussed below. Wherever possible, conservative assumptions were used in an effort to minimize uncertainties and overestimate rather than underestimate risks.

[9] US EPA Region IV (2018) identifies selenium as having potential bioaccumulative effects. Although selenium was detected in groundwater, it was not considered an ecological COI.

Exposure Estimates:

- The risk evaluation included the IL Part 845.600 constituents detected in groundwater samples (above GWPS) collected from wells associated with the FAPS. However, it is possible that not all of the detected constituents are related specifically to the FAPS.
- The human health and ecological risk characterizations were based on the maximum measured or modeled COI concentrations, rather than on averages. Thus, the variability in exposure concentrations was not considered. Assuming continuous exposure to the maximum concentration overestimates human and ecological exposures, given that receptors are mobile and concentrations change over time. For example, US EPA guidance states that risks should be estimated using average exposure concentrations as represented by the 95% upper confidence limit on the mean (US EPA, 1992). Given that exposure estimates based on the maximum concentrations did not exceed risk benchmarks, Gradient has greater confidence that there is no risk concern.
- Only constituents detected in groundwater were used to identify COIs and model COI concentrations in surface water and sediment. For the constituents that were not detected in FAPS groundwater, the detection limits were below the IL Part 845.600 GWPS and thus do not require further evaluation.
- COI concentrations in surface water were modeled using the maximum detected total COI concentrations in groundwater. Modeling surface water concentrations using total metal concentrations may overestimate surface water concentrations because dissolved concentrations, which are lower than total concentrations, represent the mobile fractions of constituents that could likely flow into and mix with surface water.
- The COIs identified in this evaluation also occur naturally in the environment. Contributions to exposure from natural or other non-FAPS-related sources were not considered in the evaluation of modeled concentrations; only exposure contributions potentially attributable to Site groundwater mixing with surface water were evaluated. While not quantified, exposures from potential FAPS-related groundwater contributions are likely to represent only a small fraction of the overall human and ecological exposure to COIs that also have natural or non-FAPS-related sources.
- Screening benchmarks for human health were developed using exposure inputs based on US EPA's recommended values for reasonable maximum exposure (RME) assessments (Stalcup, 2014). RME is defined as "the highest exposure that is reasonably expected to occur at a site but that is still within the range of possible exposures" (US EPA, 2004). US EPA states the "intent of the RME is to estimate a conservative exposure case (*i.e.*, well above the average case) that is still within the range of possible exposures" (US EPA, 1989). US EPA also notes that this high-end exposure "is the highest dose estimated to be experienced by some individuals, commonly stated as approximately equal to the 90th percentile exposure category for individuals" (US EPA, 2015c). Thus, most individuals will have lower exposures than those presented in this risk assessment.

Toxicity Benchmarks:

- Screening-level ecological benchmarks were compiled from IEPA and US EPA guidance and designed to be protective of the majority of Site conditions, leaving the option for Site-specific refinement. In some cases, these benchmarks may not be representative of the Site-specific conditions or receptors found at the Site, or may not accurately reflect concentration-response relationships encountered at the Site. For example, the ecological benchmark for cadmium is hardness dependent, and Gradient relied on US EPA's default hardness of 100 mg/L. Use of a higher hardness value would increase the cadmium SWQS because benchmarks become less

stringent with higher levels of hardness. Regardless of the hardness, the maximum modeled cadmium concentration is orders of magnitude below the SWQS.

- In addition, for the ecological evaluation, Gradient conservatively assumed all constituents to be 100% bioavailable. Modeled COI concentrations in surface water are considered total COI concentrations. In addition, the measured surface water data used in this report represent total concentrations. US EPA recommends using dissolved metals as a measure of exposure to ecological receptors because it represents the bioavailable fraction of metal in water (US EPA, 1993). Therefore, the modeled surface water COI concentrations may be an overestimation of exposure concentrations to ecological receptors.
- In general, it is important to appreciate that the human health toxicity factors used in this risk evaluation are developed to account for uncertainties, such that safe exposure levels used as benchmarks are often many times lower (even orders of magnitude lower) than the levels that cause effects that have been observed in human or animal studies. For example, toxicity factors incorporate a 10-fold safety factor to protect sensitive subpopulations. This means that a risk exceedance does not necessarily equate to actual harm.

4 Summary and Conclusions

A screening-level risk evaluation was performed for Site-related constituents in groundwater at the BPP in Baldwin, Illinois. The CSM developed for the Site indicates that groundwater beneath the FAPS flows into the Kaskaskia River adjacent to the Site and may potentially impact surface water and sediment. CEMs were developed for human and ecological receptors. The complete exposure pathways for humans include recreators (boaters) in the Kaskaskia River who are exposed to surface water and sediment, and anglers who consume locally caught fish. In addition, groundwater is used for drinking water within 1,000 meters of the BPP, and surface water from the Kaskaskia River is used for a community water supply, with the closest intake 1,325 feet southwest of the BPP. The complete exposure pathways for ecological receptors include aquatic life (including aquatic and marsh plants, amphibians, reptiles, and fish) exposed to surface water; benthic invertebrates exposed to sediment; and avian and mammalian wildlife exposed to bioaccumulative COIs in surface water, sediment, and dietary items.

Groundwater data collected from 2019 to 2024 were used to estimate exposures. The available surface water data collected from the Kaskaskia River were also evaluated. For groundwater constituents retained as COIs, surface water and sediment concentrations were modeled using the maximum detected groundwater concentration. Surface water and sediment exposure estimates were screened against benchmarks protective of human health and ecological receptors for this risk evaluation.

US EPA has established acceptable risk metrics. Risks above these US EPA-defined metrics are termed potentially "unacceptable risks." Based on the evaluation presented in this report, no unacceptable risks to human or ecological receptors resulting from CCR exposures associated with the FAPS were identified. This means that the risks from the Site are likely indistinguishable from normal background risks. Specific risk assessment results include the following:

- For groundwater used as drinking water, based on recent investigations and data collected from off-Site monitoring wells, private wells on properties south of the BPP are unlikely to be impacted by groundwater constituents associated with the BPP in excess of the GWPSs. The other private wells identified in the vicinity of the Site are upgradient or side-gradient of the BPP, and are therefore also unlikely to be impacted by groundwater constituents from the BPP.
- For surface water used as a drinking water source, all modeled COI concentrations were below the conservative risk-based screening benchmarks. Therefore, none of the COIs evaluated in surface water are expected to pose an unacceptable risk for use of the Kaskaskia River as a public water supply.
- For recreators exposed to surface water, all COIs were below the conservative risk-based screening benchmarks. Therefore, none of the COIs evaluated in surface water are expected to pose an unacceptable risk to recreators in the Kaskaskia River adjacent to the Site.
- For recreators exposed to sediment *via* incidental ingestion and dermal contact, the modeled sediment concentrations were below health-protective sediment benchmarks. Therefore, the modeled sediment concentrations are not expected to pose an unacceptable risk to recreators exposed to sediment in the Kaskaskia River adjacent to the Site.
- For anglers consuming locally caught fish, the modeled concentrations of all COIs in surface water (as well as the measured data) were below conservative benchmarks protective of fish consumption.

Therefore, none of the COIs evaluated are expected to pose an unacceptable risk to recreators consuming fish caught in the Kaskaskia River.

- Ecological receptors exposed to surface water include aquatic and marsh plants, amphibians, reptiles, and fish. The risk evaluation showed that none of the modeled or measured COIs in surface water exceeded protective screening benchmarks. Ecological receptors exposed to sediment include benthic invertebrates. The modeled sediment COIs did not exceed the conservative screening benchmarks; therefore, none of the COIs evaluated in sediment are expected to pose an unacceptable risk to ecological receptors.
- Ecological receptors were also evaluated for exposure to bioaccumulative COIs. This evaluation considered higher trophic level wildlife with direct exposure to surface water and sediment and secondary exposure through the consumption of dietary items (*e.g.*, plants, invertebrates, small mammals, fish). None of the ecological COIs were identified as having potential bioaccumulative effects. Overall, this evaluation demonstrated that none of the COIs evaluated are expected to pose an unacceptable risk to ecological receptors.

It should be noted that this evaluation incorporates a number of conservative assumptions that tend to overestimate exposure and risk. The risk evaluation was based on the maximum detected COI concentration; however, US EPA guidance states that risks should be based on a representative average concentration such as the 95% upper confidence limit on the mean; thus, using the maximum concentration tends to overestimate exposure. Although the COIs identified in this evaluation also occur naturally in the environment, the contributions to exposure from natural background sources and nearby industry were not considered; thus, CCR-related exposures were likely overestimated. Exposure estimates assumed 100% metal bioavailability, which likely results in overestimates of exposure and risks. Exposure estimates were based on inputs to evaluate the "reasonable maximum exposure"; thus, most individuals will have lower exposures than those estimated in this risk assessment.

Finally, while this evaluation concluded that current conditions do not present a risk to human health or the environment, it should be noted that based on the location of current off-site groundwater wells and the results of groundwater modeling, future conditions are also not expected to present a risk to human health or the environment.

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Appendix A

Surface Water and Sediment Modeling

Gradient modeled concentrations of constituents of interest (COIs) in the Kaskaskia River surface water and sediment based on available groundwater data. First, we estimated the flow rate of COIs discharged to the Kaskaskia River *via* groundwater. Then, we adapted United States Environmental Protection Agency (US EPA) indirect exposure assessment methodology (US EPA, 1998) in order to model surface water and sediment water concentrations in the Kaskaskia River.

Model Overview

The groundwater flow to the river is represented by a one-dimensional, steady-state model. In this model, the groundwater plume migrates horizontally in the Upper Unit (UU)/Potential Migration Pathway (PMP) and the Bedrock Unit (BU)/Uppermost Aquifer (UA) prior to flowing to the Kaskaskia River. For both layers, the groundwater flow entering the river is the flow going through a cross-sectional area that has a length equal to the length of the river adjacent to the Fly Ash Pond System (FAPS) with potential coal combustion residuals (CCR)-related impacts and a height equal to each layer's estimated thickness. It was assumed that all the groundwater flowing through these two layers would ultimately discharge to the Kaskaskia River, thus the total flow into the river is the sum of the flows in the two layers. The length of the groundwater discharge zone was estimated using Google Earth Pro (Google, LLC, 2022).

The groundwater flow to the Kaskaskia River mixes with the surface water in the river. The COIs entering the river *via* groundwater can dissolve into the water column, sorb to suspended sediments, or sorb to benthic sediments. Using US EPA's indirect exposure assessment methodology (US EPA, 1998), the model evaluates the surface water and sediment COI concentrations at a location downstream of the groundwater discharge point, assuming a well-mixed water column.

Groundwater Discharge Rate

The groundwater discharge rate was evaluated using conservative assumptions. Gradient conservatively assumed that the groundwater concentrations were uniformly equal to the maximum detected concentration of each individual COI, in both the UU and the UA. Further, Gradient ignored adsorption by subsurface soil and assumed that all the groundwater flowing through UU and UA and intersecting the river bank was discharged into the river.

For each groundwater unit, the groundwater flow rate into the river was derived using Darcy's Law:

$$Q = K \times i \times A$$

where:

Q	=	Groundwater flow rate (m^3/s)
K	=	Hydraulic conductivity (m/s)
i	=	Hydraulic gradient (m/m)
A	=	Cross-sectional area (m^2)

For each COI, the mass discharge rate into the river was then calculated by:

$$m_c = C_c \times Q \times CF$$

where:

m_c	=	Mass discharge rate of the COI (mg/year)
C_c	=	Maximum groundwater concentration of the COI (mg/L)
Q	=	Groundwater flow rate (m^3/s)
CF	=	Conversion factors: 1,000 L/m^3 and 31,557,600 s/year

The values of the aquifer parameters used for these calculations are provided in Table A.1. The calculated mass discharge rates were then used as inputs for the surface water and sediment partitioning model.

The cross-sectional area for the UU and UA were 5,943 and 12,600 m^2, respectively. The length of the discharge zone was estimated to be approximately 1,500 m. The height of the discharge zone was estimated to be 3.96 m for the UU and 8.40 m for the UA (Ramboll, 2021). The average horizontal hydraulic gradient was 0.013 m/m for the UU and 0.015 m/m for the UA (calculated from data in Ramboll, 2021). The average horizontal hydraulic conductivity of the UU was 0.000032 cm/sec and the UA was 0.000005 cm/sec (calculated from data in Ramboll, 2021).

Surface Water and Sediment Concentration

Groundwater discharged into the river will be diluted in the surface water flow. Constituents transported by groundwater into the surface water migrate into the water column and the bed sediments. The surface water model Gradient used to estimate the surface water and sediment concentrations is a steady-state model described in US EPA's indirect exposure assessment methodology (US EPA, 1998) and also used in US EPA's "Human and Ecological Risk Assessment of Coal Combustion Residuals," referred to herein as the CCR risk assessment (US EPA, 2014). This model describes the partitioning of constituents between surface water, suspended sediments, and benthic sediments based on equilibrium partition coefficients (K_d values). It estimates the concentrations of constituents in surface water, suspended sediments, and benthic sediments at steady-state equilibrium at a theoretical location downstream of the discharge point after complete mixing of the water column. In our analysis, we used the K_d values provided in the US EPA CCR risk assessment for all of the COIs (US EPA, 2014, Table J1). These coefficients are presented in Table A.2.

To be conservative, Gradient assumed that the constituents were not affected by dissipation or degradation once they entered the water body. The total water body concentration of the COI was calculated as follows (US EPA, 1998):

$$C_{wtot} = \frac{m_c}{V_f \times f_{water}}$$

where:

C_{wtot}	=	Total water body concentration of the COI (mg/L)
m_c	=	Mass discharge rate of the COI (mg/year)
V_f	=	Water body annual flow (L/year)
f_{water}	=	Fraction of the COI in the water column (unitless)

For the Kaskaskia River annual flow rate, Gradient conservatively used the low-flow (10th percentile) discharge rate of about 606 cubic feet per second (cfs), or 5.4×10^{11} L/year, based on the daily mean discharge rates measured at the United States Geological Survey (USGS) gauging station at New Athens, Illinois (USGS Station 05595000) between 2009 and 2022 (USGS, 2022a). The surface water parameters are presented in Table A.3.

The fraction of COIs in the water column was calculated for each COI using the sediment/water and suspended solids/water partition coefficients (US EPA, 2014). The fraction of COIs in the water column is defined as follows (US EPA, 2014):

$$f_{water} = \frac{(1 + [K_{dsw} \times TSS \times 0.000001]) \times \frac{d_w}{d_z}}{\left([1 + (K_{dsw} \times TSS \times 0.000001)] \times \frac{d_w}{d_z}\right) + ([bsp + K_{dbs} \times bsc] \times \frac{d_b}{d_z})}$$

where:

K_{dsw}	=	Suspended sediment-water partition coefficient (mL/g)
K_{dbs}	=	Sediment-water partition coefficient (mL/g)
TSS	=	Total suspended solids in the surface water body (mg/L). Set equal to 84.5 mg/L based on the median suspended sediment concentration measured at the USGS gauging station at New Athens, Illinois (USGS Station 05595000) between 2015 and 2022 (USGS, 2022b).
0.000001	=	Units conversion factor
d_w	=	Depth of the water column (m). The depth of the water column was estimated as 2.74 m, based on bathymetry data for the Kaskaskia River near the Baldwin Power Plant (BPP) (Bist LLC, 2022).
d_b	=	Depth of the upper benthic layer (m). Set equal to 0.03 m (US EPA, 2014).
d_z	=	Depth of the water body (m). Calculated as $d_w + d_b$. Set equal to 2.77 m.
bsp	=	Bed sediment porosity (unitless). Set equal to 0.6 (US EPA, 2014).
bsc	=	Bed sediment particle concentration (g/cm^3). Set equal to 1.0 g/cm^3 (US EPA, 2014).

The fraction of COIs dissolved in the water column (f_d) is calculated as follows (US EPA, 2014):

$$f_d = \frac{1}{1 + K_{dsw} \times TSS \times 0.000001}$$

The values for the fraction of COI in the water column and other calculated parameters are presented in Table A.4.

The total water column concentration (C_{wcTot}) of the COIs, comprising both the dissolved and suspended sediment phases, is then calculated as follows (US EPA, 2014):

$$C_{wcTot} = C_{wtot} \times f_{water} \times \frac{d_z}{d_w}$$

Finally, the dissolved water column concentration (C_{dw}) for the COIs is calculated as follows (US EPA, 2014):

$$C_{dw} = f_d \times C_{wcTot}$$

The dissolved water column concentration (C_{dw}) was then used to calculate the concentration of COIs sorbed to suspended solids in the water column (US EPA, 1998):

$$C_{sw} = C_{dw} \times K_{dsw}$$

where:

C_{sw}	=	Concentration sorbed to suspended solids (mg/kg)
C_{dw}	=	Concentration dissolved in the water column (mg/L)
K_{dsw}	=	Suspended solids/water partition coefficient (mL/g)

In the same way, using the total water body concentration and the fraction of COI in the benthic sediments, the model derives the total concentration in benthic sediments (US EPA, 2014):

$$C_{bstot} = f_{benth} \times C_{wtot} \times \frac{d_z}{d_b}$$

where:

C_{bstot}	=	Total COI concentration in bed sediment (mg/L or g/m^3)
C_{wtot}	=	Total water body COI concentration (mg/L)
f_{benth}	=	Fraction of COI in benthic sediments (unitless)
d_b	=	Depth of the upper benthic layer (m)
d_z	=	Depth of the water body (m). Calculated as $d_w + d_b$.

This value can be used to calculate dry weight sediment concentration as follows:

$$C_{seddw} = \frac{C_{bstot}}{bsc}$$

where:

C_{seddw}	=	Dry weight sediment concentration (mg/kg)
C_{bstot}	=	Total sediment concentration (mg/L)
bsc	=	Bed sediment bulk density. Used the default value of 1 g/cm^3 from US EPA (2014).

The total sediment concentration is composed of the sum of the COI concentration dissolved in the bed sediment pore water (equal to the concentration dissolved in the water column) and the COI concentration sorbed to benthic sediments (US EPA, 1998).

The COI concentration sorbed to benthic sediments was calculated as follows (US EPA, 1998):

$$C_{sb} = C_{dbs} \times K_{dbs}$$

where:

C_{sb}	=	Concentration sorbed to bottom sediments (mg/kg)
C_{dbs}	=	Concentration dissolved in the sediment pore water (mg/L)
K_{dbs}	=	Sediments/water partition coefficient (mL/kg)

For each COI, the modeled total water column concentration, dry weight sediment concentration, and concentration sorbed to sediment are presented in Table A.5.

Table A.1 Parameters Used to Estimate Groundwater Discharge to Surface Water

Groundwater Unit	Parameter	Name	Value	Unit
UU	A	Cross-Sectional Area	5,940	m^2
UU	i	Hydraulic Gradient	0.013	m/m
UU	K	Hydraulic Conductivity	0.000032	cm/s
UA	A	Cross-Sectional Area	12,600	m^2
UA	i	Hydraulic Gradient	0.015	m/m
UA	K	Hydraulic Conductivity	0.000005	cm/s

Notes:
UA = Uppermost Aquifer or Bedrock Unit; UU = Upper Unit or PMP (Potential Migration Pathway).
Source: Hydraulic gradient and hydraulic conductivity values from Ramboll (2021).
Cross-sectional area was estimated from Ramboll (2021).

Table A.2 Partition Coefficients

Constituent	Mean Sediment-Water Partition Coefficient (K_{dbs})		Mean Suspended Sediment-Water Partition Coefficient (K_{dsw})	
	Value (log_{10}) (mL/g)	Value (mL/g)	Value (log_{10}) (mL/g)	Value (mL/g)
Metals				
Arsenic	2.4	2.51E+02	3.9	7.94E+03
Boron	0.8	6.31E+00	3.9	7.94E+03
Lithium[a]	–	0	–	0
Radionuclides				
Radium 226+228	–	7.40E+03	–	7.40E+03

Notes:
Kd = Equilibrium Partition Coefficient.
Source: US EPA (2014).
(a) Lithium does not readily sorb to soils and sediments. Consequently, sediment concentrations were not modeled for this constituent (K_d was assumed to be 0).

Table A.3 Surface Water Parameters

Parameter	Name	Value	Unit
TSS	Total Suspended Solids	84.5	mg/L
V_{fx}	Surface Water Flow Rate	5.4×10^{11}	L/year
d_b	Depth of Upper Benthic Layer (default)	0.03	m
d_w	Depth of Water Column	2.74	m
d_z	Depth of Water Body	2.77	m
bsc	Bed Sediment Bulk Density (default)	1	g/cm^3
bsp	Bed Sediment Porosity (default)	0.6	–
M_{TSS}	TSS Mass per Unit Area[a]	0.23	kg/m^2
M_S	Sediment Mass per Unit Area[b]	30	kg/m^2

Notes:
CF = Conversion factor.
Source of default values: US EPA (2014).
(a) $M_{TSS} = TSS \times d_w \times CF1 \times CF2$.
(b) $M_S = d_b \times bsc \times CF3 \times CF4$.
CF1 = 1,000 L/m^3; CF2 = 1E06 kg/kg; CF3 = 1E+06 cm^3/m^3; CF4 = 0.001 kg/g.

Table A.4 Calculated Parameters

COI	Fraction of COI in the Water Column (f_{water})	Fraction of COI in the Benthic Sediments ($f_{benthic}$)	Fraction of COI Dissolved in the Water Column ($f_{dissolved}$)
Metals			
Arsenic	0.38	0.62	0.60
Boron	0.96	0.04	0.60
Lithium	0.99	0.01	0
Radionuclides			
Radium 226+228	0.02	0.98	0.62

Note:
COI = Constituent of Interest.

Table A.5 Surface Water and Sediment Modeling Results

COI	Groundwater Concentration (mg/L or pCi/L)	Mass Discharge Rate (mg/year or pCi/year)	Total Water Column Concentration (mg/L or pCi/L)	Concentration Sorbed to Bottom Sediments (mg/kg or pCi/kg)
Metals				
Arsenic	0.014	1.5E+04	2.8E08	4.3E06
Boron	2.9	3.2E+06	6.0E06	2.3E05
Lithium	0.22	2.4E+05	4.6E07	(a)
Radionuclides				
Radium 226+228	4.84	5.3E+06	9.9E06	4.5E02

Notes:
COI = Constituent of Concern; mg/L = Milligrams per Liter; pCi/kg = PicoCuries per Kilogram; pCi/L = PicoCuries per Liter.
(a) Lithium does not readily sorb to soils and sediments. Consequently, sediment concentrations were not modeled for this constituent (K_d was assumed to be 0).

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Appendix B

Screening Benchmarks

Table B.1 Calculated Water Quality Standards Protective of Incidental Ingestion and Fish Consumption

Human Health COI	BCF[a] (L/kg-tissue)	Basis	MCL (mg/L)	RfD (mg/kg-day)	ADI[b] (mg/day)	Human Threshold Criteria		
						Water & Fish (mg/L)	Water Only (mg/L)	Fish Only (mg/L)
Total Metals								
Arsenic	44	NRWQC (2002)	0.010	0.00030	0.020	0.022	2.0	0.023
Boron	1	(c)	NC	0.20	14	467	1400	700
Cobalt	300	ORNL (2020)	NC	0.00030	0.021	0.0035	2.1	0.0035
Lead	46	US EPA (2014)	0.015	NC	0.030	0.015	0.015	0.015
Lithium	1	(c)	NC	0.002	0.14	4.7	14	7.0
Molybdenum	4	US EPA, 2014	NC	0.00500	0.3500	3.9	35	4.4
Thallium	116	NRWQC (2002)	0.0020	0.000010	0.0040	0.0017	0.40	0.0017
Human Health COI	**BAF**		**MCL (pCi/L)**	**ADI (pCi/day)**	**Food Ingestion Slope Factor[d]**	**Human Threshold Criteria**		
	SW-Fish	**Basis**				**Water & Fish (pCi/L)**	**Water Only (pCi/L)**	**Fish Only (pCi/L)**
Radionuclides								
Radium-226+228	4.0	ORNL (2020)	5	10	1.43E-09	1,000	1,000	87,413

Notes:

ADI = Acceptable Daily Intake; BAF = Bioaccumulation Factor; BCF = Bioconcentration Factor; COI = Constituent of Interest; HTC = Human Threshold Criteria; IEPA = Illinois Environmental Protection Agency; MCL = Maximum Contaminant Level; NC = ; NRWQC = National Recommended Water Quality Criteria; ORNL = Oak Ridge National Laboratory; RAIS = Risk Assessment Information System; RfD = Reference Dose; SW = Surface Water; US EPA = United States Environmental Protection Agency.

(a) BCFs from the following hierarchy of sources:

NRWQC (US EPA, 2002). National Recommended Water Quality Criteria: 2002. Human Health Criteria Calculation Matrix.

US EPA (2014). Human and Ecological Risk Assessment of Coal Combustion Residuals.

ORNL RAIS (ORNL, 2020). Risk Assessment Information System (RAIS) Toxicity Values and Chemical Parameters.

(b) ADI based on the MCL is calculated as the MCL (mg/L) multiplied by a water ingestion rate of 2 L/day. In the absence of an MCL, the ADI was calculated as the RfD (mg/kg-day) multiplied by the body weight (70 kg).

(c) BCF of 1 was used as a conservative assumption, due to lack of published BCF.

(d) Food ingestion slope factors for Ra-226+D and Ra-228+D were compared and the higher factor (Ra-228+D) was selected. The "+D" indicates that the risks from "associated short-lived radioactive decay products are also included" (US EPA, 2001).

Equations from IEPA (2019):

Consumption of Water and Fish

$$HTC = \frac{ADI}{W + (F \times BCF)}$$

Incidental Consumption of Water Only

$$HTC = \frac{ADI}{W}$$

Consumption of Fish Only

$$HTC = \frac{ADI}{F \times BCF}$$

Where:

Human Threshold Criteria (HTC)	Chemical-specific	mg/L
Acceptable Daily Intake (ADI)	Chemical-specific	mg/day
Fish Consumption Rate (F)	0.02	kg/day
Bioconcentration Factor (BCF)/ Bioaccumulation Factor (BAF)	Chemical-specific	L/kg-tissue
Water Consumption Rate (W)	0.01	L/day
Body Weight	70	kg
Target Cancer Risk (TCR)	1.0E-05	

Radium-226+228

$$HTC = \frac{TCR}{(SF \times BAF \times F)}$$

Table B.2 Recreator Exposure to Sediment

COI	Relative Bioavailability B (unitless)	Dermal Absorption Fraction ABS (unitless)	Cancer				Cancer SL (mg/kg)	Non-Cancer								Recreator RSL Sediment (mg/kg)	Basis
			TRV		Child + Adult			TRV		Child		Adult		Child	Adult		
			CSF $(mg/kg\text{-}d)^{-1}$	Derm. CSF $(mg/kg\text{-}d)^{-1}$	Incidental Ingestion SL_{ing} (mg/kg)	Dermal Contact SL_{derm} (mg/kg)		RfD (mg/kg-d)	Derm. RfD (mg/kg-d)	Incidental Ingestion SL_{ing} (mg/kg)	Dermal Contact SL_{derm} (mg/kg)	Incidental Ingestion SL_{ing} (mg/kg)	Dermal Contact SL_{derm} (mg/kg)	Non-Cancer SL (mg/kg)			
Total Metals																	
Arsenic	1	3.0E-02	1.5E+00	1.5E+00	8.1E+01	4.1E+02	6.8E+01	3.0E-04	3.0E-04	4.1E+02	4.4E+03	4.4E+03	8.0E+03	3.8E+02	2.8E+03	6.8E+01	c
Boron	1	NA	NC	NC	NC	NC	NC	2.0E-01	2.0E-01	2.7E+05	NA	2.9E+06	NA	2.7E+05	2.9E+06	2.7E+05	nc
Cobalt	1	NA	NC	NC	NC	NC	NC	3.0E-04	3.0E-04	4.1E+02	NA	4.4E+03	NA	4.1E+02	4.4E+03	4.1E+02	nc
Lead	1	NA	NC	NC	NC	NC	NC	0.0E+00	0.0E+00	0.0E+00	NA	0.0E+00	NA	NC	NC	NC	nc
Lithium	1	NA	NC	NC	NC	NC	NC	2.0E-03	2.0E-03	2.7E+03	NA	2.9E+04	NA	2.7E+03	2.9E+04	2.7E+03	nc
Molybdenum	1	NA	NC	NC	NC	NC	NC	5.0E-03	5.0E-03	6.8E+03	NA	7.3E+04	NA	6.8E+03	7.3E+04	6.8E+03	nc
Thallium	1	NA	NC	NC	NC	NC	NC	1.0E-05	1.0E-05	1.4E+01	NA	1.5E+02	NA	1.4E+01	1.5E+02	1.4E+01	nc
Dissolved Metals																	
Boron	1	NA	NC	NC	NC	NC	NC	2.0E-01	2.0E-01	2.7E+05	NA	2.9E+06	NA	2.7E+05	2.9E+06	2.7E+05	nc
Lithium	1	NA	NC	NC	NC	NC	NC	2.0E-03	2.0E-03	2.7E+03	NA	2.9E+04	NA	2.7E+03	2.9E+04	2.7E+03	nc
Radionuclides																	
Radium 226 + Radium 228	1	NA	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	7.9E+03	pCi/kg
Other																	
Chloride	1	NA	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	nc
Fluoride	1	NA	NC	NC	NC	NC	NC	4.0E-02	4.0E-02	5.5E+04	NA	5.8E+05	NA	5.5E+04	5.8E+05	5.5E+04	nc
Sulfate	1	NA	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	nc

Notes:

AL = EPA Action Level; COI = Constituent of Interest; CSF = Cancer Slope Factor; derm = Dermal Contact; ing = Ingestion; NC = No criterion available; RfD = Reference Dose; SL = Screening Level; TRV = Toxicity Reference Value.

Health Benchmark defined as the lower of the Screening Levels for cancer and non-cancer. The basis of the Health Benchmark presented as c = based on cancer endpoint or nc = based on non-cancer endpoint.

Screening Benchmark = $\dfrac{1}{\dfrac{1}{SL_{ing}} + \dfrac{1}{SL_{derm}}}$

Non-cancer SL_{ing} = $\dfrac{THQ * RfD}{Intake}$ Cancer SL_{ing} = $\dfrac{TR}{Intake * CSF}$

Non-cancer SL_{derm} = $\dfrac{THQ * RfD}{Intake * ABS}$ Cancer SL_{derm} = $\dfrac{TR}{Intake * ABS * CSF}$

Target Cancer Risk (TR) = 1E-05

Target Hazard Quotient (THQ) = 1

Sediment – Ingestion (Chemical)

Intake Factor (IF) = $\dfrac{IR \times EF \times ED \times CF}{BW \times AT}$ =			Non-Cancer		Cancer		Basis
			7.3E-07	6.8E-08	6.3E-08	2.0E-08	
			Child	Adult	Child	Adult	
	IR	Ingestion Rate (mg/day)	67	33	67	33	One-third of US EPA residential soil ingestion rate (Prof. Judgment)
	EF	Sediment Exposure Frequency (days/year)	60	60	60	60	2 days/week between April and Oct when air temp. > 70°F (Prof. Judgment)
	ED	Exposure Duration (years)	6	20	6	20	Default value for Resident (US EPA, 2024b)
	CF	Conversion Factor (kg/mg)	0.000001	0.000001	0.000001	0.000001	
	BW	Body Weight (kg)	15	80	15	80	Default value for Resident (US EPA, 2024b)
	AT	Averaging Time (d)	2,190	7,300	25,550	25,550	Default value for Resident (US EPA, 2024b)

Sediment – Dermal Contact (Chemical)

Intake Factor (IF) = $\dfrac{SA \times AF \times EF \times ED \times CF}{BW \times AT}$ =			Non-Cancer		Cancer		Basis
			2.2E-06	1.2E-06	1.9E-07	3.6E-07	
			Child	Adult	Child	Adult	
	SA	Surface Area Exposed to Sediment (cm^2/day)	1,026	3,026	1,026	3,026	Age weighted SA for lower legs and feet (US EPA, 2011b)
	AF	Sediment Skin Adherence Factor (mg/cm^2)	0.2	0.2	0.2	0.2	Age weighted AF for children exposed to sediment (US EPA, 2011b)
	EF	Sediment Exposure Frequency (days/year)	60	60	60	60	2 days/week between April and Oct when air temp. > 70°F (Prof. Judgment)
	ED	Exposure Duration (years)	6	20	6	20	Default value for Resident (US EPA, 2024b)
	CF	Conversion Factor (kg/mg)	0.000001	0.000001	0.000001	0.000001	
	BW	Body Weight (kg)	15	80	15	80	Default value for Resident (US EPA, 2024b)
	AT	Averaging Time (d)	2,190	7,300	25,550	25,550	Default value for Resident (US EPA, 2024b)

Appendix B

Corrective Action Alternatives Analysis – Supporting Information Report

Intended for
Dynegy Midwest Generation, LLC
10901 Baldwin Road
Baldwin, Il 62217

Date
April 22, 2025

Project No.
1940110241-004

CORRECTIVE ACTION ALTERNATIVES ANALYSIS SUPPORTING INFORMATION REPORT

FLY ASH POND SYSTEM
BALDWIN POWER PLANT
IEPA ID NO. W1578510001-01/02/03

RAMBOLL Bright ideas. Sustainable change.

CORRECTIVE ACTION ALTERNATIVES ANALYSIS SUPPORTING INFORMATION REPORT IEPA ID NO. W1578510001-01/02/03

Project name	**Baldwin Power Plant Fly Ash Pond System**
Project no.	**1940110241-005**
Recipient	**Dynegy Midwest Generation, LLC**
Document type	**Supporting Information Report**
Revision	**FINAL**
Date	**April 22, 2025**
Prepared by	**Christopher R. Glidden**
Checked by	**J. Austin Bond, PE**
Approved by	**Brian G. Hennings, PG**
Description	**Corrective Action Alternatives Analysis Supporting Information Report**

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APPENDICES

Appendix A Feasibility-Level Design Drawings for Alternative 2 and Alternative 3 Remedies
Appendix B Groundwater Modeling Technical Memorandum
Appendix C Material Quantity, Labor, and Mileage Estimates for Alternative 2 and Alternative 3 Remedies

ACRONYMS AND ABBREVIATIONS

35 I.A.C.	Title 35 of the Illinois Administrative Code
40 C.F.R.	Title 40 of the Code of Federal Regulations
bgs	below ground surface
BAP	Bottom Ash Pond
BEC	Baldwin Energy Complex
BMP	best management practices
BPP	Baldwin Power Plant
CAAA	Corrective Action Alternatives Analysis
CAAA-SIR	Corrective Action Alternatives Analysis Supporting Information Report
CAP	Corrective Action Plan
CCR	coal combustion residuals
CCR Rule	40 C.F.R. § 257 Subpart D
cm/s	centimeters per second
CMA	Corrective Measures Assessment
COC	constituent of concern
CSM	conceptual site model
DMG	Dynegy Midwest Generation, LLC
EQ	equalization
FAPS	Fly Ash Pond System, also referred to as Site
GMR	Groundwater Modeling Report
Gradient	Gradient Corporation
GWPS	groundwater protection standard(s)
HDPE	high-density polyethylene
ID	identification
IDNR	Illinois Department of Natural Resources
IEPA	Illinois Environmental Protection Agency
Kd	soil adsorption coefficient
mL/g	milliliters per gram
PMP	potential migration pathway
NAVD88	North American Vertical Datum of 1988
NID	National Inventory of Dams
No.	number
NPDES	National Pollutant Discharge Elimination System
O&M	operations and maintenance
Ramboll	Ramboll Americas Engineering Solutions, Inc.
RS Means	RS Means Heavy Construction Cost Data
SI	surface impoundment
USEPA	United States Environmental Protection Agency
UU	upper unit

1. INTRODUCTION AND BACKGROUND

1.1 Plant and Site Information

Dynegy Midwest Generation, LLC (DMG) is the owner of the active coal-fired Baldwin Energy Complex (BEC), also referred to as the Baldwin Power Plant (BPP), in Baldwin, Randolph County, Illinois. DMG intends to complete groundwater corrective action at the coal combustion residuals (CCR) surface impoundment (SI) Fly Ash Pond System (FAPS), which is comprised of the East Fly Ash Pond, the Old East Fly Ash Pond and the West Fly Ash Pond and is identified by Illinois Environmental Protection Agency (IEPA) identification (ID) numbers (Nos.) W1578510001-01, W1578510001-02, and W1578510001-03, also referred to as Vistra Identification ID No. 605, and National Inventory of Dams (NID) No. IL50720. Groundwater corrective action for the BPP FAPS will be performed under the requirements of Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845, Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments [1] and the requirements of Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257, herein referred to as the Federal CCR Rule [2].

1.2 CAAA-SIR Background and Scope

35 I.A.C. § 845 requires a Corrective Action Alternatives Analysis (CAAA) to be completed as part of remedy selection, pursuant to the requirements of 35 I.A.C. § 845.670(e). The CAAA for the BPP FAPS was prepared by Gradient Corporation (Gradient). Ramboll Americas Engineering Solutions, Inc. (Ramboll) has prepared this Corrective Action Alternatives Analysis Supporting Information Report (CAAA-SIR) to provide information requested by Gradient to support the CAAA for the BPP FAPS.

This CAAA-SIR was prepared to address specific constituents of concern (COC) where exceedances of the 35 I.A.C. § 845.600 groundwater protection standards (GWPS) have been detected in the FAPS groundwater compliance monitoring wells. The COCs with exceedances[1] addressed by this CAAA-SIR, as of the 2024 Annual Report [3], include boron and sulfate.

This CAAA-SIR is a feasibility-level assessment utilized to evaluate multiple groundwater corrective action alternatives. The remedy that is ultimately selected within the CAAA, to which this CAAA-SIR is attached, was then further developed into a permit-level remedy within the Corrective Action Plan (CAP), to which the CAAA is attached. Therefore, there may be minor differences in information presented for the selected remedy between this CAAA-SIR and the CAP. Information that may be different includes, but is not limited to, groundwater quality data, groundwater modeling inputs and results, implementation schedules, time to reach GWPS, the physical dimensions and scope of the remedy, and engineering design parameters. These differences are due to further remedy refinement that is inherent with advancing the selected alternative into the permit-level remedy that is included within the CAP.

[1] Throughout this document, "exceedance" or "exceedances" is intended to refer only to potential exceedances of proposed applicable background statistics or GWPSs as described in the proposed groundwater monitoring program, which was submitted to the IEPA on October 25, 2021 as part of DMG's operating permit application for the BPP FAPS. That operating permit application, including the proposed groundwater monitoring program, remains under review by the IEPA and, therefore, DMG has not identified any actual exceedances.

1.2.1 Identified Corrective Action Alternatives

Corrective action remedies selected for evaluation within this CAAA-SIR were identified as potentially feasible for the FAPS in the Corrective Measures Assessment (CMA), prepared by Ramboll and attached to the CAAA prepared by Gradient. The remedies identified as potentially feasible included:

- Alternative 1: Source control with groundwater polishing (GWP);
- Alternative 2: Source control with cutoff wall; and
- Alternative 3: Source control with a groundwater management system[2].

Other remedies, including source control with in-situ chemical treatment, were determined to be infeasible for the site during the CMA process.

1.2.2 Scope of CAAA-SIR

Ramboll completed the following tasks and documented the tasks within this CAAA-SIR, for each of the corrective action alternative remedies listed in **Section 1.2.1**:

- Feasibility-level design drawings (**Appendix A**) were developed to show the approximate extents and typical sections/details of the Alternative 2 (source control with cutoff wall) and Alternative 3 (source control with a groundwater management system) remedies. Drawings were not prepared for the Alternative 1 remedy as it does not involve construction at the site.
- Narratives describing the implementation of each remedy were developed, including the pre-design, design, construction, operations, and maintenance (O&M), and closeout phases.
- Feasibility-level schedules providing the estimated time to implement the remedy were developed, including design, permitting, construction, and post-construction O&M.
- Feasibility-level plans for the management of liquids that may be within the footprint of the FAPS were developed for alternatives that include the management of extracted water.
- Information required to evaluate specific portions of 35 I.A.C. § 845.670(e) requirements were prepared, as requested by Gradient, including 35 I.A.C. § 845.670(e)(1)(H) and 35 I.A.C. § 845.670(e)(3).
- Estimates of implementation-based equipment mileage, vehicle delivery mileage, labor hour, and labor commuting mileage, were developed for each remedy alternative where physical construction and/or O&M activities are expected to occur.

All remedies presented within this CAAA-SIR were developed to integrate with the source control for the BPP FAPS that was completed in 2020 [4] in accordance with a Closure and Post-Closure Care Plan [5] that was approved by IEPA [6]. This will include maintaining the FAPS throughout the post-closure care period.

1.2.3 Criterion for Estimating Remedial Alternative Effectiveness

Groundwater modeling for each remedial alternative (included in **Appendix B**) indicates that none of the potentially feasible alternatives identified in the CMA and evaluated in this CAAA-SIR would result in GWPS being attained for all FAPS compliance monitoring wells within a 1,000-year simulation period. This is because the underlying lithological units beneath the CCR unit,

[2] This corrective measure is referred to as groundwater extraction in the April 2024 CMA.

identified as the upper unit (UU) and underlying bedrock uppermost aquifer (UA) in the 2024 Nature and Extent Report [7], consists of low-permeability soils and underlying low-permeability shale and limestone bedrock, resulting in extended times to attain GWPS, regardless of the type of evaluated remedy. These model results are consistent with the modeling results presented in the Closure and Post-Closure Care Plan [5] that was prepared in 2016 and subsequently approved by IEPA [6].

Therefore, in addition to evaluating which remedial alternative resulted in the shortest time to reach GWPS in the FAPS compliance wells, spatial analyses were performed to compare each remedial alternative's ability to reduce the future potential footprint of COCs in groundwater thereby minimizing the potential for COCs to migrate past the site's southern property boundary which could result in a future risk exposure pathway to off-site property owners. This analysis utilized maps depicting the maximum plume extent of modeled boron concentration to quantify spatial distribution and area for each remedial alternative.

Results of groundwater fate and transport modeling (**Appendix B**) conservatively estimate groundwater boron concentrations at the FAPS compliance wells through the end of the 1,000-year simulation period. As noted in the groundwater technical memorandum, the model is limited by the data used for calibration, which adequately define the local groundwater flow system and the source and extent of the plume. Since data used for calibration are near the FAPS, model predictions of transport distant spatially and temporally (*e.g.,* 1,000 years in the future) from the calibrated conditions at the CCR units will not be as reliable as predictions closer to the CCR units and concentrations observed between 2015 and 2024.

1.3 Report Contents

The following information is included within this report:

- **Section 1** includes the introduction and background;
- **Section 2** includes information for the Alternative 1 remedy: source control with GWP;
- **Section 3** includes information for the Alternative 2 remedy: source control with cutoff wall;
- **Section 4** includes information for the Alternative 3 remedy: source control with groundwater management system;
- **Section 5** includes information used to develop estimates of material quantities, labor hours, and mileage; and
- **Section 6** includes reference documents used in the development of this CAAA-SIR.

2. ALTERNATIVE 1 REMEDY: SOURCE CONTROL WITH GROUNDWATER POLISHING

The Alternative 1 remedy, source control with GWP, would include the completed source control approach which consisted of capping the waste material, after which GWP would be formally implemented. GWP is a remedial alternative that relies on natural geochemical processes and may be appropriate as recognized by the United States Environmental Protection Agency (USEPA) in a final policy directive for groundwater remediation [8].

2.1 Supporting Groundwater Modeling and Remedy Effectiveness

The COCs exceeding the GWPS at compliance groundwater monitoring wells as of the 2024 Annual Report [9] are boron and sulfate. Boron was selected for modeling the source control presented in the Closure and Post-Closure Care Plan and was identified as a surrogate for the exceedances of sulfate. For modeling purposes, it was assumed that boron would not significantly sorb or chemically react with aquifer solids (soil adsorption coefficient [Kd] was set to 0 milliliters per gram [mL/g]) which is a conservative estimate for predicting contaminant transport times in the model. Boron transport is likely to be affected by both chemical and physical attenuation mechanisms (*i.e.*, adsorption and/or precipitation reactions as well as dilution and dispersion). Physical attenuation (dilution and dispersion) of contaminants in groundwater is simulated in the groundwater computer models. Chemical attenuation mechanisms and their effect on modeled times for exceedances to attain the GWPS are discussed in the Groundwater Polishing Evaluation Report [10].

Groundwater modeling for the Alternative 1 remedy was performed in 2014 to support the 2016 closure plan for the FAPS [5] and further refined in 2024 (**Appendix B**). The updated 2024 groundwater model estimated that the GWPS would not be attained for all FAPS compliance monitoring wells within the 1,000-year prediction model simulation period after the 2020 completion of source control implementation. Following source control and GWP in Alternative 1, the GWPS was not achieved at 16 of 23 wells evaluated following the completion of the 1,000-year model simulation. Simulated boron plume extent slowly expanded over time following implementation of Alternative 1. Based on the calculations of plume extent acreages, the area of the plume increases from 420 acres (current simulated plume area) to 561 acres (1,000-year simulated plume area) for Alternative 1. Approximately 50 acres of the 1,000-year simulated plume area occur off-site. The combined linear distance of plume simulated as intersecting the property line at the end of the 1000-year simulation was continuous and approximately 5,440 feet for Alternative 1.

2.2 Remedy Implementation

Implementation of the source control (*e.g.,* final closure of the FAPS) portion of the remedy was completed in 2020. Although a formal GWP remedy has not yet been initiated and approved by IEPA, GWP processes have been ongoing since the closure was completed. Implementation of GWP would include formalizing the GWP remedy. This would include performing corrective action groundwater monitoring, enacting an adaptive management strategy, and, after GWPS have been met, performing corrective action closure and completion activities. Information associated with each of these activities is described below.

- Corrective Action Groundwater Monitoring

  - Regular corrective action groundwater monitoring would be conducted utilizing a corrective action groundwater monitoring system designed in accordance with 35 I.A.C. § 845.680(c), which specifies that wells must be installed in the plume of contamination that lies beyond the waste boundary.
    - Samples would be collected for major ions for evaluating groundwater geochemistry and COCs. Samples would be collected on a quarterly basis initially and potentially reduced to a semiannual basis once five years of monitoring have occurred, in accordance with 35 I.A.C. § 845.650(b)(4).
    - Monitoring results would be submitted to IEPA for each monitoring event, in addition to an annual groundwater monitoring and corrective action report, in accordance with 35 I.A.C. § 845.610(e).
    - Routine maintenance of the monitoring well system would occur during the monitoring period. This would include inspecting the wells, making repairs to the wells (as and if needed), and rehabilitating and/or replacing wells to improve performance (as and if needed).
- Adaptive Management during Monitoring
  - Groundwater monitoring results would be evaluated and documented in in the monitoring reports submitted to IEPA, in accordance with 35 I.A.C. § 845.610(e)
  - Remedy performance evaluation as part of adaptive site management may include additional investigation to inform updates to the CSM, groundwater, and geochemical models.
  - If remedy performance does not correspond with expectations, additional methods or techniques to achieve compliance with GWPS would be evaluated and, if feasible, implemented in accordance with 35 I.A.C. § 845.680(b).
- Corrective Action Confirmation Monitoring and Completion
  - In the event that GWPS are met in the future for all corrective action monitoring wells, corrective action confirmation groundwater monitoring would be implemented. This would include monitoring each well for three additional years to confirm that GWPS have been achieved, in accordance 35 I.A.C. § 845.680(c).
  - After completion of the corrective action confirmation monitoring period, a Corrective Action Completion Report and Certification would be prepared and submitted to IEPA, in accordance with 35 I.A.C. § 845.680(e).
  - If GWPS are not met in the future, the FAPS would remain in a perpetual state of Corrective Action Groundwater Monitoring and confirmation monitoring would not be performed.

2.2.1 Remedy Implementation Schedule

A feasibility-level implementation schedule for the Alternative 1 source control with GWP remedy is provided in **Table A** below.

Table A. Feasibility-Level Implementation Schedule – Alternative 1: Source Control with GWP

Implementation Phase	Implementation Task	Timeframe* (Preliminary Estimates)
Corrective Action Implementation	Corrective Action Monitoring (Time to Meet GWPS)	>100 years
	Corrective Action Confirmation Monitoring	36 months
	Corrective Action Completion	6 months
	Timeframe to Complete Corrective Action Implementation	>100 years
	Total Timeline to Complete Corrective Action	>100 years

2.2.2 Management of Extracted Groundwater

No groundwater extraction would occur under this remedy.

2.2.3 35 I.A.C. § 845.670(e)(1)(H) and 35 I.A.C. § 845.670(e)(3) Information

As requested by Gradient, the following information required by 35 I.A.C. § 845.670(e)(1)(H) and 35 I.A.C. § 845.670(e)(3) has been developed for the remedy. The information was developed based on preliminary-level information contained within the CMA for the BPP FAPS and then refined based on additional feasibility-level design activities performed as part of the development of this CAAA-SIR.

- Potential Need for Replacement of the Remedy – 35 I.A.C. § 845.670(e)(1)(H)
  - No replacement of the remedy would be required for source control with GWP, as a physical remedy would not be constructed.
- Degree of Difficulty Associated with Constructing the Remedy – 35 I.A.C. § 845.670(e)(3)(A)
  - No construction would be required with the source control with GWP remedy; therefore, there is no difficulty in construction of the remedy.
- Expected Operational Reliability of the Remedy - 35 I.A.C. § 845.670(e)(3)(B)
  - A report detailing the GWP process [10] has been developed and evaluates the reliability and the potential for reversibility of the chemical attenuation mechanisms. This report is attached to the Gradient CAAA.
- Need to Coordinate with and Obtain Necessary Approvals and permits from Other Agencies - 35 I.A.C. § 845.670(e)(3)(C)
  - No permits from other agencies would be required.

- Availability of Necessary Equipment and Specialists - 35 I.A.C. § 845.670(e)(3)(D)
  - Equipment and specialists for field data collection and groundwater sampling are required for the GWP alternative. Laboratory equipment and specialists would also be required to assess groundwater concentrations of site constituents. Groundwater professionals (*i.e.,* geologists, hydrogeologists, statisticians, geochemists) would be required to perform statistical analysis and other assessments to confirm that GWP is functioning as intended and prepare corrective-action related groundwater monitoring and progress reports.
  - The equipment and specialists required for site groundwater monitoring and analysis are currently performing this work as part of the routine groundwater monitoring program in accordance with 35 I.A.C. § 845.220(c)(4). Therefore, no new equipment or specialists are required for groundwater monitoring for this alternative.
- Available Capacity and Location of Needed Treatment, Storage, and Disposal Services – 35 I.A.C. § 845.670(e)(3)(E)
  - No treatment, storage, or disposal services would be required with the source control with GWP remedy, as GWP would not generate any appreciable volume of waste or wastewater.

3. ALTERNATIVE 2 REMEDY: SOURCE CONTROL WITH CUTOFF WALL

The Alternative 2 remedy, source control with cutoff wall, would include the construction of a cutoff wall that would extend from the existing perimeter berm ground surface, which ranges from approximately 390 to 450 feet[4] to an approximate elevation of 365 feet, with the wall keyed into the low-permeability bedrock underlying the UU/potential migration pathway (PMP). The total length of the cutoff wall would be approximately 7,000 feet located along the downgradient edge of the unit, and the cutoff wall would have a maximum depth of approximately 85 feet bgs. The cutoff wall would be constructed using either a mixture of soil and bentonite or cement and bentonite and would have an expected width of 2 to 3 feet. The cutoff wall would have a hydraulic conductivity value of approximately 1×10^{-7} centimeters per second (cm/s). The purpose of the cutoff wall would be to provide a long-term, maintenance-free physical barrier to reduce the potential for COCs to migrate past the site's southern property boundary to off-site property owners.

A feasibility-level drawing of the source control with cutoff wall remedy is provided as **Figure 1** in **Appendix A.**

3.1 Remedy Scoping and Groundwater Modeling Results

The location of the cutoff wall was selected by reviewing physical constraints around the FAPS where the wall could feasibly be constructed with limited impacts to other site features. The location was also selected to avoid sensitive areas such as wetlands, Waters of the United States, or floodplains, and to minimize potential impacts to the structural stability of the southern FAPS dike. This resulted in the wall being located within the FAPS, along the crest of the southern dike wall and extending west towards the tertiary pond. Since the selected location is within the current limits of the FAPS, it is not within regulatory floodplains or known wetlands, and provides a generally straight and level alignment for the wall. However, this would result in the wall impacting the final cover system of the FAPS, which would require impacted areas to be repaired after wall construction.

Construction of a cutoff wall at the downstream toe of the dike or beyond the dike would conversely require substantial modifications to the dike and may impact Waters of the United States and/or floodplains. Additionally, the proposed location allows the wall to act as a physical barrier between the FAPS and the offsite properties to the south and southwest and is generally perpendicular to existing groundwater flow patterns.

The depth of the cutoff wall was selected using iterative, three-dimensional groundwater fate and transport modeling. This included adjusting the total depth of the wall and reviewing associated times to attain GWPS and selecting a wall depth that reduced cleanup times while also improving constructability. This resulted in a wall that fully-penetrated the UU and keyed into the underlying bedrock. The thickness and hydraulic conductivity of the wall were selected based on Ramboll's design and construction experience with cutoff walls and is supported based on preliminary discussions with remedial contractors.

[4] All elevations referenced in this report are in the North American Vertical Datum of 1988 (NAVD88), unless otherwise noted.

The groundwater model (**Appendix B**) estimated that the GWPS would not be attained for all FAPS compliance monitoring wells within the 1,000-year prediction model simulation period after the implementation of Alternative 2 remedy, source control with cutoff wall. Following source control and cutoff wall in Alternative 2, the GWPS was not achieved at 16 of 23 wells evaluated following the completion of the 1,000-year model simulation. Simulated boron plume extent slowly expanded over time following implementation of Alternative 2. Based on the calculations of plume extent acreages, the area of the plume increases from 420 acres (current simulated plume area) to 559 acres (1,000-year simulated plume area) for Alternative 2. Approximately 30 acres of the 1,000-year simulated plume area occur off-site. The combined linear distance of plume simulated as intersecting the property line at the end of the 1,000-year simulation was continuous and approximately 5,440 feet for Alternative 2.

3.2 Remedy Implementation

Implementation of the Alternative 2 source control with cutoff wall remedy is expected to include multiple tasks spread out over three phases, including pre-construction activities (Phase 1), corrective action construction (Phase 2), and corrective action operations, maintenance, and closeout (Phase 3). Information for each phase is described in this section.

3.2.1 Phase 1: Pre-Construction Activities

Pre-construction activities would include further pre-design investigation, obtaining permits from other agencies, completing the final design of the remedy, and selecting a remedy implementation contractor via a bidding process. Information associated with each of these activities is descried below.

- Completing pre-design investigation, final design and bid activities, including:
  - Completion of final pre-design subsurface investigations, laboratory soil testing, engineering calculations, bench scale testing of proposed wall construction materials, design drawings, specifications, and a construction quality assurance plan.
  - Bidding and selection of a cutoff wall construction contractor.
- Obtaining permits from other agencies including:
  - A general stormwater permit for construction site activities through IEPA, including construction stormwater controls and other best management practices (BMPs) such as silt fences and other measures.
  - An Illinois Department of Natural Resources (IDNR) Office of Water Resources, Dam Safety modification permit would be obtained for modification of the FAPS embankment.

3.2.2 Phase 2: Corrective Action Construction

Corrective action construction would be initiated after pre-construction activities are complete. It would include mobilizing construction equipment to the site, preparing the site for construction activities, construction of the cutoff wall (which would include removal or partial replacement of existing subgrade soils with low-permeability wall materials), and performing post-construction and site restoration activities. Cutoff wall construction spoils that contain CCR materials would be containerized and disposed of at an off-site landfill. Construction spoils that do not contain CCR would be disposed of in an appropriate on-site location at the BPP.

Information associated with each of these activities is described below.

- The contractor would mobilize equipment and materials to the site, install stormwater BMPs around the construction area, construct a staging and laydown area, and construct a level working pad and/or temporary construction access roads along the cutoff wall alignment.
- Access roads would be located in areas where they minimize disturbance to the existing FAPS final cover system.
- Construction of the working platform would include removing, relocating, or modifying existing site infrastructure (*i.e.,* fencing or overhead electric piezometers, roadways, utilities) that may conflict with the construction of the cutoff wall.
- A temporary on-site batch plant and/or material handling system would be established for the purpose of generating low permeability backfill for the cutoff wall. This would include either mixing bentonite with the subgrade soils or producing a cement-bentonite slurry to place into the wall.
- The wall would likely be constructed utilizing either crane-mounted conventional construction equipment (*i.e.,* clamshell and/or slurry cutter); however, one-pass trenching/mixing or other innovative methods could be utilized if later determined to be appropriate based on site-specific subsurface conditions and constructability considerations.
- Installation of the cutoff wall would occur concurrently with the removal of some of the subsurface soils (soil-bentonite walls) or all of the subsurface soils (cement-bentonite wall).
- The wall would either be installed in a continuous unit, or if needed to support stability of the subgrade soils and sides of the wall during construction, in discontinuous panels (*i.e.,* primary panels) with secondary panels installed for connection after the primary panels have sufficiently cured/hardened.
- Excavated non-CCR soils (*e.g.,* spoils) would be disposed of on-site while excavated CCR spoils would be loaded into off-road dump trucks and transported to an approved off-site landfill for disposal that is located within Illinois or nearby in Missouri.
- Disturbed areas of the final cover system would be repaired after the wall has been installed. This would include removing the working platform, excavating disturbed final cover system soils, and recompacting the final cover consistent with the original design grades and specifications for the completed final closure. This would generally involve the reuse of the current cover soils but may require the importation of additional cover soils from an on-site source.
- Site restoration would be completed following the repair of the final cover system This would include repairing other site infrastructure that was relocated or damaged during construction and minor regrading and seeding of disturbed areas.
- Temporary BMPs would also be installed during the site restoration period, if required in accordance with site land disturbance permits. The BMPs would be removed once vegetation is established.

3.2.3 Phase 3: Corrective Action Operations, Maintenance, and Closeout

Corrective action operations, maintenance, and closure would be initiated after corrective action construction is completed. It would include performing corrective action groundwater monitoring,

and, after GWPS have been met, performing corrective action closeout and completion activities. Information associated with each of these activities is described below.

- Corrective Action O&M
  - No corrective action O&M is required following installation of the cutoff wall, as the cutoff wall would be a passive, below-grade structure, without maintenance or operational needs.
- Corrective Action Monitoring
  - Regular corrective action groundwater monitoring would be conducted using a corrective action groundwater monitoring system designed in accordance with 35 I.A.C. § 845.680(c), which specified that wells must be installed within the plume of contamination that lies beyond the waste boundary.
    - Samples would be collected for major ions for evaluating groundwater chemistry and COCs. Samples would be collected on a quarterly basis initially and potentially reduced to a semiannual basis once five years of monitoring have occurred, in accordance with 35 I.A.C. § 845.650(b)(4).
    - Monitoring results would be submitted to IEPA after each monitoring event, in addition to an annual groundwater monitoring and corrective action report, in accordance with 35 I.A.C. § 845.640(e). The annual corrective action report would include an evaluation of the actual performance of the remedy relative to the remedy's expected performance.
    - Routine maintenance of the monitoring well system would be conducted during the monitoring period. This would include inspection of the wells, making repairs to the wells (as and if needed), and rehabilitation and/or replacing the wells to improve performance (as and if needed).
  - If the remedy does not achieve its expected performance, additional methods or techniques to achieve compliance with GWPS would be evaluated and, if feasible, implemented in accordance with 35 I.A.C. § 845.680(b).
- Adaptive Management during Monitoring
  - Groundwater monitoring results would be evaluated and documented in in the monitoring reports submitted to IEPA, in accordance with 35 I.A.C. § 845.610(e).
  - Remedy progress evaluation as part of adaptive site management may include additional investigation to inform updates to the conceptual site model (CSM), groundwater, and geochemical models.
  - If remedy progress does not correspond with expectations, additional methods or techniques to achieve compliance with GWPS would be evaluated and, if feasible, implemented in accordance with 35 I.A.C. § 845.680(b).
- Corrective Action Completion
  - After completion of the corrective action confirmation monitoring period, a Corrective Action Completion Report and Certification would be prepared and submitted to IEPA, in accordance with 35 I.A.C. § 845.680(e).

- If GWPS are not met in the future, the FAPS would remain in a perpetual state of Corrective Action Groundwater Monitoring and confirmation monitoring would not be performed.

3.2.4 Remedy Implementation Schedule

A feasibility-level implementation schedule for the Alternative 2 source control with cutoff wall remedy is provided in **Table B** below.

Table B. Feasibility-Level Implementation Schedule – Alternative 2: Source Control with Cutoff Wall

Implementation Phase	Implementation Task	Timeframe (Preliminary Estimates)
1: Pre-Construction Activities	Agency Coordination, Approvals, and Permitting	6 to 12 months
	Final Design and Bid Process	24 to 36 months
	Timeframe to Complete Corrective Pre-Construction Activities	30 to 48 months after CAP Approval
2: Corrective Action Construction	Corrective Action Construction	12 to 24 months
	Timeframe to Complete Corrective Action Construction	12 to 24 months after completion of pre-construction activities
3: Corrective Action O&M and Closeout	Corrective Action Monitoring (Time to Meet GWPS)	>100 years
	Corrective Action Confirmation Monitoring	36 months
	Corrective Action Completion	6 months
	Timeframe to Complete Corrective Action O&M and Closeout	>100 years after completion of construction activities
	Total Timeline to Complete Corrective Action	>100 years

3.2.5 Management of Extracted Groundwater

No groundwater extraction would occur under this remedy.

3.2.6 35 I.A.C. § 845.670(e)(1)(H) and 35 I.A.C. § 845.670(e)(3) Information

As requested by Gradient, the following information required by 35 I.A.C. § 845.670(e)(1)(H) and 35 I.A.C. § 845.670(e)(3) has been developed for the remedy. The information was developed based on preliminary-level information contained within the CMA for the BPP FAPS and then refined based on additional feasibility-level design activities performed as part of the development of this CAAA-SIR.

- Potential Need for Replacement of the Remedy – 35 I.A.C. § 845.670(e)(1)(H)
  - The cutoff wall remedy is unlikely to need replacement, as the cutoff wall would be a robust, engineered, and maintenance-free subsurface structure.

- Degree of Difficulty Associated with Constructing the Remedy – 35 I.A.C. § 845.670(e)(3)(A)
  - The remedy would require mobilizing specialty equipment to the site (*i.e.,* large cranes, clamshells or slurry cutters, or one-pass trenching equipment) in addition to other supporting equipment (*i.e.,* batch plants, excavation and grading equipment).
  - While cutoff walls are routinely constructed to similar depths in similar geologic environments, they often encounter difficulties during construction. The difficulties could include encountering especially pervious layers and resulting slurry loss or encountering obstructions that require specialized techniques and/or equipment to advance past, or instability or caving in the sidewalls prior to hardening of the slurry backfill.
  - The performance of the cutoff wall would be dependent on the construction techniques employed. In order to avoid gaps, voids, or other discontinuous features or defects in the wall, continuous quality control monitoring would be required during construction.
  - The performance of the wall would also be dependent on its actual hydraulic conductivity. This would require continual monitoring, quality control testing, and quality assurance testing of slurry mixing and placement or soil-bentonite mixing in order to verify that the as-designed mix is utilized and routine testing of samples of the wall material. The wall may also require post-construction quality assurance activities (*i.e.,* coring and testing) to verify the quality of the constructed barrier.
- Expected Operational Reliability of the Remedy - 35 I.A.C. § 845.670(e)(3)(B)
  - The cutoff wall is expected to have high operational reliability if it is constructed in accordance with standard design and specifications for barrier walls. This is because the cutoff wall provides an inert, continuous, low-permeability barrier to groundwater flow.
- Need to Coordinate with and Obtain Necessary Approvals and permits from Other Agencies - 35 I.A.C. § 845.670(e)(3)(C)
  - Agency permits would need to be obtained from IEPA for construction stormwater controls and BMPs.
- Availability of Necessary Equipment and Specialists - 35 I.A.C. § 845.670(e)(3)(D)
  - Construction of the cutoff wall would require a specialized contractor experienced with constructing similar types of walls in similar geologic environments. The contractor would likely need specialized equipment, such as large cranes, clamshell buckets, slurry cutters, batch plants, or one-pass construction equipment.
  - Specialists in cutoff wall design and construction would also need to be utilized during the design and construction phase. The specialists would include design engineers, construction managers, and contractor staff experienced with cutoff wall construction and equipment operation.
  - These types of equipment and specialists have been utilized in the past for other similar types of cutoff wall design and construction projects. However, there may be shortages associated with the equipment and specialists, due to high existing backlog for specialty ground improvement contractors and design specialists who are supporting similar types of projects in the electric utility, dam/levee, and other market sectors.

- Equipment and specialists for field data collection and groundwater sampling are required for the remedy. Laboratory equipment and specialists would also be required to assess groundwater concentrations of site COCs. Groundwater professionals (*i.e.,* geologists, hydrogeologists, statisticians, geochemists) would be required to perform statistical analysis and other assessments to confirm that the remedy is functioning as intended and prepare corrective action-related groundwater monitoring and progress reports.
    - As described in **Section 2.2.3**, the equipment and specialists required for site groundwater monitoring and analysis are currently performing this work in accordance with 35 I.A.C. § 845.220(c)(4). Therefore, no new equipment or specialists are required for groundwater monitoring for this alternative.

- Available Capacity and Location of Needed Treatment, Storage, and Disposal Services – 35 I.A.C. § 845.670(e)(3)(E)
    - Wastes generated during cutoff wall construction would be limited to spoils; excavated soils would be disposed of on-site and excavated CCR would be disposed of off-site at a regional landfill. A landfill evaluation would be completed to determine the best location for disposal, taking into account several factors, including landfill capacity and hauling mileage.
    - No wastes would be generated during operation of the cutoff walls; therefore, no additional treatment, storage or disposal services would be required with the source control with cutoff wall remedy.

4. ALTERNATIVE 3 REMEDY: SOURCE CONTROL WITH GROUNDWATER MANAGEMENT SYSTEM

The Alternative 3 remedy, source control with groundwater management system, would include the construction of a system that actively controls the source of releases to reduce to the maximum extent feasible further releases of constituents. The system creates a negative gradient and removing liquids that may be or may become present within the interior of the FAPS. The groundwater management system would be comprised of the following components:

- An extraction trench which would remove liquids that may be from low-lying areas near and around the base of CCR within the interior of the FAPS.
    - The total length of the continuous trench alignment would be approximately 8,700 feet with a maximum depth of approximately 50 to 60 feet bgs.
    - The trench would be 2 to 3 feet wide and would be backfilled with highly permeable aggregate surrounding a perforated collection pipe.
    - Collection sumps would be located approximately every 500 feet along the trench alignment.
- A mechanical, electrical, and piping (MEP) system to remove extracted any liquids from the trenches and treat the liquids prior to discharge.
    - Any liquids would be pumped from each of the sumps within the extraction trenches and routed to a collection pond for settling.
    - After settling, any liquids would be discharged to either the Kaskaskia River to the west via a new or existing National Pollutant Discharge Elimination System (NPDES) outfall, and in accordance with site-specific permit requirements.

The purpose of the groundwater management system would be to provide long-term removal of liquids that may be from the FAPS. This will reduce hydraulic head beneath the existing FAPS cover system which also reduces the potential for constituents to release from the FAPS and migrate past the site's southern property boundary.

A feasibility-level drawing of the source control with groundwater management system remedy is provided as **Figure 2** in **Appendix A.**

4.1 Remedy Scoping and Groundwater Modeling Results

The location of the components which comprise the groundwater management system were selected by reviewing physical constraints within and outside of the FAPS where the system could feasibly be constructed with limited impacts to other site features. Additionally, the location of the system components was targeted to correspond to the portions of the FAPS where CCR is presumed to be present at the lowest elevations, which generally correspond with pre-construction surface drainage features. This approach would allow the system to collect the maximum amount of liquids that may be or may become present within the FAPS, thereby proactively preventing the release of constituents that may migrate past the site's southern property boundary.

The extraction trench portions of the groundwater management system would be located within the limits of the existing FAPS, as these areas correspond to the lowest elevation of CCR. Since the trenches would be completely within the limits of the FAPS, they would not be within regulatory floodplains or known wetlands, and the ground surface, which is located on top of the final cover systems, provides a generally straight and level alignment for the system. However, this would result in the system temporarily impacting the final cover system of the FAPS, which would require impacted areas to be repaired back to their current conditions after system construction.

The groundwater model (**Appendix B**) estimated that the GWPS would not be attained for all FAPS compliance monitoring wells within the 1,000-year prediction model simulation period after the implementation of Alternative 3 remedy, source control with groundwater management system. Following source control and groundwater management system in Alternative 3, the GWPS was not achieved at 4 of 23 wells evaluated following the completion of the 1,000-year model simulation. Simulated boron plume extent contracted over time following implementation of Alternative 3. Based on the calculations of plume extent acreages, the area of the plume decreases from 420 acres (current simulated plume area) to 193 acres (1,000-year simulated plume area) for Alternative 3. Approximately 20 acres of the 1,000-year simulated plume area occur off-site. The combined linear distance of plume simulated as intersecting the property line at the end of the 1,000-year simulation was approximately 2,790 feet for Alternative 3. The longest continuous linear distance of plume extent at the property line was to the southwest of the West Fly Ash Pond between monitoring well locations MW-150 and MW-151. The remaining areas that contribute to the combined linear distance of plume simulated as intersecting the property line were south of the West Fly Ash Pond and south of the East Fly Ash Pond.

4.2 Remedy Implementation

Implementation of the Alternative 3 source control with groundwater management system remedy is expected to include multiple tasks spread out over three phases, including pre-construction activities (Phase 1), corrective action construction (Phase 2), and corrective action operations, maintenance, and closeout (Phase 3). Information for each phase is described in this section.

4.2.1 Phase 1: Pre-Construction Activities

Pre-construction activities would include further pre-design investigation, obtaining permits from other agencies, completing the final design of the remedy, and selecting a remedy implementation contractor via a bidding process. Information associated with each of these activities is descried below.

- Completing pre-design investigation, final design and bid activities, including:
  - Completion of final pre-design subsurface investigations, laboratory soil testing, engineering calculations, bench scale testing of proposed groundwater management system construction materials, design drawings, specifications, and a construction quality assurance plan.
  - Bidding and selection of a groundwater management system construction contractor.
- Obtaining permits from other agencies including:

- A general stormwater permit for construction site activities through IEPA, including construction stormwater controls and other BMPs such as silt fences and other measures.
- An IDNR Office of Water Resources, Dam Safety modification permit would be obtained for modification of the FAPS embankment.
- A NPDES permit would be obtained to discharge any collected liquids for the operational lifetime of the system.

4.2.2 Phase 2: Corrective Action Construction

Corrective action construction would be initiated after pre-construction activities are complete. It would include mobilizing construction equipment to the site, preparing the site for construction activities, construction of the groundwater management system, and performing post-construction and site restoration activities. Spoils generated during construction of the extraction trench components and some of the MEP components of the groundwater management system are expected to predominantly consist of CCR materials and would therefore be disposed of at an off-site landfill.

Information associated with each of these activities is described below.

- Site Preparation
    - The contractor would mobilize equipment and materials to the site, install stormwater BMPs around the construction area, construct a staging and laydown area, and construct a level working pad and/or temporary construction access roads along the alignment of the extraction trench and MEP components of the system.
    - Access roads would be located in areas where they minimize disturbance to the existing FAPS final cover system.
    - Construction of the working platform would include removing, relocating, or modifying existing site infrastructure (*i.e.,* piezometers, roadways, utilities) that may conflict with the construction of the groundwater management system.
- Extraction Trench Installation
    - The extraction trench components of the groundwater management system would likely be constructed utilizing specialized trenching equipment (*i.e.,* one-pass trenching methods) due to the relatively deep trench depths (up to approximately 60 feet). This method uses a specialized one-pass trencher to excavate subgrade soils, place collection piping and sumps, and backfill the trench with granular fill in a single operation. Other innovative methods could be utilized if later determined to be appropriate based on site-specific subsurface conditions and constructability considerations.
        - Excavated soils (*e.g.,* trench spoils) from the trenches, which would predominantly consist of CCR materials, would be placed into off-road dump trucks and relocated to another portion of the site where the material would be spread to allow the spoils to dry. The dried spoils would be loaded into off-road dump trucks and transported to an

approved off-site landfill for disposal that is located within Illinois or nearby in Missouri.

- A perforated pipe would be installed at the bottom of the extraction trenches to collect any liquids and direct them towards collection sumps. High-density polyethylene (HDPE) conveyancing piping would be installed in the top 3 feet of the trench to convey any extracted liquids to the compressor shed equalization (EQ) tanks and from the EQ tanks to a settling pond.
  - The extraction trenches would be backfilled with imported clean granular material and capped with low-permeability clay and topsoil that is consistent with the design drawings and specifications for the completed final closure system. Where the trenches cross current stormwater control features, it may also be capped with an erosion resistant material such as riprap, also consistent with the design and construction specifications for the final closure system.

    Collection sumps would be located every 400 to 500 feet across the length of the 8,700-foot trench alignment and would consist of a pit to hold any liquids.

- Mechanical, Electrical, and Piping Installation
  - A pneumatic pump and a discharge pipe that would carry extracted liquids to an EQ tank in the nearby compressor shed would be installed in each sump.
  - A compressor shed consisting of an air compressor, EQ tank, and transfer pump would be installed every 1,000 to 2,000 feet along the trench alignment to supply compressed air to nearby pneumatic pumps and to transfer any liquids from the EQ tank to a 4-acre settling pond.
  - Electrical power drops and a buried electrical distribution system would be installed as needed to provide power for the groundwater management and water conveyance systems.
- Discharge Management Installation
  - A settling pond has been assumed for management of liquids that may or may be associated with the FAPS. This pond would be constructed using conventional construction equipment. The settling pond would be approximately 4 acres in size and 5 feet deep. Other water treatment and management technologies may be evaluated during a later phase of design.
- Site Restoration
  - Disturbed areas of the final cover system would be repaired after the system has been installed. This would include removing any working platforms, excavating disturbed final cover system soils, and recompacting the final cover consistent with the original design grades and specifications for the completed final closure. This would generally involve the reuse of the current cover soils but may require the importation of additional cover soils from an on-site source.
  - Site restoration would be completed following the repair of the final cover system. This would include repairing site infrastructure that was relocated or

damaged during construction and minor regrading and seeding of disturbed areas.

- Temporary BMPs would also be installed during the site restoration period, if required in accordance with site land disturbance permits. The BMPs would be removed once vegetation is established.

4.2.3 Phase 3: Corrective Action Operations, Maintenance, and Closeout

Corrective action operations, maintenance, and closure would be initiated after corrective action construction is completed. It would include performing corrective action groundwater monitoring, and, after GWPS have been met, performing corrective action closeout and completion activities. Information associated with each of these activities is described below.

- Corrective Action O&M
  - Continued operation of the groundwater management system would require routine, scheduled inspections and associated maintenance including, but not limited to, totalizer data collection, and maintenance of extraction pumps as well as other system components.
  - Non-routine maintenance that may occur during extended operation of the groundwater management system may include tasks such as repair or replacement of MEP components of the system. This may include the extraction pumps, repair or replacement of a system air compressor, and flushing or jetting of water conveyance lines in the event organic or inorganic solids accumulate on the interior walls.
  - Routine monitoring and compliance activities associated with the treatment and discharge of extracted water via the site's NPDES permit and either existing or new outfall would also be completed during this phase.
- Corrective Action Monitoring
  - Regular corrective action groundwater monitoring would be conducted using a corrective action groundwater monitoring system designed in accordance with 35 I.A.C. § 845.680(c), which specified that wells must be installed within the plume of contamination that lies beyond the waste boundary.
    - Samples would be collected for COCs required by 35 I.A.C. § 845.600(a)(1). Samples will be collected on a quarterly basis initially and potentially reduced to a semiannual basis once five years of monitoring have occurred, in accordance with 35 I.A.C. § 845.650(b)(4).
    - Monitoring results will be submitted to IEPA after each monitoring event, in addition to an annual groundwater monitoring and corrective action report, in accordance with 35 I.A.C. § 845.640(e). The annual corrective action report will include an evaluation of the actual performance of the remedy relative to the remedy's expected performance.
    - Routine maintenance of the monitoring well network will be conducted during the monitoring period. This will include inspection of the wells, making repairs to the wells (as and if needed), and rehabilitation and/or replacing the wells to improve performance (as and if needed).

  - If the remedy does not achieve its expected performance, additional methods or techniques to achieve compliance with GWPS would be evaluated and, if feasible, implemented in accordance with 35 I.A.C. § 845.680(b).

- Adaptive Management during Monitoring
  - Groundwater monitoring results would be evaluated and documented in in the monitoring reports submitted to IEPA, in accordance with 35 I.A.C. § 845.610(e).
  - Remedy progress evaluation as part of adaptive site management may include additional investigation to inform updates to the CSM, groundwater, and geochemical models.
  - If remedy progress does not correspond with expectations, additional methods or techniques to achieve compliance with GWPS would be evaluated and, if feasible, implemented in accordance with 35 I.A.C. § 845.680(b).
- Corrective Action Completion
  - After completion of the corrective action confirmation monitoring period, a Corrective Action Completion Report and Certification would be prepared and submitted to IEPA, in accordance with 35 I.A.C. § 845.680(e).
  - If GWPS are not met in the future, the FAPS would remain in a perpetual state of Corrective Action Groundwater Monitoring and confirmation monitoring would not be performed.

4.2.4 Remedy Implementation Schedule

A feasibility-level implementation schedule for the Alternative 3 source control with groundwater management system remedy is provided in **Table C** below.

Table C. Feasibility-Level Implementation Schedule – Alternative 3: Source Control with Groundwater Management System

Implementation Phase	Implementation Task	Timeframe (Preliminary Estimates)
1: Pre-Construction Activities	Agency Coordination, Approvals, and Permitting	6 to 12 months
	Final Design and Bid Process	24 to 36 months
	Timeframe to Complete Corrective Pre-Construction Activities	30 to 48 months after CAP Approval
2: Corrective Action Construction	Corrective Action Construction	12 to 24 months
	Timeframe to Complete Corrective Action Construction	12 to 24 months after completion of pre-construction activities
3: Corrective Action O&M and Closeout	Corrective Action Monitoring (Time to Meet GWPS)	>100 years
	Corrective Action Confirmation Monitoring	36 months
	Corrective Action Completion	6 months
	Timeframe to Complete Corrective Action O&M and Closeout	>100 years after completion of construction activities
	Total Timeline to Complete Corrective Action	>100 years

4.2.5 Management of Extracted Liquids

FAPS extracted liquids that may be present, were assumed to be managed and treated by the groundwater management system and a newly constructed settling pond to be located on-site. However, other forms of water management and/or treatment may be evaluated during future phases of design.

The settling pond would be sited to avoid conflicts with existing site infrastructure. A settling pond of approximately 4 acres in size is assumed to be sufficient to allow sediments to settle from any extracted liquids prior to discharge. Any extracted liquids would be sent to the settling pond via the pneumatic extraction pumps and transfer piping. Treated water would discharge via an existing or new NPDES outfall. Any extracted liquids would be discharged in accordance with site-specific NPDES permit requirements.

4.2.6 35 I.A.C. § 845.670(e)(1)(H) and 35 I.A.C. § 845.670(e)(3) Information

As requested by Gradient, the following information required by 35 I.A.C. § 845.670(e)(1)(H) and 35 I.A.C. § 845.670(e)(3) has been developed for the remedy. The information was developed based on preliminary-level information contained within the CMA for the BPP FAPS and then refined based on additional feasibility-level design activities performed as part of the development of this CAAA-SIR.

- Potential Need for Replacement of the Remedy – 35 I.A.C. § 845.670(e)(1)(H)
  - The groundwater management system remedy is expected to be reliable and is unlikely to need replacement over an approximately 50 year normal design life for these types of systems.
  - However, jetting or redevelopment of the perforated drainpipe within the extraction trench component may be required during the design life of the remedy.
  - The MEP components of the remedy, including the submersible sump pumps, transfer pumps, and various instrumentation and controls associated with the groundwater management system would likely need to be serviced and/or replaced over the duration of the remedy. Replacement of pumps and instrumentation and controls is likely to occur every 10 to 20 years over the duration of the remedy, resulting in multiple component replacements over the approximately 1,000-year operational life of the remedy.
  - Due to approximately 1,000-year operational life of the remedy, replacement extraction trench component of the remedy could be required due to long-term degradation and/or fouling of the perforated collection pipe and backfill granular media. Sufficient data on the performance of groundwater extraction trenches over this timeframe is not available as these types of systems have only been used for approximately 100 years or less.
  - If replacement of the extraction trench component of the remedy may be required in the future, it would be evaluated as part of ongoing adaptive site management activities.

- Degree of Difficulty Associated with Constructing the Remedy – 35 I.A.C. § 845.670(e)(3)(A)
  - The extraction trench component remedy would require mobilizing specialty equipment to the site (*i.e.,* large cranes, clamshells or slurry cutters, or potential one-pass trenching equipment) in addition to other supporting equipment (*i.e.,* excavation and grading equipment).
  - While trenches are routinely constructed to similar depths in similar geologic environments, they often encounter difficulties during construction. The difficulties could include encountering obstructions that require specialized techniques and/or equipment to advance past.
  - In addition to likely requiring a permit from the IDNR Office of Water Resources, Dam Safety section, the construction may require the detailed geotechnical design of the working platform.
  - The MEP components of the remedy are commonly constructed using regional and local contractors and are expected to have a low level of construction difficulty.
- Expected Operational Reliability of the Remedy - 35 I.A.C. § 845.670(e)(3)(B)
  - The groundwater management system is expected to have high operational reliability if constructed in accordance with the design and specifications.
    - The groundwater management system is a mechanical system that would require routine maintenance in order to reliably operate, as outlined in the Corrective Action O&M, **Section 4.2.3**.
- Need to Coordinate with and Obtain Necessary Approvals and permits from Other Agencies - 35 I.A.C. § 845.670(e)(3)(C)
  - Agency permits would need to be obtained from IEPA for construction stormwater controls and BMPs, in addition to a joint water pollution control construction and operating permit, and modifications to the site's NDPES permit or potentially a new permit. These permits typically take 18 to 24 months to obtain.
  - An IDNR Office of Water Resources, Dam Safety modification permit would be obtained for modification of the FAPS embankment.
- Availability of Necessary Equipment and Specialists - 35 I.A.C. § 845.670(e)(3)(D)
  - Construction of the groundwater management system would require a specialized contractor experienced with constructing similar types of trenches in similar geologic environments. Relatively few construction contractors with this experience, particularly using one-pass trenching equipment, are available. The contractor would likely need specialized and often custom-built one-pass construction equipment.
  - Specialists in one-pass trenching methods would also need to be utilized during the design and construction phase. The specialists would include design engineers, construction managers, and contractor staff experienced with trench construction and equipment operation.
  - Geotechnical specialists maybe needed to design the working platform and monitor the FAPS embankment for signs of distress during one-pass trench installation.

- These types of equipment and specialists have been utilized in the past for other similar types of groundwater management system designs and construction projects. However, there may be backlogs associated with the equipment and specialists, due to high existing demand for specialty ground improvement contractors and design specialists who are supporting similar types of projects in the electric utility, dam/levee, and other market sectors. These backlogs could add additional delay to the project schedule above current assumptions.
- Equipment and specialists for field data collection and groundwater sampling are required for the remedy. Laboratory equipment and specialists would also be required to assess groundwater concentrations of site COCs. Groundwater professionals (*i.e.,* geologists, hydrogeologists, statisticians, geochemists) would be required to perform statistical analysis and other assessments to confirm that the remedy is functioning as intended and prepare corrective action-related groundwater monitoring and progress reports.
  - As described in **Section 2.2.3**, the equipment and specialists required to support these activities are currently performing routine groundwater monitoring in accordance with 35 I.A.C. § 845.220(c)(4). Therefore, no new equipment or specialists are required for groundwater monitoring in this alternative.

- Available Capacity and Location of Needed Treatment, Storage, and Disposal Services - 35 I.A.C. § 845.670(e)(3)(E)
  - Wastes generated during groundwater management trench construction would be limited to trench spoils, which would predominantly consist of CCR. These spoils would be disposed of off-site at a regional landfill in Illinois or nearby in Missouri. A landfill evaluation would be completed to determine the best location for disposal taking into account several factors, including landfill capacity and hauling mileage.
  - No other wastes would be generated during operations of the groundwater management trench; therefore, no additional treatment, storage or disposal services would be required with the source control with groundwater management system remedy.

5. MATERIAL QUANTITY, LABOR, AND MILEAGE ESTIMATES

Estimates of material quantities, total labor hours, and mileage were prepared for Alternative 2 source control with cutoff wall, and Alternative 3 source control with groundwater management system to support Gradient in preparing a CAAA. Estimates were prepared for the construction and O&M of each remedy. Estimates were not prepared for Alternative 1 source control with GWP as the alternative does not require remedial construction or O&M of a physical remedy.

Both estimates were prepared utilizing the following approach:

- Major implementation (*e.g.,* construction) components and line items were identified, in accordance with the remedy implementation narratives contained within this CAAA-SIR.
- Construction quantities were estimated based on quantity estimates for volumes, areas, and units, as obtained from the feasibility-level engineering drawings and schedules included within this CAAA-SIR.
- RS Means Heavy Construction Cost Data (RS Means) [11] was utilized to estimate the crew size, equipment description, and daily output associated with each line item.
- For line items where RS Means data was not available, the crew size, equipment description, and daily output were estimated based on Ramboll's experience, information from contractors, and/or information from material suppliers.
- For the Alternative 2 source control with cutoff wall and Alternative 3 source control with groundwater management system active remedies, daily construction and O&M labor mobilization miles were estimated assuming a weekly mobilization/demobilization from St. Louis (82 miles round trip) and a local commute of 40 miles round trip per day. The number of working days and hours per week were estimated from the construction schedule developed for each remedy.
- Estimates of material delivery miles were prepared based on Ramboll's experience.

The detailed material quantity, labor, and mileage estimates are provided in **Appendix C** for each alternative.

6. REFERENCES

[1] "35 Ill. Admn. Code Part 845, Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments," Illinois Environmental Protectoin Agency, Springfield, IL, 2021.

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[3] Ramboll Americas Engineering Solutions, Inc, "2024 35 I.A.C. § 845 Annual Groundwater Monitoring and Corrective Action Report. Primary Ash Pond, Newton Power Plant," April 2025.

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[9] Ramboll, "2024 35 I.A.C. § 845 Annual Groundwater Monitoring and Corrective Action Report, Fly Ash Pond System, Baldwin Power Plant, IEPA ID No. W1578510001-01, W1578510001-02, and W1578510001-03," Ramboll, Baldwin, Illinois, January 2025.

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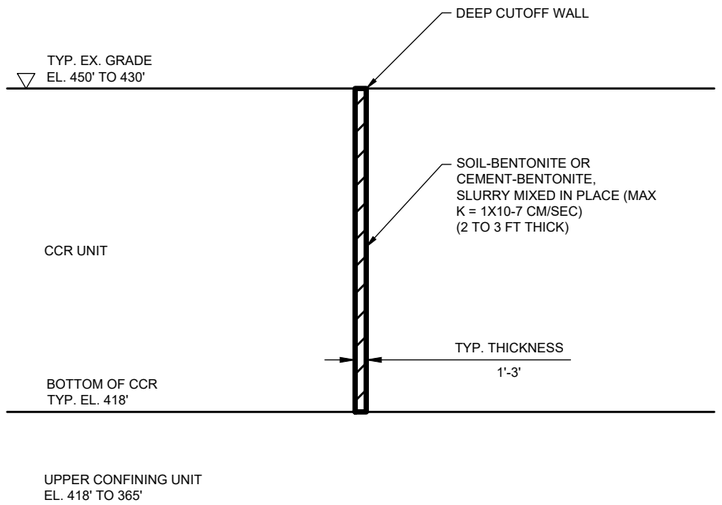
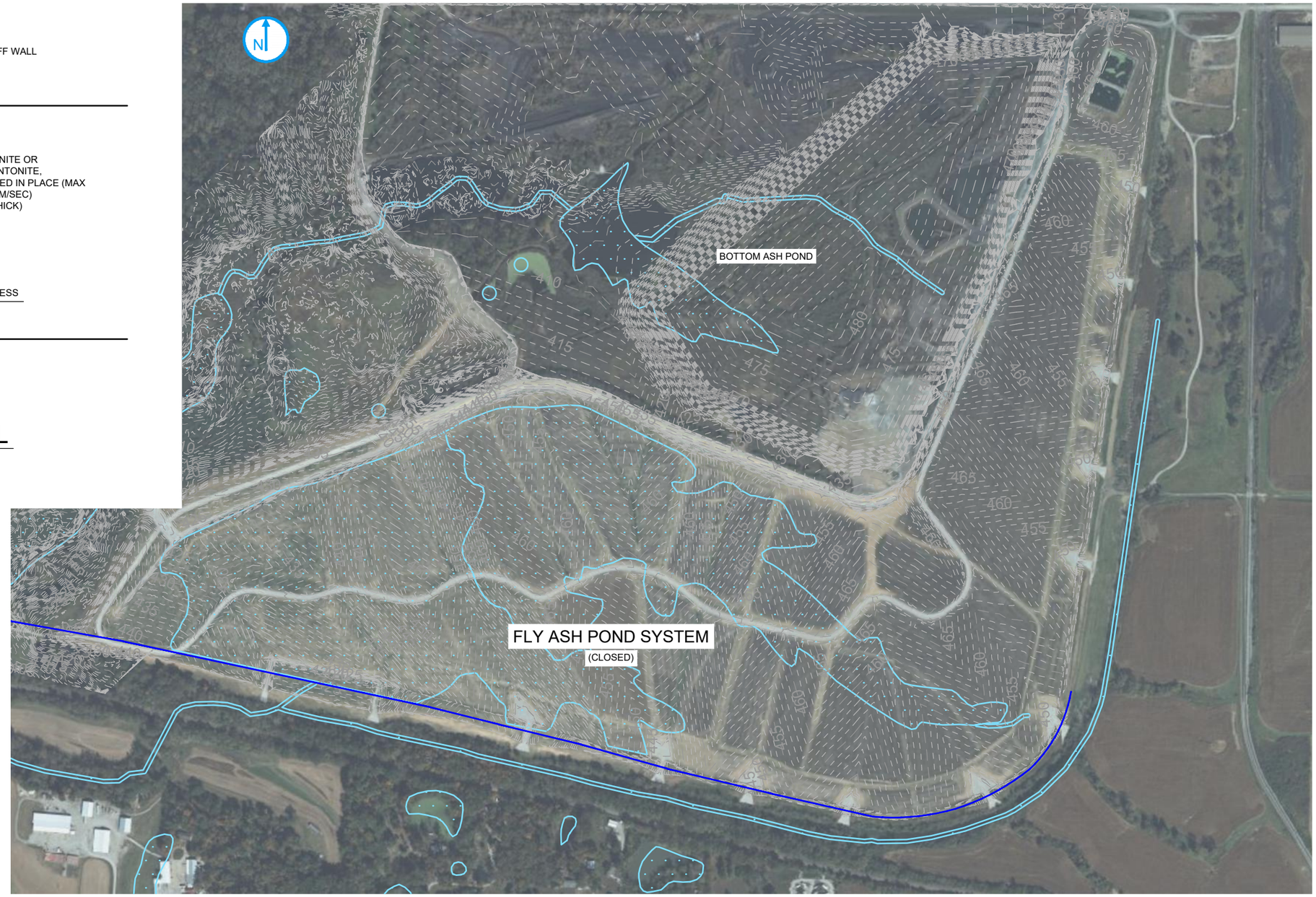
[11] Gordian, RS Means Data version 8.7, Paducah, KY: Gordian, 2023.

APPENDIX A
FEASIBILITY-LEVEL DESIGN DRAWINGS FOR ALTERNATIVE 2 AND ALTERNATIVE 3 REMEDIES



CUTOFF WALL DETAIL

NOT TO SCALE



SITE PLAN

0 600' Feet

NOTE:

1. EXISTING CONTOURS REPRESENTED PER BALDWIN POWER PLANT FLY ASH POND SYSTEM PART 845 CLOSURE PLAN CONSTRUCTION DRAWINGS COMPLETED BY INGENAE, OCTOBER 2020.
2. WETLANDS REPRESENTED AS PER ILLINOIS NATIONAL WETLANDS INVENTORY.
3. 100-YEAR FLOODPLAIN REPRESENTED AS PER FEMA FIRM FOR THE SITE.

EXISTING

- 360 — MAJOR CONTOUR
- MINOR CONTOUR
- BODY OF WATER
- WETLANDS BOUNDARY (SEE NOTE 2)

PROPOSED

- DEEP CUTOFF WALL

ALTERNATIVE 2 REMEDY
DEEP CUTOFF WALL
FEASIBILITY-LEVEL DESIGN

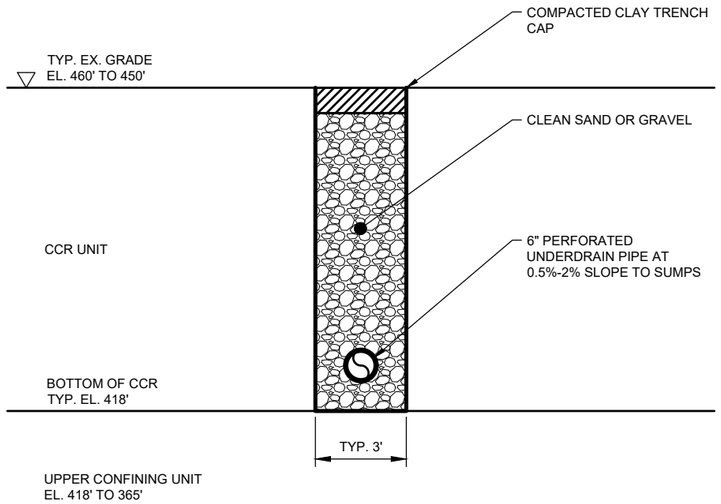
Baldwin Fly Ash Pond
Baldwin Fly Ash System Baldwin Energy Complex 10901 Baldwin Road Baldwin, IL 62217

FIGURE 1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.
A RAMBOLL COMPANY

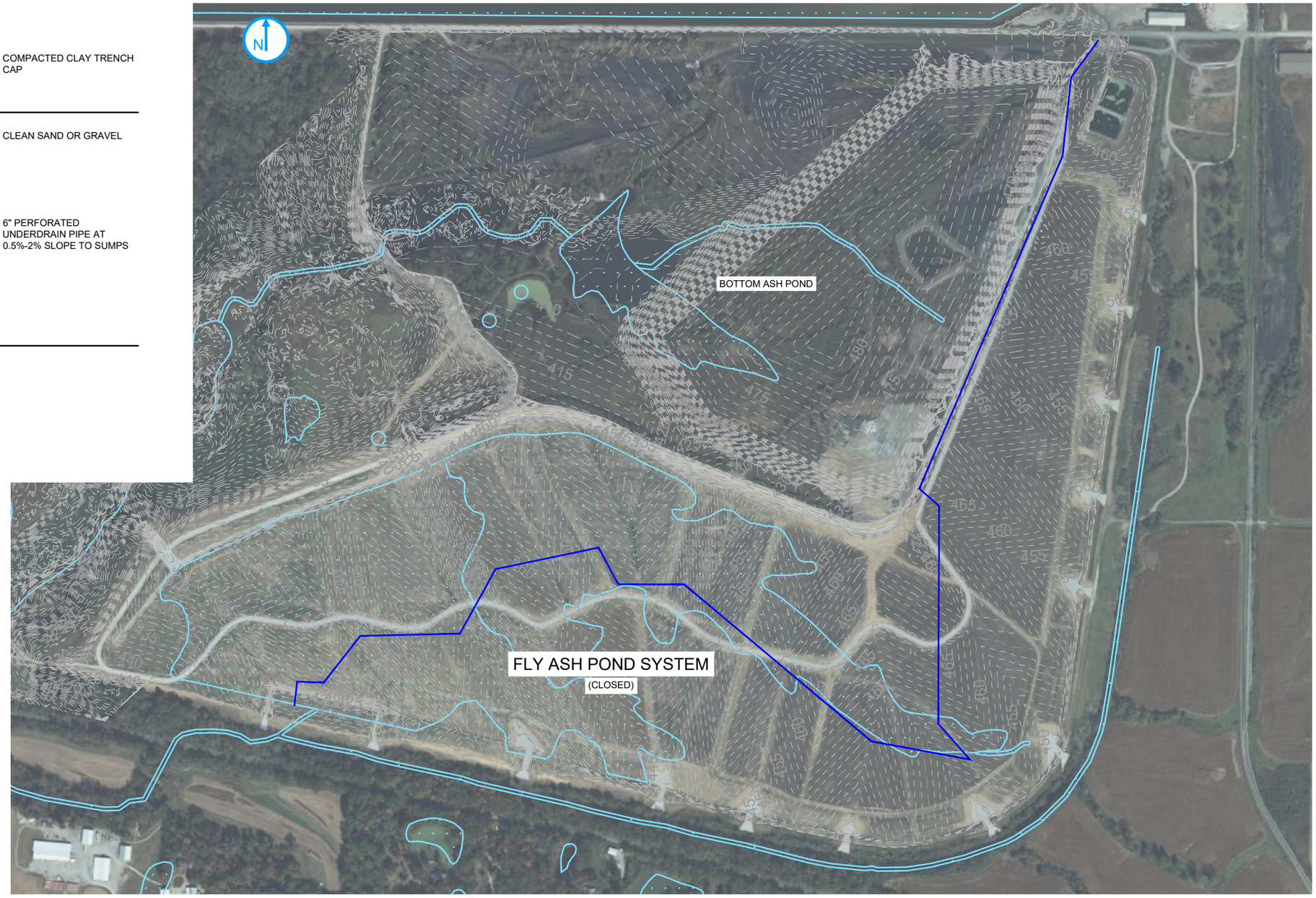
RAMBOLL

PROJECT: DATED: 11/26/2024 DESIGNER: LEMMONBN G:\DC\ACCDocs\ramboll gruppen as\rus-1940106781-002 vistra - baldwin faps\project files\4 delivery\40 WIP\401 civil\CAAA-SIR\Drawings\BAL-FAP_CAAA-SIR.dwg



TRENCH DETAIL

NOT TO SCALE



SITE PLAN

0 600' Feet

NOTE:
1. EXISTING CONTOURS REPRESENTED PER BALDWIN POWER PLANT FLY ASH POND SYSTEM PART 845 CLOSURE PLAN CONSTRUCTION DRAWINGS COMPLETED BY INGENAE, OCTOBER 2020.
2. WETLANDS REPRESENTED AS PER ILLINOIS NATIONAL WETLANDS INVENTORY.
3. 100-YEAR FLOODPLAIN REPRESENTED AS PER FEMA FIRM FOR THE SITE.

EXISTING	PROPOSED
MAJOR CONTOUR (360)	INFILTRATION COLLECTION SYSTEM
MINOR CONTOUR	
BODY OF WATER	
WETLANDS BOUNDARY (SEE NOTE 2)	

ALTERNATIVE 3 REMEDY
INFILTRATION COLLECTION SYSTEM
FEASIBILITY-LEVEL DESIGN

Baldwin Fly Ash Pond
Baldwin Fly Ash System Baldwin Energy Complex 10901 Baldwin Road Baldwin, IL 62217

FIGURE 2

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.
A RAMBOLL COMPANY
RAMBOLL

PROJECT: DATED: 11/26/2024 DESIGNER: LEMMONBK \\DC\ACCDocs\ramboll gruppen as\rus-1940106781-002 vistra - baldwin faps\project files\4 delivery\40 WIP\401 civil\CAAA-SIR\Drawings\BAL-FAP_CAAA-SIR.dwg

APPENDIX B
GROUNDWATER MODELING TECHNICAL MEMORANDUM

Intended for
Dynegy Midwest Generation, LLC

Date
April 22, 2025

Project No.
1940110241-005

GROUNDWATER MODELING TECHNICAL MEMORANDUM

BALDWIN POWER PLANT, FLY ASH POND SYSTEM

IEPA ID NO. W1578510001-01/02/03

RAMBOLL Bright ideas. Sustainable change.

GROUNDWATER MODELING TECHNICAL MEMORANDUM
BALDWIN POWER PLANT, FLY ASH POND SYSTEM

Project name	**Baldwin Power Plant Fly Ash Pond System**
Project no.	**1940110241-005**
Recipient	**Dynegy Midwest Generation, LLC.**
Document type	**Technical Memorandum**
Revision	**FINAL**
Date	**April 22, 2025**
Prepared by	**Jake J. Walczak, PG**
Checked by	**J. Austin Bond, PE**
Approved by	**Brian G. Hennings, PG**

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APPENDICES

Appendix A Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2023a. Groundwater Modeling Report Revision 1, Bottom Ash Pond. Baldwin Power Plant. Baldwin, Illinois. August 1, 2023.
Appendix B MODFLOW, MT3DMS, HELP Model, and Flux Evaluation Data Export Files (Electronic Only)
Appendix C HELP Model Inputs and Outputs
Appendix D Flux Evaluation Data

ACRONYMS AND ABBREVIATIONS

35 I.A.C.	Title 35 of the Illinois Administrative Code
40 C.F.R.	Title 40 of the Code of Federal Regulations
ASD	Alternative Source Demonstration
BAP	Bottom Ash Pond
bgs	below ground surface
BPP	Baldwin Power Plant
CBR	closure-by-removal
CCR	coal combustion residuals
CIP	closure-in-place
COC	constituent of concern
CSM	conceptual site model
DMG	Dynegy Midwest Generation, LLC
FAPS	Fly Ash Pond System
ft/day	feet per day
Geosyntec	Geosyntec Consultants, Inc.
GMR	2023 Bottom Ash Pond Groundwater Modeling Report, Revision 1
gpm	gallons per minute
Gradient	Gradient Corporation
GMS	Groundwater Management System
GWP	groundwater polishing
GWPS	groundwater protection standard(s)
HCR	Hydrogeologic Site Characterization Report
HELP	Hydrologic Evaluation of Landfill Performance
ID	identification
IEPA	Illinois Environmental Protection Agency
Kd	soil adsorption coefficient
mg/L	milligrams per liter
mL/g	milliliters per gram
NAVD88	North American Vertical Datum of 1988
NID	National Inventory of Dams
No.	number
NPDES	National Pollutant Discharge Elimination System
NRT	Natural Resource Technology, Inc.
PMP	potential migration pathway
Ramboll	Ramboll Americas Engineering Solutions, Inc.
UA	uppermost aquifer
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UU	upper unit
Vandalia Till	Vandalia Till Member of the Glasford Formation

EXECUTIVE SUMMARY

Dynegy Midwest Generation, LLC (DMG) is the owner of the active coal-fired Baldwin Energy Complex, also referred to as the Baldwin Power Plant (BPP), in Baldwin, Randolph County, Illinois. DMG intends to complete groundwater corrective action at the coal combustion residuals (CCR) surface impoundment Fly Ash Pond System (FAPS), which is identified by Illinois Environmental Protection Agency (IEPA) identification (ID) numbers (Nos.) W1578510001-01, W1578510001-02, and W1578510001-03, also referred to as Vistra Identification ID No. 605, and National Inventory of Dams (NID) No. IL50721. Groundwater corrective action for the BPP FAPS will be performed under the requirements of Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845, Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments (IEPA, 2021) and the requirements of Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257 (United States Environmental Protection Agency [USEPA], 2015). This technical memorandum is prepared to evaluate how the potential corrective action alternatives would achieve compliance with the applicable Groundwater Protection Standards (GWPS) [1]; to compare changes in the magnitude and spatial distribution of boron concentrations in groundwater for each different corrective action alternative; and to describe fate and transport of contaminants in accordance with 35 I.A.C. § 845.220 (c)(2) using groundwater models.

Groundwater contaminant transport modeling was completed to demonstrate how the proposed corrective action alternatives will maintain compliance with the applicable GWPS and minimize the potential for constituents of concern (COCs) to migrate past the site's southern property boundary. Boron is commonly used as an indicator parameter for contaminant transport modeling for CCR because it is commonly present in coal ash leachate and it is mobile (*i.e.,* has low rates of sorption or degradation) in groundwater. In addition, the Corrective Measures Assessment (Ramboll Americas Engineering Solutions, Inc. [Ramboll], 2024a) identified boron as an exceedance of the GWPS at FAPS monitoring wells. Therefore, groundwater transport modeling was completed using boron.

The 2023 Bottom Ash Pond (BAP) model provided in **Appendix A**, was used as the base model to develop a groundwater flow and transport model for the FAPS at BPP. Adjustments (*e.g.*, recharge rates for the post-closure FAPS in the updated 2024 FAPS model were modified and based on updated Hydrologic Evaluation of Landfill Performance [HELP] model simulations) were made to parameter and boundary conditions to preserve model calibration (flow and transport) as documented in this technical memorandum. The objectives of the model update were to incorporate information collected since 2023 while maintaining the previous quality of calibration.

Three prediction models were developed to evaluate corrective action alternatives, consisting of source control with GWP (Alternative 1), source control with cutoff wall (Alternative 2), and source control with a Groundwater Management System ([GMS] Alternative 3). The objective of predictive modeling is to simulate changes in the magnitude and spatial distribution of boron concentrations in groundwater for each different corrective action. The results are used to

[1] Throughout this document, "exceedance" or "exceedances" is intended to refer only to potential exceedances of proposed applicable background statistics or Groundwater Protection Standards (GWPSs) as described in the proposed groundwater monitoring program, which was submitted to the IEPA on October 31, 2021 as part of DMG's operating permit application for the FAPS. That operating permit application, including the proposed groundwater monitoring program, remains under review by the IEPA and, therefore, DMG has not identified any actual exceedances.

evaluate if implementation of these actions will achieve the GWPS of 2 milligrams per liter (mg/L) for boron at 23 selected FAPS monitoring wells and to compare the differences in spatial distribution of boron within groundwater at the site. Comparison of predicted concentrations of boron in groundwater at the FAPS monitoring wells indicates the following:

- That the time to reach GWPS at the 23 FAPS monitoring wells is similar for Alternatives 1 and 2. Alternative 1 and Alternative 2 both indicate a maximum of 30% of FAPS monitoring wells (23 wells evaluated) attaining the GWPS by the end of the 1,000-year simulation.
- Alternative 3 indicates a maximum of 83% of FAPS monitoring wells (23 wells evaluated) attaining the GWPS by the end of the 1,000-year simulation, where Alternative 3 indicates significantly greater progress toward attaining the GWPS than Alternative 1 and Alternative 2 in less time (10 of the wells are below the GWPS within 25 years and stay below the GWPS for the remainder of the 1,000-year simulation).
- Because the results of the Alternative 3 simulation indicated a significant number of FAPS monitoring wells (19 of 23) attain the GWPS but did not result in all wells attaining the GWPS within the 1,000-year model, a FAPS closure-by-removal (CBR) prediction model was completed to evaluate the difference in boron concentrations simulated at 23 FAPS monitoring wells under both Alternative 3 (source control with GMS) and CBR (source removal) conditions.
- CBR results in a maximum of 57% of the monitoring wells attaining the GWPS by the end of the 1,000-year simulation, where Alternative 3 achieves greater progress toward attaining the GWPS than CBR in less time: 70% of the wells attain the GWPS within 375 years for Alternative 3; versus, a maximum of 57% of the wells attaining the GWPS at the end of the 1,000-year simulation for CBR.

Simulated concentrations of boron were also evaluated spatially using maps of maximum boron concentration at various points in time and their relative areas in acres for each model scenario. Comparison of predicted maximum boron plume extents indicates the following:

- For Alternatives 1 and 2, the boron plume extents continue to expand between 25 and 1,000 years after implementation.
- For Alternative 3, the maximum boron plume extent continually contracts from 25 to 1,000 years, where the plume is less than half the area of the calibration condition after 1,000 years, indicating the greatest reduction compared to other scenarios.
- For CBR, the maximum boron plume extent increases between 25 and 125 years, then contracts between 125 and 1,000 years.
- At the end of the 1,000-year simulation, Alternatives 1 and 2 have the largest off-site plume extents.
- Alternatives 3 and CBR have similar trends in off-site maximum plume extent, both peaking at approximately 27 acres at 750 years after implementation and then reducing to around 20 acres at 1,000 years (end of the simulations).

Evaluations of water flux through the FAPS CCR for Alternative 3 and a sensitivity model at post-closure equilibrium indicate a reduction in total flux into the unit by 60% and a reduction in total flux out of the unit by 73%. The GMS liquids removal rate is estimated to be approximately

30 gpm for the first 8 years and decreases over time to less than 10 gpm after approximately 106 years of operation when heads at FAPS monitoring wells approach post-closure equilibrium.

Results of groundwater modeling predict that more wells are likely to exceed GWPSs in the future than are currently observed in 2024. Alternative 3 results achieve greater progress toward attaining the GWPS in less time when compared to other corrective action alternatives, including the simulated CBR scenario. None of the models predict that all wells will attain the GWPS for boron within the 1,000-year timeframe, including the simulated CBR scenario. This is due to the low hydraulic conductivity of the native soils (UU) and bedrock (UA), and low groundwater flow velocities at the site. Simulated post-construction heads in the FAPS monitoring wells reach equilibrium at approximately 106 years following implementation of corrective action alternatives, which was used for estimating future flux reductions from the FAPS. Considering models become increasingly less reliable over extended timeframes, discussions of model results beyond 106 years should be qualitative and comparative. Following implementation of corrective action, progress toward attainment of the GWPS will be routinely monitored and updated per the adaptive site management actions, which involves routine review and potential updates to the CSM and groundwater fate and transport models as appropriate and as detailed in the Corrective Action Groundwater Monitoring Plan, Baldwin Power Plant, Fly Ash Pond System (Ramboll, 2025b).

1. INTRODUCTION

1.1 Plant and Site Information

DMG is the owner of the active coal-fired Baldwin Energy Complex, also referred to as the Baldwin Power Plant, in Baldwin, Randolph County, Illinois. DMG intends to complete groundwater corrective action at the CCR surface impoundment FAPS, which is identified by IEPA ID Nos. W1578510001-01, W1578510001-02, and W1578510001-03, also referred to as Vistra Identification ID No. 605, and NID No. IL50721. Groundwater corrective action for the BPP FAPS will be performed under the requirements of 35 I.A.C. § 845 and the requirements of 40 C.F.R. § 257.

1.2 Technical Memorandum Overview

This technical memorandum is prepared to evaluate how the potential corrective action alternatives would achieve compliance with the applicable GWPSs; to compare changes in the magnitude and spatial distribution of boron concentrations in groundwater for each different corrective action alternative; and to describe fate and transport of contaminants in accordance with 35 I.A.C. § 845.220 (c)(2) using groundwater models. The groundwater modeling efforts consist of predictive fate and transport modeling to assess the long-term effectiveness and time for achieving GWPS as well as the spatial distribution of boron in groundwater for three corrective action alternatives:

Alternative 1. Source Control with GWP: This scenario is consistent with the closure conditions (capping of the FAPS) initially simulated in the 2014 model reports (Natural Resource Technology, Inc. [NRT], 2014b, 2014c) followed by simulations developed for the BAP closure-in-place (CIP) presented in the 2023 Bottom Ash Pond Groundwater Modeling Report Revision 1 ([GMR]; Ramboll, 2023a) which was revised to represent current conditions at the FAPS. The Alternative 1 remedy, source control with GWP, would include the completed source control approach which consisted of capping the waste material, after which GWP would be formally implemented. GWP is a remedial alternative that relies on natural geochemical processes and may be appropriate as recognized by the United States Environmental Protection Agency (USEPA) in a final policy directive for groundwater remediation (USEPA, 1999).

Alternative 2. Source Control with Cutoff Wall – assumes 7,000 feet long, 85-feet deep and 2 to 3-feet wide slurry wall. The Alternative 2 remedy, source control with cutoff wall, would include the construction of a cutoff wall that would extend from the existing perimeter berm ground surface, which ranges from approximately 390 to 450 feet[2] to an approximate elevation of 365 feet, with the wall keyed into the low-permeability bedrock underlying the upper unit (UU)/PMP. The total length of the cutoff wall would be approximately 7,000 feet, and the cutoff wall would have a maximum depth of approximately 85 feet below ground surface (bgs). The cutoff wall would be constructed using either a mixture of soil and bentonite or cement and bentonite and would have an expected width of 2 to 3 feet. The cutoff wall would have a hydraulic conductivity value of approximately 1×10^{-7} centimeters per second (cm/s). The purpose of the cutoff wall would be to provide a long-term, maintenance-free physical barrier to reduce the potential for COCs to migrate past the site's southern property boundary to off-site property owners.

[2] All elevations referenced in this report are in the North American Vertical Datum of 1988 (NAVD88), unless otherwise noted.

Alternative 3. Source Control with a GMS – assumes an 8,700-feet long, 50 to 60 feet deep, and 2 to 3 feet wide extraction trench. The Alternative 3 remedy, source control with groundwater management system, would include the construction of a system that actively removes liquids that are present within the interior of the FAPS. The groundwater management system would be comprised of the following components:

- An extraction trench which would remove infiltrated liquids from low-lying areas near and around the base of CCR within the interior of the FAPS.
  - The total length of the continuous trench alignment would be approximately 8,700 feet with a maximum depth of approximately 50 to 60 feet bgs.
  - The trench would be 2 to 3 feet wide and would be backfilled with highly permeable aggregate surrounding a perforated collection pipe.
  - Collection sumps would be located approximately every 500 feet along the trench alignment.
- A mechanical, electrical, and piping system to remove extracted liquids from the trenches and treat the liquids prior to discharge.
  - Liquids would be pumped from each of the sumps within the extraction trenches and routed to a collection pond constructed northwest of the FAPS for settling.
  - After settling, the liquids would be discharged to either the Kaskaskia River to the west via a new or existing National Pollutant Discharge Elimination System (NPDES) outfall, and in accordance with site-specific permit requirements.

The purpose of the groundwater management system would be to provide long-term removal of liquids from the FAPS. This will reduce hydraulic head beneath the existing FAPS cover system which also reduces the potential for liquids from the FAPS to mix with groundwater and migrate past the site's southern property boundary.

In each alternative, source control is the CIP scenario that was selected as the closure alternative for the FAPS in 2016 (AECOM, 2016) and completed in 2020 (Luminant, 2020).

1.3 Previous Groundwater Modeling Reports

Groundwater models (MODFLOW, MT3DMS, and HELP) were completed in 2014 to assess the groundwater impacts associated with closure of the FAPS and predict the fate and transport of CCR leachate components, as well as estimate the time required for hydrostatic equilibrium of groundwater beneath the FAPS (NRT, 2014b; NRT, 2014c; NRT, 2016a; NRT, 2016c). Based on these assessments, a Closure and Post-Closure Care Plan (AECOM, 2016), which included a groundwater monitoring program sufficient for long-term, post-closure monitoring, was developed and approved by IEPA in a letter to the Dynegy Operating Company dated August 16, 2016. Closure activities, which included constructing a final cover system to control the potential for water infiltration into the closed CCR unit, were completed, and FAPS closure was completed November 17, 2020.

In accordance with the requirements of 35 I.A.C. § 845, Ramboll developed MODFLOW and MT3DMS groundwater flow and transport models in 2023 for the BAP, and submitted a GMR (Ramboll, 2023a). Prediction simulations were performed to evaluate the effects of closure (source control) measures (CCR consolidation and CIP closure scenario) for the BAP on the

groundwater quality following initial corrective action measures, which includes removal of free liquids from the BAP. The FAPS prediction simulations presented in this technical memorandum incorporate changes in recharge rates at the BAP based on HELP-calculated average annual percolation rates resulting from consolidation and closure of the BAP as described in the GMR. The flow and transport models completed as part of the GMR for the BAP were developed independently from the 2014 FAPS flow and transport models, and included several model improvements (*e.g.*, increased number of calibration targets for flow and transport, updated calibration targets based on recent observations, refined grid and boundary conditions, increased model area, increased number of model layers [including simulated bedrock layers], refined layer bottom elevations, etc.) to significantly improve conceptual site model (CSM) representation. The BAP GMR models incorporated recent investigative data collected as part of the development of the Hydrogeologic Site Characterization Reports (HCRs), included the entirety of the FAPS extent, simulated FAPS construction based on the CSM, simulated FAPS operational history (including completion of closure in 2020), and were calibrated to flow and transport calibration targets based on data collected at FAPS groundwater monitoring system, for these reasons the FAPS models developed for this technical memorandum are based on the 2023 BAP GMR fate and transport models.

2. SITE BACKGROUND, GEOLOGY, AND HYDROGEOLOGY

2.1 Site Background

The BPP is located in Baldwin, Illinois (**Figure 2-1**). The BPP property is situated in an agricultural area. The BPP property is bordered to the west by the Kaskaskia River; to the east by Baldwin Road, farmland, and strip-mining areas; to the southeast by the Village of Baldwin; to the south by the Illinois Central Gulf railroad tracks, scattered residences, and State Route 154; and to the north by farmland (**Figure 2-2**). Additional detail on the site background is provided in the 2023 BAP GMR (Ramboll, 2023a; **Appendix A**) and is also found in the HCR for the BAP (Ramboll, 2023b), the Supplemental Hydrogeologic Site Characterization and Groundwater Monitoring Plan for the FAPS (NRT, 2016b) and the site Groundwater Quality Assessment and Phase II Hydrogeologic Investigation (NRT, 2014a).

2.2 Site Geology and Hydrogeology

A detailed summary of site conditions was provided in the revision to the Hydrogeologic Site Characterization Report (Ramboll, 2023b). The revision to the HCR includes hydrogeologic data collected after submittal of the initial HCR in 2021 (Ramboll, 2021) as part of the 2022 Hydrogeologic Site Investigation were also used to establish a CSM for the 2023 BAP GMR and is summarized herein. CCR fill material and two distinct water-bearing units have been identified in the vicinity of the BPP based on stratigraphic relationships and common hydrogeologic characteristics. The units are described as follows from the surface downward:

- **CCR**: CCR, consisting primarily of fly ash, bottom ash, and boiler slag. Also includes earthen fill deposits of predominantly clay and silt materials from on-site excavations that were used to construct berms and roads surrounding the various impoundments across the BPP. The overall (geometric mean) horizontal and vertical hydraulic conductivity for the CCR determined during the Phase II and 2022 Hydrogeologic Site Investigations are 1.5×10^{-2} centimeters per second (cm/s) and 4.1×10^{-5} cm/s, respectively. Horizontal and vertical hydraulic conductivities for this unit determined during the Phase II and 2022 Hydrogeologic Site Investigations ranged from 8.1×10^{-4} to 1.1×10^{-1} cm/s and 5.6×10^{-7} to 6.5×10^{-4} cm/s, respectively.
- **UU**: Predominantly clay with some silt and minor sand, silt layers, and occasional sand lenses. Includes the lithologic layers identified as the Cahokia Formation, Peoria Loess, Equality Formation, and Vandalia Till Member of the Glasford Formation (Vandalia Till). This unit is composed of unlithified natural geologic materials and extends from the upper saturated materials to the bedrock. As observed in the field, one or more of these four lithologic units may be present at a particular soil boring location; and, the observed lithologic unit(s) may or may not be saturated depending on location at the BPP. Given that these units are not consistently in contact with groundwater, this unit was renamed from UGU used in previous reports to UU. The term UU is synonymous with UGU used in previous documents. The overall (geometric mean) horizontal and vertical hydraulic conductivities for this unit determined during the Phase II and 2022 Hydrogeologic Site Investigations are 2.9×10^{-5} cm/s and 3.5×10^{-7} cm/s, respectively. Horizontal and vertical hydraulic conductivities for this unit determined during the Phase II and 2022 Hydrogeologic Site Investigations ranged from 3.5×10^{-7} to 6.8×10^{-4} cm/s and 6.3×10^{-9} to 4.2×10^{-4} cm/s, respectively. The overall (geometric mean) and range of horizontal hydraulic conductivities for this unit determined

during 2024 site investigation activities in support of the Addendum to the Nature and Extent Report, Baldwin Power Plant, Fly Ash Pond System (Ramboll, 2025a) was 2.6 x 10^{-5} cm/s and 9.0 x 10^{-8} to 1.6 x 10^{-3} cm/s, respectively, for field hydraulic conductivity tests (slug tests) completed at monitoring wells MW-195, MW-196, MW-197, PZ-174, PZ-177. Thin sand seams and the interface (contact) between the UU and bedrock have been identified as PMPs. No continuous sand seams were observed within or immediately adjacent to the FAPS; however, the sand seams may act as a PMP due to relatively higher hydraulic conductivities (on the order of 10^{-4} cm/s) than the surrounding clays (on the order of 10^{-5} cm/s). The contacts between the unlithified material and bedrock have also been identified as PMPs where horizontal hydraulic conductivity data in BPP monitoring wells with screens and/or filter packs across or immediately above the bedrock range from 3 x 10^{-7} to 6 x 10^{-4} cm/s and have a geometric mean horizontal hydraulic conductivity of 2 x 10^{-5} cm/s.

- **Bedrock Unit**: This unit is composed of interbedded shale and limestone bedrock, which underlies and is continuous across the BPP and has been identified as the uppermost aquifer (UA). The horizontal hydraulic conductivity for this unit determined during the Phase II and 2022 Hydrogeologic Site Investigations ranges from 2.4 x 10^{-7} to 3.5 x 10^{-5} cm/s with a geometric mean of 1.9 x 10^{-6} cm/s (Ramboll, 2023b).

The extent of sand and gravel aquifers in the region are primarily found along the Kaskaskia River Valley where sand and gravel deposits are highly permeable, thick, and extensive. Outside of the Kaskaskia River Valley, the unlithified materials in upland areas are predominantly clay, which generally provide a low probability of encountering sand and gravel layers for dependable groundwater supply. Although some thin sand seams and layers occur intermittently within the Vandalia Till in localized areas around the BPP, most groundwater supplies in upland areas are obtained from large diameter shallow bored wells. Typical water wells in the vicinity of the BPP are between 25 and 55 feet deep, 36 to 48 inches in diameter, and collect groundwater through slow percolation into the wells, which are large diameter to allow for greater water storage to compensate for the low rate of groundwater infiltration (Ramboll, 2023b).

The shallow bedrock is the only water-bearing unit that is continuous across the BPP. Groundwater in the bedrock mainly occurs under semi-confined to confined conditions with the overlying unlithified unit behaving as the upper confining unit to the UA. Shallow sandstone and creviced limestone may yield small supplies in some areas, but water quality becomes poorer (*i.e.*, highly mineralized) with increasing depth.

The locations of groundwater monitoring wells are provided on **Figure 2-3**. Based on elevation measurements, lateral groundwater flow in the shallow unlithified materials and bedrock is generally to the west and southwest across the BPP (Figure 2-2 of the 2023 BAP GMR [**Appendix A**]) toward the Kaskaskia River. Groundwater flow in bedrock is toward the northwest in the east and central areas of the BAP, and southwest to northwest on the east area of the FAPS until groundwater reaches the bedrock valley feature underlying the Secondary and Tertiary Ponds west of the BAP and FAPS, at which point the flow direction veers towards this bedrock surface low. Groundwater elevations across the BPP vary seasonally, generally less than 7 feet, and range between approximately 370 and 450 feet NAVD88, although flow directions are generally consistent. Additional potentiometric surface maps are included as part of the revised HCR (Ramboll, 2023b).

In the western area of the FAPS, average horizontal hydraulic gradients in the shallow unlithified materials and bedrock were 0.015 feet per foot/feet (ft/ft) and 0.016 ft/ft, respectively, as groundwater flowed from east to west across the FAPS. Average groundwater velocities in the shallow unlithified materials and bedrock in the western area of the FAPS were 0.0082 and 0.0003 feet per day (ft/day), respectively. In general, flow velocities in the vicinity of the FAPS are consistent, varying only 0.0019 ft/day in the shallow unlithified materials and 0.0002 ft/day in the bedrock.

Groundwater in the Pennsylvanian and Mississippian-aged bedrock mainly occurs under semi-confined to confined conditions as demonstrated with vertical hydraulic gradient calculations presented in the revised HCR (Ramboll, 2023b), with the overlying unlithified unit behaving as the upper confining unit to the UA (Bedrock Unit). The relatively flat horizontal groundwater gradient beneath the BPP, and the mostly upward vertical gradients, inconsistent upward/downward vertical gradients or flowing artesian conditions observed in the UU and UA, suggests the FAPS and neighboring ponds are not areas of increased recharge or infiltration (Ramboll, 2023b). These findings are further supported by the results of the 2022 Hydrogeologic Site Investigation included as part of a revised HCR (Ramboll, 2023b).

Data collected from previous field investigations, as well as the lithologic contact and groundwater elevation data from the 2022 Hydrogeologic Site Investigation reported in the revised HCR (Ramboll, 2023b), were used to develop the groundwater model for the 2023 BAP GMR (Ramboll, 2023a; **Appendix A**). The 2023 BAP GMR MODFLOW model was used to evaluate a closure scenario at the BAP: CCR consolidation and CIP using information provided in the CCR Surface Impoundment Final Closure Plan (Geosyntec, 2022). Since the revision to the HCR and BAP GMR was completed in 2023, additional site investigation activities in support of the Addendum to the Nature and Extent Report, Baldwin Power Plant, Fly Ash Pond System (Ramboll, 2025a) were completed and included: the installation of four off-site monitoring wells (MW-195 through MW-198); well inspection, abandonment, replacement and development of several existing monitoring wells; installation of temporary piezometers adjacent to and east of the FAPS, and in the interior of the BAP; pump testing and/or aquifer (slug) testing at select existing monitoring wells and temporary piezometers; and stream gauging at the creek south of the FAPS. Data collected prior to October 2024 were incorporated into the groundwater model used to evaluate the FAPS corrective action alternatives for this technical memorandum.

2.3 Groundwater Quality

Groundwater monitoring in accordance with the proposed Groundwater Monitoring Plan (Ramboll, 2023c) and sampling methodologies provided in the operating permit application for the FAPS began in the second quarter of 2023. In accordance with 35 I.A.C. § 845.610(b)(3)(C) and the statistical analysis plan submitted with the operating permit application (Appendix A of the Groundwater Monitoring Plan Revision 1) constituent concentrations observed at compliance monitoring wells were evaluated for compliance with the groundwater protection standards (GWPSs) described in 35 I.A.C. § 845.600 to determine exceedances of the GWPS. The following GWPS exceedances were determined in 2024[3] (Ramboll, 2024c; Ramboll, 2024d; and Ramboll, 2024e):

- Boron in MW-150, and MW-391

[3] GWPS exceedances determined after January 31, 2025 will be reported in the Quarter 4, 2024 Groundwater Monitoring Data and Detected Exceedances Report.

- Fluoride in MW-384
- pH (field) in MW-253 and MW-350
- Sulfate in MW-150, MW-252, MW-253R, and MW-366

An Alternative Source Demonstration (ASD) was completed on February 6, 2024 (Geosyntec, 2024) for the pH GWPS exceedance detected at MW-253 during Quarter 3, 2023. The IEPA provided written concurrence with the ASD on March 7, 2024 (IEPA, 2024). ASDs were not completed for the boron, fluoride and sulfate GWPS exceedances listed above; therefore an assessment of corrective measures (CMA) was initiated in accordance with 35 I.A.C. § 845.660(d)(3).

3. CONCEPTUAL MODEL

3.1 Conceptual Model

The HCR Revision 1 (Ramboll, 2023b), which includes data collected during the 2022 Hydrogeologic Site Investigation, is the foundation document for the site setting and CSM that describes groundwater flow at the BPP. Additional hydrogeologic data was collected after submittal of the HCR Revision 1 during the 2024 site investigation activities completed in support of the Addendum to the Nature and Extent Report, Baldwin Power Plant, Fly Ash Pond System (Ramboll, 2025a) and supports the CSM and model development. The FAPS overlies the recharge area for the underlying geologic media (*i.e.,* low permeability clays of the UU). Groundwater enters the model domain vertically via recharge. Groundwater may also enter or exit the model through the Cooling Pond, Secondary and Tertiary Ponds, the Kaskaskia River, or the many tributary streams located within the model domain. Groundwater may also exit the model through surface water management features within the BAP. Groundwater in the unlithified materials consistently flows east to west towards the Kaskaskia River. Groundwater flow in bedrock is northwest in the east and central areas of the BAP, and southwest to northwest on the east area of the FAPS until groundwater reaches the bedrock valley feature underlying the Secondary and Tertiary Ponds west of the BAP and FAPS, at which point the flow direction veers towards this bedrock surface low at the southwestern corner of the BPP.

Groundwater contaminant transport modeling was completed to demonstrate how the proposed corrective action alternatives will attain compliance with the applicable GWPS and minimize the potential for COCs to migrate past the site's southern property boundary, which could result in a future risk exposure pathway to off-site property owners. Boron is commonly used as an indicator parameter for contaminant transport modeling for CCR because it is commonly present in coal ash leachate and it is mobile (*i.e.,* has low rates of sorption or degradation) in groundwater. Based on geochemical modeling results (Geosyntec, 2025), remobilization of attenuated boron and sulfate is unlikely to affect the time to reach the GWPS. In addition, the Corrective Measures Assessment (Ramboll, 2024a) identified boron as an exceedance of the GWPS at FAPS monitoring wells as described in **Section 2.3** of this report. Therefore, groundwater transport modeling was completed using boron. The BAP and FAPS were modeled as sources of boron within the model domain. The BAP and FAPS are constructed over low permeability clays of the UU. Mass (boron) is added to groundwater via vertical recharge through CCR, and horizontal groundwater flow through CCR where it is in contact with the water table. Boron mass flows with groundwater (on-site groundwater flow directions described above). The primary transport pathway is the UA which underlies the FAPS and is continuous across the BPP. The UU also contains PMPs in the form of thin discontinuous sand seams within the UU or at the interface (contact) between the UU and bedrock where hydraulic conductivities are relatively higher.

3.1.1 Correlation of Boron with Sulfate

Boron is considered a surrogate for other parameters that exceed the GWPS at FAPS monitoring wells that do not have approved alternative source demonstrations (e.g., sulfate) because it occurs above the GWPS in the greatest number of wells and it is the constituent at the site that will likely require the longest time to achieve the groundwater protection standard. In addition, comparison of observed sulfate to boron concentrations (**Figure A** below) indicates a statistically significant correlation between these parameters in downgradient FAP monitoring wells with exceedances. The correlation coefficient (R^2) and p values (indicator of statistical significance)

are also provided on **Figure A**. Higher R^2 values (*i.e.,* closer to 1) indicate stronger correlation between parameters. A correlation is considered statistically significant when the p value is lower than 0.05. The p value is less than the target of 0.05, indicating correlations are statistically significant. The statistically significant correlation between sulfate and boron indicates boron is an appropriate surrogate for sulfate in the groundwater model, and concentrations of sulfate are expected to change consistent with model predicted boron concentrations. Accordingly, transport modeling was performed for boron as a surrogate for potential leaching of COCs attributable to the FAPS. Additional geochemical modeling and discussion of the fate of 35 I.A.C. § 845.600 parameters is provided in the Groundwater Polishing Evaluation Report, Baldwin Power Plant, Fly Ash Pond System (Geosyntec, 2025), Nature and Extent Report, Baldwin Power Plant, Fly Ash Pond System (Ramboll, 2024b) and the Addendum to the Nature and Extent Report, Baldwin Power Plant, Fly Ash Pond System (Ramboll, 2025a) that discusses the behavior of all detected 845.600 params.

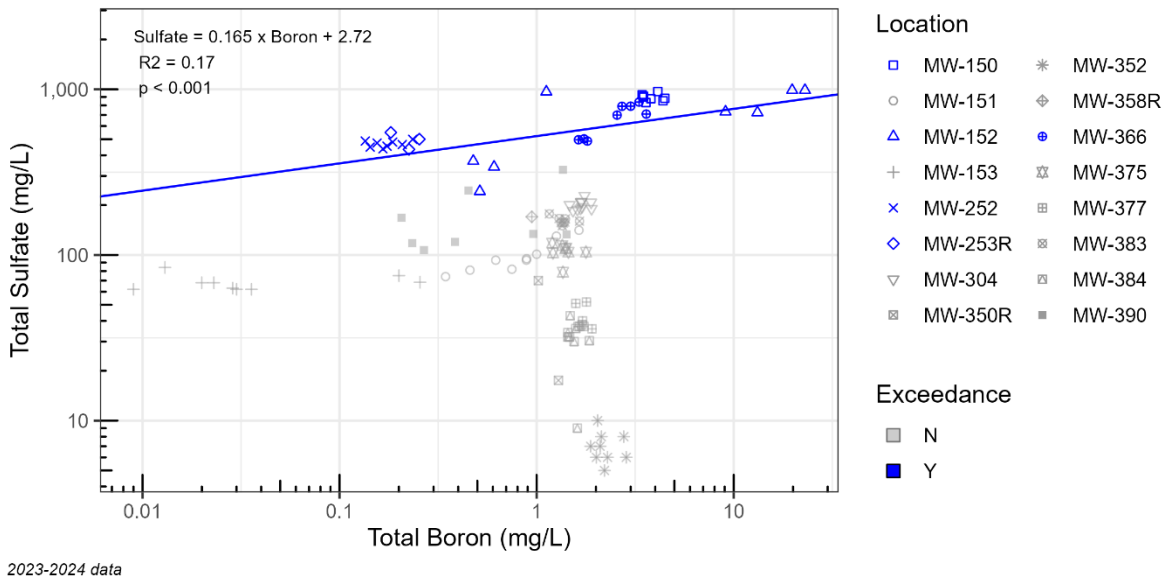

Figure A Correlation of Observed Sulfate and Boron Concentrations in Downgradient Wells (Linear regression for wells with exceedances only)

4. GROUNDWATER MODEL DEVELOPMENT AND CALIBRATION

In accordance with the requirements of 35 I.A.C. § 845, Ramboll developed MODFLOW and MT3DMS groundwater flow and transport models in 2023 for the BAP, and submitted a GMR (Ramboll, 2023a; **Appendix A**). Generally, the model boundaries, parameters, and calibration (heads, flow directions, and boron distributions) were retained for this 2024 FAPS fate and transport modeling; however, some small adjustments were made to parameter and boundary conditions to preserve model calibration (flow and transport) following updates described in **Section 2.2** (*i.e.,* the additional data collected as part of the 2024 site investigation activities in support of the Addendum to the Nature and Extent Report, Baldwin Power Plant, Fly Ash Pond System [Ramboll, 2025a]); and head and boron concentration data collected since 2023. The objectives of the model update were to incorporate information collected since 2023 while maintaining the previous quality of calibration. Since the model update is predicated on the need to simulate additional corrective action for boron concentrations in groundwater at the site, it was important to retain to the extent practicable the previous model components and calibrations, to ensure that predicted results would be comparable to both the 2023 BAP model and the 2014 model predictions for FAPS closure.

Specifications and results of the MODFLOW/MT3DMS modeling are presented below. Electronic files containing the model inputs and outputs are provided as **Appendix B**.

4.1 Model Changes for Flow and Transport Modeling Setup and Calibration

The 2023 BAP model was used as a base model to develop a groundwater flow and transport model for the FAPS at BPP. Details of the groundwater flow model descriptions, setup (including, grid and boundary conditions, and input values and sensitivity), assumptions and limitations, and calibration results of 2023 BAP model are described in Section 5 of the GMR (Ramboll, 2023a; **Appendix A**). The following changes were made to the 2023 BAP groundwater flow and transport model in development of the 2024 FAPS groundwater flow and transport model:

- The model was updated from MODFLOW-2005 to MODFLOW-NWT. MODFLOW-NWT is a modeling program designed to solve nonlinear groundwater flow problems due to unconfined aquifer conditions and is superior in solving problems involving drying and rewetting of unconfined aquifers (Niswonger et al., 2011), which were expected for the selected corrective action alternatives. MT3DMS was retained as the transport model code.
- The FAPS model was calibrated to modified median (where anomalous groundwater elevations were first eliminated before applying the median [*e.g.,* groundwater elevations that do not represent static groundwater conditions, groundwater elevation outliers, or groundwater elevations measured in error]) groundwater elevations collected from December 2015 to July 2024. **Figure 2-3** shows the locations of groundwater monitoring wells at the BPP. Several well locations (MW-253R, MW-350R, MW-196, MW-195, MW-197) and head targets (MW-253R, MW-350R, MW-196, MW-195, MW-197, MW-373, PZ-169, PZ-170, PZ-171, PZ-172, PZ-173, PZ-174, PZ-175, PZ-176, PZ-177, PZ-178, and PZ-182) were also added to the model in the vicinity of the FAPS that were not included in the 2023 BAP model. Well locations (MW-253, MW-306, MW-350, MW-387, MW-391, and MW-307) and associated head targets (MW-253, MW-306, MW-350, and MW-307) were removed from the 2023 BAP model as the wells were abandoned and/or potentially compromised. Well MW-150 was moved from

model layer 3 to model layer 4 to improve model calibration. A summary of well locations and associated BPP groundwater flow model calibration targets is provided in **Table 4-1**.

- The FAPS model was calibrated to median groundwater total boron concentrations (except for wells where only dissolved boron data was available the median dissolved boron concentration was used as the transport model calibration target) collected from December 2015 to July 2024. **Figure 2-3** shows the locations of groundwater monitoring wells at the BPP. Several transport model concentration targets (MW-196, MW-197, MW-253R, MW-350R, OW-256, OW-257, PZ-170, PZ-174, PZ-176, PZ-178, and PZ-182) were also added to the model in the vicinity of the FAPS that were not included in the 2023 BAP model. Well transport model concentration targets (MW-203, MW-253, MW-306, MW-307, MW-350, and MW-391) were removed from the 2023 BAP model as the wells were abandoned and/or potentially compromised. A summary of well locations and associated BPP groundwater transport model calibration targets is provided in **Table 4-1**.
- The simulated river stage and associated slope of model grid cells of River boundary conditions simulating the south stream (reach 4, adjacent to the FAPS) were modified to be consistent with river elevation measurements collected during the 2024 Hydrogeologic Site Investigation and calibrate new and/or updated head calibration targets at wells along the southern property boundary. As a result of river stage elevation modification, River boundary conditions moved up or down layers to maintain river elevations above the bottom elevation of the model layer as required by the model code. River boundary conditions in layer 3 were moved to layer 4 and the original River boundary condition in layer 3 was replaced with No Flow boundary conditions to reduce model errors.
- River boundary conditions simulating the south stream (reach 4, adjacent to the FAPS) were added to model grid cells south of the West Ash Pond to simulate the potential influence of a former drainage channel identified in the area using historic pre-construction topographic maps. The addition of these River boundary conditions improved flow and transport calibration in the area south of the West Ash Pond.
- River boundary conditions simulating the Cooling Pond (reach 0) were modified to eliminate isolated areas where no River boundary conditions were present in the 2023 BAP model to reduce model errors in the FAPS model.
- River boundary conditions simulating the Kaskaskia River (reach 1) were modified by decreasing river stage and river bottom elevations to elevations that were consistent with the approximate river stage and river bottom elevations at the confluence of the simulated Kaskaskia River (reach 1) and the south stream (reach 4, adjacent to the FAPS). The revised simulated river stage for the Kaskaskia River (reach 1) continued to be within range of interpolated stage data near BPP based on New Athens, Illinois (United States Geological Survey [USGS] 5595000) and Red Bud (USGS 5595240) gaging station data as with the 2023 BAP model.
- Areas with hydraulic conductivity Zone 100 (identified in Figure 5-1 of the GMR [Ramboll, 2023a; **Appendix A**] as "Above River Boundary Condition") placed above River boundary conditions in the 2023 BAP model to improve communication between the river and the groundwater in cells above were replaced with No Flow boundary conditions in the FAPS model to reduce model errors.

- Groundwater flow model input values in the 2023 BAP model summarized in Table 5-1 of the GMR (Ramboll, 2023a) were updated as necessary to improve flow calibration in the vicinity of the FAPS. The FAPS model input values are summarized in **Table 4-2**. Sensitivity analysis of the input values was completed as part of the 2023 BAP model, the results of the sensitivity analysis is summarized in Table 5-1 of the GMR (Ramboll, 2023a; **Appendix A**).
- Groundwater transport model input values in the 2023 BAP model summarized in Table 5-2 of the GMR (Ramboll, 2023a; **Appendix A**) were updated as necessary to improve transport calibration in the vicinity of the FAPS. The FAPS model input values are summarized in **Table 4-3**. Sensitivity analysis of the input values was completed as part of the 2023 BAP model, the results of the sensitivity analysis is summarized in Table 5-3 of the GMR (Ramboll, 2023a; **Appendix A**).
- No Flow boundary conditions were added to the model in rows 1 through 11 to reduce model errors in simulated areas not relevant to flow and transport at the FAPS; and improve simulation convergence.
- Property Zone 14 (representing the spatial distribution of the PMP) including inputs for hydraulic conductivity, storage, and specific yield and porosity were modified to improve FAPS model flow and transport calibration and be consistent with data collected during the 2024 site investigation activities (*e.g.,* field hydraulic test results, groundwater elevations, and borehole logging information).
- The model time frames were adjusted to simulate current conditions in 2024. The 2023 BAP transient transport calibration model was extended from 2022 to 2024. As in the 2023 BAP transient transport calibration model a series of two models were used in the FAPS transient transport calibration model, where transport Calibration Model 1 represented conditions before FAPS closure (1970 to 2020) and transport Calibration Model 2 represented conditions after FAPS closure in 2020.
- As described in Section 5.2.2.3 of the GMR (Ramboll, 2023a; **Appendix A**), the post-closure (after 2020) FAPS recharge rates for the Old East Ash Pond, East Fly Ash Pond, and West Fly Ash Cell (Recharge Zones 2, 3, and 4) were consistent with previous prediction modeling values used for the proposed cover system at the FAPS (NRT, 2014b, 2014c) in the 2023 BAP model. The recharge rates for the post-closure FAPS in the updated 2024 FAPS model were modified and based on updated HELP model simulations. Details of the HELP model setup and results are found in **Section 4.2** below. Like the 2023 BAP model, source concentrations are assumed to remain constant over time. Only recharge rate and Constant Head boundary conditions in the West Ash Pond (Constant Head boundary conditions used to simulate stormwater management operations in the active FAPS in Calibration Model 1 [pre-closure FAPS model] were removed in Calibration Model 2 [post-closure FAPS model]) were modified after 2020 to simulate FAPS closure.

The updated model calibration results are discussed in **Section 4.4**. The simulated groundwater elevations and boron concentrations in the transport calibration model served as the initial conditions for the prediction models described in **Section 5**.

4.2 HELP Model Setup and Results

The HELP model was developed by the USEPA. HELP is a one-dimensional hydrologic model of water movement across, into, through, and out of a landfill or soil column based on precipitation,

evapotranspiration, runoff, and the geometry and hydrogeologic properties of a layered soil and waste profile. HELP (Version 4.0; Tolaymat and Krause, 2020) was used to estimate percolation through post-closure FAPS. HELP files are included electronically (**Appendix B**), and inputs and outputs are attached to this report (**Appendix C**).

HELP input data and results are provided in **Table 4-4**. The post-closure scenario was modeled for a period of 30 years. Climatic inputs were synthetically generated using default equations developed for Belleville Scott Air Force Base, Illinois (the closest weather station included in the HELP database). Precipitation, temperature, and solar radiation was simulated based on the latitude of the FAPS. Cover system layers and CCR layer details for the post-closure FAPS included in the HELP models are based on grading plans, construction drawings, and cover system design documented in the FAPS Closure and Post-Closure Care Plan (AECOM, 2016).

HELP model results (**Table 4-4**) indicated 0.82 inches of percolation per year through the top of the FAPS cover system area. Simulation inputs and output results are presented in **Appendix C**.

4.3 Steady-State Flow Model and Transport Model Calibration

Calibration of a groundwater flow or transport model refers to the iterative process of adjusting model parameters and boundary conditions to obtain a reasonable match between observed conditions and simulation results. The primary criterion for evaluating the calibration of a groundwater flow model is the difference between observed and simulated water levels at a set of calibration targets. Calibration targets are a set of field measurements, typically groundwater elevations. For the calibration of a steady-state (time-invariant) model, the goal in selecting calibration targets is to define a set of water-level measurements that represent the average elevation of the water table or potentiometric surface at locations throughout the site. The calibration of a groundwater flow model should rely on discrete measurements of groundwater elevation to avoid the potential for interpretive bias that may result from attempting to match a contoured potentiometric surface (Konikow, 1978; Anderson and Woessner, 1992).

A model residual is defined as the calculated difference between the observed and simulated hydraulic head at a specific location (observed – simulated). Residual statistics are used to quantify and evaluate the relative fit of a model simulation to measured water level targets. The mean of model residuals is a representation of overall model bias; a value near zero is desired. The steady-state flow model and accompanying transport model were developed to represent conditions in 2024 (steady-state current conditions) and from 1970 to 2024 (transient transport modeling during operation of the impoundments and subsequent closure of the FAPS in 2020), respectively. The steady-state flow and transport model targets used in the 2023 BAP model represented conditions in 2022 and were updated for this FAPS model revision to incorporate current conditions in 2024, with the objective of a similar level of calibration (equivalent match to calibration targets) for the revised flow and transport models. Flow and transport model calibration targets and statistics are presented on **Table 4-1**. Both sets of targets were developed from data collected from December 2015 through July 2024; transport target simulated values were retrieved from the end of the model simulation (2024).

4.4 Calibration Flow and Transport Model Results

Results of the MODFLOW modeling are presented below. Electronic copies of the model files are attached to this report (**Appendix B**).

Observed and simulated heads are presented in **Figure 4-1 through Figure 4-8**. The mass balance error for the flow model was 0.00 percent and the ratio of the residual standard deviation to the range was 5.7 percent. The mass balance error for the flow model was within the target for the criteria of 1 percent and the ratio of the residual standard deviation to the range was within the target for the criteria of 10 percent. Another flow model calibration goal is that residuals are evenly distributed such that there is no bias affecting modeled flow. The observed heads are plotted versus the simulated heads and identified by layer in **Figure 4-1**. The near-linear relationship between observed and simulated values indicates that the model adequately represents the calibration dataset. The residual mean was -0.81 feet; in general, the simulated values were evenly distributed above and below the observed values. This is also illustrated for each layer in the observed versus residuals plot **Figure 4-2**. Some simulated values were overpredicted (negative values on **Figure 4-2**), where the most significant overpredicted values (exceeding 10 feet) were primarily within the UA (bedrock) of layer 6, largely at lower groundwater elevations near the Secondary and Tertiary Ponds and Kaskaskia River, near the southwest boundary of the West Ash Pond of the FAPS, or in bedrock wells screened below the decomposed bedrock. These residuals plot in the lower left quadrant of **Figure 4-2**.

The range of observed boron concentrations between December 2015 and July 2024 for the fifty-five (55) transport calibration locations are summarized in **Table 4-1**. The goals of the transport model calibration were to have predicted concentrations fall within the range of observed concentrations, and/or have predicted concentrations above and below the GWPS for boron (2 mg/L) match observed concentrations above or below the standard at each well. Eighteen (18) transport calibration locations had observed boron concentrations that ranged above and below the GWPS for boron (2 mg/L); for these locations the goal of transport model calibration was to have predicted concentrations match observed median concentrations above or below the standard at each well (for example, if the median observed concentration for a well was above the GWPS, the goal is to have predicted concentrations above the GWPS at the well). One or more of these goals were achieved at all but seven of the transport calibration location wells, specifically MW-150, MW-352, MW-356, MW-375, MW-385, OW-257, and PZ-176, where concentrations were underpredicted with the exception of MW-375, OW-257 and PZ-176 where concentrations were overpredicted (**Figure 4-9**). Calibration results are further discussed below.

- UA wells MW-352 and MW-356 were underpredicted transport calibration locations. The model simulated concentrations are below the GWPS (2 mg/L). These wells had observed boron concentrations that ranged above and below 2 mg/L with median observed concentrations only slightly above the GWPS at 2.12 and 2.02 mg/L, respectively. In other words, while the model simulated values below 2 mg/L the median observed calibration targets for these wells are very close to 2 mg/L.
- UU well MW-150 was an underpredicted transport calibration location; however, the calibrated results in this portion of the model domain are improved over the 2023 BAP model. MW-150 is located just downgradient of UU well PZ-174 which is west of the West Fly Ash Pond (Figure 2-3). Calibrated concentrations at model layer 4 monitoring wells MW-150 and PZ-174; and, model layer 3 monitoring well MW-196 were sensitive to the position of hydraulic conductivity Zone 14 (representing the PMP in model layer 3) located to the north and south of these well locations. The calibrated position of Zone 14 incorporated boring information acquired during the 2024 site investigation activities which improved the calibration for both PZ-174 and

MW-196 in this updated 2024 FAPS model. The calibration concentration for MW-150 was similar to the calibrated 2023 BAP model.

- The model under-predicts boron concentrations in UA locations MW-352, MW-356 and MW-385 where the concentrations observed (1.88 to 2.85 mg/L, 1.79 to 2.92 mg/L, and 2.45 mg/L respectively) are near the range of observed boron concentrations in upgradient bedrock wells like MW-304, where concentrations range from 1.27 to 2.16 mg/L. Since no initial concentrations were placed in the calibration model to represent the presence of boron observed in background wells, it is expected that the model may under-predict boron concentrations within the range of observed background.
- MW-385 and MW-386 are UA wells with only a single observed concentration value for calibration. MW-385 is an underpredicted UA well. MW-385 was installed in December 2015 on the former berm that was located between the active FAPS East Ash Pond and West Ash Pond. MW-385 was abandoned shortly after installation in February 2016, after collection of only one boron concentration data point. Since the data available for this well is limited, the usefulness of this location as a transport calibration point is also limited as the single data point may not be representative of current conditions. Like MW-385, MW-386 was abandoned shortly after installation, after collection of only one boron concentration data point, and was also located on the berm between the active FAPS East Ash Pond and West Ash Pond. Simulated boron concentrations at MW-386 met the calibration criteria discussed above; however, since the data available for this well is limited, like MW-385, the usefulness of this location as a transport calibration point is also limited as the single data point may not be representative of current conditions.
- UA well MW-375 was an over-predicted transport calibration location. The median target concentration is below 2 mg/L and the simulated concentration of 2.56 mg/L is greater than 2 mg/L. MW-375 had observed boron concentrations that ranged above and below 2 mg/L with a maximum concentration only slightly above the GWPS at 2.02 mg/L.
- UU well OW-257 was an over-predicted transport calibration location as it is nested with UU well OW-157 located north of the East Ash Pond of the FAPS, where the highest concentrations in the UU were observed. Simulating higher concentrations at OW-157 resulted in over-predicted transport calibration at OW-257 due to the close proximity of these two locations. It was preferred to calibrate the model to the greater of the observed boron concentrations.
- UU well PZ-176 was an over-predicted transport calibration location simulated near the limit of the simulated plume extent, where simulated concentrations in the modeled grid cell containing the well location are above the GWPS and the model grid cell immediately south of the well location are below the GWPS. Transport model calibration locations to the west (MW-151) and east (PZ-178) of PZ-176 met the calibration metrics and are below the GWPS, indicating the calibrated model accurately represents the limit of the plume extent along the southern property boundary.

The remaining 48 calibration locations had predicted concentrations that met one or more of the following goals of the transport model calibration: to have predicted concentrations fall within the range of observed concentrations; to have predicted concentrations above and below the GWPS for boron (2 mg/L) match observed concentrations observed above or below the standard at each well; and/or to have predicted concentrations above and below the GWPS for boron match observed median concentrations above or below the standard at each well. In other words, there

was a very good match between predicted and observed boron concentrations relative to wells with concentrations above and below the GWPS, for example:

- Off-site monitoring well MW-196 located southwest of the West Fly Ash Pond was calibrated to concentrations above the GWPS at the same order of magnitude as the observed concentrations *above* the GWPS; and, off-site monitoring well MW-197 located just downgradient of MW-196 was calibrated to concentrations *below* the GWPS at the same order of magnitude as the observed concentrations below the GWPS. The calibration of MW-196 and MW-197 accurately simulated the extent of the observed boron concentrations above 2 mg/L downgradient of the West Fly Ash Pond.
- UA well MW-366, located west of the FAPS, where the highest UA bedrock boron concentrations were observed, was calibrated within range of the observed values from December 2015 to July 2024. MW-366 was calibrated according to the calibration criteria described above, where observed boron concentrations at MW-366 ranged above and below the GWPS for boron (2 mg/L) with median observed concentrations below the GWPS. The calibrated value was also below the GWPS.
- UU well OW-157 located north of the East Ash Pond of the FAPS, where the highest concentrations in the UU were observed, had the highest simulated boron concentrations at BPP.

The calibration results for wells MW-196, MW-197, MW-366 and OW-157 indicate the transport calibration model was able to simulate the limits of boron above 2 mg/L along the downgradient limits of the plume and simulate the highest observed concentrations in both the UA and UU, respectively. Distribution of boron concentrations in the calibrated model are presented on **Figure 4-10 through Figure 4-15**.

5. PREDICTIVE MODELING

Prediction models were evaluated from projected remedy completion of 2028 to 1,000 years in the future (Year 3028). The objective of predictive modeling is to simulate changes in the magnitude and spatial distribution of boron concentrations in groundwater for each different corrective action. The results are used to evaluate if implementation of these actions will achieve the GWPS of 2 mg/L for boron at 23 FAPS monitoring wells and to compare the differences in spatial distribution of boron within groundwater at the site.

Twenty-three (23) downgradient FAPS monitoring wells were selected for evaluations of corrective action alternatives against the GWPS for boron (2 mg/L). Wells selected for these evaluations are as follows; MW-150, MW-151, MW-152, MW-252, MW-153, MW-253R, MW-350R, MW-352, MW-366, MW-375, MW-383, MW-384, MW-390, PZ-174, MW-196, MW-197, OW-257, MW-374, PZ-176, PZ-178, MW-377, PZ-175 and PZ-177, and referred to as FAPS monitoring wells herein. These FAPS monitoring wells were selected with an emphasis on including wells that meet at least one of the following criteria; monitoring wells downgradient of the FAPS and capable of monitoring current and future impacts associated with the FAPS, monitoring wells with a high likelihood of being included in corrective action groundwater monitoring programs for the FAPS, monitoring wells included in the current 35 I.A.C. § 845 groundwater monitoring program for the FAPS (Ramboll, 2023c), groundwater monitoring wells capable of monitoring potential impacts associated with the FAPS near the southern property boundary, and monitoring wells included as transport calibration model targets discussed in **Section 4**.

Simulated concentrations of boron were evaluated spatially using maps of combined maximum boron concentration within each layer at various points in time, and through time-series plots of boron concentrations for the FAPS monitoring wells.

5.1 Model Prediction Scenarios

The physical components of each scenario, their representation within the model, and simulation results are presented below. For all alternatives, simulation was performed by extending current conditions at the FAPS to 2028 (flow and transport calibration models). 2028 was used as the "time zero" for completion of the construction of the FAPS corrective actions for the predictive simulations of alternatives and is consistent with the model approach for the predictive simulations for the proposed CIP closure scenario at the BAP presented in the 2023 BAP GMR (Ramboll, 2023a; **Appendix A**).

The simulated BAP CIP presented in the 2023 BAP GMR includes an initial period to remove liquids from the BAP (2025 through 2027) followed by CCR removal from the western areas of the BAP, consolidation to the southeast, and eventually northeastern portions of the BAP, and construction of a cover system over the consolidated CCR. All of the following predictive simulations for the FAPS incorporated the BAP CIP model design to simulate construction and completion of consolidation and closure at the BAP as presented in the 2023 BAP GMR without changes. Discussion of corrective action performance in years assumes 2028 as the starting point for all FAPS predictive simulations of alternatives. **Figure 5-1** presents simulated boron concentrations in 2024 and 2028 (maximum concentration of boron at each location across all model layers) to illustrate the groundwater flow and transport conditions at the time of model calibration (2024, current conditions) and at the time of projected remedy completion (2028, start of prediction simulations for corrective action alternatives) for comparison.

5.1.1 Alternative 1 – Source Control with Groundwater Polishing (GWP)

The Alternative 1 remedy, source control with GWP, would include the completed source control approach which consisted of capping the waste material, after which GWP would be formally implemented. GWP is a remedial alternative that relies on natural geochemical processes and may be appropriate as recognized by the USEPA in a final policy directive for groundwater remediation (USEPA, 1999). This scenario is consistent with the closure conditions (capping of the FAPS) initially simulated in the 2014 model reports (NRT, 2014b, 2014c) and simulations developed for the closure of the bottom ash pond presented in the 2023 BAP GMR (Ramboll, 2023a; **Appendix A**) which was revised to represent current conditions at the FAPS as discussed in **Section 4**.

Simulation of GWP was performed by extending current conditions at the FAPS to 2028 during construction of the proposed closure scenario at the BAP, as described above. The current conditions were then extended for 1,000 years to complete the predictive simulation of Alternative 1. Boron concentrations at the FAPS monitoring wells are shown in **Figure 5-2**, and **Figure 5-3 to Figures 5-7** illustrate maximum boron concentrations at 25, 125, 375, 750 and 1,000 years after implementation, respectively.

Figure 5-2 presents concentrations of boron following closure at 23 of the FAPS monitoring wells for Alternative 1. The time to reach the GWPS standard for boron at these 23 FAPS monitoring well locations for Alternative 1 are also summarized in **Table 5-1**. The prediction model indicates Alternative 1 will result in boron concentrations declining below the GWPS (2 mg/L) within 260 years at 3 monitoring wells (MW-196, PZ-174 and PZ-175). Concentrations at another well (MW-197) increase after implementation for a period of time, then decrease to below the standard 311 years after implementation. These four wells are all UU monitoring wells. Three (3) monitoring wells start with and maintain levels below the GWPS for the entire 1,000-year simulation (MW-153, MW-150, and MW-253R). Following source control and GWP in Alternative 1, the GWPS was not achieved at 16 of 23 wells following the completion of the 1,000-year model simulation (**Table 5-1**).

The predicted simulations of Alternative 1 indicate the majority of downgradient wells which are initially below the GWPS are predicted to increase in concentration over time to a concentration above the GWPS within the 1,000-year simulation period. All of these wells are located in layers representing the UA with the exception of UU well PZ-178. The transport of boron in groundwater is slow due to the low permeability of the UU and UA (summarized in **Section 2.2**). Wells that have predicted increasing trends take an average of 279 years to increase to levels above the GWPS in Alternative 1. Boron concentrations in groundwater are not predicted to decrease below the GWPS at any point during the 1,000-year simulation at five (5) monitoring well locations, including wells in the UU, PMP, and UA.

Figure 5-3 to Figures 5-7 illustrate the simulated boron plume extent slowly expanding over time following implementation of Alternative 1. The calculated areas of the simulated boron plume extents are summarized in **Table 5-2** for the corrective action alternatives and includes the area of the plume extent for the calibration model (representing conditions in 2024 prior to implementation of the alternatives) for comparison. Based on the acreages included in **Table 5 2**, the area of the plume increases from 420 to 561 acres for Alternative 1.

5.1.2 Alternative 2 – Source Control with Cutoff Wall

The Alternative 2 remedy, source control with cutoff wall, would include the construction of a cutoff wall that would extend from the existing perimeter berm ground surface, which ranges from approximately 390 to 450 feet[4] to an approximate elevation of 365 feet, with the wall keyed into the low-permeability bedrock underlying the UU/PMP. The total length of the cutoff wall would be approximately 7,000 feet, and the cutoff wall would have a maximum depth of approximately 85 feet bgs. The cutoff wall would be constructed using either a mixture of soil and bentonite or cement and bentonite and would have an expected width of 2 to 3 feet. The cutoff wall would have a hydraulic conductivity value of approximately 1 x 10^{-7} cm/s. The purpose of the cutoff wall would be to provide a long-term, maintenance-free physical barrier to reduce the potential for COCs to migrate past the site's southern property boundary to off-site property owners.

Model Alternative 1 was modified to include the cutoff wall located in the FAPS directly north of the southern dike wall and extending west towards the tertiary pond. The cutoff wall was simulated using the horizontal flow barrier (HFB) package in MODFLOW, with a thickness of 3 feet and a hydraulic conductivity of 1x10^{-7} cm/s. These scenarios assume no changes to the cover system installed during FAPS closure (*i.e.,* any disturbance to the existing cap on the FAPS will be remedied following cutoff wall installation). The HFB boundary conditions were placed in model layers 2 through 4 to simulate the cutoff wall extending from grade through the UU to bedrock and immediately adjacent to the FAPS along the southern boundary and extending to the tertiary pond. Simulation of the cutoff wall was performed by extending current conditions at the FAPS to 2028 during construction of the proposed CIP closure scenario at the BAP, as described in **Section 5.1**, and the cutoff wall. Following completion of construction of the cutoff wall in 2028, the Alternative 1 model was modified to simulate the cutoff wall as described above, and the simulation was run for 1,000 years to complete the predictive simulation of Alternative 2. Boron concentrations at the FAPS monitoring wells are shown in **Figure 5-8**, and **Figure 5-3 to Figures 5-7** illustrate maximum boron concentrations at 25, 125, 375, 750 and 1,000 years after implementation, respectively.

Figure 5-8 presents concentrations of boron following closure at 23 of the FAPS monitoring wells for Alternative 2. The time to reach the GWPS standard for boron at these 23 FAPS monitoring well locations for Alternative 2 are also summarized in **Table 5-3**. The prediction model indicates Alternative 2 will result in boron concentrations declining below the GWPS (2 mg/L) within 393 years at 3 monitoring wells (MW-196, PZ-174 and PZ-175). Concentrations at another well (MW-197) increase after implementation for a period of time then decrease to below the GWPS 336 years after implementation. These four wells are all UU monitoring wells. Three (3) monitoring wells start with and maintain levels below the GWPS for the entire 1,000-year simulation (MW-153, MW-150, and MW-253R). Following source control and cutoff wall in Alternative 2, the GWPS was not achieved at 16 of 23 wells following the completion of the 1,000-year model simulation (**Table 5-3**).

The predicted simulations of Alternative 2 indicate the majority of downgradient wells are initially below the GWPS but are predicted to continue to increase in concentration over time to a concentration above the GWPS within the 1,000-year simulation period. All of these wells are

[4] All elevations referenced in this report are in the North American Vertical Datum of 1988 (NAVD88), unless otherwise noted.

located in layers representing the UA with the exception of UU well PZ-178. The transport of boron in groundwater is slow due to the low permeability UU and UA, and wells that have predicted increasing trends are taking on average 214 years to increase to levels above the GWPS in Alternative 2. Boron concentrations in groundwater are not predicted to decrease below the GWPS at any point during the 1,000-year simulation at five (5) monitoring well locations, including wells in the UU, PMP, and UA.

Figure 5-3 to Figures 5-7 illustrate the simulated boron plume extent slowly expanding over time following implementation of Alternative 2, like Alternative 1. Based on the acreages included in **Table 5-2**, the area of the plume increases from 420 to 559 acres for Alternative 2.

5.1.3 Alternative 3 – Source Control with a Groundwater Management System (GMS)

The Alternative 3 remedy, source control with groundwater management system, would include the construction of a system that actively removes liquids that are present within the interior of the FAPS. The groundwater management system would be comprised of the following components:

- An extraction trench which would remove infiltrated liquids from low-lying areas near and around the base of CCR within the interior of the FAPS.
  - The total length of the continuous trench alignment would be approximately 8,700 feet with a maximum depth of approximately 50 to 60 feet bgs.
  - The trench would be 2 to 3 feet wide and would be backfilled with highly permeable aggregate surrounding a perforated collection pipe.
  - Collection sumps would be located approximately every 500 feet along the trench alignment.
- A mechanical, electrical, and piping system to remove extracted liquids from the trenches and treat the liquids prior to discharge.
  - Liquids would be pumped from each of the sumps within the extraction trenches and routed to a collection pond constructed northwest of the FAPS for settling.
  - After settling, the liquids would be discharged to either the Kaskaskia River to the west via a new or existing NPDES outfall, and in accordance with site-specific permit requirements.

The purpose of the groundwater management system would be to provide long-term removal of liquids from the FAPS. This will reduce hydraulic head beneath the existing FAPS cover system which also reduces the potential for liquids from the FAPS to mix with groundwater and migrate past the site's southern property boundary.

Model Alternative 1 was modified to include GMS situated within the FAPS with an alignment that was configured to drain infiltrated liquids from the lowest spots within the CCR unit. Model Alternative 2 was not used because the cutoff wall is not a component of Alternative 3. In the model, the GMS was represented using the Drain package of MODFLOW, with conductance values set to 10,000 square feet per day (ft^2/d) that corresponds to hydraulic conductivity of $2.2x10^{-2}$ cm/sec or 62.4 ft/day to facilitate water flow. The drain stage is assumed to be 1 foot above the bottom of the CCR unit (bottom elevation of layer 1), providing sufficient space for the placement of the perforated collection pipe. The Drain boundary conditions were placed in layer 2 of the model to allow Constant Concentration boundary conditions (which represent source

concentrations in the CCR unit) to remain in layer 1 (only one boundary condition is allowed in a cell). The hydraulic conductivity of layer 1 cells above the layer 2 Drain boundary conditions was set to 3.5×10^{-3} cm/s or 10 ft/day to correspond to permeable aggregate backfill placed above the perforated collection pipes. Simulation of GMS was performed by extending current conditions at the FAPS to 2028 during construction of the proposed CIP closure scenario at the BAP, as described in **Section 5.1**, and GMS. Following completion of construction of the GMS in 2028, the Alternative 1 model was modified to simulate the GMS as described above, and the simulation was run for 1,000 years to complete the predictive simulation of Alternative 3. Boron concentrations at the FAPS monitoring wells are shown in **Figure 5-9,** and **Figure 5-3 to Figures 5-7** illustrate maximum boron concentrations at 25, 125, 375, 750 and 1,000 years after implementation, respectively.

Figure 5-9 presents concentrations of boron following closure at 23 of the FAPS monitoring wells for Alternative 3. The time to reach the GWPS standard for boron at 23 FAPS monitoring well locations for Alternative 3 are also summarized in **Table 5-4**. The prediction model indicates Alternative 3 will result in boron concentrations declining below the GWPS (2 mg/L) within 347 years at 6 monitoring wells (MW-152, PZ-177, MW-196, PZ-174, PZ-175 and PZ-176) and 770 years at another well (OW-257) where the calibrated concentration was highest among the evaluated FAPS monitoring wells. Concentrations at another three wells (MW-197, PZ-178 and MW-252) increase after implementation for a period of time then decrease to below the GWPS between 328 and 618 years after implementation. These 10 wells are UU, PMP and UA monitoring wells. Nine (9) monitoring wells start with and maintain levels below the GWPS for the entire 1,000-year simulation (including 7 wells in the UA). Following source control and GMS in Alternative 3, the GWPS was not achieved at 4 of 23 wells following the completion of the 1,000-year model simulation (**Table 5-4**).

The predicted simulations of Alternative 3 indicated three of these four downgradient wells that do not achieve GWPS within 1,000 years are initially below the GWPS but are predicted to continue to increase in concentration over time to a concentration above the GWPS within the 1,000-year simulation period. All of these wells are located in layers representing the UA. The transport of these concentrations is slow due to the low permeability UU and UA, and wells that have predicted increasing trends are taking on average 655 years to increase to levels above the GWPS in Alternative 3. One monitoring well does not show concentrations below the GWPS at any point during the 1,000-year simulation, UA monitoring well MW-375.

Figure 5-3 to Figures 5-7 illustrate the simulated boron plume extent contracting over time following implementation of Alternative 3. Based on the acreages included in **Table 5-2**, the area of the plume decreases from 420 to 193 acres for Alternative 3.

5.1.4 Closure-By-Removal (CBR) Scenario

Because the results of the Alternative 3 simulation indicated a significant number of FAPS monitoring wells (19 of 23) attain the GWPS but did not result in all wells attaining the GWPS within the 1,000-year model, a FAPS CBR prediction model was completed to evaluate the difference in boron concentrations simulated at 23 FAPS monitoring wells under both Alternative 3 (source control with GMS) and CBR (source removal) conditions. The CBR simulation is not a selected corrective action remedy and was completed only to compare and contrast the results of Alternative 3 (source control with GMS) against a scenario where the CCR within the FAPS is completely removed from the model domain (source removal).

The CBR Scenario, source removal, will include the removal of all CCR materials contained within the FAPS. The purpose of CBR is to eliminate source material and prevent future infiltration of liquids into CCR in the area of the FAPS.

Model Alternative 1 was modified to include CBR within the FAPS area. Model Alternative 2 and 3 were not used because the cutoff wall and GMS are not components of the CBR Scenario. In the model, CBR was represented by (i) applying No Flow boundary conditions in the entire FAPS footprint to simulate the absence of material in model layer 1 following CBR; (ii) setting the recharge rates within the FAPS footprint to equal ambient recharge rates; and, (iii) removing all source concentrations within the FAPS footprint following CBR (source concentrations associated with recharge zones and saturated ash cells [Constant Concentration boundary conditions]). Simulation of CBR was performed by extending current conditions at the FAPS to 2028 during construction of the proposed CIP closure scenario at the BAP, as described in **Section 5.1**, and CBR. Following completion of construction of CBR in 2028, the Alternative 1 model was modified to simulate the CBR as described above, and the simulation was run for 1,000 years to complete the predictive simulation of the CBR Scenario. For the purposes of comparison, it was assumed CBR would also be completed by 2028; however, CBR could not possibly be completed by 2028. Boron concentrations at the FAPS monitoring wells are shown in **Figure 5-10,** and **Figure 5-3 to Figures 5-7** illustrate maximum boron concentrations at 25, 125, 375, 750 and 1,000 years after implementation, respectively.

Figure 5-10 presents concentrations of boron following closure at 23 of the FAPS monitoring wells for each of the corrective action alternatives and the CBR Scenario. The time to reach the GWPS standard for boron at 23 FAPS monitoring well locations for the CBR Scenario are also summarized in **Table 5-5**. The prediction model indicates the CBR Scenario will result in boron concentrations declining below the GWPS (2 mg/L) within 168 years at 3 monitoring wells (MW-152, PZ-174, and PZ-176). Concentrations at another well (MW-252) increase after implementation for a period of time, then decrease to below the GWPS 918 years after implementation. These 4 wells are UU and UA monitoring wells. Nine (9) monitoring wells start with and maintain levels below the GWPS for the entire 1,000-year simulation (including 7 wells in the UA). Following source removal in the CBR Scenario, the GWPS was not achieved at 10 of 23 wells following the completion of the 1,000-year model simulation (**Table 5-5**).

The predicted simulations of the CBR Scenario indicated five of these ten downgradient wells are initially below the GWPS but are predicted to continue to increase in concentration over time to a concentration above the GWPS within the 1,000-year simulation period. These wells are located in layers representing the UU and UA. The transport of these concentrations is slow due to the low permeability UU and UA, and wells that have predicted increasing trends are taking on average 373 years to increase to levels above the GWPS in the CBR Scenario (two of which increase to levels above the GWPS within 30 years [UU wells MW-197 and PZ-178). One monitoring well (MW-252) shows concentrations decreasing to concentrations below the GWPS only temporarily, between 418 and 608 years, with concentrations above the GWPS at the end of the 1,000-year simulation. Four monitoring wells in the UU, PMP, and UA (PZ-177, MW-196, PZ-175 and MW-375) do not show concentrations below the GWPS at any point during the 1,000-year simulation.

Figure 5-3 to Figures 5-7 illustrate the simulated boron plume extent contracting over time following implementation of the CBR Scenario. Based on the acreages included in **Table 5-2**, the area of the plume decreases from 420 to 387 acres for the CBR Scenario.

6. PREDICTIVE ALTERNATIVE SIMULATION RESULTS

6.1 Prediction Scenario Results Discussion

Simulations of the proposed corrective actions and the CBR Scenario were similar in that none of the three alternatives, or the CBR, demonstrated that concentrations of boron in all FAPS monitoring wells would reduce below the GWPS within the 1,000-year period. Consequently, spatial analyses were performed for each proposed corrective action and the CBR Scenario, evaluating boron concentrations at five different time intervals (25, 125, 375, 750 and 1,000 years after implementation). This comparative spatial analysis utilized maps depicting the maximum boron concentration plume extent above the GWPS for the combined simulated layers (**Figure 5-3 to Figures 5-7**), and the corresponding areas of the maximum plume extent above the GWPS for each remedial alternative. **Table 5-2** provides the quantified data for comparison of the three proposed corrective action alternatives and CBR.

6.1.1 Comparison of Corrective Action Alternatives Against the Groundwater Protection Standard (GWPS) for Boron (2 mg/L)

Comparison of predicted concentrations of boron in groundwater at the FAPS monitoring wells indicates that the time to reach GWPS at the 23 FAPS monitoring wells is similar for Alternatives 1 and 2. The 1,000-year simulations for Alternative 1 and Alternative 2 result in 7 monitoring wells attaining the GWPS (3 of which start and end below the GWPS), and 16 wells that do not attain the GWPS at the end of the simulations. **Table A** below summarizes the timeframes to attain GWPS for the FAPS monitoring wells as a percentage of the 23 FAPS monitoring wells below the GWPS for each alternative.

Table A. Progression of Simulated Timeframes to Attain GWPS in FAPS Monitoring Wells†

Years‡ After Implementation	Alternative 1: Source Control with Groundwater Polishing (GWP)	Alternative 2: Source Control with Cutoff Wall	Alternative 3: Source Control with a Groundwater Management System (GMS)	Closure-By-Removal (CBR)
25	13%	13%	43%	43%
125	17%	17%	48%	48%
375	30%	26%	70%	52%
750	30%	30%	78%	52%
1,000	30%	30%	83%	57%

†: 23 wells were used to estimate time to reach GWPS in this Groundwater Modeling Technical Memorandum as described in **Section 5**.

‡: Years counted starting from completion of source control or source removal.

As shown in **Table A** above, Alternative 1 and Alternative 2 both indicate a maximum of 30% of FAPS monitoring wells (23 wells evaluated) attaining the GWPS by the end of the 1,000-year simulation, where Alternative 1 reaches this maximum earlier than Alternative 2. The declining and stable trends occur in Alternatives 1 and 2 as a result of reduced recharge into the FAPS following completion of the cover system. By reducing recharge, the cover system reduces percolation of solute mass from the FAPS, which decreases the boron concentration entering the

model domain. The predicted simulations of Alternatives 1 and 2 indicate the majority of downgradient wells are initially below the GWPS but are predicted to continue to increase in concentration over time to a concentration above the GWPS within the 1,000-year simulation period. The likely cause is that the cover system did not reduce heads within the FAPS enough to prevent residual groundwater boron concentrations from being pushed down into the lower hydrostratigraphic units over time. In addition, the simulated heads within the FAPS in Alternative 2 increase slightly as a result of placement of the cutoff wall along its southern boundary, which may result in an increase in the force driving impacted groundwater into the lower hydrostratigraphic units over time. The transport of boron in groundwater is slow due to the low permeability UU and UA, and wells that have predicted increasing trends are taking on average 279 and 214 years to increase to levels above the GWPS in Alternative 1 and Alternative 2, respectively. The shorter average time to increase to levels above the GWPS observed in Alternative 2 when compared to Alternative 1 is likely related to the influence of the cutoff wall on heads within the FAPS (increased heads) and subsequent increase in force driving impacted groundwater into the lower hydrostratigraphic units over time.

The 1,000-year simulation for Alternative 3 results in 19 monitoring wells that are below the GWPS (9 of which start and end below the GWPS), and 4 wells that are above the GWPS at the end of the simulation. As shown in **Table A** above, Alternative 3 indicates a maximum of 83% of FAPS monitoring wells (23 wells evaluated) attaining the GWPS by the end of the 1,000-year simulation, where Alternative 3 indicates significantly greater progress toward attaining the GWPS than Alternative 1 and Alternative 2 in less time (10 of the wells are below the GWPS within 25 years and stay below the GWPS for the remainder of the 1,000-year simulation). The declining and stable trends occur in Alternative 3 as a result of reduced recharge into the FAPS following completion of the cover system as described above for Alternative 1, as well as the significant reduction in infiltration as a result of the GMS, which further reduces mass from entering the model domain and removes existing mass from the model domain. The simulated GMS greatly reduces head within the FAPS (increasing the number of simulated dry cells) thereby reducing the force pushing impacted groundwater into deeper hydrostratigraphic units (resulting in simulated concentrations at 7 wells remaining below GWPS in the UA). Although GMS in Alternative 3 does significantly reduce the head within the FAPS there is still higher head surrounding the FAPS that can continue to drive residual boron concentrations from the UU down into the UA. The remaining head outside the area of the FAPS is likely resulting in the continued observations of boron concentrations above the GWPS in four FAPS monitoring wells in the UA following Alternative 3.

The 1,000-year simulation results for CBR indicate 13 monitoring wells will attain the GWPS (9 of which start and end below the GWPS), and 10 wells that remain above the GWPS at the end of the simulation. CBR reduces boron concentration by reducing mass from entering the model domain (reduced to zero additional mass entering the model since the source is completely removed). As shown in **Table A** above, CBR results in a maximum of 57% of FAPS monitoring wells (23 wells evaluated) attaining the GWPS by the end of the 1,000-year simulation, where Alternative 3 results achieve greater progress toward attaining the GWPS than CBR in less time (16 of the wells attain the GWPS [70%] within 375 years for Alternative 3 versus only 13 of the wells attaining the GWPS [57%] at the end of the 1,000-year simulation for CBR due to the significant reduction in infiltration, reduced head, and mass removal following implementation of Alternative 3 discussed in detail above).

6.1.2 Spatial Analyses of Corrective Action Alternatives and Closure-By-Removal (CBR) Scenario

6.1.2.1 Spatial Comparison of Maximum Plume Extents for Corrective Action Alternatives and Closure-By-Removal (CBR) Scenario

Simulated concentrations of boron were also evaluated spatially using maps of maximum boron concentration[5] at various points in time (**Figure 5-3 to Figures 5-7**) and their relative areas in acres are provided for comparison in **Table 5-2** for each model scenario. As illustrated in **Figure 5-3 to Figures 5-7** the maximum boron plume extents continue to expand for Alternative 1 and Alternative 2 between 25 and 1,000 years after implementation of corrective action in 2028. The maximum boron plume extent for CBR increases between 25 and 125 years after 2028, then contracts between 125 and 1,000 years after implementation. Conversely, the maximum plume extent continually contracts for Alternative 3 between 25 and 1,000 years after implementation. All scenarios indicate an increase in maximum plume extent between the calibration condition and 25 years after implementation (**Table 5-2**) as the system takes a while to respond to the implemented changes.

Alternative 1 and Alternative 2 had the largest simulated maximum plume extent at the end of the 1,000-year simulation (**Table 5-2**), where both alternatives had approximately 560-acre areas with predicted groundwater concentrations above the GWPS. CBR maximum plume extent area decreased to an area of 387 acres at the end of the 1,000-year simulation, while Alternative 3 saw further reductions in maximum plume extent to an area of 193 acres at the end of the 1,000-year simulation, representing a 50% reduction in the maximum plume extent area when compared to CBR. The area of the plume 1,000 years after implementation of Alternative 3 is also less than half the area under the calibration condition, indicating a significant decrease in the size of the plume footprint overall relative to all other modeled scenarios.

6.1.2.2 Spatial Comparison of Off-Site Maximum Plume Extents for Corrective Action Alternatives and Closure-By-Removal (CBR) Scenario

Boron concentrations have been observed above the GWPS at off-site UU monitoring well MW-196 located south of the southwest limit of the West Fly Ash Pond (the off-site well closest to the property line). The limit of these observed off-site concentrations above the GWPS were defined by the observed concentrations below the GWPS at UU monitoring well MW-197 (south of MW-196). The model representing current conditions in 2024 was calibrated to the observed off-site boron concentrations, where simulated boron concentrations at MW-196 were simulated above the GWPS and boron concentrations at MW-197 were simulated below the GWPS. **Figure 5-1** illustrates the simulated boron plume extent (including simulated off-site plume extent) for the calibrated transport model representing current conditions in 2024. As a response to the observed (MW-196) and simulated future off-site concentrations of boron above the GWPS, Ramboll will conduct a receptor survey to identify off-site properties with water wells that may be susceptible to current or future groundwater impacts related to the FAPS. The Human Health and Ecological Risk Assessment for the FAPS (Gradient, 2024) currently concludes there is no unacceptable risk to human health or the environment under present or future conditions, including all future corrective action alternatives. However, should the receptor survey indicate a

[5] The maximum extent of boron limits illustrated on the figures were created by combining the modeled boron concentration from all layers of the model into Layer 1 of the model using the "contour maximum concentrations in Layer 1" option available in the "import model results" menu of Groundwater Vistas.

risk to mitigate, the Human Health and Ecological Risk Assessment will be revised accordingly. With the implementation of the selected corrective action alternative it is anticipated that the potential releases of CCR-related constituents, as well as exposures to these constituents in the environment, will decline over time.

A spatial comparison of the simulated off-site maximum plume extents for corrective action alternative and the CBR Scenario is found below. This analysis utilized maps depicting the maximum boron concentration plume extent above the GWPS for the combined simulated layers (**Figure 5-3 to Figures 5-7**). The relative areas of the off-site maximum boron plume extents were also evaluated and compared (**Table 5-2**).

Alternative 1 and Alternative 2 had the largest simulated off-site plume extent at the end of the 1,000-year simulation, where approximately 50-acre and 30-acre areas contained concentrations above the GWPS off-site, respectively. The combined linear distance of plume simulated along the property line at the end of the 1,000-year simulation was continuous and approximately 5,440 feet for Alternative 1 and Alternative 2. Although there were increases and decreases over time between 25 and 1,000 years after implementation, the general trend was increasing off-site maximum plume extent for Alternative 1, while Alternative 2 plateaued at approximately 30 acres of area off-site at 750 years after implementation. Alternative 2 maximum plume extent off-site was likely stabilized as a result of the cutoff wall slowing or halting continued off-site plume migration.

Alternative 3 and CBR trends in off-site maximum plume extent were similar and only varied by less than two acres during all evaluated timeframes. The areas of off-site plume extent for Alternative 3 and CBR increased to a maximum of an approximately 27-acre area of off-site maximum plume extent 750 years after implementation followed by a decrease to an approximately 20-acre area of off-site plume extent at the end of the 1,000-year simulation. These results show Alternative 3 and CBR have the smallest off-site maximum plume extent when considering long-term potential off-site impacts and the difference between Alternative 3 and CBR is negligible when considering these off-site impacts. The combined linear distance of plume simulated along the property line at the end of the 1,000-year simulation was approximately 2,790 and 2,840 feet for Alternative 3 and the CBR Scenario, respectively. This difference in the combined linear distance between Alternative 3 and the CBR Scenario was negligible. Both models indicate the longest continuous linear distance of plume extent at the property line was to the southwest of the West Fly Ash Pond between monitoring well locations MW-150 and MW-151. The remaining areas that contribute to the combined linear distance of plume simulated along the property line were south of the West Fly Ash Pond and south of the East Fly Ash Pond. A longer linear section south of the West Fly Ash Pond was simulated at the property line in the CBR Scenario. No linear distance of plume was simulated along the property line at the end of the 1,000-year simulation south of the East Fly Ash Pond for the CBR Scenario, whereas a linear distance of approximately 360 feet was simulated at the property line in Alternative 3 (note this area of the Alternative 3 plume did not cross the property line).

6.2 Post-Construction Flux Evaluations for Alternative 3

Evaluations of post-construction water flux through the FAPS CCR were completed using data obtained from the Alternative 3 prediction model when simulated post-construction heads in the FAPS monitoring wells reached equilibrium at approximately 106 years following implementation. The Calibration Model 1 (pre-closure FAPS model) and post-construction Alternative 3 prediction

model simulated water flux values are summarized in **Appendix D** and discussed below. Data export files used for flux evaluations are found along with model files in **Appendix B**.

Figure 6-1 is a plot showing the changes in flux reduction (shown as negative percentage [where positive percentage represents an increase]) over time, starting from implementation of the Alternative 3 through approximately 120 years following implementation. This was determined by comparing the simulated post-construction Alternative 3 movement of water in and out of the FAPS CCR to pre-construction conditions (Calibration Model 1 [pre-closure FAPS model]). Alternative 3 was predicted to reduce total flux in of the FAPS CCR by approximately 60 percent (%) within 2 years following implementation and flux reductions remain around 60% when heads reach post-closure equilibrium. The reduction in total flux in is predicted to exceed 60% reduction for the remaining model timeframe (maximum reduction of approximately 63%). Alternative 3 was predicted to reduce total flux out of the FAPS CCR by approximately 60% when heads reach post-closure equilibrium. The reduction in total flux out is predicted to exceed approximately 60% reduction for the remaining model timeframe (maximum reduction of approximately 62%). An initial increase was predicted for total flux out of the FAPS CCR by approximately 90% within 2 years following implementation of Alternative 3, followed by reduction of total flux by approximately 10% within approximately 8 years following implementation. The cause of the simulated initial increase is discussed in the next paragraph. The groundwater flow system reached equilibrium within approximately 106 years following implementation of Alternative 3, at which time total flux in and out are predicted to reduce by approximately 60% (**Figure 6-2**).

To determine the cause of the simulated initial increase in flux-out, a sensitivity model was developed to evaluate model construction of the GMS. As described in **Section 5**, the GMS was represented using the Drain package of MODFLOW. The drain stage is assumed to be 1 foot above the bottom of the CCR unit (bottom elevation of layer 1), providing sufficient space for the placement of the perforated collection pipe. The Drain boundary conditions were placed in layer 2 of the model to allow Constant Concentration boundary conditions (which represent source concentrations in the CCR unit) to remain in layer 1 (only one boundary condition is allowed in a cell). In the sensitivity model, Drain boundary conditions representing the GMS were moved from layer 2 to layer 1. Since only one boundary condition is allowed in a cell, overlapping Constant Concentration boundary conditions in layer 1 were deleted to allow for Drain boundary condition placement in layer 1. Drain stage of layer 1 Drain boundary conditions were modified to prevent potential model errors (drain stage cannot be lower than bottom elevation of layer 1), as necessary. **Figure 6-3** is a plot showing the sensitivity model changes in flux reduction (shown as negative percentage [where positive percentage represents an increase]) over time, starting from implementation of the Alternative 3 through approximately 120 years following implementation. The flux-in and flux-out results of the sensitivity model (**Figure 6-3**) are the inverse of the original model results (**Figure 6-1**).

The difference in flux in and out between the initial model and the sensitivity model can be attributed to the position of the Drain boundary conditions relative to the movement of water in and out of the FAPS CCR, where the initial model has Drain boundary conditions along the base of ash surface and outside of the FAPS CCR (layer 2) and the sensitivity model has Drain boundary conditions along the base of ash surface and inside of the FAPS CCR (layer 1). As Drain boundary conditions remove water from the FAPS CCR as a function of the GMS, water is prevented from moving into the FAPS CCR from layer 2 Drain boundary conditions below the

FAPS CCR in the initial model, while water is prevented from moving out of the FAPS CCR from layer 1 Drain boundary conditions within the unit in the sensitivity model. In other words, as a function of the position of the Drain boundary conditions in the model construction more water is allowed to move out of the FAPS CCR in the initial model, while more water is allowed to move into the FAPS CCR in the sensitivity model. Both models indicate a significant reduction in flux in and out of the FAPS CCR when compared to the Calibration Model 1 (pre-closure FAPS model).

When simulated post construction heads reach equilibrium in the sensitivity model the reduction in total flux in is predicted to be approximately 42% and total flux out was predicted to be reduced by approximately 73% (**Figure 6-4**). The reduction in total flux in is predicted to be approximately 50% and the reduction in total flux out is predicted to exceed 70% for the remaining model timeframe.

The groundwater flow system reaches equilibrium within approximately 106 years following implementation of the Alternative 3, at which time total flux in and out are predicted to reduce by approximately 60% for the initial model and flux in and out are predicted to reduce by approximately 42 and 73%, respectively, for the sensitivity model (**Figures 6-2 and 6-4**). Since the GMS will be removing water from the FAPS the original simulation results are more representative of the anticipated reduction in flux in (60%); and, the sensitivity simulation results are more representative of the anticipated reduction in flux out (73% reduction) that would be expected following implementation.

Based on the initial and sensitivity models, flux in and out are predicted to reduce by approximately 60% and 73%, respectively, after approximately 106 years following implementation of the Alternative 3 when heads reach post-closure equilibrium at the FAPS monitoring wells. Total flux in includes flux through the CCR (25 gpm) and the modeled Constant Head boundary conditions (3 gpm) used to simulate surface water management within the active FAPS, with no surface water management within the closed FAPS. Prior to construction of Alternative 3 (*i.e.*, Calibration Model 1 [pre-closure FAPS model]) the total groundwater flux into the CCR is the same as total flux out at approximately 28 gpm (**Appendix D**). When the groundwater system reaches post-closure equilibrium approximately 106 years following implementation of Alternative 3, the groundwater flux into and out of the CCR is also similar at approximately 11 and 8 gpm, respectively.

Simulation of Alternative 3 remedy assumed operation of the GMS. The simulated rate of liquids removal by the GMS versus time data from the flow prediction model (MODFLOW-NWT model) for Alternative 3 remedy was plotted in **Figure 6-5**. As shown in the figure, the liquids removal rate is higher at the beginning of the operation (*e.g.,* greater than 30 gpm for the first 8 years of the operation) due to higher initial groundwater elevations at the start of liquids removal. As simulated, groundwater level near the GMS decrease as operation of the GMS continues, as does the simulated rate of liquids removal. The rate of liquids removal decreases to less than 10 gpm after approximately 106 years of operation when heads at FAPS monitoring wells approach post-closure equilibrium. The minimum rate of liquids removal is predicted to be approximately 6.4 gpm at the end of the simulation.

6.3 Assessment of Geochemical Process

This groundwater flow and transport model estimates the time for boron to reach the GWPS under different potential corrective actions based on physical components of GWP. As described

in the GMR for the 2023 BAP model, it was assumed that boron would not significantly sorb or chemically react with aquifer solids (soil adsorption coefficient [Kd] was set to 0 milliliters per gram [mL/g]), which is a conservative estimate for estimating contaminant transport times.

The results of the groundwater polishing evaluation (Geosyntec, 2025), which applied geochemical modeling, indicate that chemical attenuation of boron and sulfate is feasible under current conditions through sorption to iron and aluminum oxide solids. Barite precipitation is also predicted to contribute to the chemical attenuation of sulfate. Though a small amount of desorption of boron and sulfate is predicted with background groundwater interaction, the impact of the desorption to aqueous boron and sulfate concentrations is negated by interaction with background groundwater that contains lower concentrations of both parameters. Aqueous boron and sulfate concentrations should decrease below the GWPS at all wells in the compliance monitoring system post-source control. Based on modeling results, remobilization of attenuated boron and sulfate is unlikely to affect the time to reach the GWPS.

6.4 Discussion of Long-Term Modeling Results

Potential GWPS exceedances of boron, fluoride, and sulfate have been determined at five individual active[6] monitoring locations as of 2024 (**Section 2.3**). Results of groundwater modeling predict that more wells are likely to exceed GWPSs in the future. The modeling results presented in **Figures 5-2, 5-8, 5-9, and 5-10** illustrate predicted boron concentrations over time with the following observations:

- Alternative 3 indicates significantly greater progress toward attaining the GWPS than Alternative 1 and Alternative 2 in less time.
  - 10 of the wells are below the GWPS within 25 years and will stay below the GWPS for the remainder of the 1,000-year simulation.
- Alternative 3 results also achieve greater progress toward attaining the GWPS than CBR in less time.
  - 16 of the wells attain the GWPS within 375 years for Alternative 3 versus 13 of the wells attaining the GWPS at the end of the 1,000-year simulation for CBR.
- None of the models predict that all wells will attain the GWPS for boron within the 1,000-year timeframe, including the simulated CBR scenario.
  - This is due to the low hydraulic conductivity of the native soils (UU) and bedrock (UA); and, low groundwater flow velocities at the site.

As with all models, this groundwater flow and transport model is limited by the data used for calibration, which adequately define the local groundwater flow system and the source and extent of the plume. Since data used for calibration are near the BAP and FAPS, model predictions of transport distant spatially and temporally from the calibrated conditions at the CCR units will not be as reliable as predictions closer to the CCR units and groundwater concentrations observed between 2015 and 2024. Groundwater corrective action will include monitoring and adaptive site management which includes routine review of the CSM and decision points for making updates to the CSMs and the groundwater fate and transport models as appropriate in the future.

[6] MW-391 was abandoned on October 9, 2024

Simulated post-construction heads in the FAPS monitoring wells reached equilibrium at approximately 106 years following implementation of corrective action alternatives and was used as a representative simulated time period for estimating future flux reductions from the FAPS (**Section 6.2**). Considering that: (1) models become increasingly less reliable as the length of time increases for predictions and (2) the model simulations indicate the groundwater flow system approaches equilibrium approximately 106 years after implementation; discussion of model results beyond 106 years should be more qualitative such as comparison between observed future trends and predicted trends, and as a tool for comparison between model simulations. Following implementation of corrective action, progress toward attainment of the GWPS will be routinely monitored and updated following the adaptive site management actions provided in the Corrective Action Groundwater Monitoring Plan, Baldwin Power Plant, Fly Ash Pond System (Ramboll, 2025b).

7. CONCLUSION

Existing site-specific three-dimensional groundwater flow (MODFLOW) and transport models (MT3DMS) were revised and employed to evaluate how the potential corrective action alternatives would achieve compliance with the applicable GWPS; to compare changes in the magnitude and spatial distribution of boron concentrations in groundwater for each different corrective action alternative; and to describe fate and transport of contaminants in accordance with 35 I.A.C. § 845.220 (c)(2) using groundwater models. Boron was selected for simulation of groundwater quality changes resulting from the FAPS and was shown to be an acceptable surrogate for modeling groundwater quality changes in other site COCs (sulfate). It was assumed that boron would not significantly sorb or chemically react with aquifer solids (Kd was set to 0 mL/g) which is a conservative estimate for predicting contaminant transport times in the model. Based on an assessment of geochemical processes at the site, remobilization of attenuated boron and sulfate is unlikely to affect the estimated times to reach the GWPS.

Three prediction models were developed to evaluate corrective action alternatives, consisting of source control with GWP (Alternative 1), cutoff wall (Alternative 2), and a groundwater management system (Alternative 3). The objective of predictive modeling is to simulate changes in the magnitude and spatial distribution of boron concentrations in groundwater for each different corrective action. The results are used to evaluate if implementation of these actions will achieve the GWPS of 2 mg/L for boron at 23 FAPS monitoring wells and to compare the differences in spatial distribution of boron within groundwater at the site.

Comparison of predicted concentrations of boron in groundwater at the FAPS monitoring wells indicates that the time to reach GWPS at the 23 FAPS monitoring wells is similar for Alternatives 1 and 2. Alternative 1 and Alternative 2 both indicate a maximum of 30% of FAPS monitoring wells (23 wells evaluated) attaining the GWPS by the end of the 1,000-year simulation. Alternative 3 indicates a maximum of 83% of FAPS monitoring wells (23 wells evaluated) attaining the GWPS by the end of the 1,000-year simulation, where Alternative 3 indicates significantly greater progress toward attaining the GWPS than Alternative 1 and Alternative 2 in less time (10 of the wells are below the GWPS within 25 years and stay below the GWPS for the remainder of the 1,000-year simulation).

Because the results of the Alternative 3 simulation did not result in all wells attaining the GWPS within the 1,000-year model, a FAPS CBR prediction model was completed to evaluate the difference in boron concentrations simulated at the 23 FAPS monitoring wells under both Alternative 3 (source control with GMS) and CBR (source removal) conditions. CBR results in a maximum of 57% of the monitoring wells attaining the GWPS by the end of the 1,000-year simulation, where Alternative 3 achieves greater progress toward attaining the GWPS than CBR in less time: 70% of the wells attain the GWPS within 375 years for Alternative 3; versus, a maximum of 57% of the wells attaining the GWPS at the end of the 1,000-year simulation for CBR.

Simulated concentrations of boron were also evaluated spatially using maps of maximum boron concentration at various points in time and their relative areas in acres for each model scenario. The maximum boron plume extents continue to expand for Alternative 1 and Alternative 2 between 25 and 1,000 years after implementation of corrective action in 2028. The maximum boron plume extent for CBR increases between 25 and 125 years after 2028, then contracts between 125 and 1,000 years after implementation. The maximum plume extent continually

contracts for Alternative 3 between 25 and 1,000 years after implementation. The area of the plume 1,000 years after implementation of Alternative 3 is also less than half the area under the calibration condition, indicating a significant improvement in the reduction of the plume footprint overall and the greatest reduction in plume footprint when compared to other scenarios. Alternative 3 and CBR trends in off-site maximum plume extent were similar and only varied by less than two acres during all evaluated timeframes. The areas of off-site plume extent for Alternative 3 and CBR increased to a maximum of an approximately 27-acre area of off-site maximum plume extent 750 years after implementation followed by a decrease to an approximately 20-acre area of off-site plume extent at the end of the 1,000-year simulation.

Evaluations of water flux through the FAPS CCR for Alternative 3 and a sensitivity model at post-closure equilibrium indicate a reduction in total flux into the unit by 60% and a reduction in total flux out of the unit by 73%. The GMS liquids removal rate is estimated to be approximately 30 gpm for the first 8 years and decreases over time to less than 10 gpm after approximately 106 years of operation when heads at FAPS monitoring wells approach post-closure equilibrium.

Results of all groundwater modeling scenarios predict that more wells are likely to exceed GWPSs in the future than are currently observed in 2024. Alternative 3 results achieve greater progress toward attaining the GWPS in less time when compared to other corrective action alternatives, including the simulated CBR scenario. None of the models predict that all wells will attain the GWPS for boron within the 1,000-year timeframe, including the simulated CBR scenario. This is due to the low hydraulic conductivity of the native soils (UU) and bedrock (UA), and low groundwater flow velocities at the site. Simulated post-construction heads in the FAPS monitoring wells reach equilibrium at approximately 106 years following implementation of corrective action alternatives, which was used for estimating future flux reductions from the FAPS. Considering models become increasingly less reliable over extended timeframes, discussions of model results beyond 106 years should be qualitative and comparative. Following implementation of corrective action, progress toward attainment of the GWPS will be routinely monitored and updated per the adaptive site management actions, which involves routine review and potential updates to the CSM and groundwater fate and transport models as appropriate and is detailed in the Corrective Action Groundwater Monitoring Plan, Baldwin Power Plant, Fly Ash Pond System (Ramboll, 2025b).

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TABLES

TABLE 4-1. FLOW AND TRANSPORT MODEL CALIBRATION TARGETS

GROUNDWATER MODELING TECHNICAL MEMORANDUM

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, IL

Well ID	Monitored Hydrogeologic Unit	Modeled Target Location (Layer Number)	Flow Model Target Groundwater Elevation (Modified Median Value December 2015 to July 2024 [feet NAVD88][1])	Transport Model Target Total Boron Concentrations December 2015 to July 2024 (mg/L)		
				Minimum	Median	Maximum
MW-104DR	UU	3	445.15	0.016[4]	0.02[4]	0.177[4]
MW-104SR	UU	2	445.22	0.05[4]	0.1425[4]	0.243[4]
MW-116	UU	4	448.77	0.023	0.024	0.025
MW-126	UU	2	459.46	0.0092	0.0106	0.012
MW-150	UU	4	377.38	3.43	3.59	4.38
MW-151	UU	5	394.38	0.345	0.818	1.26
MW-152	UU	3	419.44	0.477	1.12	19.8
MW-153	UU	2	431.88	0.009	0.02585	0.2
MW-154	UU	5	376.93	0.016[4]	0.02[4]	0.056[4]
MW-155	UU	3	373.98	0.0092[4]	0.02[4]	0.2[4]
MW-158R	UU	2	448.47	0.0254	0.061	0.0666
MW-192	UU	2	428.74	0.01	0.0376	0.0686
MW-193	UU	3	429.07	0.01	0.0496	0.0645
MW-194	UU	3	431.03	0.01	0.021	0.2
MW-204	UA	6	443.27	0.754	1.02	1.35
MW-252	UU	5	422.56	0.135	0.166	0.235
MW-253R	UU	5	427.46[3]	0.182	0.182	0.182
MW-258	UA	5	441.95	1.03	1.225	1.35
MW-304	UA	6	445.66	1.27	1.68	2.16
MW-350R	UA	6	370.32[3]	1.02	1.02	1.02
MW-352	UA	6	423.42[2]	1.88	2.115	2.85
MW-355	UA	6	370.34	0.0092[4]	0.024[4]	0.577[4]
MW-356	UA	6	424.92[2]	1.79	2.02	2.92
MW-358	UA	6	No Target	0.142	1.38	1.67
MW-366	UA	6	410.45	1.19	1.67	3.6
MW-369	UA	6	413.31[2]	0.232	0.918	2.4
MW-370	UA	6	402.59	1.56	1.825	2.67
MW-374	UA	6	388.64	No Target		
MW-375	UA	6	391.22	0.979	1.375	2.06
MW-377	UA	6	416.38	1.54	1.725	2.01
MW-382	UA	5	414.93	1.59	1.75	2.57
MW-383	UA	6	440.48	1.16	1.395	2.05
MW-384	UA	6	444.34	1.26	1.48	2.26
MW-385	UA	6	No Target	2.45	2.45	2.45
MW-386	UA	6	No Target	1.34	1.34	1.34
MW-388	UA	6	393.27	No Target		
MW-389	UA	6	399.29	No Target		
MW-390	UA	6	419.17	0.175	0.4985	2.3
MW-392	UA	6	428.4	1.57	1.86	2.7
MW-393	UA	6	429.51	1.53	1.74	2.76
MW-394	UA	6	431.78	1.39	1.8	2.89
OW-156	UU	2	420.78	0.02	0.024	0.03
OW-157	UU	2	426.41	44.6	45.2	45.3
OW-256	UU	3	No Target	0.156	0.192	0.267
OW-257	UU	5	No Target	0.463	0.509	0.693
TPZ-164	CCR	1	431.14	0.922	1.34	2.04
XPW01	CCR	1	427.54	0.563	0.93	1.03
XPW02	CCR	1	433.52	0.87	1.18	1.52
XPW04	CCR	1	426.78	0.835	1.15	1.38
XPW05	CCR	1	432.52	0.828	1.02	1.57
XPW06	CCR	1	415.17	1.55	2.8	4.64
MW-196	UU	3	388.73[3]	3	3.925	4.85
MW-195	UU	3	388.61[3]	No Target		
MW-197	UU	3	385.02[3]	0.0254	0.0309	0.0364
MW-373	UA	6	377.36	No Target		
PZ-169	UU	3	409.56	No Target		
PZ-170	UU	5	405.93	0.255	0.286	0.426
PZ-171	UU	3	403.5	No Target		
PZ-172	UU	4	391.78	No Target		
PZ-173	UU	4	383.16	No Target		
PZ-174	UU	4	389.04	4.03	4.03	4.03
PZ-175	UU	4	394.97	No Target		
PZ-176	UU	5	394.52	1.21	1.21	1.21
PZ-177	UU	3	413.89	No Target		
PZ-178	UU	4	422.12	0.663	0.663	0.663
PZ-182	UU	3	413.43	0.396	0.484	0.684

[O: EGP 1/3/23, C: JJW 1/4/23, U: JJW 5/2/23, C: EGP 5/16/23, U:JJW 1/17/25, C: EGP 1/30/25]

TABLE 4-1. FLOW AND TRANSPORT MODEL CALIBRATION TARGETS

GROUNDWATER MODELING TECHNICAL MEMORANDUM

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, IL

Notes:

[1] Target groundwater elevations represent modified median groundwater elevations from December 2015 to July 2024. Anomalous groundwater elevations (e.g., groundwater elevations that do not represent static groundwater conditions, groundwater elevation outliers, or groundwater elevations measured in error) monitored between December 2015 and July 2024 were removed from the median groundwater elevation calculations used as flow calibration targets.

[2] Target groundwater elevation used 2022 target from 2023 Bottom Ash Pond Groundwater Modeling Report.
[3] Target groundwater elevation used single value due to limited data (typically most recent measurement) for wells constructed or reoccupied in 2024.
[4] Target boron concentration used dissolved boron data from March 2015 to July 2024.
ID = identification
mg/L = milligrams per liter
NAVD88 = North American Vertical Datum of 1988

Hydrogeologic Unit:
CCR = coal combustion residuals
UA = uppermost aquifer
UU = upper unit

TABLE 4-2. FLOW MODEL INPUT AND SENSITIVITY ANALYSIS RESULTS
GROUNDWATER MODELING TECHNICAL MEMORANDUM
BALDWIN POWER PLANT
FLY ASH POND SYSTEM
BALDWIN, IL

Zone	Zone Description	Materials	ft/d	cm/s	Kh/Kv	Value Source	Sensitivity[1,2]
Horizontal Hydraulic Conductivity			**Calibration Model**				
1	UU	silty clay	0.085	3.00E-05	NA	Calibrated - Near Geomean Hydraulic Conductivity Field Test Results for Wells Screened in the Upper Unit (Ramboll, 2023b)	Moderate
2	Old East Fly Ash Pond	CCR	0.5	1.76E-04	NA	Calibrated - Near Geomean of Vertical Hydraulic Conductivity Laboratory Test Results from FAPS Wells (Ramboll, 2023b)	Negligible
3	East Fly Ash Pond	CCR	0.5	1.76E-04	NA	Calibrated - Near Geomean of Vertical Hydraulic Conductivity Laboratory Test Results from FAPS Wells (Ramboll, 2023b)	Low
4	West Fly Ash Pond	CCR	0.5	1.76E-04	NA	Calibrated - Near Geomean of Vertical Hydraulic Conductivity Laboratory Test Results from FAPS Wells (Ramboll, 2023b)	Low
7	Bottom Ash Pond	CCR	1.5	5.29E-04	NA	Calibrated - Near Minimum Hydraulic Conductivity Field Test Results for Wells Screened in BAP (Ramboll, 2023b)	Moderate
8	UA (Decomposed Bedrock)	bedrock	0.05	1.76E-05	NA	Calibrated - Within Range of Hydraulic Conductivity Field Test Results for Wells Screened in Bedrock (Ramboll, 2023b)	Low
9	UA	bedrock	0.05	1.76E-05	NA	Calibrated - Within Range of Hydraulic Conductivity Field Test Results for Wells Screened in Bedrock (Ramboll, 2023b)	High
10	UU (Top of Vandalia)	silty clay	0.085	3.00E-05	NA	Calibrated - Near Geomean Hydraulic Conductivity Field Test Results for Wells Screened in the Upper Unit (Ramboll, 2023b)	Low
12	River Alluvium	silty clay	0.1	3.53E-05	NA	Calibrated	Low
14	PMP	sand seams	2.0	7.06E-04	NA	Calibrated - Near Geomean Hydraulic Conductivity Field Test Results for Wells Screened Across Upper Unit Sands (Ramboll, 2023b; Ramboll, 2025)	Moderate
16	Fill at BAP & FAPS Boundary	fill	0.5	1.76E-04	NA	Calibrated	Negligible
100	Above River Boundary Condition	NA	500	1.76E-01	NA	Calibrated - Conductivity Value to Allow Groundwater Flow to River Boundary Conditions	Negligible
Vertical Hydraulic Conductivity			**Calibration Model**				
1	UU	silty clay	0.0085	3.00E-06	10	Calibrated - Within Range of Upper Unit Vertical Hydraulic Conductivity Laboratory Test Results (Ramboll, 2023b)	Moderate
2	Old East Fly Ash Pond	CCR	0.5	1.76E-04	1	Calibrated - Near Geomean of Vertical Hydraulic Conductivity Laboratory Test Results from FAPS Wells (Ramboll, 2023b)	Negligible
3	East Fly Ash Pond	CCR	0.5	1.76E-04	1	Calibrated - Near Geomean of Vertical Hydraulic Conductivity Laboratory Test Results from FAPS Wells (Ramboll, 2023b)	Negligible
4	West Fly Ash Pond	CCR	0.5	1.76E-04	1	Calibrated - Near Geomean of Vertical Hydraulic Conductivity Laboratory Test Results from FAPS Wells (Ramboll, 2023b)	Negligible
7	Bottom Ash Pond	CCR	1.5	5.29E-04	1	Calibrated - Near BAP Well TPZ-164 Vertical Hydraulic Conductivity Laboratory Test Results (Ramboll, 2023b)	Negligible
8	UA (Decomposed Bedrock)	bedrock	0.01	3.53E-06	5	Calibrated	Low

TABLE 4-2. FLOW MODEL INPUT AND SENSITIVITY ANALYSIS RESULTS
GROUNDWATER MODELING TECHNICAL MEMORANDUM
BALDWIN POWER PLANT
FLY ASH POND SYSTEM
BALDWIN, IL

Zone	Zone Description	Materials	ft/d	cm/s	Kh/Kv	Value Source	Sensitivity[1,2]
Vertical Hydraulic Conductivity			**Calibration Model**				
9	UA	bedrock	0.005	1.76E-06	10	Calibrated	Moderate
10	UU (Top of Vandalia)	silty clay	0.0085	3.00E-06	10	Calibrated - Within Range of Upper Unit Vertical Hydraulic Conductivity Laboratory Test Results (Ramboll, 2023b)	Low
12	River Alluvium	silty clay	0.1	3.53E-05	1	Calibrated	Negligible
14	PMP	sand seams	2.0	7.06E-04	1	Calibrated - Near Geomean Hydraulic Conductivity Field Test Results for Wells Screened Across Upper Unit Sands (Ramboll, 2023b; Ramboll, 2025)	Negligible
16	Fill at BAP & FAPS Boundary	fill	0.5	1.76E-04	NA	Calibrated	Negligible
100	Above River Boundary Condition	NA	500	1.76E-01	1	Calibrated - Conductivity Value to Allow Groundwater Flow to River Boundary Conditions	Negligible
Zone	**Zone Description**	**Materials**	**ft/d**	**in/year**	**Kh/Kv**	**Value Source**	**Sensitivity[1,2]**
Recharge			**Calibration Model**				
1	Silty Clay	silty clay	1.00E-05	0.04	NA	Calibrated	Low
2	Old East Fly Ash Pond	CCR	1.87E-04	0.82	NA	HELP model output for cover system simulation based on design documented in the FAPS Closure and Post-Closure Care Plan (AECOM, 2016)	Low
3	East Fly Ash Pond	CCR	1.87E-04	0.82	NA	HELP model output for cover system simulation based on design documented in the FAPS Closure and Post-Closure Care Plan (AECOM, 2016)	Low
4	West Fly Ash Pond	CCR	1.87E-04	0.82	NA	HELP model output for cover system simulation based on design documented in the FAPS Closure and Post-Closure Care Plan (AECOM, 2016)	Low
5	Secondary Pond	silty clay	1.00E-05	0.04	NA	Calibrated	Negligible
6	Tertiary Pond	silty clay	1.00E-05	0.04	NA	Calibrated	Negligible
7	Bottom Ash Pond	CCR	1.80E-04	0.79	NA	Calibrated	Low
Storage							
1	UU	silty clay	*Not used in steady-state calibration model*				
2	Old East Fly Ash Pond	CCR					
3	East Fly Ash Pond	CCR					
4	West Fly Ash Pond	CCR					
7	Bottom Ash Pond	CCR					
8	UA (Decomposed Bedrock)	bedrock					
9	UA	bedrock					
10	UU (Top of Vandalia)	silty clay					
12	River Alluvium	silty clay					
14	PMP	sand seams					
16	Fill at BAP & FAPS Boundary	fill					
100	Above River Boundary Condition	NA					

TABLE 4-2. FLOW MODEL INPUT AND SENSITIVITY ANALYSIS RESULTS
GROUNDWATER MODELING TECHNICAL MEMORANDUM
BALDWIN POWER PLANT
FLY ASH POND SYSTEM
BALDWIN, IL

River Parameters

	Relative Location	Stage of River (feet)	Sensitivity	River Bottom Elevation (feet)	Hydraulic Conductivity (ft/d)	Average River Conductance (ft^2/d)	Sensitivity[1,2]
Reach 0	Cooling Pond	429	Moderate	410	3.80	3.80E+04	Negligible
Reach 1	Kaskaskia River	368	High	363	5.17	5.17E+04	Negligible
Reach 2	South Stream (Southern Limit of Model Domain)	456.03-370.27	Negligible	452.03-365.81	2.08	2.08E+04	Negligible
Reach 3	South Stream (Between Reach 2 and Reach 4)	449.98-370.17	Moderate	447.98-368.17	2.05	2.05E+04	Negligible
Reach 4	South Stream (Adjacent to FAPS)	440-368	Moderately High	438-366	0.36	3.60E+03	Negligible
Reach 5	Northwest Stream (West of Cooling Pond)	410.66-370.38	Negligible	408.66-368.38	3.89	3.89E+04	Negligible
Reach 7	Northeast Stream (East of Cooling Pond)	454.75-427.06	High	452.75-425.06	2.60	2.60E+04	Negligible
Reach 8	Secondary and Tertiary Pond	396	Low	394.87-376.17	0.26	2.60E+03	Negligible

TABLE 4-2. FLOW MODEL INPUT AND SENSITIVITY ANALYSIS RESULTS
GROUNDWATER MODELING TECHNICAL MEMORANDUM
BALDWIN POWER PLANT
FLY ASH POND SYSTEM
BALDWIN, IL

River Parameters							
Value Source	NA	Calibrated - Cooling Pond Stage (Reach 0) Approximates Elevation at which Pond is Maintained; Kaskasia River Stage (Reach 1) at Baldwin Power Plant Based on Interpolated Stage Data Provided at New Athens, Illinois (USGS 5595000) and Red Bud (USGS 5595240); River Stage at Reaches 2 through 7 Approximate Topography; River Stage at Reach 8 Based on Historic Groundwater Elevation within Secondary and Tertiary Ponds at TPZ-165	NA	Calibrated	Calibrated	Calibrated	NA

Constant Head Parameters			
	Relative Location	**Head at Boundary (feet)**	**Sensitivity**
Reach 0	BAP Constant Head West	415	Negligible
Reach 1	BAP Constant Head Central	425	Negligible
Value Source	NA	Calibrated - Head at Boundary Based on Estimated Water Surface Elevation within BAP	NA

[O: EGP 1/21/25; C: JJW 1/22/25]

Notes:
[1] Sensitivity Explanation (sensitivity analysis was completed as part of the 2023 BAP Model [Ramboll, 2023a])
Negligible - SSR changed by less than 1%
Low - SSR change between 1% and 10%
Moderate - SSR change between 10% and 50%
Moderately High - SSR change between 50% and 100%
High - SSR change greater than 100%
SSR = sum of squared residuals
- - - = not tested
[2] Sensitivity analysis was completed as part of the 2023 BAP Model (Ramboll, 2023a)
BAP = bottom ash pond
FAPS = fly ash pond system
cm/s = centimeters per second
ft/d = feet per day
ft^2/day = feet squared per day
in/yr = inches per year
Kh/Kv = anisotropy ratio
NA = not applicable

Hydrogeologic Unit:
CCR = coal combustion residuals
PMP = potential migration pathway
UA = uppermost aquifer
UU = upper unit

References:

AECOM, 2016. Closure and Post-Closure Care Plan for the Baldwin Fly Ash Pond System at Dynegy Midwest Generation, LLC Baldwin Energy Complex, Baldwin, Illinois. March.
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Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2025. Addendum to the Nature and Extent Report, Baldwin Power Plant, Fly Ash Pond System, IEPA No. W1578510001-01, W1578510001-02, and W1578510001-03, Baldwin, Illinois. April 22, 2025.
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Natural Resource Technology, Inc. (NRT), 2014c. Groundwater Model and Simulation of Closure Alternatives, Model Report Addendum Baldwin Ash Pond System. September 30.

TABLE 4-3. TRANSPORT MODEL INPUT VALUES (CALIBRATION)
GROUNDWATER MODELING TECHNICAL MEMORANDUM
BALDWIN POWER PLANT
FLY ASH POND SYSTEM
BALDWIN, IL

Zone or Reach	Hydrostratigraphic Unit	Materials	Calibration Model[1]						
			Calibration Model 1 Dates: 1970-2020 Recharge (ft/d)	Calibration Model 2 Dates: 2021-2024 Recharge (ft/d)	Boron Concentration (mg/L)	Calibration Model 1 Dates: 1970-2020 Constant Head (feet)	Calibration Model 2 Dates: 2021-2024 Constant Head (feet)	Value Source	Sensitivity
Initial Concentration									
Entire Domain	NA	NA	NA	NA	0	NA	NA	NA	- - -
Source Concentration (recharge)									
Zone 2	Old East Fly Ash Pond	CCR	4.00E-04	1.87E-04	38	NA	NA	HELP model output for cover system simulation based on design documented in the FAPS Closure and Post-Closure Care Plan (AECOM, 2016a)	- - -
Zone 3	East Fly Ash Pond	CCR	8.00E-04	1.87E-04	79	NA	NA	HELP model output for cover system simulation based on design documented in the FAPS Closure and Post-Closure Care Plan (AECOM, 2016a)	- - -
Zone 4	West Fly Ash Pond	CCR	6.00E-04	1.87E-04	47	NA	NA	HELP model output for cover system simulation based on design documented in the FAPS Closure and Post-Closure Care Plan (AECOM, 2016a)	- - -
Zone 7	Bottom Ash Pond (West)	CCR	1.80E-04	1.80E-04	4	NA	NA	calibrated	- - -
Zone 8	Bottom Ash Pond (East)	CCR	1.80E-04	1.80E-04	1.5	NA	NA	calibrated	- - -
Source Concentration (constant concentration cells) and Stormwater Management (constant head cells)									
Reach 2	Old East Fly Ash Pond	CCR	NA	NA	38	NA	NA	calibrated	- - -
Reach 3	East Fly Ash Pond	CCR	NA	NA	79	NA	NA	calibrated	- - -
Reach 4	West Fly Ash Pond Constant Head	CCR	NA	NA	47	424.3	NA	calibrated - head at boundary consistent with stormwater management practices within the active FAPS (AECOM, 2016b)	- - -
Reach 14	West Fly Ash Pond (Berm)	CCR	NA	NA	47	NA	NA	calibrated	- - -
Reach 0	BAP Constant Head West	CCR	NA	NA	4	415	415	calibrated - head at boundary based on estimated water surface elevation within BAP	- - -
Reach 1	BAP Constand Head Central	CCR	NA	NA	4	425	425	calibrated - head at boundary based on estimated water surface elevation within BAP	- - -
Reach 7	Bottom Ash Pond (West)	CCR	NA	NA	4	NA	NA	calibrated	- - -
Reach 8	Bottom Ash Pond (East)	CCR	NA	NA	1.5	NA	NA	calibrated	- - -

TABLE 4-3. TRANSPORT MODEL INPUT VALUES (CALIBRATION)
GROUNDWATER MODELING TECHNICAL MEMORANDUM
BALDWIN POWER PLANT
FLY ASH POND SYSTEM
BALDWIN, IL

Storage, Specific Yield and Effective Porosity							
Zone	**Hydrostratigraphic Unit**	**Materials**	**Storage**	**Specific Yield**	**Effective Porosity**	**Value Source**	**Sensitivity[2]**
1	UU	silty clay	0.003	0.15	0.15	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3 of Ramboll, 2023a
2	Old East Fly Ash Pond	CCR	0.003	0.2	0.2	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3 of Ramboll, 2023a
3	East Fly Ash Pond	CCR	0.003	0.2	0.2	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3 of Ramboll, 2023a
4	West Fly Ash Pond	CCR	0.003	0.2	0.2	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3 of Ramboll, 2023a
7	Bottom Ash Pond	CCR	0.003	0.25	0.25	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3 of Ramboll, 2023a
8	UA (Decomposed Bedrock)	bedrock	0.003	0.15	0.15	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3 of Ramboll, 2023a
9	UA	bedrock	0.003	0.3	0.3	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3 of Ramboll, 2023a
10	UU (Top of Vandalia)	silty clay	0.003	0.15	0.15	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3 of Ramboll, 2023a
12	River Alluvium	silty clay	0.003	0.15	0.15	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3 of Ramboll, 2023a
14	PMP	sand seams	0.003	0.25	0.25	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3 of Ramboll, 2023a
16	Fill at BAP & FAPS Boundary	fill	0.003	0.2	0.2	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3 of Ramboll, 2023a
100	Above River Boundary Condition	NA	0.003	0.5	0.5	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3 of Ramboll, 2023a

TABLE 4-3. TRANSPORT MODEL INPUT VALUES (CALIBRATION)
GROUNDWATER MODELING TECHNICAL MEMORANDUM
BALDWIN POWER PLANT
FLY ASH POND SYSTEM
BALDWIN, IL

Dispersivity						
Applicable Region	**Hydrostratigraphic Unit**	**Materials**	**Longitudinal (feet)**	**Transverse (feet)**	**Vertical (feet)**	**Sensitivity**
Entire Domain	NA	NA	5	0.5	0.05	- - -

[O: EGP 1/21/25, C: JJW 1/22/25]

Notes:
[1] The concentrations from the end of the calibrated transport model were imported as initial concentrations for the prediction model runs.
[2] Sensitivity analysis was completed as part of the 2023 BAP Model (Ramboll, 2023a)
- - - = not tested
ft/d = feet per day
mg/L = milligrams per liter
NA = not applicable

Hydrogeologic Unit:

CCR = coal combustion residuals
PMP = potential migration pathway
UA = uppermost aquifer
UU = upper unit

References:

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TABLE 4-4. HELP MODEL INPUT AND OUTPUT VALUES

GROUNDWATER MODELING TECHNICAL MEMORANDUM

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, IL

Closure Scenario Number (Drainage Length)	FAPS CIP - Current Conditions	Notes
Input Parameter		
Climate-General		
City	Baldwin, IL	Nearby city to the Site within HELP database
Latitude	38.18	Site latitude
Evaporative Zone Depth	6	Estimated based on geographic location (Illinois) and uppermost soil type (Tolaymat, T. and Krause, M 2020)
Maximum Leaf Area Index	4.5	Maximum for geographic location (Illinois) (Tolaymat, T. and Krause, M, 2020)
Growing Season Period, Average Wind Speed, and Quarterly Relative Humidity	Belleville Scott Air Force Base, IL	Nearby city to the FAPS within HELP database
Number of Years for Synthetic Data Generation	30	
Temperature, Evapotranspiration, and Precipitation	Precipitation, temperature, and solar radiation was simulated based on HELP V4 weather simulation for: Lat/Long: 38.18/ -89.85	
Soils-General		
% where runoff possible	100	
Area (acres)	232	
Specify Initial Moisture Content	No	
Surface Water/Snow	Model Calculated	

TABLE 4-4. HELP MODEL INPUT AND OUTPUT VALUES

GROUNDWATER MODELING TECHNICAL MEMORANDUM

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, IL

Closure Scenario Number (Drainage Length)	FAPS CIP - Current Conditions	Notes
Soils-Layers		
1	Vegetative Soil Layer (HELP Final Cover Soil [topmost layer])	Layers details for CIP areas based on grading plans, construction drawings, and cover system design for Baldwin FAPS
2	Protective Soil Layer (HELP Vertical Percolation Layer)	
3	Unsaturated CCR Material (HELP Waste)	
Soil Parameters--Layer 1		
Type	1	Vertical Percolation Layer (Cover Soil)
Thickness (in)	6	design thickness
Texture	9	Defaults used
Description	Silt Loam	
Saturated Hydraulic Conductivity (cm/s)	1.90E-04	Default used for CIP area
Soil Parameters--Layer 2		
Type	3	Barrier Soil Liner; Geosynthetic Drainage Net
Thickness (in)	18	Custom used from watershed geo
Texture	43	Defaults used
Description	Barrier Soil	
Saturated Hydraulic Conductivity (cm/s)	1.00E-07	Custom used from watershed geo
Soil Parameters--Layer 3		
Type	1	Waste; Geomembrane Liner
Thickness (in)	306.6	design thickness
Texture	83	Defaults used

TABLE 4-4. HELP MODEL INPUT AND OUTPUT VALUES
GROUNDWATER MODELING TECHNICAL MEMORANDUM
BALDWIN POWER PLANT
FLY ASH POND SYSTEM
BALDWIN, IL

Closure Scenario Number (Drainage Length)	**FAPS CIP - Current Conditions**	**Notes**
Description	Unsaturated CCR Material (HELP Waste)	
Saturated Hydraulic Conductivity (cm/s)	1.00E-04	Customs used from Construction Completion and Construction Quality Assurance Report for Final Closure and watershed geo
Soils--Runoff		
Runoff Curve Number	80	HELP-computed curve number
Slope	1.60%	Estimated from construction design drawings
Length (ft)	1290	estimated maximum flow path
Vegetation	fair	fair indicating fair stand of grass on surface
Execution Parameters		
Years	30	
Report Daily	No	
Report Monthly	No	
Report Annual	Yes	
Output Parameter		
Unsaturated Percolation Rate (in/yr)	**0.82**	

[OB: EGP 1/21/25; CB: JJW 1/22/25]

Notes:
% = percent
cm/s = centimeters per second
ft = feet
HELP = Hydrologic Evaluation of Landfill Performance
in = inches
in/yr = inches per year

References:
Tolaymat, T. and Krause, M, 2020. Hydrologic Evaluation of Landfill Performance: HELP 4.0 User Manual . United States Environmental Protection Agency, Washington, DC, EPA/600/B 20/219.

TABLE 5-1. SIMULATED YEARS TO ACHIEVE GWPS FOR BORON (2 MG/L) AT FAPS MONITORING WELLS FOR ALTERNATIVE 1

GROUNDWATER MODELING TECHNICAL MEMORANDUM

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, IL

Alternative 1: Source Control with Groundwater Polishing (GWP)							
Well	**Modeled Layer**	**HSU**	**Area**	**Simulated Year Below GWPS (2 mg/L Boron)**	**Simulated Year Above GWPS (2 mg/L Boron)**	**Simulated Year Below GWPS (2 mg/L Boron)**	**Final Simulated Year Below GWPS (2 mg/L Boron)**
MW-153	2	UU	East	0	--	--	**0**
MW-152	3	UU	South	NA	--	--	NA
PZ-177	3	PMP	South	NA	--	--	NA
MW-196	3	UU	South	260	--	--	**260**
MW-197	3	UU	South	0	30	311	**311**
MW-150	4	UU	South	0	--	--	**0**
PZ-174	4	UU	South	74	--	--	**74**
PZ-175	4	UU	South	215	--	--	**215**
PZ-178	4	UU	South	0	4	NA	NA
MW-253R	5	UA (Decomposed Bedrock)	East	0	--	--	**0**
OW-257	5	UA (Decomposed Bedrock)	North	NA	--	--	NA
MW-151	5	UA (Decomposed Bedrock)	South	0	346	NA	NA
MW-252	5	UA (Decomposed Bedrock)	South	0	24	NA	NA
PZ-176	5	UA (Decomposed Bedrock)	South	NA	--	--	NA
MW-383	6	UA	North	0	283	NA	NA
MW-384	6	UA	North	0	178	NA	NA
MW-350R	6	UA	South	0	826	NA	NA
MW-352	6	UA	South	0	426	NA	NA
MW-374	6	UA	South	0	159	NA	NA
MW-375	6	UA	South	NA	--	--	NA
MW-377	6	UA	South	0	392	NA	NA
MW-366	6	UA	West	0	101	NA	NA
MW-390	6	UA	West	0	328	NA	NA

[OB: JJW 1/21/25; C: EGP 1/30/25]

RAMBOLL

TABLE 5-1. SIMULATED YEARS TO ACHIEVE GWPS FOR BORON (2 MG/L) AT FAPS MONITORING WELLS FOR ALTERNATIVE 1

GROUNDWATER MODELING TECHNICAL MEMORANDUM

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, IL

Notes:
Value of "0" indicates concentration at or below GWPS at start of prediction simulation
Bold values indicate concentration at or below GWPS at end of prediction simulation
GWP = Groundwater Polishing
GWPS = Groundwater Protection Standard
HSU = hydrostratigraphic unit
mg/L = milligrams per liter
NA = not applicable, concentration does not achieve GWPS

Hydrogeologic Unit:
PMP = potential migration pathway
UA = uppermost aquifer
UU = upper unit

TABLE 5-2. MODELED BORON PLUME (2 MG/L) ACREAGES AT SELECT TIMES AFTER IMPLEMENTATION

GROUNDWATER MODELING TECHNICAL MEMORANDUM

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, IL

Modeled Scenario	Years After Implementation	Modeled Boron Plume (2 mg/L) Acres	Off-Site Area of Modeled Boron Plume (2 mg/L) Acres
Current Conditions (Calibration Model 2)	0	420.25	9.59
Alternative 1: Source Control with Groundwater Polishing (GWP)	25	469.78	11.34
	125	491.53	15.68
	375	512.21	13.83
	750	542.48	34.37
	1000	560.51	49.32
Alternative 2: Source Control with Cutoff Wall	25	468.22	11.20
	125	489.24	15.21
	375	511.67	14.45
	750	543.05	31.91
	1000	558.85	31.91
Alternative 3: Source Control with Groundwater Management System (GMS)	25	465.20	11.26
	125	435.11	15.86
	375	323.07	17.30
	750	234.62	26.11
	1000	192.66	19.41
Closure By Removal (CBR)	25	465.43	11.24
	125	474.32	15.49
	375	455.02	19.06
	750	419.40	26.64
	1000	387.02	18.35

[OB: JJW 1/21/25; CB: EGP 1/30/25]

Notes:

CBR = closure-by-removal

GMS = Groundwater Management System

GWP = Groundwater Polishing

GWPS = Groundwater Protection Standard

mg/L = milligrams per liter

TABLE 5-3. SIMULATED YEARS TO ACHIEVE GWPS FOR BORON (2 MG/L) AT FAPS MONITORING WELLS FOR ALTERNATIVE 2

GROUNDWATER MODELING TECHNICAL MEMORANDUM

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, IL

Alternative 2: Source Control with Cutoff Wall							
Well	**Modeled Layer**	**HSU**	**Area**	**Simulated Year Below GWPS (2 mg/L Boron)**	**Simulated Year Above GWPS (2 mg/L Boron)**	**Simulated Year Below GWPS (2 mg/L Boron)**	**Final Simulated Year Below GWPS (2 mg/L Boron)**
MW-153	2	UU	East	0	--	--	**0**
MW-152	3	UU	South	NA	--	--	NA
PZ-177	3	PMP	South	NA	--	--	NA
MW-196	3	UU	South	296	--	--	**296**
MW-197	3	UU	South	0	30	336	**336**
MW-150	4	UU	South	0	--	--	**0**
PZ-174	4	UU	South	80	--	--	**80**
PZ-175	4	UU	South	393	--	--	**393**
PZ-178	4	UU	South	0	18	NA	NA
MW-253R	5	UA (Decomposed Bedrock)	East	0	--	--	**0**
OW-257	5	UA (Decomposed Bedrock)	North	NA	--	--	NA
MW-151	5	UA (Decomposed Bedrock)	South	0	284	NA	NA
MW-252	5	UA (Decomposed Bedrock)	South	0	46	NA	NA
PZ-176	5	UA (Decomposed Bedrock)	South	NA	--	--	NA
MW-383	6	UA	North	0	282	NA	NA
MW-384	6	UA	North	0	173	NA	NA
MW-350R	6	UA	South	0	520	NA	NA
MW-352	6	UA	South	0	261	NA	NA
MW-374	6	UA	South	0	158	NA	NA
MW-375	6	UA	South	NA	--	--	NA
MW-377	6	UA	South	0	216	NA	NA
MW-366	6	UA	West	0	94	NA	NA
MW-390	6	UA	West	0	298	NA	NA

[OB: JJW 1/21/25; C: EGP 1/30/25]

RAMBOLL

TABLE 5-3. SIMULATED YEARS TO ACHIEVE GWPS FOR BORON (2 MG/L) AT FAPS MONITORING WELLS FOR ALTERNATIVE 2

GROUNDWATER MODELING TECHNICAL MEMORANDUM

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, IL

Notes:
Value of "0" indicates concentration at or below GWPS at start of prediction simulation
Bold values indicate concentration at or below GWPS at end of prediction simulation
GWPS = Groundwater Protection Standard
HSU = hydrostratigraphic unit
mg/L = milligrams per liter
NA = not applicable, concentration does not achieve GWPS

Hydrogeologic Unit:
PMP = potential migration pathway
UA = uppermost aquifer
UU = upper unit

TABLE 5-4. SIMULATED YEARS TO ACHIEVE GWPS FOR BORON (2 MG/L) AT FAPS MONITORING WELLS FOR ALTERNATIVE 3

GROUNDWATER MODELING TECHNICAL MEMORANDUM

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, IL

Alternative 3: Source Control with Groundwater Management System (GMS)							
Well	**Modeled Layer**	**HSU**	**Area**	**Simulated Year Below GWPS (2 mg/L Boron)**	**Simulated Year Above GWPS (2 mg/L Boron)**	**Simulated Year Below GWPS (2 mg/L Boron)**	**Final Simulated Year Below GWPS (2 mg/L Boron)**
MW-153	2	UU	East	0	--	--	**0**
MW-152	3	UU	South	216	--	--	**216**
PZ-177	3	PMP	South	347	--	--	**347**
MW-196	3	UU	South	266	--	--	**266**
MW-197	3	UU	South	0	30	328	**328**
MW-150	4	UU	South	0	--	--	**0**
PZ-174	4	UU	South	72	--	--	**72**
PZ-175	4	UU	South	182	--	--	**182**
PZ-178	4	UU	South	0	4	468	**468**
MW-253R	5	UA (Decomposed Bedrock)	East	0	--	--	**0**
OW-257	5	UA (Decomposed Bedrock)	North	770	--	--	**770**
MW-151	5	UA (Decomposed Bedrock)	South	0	--	--	**0**
MW-252	5	UA (Decomposed Bedrock)	South	0	26	618	**618**
PZ-176	5	UA (Decomposed Bedrock)	South	16	--	--	**16**
MW-383	6	UA	North	0	--	--	**0**
MW-384	6	UA	North	0	--	--	**0**
MW-350R	6	UA	South	0	--	--	**0**
MW-352	6	UA	South	0	815	NA	NA
MW-374	6	UA	South	0	170	NA	NA
MW-375	6	UA	South	NA	--	--	NA
MW-377	6	UA	South	0	--	--	**0**
MW-366	6	UA	West	0	--	--	**0**
MW-390	6	UA	West	0	980	NA	NA

[OB: JJW 1/21/25; C: EGP 1/30/25]

RAMBOLL

TABLE 5-4. SIMULATED YEARS TO ACHIEVE GWPS FOR BORON (2 MG/L) AT FAPS MONITORING WELLS FOR ALTERNATIVE 3

GROUNDWATER MODELING TECHNICAL MEMORANDUM

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, IL

Notes:

Value of "0" indicates concentration at or below GWPS at start of prediction simulation

Bold values indicate concentration at or below GWPS at end of prediction simulation

GMS = Groundwater Management System

GWPS = Groundwater Protection Standard

HSU = hydrostratigraphic unit

mg/L = milligrams per liter

NA = not applicable, concentration does not achieve GWPS

Hydrogeologic Unit:

PMP = potential migration pathway

UA = uppermost aquifer

UU = upper unit

TABLE 5-5. SIMULATED YEARS TO ACHIEVE GWPS FOR BORON (2 MG/L) AT FAPS MONITORING WELLS FOR CBR SCENARIO

GROUNDWATER MODELING TECHNICAL MEMORANDUM

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, IL

Closure By Removal (CBR)							
Well	**Modeled Layer**	**HSU**	**Area**	**Simulated Year Below GWPS (2 mg/L Boron)**	**Simulated Year Above GWPS (2 mg/L Boron)**	**Simulated Year Below GWPS (2 mg/L Boron)**	**Final Simulated Year Below GWPS (2 mg/L Boron)**
MW-153	2	UU	East	0	--	--	**0**
MW-152	3	UU	South	168	--	--	**168**
PZ-177	3	PMP	South	NA	--	--	NA
MW-196	3	UU	South	NA	--	--	NA
MW-197	3	UU	South	0	30	NA	NA
MW-150	4	UU	South	0	--	--	**0**
PZ-174	4	UU	South	66	--	--	**66**
PZ-175	4	UU	South	NA	--	--	NA
PZ-178	4	UU	South	0	8	NA	NA
MW-253R	5	UA (Decomposed Bedrock)	East	0	--	--	**0**
OW-257	5	UA (Decomposed Bedrock)	North	418	608	NA	NA
MW-151	5	UA (Decomposed Bedrock)	South	0	--	--	**0**
MW-252	5	UA (Decomposed Bedrock)	South	0	276	918	**918**
PZ-176	5	UA (Decomposed Bedrock)	South	22	--	--	**22**
MW-383	6	UA	North	0	--	--	**0**
MW-384	6	UA	North	0	--	--	**0**
MW-350R	6	UA	South	0	732	NA	NA
MW-352	6	UA	South	0	910	NA	NA
MW-374	6	UA	South	0	185	NA	NA
MW-375	6	UA	South	NA	--	--	NA
MW-377	6	UA	South	0	--	--	**0**
MW-366	6	UA	West	0	--	--	**0**
MW-390	6	UA	West	0	--	--	**0**

[OB: JJW 1/21/25; C: EGP 1/30/25]

RAMBOLL

TABLE 5-5. SIMULATED YEARS TO ACHIEVE GWPS FOR BORON (2 MG/L) AT FAPS MONITORING WELLS FOR CBR SCENARIO

GROUNDWATER MODELING TECHNICAL MEMORANDUM

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, IL

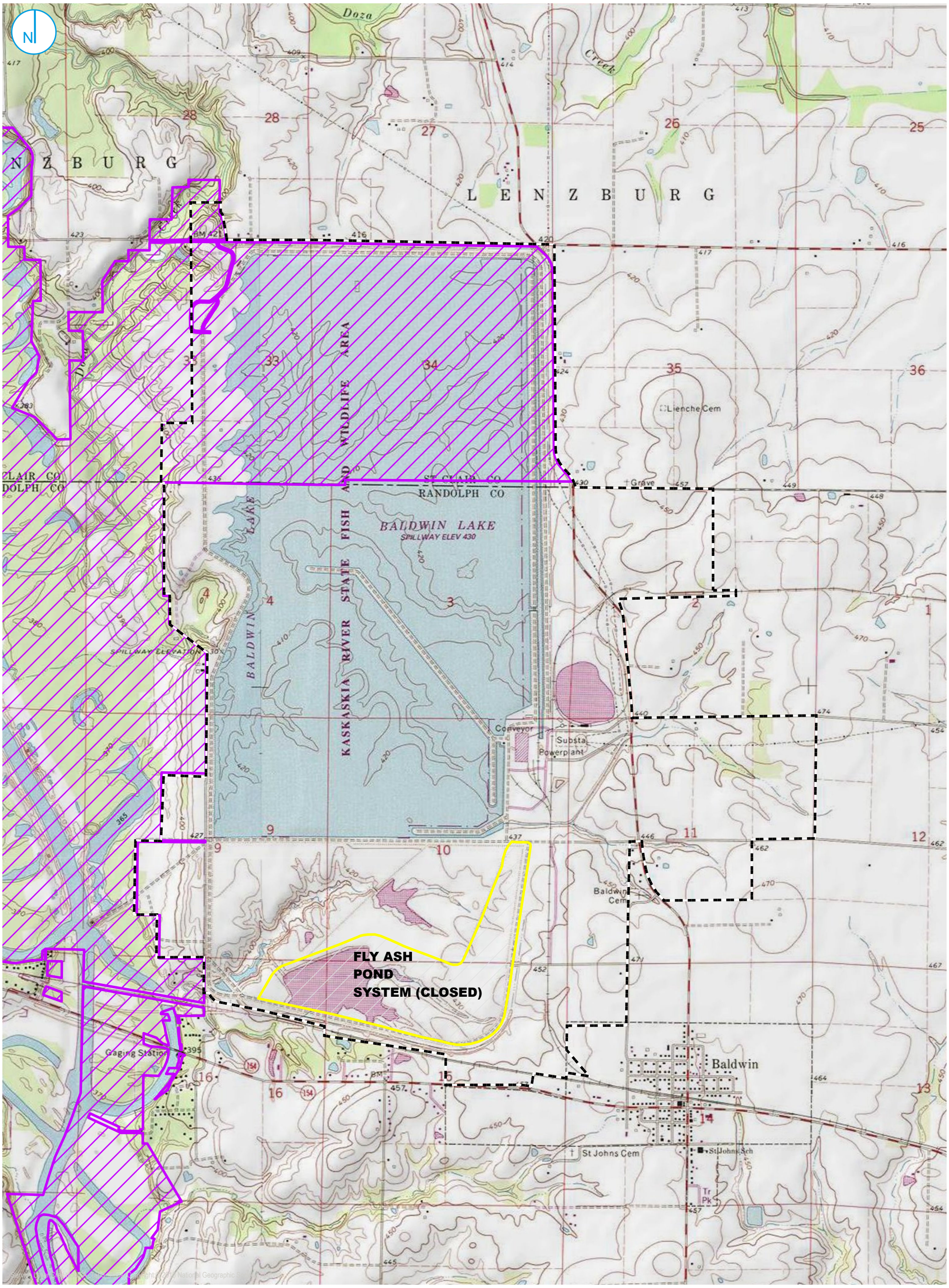
Notes:

Value of "0" indicates concentration at or below GWPS at start of prediction simulation
Bold values indicate concentration at or below GWPS at end of prediction simulation
CBR = closure-by-removal
GWPS = Groundwater Protection Standard
HSU = hydrostratigraphic unit
mg/L = milligrams per liter
NA = not applicable, concentration does not achieve GWPS

Hydrogeologic Unit:

PMP = potential migration pathway
UA = uppermost aquifer
UU = upper unit

FIGURES



REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY
KASKASKIA RIVER STATE FISH AND WILDLIFE AREA

SOURCE NOTE
I-View, Prairie State Conservation Coalition accessed via Illinois Department of Natural Resources Division of Natural Heritage Website
https://www2.illinois.gov/sites/naturalheritage/DataResearch/Pages/Access-Our-Data.aspx

0 1,000 2,000 Feet

SITE LOCATION MAP

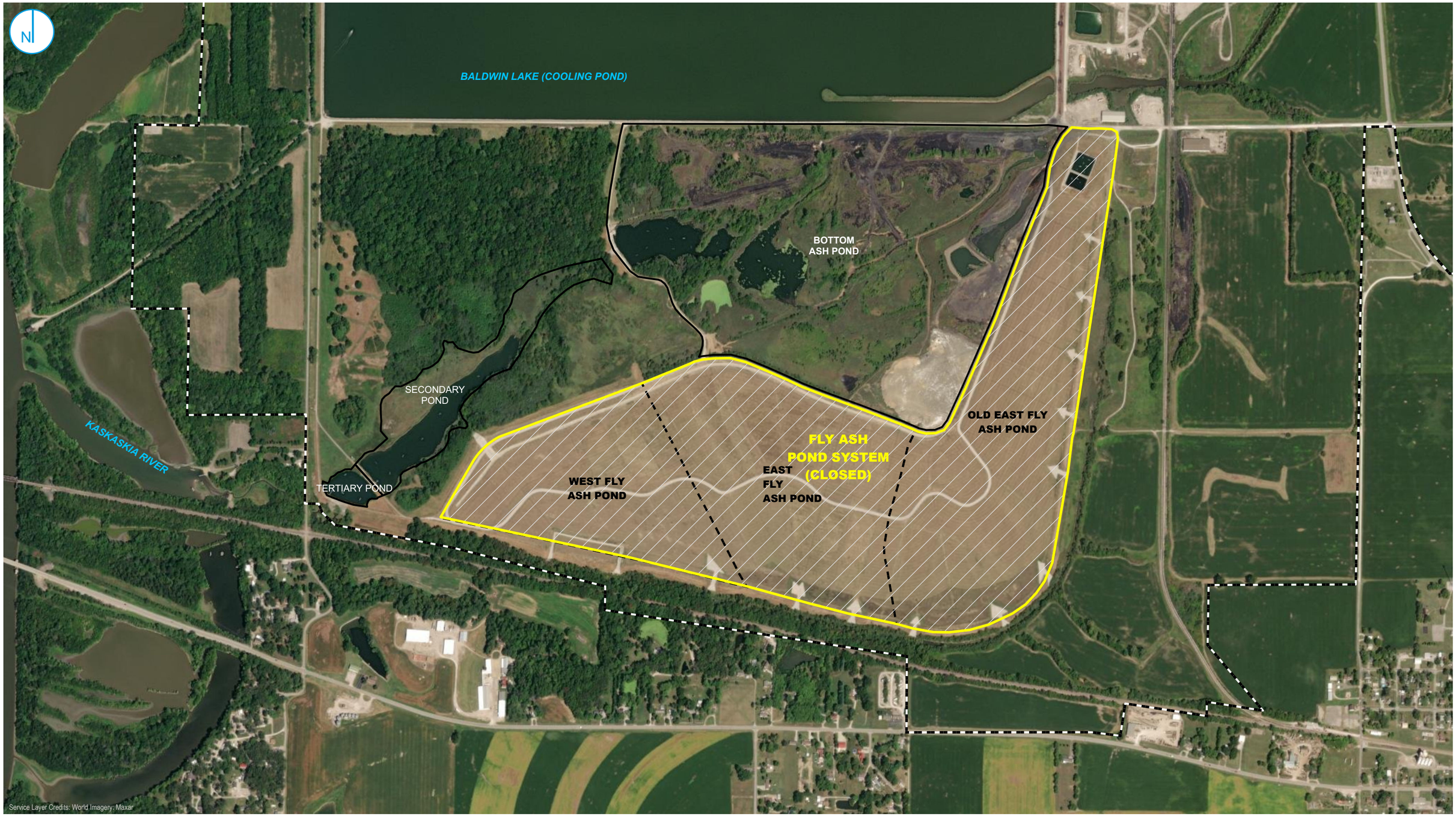
FIGURE 2-1

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

Y:\MappingProjects\22\22285\MXD\CAAA_SIR\Baldwin\FAPS\ModelingTechMemo.aprx\Figure 2-2_Site Map



PROJECT: 169000XXXX | DATED: 1/17/2025 | DESIGNER: GALARNMC

REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
CAPPED AREA
PROPERTY BOUNDARY

0 400 800 Feet

SITE MAP

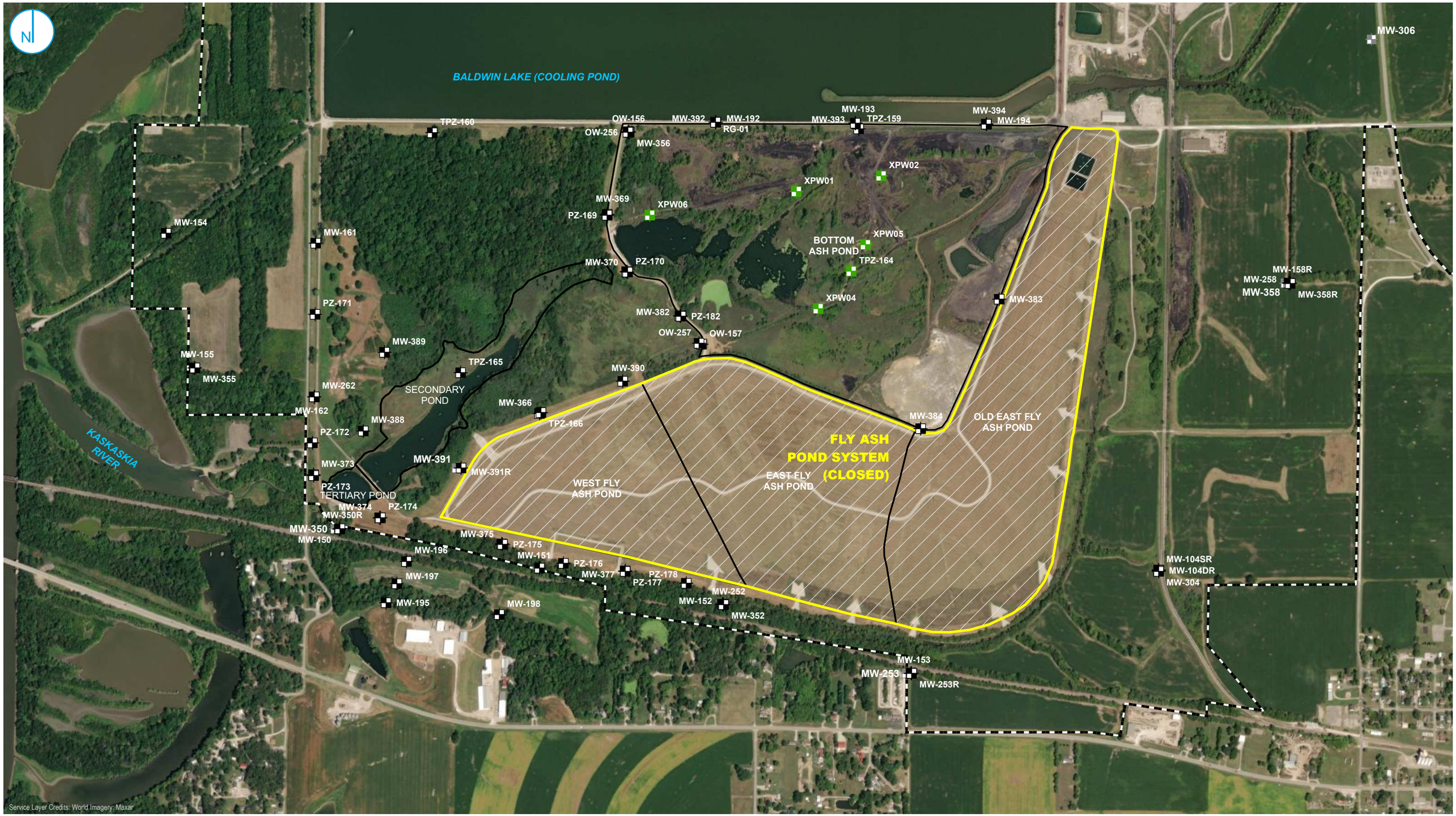
FIGURE 2-2

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

Y:\Mapping\Projects\22\2285\MXD\Sampling_and_Analysis_Request\SAR_Maps.aprx\BAL_Monitoring Well Location Map1



PROJECT: 169000XXXX | DATED: 1/29/2025 | DESIGNER: GALARNMC

MONITORING WELL
POREWATER WELL
RAIN GAGE
MONITORING WELL CLOSED IN 2024

REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
CAPPED AREA
PROPERTY BOUNDARY

0 450 900 Feet

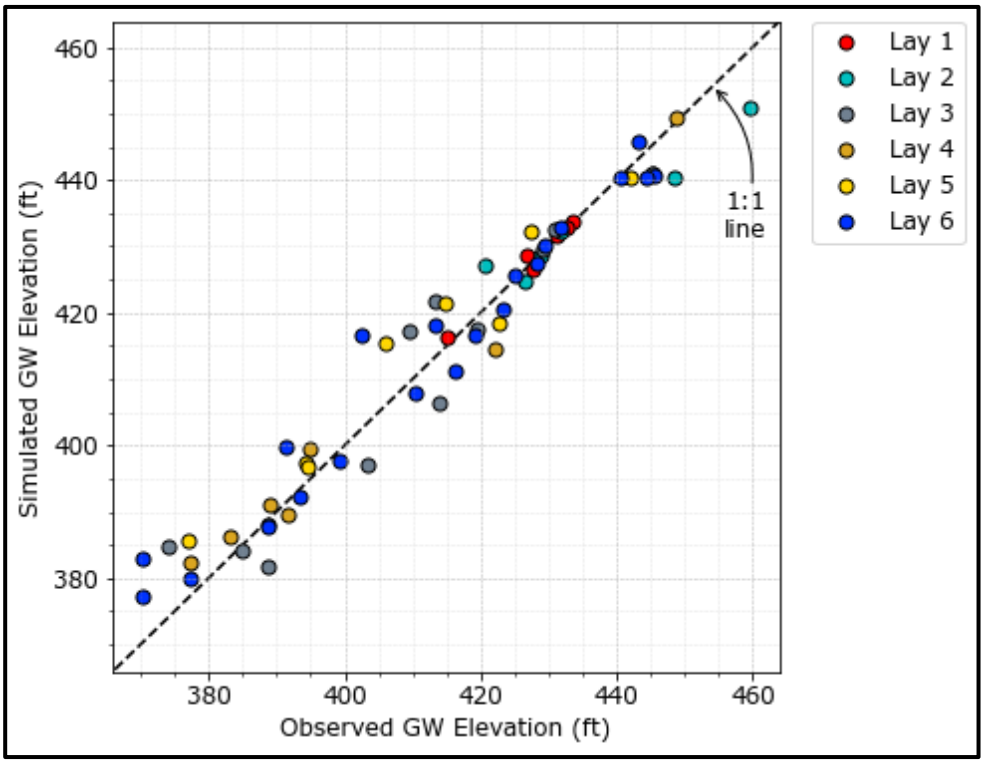
MONITORING WELL LOCATION MAP

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 2-3

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

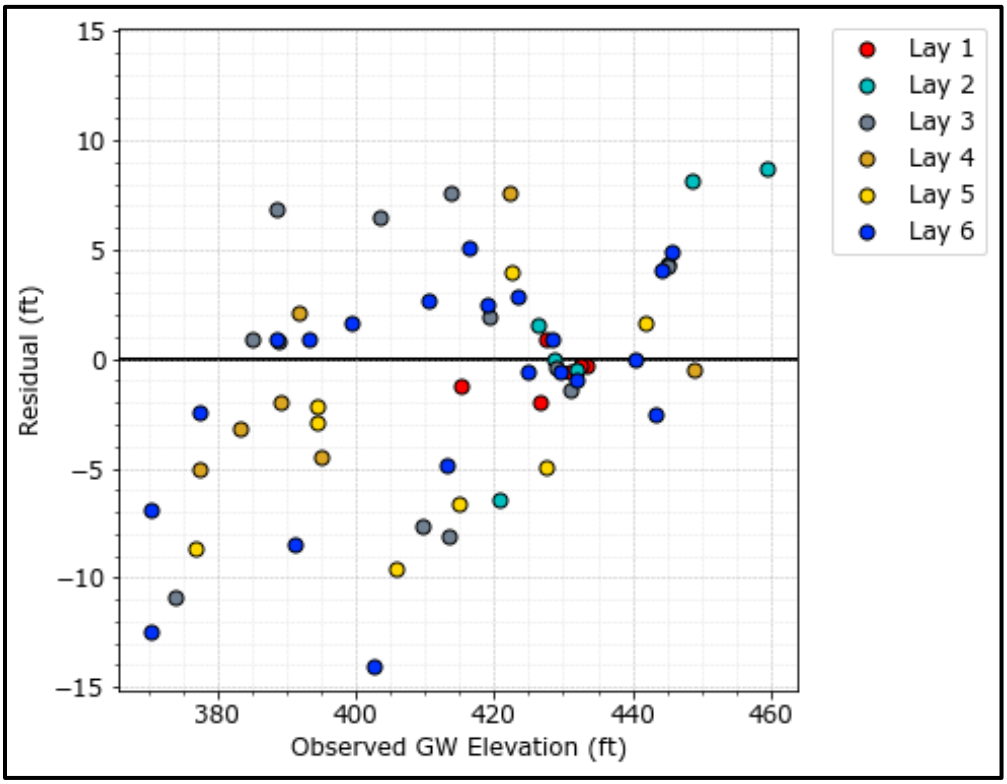
RAMBOLL



OBSERVED VERSUS SIMULATED GROUNDWATER ELEVATIONS

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

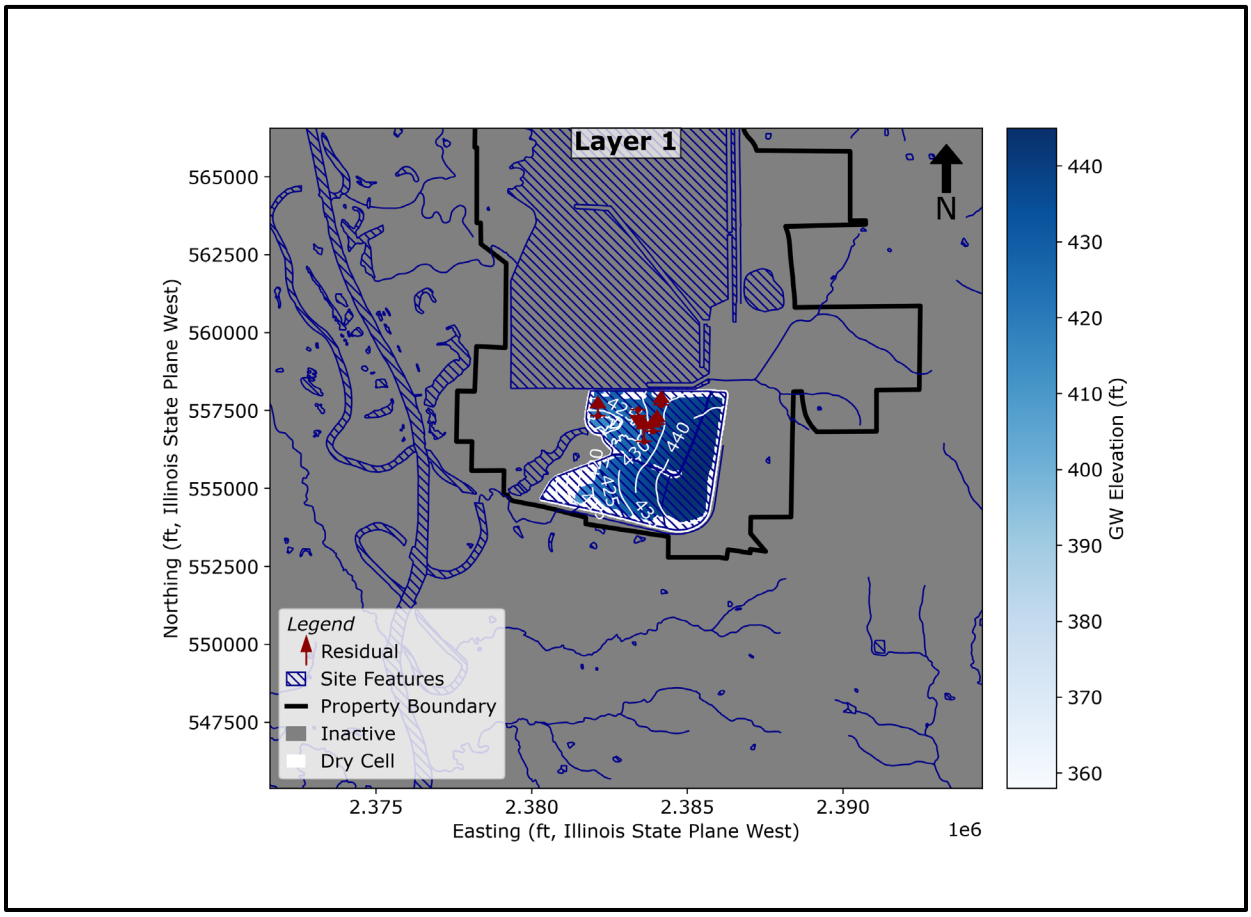
RAMBOLL



OBSERVED VERSUS RESIDUAL GROUNDWATER ELEVATIONS

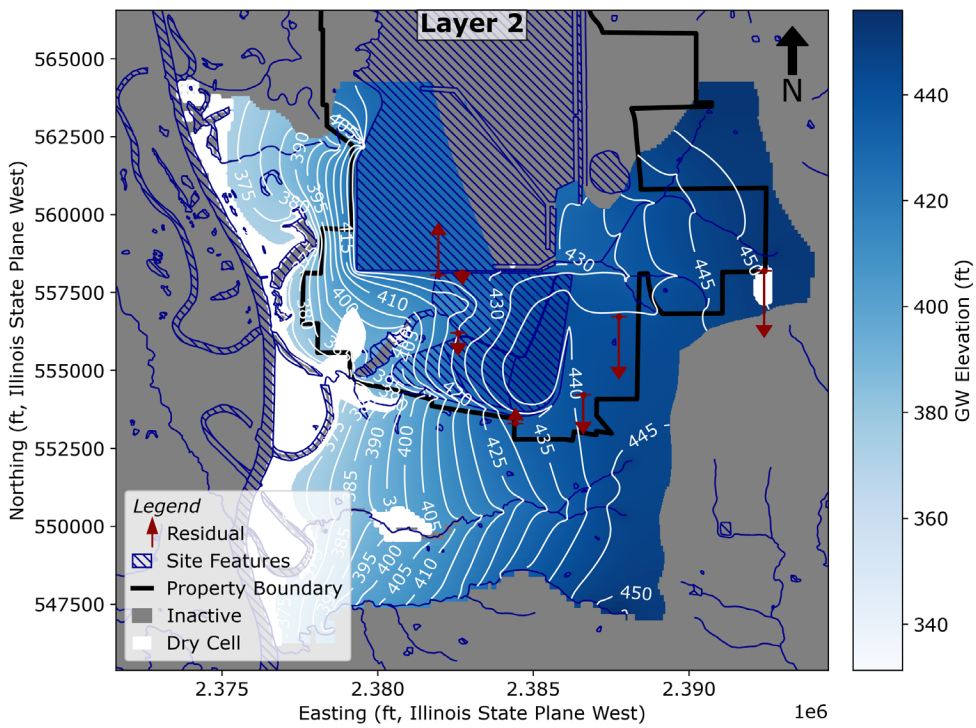
GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL



SIMULATED STEADY STATE GROUNDWATER LEVEL CONTOURS FROM LAYER 1 OF THE CALIBRATED MODEL

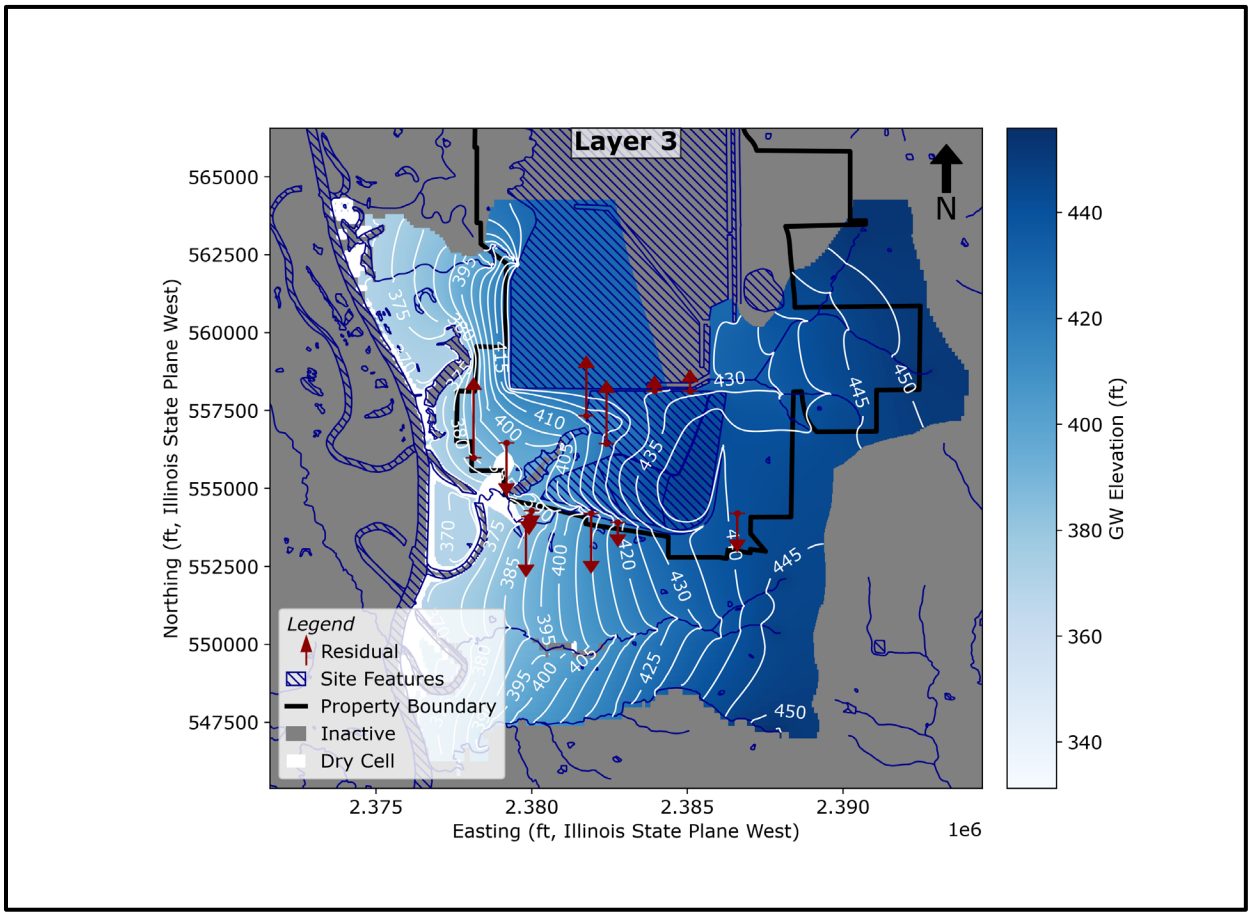
GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS



SIMULATED STEADY STATE GROUNDWATER LEVEL CONTOURS FROM LAYER 2 OF THE CALIBRATED MODEL

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

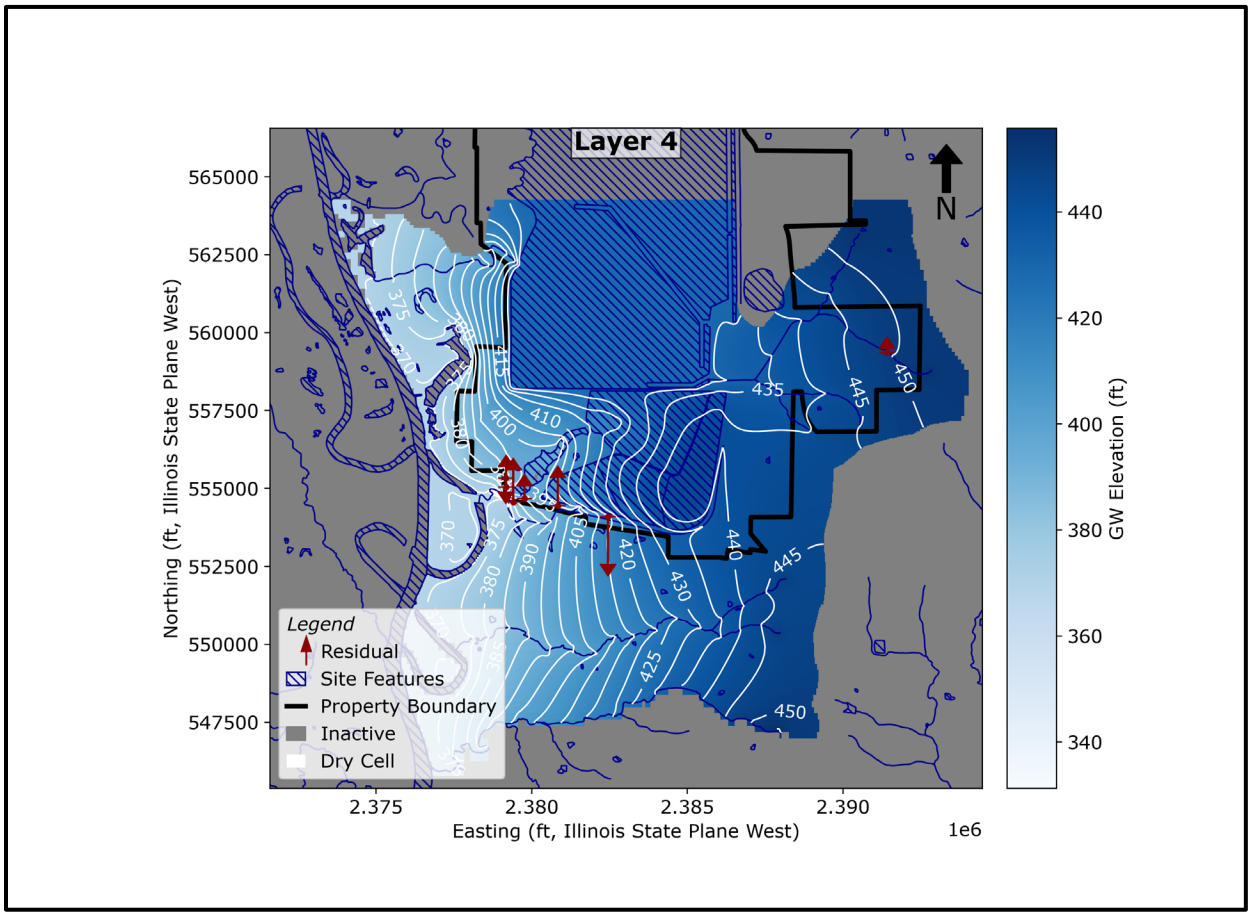
RAMBOLL



SIMULATED STEADY STATE GROUNDWATER LEVEL CONTOURS FROM LAYER 3 OF THE CALIBRATED MODEL

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

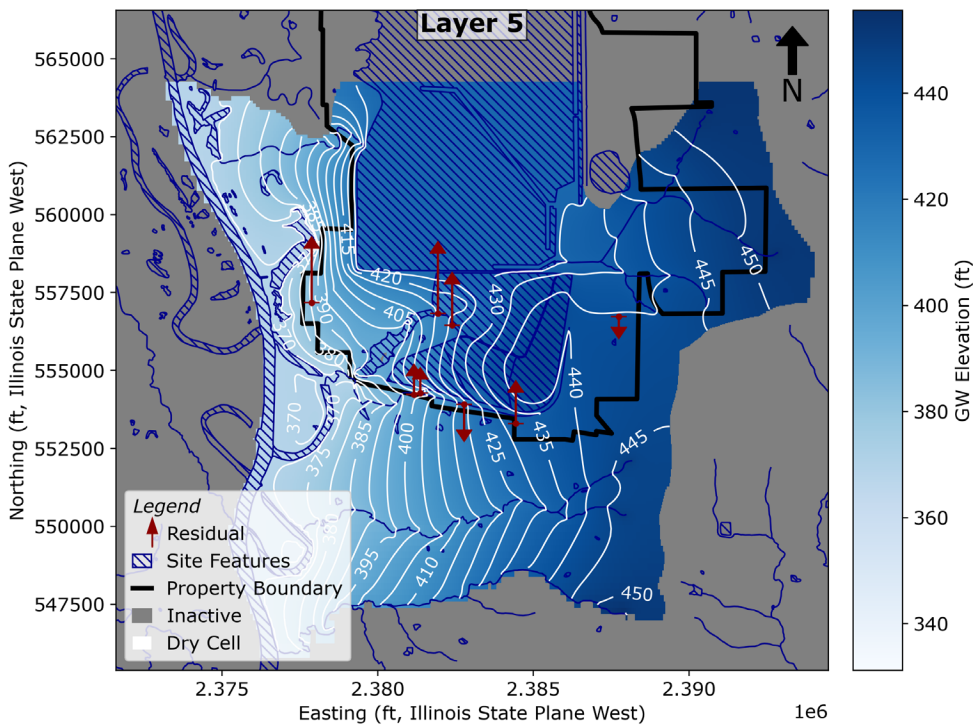
RAMBOLL



SIMULATED STEADY STATE GROUNDWATER LEVEL CONTOURS FROM LAYER 4 OF THE CALIBRATED MODEL

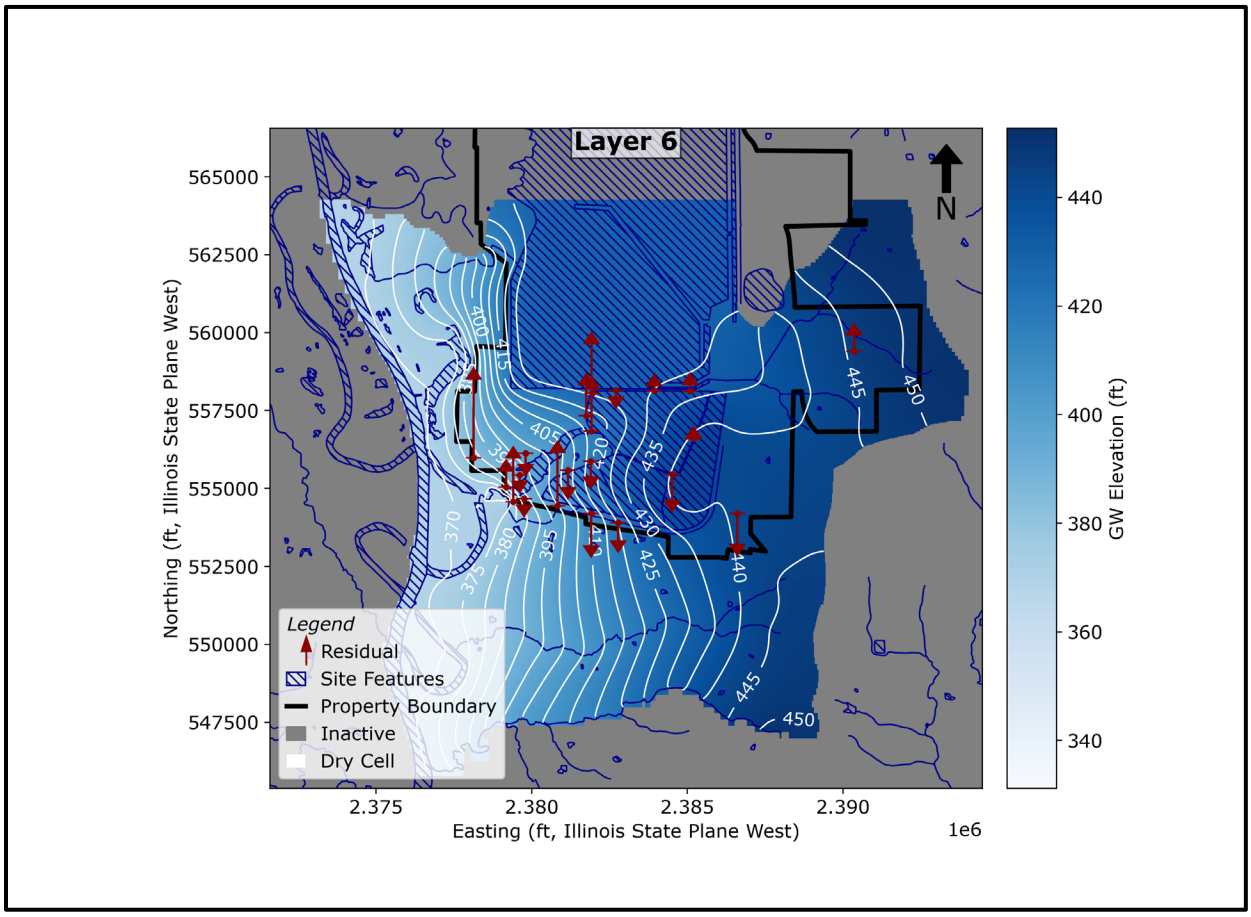
GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL



SIMULATED STEADY STATE GROUNDWATER LEVEL CONTOURS FROM LAYER 5 OF THE CALIBRATED MODEL

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

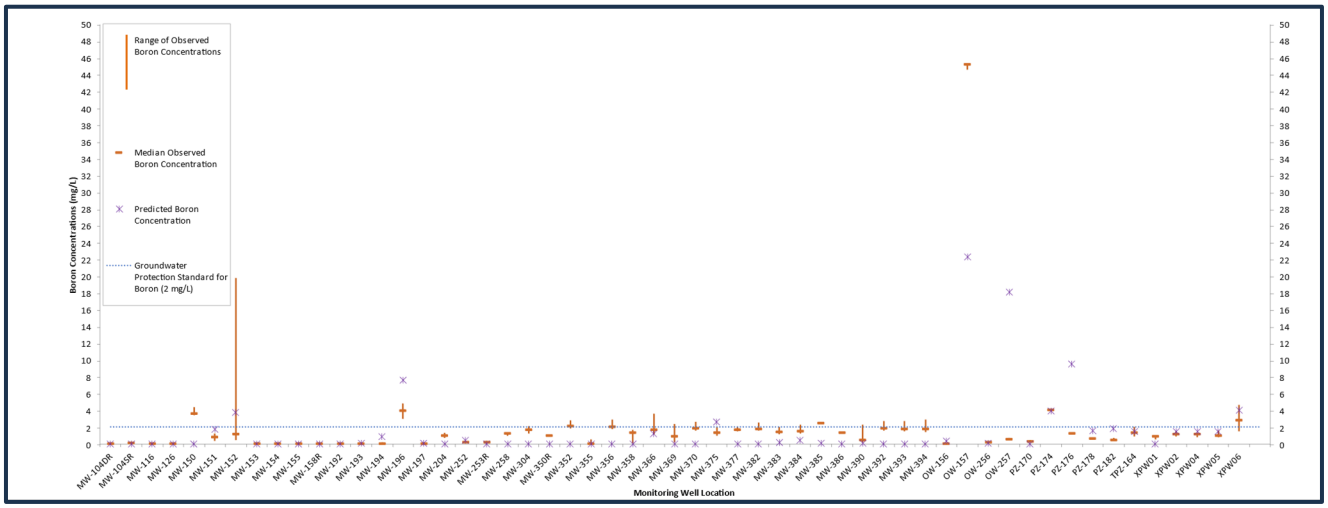


SIMULATED STEADY STATE GROUNDWATER LEVEL CONTOURS FROM LAYER 6 OF THE CALIBRATED MODEL

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

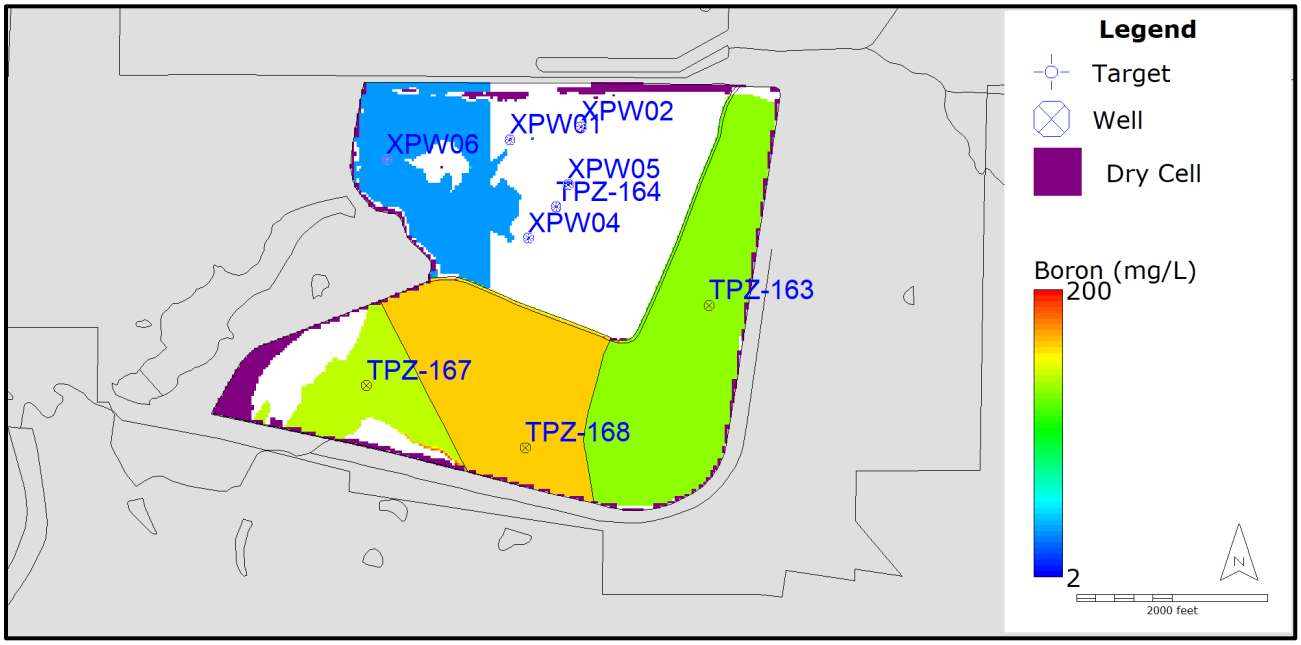
RAMBOLL

FIGURE 4-9



OBSERVED AND SIMULATED BORON CONCENTRATIONS (mg/L)

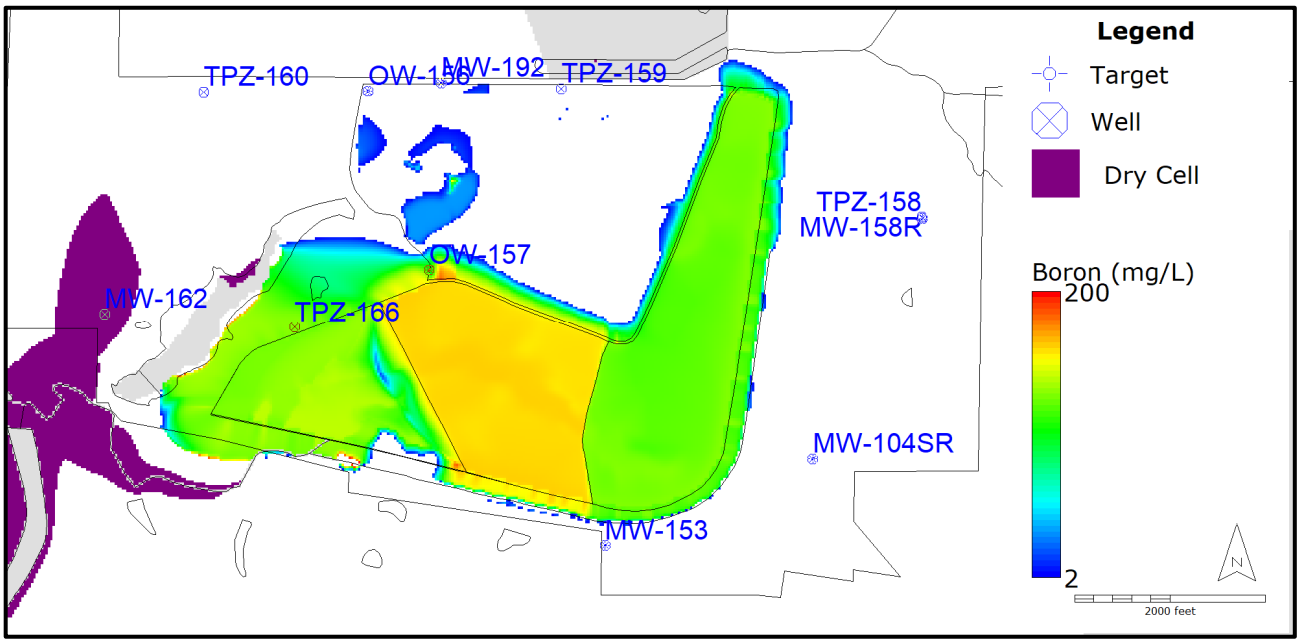
GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS



LAYER 1 DISTRIBUTION OF BORON CONCENTRATIONS (mg/L) IN THE CALIBRATED MODEL

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

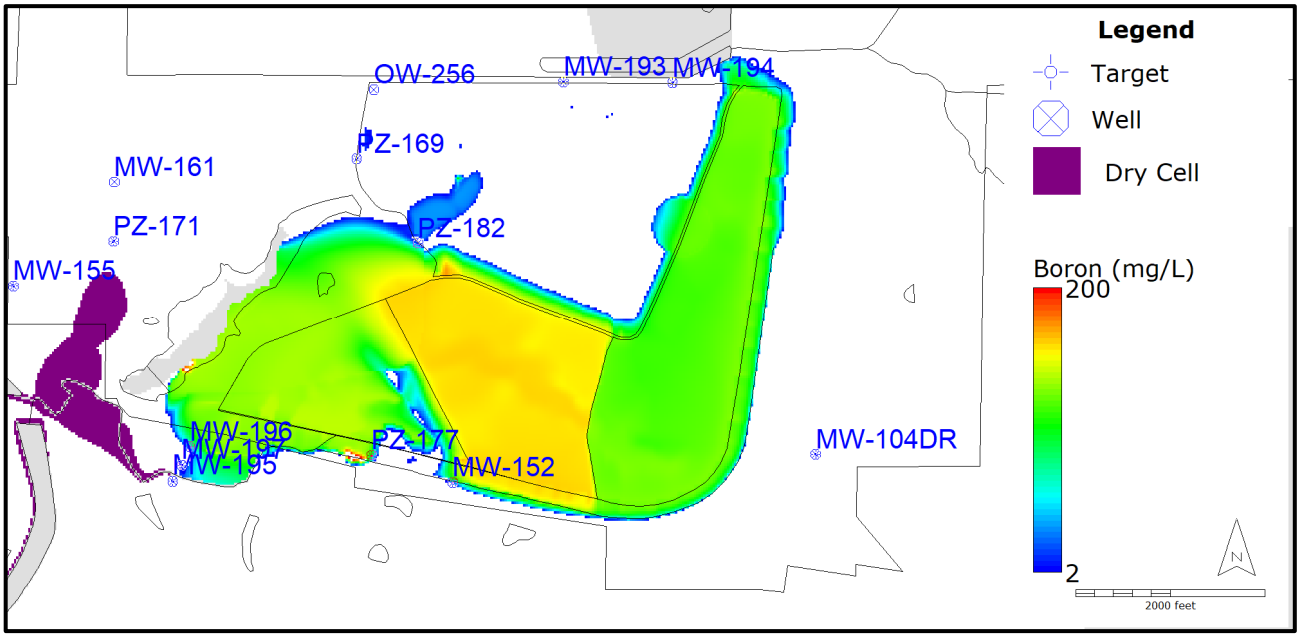
RAMBOLL



LAYER 2 DISTRIBUTION OF BORON CONCENTRATIONS (mg/L) IN THE CALIBRATED MODEL

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

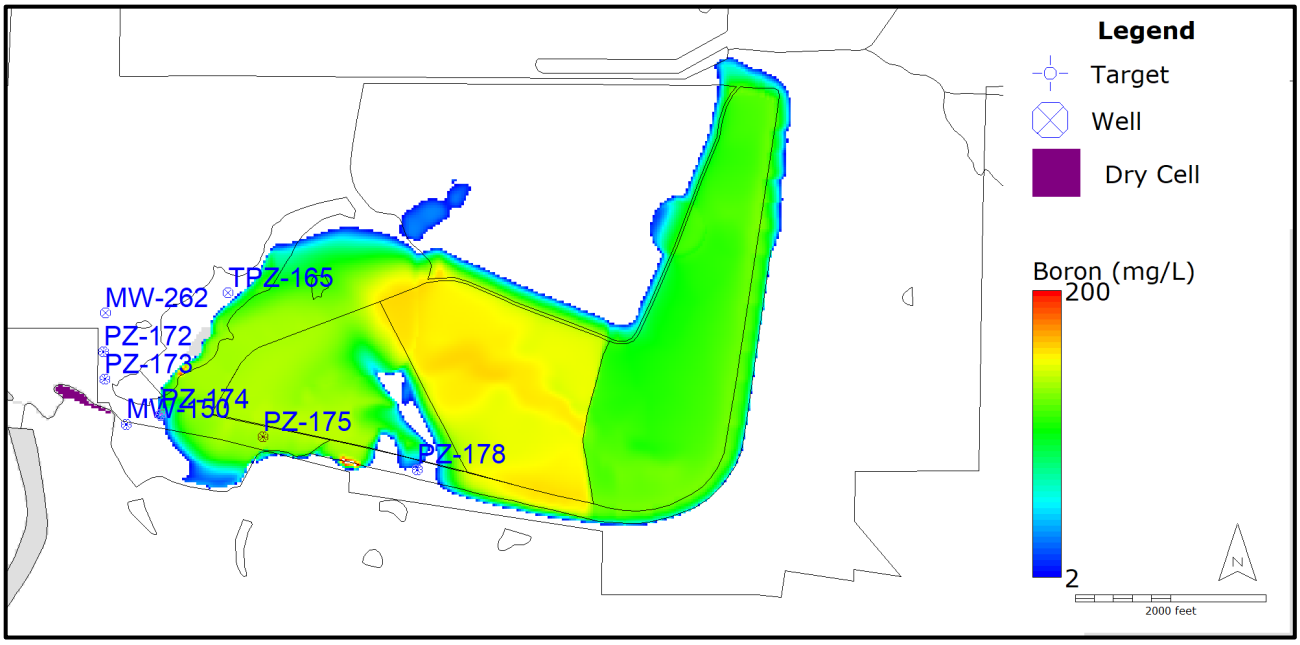
RAMBOLL



LAYER 3 DISTRIBUTION OF BORON CONCENTRATIONS (mg/L) IN THE CALIBRATED MODEL

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

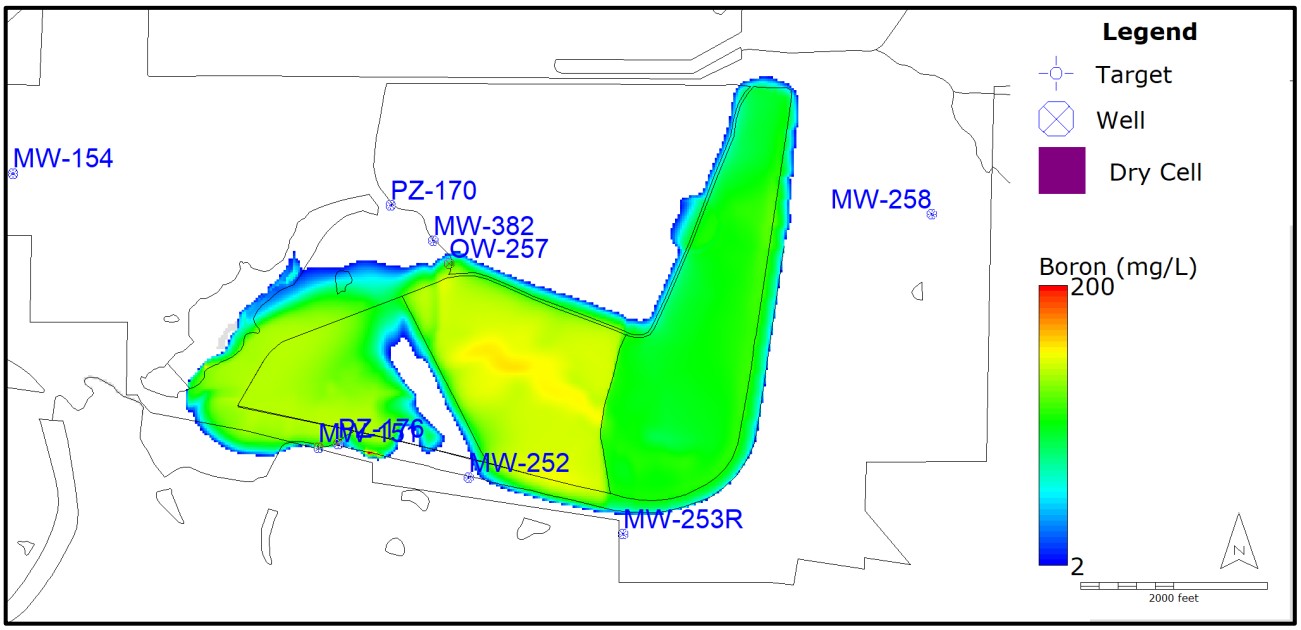
RAMBOLL



LAYER 4 DISTRIBUTION OF BORON CONCENTRATIONS (mg/L) IN THE CALIBRATED MODEL

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

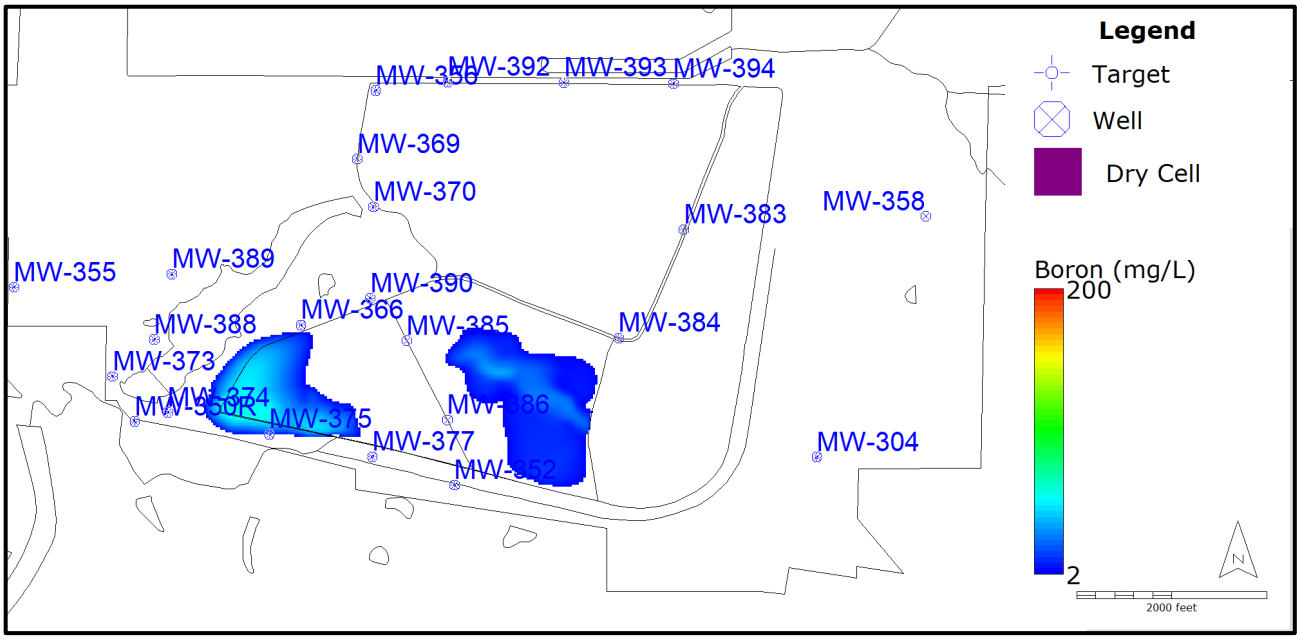
RAMBOLL



LAYER 5 DISTRIBUTION OF BORON CONCENTRATIONS (mg/L) IN THE CALIBRATED MODEL

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

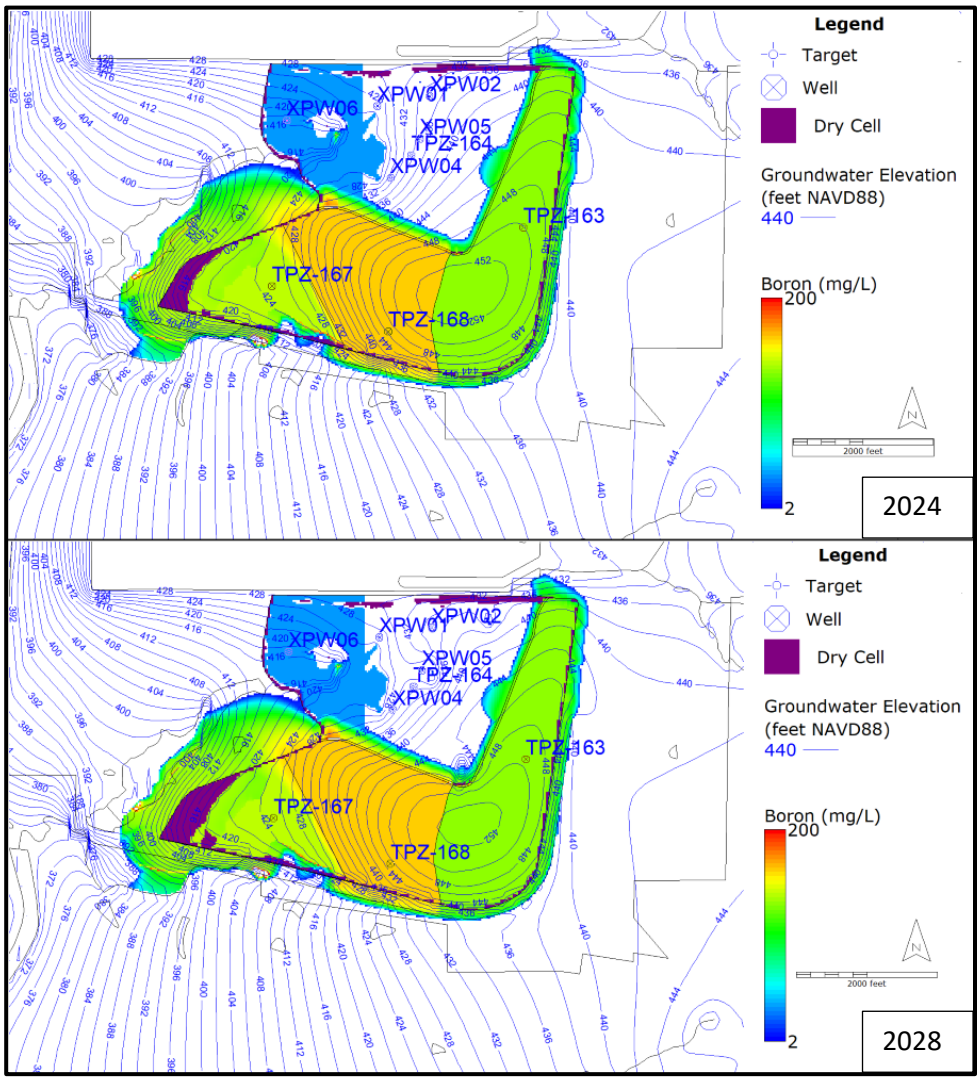
RAMBOLL



LAYER 6 DISTRIBUTION OF BORON CONCENTRATIONS (mg/L) IN THE CALIBRATED MODEL

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 5-1



SIMULATED GROUNDWATER ELEVATIONS AND BORON CONCENTRATIONS, 2024 AND 2028

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

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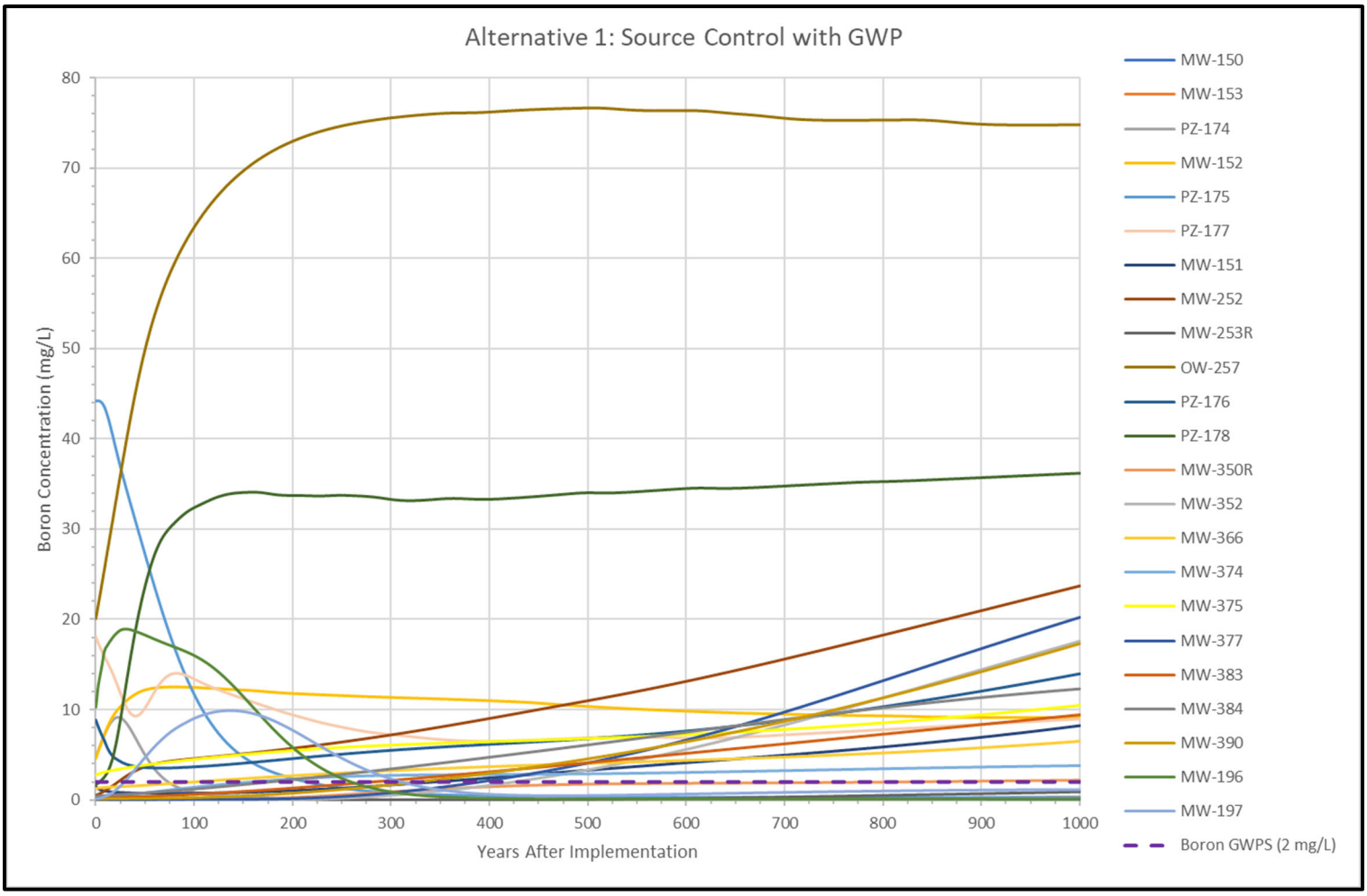
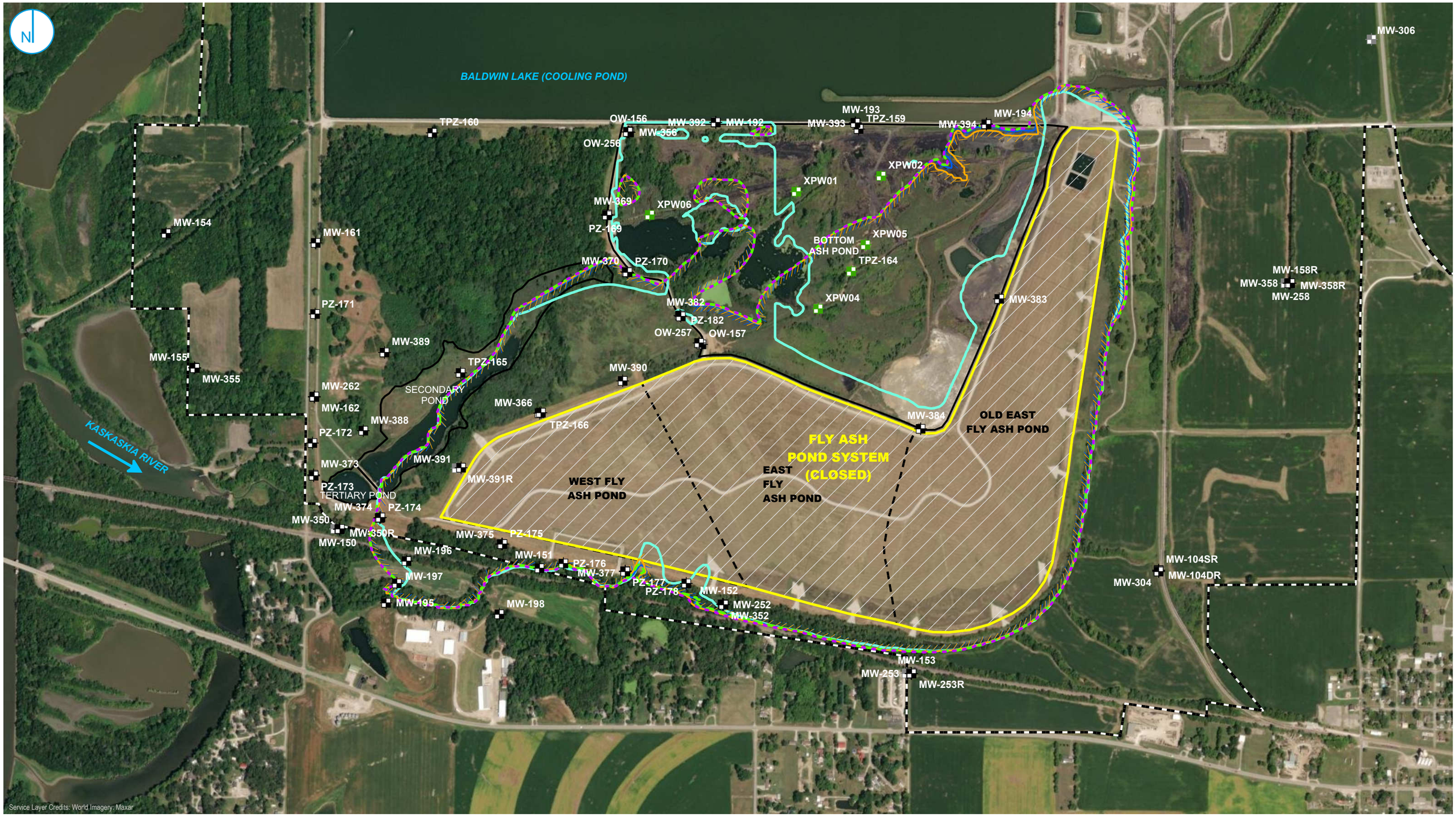
FIGURE 5-2



MODEL PREDICTED BORON CONCENTRATIONS AT FAPS MONITORING WELLS FOR ALTERNATIVE 1: SOURCE CONTROL WITH GWP

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL



MONITORING WELL
POREWATER WELL
CLOSED MONITORING WELL

REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
CAPPED AREA
PROPERTY BOUNDARY

ALTERNATIVE 1. SOURCE CONTROL WITH GROUNDWATER POLISHING (GWP)
ALTERNATIVE 2. SOURCE CONTROL WITH CUTOFF WALL
ALTERNATIVE 3. SOURCE CONTROL WITH GROUNDWATER MANAGEMENT SYSTEM (GMS)
CLOSURE BY REMOVAL (CBR)
CALIBRATION MODEL PLUME EXTENT

0 400 800 Feet

MODELED BORON PLUME (2 MG/L) 25 YEARS AFTER IMPLEMENTATION

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 5-3

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

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Y:\Mapping\Projects\22\2285\MXD\CAAA_SIR\Baldwin\FAPS\ModelingTechMemo.aprx\Figure 5-3. Boron Plume 25 Years

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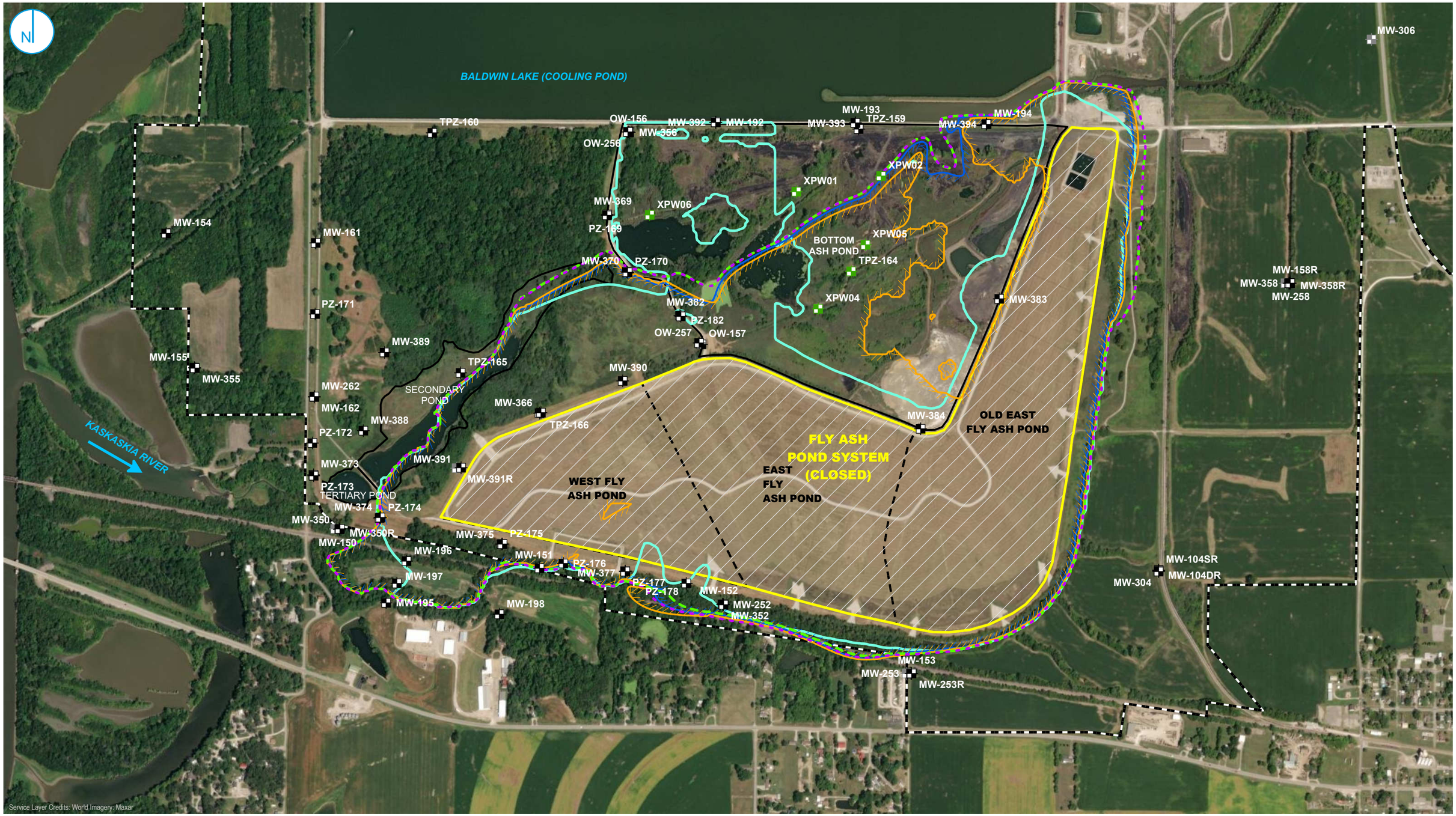
Y:\Mapping\Projects\22\2285\MXD\CAAA_SIR\Baldwin\FAPS\ModelingTechMemo.aprx\Figure 5-4. Boron Plume 125 Years



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- MONITORING WELL
- POREWATER WELL
- CLOSED MONITORING WELL

- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- CAPPED AREA
- PROPERTY BOUNDARY

- ALTERNATIVE 1. SOURCE CONTROL WITH GROUNDWATER POLISHING (GWP)
- ALTERNATIVE 2. SOURCE CONTROL WITH CUTOFF WALL
- ALTERNATIVE 3. SOURCE CONTROL WITH GROUNDWATER MANAGEMENT SYSTEM (GMS)
- CLOSURE BY REMOVAL (CBR)
- CALIBRATION MODEL PLUME EXTENT

0 400 800 Feet

MODELED BORON PLUME (2 MG/L) 125 YEARS AFTER IMPLEMENTATION

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 5-4

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

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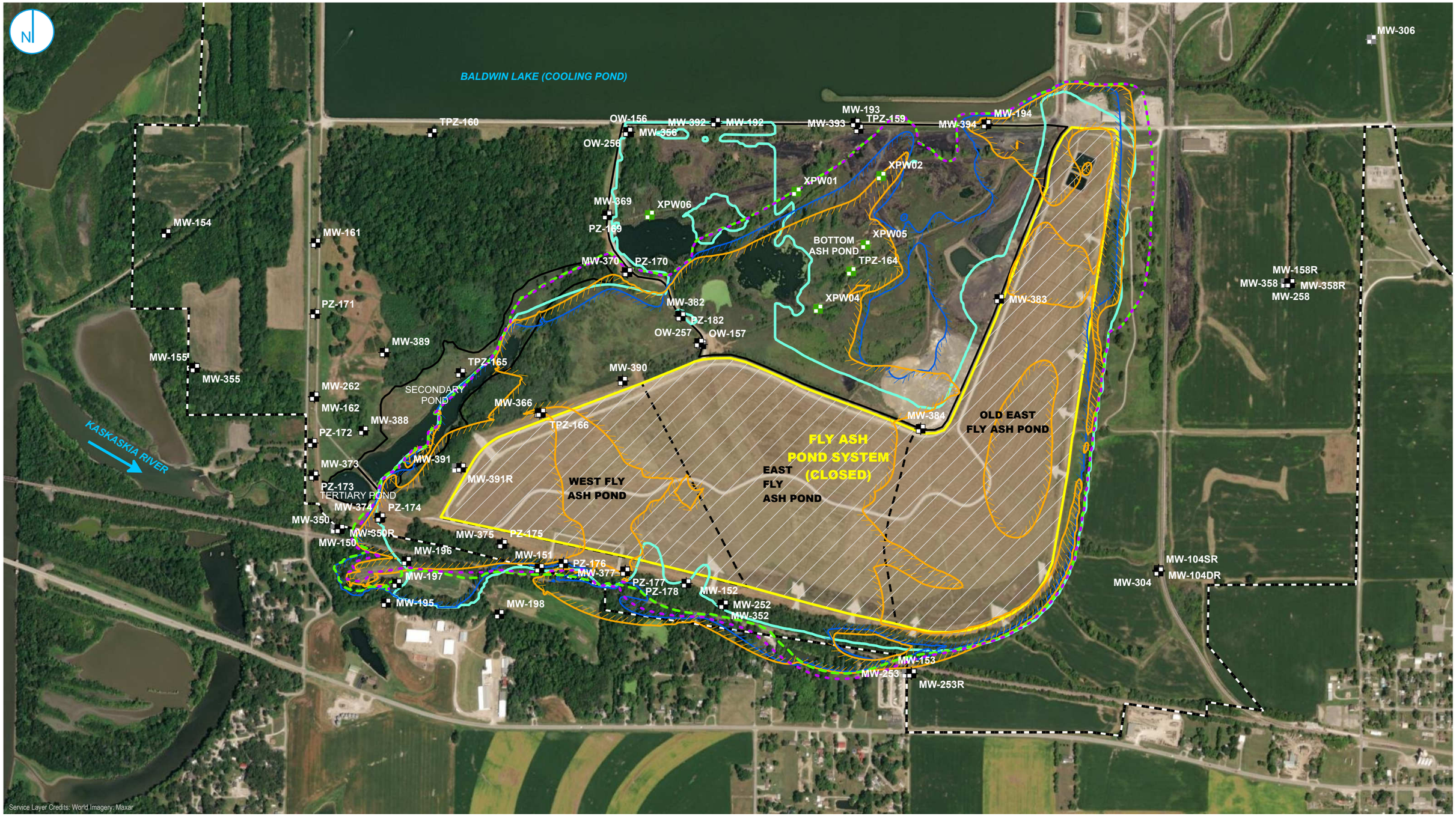

Y:\Mapping\Projects\22\2285\MXD\CAAA_SIR\Baldwin\FAPS\ModelingTechMemo.aprx\Figure 5-5. Boron Plume 375 Years

PROJECT: 169000XXXX | DATED: 2/3/2025 | DESIGNER: GALARNMC

- MONITORING WELL
- POREWATER WELL
- CLOSED MONITORING WELL
- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- CAPPED AREA
- PROPERTY BOUNDARY
- ALTERNATIVE 1. SOURCE CONTROL WITH GROUNDWATER POLISHING (GWP)
- ALTERNATIVE 2. SOURCE CONTROL WITH CUTOFF WALL
- ALTERNATIVE 3. SOURCE CONTROL WITH GROUNDWATER MANAGEMENT SYSTEM (GMS)
- CLOSURE BY REMOVAL (CBR)
- CALIBRATION MODEL PLUME EXTENT

MODELED BORON PLUME (2 MG/L) 375 YEARS AFTER IMPLEMENTATION

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 5-5

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

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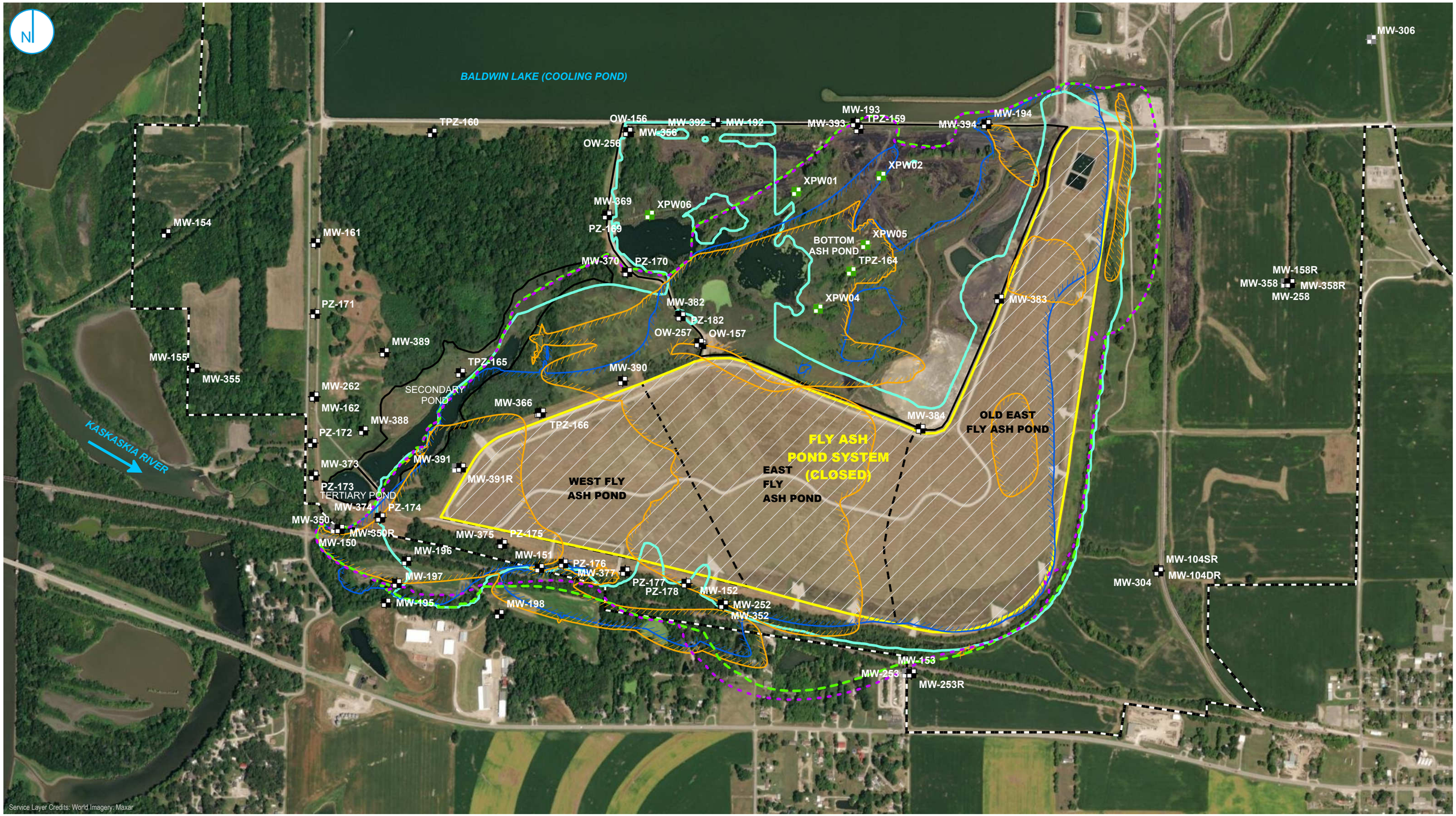
Y:\Mapping\Projects\22\2285\MXD\CAAA_SIR\Baldwin\FAPS\ModelingTechMemo.aprx\Figure 5-6. Boron Plume 750 Years



PROJECT: 169000XXXX | DATED: 2/3/2025 | DESIGNER: GALARNMC

- MONITORING WELL
- POREWATER WELL
- CLOSED MONITORING WELL

- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- CAPPED AREA
- PROPERTY BOUNDARY

- ALTERNATIVE 1. SOURCE CONTROL WITH GROUNDWATER POLISHING (GWP)
- ALTERNATIVE 2. SOURCE CONTROL WITH CUTOFF WALL
- ALTERNATIVE 3. SOURCE CONTROL WITH GROUNDWATER MANAGEMENT SYSTEM (GMS)
- CLOSURE BY REMOVAL (CBR)
- CALIBRATION MODEL PLUME EXTENT

0 400 800 Feet

MODELED BORON PLUME (2 MG/L) 750 YEARS AFTER IMPLEMENTATION

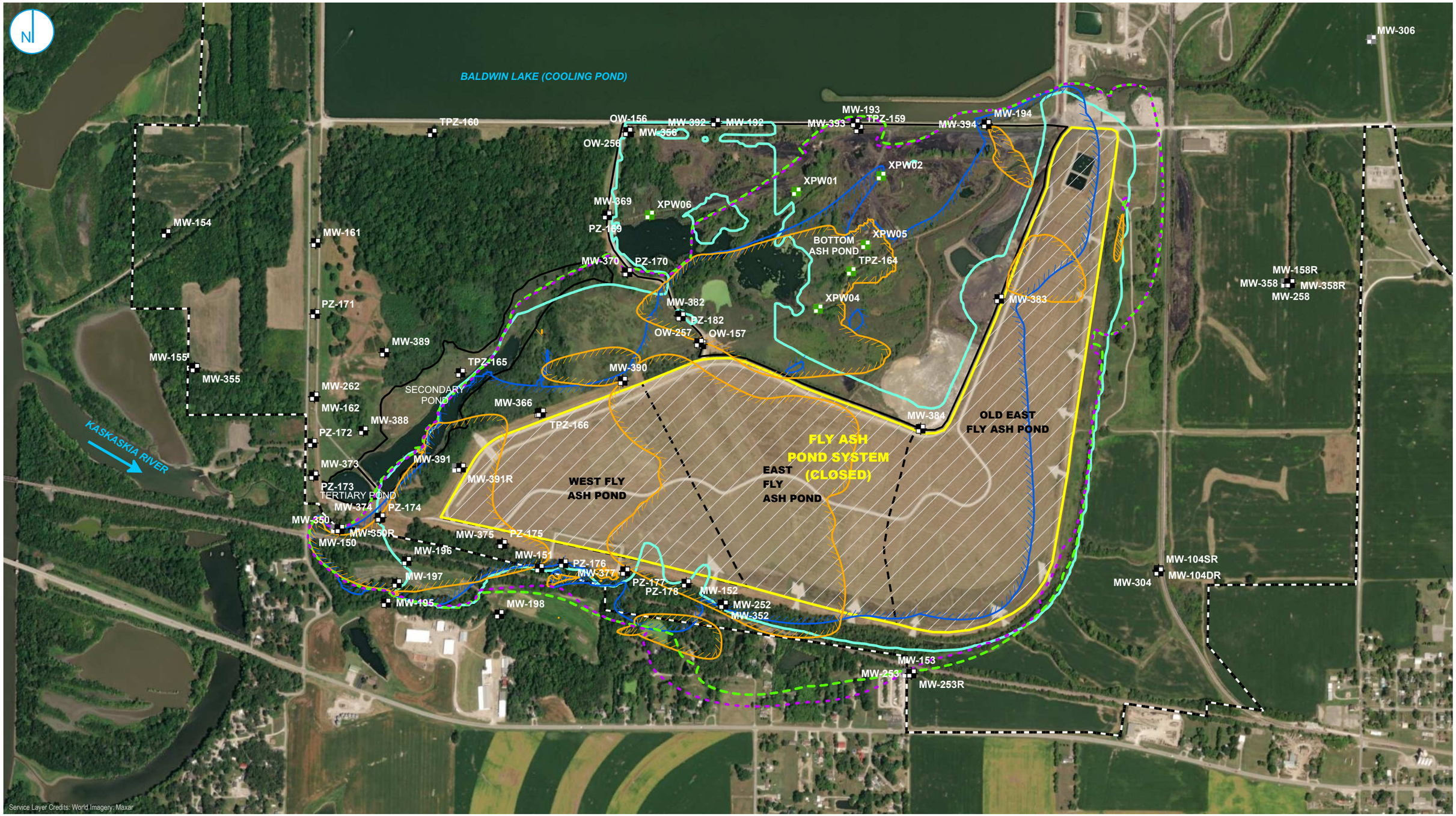
GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 5-6

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL

Y:\Mapping\Projects\22\2285\MXD\CAAA_SIR\Baldwin\FAPS\ModelingTechMemo.aprx\Figure 5-7. Boron Plume 1000 Years



PROJECT: 169000XXXX | DATED: 2/3/2025 | DESIGNER: GALARNMC

- MONITORING WELL
- POREWATER WELL
- CLOSED MONITORING WELL

- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- CAPPED AREA
- PROPERTY BOUNDARY

- ALTERNATIVE 1. SOURCE CONTROL WITH GROUNDWATER POLISHING (GWP)
- ALTERNATIVE 2. SOURCE CONTROL WITH CUTOFF WALL
- ALTERNATIVE 3. SOURCE CONTROL WITH GROUNDWATER MANAGEMENT SYSTEM (GMS)
- CLOSURE BY REMOVAL (CBR)
- CALIBRATION MODEL PLUME EXTENT

0 400 800 Feet

MODELED BORON PLUME (2 MG/L) 1000 YEARS AFTER IMPLEMENTATION

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 5-7

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

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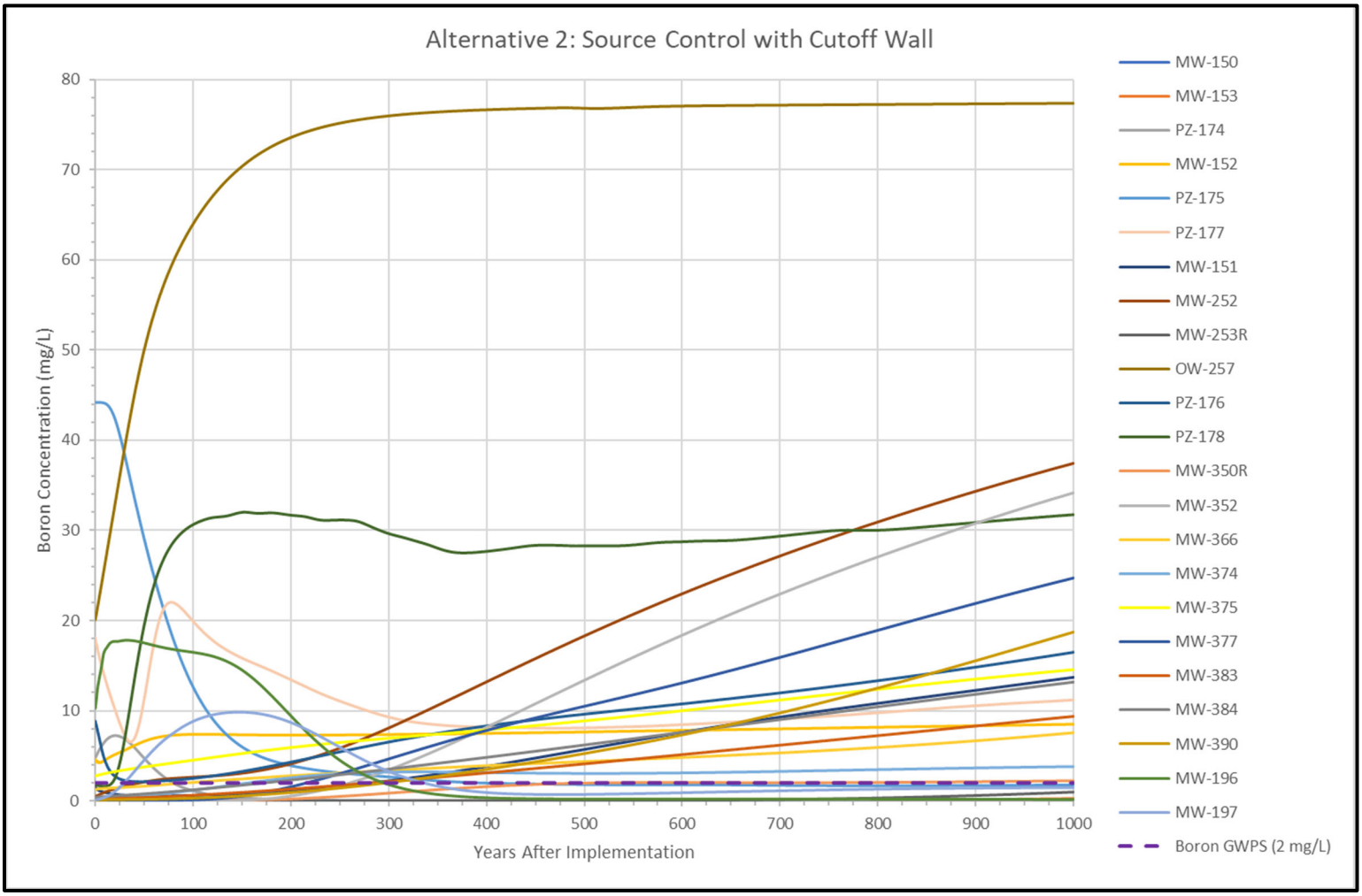
FIGURE 5-8



MODEL PREDICTED BORON CONCENTRATIONS AT FAPS MONITORING WELLS FOR ALTERNATIVE 2: SOURCE CONTROL WITH CUTOFF WALL

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

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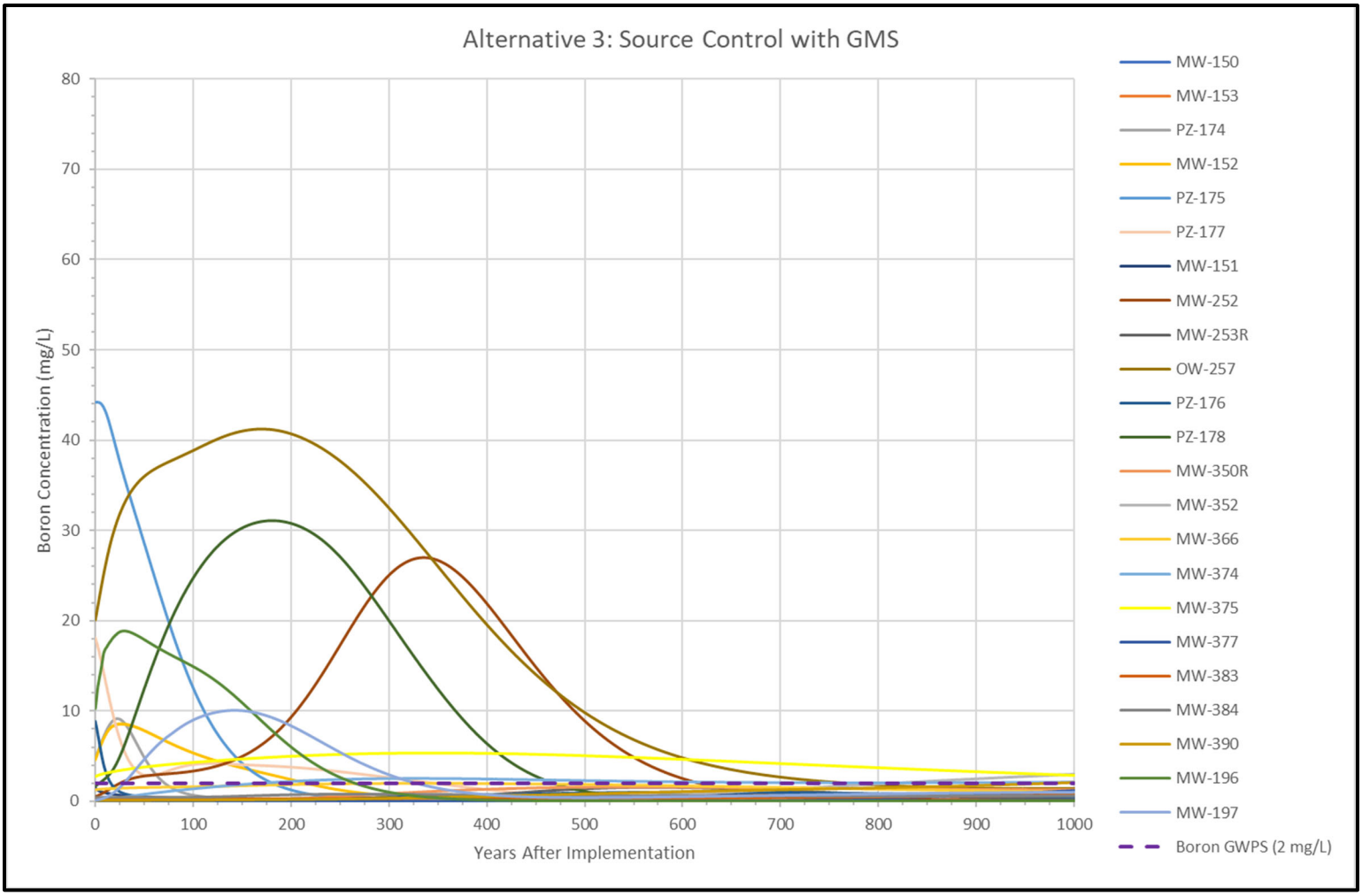
FIGURE 5-9

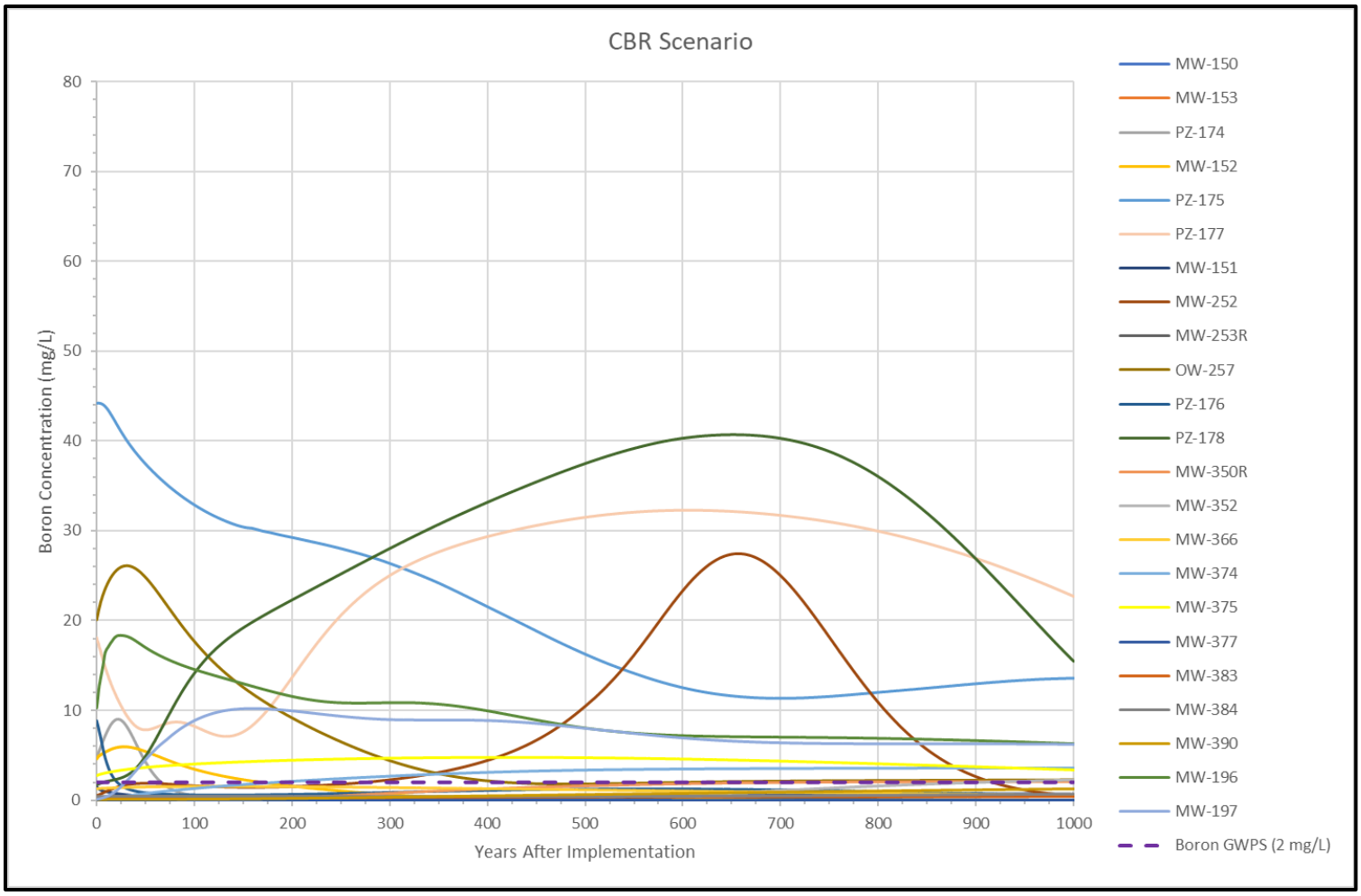


MODEL PREDICTED BORON CONCENTRATIONS AT FAPS MONITORING WELLS FOR ALTERNATIVE 3: SOURCE CONTROL WITH GMS

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

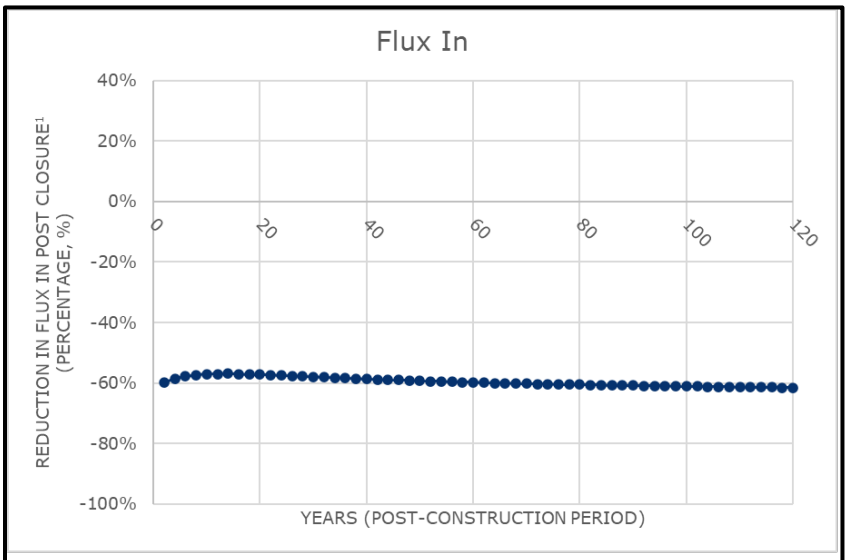
RAMBOLL

FIGURE 5-10

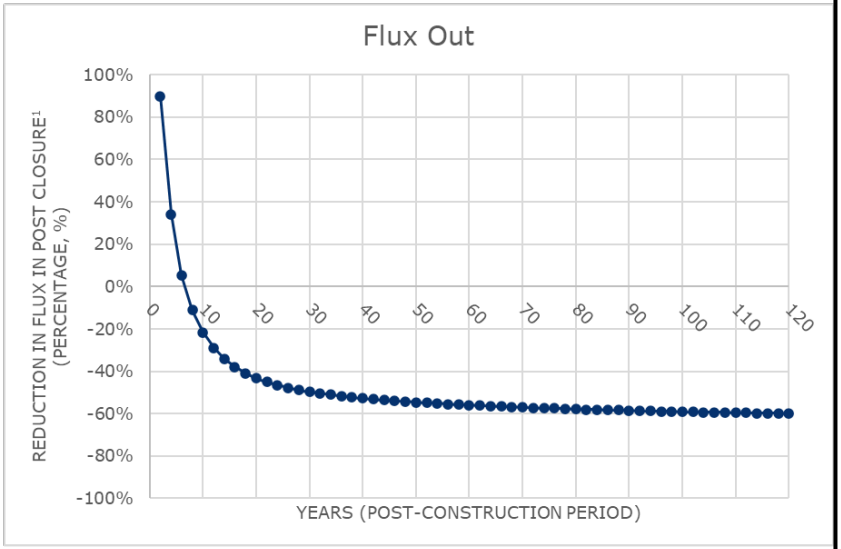


MODEL PREDICTED BORON CONCENTRATIONS AT FAPS MONITORING WELLS FOR CBR SCENARIO

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS



Notes:
1. Reduction in flux in as compared to flux in at the end of Calibration Model 1 (pre-closure FAPS model). Reduction in flux in are expressed as negative percentages to illustrate decreases in flux over time

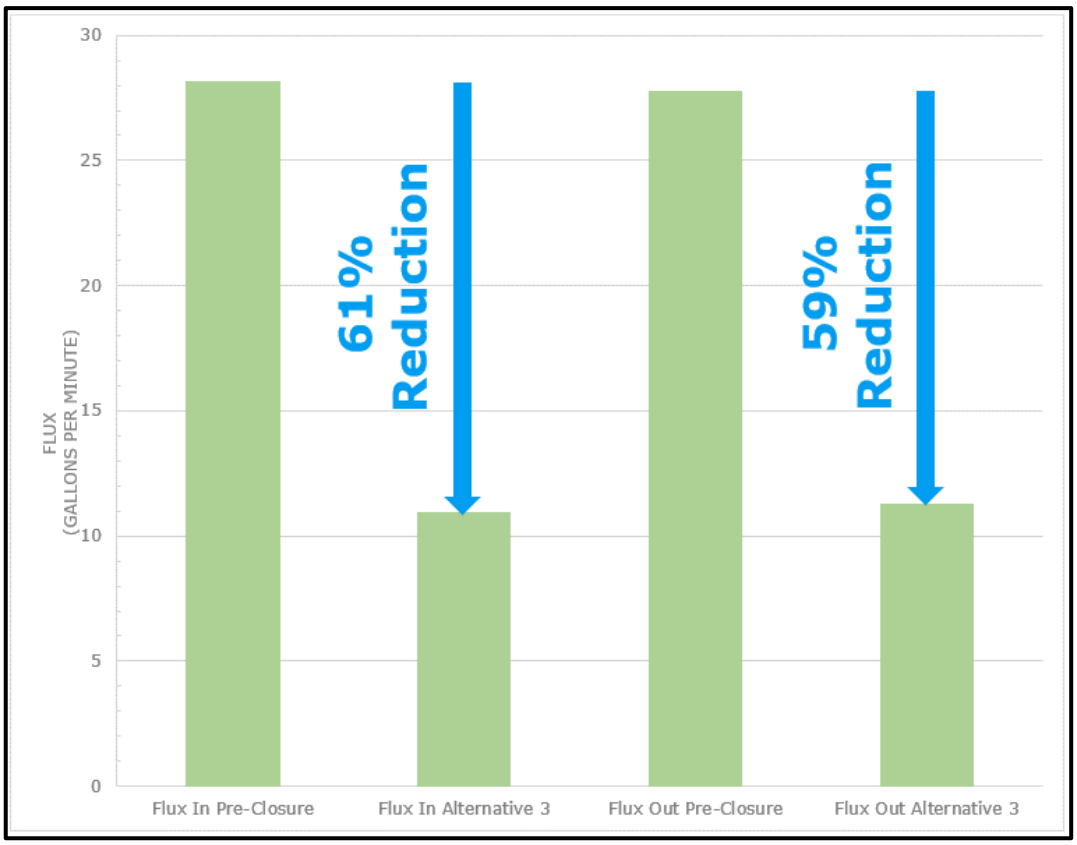


Notes:
1. Reduction in flux in as compared to flux out at the end of Calibration Model 1 (pre-closure FAPS model). Reduction in flux out are expressed as negative percentages to illustrate decreases in flux over time

REDUCTIONS IN TOTAL FLUX IN AND OUT OF CCR FOLLOWING IMPLEMENTATION OF ALTERNATIVE 3: SOURCE CONTROL WITH GMS

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

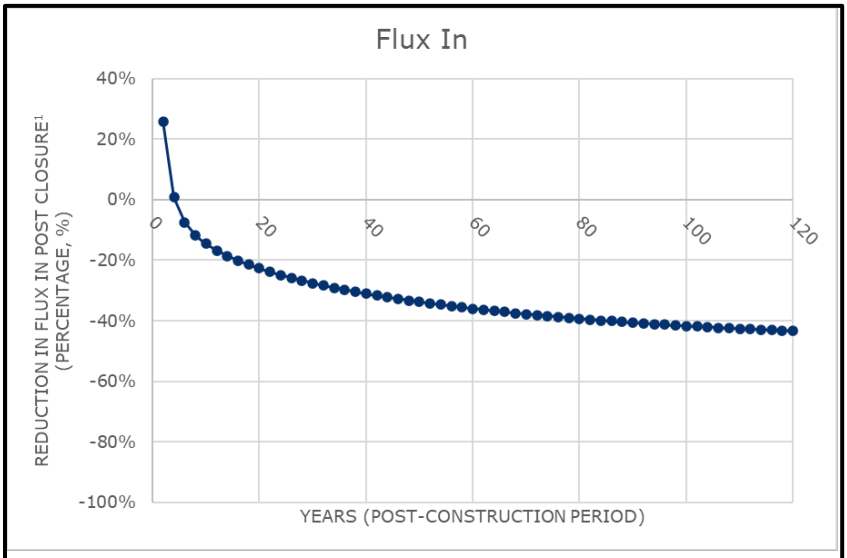
RAMBOLL



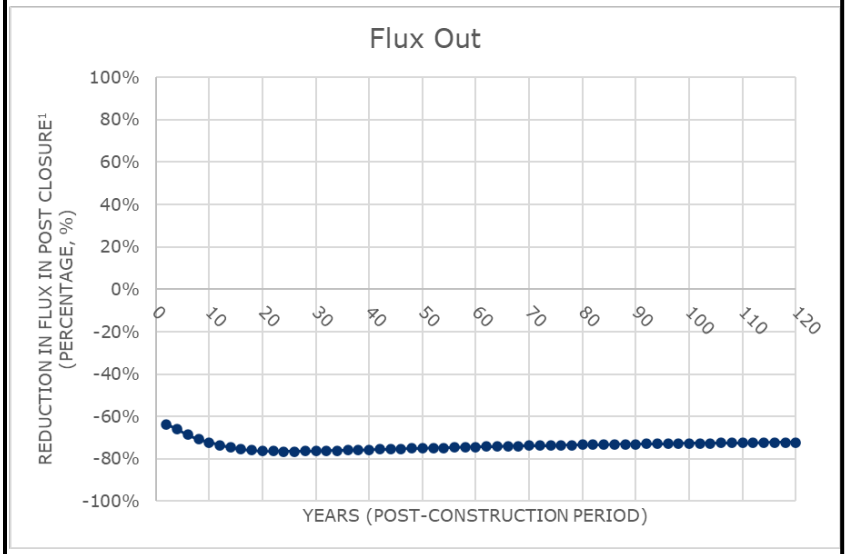
REDUCTIONS IN TOTAL FLUX IN AND OUT OF CCR 106 YEARS FOLLOWING IMPLEMENTATION OF ALTERNATIVE 3: SOURCE CONTROL WITH GMS

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL

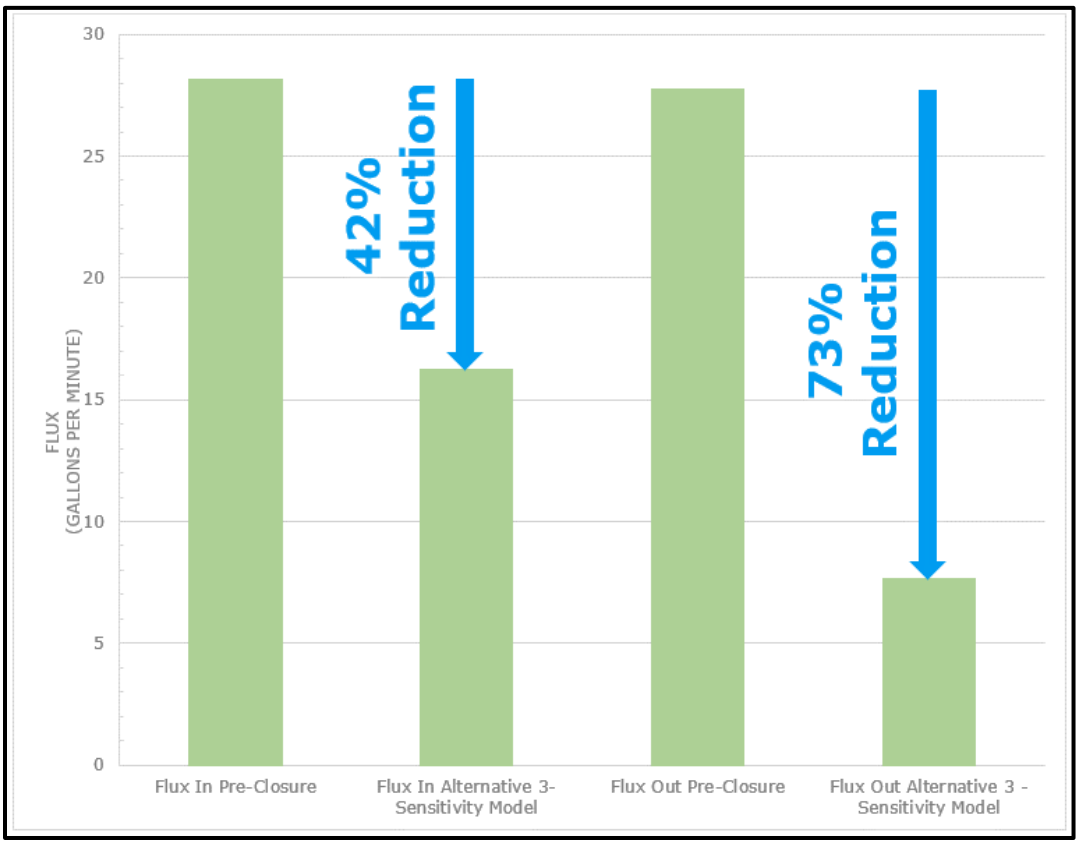


Notes:
1. Reduction in flux in as compared to flux in at the end of Calibration Model 1 (pre-closure FAPS model). Reduction in flux in are expressed as negative percentages to illustrate decreases in flux over time

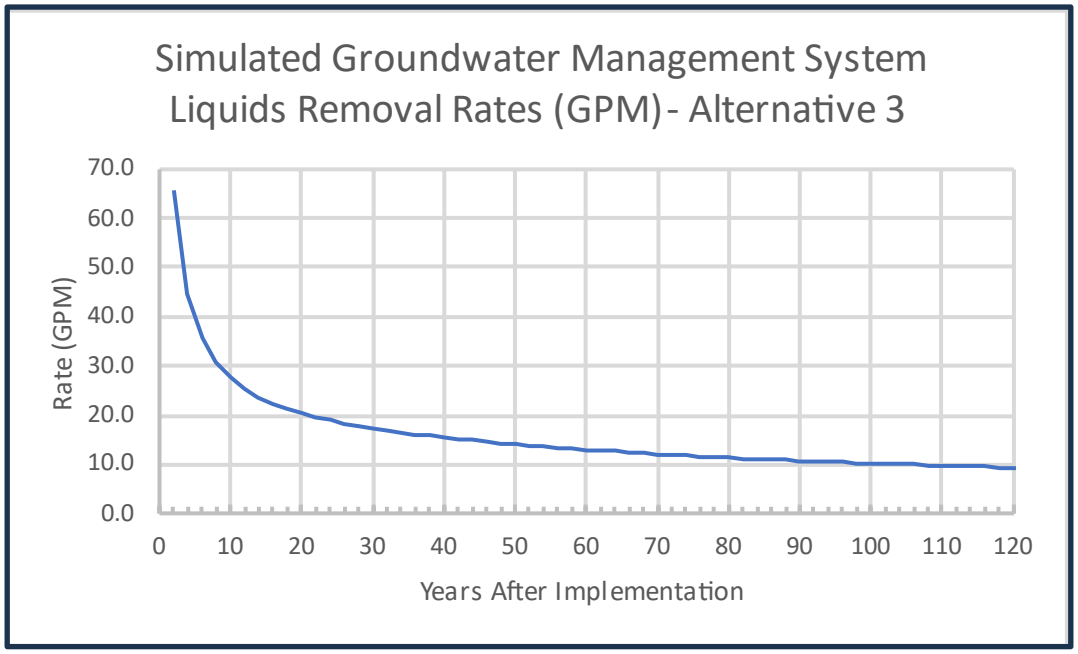


Notes:
1. Reduction in flux in as compared to flux out at the end of Calibration Model 1 (pre-closure FAPS model). Reduction in flux out are expressed as negative percentages to illustrate decreases in flux over time

REDUCTIONS IN TOTAL FLUX IN AND OUT OF CCR FOLLOWING IMPLEMENTATION OF ALTERNATIVE 3: SOURCE CONTROL WITH GMS – SENSITIVITY MODEL



REDUCTIONS IN TOTAL FLUX IN AND OUT OF CCR 106 YEARS FOLLOWING IMPLEMENTATION OF ALTERNATIVE 3: SOURCE CONTROL WITH GMS – SENSITIVITY MODEL



SIMULATED GROUNDWATER MANAGEMENT SYSTEM LIQUIDS REMOVAL RATES FOR ALTERNATIVE 3: SOURCE CONTROL WITH GMS

GROUNDWATER MODELING TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

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APPENDIX A
RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC. (RAMBOLL), 2023A. GROUNDWATER MODELING REPORT REVISION 1, BOTTOM ASH POND. BALDWIN POWER PLANT. BALDWIN , ILLINOIS. AUGUST 1, 2023.

Intended for
Dynegy Midwest Generation, LLC

Date
August 1, 2023

Project No.
1940102653

GROUNDWATER MODELING REPORT
REVISION 1

BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

GROUNDWATER MODELING REPORT REVISION 1
BALDWIN POWER PLANT BOTTOM ASH POND

Project Name	**Baldwin Power Plant Bottom Ash Pond**
Project No.	**1940102653**
Recipient	**Dynegy Midwest Generation, LLC**
Document Type	**Groundwater Modeling Report**
Revision	**Revision 1**
Date	**August 1, 2023**

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ACRONYMS AND ABBREVIATIONS

§	Section
35 I.A.C.	Title 35 of the Illinois Administrative Code
40 C.F.R.	Title 40 of the Code of Federal Regulations
ASD	Alternate Source Demonstration
BAP	Bottom Ash Pond
BPP	Baldwin Power Plant
CCR	coal combustion residuals
CIP	closure in place
cm/s	centimeters per second
Cooling Pond	Baldwin Lake
CSM	conceptual site model
DMG	Dynegy Midwest Generation, LLC
FAPS	Fly Ash Pond System
ft/day	feet/foot per day
ft/ft	feet per foot/feet
Geosyntec	Geosyntec Consultants, Inc.
GMP	Groundwater Monitoring Plan
GMR	Groundwater Modeling Report
gpm	gallons per minute
GWPS	Groundwater Protection Standard
HCR	Hydrogeologic Site Characterization Report
HELP	Hydrologic Evaluation of Landfill Performance
HUC	Hydrologic Unit Code
ID	Identification
IEPA	Illinois Environmental Protection Agency
Kd	distribution coefficient
Kh/Kv	vertical anisotropy
mg/L	milligrams per liter
mL/g	milliliters per gram
NAVD88	North American Vertical Datum of 1988
NGVD29	National Geodetic Vertical Datum of 1929
NID	National Inventory of Dams
No.	number
NPDES	National Pollutant Discharge Elimination System
NRT	Natural Resource Technology, Inc.
Phase II	Groundwater Quality Assessment and Phase II Hydrogeologic Investigation
PMP	potential migration pathway
Ramboll	Ramboll Americas Engineering Solutions, Inc.
SI	surface impoundment
Site	combined area including the BAP, FAPS, Secondary Pond, Tertiary Pond, and Cooling Pond
SDA	spray dry absorption
SSR	sum of squared residuals

S_y	specific yield
TDS	Total Dissolved Solids
TVD	total-variation-diminishing
UA	uppermost aquifer
UGU	Upper Groundwater Unit
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UU	Upper Unit

EXECUTIVE SUMMARY

Ramboll Americas Engineering Solutions, Inc. (Ramboll) has prepared this Groundwater Modeling Report (GMR) on behalf of the Baldwin Power Plant (BPP), operated by Dynegy Midwest Generation, LLC (DMG), in accordance with requirements of Title 35 of the Illinois Administrative Code (35 I.A.C.) Section (§) 845: Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments. This document presents the results of predictive groundwater modeling simulations for the proposed closure scenario for the Bottom Ash Pond (BAP). The BAP (coal combustion residuals [CCR] unit Identification [ID] number [No.] 601, Illinois Environmental Protection Agency [IEPA] ID No. W1578510001-06, and National Inventory of Dams [NID] No. IL50721) is the only active CCR unit present on the BPP property. The Fly Ash Pond System (FAPS) is a closed CCR unit on the BPP property (CCR unit ID 605; IEPA ID Nos. W1578510001-01, W1578510001-02, and W1578510001-03; and NID No. IL50721).

The BPP is located in Baldwin, Illinois (**Figure 1-1**). The BPP property is situated in an agricultural area. The BPP property is bordered to the west by the Kaskaskia River; to the east by Baldwin Road, farmland, and strip-mining areas; to the southeast by the Village of Baldwin; to the south by the Illinois Central Gulf railroad tracks, scattered residences, and State Route 154; and to the north by farmland (**Figure 1-2**).

A detailed summary of site conditions was provided in the revision to the Hydrogeologic Site Characterization Report (HCR; Ramboll, 2023d). The revision to the HCR includes hydrogeologic data collected after submittal of the initial HCR in 2021 (Ramboll, 2021c) as part of the 2022 Hydrogeologic Site Investigation were also used to establish a conceptual site model (CSM) for this GMR and is summarized herein. Three distinct water-bearing units have been identified in the vicinity of the BAP based on stratigraphic relationships and common hydrogeologic characteristics. The units are described as follows from the surface downward:

- **CCR**: CCR, consisting primarily of fly ash, bottom ash, and boiler slag. Also includes earthen fill deposits of predominantly clay and silt materials from on-site excavations that were used to construct berms and roads surrounding the various impoundments across the Site.
- **Upper Unit (UU)**: Predominantly clay with some silt and minor sand, silt layers, and occasional sand lenses. Includes the lithologic layers identified as the Cahokia Formation, Peoria Loess, Equality Formation, and Vandalia Till. This unit is composed of unlithified natural geologic materials and extends from the upper saturated materials to the bedrock. Thin sand seams and the interface (contact) between the UU and bedrock have been identified as potential migration pathways (PMPs). No continuous sand seams were observed within or immediately adjacent to the BAP; however, the sand seams may act as a PMP due to relatively higher hydraulic conductivities. The acronym UU and the materials it contains is synonymous with Upper Groundwater Unit (UGU) used in previous documents.
- **Bedrock Unit**: This unit is considered the uppermost aquifer (UA). Pennsylvanian and Mississippian-aged bedrock is composed of interbedded shale and limestone bedrock, which underlies and is continuous across the entire Site.

The extent of sand and gravel aquifers in the region are primarily found along the Kaskaskia River Valley where sand and gravel deposits are highly permeable, thick, and extensive. Outside of the Kaskaskia River Valley, the unlithified materials in upland areas are predominantly clay, which generally provide a low probability of encountering sand and gravel layers for dependable groundwater supply. Although some thin sand seams and layers occur intermittently within the

Vandalia Till in localized areas around the BPP, most groundwater supplies in upland areas are obtained from large diameter shallow bored wells. Typical water wells in the vicinity of the BPP are between 25 and 55 feet deep, 36 to 48 inches in diameter, and collect groundwater through slow percolation into the wells, which are large diameter to allow for greater water storage to compensate for the low rate of groundwater infiltration (Ramboll, 2023d).

The shallow bedrock is the only water-bearing unit that is continuous across the Site. Groundwater in the bedrock mainly occurs under semi-confined to confined conditions with the overlying unlithified unit behaving as the upper confining unit to the UA. Shallow sandstone and creviced limestone may yield small supplies in some areas, but water quality becomes poorer (*i.e.*, highly mineralized) with increasing depth.

Data collected from previous field investigations, as well as the lithologic contact and groundwater elevation data from the 2022 Hydrogeologic Site Investigation reported in the revised HCR (Ramboll, 2023d), were used to develop a groundwater model for the BAP. The MODFLOW model was used to evaluate a closure scenario: CCR consolidation and closure in place (CIP) using information provided in the CCR Surface Impoundment Final Closure Plan (Geosyntec Consultants, Inc. [Geosyntec], 2022a).

The CIP closure scenario was predicted to reduce total flux in and out of the BAP CCR by greater than 90 percent within 30 days following implementation of the CIP closure scenario. This was determined by comparing the post-construction movement of water in and out of the consolidated BAP CCR to pre-construction conditions. The reduction in total flux in and out of the consolidated BAP CCR is predicted to exceed 90 percent reduction for the remaining model timeframe. In general, the greatest predicted reduction in heads among the proposed BAP compliance monitoring wells takes place within approximately 93 years following implementation of the CIP closure scenario, at which time total flux in and out are predicted to reduce by 95 and 93 percent respectively. Due to the low hydraulic conductivity of the UU and UA materials, heads are not predicted to stabilize at all proposed BAP compliance monitoring wells until approximately 482 years following implementation of the CIP closure scenario, at which time total flux in and out are predicted to reduce by approximately 96 percent.

A monitoring well network was included in a proposed BAP Groundwater Monitoring Plan (GMP) (Ramboll 2021a) to satisfy requirements of 35 I.A.C. § 845 and was submitted as part of the operating permit application for the BAP in 2021. Additional wells completed in 2022 are included in a revision to the proposed GMP (Ramboll, 2023b) that will be included as part of the final construction permit application for submittal to IEPA no later than August 1, 2023. A review and summary of data collected from 2015 through May 2023 are included in the revised HCR (Ramboll, 2023d).

Quarterly monitoring under 35 I.A.C. § 845.650(b) will commence no later than the second quarter of 2023. As such, comparisons of groundwater contaminant concentrations to the Groundwater Protection Standard (GWPS) in this report are considered potential exceedances. Potential exceedances of the GWPS are presented in the attached revision to the History of Potential Exceedances (**Appendix A**, Ramboll, 2023c) and discussed in **Section 3** of this report. Based on statistical analysis, evaluation of subsequent potential exceedances of the GWPS, and intention to pursue Alternate Source Demonstrations (ASDs), it has been determined there are no potential exceedances of applicable groundwater standards attributable to the BAP.

Groundwater contaminant transport modeling was completed to demonstrate how the proposed CIP closure plan will maintain compliance with the applicable GWPS. Boron is commonly used as

an indicator parameter for contaminant transport modeling for CCR because it is commonly present in coal ash leachate and it is mobile (*i.e.*, has low rates of sorption or degradation) in groundwater. The revised History of Potential Exceedances did not identify boron as a potential exceedance of the GWPS; however, boron has been detected in BAP porewater and groundwater; therefore, groundwater transport modeling was completed using boron.

The model domain for evaluating boron transport following closure of the BAP includes the closed FAPS which is present along the eastern and southern boundaries of the BAP. The FAPS completed IEPA approved closure activities in November of 2020, and it is another potential source of boron within the model domain. The closure plan for the FAPS also included groundwater modeling of boron transport. Boron transport within the current BAP model was compared to the results from the previous FAPS closure plan modeling and found that simulated flow and transport associated with the FAPS are consistent between the two models. As described in this report, proposed BAP compliance wells PZ-182, OW-257, and MW-382 are located in the direction of groundwater flow from the north central area of the FAPS between the FAPS (East Fly Ash Pond) and the surface water drainage feature near the west end of the BAP. Because these wells are downgradient of the FAPS which is an alternate source of boron, and groundwater quality at these wells is not attributable to the BAP, these wells were not included in the evaluation of BAP compliance with the GWPS following implementation of the CIP scenario.

Additionally, a BAP closure by removal (CBR) closure scenario prediction model was completed to evaluate the difference in post-construction boron concentrations simulated at PZ-182, OW-257, and MW-382 under both CIP and CBR conditions. Concentrations are predicted to increase above the GWPS for boron (2 milligrams per liter [mg/L]) following implementation of both BAP CIP and CBR closure scenarios in these three wells. Maximum concentrations within the modeling timeframes at these wells are predicted to be on the same order of magnitude for both BAP CIP and CBR closure scenarios. Since concentrations at proposed BAP compliance monitoring wells PZ-182, OW-257, and MW-382 increase to concentrations above the GWPS following implementation of the CBR closure scenario, after BAP source concentrations have been removed, the source for predicted post-construction concentrations within the model domain can only be attributable to the closed FAPS. These results support the conclusion that wells PZ-182, OW-257, and MW-382 should not be included in the evaluation of BAP compliance with the GWPS following implementation of the CIP scenario.

Results of groundwater fate and transport modeling conservatively estimate that groundwater boron concentrations at the proposed BAP compliance wells that are not influenced by the FAPS will remain below the GWPS following implementation of the CIP scenario at the BAP.

1. INTRODUCTION

1.1 Overview

In accordance with requirements of 35 I.A.C. § 845, Ramboll has prepared this GMR on behalf of the BPP, operated by DMG. This report applies specifically to the CCR unit referred to as the BAP (**Figure 1-1**). The BAP is a 177-acre unlined CCR surface impoundment (SI) used to manage CCR and non-CCR waste streams at the BPP. This GMR presents and evaluates the results of predictive groundwater modeling simulations for a proposed CIP closure scenario which includes: CCR removal from the western areas of the BAP, consolidation to the southeast, and eventually northeastern portions of the BAP, and construction of a cover system over the remaining CCR following initial corrective action measures (removal of free liquids from the BAP).

1.2 Site Location and Background

The BPP is located in southwest Illinois in Randolph and St. Clair Counties. The Randolph County portion of the BPP is located within Sections 2, 3, 4, 9, 10, 11, 14, 15, and 16 of Township 4 South and Range 7 West. The St. Clair County portion of the property is located within Sections 33, 34, and 35 of Township 3 South and Range 7 West. The BAP is approximately one-half mile west-northwest of the Village of Baldwin (**Figure 1-1**).

The BPP property is bordered to the west by the Kaskaskia River; to the east by Baldwin Road, farmland, and strip-mining areas; to the southeast by the Village of Baldwin; to the south by the Illinois Central Gulf railroad tracks, scattered residences, and State Route 154; and to the north by farmland. The St. Clair/Randolph County Line crosses east-west at approximately the midpoint of Baldwin Lake (*i.e.,* Cooling Pond). **Figure 1-1** shows the location of the BPP; **Figure 1-2** is a site map showing the location of the BAP (a 35 I.A.C. § 845 regulated CCR unit and the subject of this GMR), FAPS (an IEPA closed CCR unit), Secondary Pond, Tertiary Pond, and Cooling Pond. The combined area including the BAP, FAPS, Secondary Pond, Tertiary Pond, and Cooling Pond will hereinafter be referred to as the Site.

1.3 Site History and Unit Description

The BPP is a coal-fired electrical generating plant that began operation of its first unit in 1970; two additional generating units were put into service in 1973 and 1975. The plant initially burned bituminous coal from Illinois and switched to subbituminous coal in 1999. Total plant generating capacity is approximately 1,892 megawatts.

The BAP is classified as an existing, unlined CCR SI and covers an area of approximately 177 acres in the southern portion of the BPP property (**Figure 1-2**). The BAP is surrounded by a perimeter road and is bounded to the north by the Cooling Pond, and to the east and south by the closed FAPS CCR Multi-Unit. The BAP is also bounded to the west by the easternmost wooded area that surrounds the Secondary and Tertiary Ponds. The BAP is being used to store and dispose of sluiced bottom ash, some of which is mined for beneficial use, to temporarily store spray dry absorption (SDA) waste, and to clarify plant process water, including other non-CCR station process wastewaters, prior to discharge in accordance with the BPP's National Pollutant Discharge Elimination System (NPDES) permit (AECOM, 2016b; IEPA, 2016).

The FAPS at the BPP is a closed CCR Multi-Unit consisting of three unlined SIs: Old East Fly Ash Pond (IEPA Unit ID W1578510001-01), the East Fly Ash Pond (IEPA Unit ID W1578510001-02), and West Fly Ash Pond (IEPA Unit ID W1578510001-03), with a combined surface area of

approximately 232 acres (**Figure 1-2**). During operation, the FAPS discharged water to the BAP. The receiving water bodies for the BAP were the Secondary Pond, and in turn the Tertiary Pond, which ultimately discharges towards a tributary of the Kaskaskia River, south of the Cooling Pond intake structure. A Groundwater Quality Assessment and Phase II Hydrogeologic Investigation (Phase II; Natural Resource Technology, Inc. [NRT], 2014a) was followed by a Supplemental Hydrogeologic Site Characterization and Groundwater Monitoring Plan dated March 31, 2016 (NRT, 2016a) with revised pages included in the response to IEPA July 13, 2016 comments in the technical memorandum dated August 8, 2016 (NRT, 2016b) to define the hydrogeology and to assess the groundwater impacts related to the FAPS. Groundwater models were also completed to assess the groundwater impacts associated with closure of the FAPS and predict the fate and transport of CCR leachate components, as well as estimate the time required for hydrostatic equilibrium of groundwater beneath the FAPS (NRT, 2014b; NRT, 2014c; NRT, 2016c). Based on these assessments, a Closure and Post-Closure Care Plan (AECOM, 2016a), which included a groundwater monitoring program sufficient for long-term, post-closure monitoring, was developed and approved by IEPA in a letter to the Dynegy Operating Company dated August 16, 2016. Closure activities, which included constructing a final cover system to control the potential for water infiltration into the closed CCR unit, were completed, and FAPS closure was completed November 17, 2020. The approximate dates of construction of each successive stage of the BAP and FAPS are summarized in **Table A** below (AECOM, 2016b).

Table A. History of Construction

Date	Event
1969	Construction of Old East Fly Ash Pond, East Fly Ash Pond, and West Fly Ash Pond external perimeter embankment
1979	Construction of East Fly Ash Pond and West Fly Ash Pond northern embankment
1989	Raise inboard perimeter of the entire East Fly Ash Pond and West Fly Ash Pond
1995	Construction of interior dike between the East Fly Ash Pond and West Fly Ash Pond
1999	Raise of interior dike between the East Fly Ash Pond and West Fly Ash Pond; replacement of outlet pipe from the West Fly Ash Pond to the Secondary Pond
2012	Modification of BAP embankment (original construction date unknown)
2016	Closure Plan completed for the FAPS and approved by IEPA
2020	FAPS closure activities, including construction of a final cover system, and FAPS closure completed

2. SITE GEOLOGY AND HYDROGEOLOGY

BAP hydrogeologic data presented in the initial HCR (Ramboll, 2021c) and BAP hydrogeologic data collected after submittal of the initial HCR in 2021 as part of the 2022 Hydrogeologic Site Investigation and included in the revision to the HCR (Ramboll, 2023d) were used to establish a CSM for this GMR and is summarized below. Refer to the revision to the HCR (Ramboll, 2023d) for more details of regional and local site characteristics. BAP hydrogeologic data collected as part of the 2022 Hydrogeologic Site Investigation are presented in a revised HCR (Ramboll, 2023d) to be included in a construction permit application for submittal to IEPA no later than August 1, 2023. Surface elevations range from approximately 415 feet North American Vertical Datum of 1988 (NAVD88) in the east side of the BAP to 450 feet NAVD88 in the west side of the BAP. Topographic maps drawn prior to construction indicate the areas of the BAP were generally between 400 and 430 feet National Geodetic Vertical Datum of 1929 (NGVD29), which included a drainage feature near the west end of the BAP (Figure 2-2 of the revised HCR). Topography in the vicinity of the Site (**Figure 1-1**) ranges from approximately 370 feet NAVD88 along the Kaskaskia River southwest of the Site to 450 feet NAVD88 towards the south and east. The principal surface drainage for the region is the Kaskaskia River.

There are five principal types of unlithified materials above the bedrock in the vicinity of the BAP, these include the following in descending order:

- Fill, predominantly coal ash (fly ash, bottom ash, and slag) within the CCR units, but also including general fill within constructed levees around the Cooling Pond, constructed berms around the Site, and constructed railroad embankments south of the Site;
- Alluvial clay, sandy clay, and clayey sand of the Cahokia Formation (ranging in thickness at the BAP from 13 to 27 feet);
- Silt and silty clay of the Peoria Loess (ranging in thickness at the BAP from 2 to 23 feet);
- Clay and sandy clay of the Equality Formation (ranging in thickness at the BAP from 8 to 37 feet), with occasional sand seams and lenses; and
- Clay and sandy clay diamictons of the Vandalia Till (ranging in thickness at the BAP from 11 to 37 feet) with intermittent and discontinuous sand lenses.

Depth to bedrock ranges from approximately 28.4 feet towards the west end of the BAP (MW-370) to approximately 57 feet immediately north of the BAP (MW-393).

Three distinct water-bearing units have been identified in the vicinity of the BAP based on stratigraphic relationships and common hydrogeologic characteristics. The units are described as follows from the surface downward:

- **CCR**: CCR, consisting primarily of fly ash, bottom ash, and boiler slag. Also includes earthen fill deposits of predominantly clay and silt materials from on-site excavations that were used to construct berms and roads surrounding the various impoundments across the Site. The overall (geometric mean) horizontal and vertical hydraulic conductivity for the CCR determined during the Phase II and 2022 Hydrogeologic Site Investigations are 1.5×10^{-2} centimeters per second (cm/s) and 4.1×10^{-5} cm/s, respectively. Horizontal and vertical hydraulic conductivities for this unit determined during the Phase II and 2022 Hydrogeologic

Site Investigations ranged from 8.1 x 10^{-4} to 1.1 x 10^{-1} cm/s and 5.6 x 10^{-7} to 6.5 x 10^{-4} cm/s, respectively.

- **UU**: Predominantly clay with some silt and minor sand, silt layers, and occasional sand lenses. Includes the lithologic layers identified as the Cahokia Formation, Peoria Loess, Equality Formation, and Vandalia Till. This unit is composed of unlithified natural geologic materials and extends from the upper saturated materials to the bedrock. As observed in the field, one or more of these four lithologic units may be present at a particular soil boring location; and, the observed lithologic unit(s) may or may not be saturated depending on location at the Site. Given that these units are not consistently in contact with groundwater, this unit was renamed from UGU used in previous reports to UU. The term UU is synonymous with UGU used in previous documents. The overall (geometric mean) horizontal and vertical hydraulic conductivities for this unit determined during the Phase II and 2022 Hydrogeologic Site Investigations are 2.9 x 10^{-5} cm/s and 3.5 x 10^{-7} cm/s, respectively. Horizontal and vertical hydraulic conductivities for this unit determined during the Phase II and 2022 Hydrogeologic Site Investigations ranged from 3.5 x 10^{-7} to 6.8 x 10^{-4} cm/s and 6.3 x 10^{-9} to 4.2 x 10^{-4} cm/s, respectively. Thin sand seams and the interface (contact) between the UU and bedrock have been identified as PMPs. No continuous sand seams were observed within or immediately adjacent to the BAP; however, the sand seams may act as a PMP due to relatively higher hydraulic conductivities (on the order of 10^{-4} cm/s) than the surrounding clays (on the order of 10^{-5} cm/s). The contacts between the unlithified material and bedrock have also been identified as PMPs where horizontal hydraulic conductivity data in Site monitoring wells with screens and/or filter packs across or immediately above the bedrock range from 3 x 10^{-7} to 6 x 10^{-4} cm/s and have a geometric mean horizontal hydraulic conductivity of 2 x 10^{-5} cm/s.
- **Bedrock Unit**: This unit is composed of interbedded shale and limestone bedrock, which underlies and is continuous across the entire Site and has been identified as the UA. The horizontal hydraulic conductivity for this unit determined during the Phase II and 2022 Hydrogeologic Site Investigations ranges from 2.4 x 10^{-7} to 3.5 x 10^{-5} cm/s with a geometric mean of 1.9 x 10^{-6} cm/s (Ramboll, 2023d).

In general, the UU consists of low permeability clays and silts. Within the UU, only thin and intermittent sand lenses are present within predominantly clay deposits; thus, the unlithified materials do not represent a continuous aquifer unit. Thin, non-continuous sandy deposits (*i.e.,* PMPs) that exist across the Site do not appear to extend to the FAPS and BAP as evidenced by soil borings adjacent to the CCR units in which no sand was observed.

The extent of sand and gravel aquifers in the region are primarily found along the Kaskaskia River Valley where sand and gravel deposits are highly permeable, thick, and extensive. Outside of the Kaskaskia River Valley, the unlithified materials in upland areas are predominantly clay, which generally provide a low probability of encountering sand and gravel layers for dependable groundwater supply. Although some thin sand seams and layers occur intermittently within the Vandalia Till in localized areas around the BPP, most groundwater supplies in upland areas are obtained from large diameter shallow bored wells. Typical water wells in the vicinity of the BPP are between 25 and 55 feet deep, 36 to 48 inches in diameter, and collect groundwater through slow percolation into the wells, which are large diameter to allow for greater water storage to compensate for the low rate of groundwater infiltration (Ramboll, 2023d).

The underlying bedrock at the Site is Pennsylvanian and Mississippian bedrock, mainly limestone and shale. A bedrock low is present at the southwest corner of the Site and extends

northeastward. The Tertiary Pond in the southwest corner of the Site corresponds to the lowest observed bedrock surface elevation (372.6 feet NAVD88). Higher bedrock elevations are present east of the BPP and FAPS as observed at MW-358 (428.6 feet NAVD88). The bedrock in the vicinity of the BAP yields small amounts of water from interconnected pores, cracks, fractures, crevices, joints, and bedding planes. The shallow bedrock is the only water-bearing unit that is continuous across the Site. Shallow sandstone and creviced limestone may yield small supplies in some areas, but water quality becomes poorer (*i.e.,* highly mineralized) with increasing depth. The Pennsylvanian and Mississippian rocks generally have low porosities and permeabilities, are not a reliable source of groundwater, and the quality varies considerably (Pryor, 1956). Limestones intercepted at the Site are generally light to dark gray, fine-grained, thin bedded, banded, argillaceous, and competent except where weathered. Weathering of the limestone produces a calcareous clay. Limestone layers are often interbedded with thin shale layers and are sometimes fossiliferous or sandy. The shale layers are generally weathered, competent, silty, slightly micaceous, fissile, and dark gray. Where highly weathered shale (*i.e.,* decomposed bedrock) was encountered, the shale was non-fissile and resembled an unlithified stiff clay with medium to high plasticity.

The locations of groundwater monitoring wells are provided on **Figure 2-1**. Based on elevation measurements, lateral groundwater flow in the shallow unlithified materials and bedrock is generally to the west and southwest across the Site (**Figure 2-2**) toward the Kaskaskia River. Groundwater flow in bedrock is toward the northwest in the east and central areas of the BAP, and southwest to northwest on the east area of the FAPS until groundwater reaches the bedrock valley feature underlying the Secondary and Tertiary Ponds west of the BAP and FAPS, at which point the flow direction veers towards this bedrock surface low. Groundwater elevations across the Site vary seasonally, generally less than 7 feet, and range between approximately 370 and 450 feet NAVD88, although flow directions are generally consistent. Additional potentiometric surface maps are located in Figures 3-2 to 3-5 and Appendix E of the revised HCR (Ramboll, 2023d).

In the western area of the FAPS, average horizontal hydraulic gradients in the shallow unlithified materials and bedrock were 0.015 feet per foot/feet (ft/ft) and 0.016 ft/ft, respectively, as groundwater flowed from east to west across the FAPS. Average groundwater velocities in the shallow unlithified materials and bedrock in the western area of the FAPS were 0.0082 and 0.0003 feet per day (ft/day), respectively. In general, flow velocities in the vicinity of the FAPS are consistent, varying only 0.0019 ft/day in the shallow unlithified materials and 0.0002 ft/day in the bedrock.

Between monitoring wells in the northeastern portion of the BAP, average horizontal hydraulic gradients in the shallow unlithified materials and bedrock were 0.004 and 0.003 ft/ft, respectively, as groundwater flowed southeast to northwest across the BAP. Average groundwater velocities in the shallow unlithified materials and bedrock in the northeast portion of the BAP were 0.0023 and 0.0001 ft/day, respectively. Between monitoring wells in the western portion of the BAP average horizontal hydraulic gradients in the shallow unlithified materials and bedrock were 0.011 and 0.017 ft/ft, respectively, as groundwater flowed northeast to southwest across the BAP. Average groundwater velocities in the west area of the BAP in shallow unlithified materials and bedrock were 0.0058 and 0.0003 ft/day, respectively. In general, flow velocities are consistent, varying only 0.001 ft/day in shallow unlithified materials and 0.0001 ft/day in bedrock in the vicinity of the BAP.

Groundwater in the Pennsylvanian and Mississippian-aged bedrock mainly occurs under semi confined to confined conditions as demonstrated with vertical hydraulic gradient calculations presented in the revised HCR (Ramboll, 2023d), with the overlying unlithified unit behaving as the upper confining unit to the UA (Bedrock Unit). The relatively flat horizontal groundwater gradient beneath the Site, and the mostly upward vertical gradients, inconsistent upward/downward vertical gradients or flowing artesian conditions observed in the UU and UA, suggests the BAP and neighboring ponds are not areas of increased recharge or infiltration (Ramboll, 2023d).

In 2022, additional wells were installed as part of the 2022 Hydrogeologic Site Investigation, after the initial HCR was completed (Ramboll, 2021c), for further hydrogeologic investigation and water quality evaluation. The results of the 2022 Hydrogeologic Site Investigation and water quality evaluation are included in a revised HCR (Ramboll, 2023d). A summary of monitoring well locations and construction details for wells used in this GMR are included in **Table 2-1** and the locations are depicted on **Figure 2-1**. Groundwater elevation readings and lithologic contact information from the wells completed in 2022 have been incorporated into this GMR. Groundwater elevation data from 48 of the 78 total monitoring wells included in **Table 2-1** and depicted on **Figure 2-1**, were utilized as groundwater model flow calibration targets as summarized in **Table 2-2** and described in **Sections 5.2 and 5.2.2**. Boron concentration data from 50 of the 78 total monitoring wells included in **Table 2-1** and depicted on **Figure 2-1**, were utilized as transport model calibration targets as summarized in **Table 2-2** and described in **Sections 5.2 and 5.2.3**. Complete documentation of the 2022 Hydrogeologic Site Investigation activities at the BAP including boring logs, monitoring well and piezometer construction forms, and summary tables of testing results (*e.g.,* groundwater analytical results, horizontal and vertical gradient calculations, and single well aquifer test results), are provided in a revised HCR (Ramboll, 2023d).

3. GROUNDWATER QUALITY

The classification of groundwater at the Site was addressed in the Phase II investigation (NRT, 2014a). Field hydraulic conductivity tests performed on the UU materials (*i.e.,* Cahokia Formation, Equality Formation, and Vandalia Till) and Bedrock Unit materials (*i.e.,* Mississippian and Pennsylvanian bedrock) as part of the Phase II and 2022 Hydrogeologic Site Investigations had geometric mean hydraulic conductivities of 2.9 x 10^{-5} cm/s and 1.9 x 10^{-6} cm/s, respectively.

Geologic material with a hydraulic conductivity of less than 1 x 10^{-4} cm/s which does not meet the provisions of 35 I.A.C. § 620.210 (Class I), 35 I.A.C. § 620.230 (Class III), or 35 I.A.C. § 620.240 (Class IV), meets the definition of a Class II – General Resource Groundwater (35 I.A.C. § 620.220). Based on the detailed geologic information provided for the unlithified materials and bedrock at BPP, along with the hydrogeologic data, the groundwater in both the unlithified deposits and underlying bedrock at the Site is classified as Class II - General Resource Groundwater.

Bedrock was intercepted at 42 borings/well locations installed during the Phase II Investigation, the investigation for Supplemental Hydrogeologic Site Characterization and Groundwater Monitoring Plan, and the 2022 Hydrogeologic Site Investigation (Ramboll, 2023d). The UA at the Site is the shallow Pennsylvanian and Mississippian-aged bedrock that immediately underlies the unlithified deposits. The shallow bedrock yields water through interconnected secondary porosity features (*e.g.,* cracks, fractures, crevices, joints, bedding planes, and other secondary openings). The shallow bedrock is the only water-bearing unit that is continuous across the Site. Groundwater in the Pennsylvanian and Mississippian-aged bedrock mainly occurs under semi-confined to confined conditions with the overlying unlithified unit behaving as the upper confining unit to the UA. Off-site, immediately upgradient and downgradient of the BPP property boundaries, both the shallow glacial deposits and the shallow bedrock have served as a source of water supply (see water well survey in Section 5.1 of the revised HCR; Ramboll, 2023d). The shallow unlithified deposits off-site have yielded water through intermittent, discontinuous sand lenses and, in the bedrock, through fractured sandstone and limestone. However, within the boundaries of the Site, only thin and intermittent sand lenses are present within predominantly clay deposits; thus, the unlithified materials do not represent a continuous aquifer unit. Based on the above, the Bedrock Unit is the only viable aquifer in the vicinity of the Site and was designated as the UA in the Supplemental Hydrogeologic Site Characterization and Groundwater Monitoring Plan (NRT, 2016b), consistent with the United States Environmental Protection Agency (USEPA) definition in Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257.53.

Water quality in the UA (*i.e.,* Pennsylvanian and Mississippian-aged bedrock) decreases with increasing depth as water becomes increasingly mineralized. Further, the ability of the unit to store and transmit water is dependent on the density of bedrock features that contribute to secondary porosities and whether those features are interconnected enough to yield water. Therefore, the lower limit of the UA is the depth at which either the groundwater is mineralized to a point that it is no longer a useable water source, or the secondary porosities do not yield a sufficient volume of groundwater to produce a useable water supply.

A monitoring well network was included in a proposed BAP GMP (Ramboll 2021a) to satisfy requirements of 35 I.A.C. § 845 and was submitted as part of the operating permit application for the BAP in 2021. Additional wells completed in 2022 are included in a revision to the

proposed GMP (Ramboll, 2023b) that will be included as part of the construction permit application for submittal to IEPA no later than August 1, 2023. A review and summary of data collected from 2015 through May 2023 are included in the revised HCR (Ramboll, 2023d). Groundwater data collected from the 40 C.F.R. § 257 network monitoring wells and proposed 35 I.A.C. § 845 monitoring wells between 2015 and 2023 were evaluated with respect to standards included in 35 I.A.C § 845.600(a)(1) in the revised HPE (**Appendix A**, Ramboll, 2023c). This data set was selected because it includes parameters (total metals) consistent with the parameter list in 35 I.A.C. § 845.600(a)(1). Based on this data set, there were no consistent and/or significant concentrations of antimony, barium, boron, cadmium, calcium, mercury, molybdenum, pH, selenium, sulfate, and total dissolved solids (TDS) greater than the GWPSs. A summary of groundwater statistical analysis is provided in the revised HPE (Ramboll, 2023c). The Determination of Potential Exceedances (Table 1 of **Appendix A**) and Summary of Potential Exceedances (Table 2 of **Appendix A**) indicate the parameter well pairs listed below were detected at concentrations greater than the applicable 35 I.A.C. § 845.600(a)(1) standards and are considered potential exceedances:

- Arsenic at well OW-257
- Beryllium at well OW-257
- Chromium at well OW-257
- Chloride at well MW-370
- Cobalt at well OW-257
- Fluoride at well MW-393
- Lead at well OW-257
- Lithium at well OW-257
- Radium 226 and 228 combined at well OW-257
- Thallium at well OW-257

An ASD (**Appendix B**) was prepared by Ramboll (2023a) to further evaluate previously identified potential GWPS exceedances at UU compliance well MW-370. The results of the evaluation demonstrated that the potential GWPS exceedance of lithium in well MW-370 was not related to the BAP based on several lines of evidence presented in the ASD. Additional data is being collected to support multiple lines of evidence demonstrating the CCR unit is also not the source of observed detections of lithium at OW-257. Since an ASD is being pursued, and potential GWPS exceedances for lithium are not related to the BAP, lithium will not be discussed further in this GMR.

ASDs will be pursued for potential exceedances of chloride and fluoride at wells MW-370 and MW-393, respectively. ASDs will also be pursued for potential exceedances at proposed UU compliance well OW-257. Additional data is being collected to support multiple lines of evidence demonstrating the CCR unit is not the source of observed detections. Since ASDs are being pursued, arsenic, beryllium, chromium, chloride, cobalt, fluoride, lead, lithium, radium 226 and 228 combined, and thallium will not be discussed further in this GMR.

Quarterly monitoring under 35 I.A.C. § 845.650(b) will commence no later than the second quarter of 2023. As such, comparisons of groundwater contaminant concentrations to the GWPS

in this report are considered potential exceedances. Potential exceedances of the GWPS are presented in the attached revision to the History of Potential Exceedances (**Appendix A**). Based on statistical analysis, evaluation of subsequent potential exceedances of the GWPS, and intention to pursue ASDs, it has been determined there are no potential exceedances of applicable groundwater standards attributable to the BAP.

4. GROUNDWATER MODEL

4.1 Overview

Data collected from previous field investigations, as well as the lithologic contact, groundwater elevation, and boron concentration data from 2022 Hydrogeologic Site Investigation and subsequent groundwater sampling events included in the revised HCR (Ramboll, 2023d), were used to develop a groundwater flow and transport model for the BAP. The MODFLOW (flow) and MT3DMS (transport) models were used to evaluate one closure scenario: CCR consolidation and CIP using information provided in the CCR Surface Impoundment Final Closure Plan (Geosyntec, 2022a). The results of the MODFLOW and MT3DMS modeling of the CIP closure scenario are summarized in this GMR. Associated model files are included as **Appendix C.** Contaminant transport modeling was completed in 2023 following the collection of additional groundwater samples from the monitoring wells installed in 2022. Transport modeling results are provided in this revised GMR and will be included in a construction permit application for submittal to IEPA no later than August 1, 2023.

4.2 Conceptual Site Model

The revised HCR (Ramboll, 2023d) is the foundation document for the site setting and CSM that describes groundwater flow at the Site. Additional hydrogeologic data was collected after submittal of the initial in 2021 HCR (Ramboll, 2021c) during the 2022 Hydrogeologic Site Investigation and included in this GMR to support the CSM and develop the model. The BAP overlies the recharge area for the underlying geologic media (*i.e.,* low permeability clays of the UU). Groundwater enters the model domain vertically via recharge. Groundwater may also enter or exit the model through the Cooling Pond, Secondary and Tertiary Ponds, the Kaskaskia River, or the many tributary streams located within the model domain. Groundwater may also exit the model through surface water management features within the BAP. Groundwater in the unlithified materials consistently flows east to west towards the Kaskaskia River. Groundwater flow in bedrock is northwest in the east and central areas of the BAP, and southwest to northwest on the east area of the FAPS until groundwater reaches the bedrock valley feature underlying the Secondary and Tertiary Ponds west of the BAP and FAPS, at which point the flow direction veers towards this bedrock surface low at the southwestern corner of the Site.

Groundwater contaminant transport modeling was completed to demonstrate how the proposed CIP closure scenario will maintain compliance with the applicable GWPS. Boron is commonly used as an indicator parameter for contaminant transport modeling for CCR because it is commonly present in coal ash leachate and it is mobile (*i.e.*, has low rates of sorption or degradation) in groundwater. The revision to the History of Potential Exceedances (**Appendix A**, Ramboll, 2023c) did not identify boron as a potential exceedance of the GWPS; however, boron has been detected in BAP porewater and groundwater. Therefore, groundwater transport modeling was completed using boron. The BAP and FAPS were modeled as sources of boron within the model domain. The BAP and FAPS are constructed over low permeability clays of the UU. Mass (boron) is added to groundwater via vertical recharge through CCR, and horizontal groundwater flow through CCR where it is in contact with the water table. Boron mass flows with groundwater (onsite groundwater flow directions described above). The primary transport pathway is the UA which underlies the BAP and is continuous across the entire Site. The UU also contains PMPs in the form of thin discontinuous sand seams within the UU or at the interface (contact) between the UU and bedrock where hydraulic conductivities are relatively higher.

4.3 Model Approach

A three-dimensional groundwater flow and transport model was calibrated to represent the conceptual flow system described above. Initial steady state flow modeling was performed to represent current Site conditions in 2022 following closure of the FAPS in 2020. This flow model was calibrated to match median groundwater elevations for recent groundwater elevation data. The calibrated steady state flow model was used to develop a calibrated transient flow and transport model to match recent boron concentrations observed at each monitoring well. The calibrated model was then used to evaluate the effectiveness of the CIP closure scenario. The start of the transient flow and transport model was initiated in 1970 (model year 0) when the BPP began operation and the BAP and FAPS were active (initial conditions model) through 2020 (51 model years) when closure at the FAPS was complete. Three models were included for the closure prediction simulation. The first model simulated an extended period of current conditions, 2021 to 2024 (4 model years). The second model simulated a period for the removal of free liquids, 2025 to 2027 (3 model years). The third model simulated the final closure conditions, 2028 to 3027 (1,000 model years). The prediction modeling timeline for the CIP closure scenario is illustrated in **Figure 4-1**.

Three model codes were used to simulate groundwater flow and contaminant transport:

- Groundwater flow was modeled in three dimensions using MODFLOW 2005
- Contaminant transport was modeled in three dimensions using MT3DMS
- Percolation (recharge) after consolidation of CCR and cover system construction was modeled using the results of the Hydrologic Evaluation of Landfill Performance (HELP) model.

5. MODEL SETUP AND CALIBRATION

5.1 Model Descriptions

For the construction and calibration of the numerical groundwater flow model for the Site, Ramboll selected the model code MODFLOW, a publicly available groundwater flow simulation program developed by the United States Geological Survey (USGS) (McDonald and Harbaugh, 1988). MODFLOW is thoroughly documented, widely used by consultants, government agencies and researchers, and is consistently accepted in regulatory and litigation proceedings. MODFLOW uses a finite difference approximation to solve a three-dimensional head distribution in a transient, multi-layer, heterogeneous, anisotropic, variable-gradient, variable-thickness, confined or unconfined flow system—given user-supplied inputs of hydraulic conductivity, aquifer/layer thickness, recharge, wells, and boundary conditions. The program also calculates water balance at wells, rivers, and drains.

Major assumptions of the MODFLOW code are: (i) groundwater flow is governed by Darcy's law; (ii) the formation behaves as a continuous porous medium; (iii) flow is not affected by chemical, temperature, or density gradients; and (iv) hydraulic properties are constant within a grid cell. Other assumptions concerning the finite difference equation can be found in McDonald and Harbaugh (1988). MODFLOW 2005 was used for these simulations with Groundwater Vistas 8 software for model pre- and post- processing tasks (Environmental Simulations, Inc., 2018).

MT3DMS (Zheng and Wang, 1998) is an update of MT3D. It calculates concentration distribution for a single dissolved solute as a function of time and space. Concentration is distributed over a three-dimensional, non-uniform, transient flow field. Solute mass may be input at discrete points (wells, drains, river nodes, constant head cells), or distributed evenly or unevenly over the land surface (recharge).

MT3DMS accounts for advection, dispersion, diffusion, first-order decay, and sorption. Sorption can be calculated using linear, Freundlich, or Langmuir isotherms. First-order decay terms may be differentiated for the adsorbed and dissolved phases.

The program uses the standard finite difference method, the particle-tracking-based Eulerian-Lagrangian methods, and the higher-order finite-volume total-variation-diminishing (TVD) method for the solution schemes. The finite difference solution has numerical dispersion for low-dispersivity transport scenarios but conserves good mass balance. The particle-tracking method avoids numerical dispersion but was not accurate in conserving mass. The TVD solution is not subject to significant numerical distribution and adequately conserves mass, but is numerically intensive, particularly for long-term models such as developed for the BAP. The finite difference solution was used for this simulation.

Major assumptions of MT3DMS are: (i) changes in the concentration field do not affect the flow field; (ii) changes in the concentration of one solute do not affect the concentration of another solute; (iii) chemical and hydraulic properties are constant within a grid cell; and (iv) sorption is instantaneous and fully reversible, while decay is not reversible.

The HELP model was developed by the USEPA. HELP is a one-dimensional hydrologic model of water movement across, into, through, and out of a landfill or soil column based on precipitation, evapotranspiration, runoff, and the geometry and hydrogeologic properties of a layered soil and

waste profile. For this modeling, results of the HELP model, HELP Version 4.0 (Tolaymat and Krause, 2020), were used to estimate the hydraulic conditions beneath consolidation areas.

5.2 Flow and Transport Model Setup

The modeled area was approximately 11,125 feet (445 rows) by 16,375 feet (655 columns) with the BAP located in the east-central portion of the model. The western edge of the model is bounded by the Kaskaskia River. The north, east, and south edges of the model were selected to maintain sufficient distance from the BAP to reduce boundary interference with model calculations, while not extending too far past the extent of available calibration data. The model area is displayed in **Figure 5-1**.

The MODFLOW model was calibrated to median groundwater elevation collected from December 2015 to June 2022. The flow model calibration targets are presented in **Table 2-2**. MT3DMS was run on the calibrated flow model and model-simulated concentrations were calibrated to the range of observed boron concentration values at the monitoring wells from December 2015 to December 2022 presented in **Table 2-2**. Multiple iterations of MODFLOW and MT3DMS calibration were performed to achieve an acceptable match to observed flow and transport data. For the BAP, the calibrated flow and transport models were used in predictive modeling to evaluate the CIP closure scenario by consolidating CCR and using HELP modeled recharge values to simulate changes proposed in the closure scenario.

5.2.1 Grid and Boundary Conditions

A six-layer, 445 x 655 node grid was established with 25-foot grid spacing in the vicinity of the BAP and BPP property. The grid increases gradually to a maximum 450-foot row spacing and 225-foot column spacing near the edges of the model. The model grid and boundary conditions are illustrated in **Figures 5-2 through 5-7**. All edges of the model are no-flow (*i.e.,* Neumann) boundaries in all layers of the model with the exceptions of the western edge in layer 4, where a river (mixed) boundary was placed to simulate the mean flow conditions of the Kaskaskia River, and vary between no-flow (*i.e.,* Neumann) and river (*i.e.,* mixed) boundaries on the northern edge in layers 2 through 4, where a river (*i.e.,* mixed) boundary was placed to simulate the Cooling Pond, and the southern edge in layers 2 through 4, where river (*i.e.,* mixed) boundary was placed to simulate the southernmost tributary. The limits of the model domain approximate the limits of the Kaskaskia River subwatershed (Hydrologic Unit Code [HUC] boundary) in which the BPP and BAP reside. The top of the model was a time-dependent specified flux (*i.e.,* Neumann) boundary, with specified flux rates equal to the recharge rate. Surface water features within the active BAP were simulated in the model as constant head boundaries.

5.2.2 Flow Model Input Values and Sensitivity

Flow model input values and sensitivity analysis results are presented in **Table 5-1** and described below.

The modeled well location layers and flow model calibration targets (*i.e.*, median groundwater elevations from December 2015 to June 2022 [or November 2022 groundwater elevations for wells constructed or reoccupied in 2022] and target well locations) are summarized in **Table 2-2**. Anomalous groundwater elevations (*e.g.,* groundwater elevations that do not represent static groundwater conditions, groundwater elevation outliers, or groundwater elevations measured in error) monitored between December 2015 and June 2022 were removed from the median groundwater elevation calculations used as flow calibration targets. UU wells MW-151, MW-154,

MW-252, and MW-253 are screened just above or at the interface between the UU and decomposed bedrock of the UA and may be hydraulically connected to multiple hydrostratigraphic units (*i.e.,* multiple modeled layers). In the flow calibration model, flow calibration targets for UU wells MW-151, MW-154, MW-252, and MW-253 were placed in the decomposed bedrock model layer, which exhibited heads more representative of the groundwater observations in these wells.

Sensitivity analysis was conducted by changing input values and observing changes in the sum of squared residuals (SSR). Horizontal conductivity, vertical conductivity, and river conductance terms were all varied between one-tenth and ten times calibrated values. Recharge terms were varied between one-half and two times calibrated values. River stage for river reach 0 (*i.e.,* Cooling Pond) and river reach 1 (*i.e.,* Kaskaskia River) were varied between 98.5 and 101.5 percent of calibrated values. River stage for river reaches 2 through 8 and constant head reaches 0 and 1 were varied between 99.5 and 100.5 percent of calibrated values. When the calibrated model was tested, SSR was 1,210.53. Sensitivity test results were categorized into negligible, low, moderate, moderately high, and high sensitivity based on the change in SSR as summarized in the notes in **Table 5-1**.

5.2.2.1 Model Layers

All available boring log data included in the revised HCR (Ramboll, 2023d) and lithologic contacts from the 2022 Hydrogeologic Site Investigation activities were used to develop surfaces utilizing Surfer® software for each of the three distinct water-bearing units described in **Section 2**. Layer 1 (**Figure 5-8**) modeled only CCR material within the limits of the BAP and FAPS; no flow cells were used outside the limits of the CCR units. The approximate base of ash surface in the BAP was provided by Geosyntec, which was developed using historic pre-construction topographic maps and incorporated base of ash data collected by Ramboll from borings within the BAP completed in 2022. The approximate base of ash surface in the FAPS was developed using historic pre-construction topographic maps. The modeled UU was split into three modeled layers, where model layer 2 (**Figure 5-9**) represented the upper silty clay of the UU, model layer 3 (**Figure 5-10**) represented a discontinuous transmissive zone within the UU (this unit is considered a PMP) or represented the approximate top of Vandalia Till/lower silty clay of UU in absence of a transmissive zone, and model layer 4 (**Figure 5-11**) represented the lower silty clay of the UU. Model layer 5 (**Figure 5-12**) represented the decomposed bedrock of the UA near the contact between the UU and UA. Model layer 6 (**Figure 5-13**) represented the deeper more competent bedrock of the UA. The bottom elevation of the UA (*i.e.,* bedrock) in layer 6 was flat lying and assumed to be an elevation of 200 feet NAVD88. The resulting surfaces were imported as layers into the model to represent the distribution and change in thickness of each water-bearing unit across the model domain.

5.2.2.2 Hydraulic Conductivity

Hydraulic conductivity values and sensitivity results are summarized in **Table 5-1**. When available, these values were derived from field or laboratory measured values reported in the revised HCR (Ramboll, 2023d) and collected during the 2022 Hydrogeologic Site Investigation, to be representative of site-specific conditions. The sources of the hydraulic conductivity values are summarized in **Table 5-1**. Conductivity zones that did not have representative site data were determined through model calibration. No horizontal anisotropy was assumed. Vertical anisotropy (presented as Kh/Kv in **Table 5-1**) was applied to conductivity zones to simulate preferential flow in the horizontal direction in the UU and UA.

The spatial distribution of the hydraulic conductivity zones in each layer (**Figures 5-14 through 5-19**) simulates the distribution of hydraulic conductivity as reported in the revised HCR (Ramboll, 2023d) and determined from hydrogeologic data collected during the 2022 Hydrogeologic Site Investigation. All hydraulic conductivity zones were laterally continuous within the model with the exception of the CCR hydraulic conductivity zones Old East Fly Ash Pond, East Fly Ash Pond, West Fly Ash Cell, and BAP (zones 2, 3, 4, and 7); the fill at the BAP and FAPS boundary (zone 16), the river alluvium hydraulic conductivity zone (zone 12); and the PMP hydraulic conductivity zone (zone 14). The limits of the ash fill were determined from data presented in the revised HCR (Ramboll, 2023d) and determined from hydrogeologic data collected during the 2022 Hydrogeologic Site Investigation. The ash fill extent was propagated through all related ash fill property zones (*i.e.*, recharge, storage, specific yield [S_y], and effective porosity). Conductivity zone 100 (identified on figures as "Above River BC") was placed above river cells to improve communication between the river and the groundwater in layers above the layer in which the river boundary condition was placed.

The model had a high sensitivity to changes in horizontal conductivity in zone 9 (*i.e.,* UA), and a moderate sensitivity in zone 1 (*i.e.,* UU), zone 7 (*i.e.,* BAP), and zone 14 (*i.e.,* PMP); the model had a low or negligible sensitivity to changes in horizontal conductivity in the remaining hydraulic conductivity zones. The model had a moderate sensitivity to changes in vertical conductivity in zone 1 (*i.e.,* UU) and zone 9 (*i.e.,* UA), while the model exhibited a negligible sensitivity in the remaining hydraulic conductivity zones.

5.2.2.3 Recharge

Recharge rates (**Table 5-1**) were determined through calibration of the model to median groundwater elevation collected from December 2015 to June 2022, as presented in **Table 2-2**. The spatial distribution of recharge zones was based on the location and type of material present at land surface (**Figure 5-20**). Seven different zones were created to simulate recharge in the model area. A single silty clay zone (zone 1) was used to simulate ambient recharge over the upper silty clay of the UU outside the limits of the CCR units. Zones 5 and 6 were used to simulate recharge over the upper silty clay of the UU in the area of the Secondary Pond and Tertiary Pond, respectively. The recharge occurring through the ash fill placed in the FAPS and BAP was split into four different values, where recharge was varied based upon the historical use of each ash fill area and the response of flow calibration target heads. Post-closure FAPS recharge rates for the Old East Ash Pond, East Fly Ash Pond, and West Fly Ash Cell (zones 2, 3, and 4) were consistent with previous prediction modeling values used for the proposed cover system at the FAPS (NRT, 2014b). The BAP was simulated with a single zone (zone 7) which also had the greatest recharge value within the model domain.

The model had low sensitivity to changes in recharge in all zones, with the exception of zones 5 (Secondary Pond) and 6 (Tertiary Pond), where sensitivity was negligible.

5.2.2.4 Storage and Specific Yield

The calibration model did not use these terms because it was run at steady state. For the transport model, which was run in transient, no field data defining these terms were available so published values were used consistent with Fetter (1988). S_y was set to equal effective porosity values described in **Section 5.2.3.3**. The spatial distribution of the storage and S_y zones were consistent with those of the hydraulic conductivity zones. The sensitivity of these parameters was tested by evaluating their effect on the transport model as described in **Section 5.2.3.4**.

5.2.2.5 River Parameters

River reaches are illustrated in **Figure 5-1**. The Kaskaskia River was simulated using head-dependent flux nodes in modeled river reach 1 that required inputs for river stage, width, bed thickness, and bed hydraulic conductivity (**Table 5-1**). River width, bed thickness, and bed hydraulic conductivity parameters were used to calculate a conductance term for the boundary node. This conductance term was determined by adjusting hydraulic conductivity during model calibration. The calibrated hydraulic conductivity value was set at 5.17 ft/day. The length of the modeled river extends from the northernmost extent of the model domain to the southernmost extent of the model domain using river reach 1. The modeled river stage in the calibration model was based on available Kaskaskia River stage data at Red Bud, Illinois (USGS 05595240) and at New Athens, Illinois (USGS 05595000) gaging stations in 2021 and 2022. No slope was applied to the upstream and downstream modeled river stage as calculated gradients between the two gaging stations were determined to be negligible across the length of the model domain. The river boundary was placed in layer 4 corresponding with simulated river elevation (**Figure 5-5**).

The Cooling Pond was simulated using head-dependent flux nodes in modeled river reach 0 (**Table 5-1**). The conductance term was determined by adjusting hydraulic conductivity during model calibration. The calibrated hydraulic conductivity value was set at 3.8 ft/day. The river stage in the calibration model approximated the elevation at which the Cooling Pond is maintained (Ramboll, 2023d). The river boundary was placed in layers 2 through 4 corresponding with simulated river elevation (**Figures 5-3 through 5-5**).

The Secondary and Tertiary ponds were simulated using head-dependent flux nodes in modeled river reach 8 (**Table 5-1**). The conductance term was determined by adjusting hydraulic conductivity during model calibration. The calibrated hydraulic conductivity value was set at 0.26 ft/day. The river stage in the calibration model approximated historic groundwater elevations measured in monitoring well TPZ-165 placed within the limits of the Secondary Pond (**Figure 2-1**) (NRT, 2014a). The bottom of the river boundary was estimated using historic topographic maps and placed in layers 2 through 6 corresponding with simulated river elevation (**Figures 5-3 through 5-7**).

The remaining tributaries were simulated using head-dependent flux nodes in modeled river reaches 2 through 5 and reach 7 (**Table 5-1**). The conductance terms were determined by adjusting hydraulic conductivity during model calibration. Calibrated hydraulic conductivity values by tributary river reach are shown in **Table 5-1**. The river stage in the calibration model approximated local topography for each reach. The river boundaries were placed in layers 2 through 5 corresponding with simulated river elevation (**Figures 5-3 through 5-6**).

The model had moderate and high sensitivity to changes in river stage at reach 0 (Cooling Pond) and reach 1 (Kaskaskia River), respectively. The model had high sensitivity at reach 7 (northeast stream [east of Cooling Pond]) and moderate to moderately high sensitivity at reach 3 (south stream [between reach 2 and reach 4]) and reach 4 (south stream [adjacent to FAPS]) (**Table 5-1**). The remaining river reaches had low to negligible sensitivity to changes in river stage. The model had negligible sensitivity to changes in river conductance.

5.2.2.6 Constant Head Boundary Parameters

Surface water features within the active BAP were simulated in the model as constant head boundaries. The constant head boundaries required inputs for head at the boundaries (elevation).

These constant head boundary features act as discharge features within the BAP, which is consistent with stormwater management practices within the active BAP (AECOM, 2016b). The head at the boundaries for reaches 0 and 1 estimated water surface elevation within the BAP. The constant head boundaries were placed in layer 1 within the BAP (**Figure 5-2**).

The model had negligible sensitivity to changes in head in reach 0 (BAP constant head west) and reach 1 (BAP constant head central).

5.2.3 Transport Model Input Values and Sensitivity

MT3DMS input values are listed in **Table 5-2** and described below. Sensitivity of the transport model is summarized in **Table 5-3**.

Groundwater transport was calibrated to groundwater boron concentration ranges at each well as measured from the monitoring wells between December 2015 and December 2022. The transport model calibration targets are summarized in **Table 2-2**.

Sensitivity analysis was conducted by changing input values and observing percent change in boron concentration at each well from the calibrated model boron concentration. Effective porosity was varied by decreasing and increasing calibrated model values by 0.05. Storage values were multiplied and divided by a factor of 10, and S_y by a factor of 2. High S_y sensitivity was not analyzed for zone 100 (identified on figures as “Above River BC”) since the calibration value was already near upper limits of acceptable values for S_y (0.5).

5.2.3.1 Initial Concentrations

No initial concentrations were placed in the calibration model. The flow model was run as transient, and concentration was added to the model through recharge and constant concentration cells starting at the same time as the flow simulation. Two models (Calibration Model 1 and Calibration Model 2) run in series were used to calibrate concentrations to current observations and simulate changes in CCR unit operations at the Site from construction (1970) to present day (2022 [*i.e.,* current conditions]). The first model (Calibration Model 1) started at the time of BAP and FAPS construction (1970) and ended in 2020 (51-year calibration model period) when the FAPS was closed. The second model (Calibration Model 2) started in 2021 and ended in 2022 (2-year calibration model period) following the FAPS closure and included reduced recharge in the FAPS consistent with estimated closed FAPS recharge values in the 2014 FAPS groundwater modeling report (NRT, 2014b; NRT, 2014c), and removal of constant head cells in the West Ash Pond that were used to simulate stormwater management operations in the active FAPS in Calibration Model 1 to simulate the reduced activity in this area of the pond. The transport model timeline is illustrated in **Figure 4-1**.

5.2.3.2 Source Concentrations

Five concentration sources in the form of vertical percolation (recharge zones) through CCR were simulated in layer 1 for calibration (**Figure 5-20 and Table 5-2**) (recharge zones in order of greatest to least simulated recharge): (i) percolation through CCR in the active BAP (zone 7, BAP [West]; zone 8, BAP [East]), and (ii) percolation through CCR in the FAPS (zone 2, Old East Fly Ash Pond; zone 3, East Fly Ash Pond; zone 4, West Fly Ash Pond) active 1970 to 2020 (Calibration Model 1) and closed 2020 to 2022 (Calibration Model 2). All five sources were simulated by assigning concentration to the recharge input. Recharge rates in the active BAP were consistent across zone 7 (BAP [West]) and zone 8 (BAP [East]) which approximately bisect

the active BAP; however, concentrations applied to recharge zones 7 and 8 were 4 and 1.5 mg/L, respectively, to reflect concentrations of boron observed at CCR porewater wells in each side of the active BAP.

The CCR sources were also simulated with constant concentration cells placed in layer 1 to simulate saturated ash conditions (see constant concentration cell reaches described in **Table 5-2**). From the model perspective, this means that when the simulated water level is above the base of these cells, water that passes through the cell will take on the assigned concentration. The spatial distributions of source concentrations applied to constant concentration cell reaches (saturated ash cells) are consistent with the spatial distributions of concentrations applied to the recharge zones. All source concentrations were calibrated in the transport model to the boron concentration data collected from December 2015 to December 2022.

Because these are the sources of concentration in the model, the model will be highly sensitive to changes in the input values. For that reason, sensitivity testing was not completed for the source values.

5.2.3.3 Effective Porosity

Effective porosity for each modeled zone were derived from an average between estimated values of 0.20 for silt material, 0.267 for gravel, 0.07 for clay, and 0.28 for sand (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983), for each material modeled then adjusted during model calibration and presented in **Table 5-2**. The spatial distribution of the effective porosity zones was consistent with those of the hydraulic conductivity zones.

Sensitivity testing was completed on all wells and the results are provided in **Table 5-3**. Monitoring locations where the calibrated and tested concentrations were below 0.1 mg/L boron are not included in the following discussion of model sensitivity to boron transport. The model had a negligible to moderately high sensitivity to decreases in porosity values, with exception of MW-382 where sensitivity was high. The model had a negligible to moderate sensitivity to increases in porosity values, with exception of three monitoring locations where sensitivity was moderately high (*i.e.,* MW-382, MW-385, and MW-390).

5.2.3.4 Storage and Specific Yield Sensitivity

Sensitivity testing was completed on all wells and the results are provided in **Table 5-3**. Monitoring locations where the calibrated and tested concentrations were below 0.1 mg/L boron are not included in the following discussion of model sensitivity to boron transport. The transport model had a negligible to moderate sensitivity to decreases in storage and S_y, with exception of seven monitoring locations where sensitivity was moderately high (i.e., MW-151, MW-366, MW-375, MW-382, MW-384, MW-385, and MW-390). The transport model had a negligible to moderately high sensitivity to increases in storage and S_y, with exception of three monitoring locations where sensitivity was high (i.e., MW-382, MW-385, and MW-390).

5.2.3.5 Dispersivity

Physical attenuation (dilution and dispersion) of contaminants is simulated in MT3DMS. Dispersion in porous media refers to the spreading of contaminants over a greater region than would be predicted solely from the average groundwater velocity vectors (Anderson, 1979; Anderson, 1984). Dispersion is caused by both mechanical dispersion, a result of deviations of actual velocity at a microscale from the average groundwater velocity, and molecular diffusion

driven by concentration gradients. Molecular diffusion is generally secondary and negligible compared to the effects of mechanical dispersion and only becomes important when groundwater velocity is very low [immobile water]. The sum of mechanical dispersion and molecular diffusion is termed hydrodynamic dispersion, or simply dispersion (Zheng and Wang, 1998).

Dispersivity values were applied to the entire model domain and determined during calibration. Longitudinal dispersivity was set at 5 feet. The transverse and vertical dispersivity were set at 1/10 and 1/100 of longitudinal dispersivity. These input values were determined during model calibration. With travel distances of less than 100 feet for groundwater from the source to the majority of the monitoring points, the model is not expected to be sensitive to dispersivity inputs and the sensitivity of the model to dispersivity was not tested.

5.2.3.6 Retardation

It was assumed that boron would not significantly sorb or chemically react with aquifer solids (distribution coefficient [Kd] was set to 0 milliliters per gram [mL/g]) which is a conservative estimate for estimating contaminant transport times. Boron transport is likely to be affected by both chemical and physical attenuation mechanisms (*i.e.*, adsorption and/or precipitation reactions as well as dilution and dispersion). Further assessment of these processes and how they affect boron transport at the Site will be completed as part of future remedy selection evaluations. For the purposes of this GMR, and as mentioned at the beginning of this section, no retardation was applied to boron transport in the model (*i.e.,* Kd was set to 0).

5.3 Flow and Transport Model Assumptions and Limitations

Simplifying assumptions were made while developing this model:

- Following closure of the FAPS in 2020, the groundwater flow system can be simulated as steady state for calibration to current conditions.
- Natural recharge is constant over the long term.
- Fluctuations in river stage do not affect groundwater flow over the long term.
- Hydraulic conductivity is consistent within each material (hydraulic conductivity zone) modeled.
- The approximate base of ash surface in the BAP was provided by Geosyntec, which was developed using historic pre-construction topographic maps and incorporated base of ash data collected by Ramboll from borings within the BAP completed in 2022. The approximate base of ash surface in the FAPS was developed using historic pre-construction topographic maps.
- Constant head cells were used to simulate surface water management features during operation of the CCR units.
- Recharge rates were modified, and constant head cells were removed after 2020 in the area of the FAPS to simulate closure.
- Source concentrations are assumed to remain constant over time. Only recharge rate was modified after 2020 to simulate FAPS closure.
- Boron is not adsorbed and does not decay; mixing and dispersion are the only attenuation mechanisms.

The model is limited by the data used for calibration, which adequately define the local groundwater flow system and the source and extent of the plume. Since data used for calibration are near the BAP and FAPS, model predictions of transport distant spatially and temporally from the calibrated conditions at the CCR units will not be as reliable as predictions closer to the CCR units and concentrations observed between 2015 and 2022.

5.4 Calibration Flow and Transport Model Results

Results of the MODFLOW modeling are presented below. Electronic copies of the model files are attached to this report (**Appendix C**).

Observed and simulated heads are presented in **Figure 5-21 through Figure 5-28**. The mass balance error for the flow model was 0.02 percent and the ratio of the residual standard deviation to the range was 5.4 percent. The mass balance error for the flow model was within the target for the criteria of 1 percent and the ratio of the residual standard deviation to the range was within the target for the criteria of 10 percent. Another flow model calibration goal is that residuals are evenly distributed such that there is no bias affecting modeled flow. The observed heads are plotted versus the simulated heads and identified by layer in **Figure 5-21**. The near-linear relationship between observed and simulated values indicates that the model adequately represents the calibration dataset. The residual mean was -1.33 feet; in general, the simulated values were evenly distributed above and below the observed values. This is also illustrated by layer in the observed versus residuals plot **Figure 5-22**. Some simulated values were overpredicted (negative values on **Figure 5-22**), where the most significant overpredicted values (exceeding 10 feet) were primarily within the UA (bedrock) of layer 6, largely at lower groundwater elevations near the Secondary and Tertiary Ponds, near the southwest boundary of the West Ash Pond of the FAPS, or in bedrock wells screened below the decomposed bedrock. These residuals plot in the lower left quadrant of **Figure 5-22**.

The range of observed boron concentrations between December 2015 and December 2022 for the fifty (50) transport calibration locations are summarized in **Table 2-2**. The goals of the transport model calibration were to have predicted concentrations fall within the range of observed concentrations, and/or have predicted concentrations above and below the GWPS for boron (2 mg/L) match observed concentrations above or below the standard at each well. Twenty (20) transport calibration locations had observed boron concentrations that ranged above and below the GWPS for boron (2 mg/L); for these locations the goal of transport model calibration was to have predicted concentrations above and below the GWPS for boron match observed median concentrations above or below the standard at each well (for example, if the median observed concentration for a well was above the GWPS, the goal is to have predicted concentrations above the GWPS at the well). One or more of these goals were achieved at all but five of the transport calibration location wells, specifically MW-150, MW-151, MW-356, MW-385, and MW-394, where concentrations were underpredicted with the exception of MW-151, where concentrations were overpredicted (**Figure 5-29**). Deviations from the observed boron concentrations are discussed below.

- MW-150, MW-356, and MW-394 were underpredicted transport calibration locations and had observed boron concentrations that ranged above and below the GWPS for boron (2 mg/L) with median observed concentrations only slightly above the GWPS for boron at 2.12, 2.01, and 2.02 mg/L, respectively.

- UU well MW-150 is nested with MW-350 at the southwest corner of the Site near the Tertiary Pond. The MW-150/MW-350 well nest was observed to have generally downward vertical gradients in the revised HCR (Ramboll, 2023d); however, other nested wells near the Secondary and Tertiary ponds indicate the presence of upward gradients between the UA and UU. The model calibration resulted in upward vertical gradients in these areas including the MW-150/MW-350 wells nest. The modeled gradients at this well nest likely inhibit the downward migration of simulated boron concentrations to MW-150. Nested well MW-350 has low observed boron concentrations and met the model calibration criteria discussed above.
- In general, the model under-predicts boron concentrations in bedrock locations like MW-356 and MW-394 where the range of concentrations observed (1.79 to 2.92 mg/L and 1.87 to 2.23 mg/L, respectively) are near the range of observed boron concentrations in upgradient bedrock wells like MW-304, where concentrations range from 1.27 to 2.16 mg/L. Since no initial concentrations were placed in the calibration model to represent the presence of boron observed in background wells, it is expected that the model may under-predict boron concentrations within the range of observed background.
- MW-385 is an under-predicted bedrock well identified as a UA well in the revised HCR (Ramboll, 2023d). MW-385 was installed in December 2015 on the former berm that was located between the active FAPS East Ash Pond and West Ash Pond. MW-385 was abandoned shortly after installation in February 2016, after collection of only one boron concentration data point. Since the data available for this well is limited, the usefulness of this location as a transport calibration point is also limited as the single data point may not be representative of current conditions. Like MW-385, MW-386 was abandoned shortly after installation, after collection of only one boron concentration data point, and was also located on the berm between the active FAPS East Ash Pond and West Ash Pond. Simulated boron concentrations at MW-386 met the calibration criteria discussed above; however, since the data available for this well is limited, like MW-385, the usefulness of this location as a transport calibration point is also limited as the single data point may not be representative of current conditions.
- MW-151 is identified as a UU well in the revised HCR (Ramboll, 2023d). MW-151 was constructed with a filter pack that extends from the UU into the weathered bedrock. This well was modeled in layer 5 which represents the decomposed bedrock rather than UU layers 2 through 4. Boron concentrations are over-predicted by the model at this location which may be associated with the well being screened across multiple model layers.

The remaining calibration locations had predicted concentrations that met one or more of the following goals of the transport model calibration: to have predicted concentrations fall within the range of observed concentrations; to have predicted concentrations above and below the GWPS for boron (2 mg/L) match observed concentrations observed above or below the standard at each well; and/or to have predicted concentrations above and below the GWPS for boron match observed median concentrations above or below the standard at each well. In other words, there was a very good match between predicted and observed boron concentrations relative to wells with concentrations above and below the GWPS. For example, UA well MW-391, located west of the FAPS, where the highest UA bedrock boron concentrations were observed, was calibrated near the median concentration of the observed values from December 2015 to December 2022. Similarly, UU well OW-157 located north of the East Ash Pond of the FAPS, where the highest concentrations in the UU were observed, had the highest predicted boron concentrations on Site. The calibration result for wells MW-391 and OW-157 indicate the transport calibration model was able to simulate the highest observed concentrations in both the UA and UU, respectively. The

simulated boron concentrations at porewater wells within the BAP also approximated the median of the observed boron concentrations, with the exception of XPW01 which was simulated as dry, indicating the simulated BAP boron source concentrations were representative. The distribution of boron concentrations in the calibrated model are presented on **Figure 5-30 through Figure 5-35**.

6. SIMULATION OF CIP CLOSURE SCENARIO

6.1 Overview and Prediction Model Development

Prediction simulations were performed to evaluate the effects of closure (source control) measures (CCR consolidation and CIP closure scenario) for the BAP on the groundwater quality following initial corrective action measures, which includes removal of free liquids from the BAP. As discussed in **Section 5.2.3.5**, physical attenuation (dilution and dispersion) of contaminants in groundwater is simulated in MT3DMS, which captures the physical process of natural attenuation as part of corrective actions for the closure scenario simulated. No retardation was applied to boron transport in the model (*i.e.,* Kd was set to 0) as discussed in **Section 5.2.3.6**. The following methods were used to develop the prediction models and simulate the CIP closure scenario:

- Extend the modeled existing conditions (calibration conditions) approximately 2 years prior to applying initial corrective action measures to allow time for IEPA coordination, approvals, and permitting; as well as the final design and bid process according to the schedule in the CCR Surface Impoundment Final Closure Plan (Geosyntec, 2022a).
- Define CCR removal and consolidation areas based on designs provided in the CCR Surface Impoundment Final Closure Plan (Geosyntec, 2022a).
- Apply several constant head cell areas to the BAP for the dewatering period (approximately 3 years) to remove free liquids within the BAP (initial corrective action measures).
- Apply drains (drain input parameters approximated designs provided in the CCR Surface Impoundment Final Closure Plan [Geosyntec, 2022a]) to simulate storm water management within CCR removal areas following closure.
- Apply no flow cells and remove recharge in the CCR removal areas to simulate the absence of material in model layer 1 following consolidation and cover system construction.
- Remove source concentrations within the CCR removal areas (source concentrations associated with recharge zones and saturated ash cells [constant concentration cells]).
- Apply reduced recharge in the consolidated CIP areas to simulate the effects of the cover system on the groundwater flow system (HELP calculated percolation rates were developed based on cover system construction materials and designs provided in the CCR Surface Impoundment Final Closure Plan (Geosyntec, 2022a).

HELP modeling input and output values are summarized in **Table 6-1** and described in detail below. Prediction simulations were performed to evaluate changes in the groundwater flow system from the CIP closure scenario. The following simplifying assumptions were made during the simulations:

- In the CIP closure scenario, HELP-calculated average annual percolation rates were developed from a 30-year HELP model run. This 30-year HELP-calculated percolation rate remained constant over duration of the closure scenario prediction model run following closure.
- Changes in recharge resulting from dewatering, CCR removal, consolidation, construction of the cover system, and final grading (recharge rates are based on HELP-calculated average annual percolation rates) have an instantaneous effect on recharge and percolation through surface materials.

- The geocomposite drainage layer and geomembrane liner placed over the ash consolidation area were assumed to have good field placement and assumed to have the same slope as the final grade of the overlying cover materials based on the design drawings provided in the CCR Surface Impoundment Final Closure Plan (Geosyntec, 2022a).
- CCR removal areas were assumed to have the same topography as the former approximated base of ash surface in the BAP.

6.2 HELP Model Setup and Results

HELP (Version 4.0; Tolaymat and Krause, 2020) was used to estimate percolation through the top and slopes of the BAP CIP Consolidation area. HELP files are included electronically (**Appendix C**), and outputs are attached to this report (**Appendix D**).

HELP input data and results are provided in **Table 6-1**. All scenarios were modeled for a period of 30 years. Climatic inputs were synthetically generated using default equations developed for Belleville Scott Air Force Base, Illinois (the closest weather station included in the HELP database). Precipitation, temperature, and solar radiation was simulated based on the latitude of the BAP. Thickness and type of the geosynthetic drainage layer, geotextile protective cushion layer, geomembrane liner, soil backfill, and soil runoff input parameters were developed for the ash consolidation scenario using data provided the CCR Surface Impoundment Final Closure Plan (Geosyntec, 2022a).

HELP model results (**Table 6-1**) indicated 0.000239 inches of percolation per year through the top of the BAP CIP consolidation and cover system area, and 0.000007 inches of percolation per year through the slopes of the BAP consolidation and cover system areas. The differences in HELP model runs for each area included the type of lateral drainage layer or cushion, soil runoff slope, and the soil runoff slope length; all other HELP model input parameters were the same for each simulated area. Two additional HELP model simulations were completed to support the *Proposed Alternative Final Protective Layer Equivalency Demonstration* (Geosyntec, 2022b) which is an appendix to the Construction Permit Application to which this report is also attached. Results of these two additional HELP simulations were not incorporated in the MODFLOW simulations for closure. Simulation inputs and output results are presented in **Appendix D**.

6.3 Simulation of CIP Closure Scenario

The calibrated model was used to evaluate the effectiveness of the CIP closure scenario by defining CCR removal and consolidation areas, reducing head to simulate a dewatering period (approximately 3 years), removing source concentrations within the removal areas, applying drains to simulate storm water management within CCR removal areas following closure, applying no flow cells and removing recharge in the CCR removal areas to simulate the absence of material in model layer 1 following closure, and applying reduced recharge in the consolidation and CIP areas to simulate the effects of the cover system on transport.

As discussed in the model approach **Section 4.3** and illustrated on **Figure 4-1**, the start of the transient flow and transport model was initiated in 1970 (model year 0), when the BPP began operation and the BAP and FAPS were active (initial conditions model), through 2020 (51 model years) when closure at the FAPS was complete. Three models were included for the closure prediction simulation. The first model simulated an extended period of current conditions, 2021 to 2024 (4 model years). The second model simulated a period for the removal of free liquids, 2025

to 2027 (3 model years). The third model simulated the final closure conditions, 2028 to 3027 (1,000 model years). The prediction model input values are summarized in **Table 6-2**.

6.3.1 CIP Closure Scenario Groundwater Flow System and Predicted Boron Concentrations

The design for CIP includes an initial 3-year dewatering period to remove free liquids followed by CCR removal from the western areas of the BAP, consolidation to the southeast, and eventually northeastern portions of the BAP, and construction of a cover system over the remaining CCR (**Figure 6-1**).

Post-construction heads decrease at monitoring wells surrounding the CCR removal and consolidated CIP areas of the BAP following dewatering and implementation of CIP. In general, the greatest predicted reduction in heads among the proposed BAP compliance monitoring wells (MW-192, MW-193, MW-356, MW-369, MW-370, MW-382, MW-392, MW393, MW-394, OW-256, OW-257, PZ-170, and PZ-182) takes place within approximately 93 years following implementation of the CIP closure scenario. The heads at these wells continue to decrease until they are predicted to stabilize (approximate hydraulic steady state); however, due to the low hydraulic conductivity of the UU and UA materials, heads are not predicted to stabilize at all proposed BAP compliance monitoring wells until approximately 482 years following implementation of the CIP closure scenario. Groundwater flow directions are predicted to remain consistent with current flow directions.

Evaluations of post-construction water flux through the consolidated and covered BAP CCR were completed using data obtained from the CIP closure scenario prediction model when simulated post-construction heads in the proposed BAP compliance monitoring wells reached their most significant reduction in heads at approximately 93 years following implementation of the CIP closure scenario. The pre-construction (calibration model) and post-construction CIP closure scenario prediction model simulated water flux values are summarized in **Appendix E** and discussed below. Data export files used for flux evaluations are found along with model files in **Appendix C**.

Figure 6-2 is a plot showing the changes in flux reduction (shown as negative percentage) over time, starting from implementation of the CIP closure scenario through approximately 100 years following implementation. The CIP closure scenario was predicted to reduce total flux in and out of the BAP CCR by greater than 90 percent within 30 days following implementation of the CIP closure scenario. This was determined by comparing the post-construction movement of water in and out of the consolidated BAP CCR to pre-construction conditions. The reduction in total flux in and out of the consolidated BAP CCR is predicted to exceed 90 percent reduction for the remaining model timeframe. In general, the greatest predicted reduction in heads among the proposed BAP compliance monitoring wells takes place within approximately 93 years following implementation of the CIP closure scenario, at which time total flux in and out are predicted to reduce by 95 and 93 percent, respectively (**Figure 6-3**). Flux in and out are predicted to reduce by approximately 96 percent after approximately 482 years following implementation of the CIP closure scenario when heads are predicted to stabilize at the BAP compliance wells. Prior to construction (*i.e.*, current existing conditions) the total groundwater flux into the CCR is 10.90 gallons per minute (gpm) versus a total flux out of 10.77 gpm (**Appendix E**). Total flux out includes flux through the CCR (3.39 gpm) and the modeled constant head cells (7.38 gpm) used to simulate surface water management within the active BAP. Approximately 93 years following

implementation of the CIP closure scenario, the groundwater flux into and out of the CCR is equal at approximately 0.56 and 0.70 gpm, respectively, with no surface water management within the CIP area.

An evaluation of simulated boron plumes greater than the GWPS (2 mg/L for boron) in both pre-construction calibration models and post-construction prediction models indicated several proposed BAP compliance monitoring wells (PZ-182, OW-257, MW-382) to be potentially influenced by boron concentrations associated with the closed FAPS. The model domain for evaluating boron transport following closure of the BAP includes the closed FAPS, which is present along the eastern and southern boundaries of the BAP. The FAPS completed IEPA approved closure activities in November of 2020, and it is another potential source of boron within the model domain. The closure plan for the FAPS also included groundwater modeling of boron transport. The evaluation included a review of maximum plume extents associated with the FAPS presented in the 2014 FAPS groundwater modeling reports (NRT, 2014b; NRT, 2014c) (completed as part of the FAPS Closure Plan Report [AECOM, 2016a]), as well as a review of simulated groundwater flow directions and simulated boron concentrations in both the BAP pre-construction calibration and BAP post-construction prediction models. Groundwater elevations and boron concentrations at FAPS closure monitoring wells were calibrated during development of the current BAP flow and transport model and the simulation period was extended to 1,000 years to verify consistent results with the 2014 FAPS groundwater modeling reports. Changes in FAPS operations were incorporated into the current BAP modeling (utilizing similar changes in recharge used to simulate closure in the previous 2014 model). Boron transport within the current BAP model was compared to the results from the previous FAPS closure plan modeling and found that simulated flow and transport associated with the FAPS are consistent between the two models. Proposed BAP compliance wells PZ-182, OW-257, and MW-382 are located in the direction of groundwater flow from the north central area of the FAPS between the FAPS (East Ash Pond) and the surface water drainage feature near the west end of the BAP. Because these wells are downgradient of the FAPS, which is an alternate source of boron, these wells were not included in the evaluation of BAP compliance with the GWPS following implementation of the CIP closure scenario.

Simulated boron concentrations at the remaining proposed BAP compliance monitoring wells (PZ-170, OW-256, MW-192, MW-193, MW-370, MW-369, MW-392, MW-393, and MW-394) were below the GWPS (2 mg/L for boron) during the pre-construction period (calibration model), and prediction modeling results indicated these proposed BAP compliance monitoring wells would continue to remain below the GWPS for the post-construction modeling timeframe following dewatering and consolidation (**Figure 6-4**). The maximum extent of the plume above the GWPS for boron (2 mg/L) at 93 years following implementation of the CIP closure scenario, when simulated post-construction heads in the proposed BAP compliance monitoring wells reached their most significant reduction in heads, is illustrated in **Figure 6-5,** where boron exceedances are within the footprint of the former BAP except where source concentrations are potentially associated with the closed FAPS.

Additionally, a BAP CBR closure scenario prediction model was completed to evaluate the difference in post-construction boron concentrations simulated at PZ-182, OW-257, and MW-382 under both CIP and CBR conditions. The CBR closure scenario was simulated by: (i) extending the initial 3-year dewatering period to remove free liquids used in the CIP prediction model to an initial 9-year dewatering period, as the CBR construction timeframe is longer than CIP (see

information provided in the CCR Surface Impoundment Final Closure Plan [Geosyntec, 2022a] which is an appendix to the Construction Permit Application to which this report is also attached); (ii) applying no flow cells and removing recharge in the entire BAP footprint to simulate the absence of material in model layer 1 following CBR; and, (iii) removing all source concentrations within the BAP footprint following CBR (source concentrations associated with recharge zones and saturated ash cells [constant concentration cells]). A timeseries plot of predicted boron concentrations following implementation of the BAP CIP and CBR closure scenarios at proposed BAP compliance monitoring wells PZ-182, OW-257, and MW-382 is provided in **Figure 6-6**. As illustrated in **Figure 6-6**, concentrations are predicted to increase above the GWPS for boron (2 mg/L) following implementation of both BAP CIP and CBR closure scenarios in these three wells. Maximum concentrations within the modeling timeframes at these wells are predicted to be on the same order of magnitude for both BAP CIP and CBR closure scenarios.

The differences in predicted concentrations between CIP and CBR illustrated on **Figure 6-6** are likely due to slightly lower heads simulated at PZ-182, OW-257, and MW-382 in the CBR scenario, which increases the hydraulic gradient beneath the BAP which drives more rapid predicted arrival of boron in these wells from the FAPS. Since concentrations at proposed BAP compliance monitoring wells PZ-182, OW-257, and MW-382 increase to concentrations above the GWPS following implementation of the CBR closure scenario when BAP source concentrations have been removed, the source for predicted post-construction concentrations within the model domain must be the closed FAPS. These results support the conclusion that wells PZ-182, OW-257, and MW-382 should not be included in the evaluation of BAP compliance with the GWPS following implementation of the CIP closure scenario.

Although predicted boron concentrations at proposed BAP compliance wells PZ-182 and MW-382 are influenced by the FAPS, simulated boron concentrations at these wells started below the GWPS during the pre-construction period (calibration model) and an initial decrease in predicted concentrations was observed immediately following implementation of the BAP CIP closure scenario (**Figure 6-4**). The initial decrease in predicted boron concentrations is followed by a predicted increase in concentrations at approximately 14 and 80 years in wells PZ-182 and MW-382, respectively, following implementation of the CIP closure scenario as simulated concentrations associated with the FAPS begin to influence predicted boron concentrations in wells further along the flow path between the FAPS (East Ash Pond) and the drainage feature near the west end of the BAP.

Results of groundwater fate and transport modeling conservatively estimate that groundwater boron concentrations at the proposed BAP compliance wells that are not influenced by the FAPS will remain below the GWPS following implementation of the CIP closure scenario at the BAP. The model is limited by the data used for calibration, which adequately define the local groundwater flow system and the source and extent of the plume. Since data used for calibration are near the BAP and FAPS, model predictions of transport distant spatially and temporally from the calibrated conditions at the CCR units will not be as reliable as predictions closer to the CCR units and concentrations observed between 2015 and 2022.

7. CONCLUSIONS

This GMR has been prepared to evaluate the groundwater flow system and transport of boron concentrations at the BAP and how the proposed CIP closure scenario will reduce total flux in and out of the CCR and maintain compliance with the GWPS for boron (2 mg/L) in the post-construction BAP. Groundwater elevation data collected from sampling events from December 2015 to June 2022 (or November 2022 groundwater elevations for wells constructed or reoccupied in 2022) and boron concentration data collected from sampling events from December 2015 to December 2022 were used to develop a groundwater flow and transport model for the BPP BAP and surrounding area. The MODFLOW and MT3DMS models were then used to evaluate the CIP closure scenario which includes: CCR removal from the western areas of the BAP, consolidation to the southeast, and eventually northeastern portions of the BAP, and construction of a cover system over the remaining CCR following initial corrective action measures (removal of free liquids from the BAP) using information provided in the CCR Surface Impoundment Final Closure Plan (Geosyntec, 2022a).

The CIP closure scenario was predicted to reduce total flux in and out of the BAP CCR by greater than 90 percent within 30 days following implementation of the CIP closure scenario. This was determined by comparing the post-construction movement of water in and out of the consolidated BAP CCR to pre-construction conditions. The reduction in total flux in and out of the consolidated BAP CCR is predicted to exceed 90 percent reduction for the remaining model timeframe. In general, the greatest predicted reduction in heads among the proposed BAP compliance monitoring wells takes place within approximately 93 years following implementation of the CIP closure scenario, at which time total flux in and out are predicted to reduce by 95 and 93 percent, respectively. Due to the low hydraulic conductivity of the UU and UA materials, heads are not predicted to stabilize at all proposed BAP compliance monitoring wells until approximately 482 years following implementation of the CIP closure scenario, at which time total flux in and out are predicted to reduce by approximately 96 percent.

The model domain for evaluating boron transport following closure of the BAP includes the closed FAPS which is present along the eastern and southern boundaries of the BAP. The FAPS completed IEPA approved closure activities in November of 2020, and it is another potential source of boron within the model domain. The closure plan for the FAPS also included groundwater modeling of boron transport. Boron transport within the current BAP model was compared to the results from the previous FAPS closure plan modeling and found that simulated flow and transport associated with the FAPS are consistent between the two models. As described in this report, proposed BAP compliance wells PZ-182, OW-257, and MW-382 are located in the direction of groundwater flow from the north central area of the FAPS between the FAPS (East Ash Pond) and the surface water drainage feature near the west end of the BAP. Because these wells are downgradient of the FAPS which is an alternate source of boron, and groundwater quality at these wells is not attributable to the BAP, these wells were not included in the evaluation of BAP compliance with the GWPS following implementation of the CIP closure scenario.

Additionally, a BAP CBR closure scenario prediction model was completed to evaluate the difference in post-construction boron concentrations simulated at PZ-182, OW-257, and MW-382 under both CIP and CBR conditions. Concentrations are predicted to increase above the GWPS for boron (2 mg/L) following implementation of both BAP CIP and CBR closure scenarios in these

three wells. Maximum concentrations within the modeling timeframes at these wells are predicted to be on the same order of magnitude for both BAP CIP and CBR closure scenarios. Since concentrations at proposed BAP compliance monitoring wells PZ-182, OW-257, and MW-382 increase to concentrations above the GWPS following implementation of the CBR closure scenario, after BAP source concentrations have been removed, the source for predicted post-construction concentrations within the model domain can only be attributable to the closed FAPS. These results support the conclusion that wells PZ-182, OW-257, and MW-382 should not be included in the evaluation of BAP compliance with the GWPS following implementation of the CIP closure scenario.

Results of groundwater fate and transport modeling conservatively estimate that groundwater boron concentrations at the proposed BAP compliance wells that are not influenced by the FAPS will remain below the GWPS following implementation of the CIP closure scenario at the BAP.

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TABLES

TABLE 2-1. MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS
GROUNDWATER MODELING REPORT
BALDWIN POWER PLANT
BOTTOM ASH POND
BALDWIN, ILLINOIS

Well Number	HSU	Date Constructed	Top of PVC Elevation (ft)	Measuring Point Elevation (ft)	Measuring Point Description	Ground Elevation (ft)	Screen Top Depth (ft BGS)	Screen Bottom Depth (ft BGS)	Screen Top Elevation (ft)	Screen Bottom Elevation (ft)	Well Depth (ft BGS)	Bottom of Boring Elevation (ft)	Screen Length (ft)	Screen Diameter (inches)	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
MW-104SR	UU	2011-08-01	455.54	455.54	Top of PVC	452.52	4.80	14.80	447.80	437.70	15.00	437.50	10	2	38.188355	-89.853434
MW-104DR	UU	2011-08-01	455.62	455.62	Top of PVC	452.62	23.20	28.20	429.40	424.40	28.50	417.60	5.1	2	38.188344	-89.853434
MW-116	UU	1991-09-30	457.97	547.97	Top of PVC	454.90	15.00	25.00	439.90	429.90	25.00	429.90	10	2	--	--
MW-126	UU	2009-06-19	469.84	469.84	Top of PVC	466.84	9.95	19.31	456.89	447.53	19.31	446.87	9.36	2	--	--
MW-150	UU	2010-09-01	396.54	396.54	Top of PVC	393.84	15.00	24.70	378.80	369.20	25.20	368.70	9.6	2	38.189401	-89.878468
MW-151	UU	2010-09-01	399.96	399.96	Top of PVC	397.22	6.10	15.80	391.10	381.40	16.30	380.90	9.6	2	38.188449	-89.872354
MW-152	UU	2010-09-01	424.99	424.99	Top of PVC	422.18	7.50	16.70	414.70	405.50	17.20	405.00	9.3	2	38.187569	-89.866764
MW-153	UU	2010-09-01	445.67	445.67	Top of PVC	442.77	10.40	20.00	432.40	422.80	20.50	422.30	9.6	2	38.185884	-89.86101
MW-154	UU	2010-09-01	387.76	387.76	Top of PVC	384.99	7.50	12.20	377.50	372.80	12.70	372.30	4.6	2	38.196555	-89.883732
MW-155	UU	2010-09-01	393.55	393.55	Top of PVC	390.62	10.30	19.90	380.30	370.70	20.50	370.20	9.6	2	38.193312	-89.882878
MW-158R	UU	2022-10-08	456.24	456.24	Top of PVC	453.56	8.00	18.00	445.56	435.56	18.00	435.56	10	2	38.195275	-89.849411
MW-161	UU	2013-08-01	431.27	431.27	Top of PVC	428.74	23.30	32.80	405.40	396.00	33.40	384.00	9.5	2	38.19631	-89.879159
MW-162	UU	2013-08-01	433.20	433.20	Top of PVC	430.83	15.90	25.30	415.00	405.50	25.90	404.90	9.5	2	38.192595	-89.879221
MW-192	UU	2022-09-27	436.94	436.94	Top of PVC	434.04	20.00	30.00	414.04	404.04	30.00	400.04	10	2	38.199203	-89.866927
MW-193	UU	2022-10-04	438.06	438.06	Top of PVC	434.51	22.00	32.00	412.51	402.51	32.00	402.51	10	2	38.199173	-89.862658
MW-194	UU	2022-10-05	438.20	438.20	Top of PVC	435.43	18.00	28.00	407.43	397.43	28.00	405.43	10	2	38.199138	-89.858653
MW-203	UA	--	457.53	457.53	Top of PVC	455.66	67.00	77.00	388.66	378.66	78.00	377.67	10	2	--	--
MW-204	UA	1991-09-30	456.02	456.02	Top of PVC	453.30	68.00	78.00	385.30	375.30	79.00	79.00	10	2	--	--
MW-252	UU	2010-09-01	425.07	425.07	Top of PVC	422.27	44.40	49.00	377.90	373.20	49.50	372.70	4.6	2	38.187563	-89.866745
MW-253	UU	2010-09-01	445.84	445.84	Top of PVC	442.70	29.90	34.50	412.80	408.20	35.00	407.70	4.6	2	38.185885	-89.861026
MW-258	UA	2022-10-07	456.12	456.12	Top of PVC	453.50	40.00	50.00	413.59	403.59	50.00	390.50	10	2	38.195276	-89.849429
MW-262	UU	2013-08-01	433.21	433.21	Top of PVC	430.86	42.10	46.60	388.70	384.20	47.20	379.90	4.5	2	38.192605	-89.87922
MW-304	UA	2015-10-20	455.49	455.49	Top of PVC	453.03	45.00	55.00	408.00	398.00	55.00	317.60	10	2	38.188332	-89.853441

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Well Number	HSU	Date Constructed	Top of PVC Elevation (ft)	Measuring Point Elevation (ft)	Measuring Point Description	Ground Elevation (ft)	Screen Top Depth (ft BGS)	Screen Bottom Depth (ft BGS)	Screen Top Elevation (ft)	Screen Bottom Elevation (ft)	Well Depth (ft BGS)	Bottom of Boring Elevation (ft)	Screen Length (ft)	Screen Diameter (inches)	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
MW-306	UA	1991-09-25	453.17	453.17	Top of PVC	450.91	72.70	87.70	378.20	363.20	87.70	361.20	15	2	38.20114	-89.846756
MW-307	UA	1991-09-16	436.66	436.66	Top of PVC	434.00	57.00	72.00	377.00	362.00	74.00	333.00	15	2	--	--
MW-350	UA	2010-09-01	396.80	396.80	Top of PVC	394.11	41.60	46.20	352.50	347.90	46.60	347.40	4.6	2	38.189416	-89.878477
MW-352	UA	2010-09-01	425.04	425.04	Top of PVC	422.36	67.90	72.50	354.50	349.80	73.00	348.60	4.6	2	38.187554	-89.866729
MW-355	UA	2010-09-01	393.69	393.69	Top of PVC	390.82	27.40	32.00	363.40	358.80	32.50	358.20	4.6	2	38.193305	-89.882865
MW-356	UA	2015-10-01	427.60	427.60	Top of PVC	425.18	56.00	66.00	369.20	359.20	66.00	290.20	10	2	38.198963	-89.869578
MW-358	UA	2022-10-08	455.73	455.73	Top of PVC	453.59	80.00	90.00	373.73	363.73	90.00	363.59	10	2	38.195275	-89.849417
MW-366	UA	2015-12-04	425.08	425.08	Top of PVC	422.54	42.00	52.00	380.50	370.50	52.00	368.20	10	2	38.192191	-89.872345
MW-369	UA	2015-11-19	422.71	422.71	Top of PVC	420.49	56.00	66.00	364.50	354.50	66.00	349.80	10	2	38.196986	-89.870258
MW-370	UA	2015-11-25	420.85	420.85	Top of PVC	418.67	53.00	63.00	365.70	355.70	63.00	352.70	10	2	38.195603	-89.869669
MW-373	UA	2015-10-28	391.32	391.32	Top of PVC	388.80	20.00	30.00	368.80	358.80	30.00	293.70	10	2	38.190726	-89.879258
MW-374	UA	2015-11-10	400.91	400.91	Top of PVC	398.41	30.00	40.00	368.40	358.40	40.00	356.10	10	2	38.189682	-89.877242
MW-375	UA	2015-11-06	423.05	423.05	Top of PVC	420.50	57.00	67.00	363.50	353.50	67.00	335.80	10	2	38.189045	-89.873514
MW-377	UA	2015-11-02	421.36	421.36	Top of PVC	418.75	46.00	56.00	372.80	362.80	56.00	360.50	10	2	38.188386	-89.869742
MW-382	UA	2015-11-23	431.19	431.19	Top of PVC	428.67	56.00	66.00	372.70	362.70	66.00	358.10	10	2	38.19454	-89.868044
MW-383	UA	2015-12-21	459.49	459.49	Top of PVC	457.18	58.00	68.00	399.20	389.20	68.00	384.20	10	2	38.194913	-89.858286
MW-384	UA	2015-12-18	458.95	458.95	Top of PVC	456.70	60.50	70.50	396.20	386.20	70.50	362.60	10	2	38.191789	-89.860699
MW-385	UA	2015-12-16	454.56	454.56	Top of PVC	454.82	80.00	90.00	374.80	364.80	90.00	361.80	10	2	38.191729	-89.86847
MW-386	UA	2015-12-11	454.17	454.17	Top of PVC	454.67	76.00	86.00	378.70	368.70	86.00	365.70	10	2	38.189441	-89.866991
MW-387	UA	2015-11-18	426.63	426.63	Top of PVC	424.01	48.00	58.00	376.00	366.00	58.00	362.70	10	2	38.190905	-89.874773
MW-388	UA	2015-12-12	408.92	408.92	Top of PVC	406.28	33.00	43.00	373.30	363.30	43.00	361.10	10	2	38.191785	-89.87773
MW-389	UA	2015-12-01	419.90	419.90	Top of PVC	417.30	42.00	52.00	375.30	365.30	52.00	361.60	10	2	38.193679	-89.877076
MW-390	UA	2016-03-04	428.06	428.06	Top of PVC	425.98	50.00	65.00	376.00	361.00	65.00	358.00	15	2	38.192956	-89.869793
MW-391	UA	2016-03-10	426.63	426.63	Top of PVC	424.24	55.00	70.00	369.20	354.20	70.00	349.80	15	2	38.190869	-89.874759

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Well Number	HSU	Date Constructed	Top of PVC Elevation (ft)	Measuring Point Elevation (ft)	Measuring Point Description	Ground Elevation (ft)	Screen Top Depth (ft BGS)	Screen Bottom Depth (ft BGS)	Screen Top Elevation (ft)	Screen Bottom Elevation (ft)	Well Depth (ft BGS)	Bottom of Boring Elevation (ft)	Screen Length (ft)	Screen Diameter (inches)	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
MW-392	UA	2022-09-26	437.02	437.02	Top of PVC	434.07	74.00	84.00	360.07	350.07	84.00	350.07	10	2	38.199203	-89.866934
MW-393	UA	2022-10-04	437.86	437.86	Top of PVC	434.59	75.00	85.00	359.59	349.59	85.00	349.59	10	2	38.199174	-89.862666
MW-394	UA	2022-10-05	438.29	438.29	Top of PVC	435.51	73.00	83.00	362.51	352.51	83.00	350.51	10	2	38.199136	-89.85866
OW-156	UU	2010-09-01	427.87	427.87	Top of PVC	425.14	7.90	17.20	417.30	407.90	17.70	407.40	9.3	2	38.198969	-89.869592
OW-157	UU	2010-09-01	432.64	432.64	Top of PVC	429.90	7.80	17.10	422.10	412.80	17.60	412.30	9.3	2	38.19384	-89.867384
OW-256	UU	2013-08-01	427.70	427.70	Top of PVC	425.20	28.00	32.50	397.20	392.70	33.10	389.20	4.5	2	38.198966	-89.86961
OW-257	UU	2013-08-01	431.02	431.02	Top of PVC	428.17	34.00	38.50	394.20	389.70	39.10	388.60	4.5	2	38.193865	-89.867456
PZ-169	UU	2015-07-28	422.60	422.60	Top of PVC	420.01	31.50	41.50	388.50	378.50	41.50	378.00	10	2	38.196962	-89.870253
PZ-170	UU	2015-07-29	421.43	421.43	Top of PVC	418.58	21.10	31.10	397.50	387.50	31.10	387.50	10	2	38.195585	-89.869632
PZ-171	UU	2015-07-31	434.15	434.15	Top of PVC	431.54	28.00	38.00	403.50	393.50	38.00	393.50	10	2	38.194595	-89.879189
PZ-172	UU	2015-08-03	412.95	412.95	Top of PVC	410.22	16.00	26.00	394.20	384.20	26.00	384.00	10	2	38.191491	-89.879283
PZ-173	UU	2015-08-03	391.46	391.46	Top of PVC	388.43	3.50	13.50	384.90	374.90	13.50	374.30	10	2	38.1907	-89.879247
PZ-174	UU	2015-08-04	401.92	401.92	Top of PVC	398.97	14.50	24.50	384.50	374.50	24.50	374.30	10	2	38.189682	-89.877209
PZ-175	UU	2015-08-07	423.01	423.01	Top of PVC	419.87	40.00	50.00	379.90	369.90	50.00	369.70	10	2	38.189032	-89.873481
PZ-176	UU	2015-08-06	406.44	406.44	Top of PVC	403.46	18.10	28.10	385.40	375.40	28.60	374.90	10	2	38.188565	-89.871623
PZ-177	UU	2015-08-06	420.90	420.90	Top of PVC	417.93	20.50	30.50	397.40	387.40	30.50	387.20	10	2	38.188361	-89.869736
PZ-178	UU	2015-08-05	431.26	431.26	Top of PVC	428.45	33.00	43.00	395.50	385.50	43.00	385.00	10	2	38.188076	-89.867868
PZ-182	UU	2015-07-30	431.61	431.61	Top of PVC	428.47	24.00	34.00	404.50	394.50	34.00	394.50	10	2	38.194512	-89.86801
TPZ-158	UU	2013-08-01	456.26	456.26	Top of PVC	453.26	9.20	18.30	444.00	435.00	18.90	434.30	9.1	1.3	38.195308	-89.849428
TPZ-159	UU	2013-08-01	447.64	447.64	Top of PVC	444.69	20.00	29.00	424.70	415.70	29.60	394.70	9.1	1.3	38.199022	-89.862558
TPZ-160	UU	2013-08-01	431.49	431.49	Top of PVC	428.59	9.80	18.80	418.80	409.80	19.40	393.60	9.1	1.3	38.19896	-89.875586
TPZ-163	CCR	2013-08-01	458.41	458.41	Top of PVC	455.51	8.60	18.10	446.90	437.40	18.70	410.50	9.5	2	38.19274	-89.857249
TPZ-164	CCR	2013-08-01	435.10	435.10	Top of PVC	432.50	5.20	9.70	427.30	422.80	10.30	422.20	4.5	2	38.195586	-89.862797
TPZ-165	UU	2013-08-01	398.85	398.85	Top of PVC	396.10	7.80	16.80	388.30	379.30	17.40	378.70	9.1	1.3	38.193174	-89.874746

TABLE 2-1. MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS
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Well Number	HSU	Date Constructed	Top of PVC Elevation (ft)	Measuring Point Elevation (ft)	Measuring Point Description	Ground Elevation (ft)	Screen Top Depth (ft BGS)	Screen Bottom Depth (ft BGS)	Screen Top Elevation (ft)	Screen Bottom Elevation (ft)	Well Depth (ft BGS)	Bottom of Boring Elevation (ft)	Screen Length (ft)	Screen Diameter (inches)	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
TPZ-166	UU	2013-08-01	425.18	425.18	Top of PVC	422.33	15.30	24.70	407.10	397.60	25.30	396.80	9.5	2	38.1922	-89.872297
TPZ-167	CCR	2013-08-01	441.38	441.38	Top of PVC	438.63	21.40	30.90	417.20	407.70	31.50	389.90	9.5	2	38.190478	-89.869723
TPZ-168	CCR	2013-08-01	457.53	457.53	Top of PVC	454.93	15.80	25.30	439.20	429.70	25.80	384.90	9.5	2	38.188681	-89.863954
XPW01	CCR	2022-09-23	437.66	437.66	Top of PVC	435.12	7.00	12.00	428.12	423.12	12.00	421.12	5	2	38.197522	-89.864474
XPW02	CCR	2022-09-24	437.92	437.92	Top of PVC	434.86	6.00	11.00	428.86	423.86	11.00	420.86	5	2	38.197894	-89.86188
XPW04	CCR	2022-09-24	434.58	434.58	Top of PVC	430.59	6.50	16.50	424.09	414.09	16.50	410.59	10	2	38.194698	-89.863819
XPW05	CCR	2022-09-24	437.27	437.27	Top of PVC	434.12	18.00	28.00	416.12	406.12	28.00	404.12	10	2	38.196233	-89.862366
XPW06	CCR	2022-09-22	417.72	417.72	Top of PVC	418.06	5.00	10.00	412.99	407.99	10.00	402.06	5	2	38.196967	-89.868954

Notes:
All elevation data are presented relative to the North American Vertical Datum 1988 (NAVD88), GEOID 12A
-- = data not available
BGS = below ground surface
CCR = coal combustion residuals
ft = foot or feet
HSU = Hydrostratigraphic Unit
PVC = polyvinyl chloride
UA = uppermost aquifer
UU = upper unit
generated 01/09/2023, 11:09:49 AM CST

TABLE 2-2. FLOW AND TRANSPORT MODEL CALIBRATION TARGETS

GROUNDWATER MODELING REPORT

BALDWIN POWER PLANT

BOTTOM ASH POND

BALDWIN, IL

Well ID	Monitored Hydrogeologic Unit	Modeled Target Location (Layer Number)	Flow Model Target Groundwater Elevation (Modified Median Value December 2015 to June 2022 [feet NAVD88][1])	Transport Model Target Total Boron Concentrations December 2015 to December 2022 (mg/L)		
				Minimum	Median	Maximum
MW-104DR	UU	3	445.01	0.0191	0.02	0.05
MW-104SR	UU	2	446.42	0.04	0.128	0.237
MW-116	UU	4	449.61 [2]	0.023	0.024	0.025
MW-126	UU	2	459.57 [2]	0.0092	0.0106	0.012
MW-150	UU	3	377.70	0.31[3]	2.12[3]	4.29[3]
MW-151	UU	5	395.62	0.217[3]	0.267[3]	0.507[3]
MW-152	UU	3	419.87	0.015[3]	9.92[3]	29[3]
MW-153	UU	2	432.69	0.009[3]	0.02[3]	21.5[3]
MW-154	UU	5	379.61	0.018[3]	0.02[3]	0.056[3]
MW-155	UU	3	373.98	0.0114[3]	0.02[3]	0.05[3]
MW-158R	UU	2	442.63 [2]	0.0254	0.0347	0.061
MW-192	UU	2	428.57 [2]	0.0525	0.0537	0.0686
MW-193	UU	3	429.02 [2]	0.0473	0.059	0.0645
MW-194	UU	3	431.32 [2]	0.019	0.022	0.023
MW-203	UA	6	No Target	0.907	0.907	0.907
MW-204	UA	6	442.82 [2]	1.02	1.03	1.35
MW-252	UU	5	424.93	0.12[3]	0.144[3]	1.47[3]
MW-253	UU	5	434.66	0.0333[3]	0.0604[3]	0.24[3]
MW-258	UA	5	441.95 [2]	1.03	1.27	1.35
MW-304	UA	6	445.93	1.27	1.685	2.16
MW-306	UA	6	435.63	0.025	0.2	0.634
MW-307	UA	6	431.10 [2]	1.2	1.47	1.63
MW-350	UA	6	374.27	0.541	0.652	0.9
MW-352	UA	6	423.42	0.76[3]	1.82[3]	2.09[3]
MW-355	UA	6	370.39	0.02[3]	0.024[3]	0.05[3]
MW-356	UA	6	424.92	1.79	2.01	2.92
MW-358	UA	6	No Target	1.1	1.25	1.67
MW-366	UA	6	409.99	1.19	1.66	2.7
MW-369	UA	6	413.31	0.592	1.55	2.4
MW-370	UA	6	402.35	1.56	1.82	2.67
MW-374	UA	6	388.62	No Target		
MW-375	UA	6	392.00	0.979	1.37	2.06
MW-377	UA	6	416.56	1.54	1.74	2.01
MW-382	UA	5	414.96	1.6	1.75	2.57
MW-383	UA	6	441.03	1.26	1.42	2.05
MW-384	UA	6	445.34	1.26	1.48	2.26
MW-385	UA	6	No Target	2.45	2.45	2.45
MW-386	UA	6	No Target	1.34	1.34	1.34
MW-388	UA	6	393.34	No Target		
MW-389	UA	6	400.58	No Target		
MW-390	UA	6	423.44	0.175	0.546	2.3
MW-391	UA	6	No Target	1.3	3.25	8.91
MW-392	UA	6	428.08 [2]	1.57	1.72	2.33
MW-393	UA	6	429.29 [2]	1.53	1.83	2.04
MW-394	UA	6	432.69 [2]	1.87	2.02	2.23
OW-156	UU	2	421.74	0.02[3]	0.024[3]	0.03[3]
OW-157	UU	2	426.61	44.6[3]	45.2[3]	45.3[3]
TPZ-164	CCR	1	431.14	1.09	1.47	2.04
XPW01	CCR	1	426.15 [2]	0.93	0.942	1.03
XPW02	CCR	1	433.52 [2]	1.18	1.2	1.52
XPW04	CCR	1	426.56 [2]	1.15	1.28	1.38
XPW05	CCR	1	432.43 [2]	1.02	1.16	1.25
XPW06	CCR	1	415.07 [2]	2.29	3.86	4.64

[O: EGP 1/3/23, C: JJW 1/4/23, U: JJW 5/2/23, C: EGP 5/16/23]

Notes:

[1] Target groundwater elevations represent modified median groundwater elevations from December 2015 to June 2022. Anomalous groundwater elevations (e.g., groundwater elevations that do not represent static groundwater conditions, groundwater elevation outliers, or groundwater elevations measured in error) monitored between December 2015 and June 2022 were removed from the median groundwater elevation calculations used as flow calibration targets.

[2] Target groundwater elevation used most recent measurement (November 2022) for wells constructed or reoccupied in 2022

[3] Target boron concentration used dissolved boron data from November 2010 to December 2022

ID = identification

mg/L = milligrams per liter

NAVD88 = North American Vertical Datum of 1988

Hydrogeologic Unit:

CCR = coal combustion residuals

UA = uppermost aquifer

UU = upper unit

TABLE 5-1. FLOW MODEL INPUT AND SENSITIVITY ANALYSIS RESULTS
GROUNDWATER MODELING REPORT
BALDWIN POWER PLANT
BOTTOM ASH POND
BALDWIN, ILLINOIS

Zone	Zone Description	Materials	ft/d	cm/s	Kh/Kv	Value Source	Sensitivity[1]
Horizontal Hydraulic Conductivity			**Calibration Model**				
1	UU	silty clay	0.07	2.47E-05	NA	Calibrated - Near Geomean Hydraulic Conductivity Field Test Results for Wells Screened in the Upper Unit (Ramboll, 2023d)	Moderate
2	Old East Fly Ash Pond	CCR	0.5	1.76E-04	NA	Calibrated - Near Geomean of Vertical Hydraulic Conductivity Laboratory Test Results from FAPS Wells (Ramboll, 2023d)	Negligible
3	East Fly Ash Pond	CCR	0.5	1.76E-04	NA	Calibrated - Near Geomean of Vertical Hydraulic Conductivity Laboratory Test Results from FAPS Wells (Ramboll, 2023d)	Low
4	West Fly Ash Pond	CCR	0.5	1.76E-04	NA	Calibrated - Near Geomean of Vertical Hydraulic Conductivity Laboratory Test Results from FAPS Wells (Ramboll, 2023d)	Low
7	Bottom Ash Pond	CCR	1.5	5.29E-04	NA	Calibrated - Near Minimum Hydraulic Conductivity Field Test Results for Wells Screened in BAP (Ramboll, 2023d)	Moderate
8	UA (Decomposed Bedrock)	bedrock	0.05	1.76E-05	NA	Calibrated - Within Range of Hydraulic Conductivity Field Test Results for Wells Screened in Bedrock (Ramboll, 2023d)	Low
9	UA	bedrock	0.05	1.76E-05	NA	Calibrated - Within Range of Hydraulic Conductivity Field Test Results for Wells Screened in Bedrock (Ramboll, 2023d)	High
10	UU (Top of Vandalia)	silty clay	0.07	2.47E-05	NA	Calibrated - Near Geomean Hydraulic Conductivity Field Test Results for Wells Screened in the Upper Unit (Ramboll, 2023d)	Low
12	River Alluvium	silty clay	0.6	2.12E-04	NA	Calibrated	Low
14	PMP	sand seams	0.3	1.06E-04	NA	Calibrated - Near Geomean Hydraulic Conductivity Field Test Results for Wells Screened Across Upper Unit Sands (Ramboll, 2023d)	Moderate
16	Fill at BAP & FAPS Boundary	fill	0.5	1.76E-04	NA	Calibrated	Negligible
100	Above River Boundary Condition	NA	500	1.76E-01	NA	Calibrated - Conductivity Value to Allow Groundwater Flow to River Boundary Conditions	Negligible
Vertical Hydraulic Conductivity			**Calibration Model**				
1	UU	silty clay	0.007	2.47E-06	10	Calibrated - Within Range of Upper Unit Vertical Hydraulic Conductivity Laboratory Test Results (Ramboll, 2023d)	Moderate
2	Old East Fly Ash Pond	CCR	0.5	1.76E-04	1	Calibrated - Near Geomean of Vertical Hydraulic Conductivity Laboratory Test Results from FAPS Wells (Ramboll, 2023d)	Negligible
3	East Fly Ash Pond	CCR	0.5	1.76E-04	1	Calibrated - Near Geomean of Vertical Hydraulic Conductivity Laboratory Test Results from FAPS Wells (Ramboll, 2023d)	Negligible
4	West Fly Ash Pond	CCR	0.5	1.76E-04	1	Calibrated - Near Geomean of Vertical Hydraulic Conductivity Laboratory Test Results from FAPS Wells (Ramboll, 2023d)	Negligible
7	Bottom Ash Pond	CCR	1.5	5.29E-04	1	Calibrated - Near BAP Well TPZ-164 Vertical Hydraulic Conductivity Laboratory Test Results (Ramboll, 2023d)	Negligible
8	UA (Decomposed Bedrock)	bedrock	0.01	3.53E-06	5	Calibrated	Low

TABLE 5-1. FLOW MODEL INPUT AND SENSITIVITY ANALYSIS RESULTS
GROUNDWATER MODELING REPORT
BALDWIN POWER PLANT
BOTTOM ASH POND
BALDWIN, ILLINOIS

Zone	Zone Description	Materials	ft/d	cm/s	Kh/Kv	Value Source	Sensitivity[1]
Vertical Hydraulic Conductivity			**Calibration Model**				
9	UA	bedrock	0.005	1.76E-06	10	Calibrated	Moderate
10	UU (Top of Vandalia)	silty clay	0.007	2.47E-06	10	Calibrated - Within Range of Upper Unit Vertical Hydraulic Conductivity Laboratory Test Results (Ramboll, 2023d)	Low
12	River Alluvium	silty clay	0.6	2.12E-04	1	Calibrated	Negligible
14	PMP	sand seams	0.3	1.06E-04	1	Calibrated - Near Geomean Hydraulic Conductivity Field Test Results for Wells Screened Across Upper Unit Sands (Ramboll, 2023d)	Negligible
16	Fill at BAP & FAPS Boundary	fill	0.5	1.76E-04	NA	Calibrated	Negligible
100	Above River Boundary Condition	NA	500	1.76E-01	1	Calibrated - Conductivity Value to Allow Groundwater Flow to River Boundary Conditions	Negligible
Recharge			**Calibration Model**				
1	Silty Clay	silty clay	1.00E-05	0.04	NA	Calibrated	Low
2	Old East Fly Ash Pond	CCR	6.80E-05	0.30	NA	calibrated - 2021-2022 recharge at FAPS consistent with estimated closed FAPS recharge values in 2014 FAPS groundwater modeling report (NRT, 2014b; NRT, 2014c)	Low
3	East Fly Ash Pond	CCR	6.80E-05	0.30	NA	calibrated - 2021-2022 recharge at FAPS consistent with estimated closed FAPS recharge values in 2014 FAPS groundwater modeling report (NRT, 2014b; NRT, 2014c)	Low
4	West Fly Ash Pond	CCR	6.80E-05	0.30	NA	calibrated - 2021-2022 recharge at FAPS consistent with estimated closed FAPS recharge values in 2014 FAPS groundwater modeling report (NRT, 2014b; NRT, 2014c)	Low
5	Secondary Pond	silty clay	1.00E-05	0.04	NA	Calibrated	Negligible
6	Tertiary Pond	silty clay	1.00E-05	0.04	NA	Calibrated	Negligible
7	Bottom Ash Pond	CCR	1.80E-04	0.79	NA	Calibrated	Low
Storage							
1	UU	silty clay	*Not used in steady-state calibration model*				
2	Old East Fly Ash Pond	CCR					
3	East Fly Ash Pond	CCR					
4	West Fly Ash Pond	CCR					
7	Bottom Ash Pond	CCR					
8	UA (Decomposed Bedrock)	bedrock					
9	UA	bedrock					
10	UU (Top of Vandalia)	silty clay					
12	River Alluvium	silty clay					
14	PMP	sand seams					
16	Fill at BAP & FAPS Boundary	fill					
100	Above River Boundary Condition	NA					

TABLE 5-1. FLOW MODEL INPUT AND SENSITIVITY ANALYSIS RESULTS
GROUNDWATER MODELING REPORT
BALDWIN POWER PLANT
BOTTOM ASH POND
BALDWIN, ILLINOIS

River Parameters

	Relative Location	Stage of River (feet)	Sensitivity	River Bottom Elevation (feet)	Hydraulic Conductivity (ft/d)	Average River Conductance (ft^2/d)	Sensitivity
Reach 0	Cooling Pond	429	Moderate	410	3.80	3.80E+04	Negligible
Reach 1	Kaskaskia River	370	High	365	5.17	5.17E+04	Negligible
Reach 2	South Stream (Southern Limit of Model Domain)	456.03-370	Negligible	452.03-365.54	2.08	2.08E+04	Negligible
Reach 3	South Stream (Between Reach 2 and Reach 4)	449.98-370.06	Moderate	447.98-368.06	2.05	2.05E+04	Negligible
Reach 4	South Stream (Adjacent to FAPS)	445-368	Moderately High	443-366	0.36	3.60E+03	Negligible
Reach 5	Northwest Stream (West of Cooling Pond)	410.66-370	Negligible	408.66-368	3.89	3.89E+04	Negligible
Reach 7	Northeast Stream (East of Cooling Pond)	454.75-427	High	452.75-425	2.60	2.60E+04	Negligible
Reach 8	Secondary and Tertiary Pond	396	Low	394.99-376.17	0.26	2.60E+03	Negligible

TABLE 5-1. FLOW MODEL INPUT AND SENSITIVITY ANALYSIS RESULTS
GROUNDWATER MODELING REPORT
BALDWIN POWER PLANT
BOTTOM ASH POND
BALDWIN, ILLINOIS

River Parameters							
Value Source	NA	Calibrated - Cooling Pond Stage (Reach 0) Approximates Elevation at which Pond is Maintained; Kaskasia River Stage (Reach 1) at Baldwin Power Plant Based on Interpolated Stage Data Provided at New Athens, Illinois (USGS 5595000) and Red Bud (USGS 5595240); River Stage at Reaches 2 through 7 Approximate Topography; River Stage at Reach 8 Based on Historic Groundwater Elevation within Secondary and Tertiary Ponds at TPZ-165	NA	Calibrated	Calibrated	Calibrated	NA

Constant Head Parameters			
	Relative Location	**Head at Boundary (feet)**	**Sensitivity**
Reach 0	BAP Constant Head West	415	Negligible
Reach 1	BAP Constand Head Central	425	Negligible
Value Source	NA	Calibrated - Head at Boundary Based on Estimated Water Surface Elevation within BAP	NA

[O: JJW 2/17/2023 ; C: EGP 5/18/23]

Notes:
[1] Sensitivity Explanation:
Negligible - SSR changed by less than 1%
Low - SSR change between 1% and 10%
Moderate - SSR change between 10% and 50%
Moderately High - SSR change between 50% and 100%
High - SSR change greater than 100%
SSR = sum of squared residuals
- - - = not tested
BAP = bottom ash pond
FAPS = fly ash pond system
cm/s = centimeters per second
ft/d = feet per day
ft^2/day = feet squared per day
in/yr = inches per year
Kh/Kv = anisotropy ratio
NA = not applicable

Hydrogeologic Unit:
CCR = coal combustion residuals
PMP = potential migration pathway
UA = uppermost aquifer
UU = upper unit

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TABLE 5-2. TRANSPORT MODEL INPUT VALUES (CALIBRATION)
GROUNDWATER MODELING REPORT
BALDWIN POWER PLANT
BOTTOM ASH POND
BALDWIN, ILLINOIS

	Hydrostratigraphic Unit	Materials	Calibration Model						
			Calibration Model 1 Dates: 1970-2020 Recharge (ft/d)	Calibration Model 2 Dates: 2021-2022 Recharge (ft/d)	Boron Concentration (mg/L)	Calibration Model 1 Dates: 1970-2020 Constant Head (feet)	Calibration Model 2 Dates: 2021-2022 Constant Head (feet)	Value Source	Sensitivity
Initial Concentration									
Entire Domain	NA	NA	NA	NA	0	NA	NA	NA	- - -
Source Concentration (recharge)									
Zone 2	Old East Fly Ash Pond	CCR	4.00E-04	6.80E-05	38	NA	NA	calibrated - 2021-2022 recharge at FAPS consistent with estimated closed FAPS recharge values in 2014 FAPS groundwater modeling report (NRT, 2014b; NRT, 2014c)	- - -
Zone 3	East Fly Ash Pond	CCR	8.00E-04	6.80E-05	79	NA	NA	calibrated - 2021-2022 recharge at FAPS consistent with estimated closed FAPS recharge values in 2014 FAPS groundwater modeling report (NRT, 2014b; NRT, 2014c)	- - -
Zone 4	West Fly Ash Pond	CCR	6.00E-04	6.80E-05	47	NA	NA	calibrated - 2021-2022 recharge at FAPS consistent with estimated closed FAPS recharge values in 2014 FAPS groundwater modeling report (NRT, 2014b; NRT, 2014c)	- - -
Zone 7	Bottom Ash Pond (West)	CCR	1.80E-04	1.80E-04	4	NA	NA	calibrated	- - -
Zone 8	Bottom Ash Pond (East)	CCR	1.80E-04	1.80E-04	1.5	NA	NA	calibrated	- - -
Source Concentration (constant concentration cells) and Stormwater Management (constant head cells)									
Reach 2	Old East Fly Ash Pond	CCR	NA	NA	38	NA	NA	calibrated	- - -
Reach 3	East Fly Ash Pond	CCR	NA	NA	79	NA	NA	calibrated	- - -
Reach 4	West Fly Ash Pond Constant Head	CCR	NA	NA	47	424.3	NA	calibrated - head at boundary consistent with stormwater management practices within the active FAPS (AECOM, 2016b)	- - -
Reach 14	West Fly Ash Pond (Berm)	CCR	NA	NA	47	NA	NA	calibrated	- - -
Reach 0	BAP Constant Head West	CCR	NA	NA	4	415	415	calibrated - head at boundary based on estimated water surface elevation within BAP	- - -
Reach 1	BAP Constand Head Central	CCR	NA	NA	4	425	425	calibrated - head at boundary based on estimated water surface elevation within BAP	- - -
Reach 7	Bottom Ash Pond (West)	CCR	NA	NA	4	NA	NA	calibrated	- - -
Reach 8	Bottom Ash Pond (East)	CCR	NA	NA	1.5	NA	NA	calibrated	- - -

TABLE 5-2. TRANSPORT MODEL INPUT VALUES (CALIBRATION)
GROUNDWATER MODELING REPORT
BALDWIN POWER PLANT
BOTTOM ASH POND
BALDWIN, ILLINOIS

Storage, Specific Yield and Effective Porosity							
Zone	**Hydrostratigraphic Unit**	**Materials**	**Storage**	**Specific Yield**	**Effective Porosity**	**Value Source**	**Sensitivity**
1	UU	silty clay	0.003	0.15	0.15	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3
2	Old East Fly Ash Pond	CCR	0.003	0.2	0.2	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3
3	East Fly Ash Pond	CCR	0.003	0.2	0.2	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3
4	West Fly Ash Pond	CCR	0.003	0.2	0.2	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3
7	Bottom Ash Pond	CCR	0.003	0.25	0.25	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3
8	UA (Decomposed Bedrock)	bedrock	0.003	0.15	0.15	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3
9	UA	bedrock	0.003	0.3	0.3	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3
10	UU (Top of Vandalia)	silty clay	0.003	0.15	0.15	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3
12	River Alluvium	silty clay	0.003	0.15	0.15	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3
14	PMP	sand seams	0.003	0.25	0.25	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3
16	Fill at BAP & FAPS Boundary	fill	0.003	0.2	0.2	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3
100	Above River Boundary Condition	NA	0.003	0.5	0.5	Storage Estimated from Literature (Fetter, 1988); Specific Yield Set Equal to Effective Porosity; Calibrated - Effective Porosity Estimated from Literature (Fetter, 1988; Morris and Johnson, 1967; Heath, 1983; Walton, 1988)	see Table 5-3

TABLE 5-2. TRANSPORT MODEL INPUT VALUES (CALIBRATION)

GROUNDWATER MODELING REPORT

BALDWIN POWER PLANT

BOTTOM ASH POND

BALDWIN, ILLINOIS

Dispersivity						
Applicable Region	**Hydrostratigraphic Unit**	**Materials**	**Longitudinal (feet)**	**Transverse (feet)**	**Vertical (feet)**	**Sensitivity**
Entire Domain	NA	NA	5	0.5	0.05	- - -

[O: JJW 5/5/2023, C:EGP 5/22/23]

Notes:

[1] The concentrations from the end of the calibrated transport model were imported as initial concentrations for the prediction model runs.

- - - = not tested

ft/d = feet per day

mg/L = milligrams per liter

NA = not applicable

Hydrogeologic Unit:

CCR = coal combustion residuals

PMP = potential migration pathway

UA = uppermost aquifer

UU = upper unit

References:

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Natural Resource Technology, Inc. (NRT), 2014c. Groundwater Model and Simulation of Closure Alternatives, Model Report Addendum Baldwin Ash Pond System. September 30.

TABLE 5-3. TRANSPORT MODEL INPUT VALUES (SENSITIVITY)

GROUNDWATER MODELING REPORT

BALDWIN POWER PLANT

BOTTOM ASH POND

BALDWIN, ILLINOIS

Well ID	Calibration Concentration (mg/L)	Storage and Specific Yield				Effective Porosity			
		File Name		File Name		File Name		File Name	
		BAL_Conc_324_T_A _s_sy_low.gwv BAL_Conc_324_T_B_2_s_sy_low.gwv		BAL_Conc_324_T_A _s_sy_high.gwv BAL_Conc_324_T_B_2_s_sy_high.gwv		BAL_Conc_324_T_A_por_low.gwv BAL_Conc_324_T_B_2_por_low.gwv		BAL_Conc_324_T_A_por_high.gwv BAL_Conc_324_T_B_2_por_high.gwv	
		Concentration (mg/L)	Sensitivity [1]	Concentration (mg/L)	Sensitivity [1]	Concentration (mg/L)	Sensitivity [1]	Concentration (mg/L)	Sensitivity [1]
MW-116	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
MW-126	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
MW-158R	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
MW-192	2.3E-02	2.2E-02	low	2.3E-02	low	2.5E-02	moderate	2.0E-02	moderate
MW-193	0.2	0.3	moderate	0.2	low	0.3	moderate	0.2	moderate
MW-194	1.3	1.2	low	1.3	negligible	1.4	low	1.2	low
MW-203	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
MW-204	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
MW-258	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
MW-304	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
MW-306	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
MW-307	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
MW-350	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
MW-356	5.0E-06	3.0E-06	moderate	6.0E-06	moderate	9.0E-06	moderately high	3.0E-06	moderate
MW-358	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
MW-366	1.5	0.6	moderately high	2.4	moderately high	2.0	moderate	1.1	moderate
MW-369	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
MW-370	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
MW-375	1.3	0.5	moderately high	1.9	moderate	1.8	moderate	0.9	moderate
MW-377	4.9E-03	0.0	high	3.0E-02	high	1.2E-02	high	1.4E-03	moderately high
MW-382	0.3	4.44E-03	moderately high	1.5	high	0.7	high	0.2	moderately high
MW-383	4.6E-02	1.2E-02	moderately high	4.2E-02	low	9.0E-02	moderately high	2.4E-02	moderate
MW-384	0.2	0.1	moderately high	0.1	moderately high	0.3	moderately high	0.1	moderate
MW-385	0.2	2.62E-03	moderately high	0.7	high	0.3	moderately high	0.1	moderately high
MW-386	4.0E-02	0.0	high	1.3E-01	high	9.1E-02	high	1.5E-02	moderately high
MW-390	0.2	4.48E-03	moderately high	0.5	high	0.3	moderately high	0.1	moderately high
MW-391	3.5	2.7	moderate	3.8	low	4.1	moderate	2.9	moderate
MW-392	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
MW-393	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
MW-394	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
TPZ-164	1.5	1.5	negligible	1.5	negligible	1.5	negligible	1.5	negligible
XPW01	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
XPW02	1.5	1.5	negligible	1.5	negligible	1.5	negligible	1.5	negligible
XPW04	1.5	1.5	negligible	1.5	negligible	1.5	negligible	1.5	negligible
XPW05	1.5	1.5	negligible	1.5	negligible	1.5	negligible	1.5	negligible
XPW06	4.0	4.0	negligible	4.0	negligible	4.0	negligible	4.0	negligible

TABLE 5-3. TRANSPORT MODEL INPUT VALUES (SENSITIVITY)
GROUNDWATER MODELING REPORT
BALDWIN POWER PLANT
BOTTOM ASH POND
BALDWIN, ILLINOIS

Well ID	Calibration Concentration (mg/L)	Storage and Specific Yield				Effective Porosity			
		File Name		File Name		File Name		File Name	
		BAL_Conc_324_T_A _s_sy_low.gwv BAL_Conc_324_T_B_2_s_sy_low.gwv		BAL_Conc_324_T_A _s_sy_high.gwv BAL_Conc_324_T_B_2_s_sy_high.gwv		BAL_Conc_324_T_A_por_low.gwv BAL_Conc_324_T_B_2_por_low.gwv		BAL_Conc_324_T_A_por_high.gwv BAL_Conc_324_T_B_2_por_high.gwv	
		Concentration (mg/L)	Sensitivity [1]	Concentration (mg/L)	Sensitivity [1]	Concentration (mg/L)	Sensitivity [1]	Concentration (mg/L)	Sensitivity [1]
MW-104SR	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
MW-104DR	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
MW-150	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
MW-151	6.1	2.8	moderately high	10.3	moderately high	9.7	moderately high	3.1	moderate
MW-152	2.5	2.9	moderate	1.1	moderately high	3.7	moderate	1.6	moderate
MW-153	9.0E-06	0.0	high	3.0E-06	moderately high	1.0E-04	high	1.0E-06	moderately high
MW-154	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
MW-155	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
MW-252	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
MW-253	0.0	0.0	negligible	0.0	negligible	6.00E-06	negligible	0.0	negligible
MW-352	1.0E-06	2.1E-05	high	0.0	high	0.0	high	1.0E-06	negligible
MW-355	0.0	0.0	negligible	0.0	negligible	0.0	negligible	0.0	negligible
OW-156	0.7	0.7	negligible	0.7	low	0.7	low	0.6	low
OW-157	14.8	19.4	moderate	7.3	moderately high	20.0	moderate	11.3	moderate
		S*0.1 Sy*0.5		S*10 Sy*2[2]		Porosity-0.05		Porosity+0.05	

[O: JJW 5/22/23; C: EGP 5/23/23]

Notes:

[1] Sensitivity Explanation:
Negligible = concentration changed by less than 1%
Low = concentration change between 1% and 10%
Moderate = concentration change between 10% and 50%
Moderately High = concentration change between 50% and 100%
High = concentration change greater than 100%

ID = identification
mg/L = milligrams per liter
S = storativity
Sy = specific yield

[2] High specific yield sensitivity not analyzed for zone 100 (Above River Boundary Conditions) since the calibration value was already near upper limits of acceptable values for specific yield

TABLE 6-1. HELP MODEL INPUT AND OUTPUT VALUES
GROUNDWATER MODELING REPORT
BALDWIN POWER PLANT
BOTTOM ASH POND
BALDWIN, ILLINOIS

Closure Scenario Number (Drainage Length)	BAP CIP - Consolidation Area (Top)	BAP CIP - Consolidation Area (Slopes)	Notes
Input Parameter			
Climate-General			
City	Baldwin, IL	Baldwin, IL	Nearby city to the Site within HELP database
Latitude	38.18	38.18	Site latitude
Evaporative Zone Depth	18	18	Estimated based on geographic location (Illinois) and uppermost soil type (Tolaymat, T. and Krause, M 2020)
Maximum Leaf Area Index	4.5	4.5	Maximum for geographic location (Illinois) (Tolaymat, T. and Krause, M, 2020)
Growing Season Period, Average Wind Speed, and Quarterly Relative Humidity	Belleville Scott Air Force Base, IL	Belleville Scott Air Force Base, IL	Nearby city to the Baldwin Ash Pond within HELP database
Number of Years for Synthetic Data Generation	30	30	
Temperature, Evapotranspiration, and Precipitation	Precipitation, temperature, and solar radiation was simulated based on HELP V4 weather simulation for: Lat/Long: 38.18/ -89.85	Precipitation, temperature, and solar radiation was simulated based on HELP V4 weather simulation for: Lat/Long: 38.18/ -89.85	
Soils-General			
% where runoff possible	100	100	
Area (acres)	53.73	21.39	CIP - Consolidation and Cover System Area based on construction drawing for Baldwin Ash Pond
Specify Initial Moisture Content	No	No	
Surface Water/Snow	Model Calculated	Model Calculated	
Soils-Layers			
1	Vegetative Soil Layer (HELP Final Cover Soil [topmost layer])	Vegetative Soil Layer (HELP Final Cover Soil [topmost layer])	Layers details for CIP areas based on grading plans, construction drawings, and cover system design for Baldwin BAP
2	Protective Soil Layer (HELP Vertical Percolation Layer)	Protective Soil Layer (HELP Vertical Percolation Layer)	
3	Geotextile Protective Layer (Custom)	Geocomposite Drainage Layer (HELP Geosynthetic Drainage Net)	
4	Geomembrane Liner	Geomembrane Liner	
5	Unsaturated CCR Material (HELP Waste)	Unsaturated CCR Material (HELP Waste)	
Soil Parameters--Layer 1			
Type	1	1	Vertical Percolation Layer (Cover Soil)
Thickness (in)	6	6	Layer 1 thickness is the average thickness of unsaturated backfill material
Texture	26	26	Default used for CIP Consolidation area
Description	Silty Clay Loam (Moderate)	Silty Clay Loam (Moderate)	
Saturated Hydraulic Conductivity (cm/s)	1.90E-06	1.90E-06	Default used for CIP Consolidation area
Soil Parameters--Layer 2			
Type	1	1	Vertical Percolation Layer (BAP)
Thickness (in)	18	18	design thickness

TABLE 6-1. HELP MODEL INPUT AND OUTPUT VALUES
GROUNDWATER MODELING REPORT
BALDWIN POWER PLANT
BOTTOM ASH POND
BALDWIN, ILLINOIS

Closure Scenario Number (Drainage Length)	BAP CIP - Consolidation Area (Top)	BAP CIP - Consolidation Area (Slopes)	Notes
Texture	28	28	Defaults used
Description	Silty Clay (Moderate)	Silty Clay (Moderate)	
Saturated Hydraulic Conductivity (cm/s)	1.20E-06	1.20E-06	Defaults used
Soil Parameters--Layer 3			
Type	2	2	Lateral Drainage Layer
Thickness (in)	0.175	0.2	design thickness
Texture	43	20	Custom used for the top area of the CIP and a Default used for the slopes
Description	16 oz Nonwoven Geotextile	Geosynthetic Drainage Net	
Saturated Hydraulic Conductivity (cm/s)	3.00E-01	1.00E+01	Custom used for the top area of the CIP and a Defaults used for the slopes
Soil Parameters--Layer 4			
Type	4	4	Flexible Membrane Liner
Thickness (in)	0.04	0.04	design thickness
Texture	36	36	Defaults used
Description	LDPE Membrane	LDPE Membrane	
Saturated Hydraulic Conductivity (cm/s)	4.00E -13	4.00E -13	Defaults used
Soil Parameters--Layer 5			
Type	1	1	Vertical Percolation Layer (Waste)
Thickness (in)	545.28	231.72	design thickness
Texture	83	83	Custom used for CCR material
Description	Unsaturated CCR Material (HELP Waste)	Unsaturated CCR Material (HELP Waste)	
Saturated Hydraulic Conductivity (cm/s)	5.29E-04	5.29E-04	Custom used for CCR material from HCR average
Soils--Runoff			
Runoff Curve Number	89.8	91.1	HELP-computed curve number
Slope	2.00%	25.00%	Estimated from construction design drawings
Length (ft)	600	150	estimated maximum flow path
Vegetation	fair	fair	fair indicating fair stand of grass on surface of soil backfill
Execution Parameters			
Years	30	30	
Report Daily	No	No	
Report Monthly	No	No	
Report Annual	Yes	Yes	
Output Parameter			
Unsaturated Percolation Rate (in/yr)	**0.000239**	**0.000007**	

Notes:
[O: EGP 12/15/22, C: LCA 12/16/22]
% = percent
ft = feet
HELP = Hydrologic Evaluation of Landfill Performance
in = inches
in/yr = inches per year
Lat = latitude
Long = longitude
CBR = Closure By Removal
CIP = Closure In Place
HCR = Hydrogeologic Characterization Report

References:
Tolaymat, T. and Krause, M, 2020. Hydrologic Evaluation of Landfill Performance: HELP 4.0 User Manual . United States Environmental Protection Agency, Washington, DC, EPA/600/B 20/219.
Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2021. Hydrogeologic Site Characterization Report. Newton Primary Ash Pond. Newton Power Plant. Newton, Illinois.

TABLE 6-2. PREDICTION MODEL INPUT VALUES
GROUNDWATER MODELING REPORT
BALDWIN POWER PLANT
BOTTOM ASH POND
BALDWIN, ILLINOIS

Scenario: CIP (CCR removal from the western areas of the Bottom Ash Pond, consolidation to the eastern areas of the Bottom Ash Pond, and construction of a cover system over the remaining CCR)

Prediction Model	Model Years	Zone Description	Recharge Zone	Boron Recharge Concentration (mg/L)	Recharge (ft/day)	Recharge (in/yr)	Source Concentration (constant concentration cells) and Stormwater Management (constant head cells) Description	Reach Number	Constant Head (feet)	Constant Concentration (mg/L)
Initial Conditions	51	Old East Fly Ash Pond	2	38	4.00E-04	1.75	Old East Fly Ash Pond	2	--	38
Initial Conditions	51	East Fly Ash Pond	3	79	8.00E-04	3.50	East Fly Ash Pond	3	--	79
Initial Conditions	51	West Fly Ash Cell	4	47	6.00E-04	2.63	--	--	--	--
Initial Conditions	51	--	--	--	--	--	West Fly Ash Pond Constant Head	4	424.3	47
Initial Conditions	51	--	--	--	--	--	West Fly Ash Pond (Berm)	14	--	47
Initial Conditions	51	--	--	--	--	--	BAP Constant Head West	0	415.0	4
Initial Conditions	51	--	--	--	--	--	BAP Constand Head Central	1	425.0	4
Initial Conditions	51	Bottom Ash Pond (West)	7	4	1.80E-04	0.79	Bottom Ash Pond (West)	7	--	4
Initial Conditions	51	Bottom Ash Pond (East)	8	1.5	1.80E-04	0.79	Bottom Ash Pond (East)	8	--	1.5
Exisiting Conditions	4	Old East Fly Ash Pond (Post-Closure)	2	38	6.80E-05	0.30	Old East Fly Ash Pond	2	--	38
Exisiting Conditions	4	East Fly Ash Pond (Post-Closure)	3	79	6.80E-05	0.30	East Fly Ash Pond	3	--	79
Exisiting Conditions	4	West Fly Ash Cell (Post-Closure)	4	47	6.80E-05	0.30	--	--	--	--
Exisiting Conditions	4	--	--	--	--	--	West Fly Ash Pond Constant Head	4	--	47
Exisiting Conditions	4	--	--	--	--	--	West Fly Ash Pond (Berm)	14	--	47
Exisiting Conditions	4	--	--	--	--	--	BAP Constant Head West	0	415.0	4
Exisiting Conditions	4	--	--	--	--	--	BAP Constand Head Central	1	425.0	4
Exisiting Conditions	4	Bottom Ash Pond (West)	7	4	1.80E-04	0.79	Bottom Ash Pond (West)	7	--	4
Exisiting Conditions	4	Bottom Ash Pond (East)	8	1.5	1.80E-04	0.79	Bottom Ash Pond (East)	8	--	1.5
Dewatering	3	Old East Fly Ash Pond (Post-Closure)	2	38	6.80E-05	0.30	Old East Fly Ash Pond	2	--	38
Dewatering	3	East Fly Ash Pond (Post-Closure)	3	79	6.80E-05	0.30	East Fly Ash Pond	3	--	79
Dewatering	3	West Fly Ash Cell (Post-Closure)	4	47	6.80E-05	0.30	--	--	--	--
Dewatering	3	--	--	--	--	--	West Fly Ash Pond Constant Head	4	--	47
Dewatering	3	--	--	--	--	--	West Fly Ash Pond (Berm)	14	--	47
Dewatering	3	--	--	--	--	--	BAP Constant Head West	0	415.0	4
Dewatering	3	--	--	--	--	--	BAP Constand Head Central	1	425.0	4
Dewatering	3	Bottom Ash Pond (West)	7	4	1.80E-04	0.79	Bottom Ash Pond (West)	7	--	4
Dewatering	3	Bottom Ash Pond (East)	8	1.5	1.80E-04	0.79	Bottom Ash Pond (East)	8	--	1.5
Dewatering	3	--	--	--	--	--	CIP Area Dewater Constant Head (Northeast)	26	433	1.5
Dewatering	3	--	--	--	--	--	CIP Area Dewater Constant Head (West Central)	23	420	1.5
Dewatering	3	--	--	--	--	--	CIP Area Dewater Constant Head (Southeast)	24	433	1.5
CIP	1000	Old East Fly Ash Pond (Post-Closure)	2	38	6.80E-05	0.30	Old East Fly Ash Pond	2	--	38
CIP	1000	East Fly Ash Pond (Post-Closure)	3	79	6.80E-05	0.30	East Fly Ash Pond	3	--	79
CIP	1000	West Fly Ash Cell (Post-Closure)	4	47	6.80E-05	0.30	--	--	--	--

TABLE 6-2. PREDICTION MODEL INPUT VALUES
GROUNDWATER MODELING REPORT
BALDWIN POWER PLANT
BOTTOM ASH POND
BALDWIN, ILLINOIS

Scenario: CIP (CCR removal from the western areas of the Bottom Ash Pond, consolidation to the eastern areas of the Bottom Ash Pond, and construction of a cover system over the remaining CCR)

Prediction Model	Model Years	Zone Description	Recharge Zone	Boron Recharge Concentration (mg/L)	Recharge (ft/day)	Recharge (in/yr)	Source Concentration (constant concentration cells) and Stormwater Management (constant head cells) Description	Reach Number	Constant Head (feet)	Constant Concentration (mg/L)
CIP	1000	--	--	--	--	--	West Fly Ash Pond Constant Head	4	--	47
CIP	1000	--	--	--	--	--	West Fly Ash Pond (Berm)	14	--	47
CIP	1000	--	--	--	--	--	BAP Constant Head West	0	415.0	4
CIP	1000	--	--	--	--	--	BAP Constand Head Central	1	425.0	4
CIP	1000	Removal Area - Bottom Ash Pond (Post-Closure)	7	--	0	0	--	--	--	--
CIP	1000	CIP Top - Bottom Ash Pond (Post-Closure)	8	4	5.46E-08	2.39E-04			--	--
CIP	1000	CIP Slopes - Bottom Ash Pond (Post-Closure)	9	4	1.60E-09	7.01E-06			--	--
CIP	1000	--	--	--	--	--	CIP Area - Bottom Ash Pond (Post-Closure)	20	--	4

Prediction Model	Construction Period (years)	Zone Description	Hydraulic Conductivity Zone	Horizontal Hydraulic Conductivity (ft/d)	Horizontal Hydraulic Conductivity (cm/s)	Vertical Hydraulic Conductivity (ft/d)	Vertical Hydraulic Conductivity (cm/s)
Initial Conditions	51	Bottom Ash Pond	7	1.5	5.29E-04	1.5	5.29E-04
Exisiting Conditions	4	Bottom Ash Pond	7	1.5	5.29E-04	1.5	5.29E-04
Dewatering	3	Bottom Ash Pond	7	1.5	5.29E-04	1.5	5.29E-04
CIP	1000	CIP Top - Bottom Ash Pond (Post-Closure)	18	1.5	5.29E-04	1.5	5.29E-04
CIP	1000	CIP Slopes - Bottom Ash Pond (Post-Closure)	19	1.5	5.29E-04	1.5	5.29E-04

Prediction Model	Construction Period (years)	Drain Reach	Relative Location	Stage of Drain (feet)	Thickness of Drain Bed (feet)	Hydraulic Conductivity (ft/d)	Drain Conductance (ft^2/d)
CIP	1000	10	BAP Drain West	410	1	6.00	6.00E+04

[O: JJW 1/6/23; EGP 5/22/23]

Notes:
-- = boundary condition or property zone not included in prediction model
CCR = coal combustion residuals
CIP = Closure In Place
ft^2/day = feet squared per day
ft/day = feet per day
in/yr = inches per year
cm/s = centimeters per second

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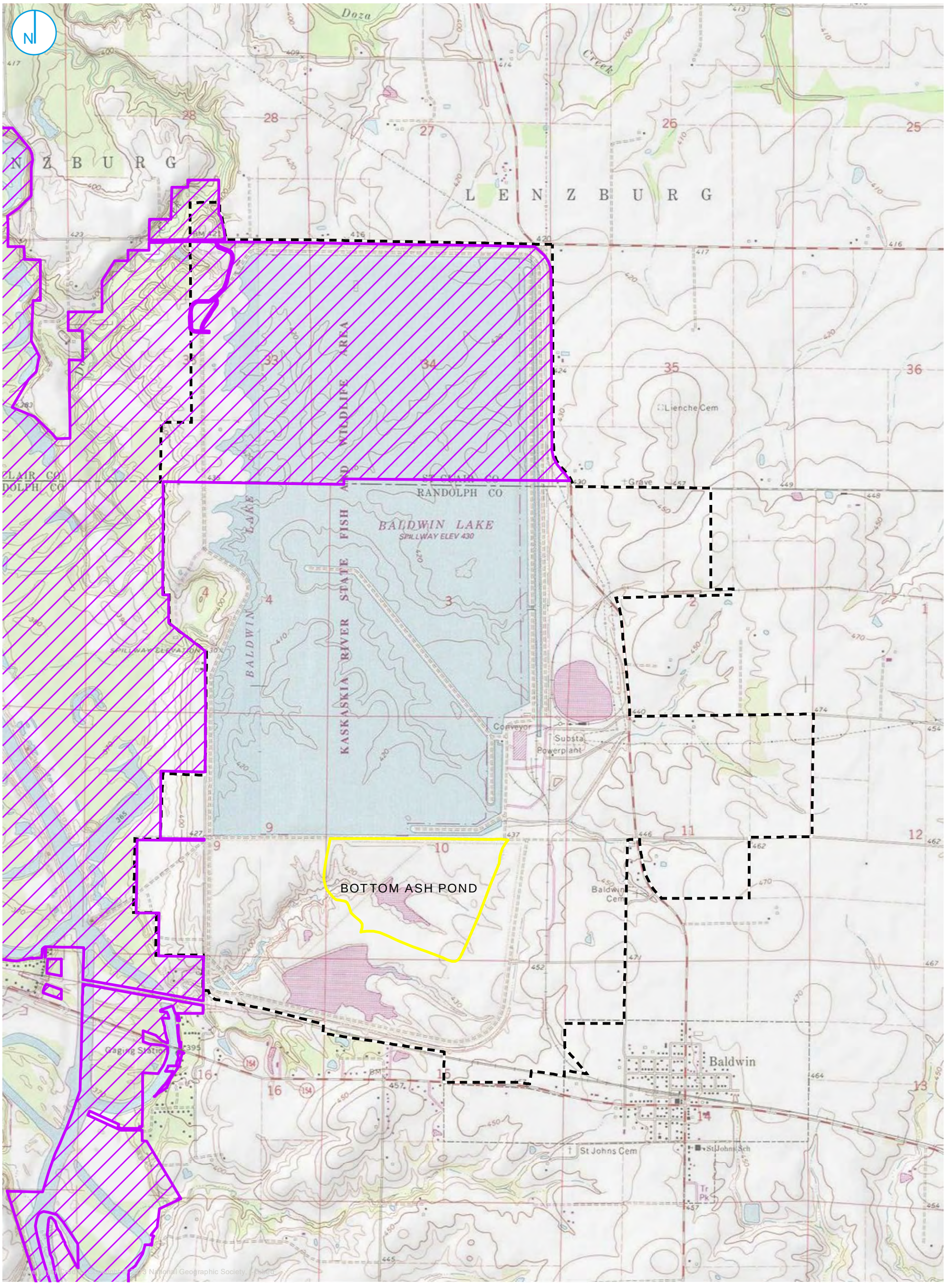
FIGURES



BOTTOM ASH POND BOUNDARY
PROPERTY BOUNDARY
KASKASKIA RIVER STATE FISH AND WILDLIFE AREA

SOURCE NOTE
I-View, Prairie State Conservation Coalition accessed via Illinois Department of Natural Resources Division of Natural Heritage Website
https://www2.illinois.gov/sites/naturalheritage/DataResearch/Pages/Access-Our-Data.aspx

0 1,000 2,000 Feet

SITE LOCATION MAP

FIGURE 1-1

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

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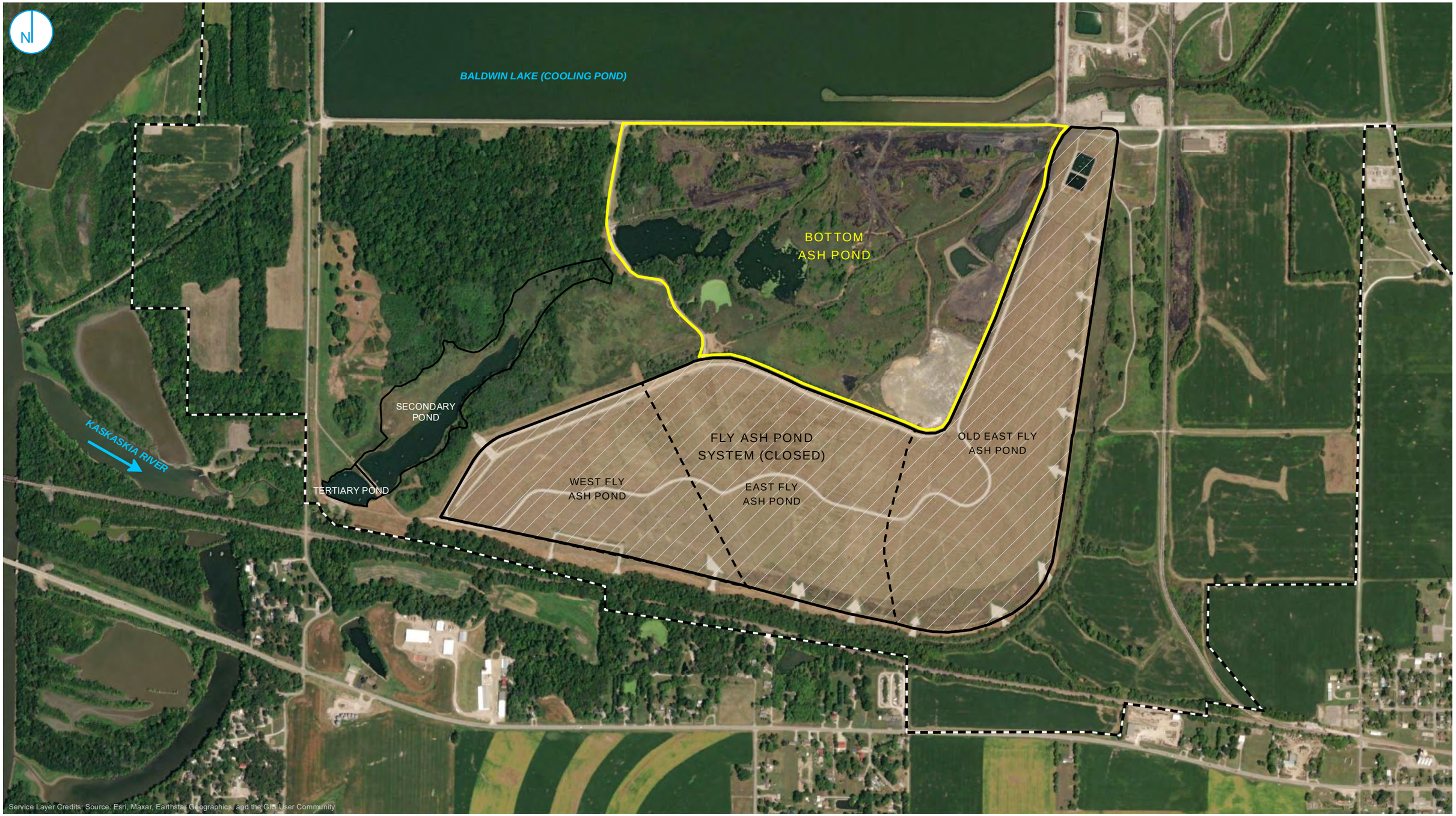

35 I.A.C. § 845 REGULATED UNIT (SUBJECT UNIT)
LIMITS OF FINAL COVER
SITE FEATURE
FLY ASH POND SYSTEM (CLOSED)
PROPERTY BOUNDARY

0 400 800 Feet

SITE MAP

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 1-2

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

PROJECT: 169000XXXX | DATED: 5/23/2023 | DESIGNER: GALARNMC
Y:\Mapping\Projects\22\2285\MXD\Model_Figures\Baldwin\Figure 1-2_Base Map.mxd

Y:\Mapping\Projects\22\2285\MXD\845_Operating_Permit\Baldwin\BAP\Groundwater_Modeling_Report\Figure 2-1_Monitoring Well Location Map.mxd

PROJECT: 169000XXXX | DATED: 5/3/2023 | DESIGNER: GALARNMC

35 I.A.C. § 845 REGULATED UNIT (SUBJECT UNIT)
LIMITS OF FINAL COVER
SITE FEATURE
FLY ASH POND SYSTEM (CLOSED)
PROPERTY BOUNDARY

MONITORING WELL
PORE WATER WELL

0 500 1,000 Feet

MONITORING WELL LOCATION MAP

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 2-1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

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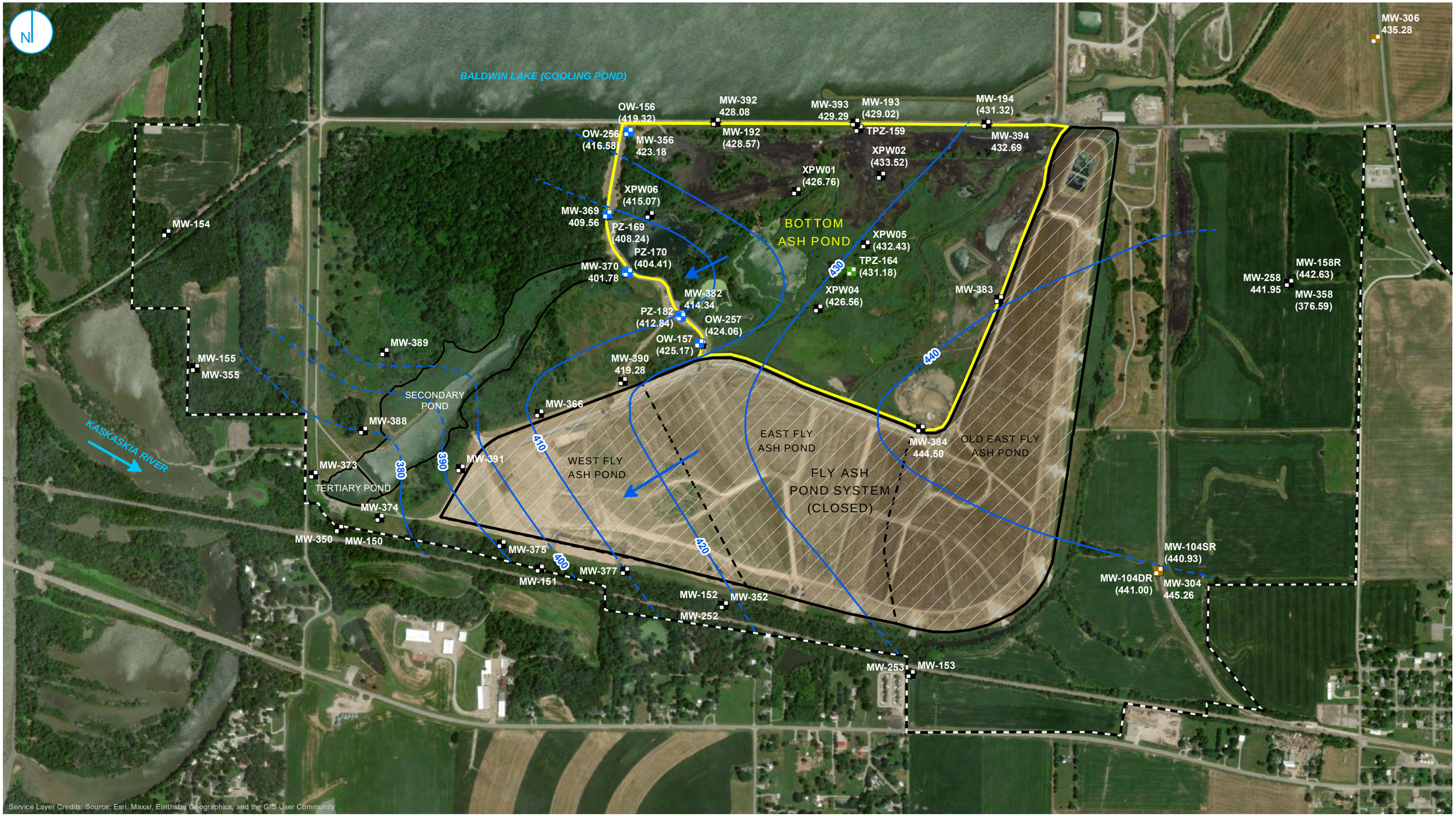

Y:\Mapping\Projects\221285\MXD\845_Operating_Permit\Baldwin\BAP\Groundwater_Modeling_Report\Figure 2-2_Pot Surface 20221114.mxd

PROJECT: 169000XXXX | DATED: 1/6/2023 | DESIGNER: galarmmc

- BACKGROUND WELL
- COMPLIANCE WELL
- PORE WATER WELL
- MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (10-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- 35 I.A.C. § 845 REGULATED UNIT (SUBJECT UNIT)
- FLY ASH POND SYSTEM (CLOSED)
- SITE FEATURE
- CAPPED AREA
- PROPERTY BOUNDARY

0 400 800 Feet

NOTES:
1. ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
2. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

BEDROCK POTENTIOMETRIC SURFACE MAP NOVEMBER 14, 2022

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 2-2

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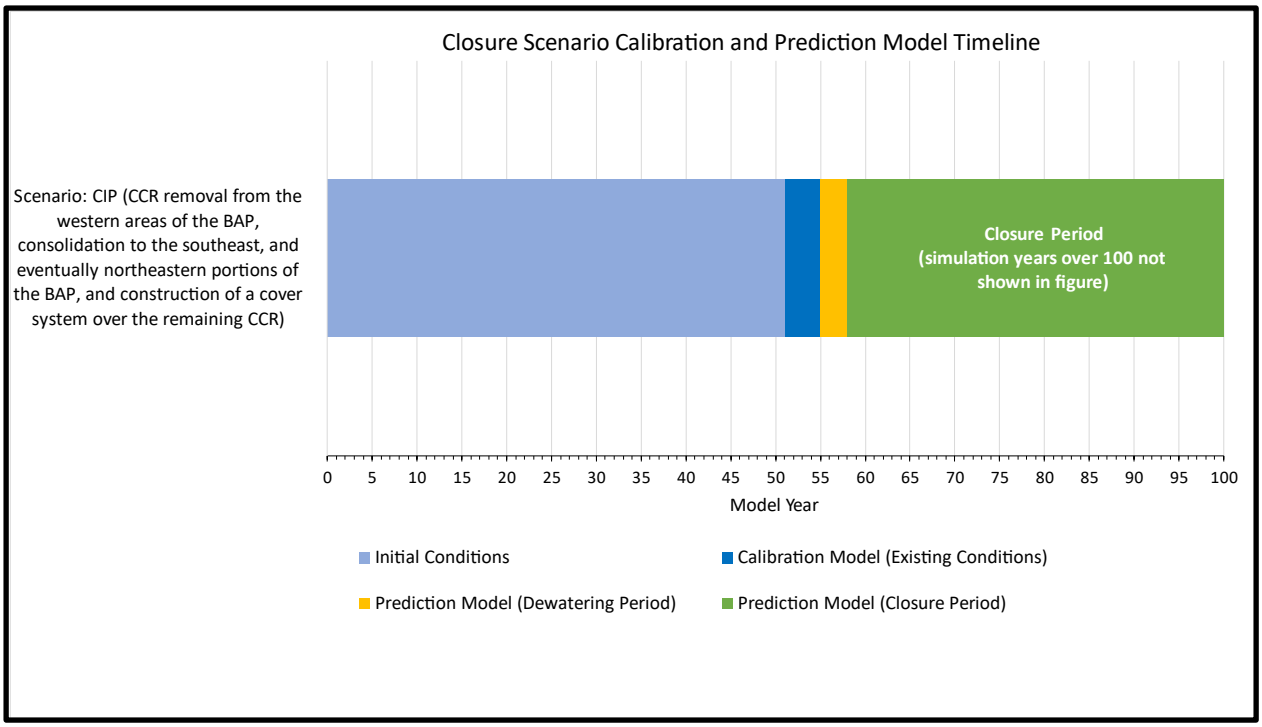
FIGURE 4-1



CLOSURE SCENARIO CALIBRATION AND PREDICTION MODEL TIMELINE

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

35 I.A.C. § 845 REGULATED UNIT (SUBJECT UNIT)
FLY ASH POND SYSTEM (CLOSED)
LIMITS OF FINAL COVER
SITE FEATURE
MODEL DOMAIN
NO FLOW AREA
RIVER
WATERBODY

0 1,250 2,500 Feet

MODEL AREA MAP

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 5-1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

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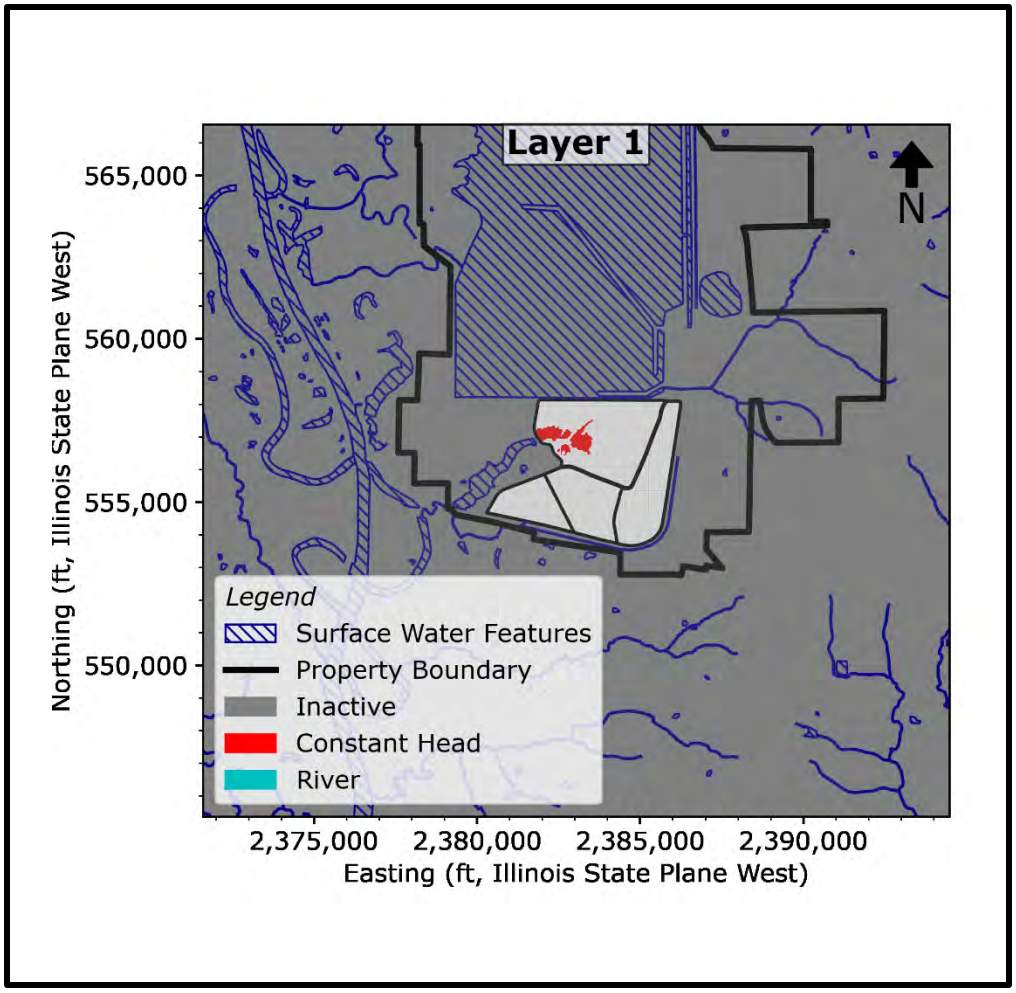

BOUNDARY CONDITIONS FOR LAYER 1 OF THE CALIBRATED NUMERICAL MODEL

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

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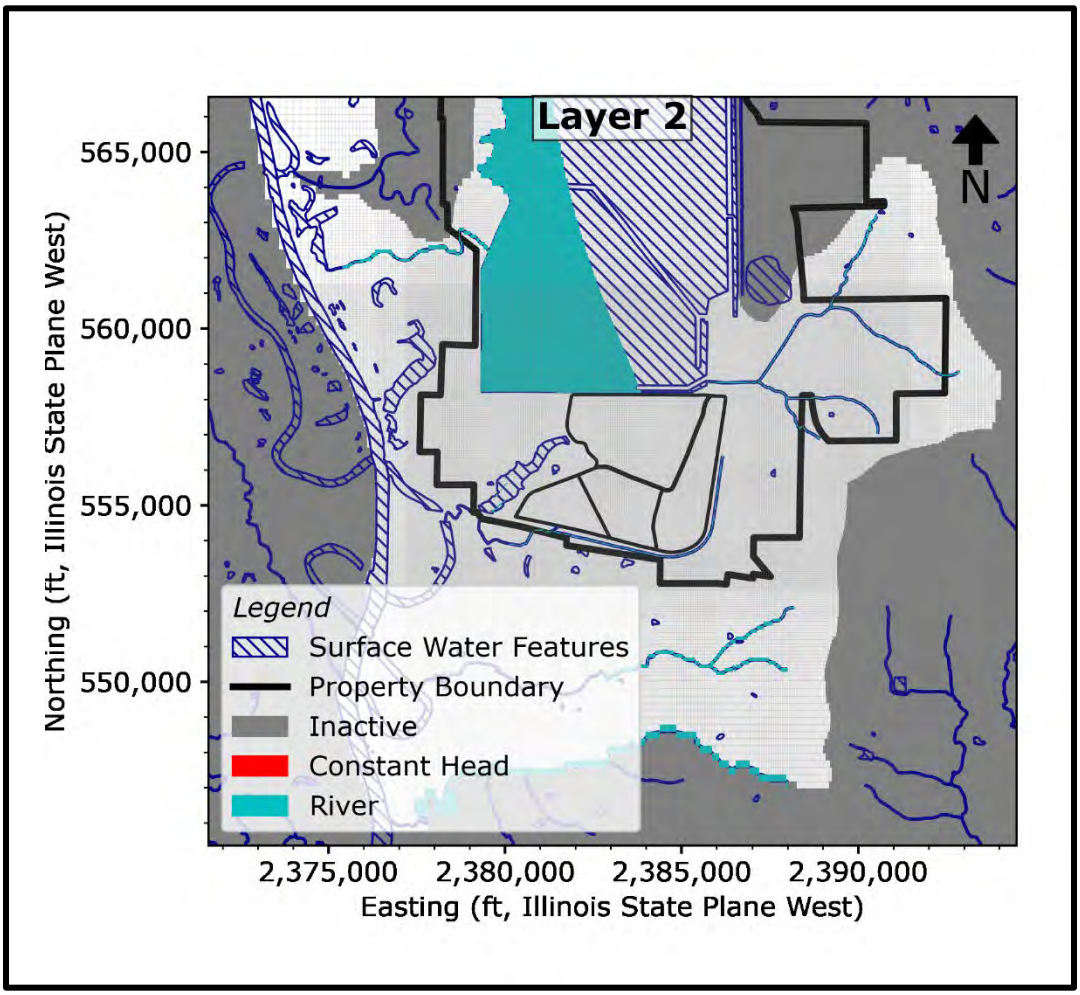
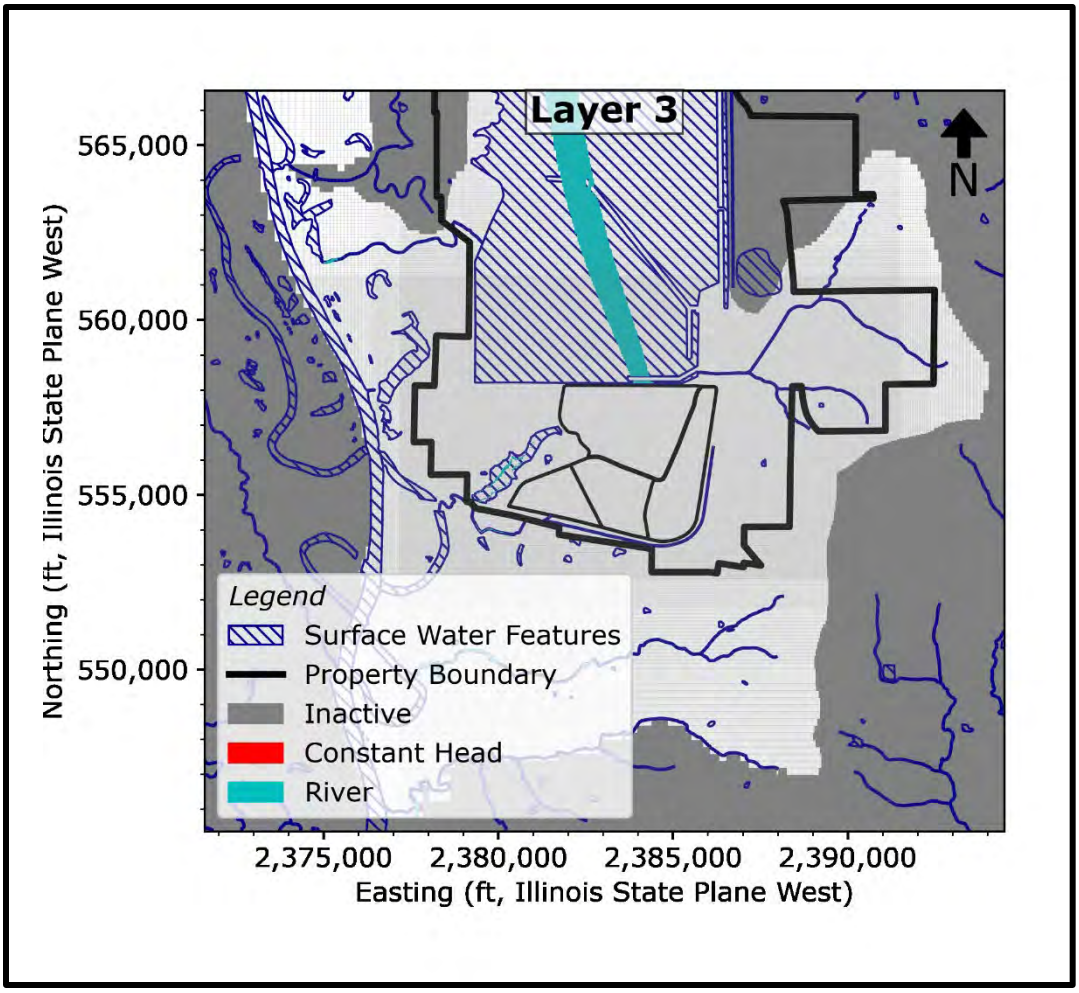
FIGURE 5-3



BOUNDARY CONDITIONS FOR LAYER 2 OF THE CALIBRATED NUMERICAL MODEL

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

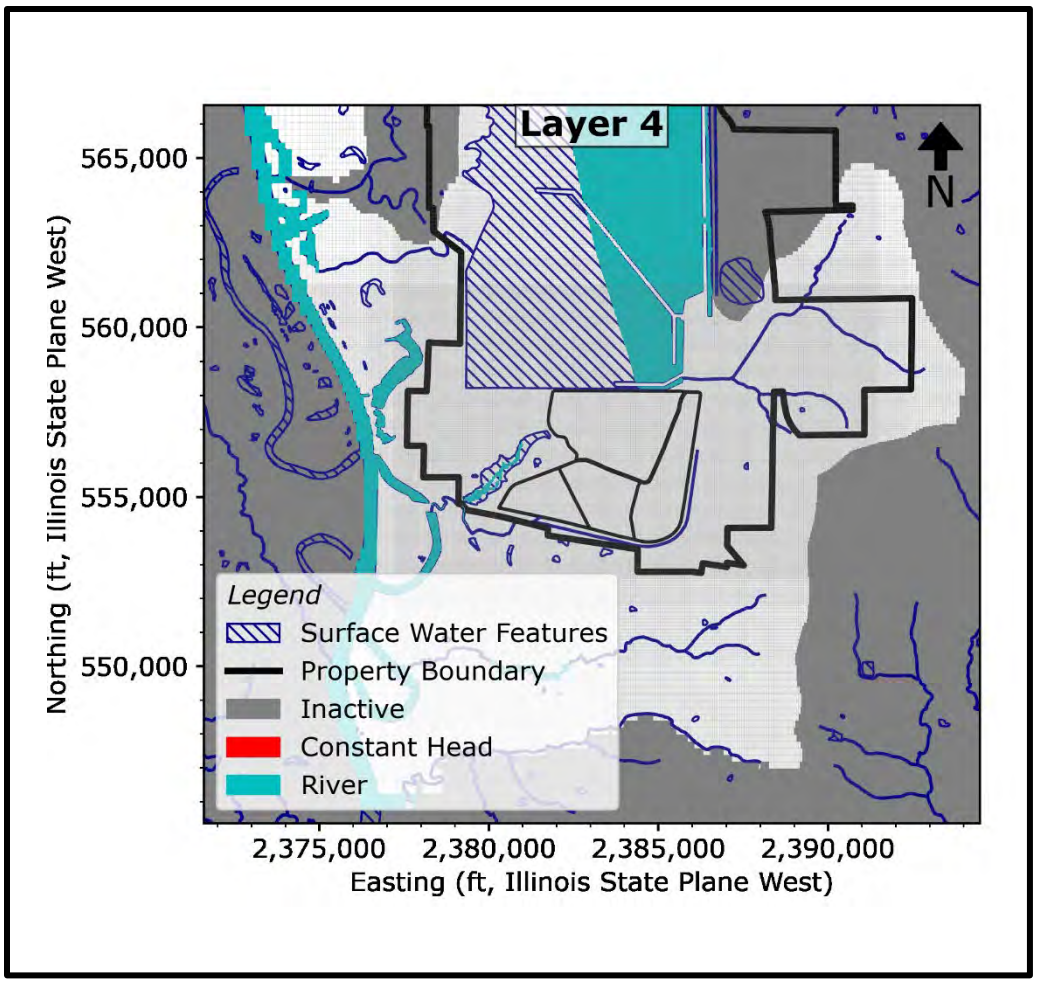
RAMBOLL



BOUNDARY CONDITIONS FOR LAYER 3 OF THE CALIBRATED NUMERICAL MODEL

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

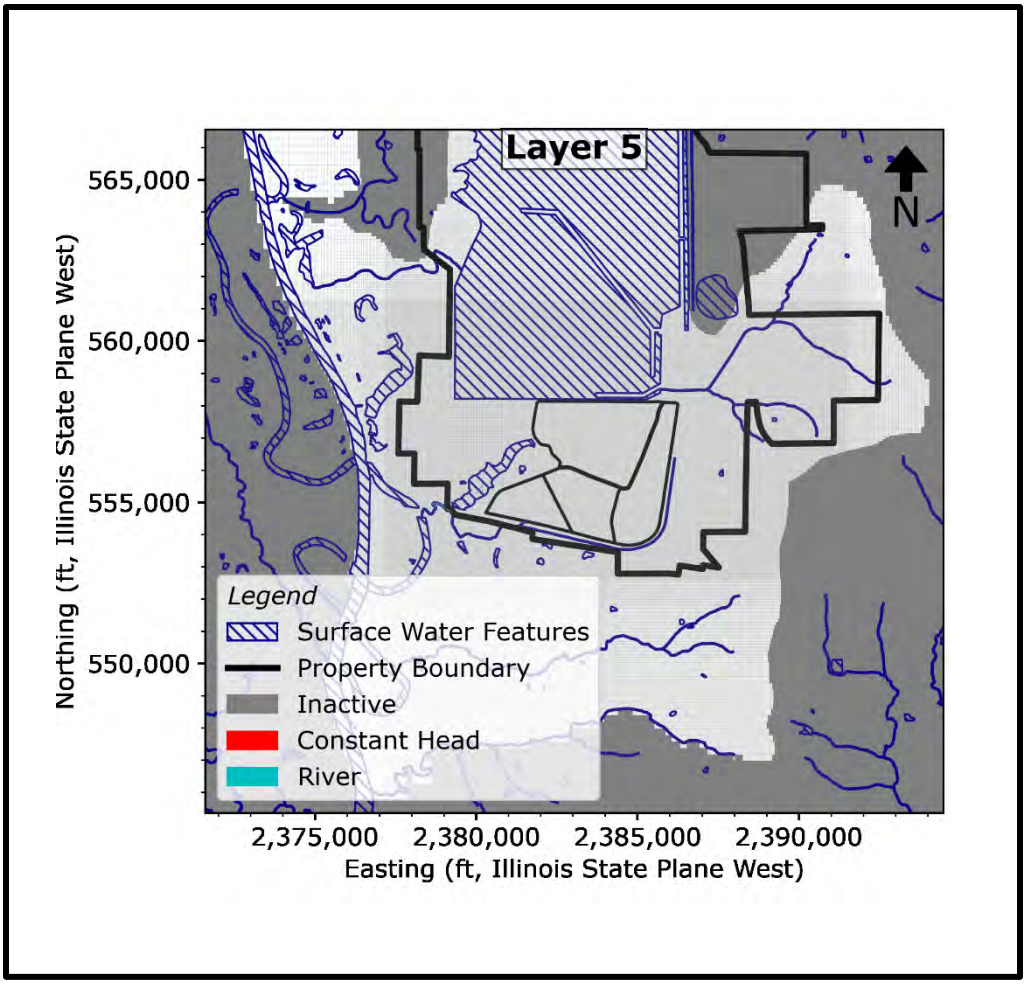
RAMBOLL



BOUNDARY CONDITIONS FOR LAYER 4 OF THE CALIBRATED NUMERICAL MODEL

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

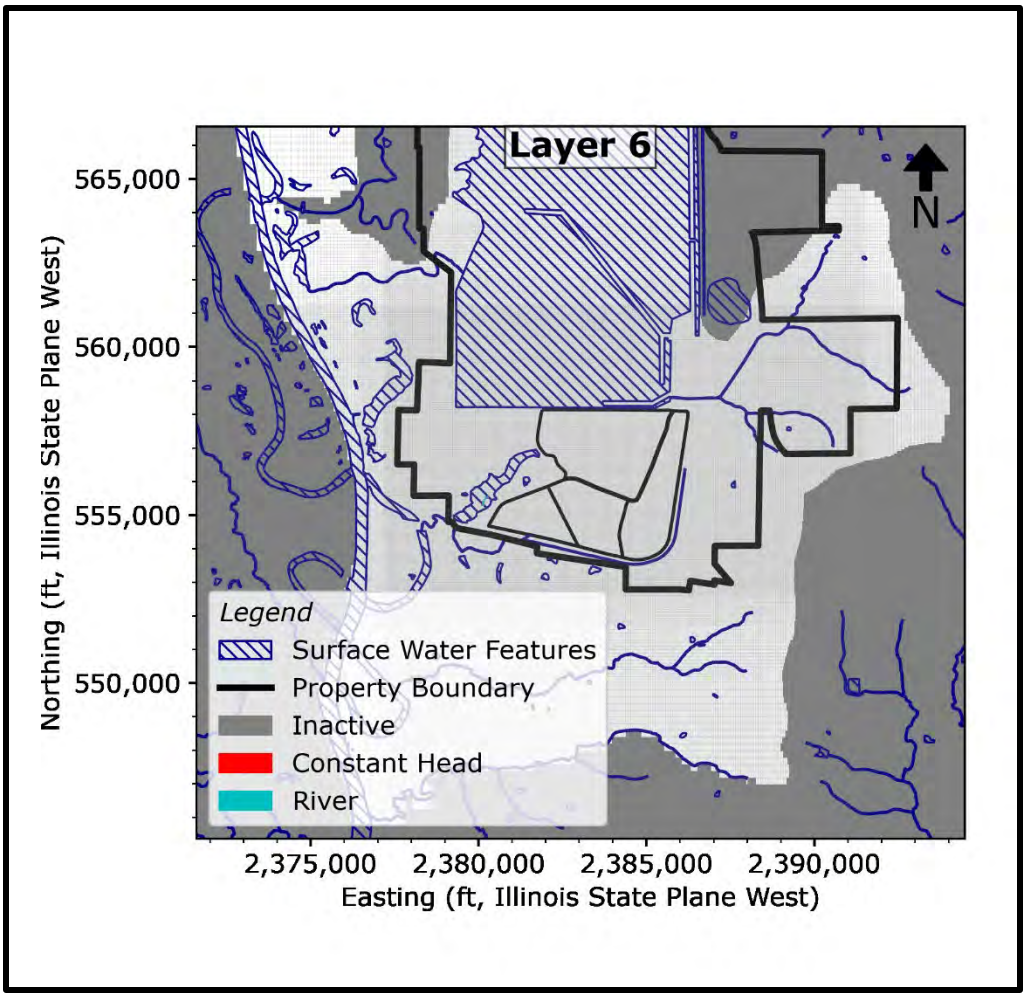
RAMBOLL



BOUNDARY CONDITIONS FOR LAYER 5 OF THE CALIBRATED NUMERICAL MODEL

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

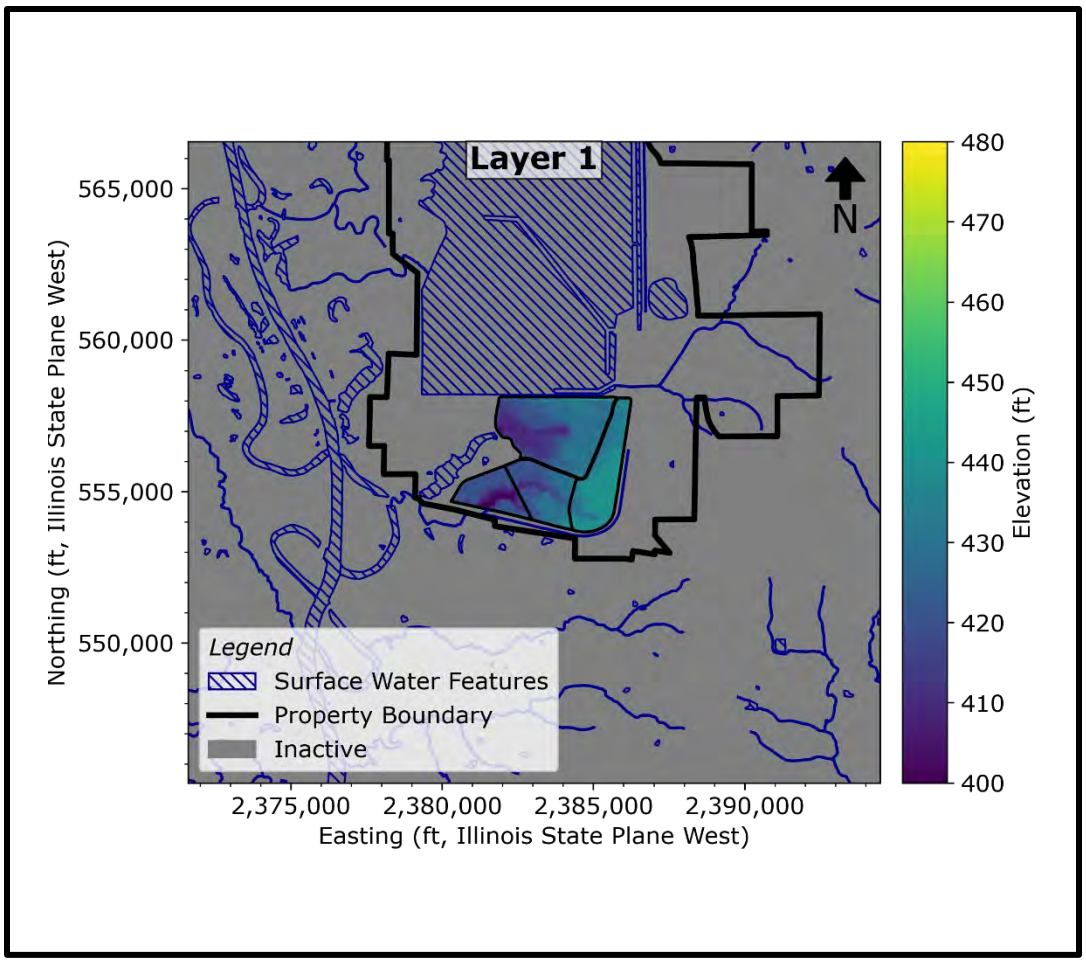
RAMBOLL



BOUNDARY CONDITIONS FOR LAYER 6 OF THE CALIBRATED NUMERICAL MODEL

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

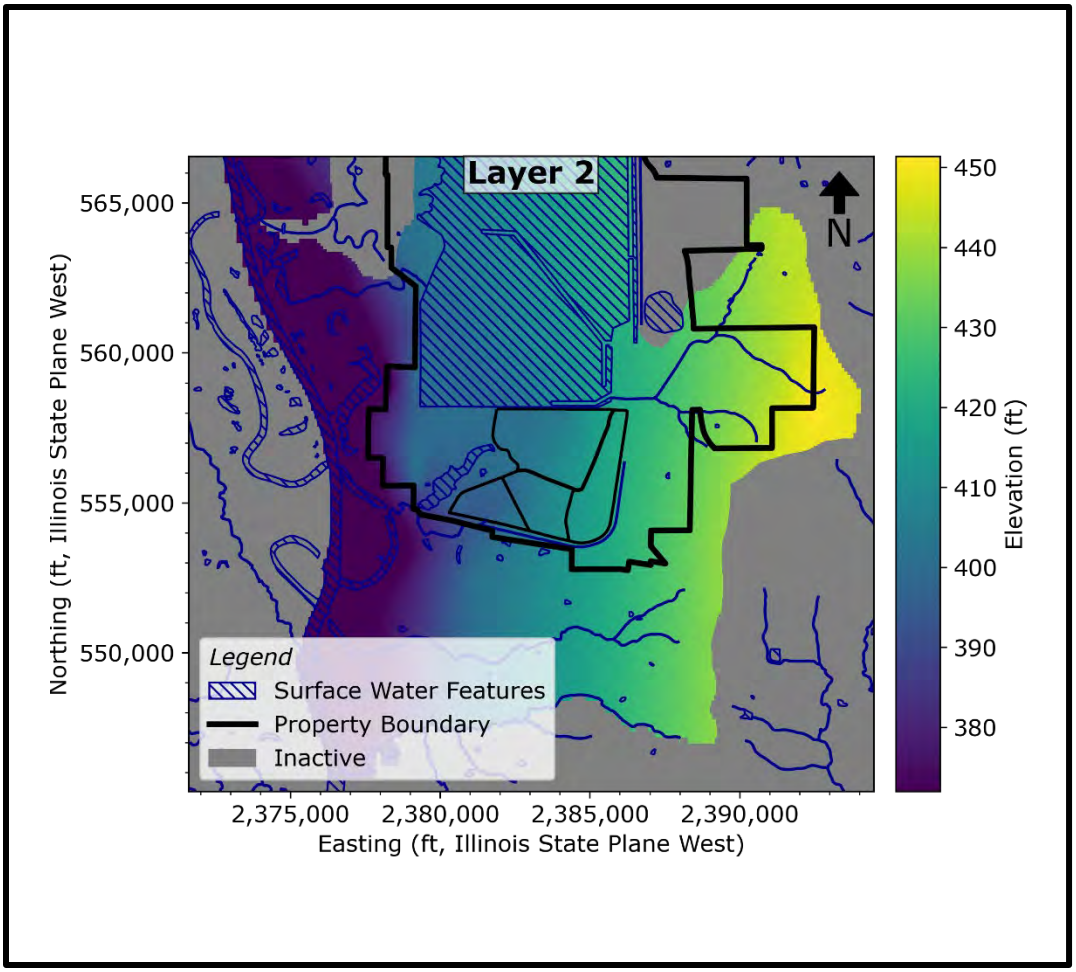
RAMBOLL



BOTTOM ELEVATION OF MODEL LAYER 1

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

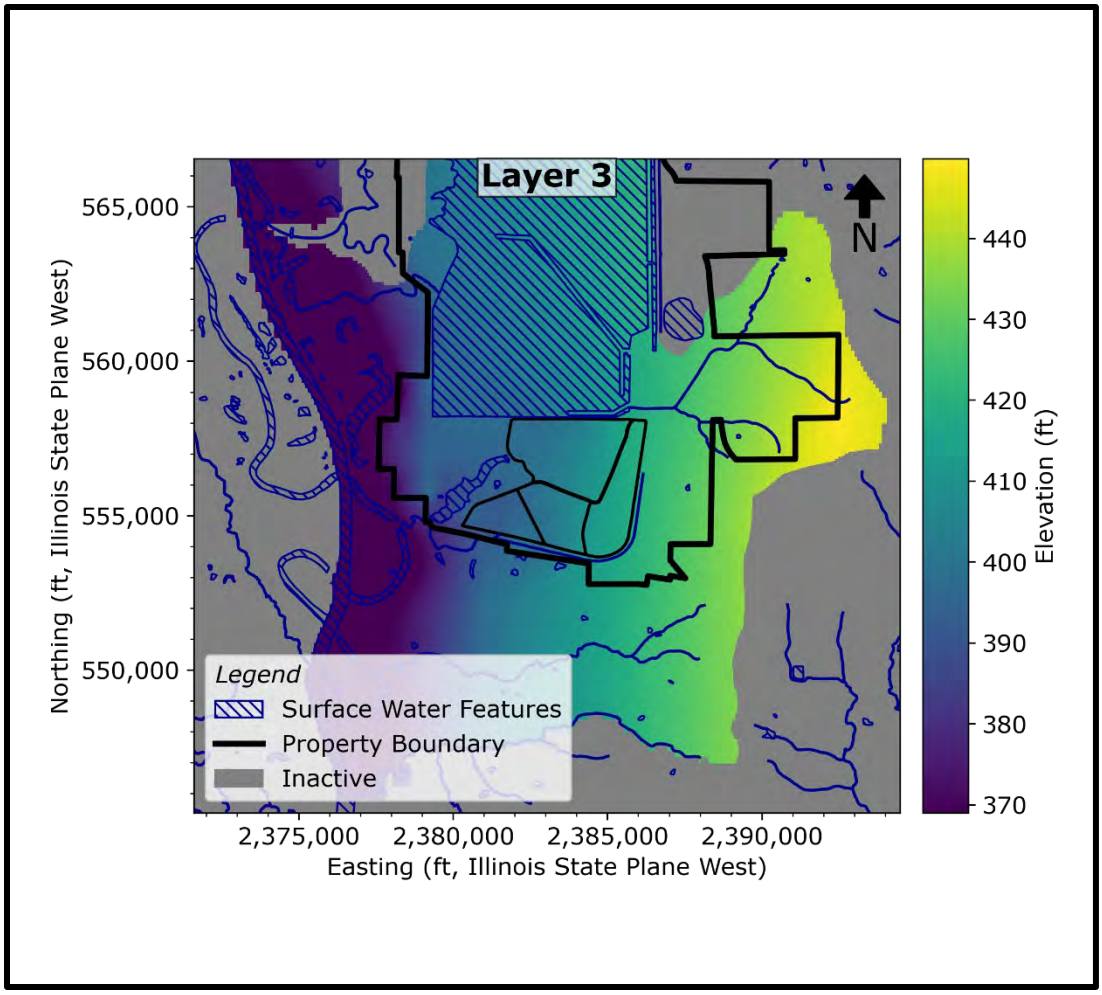
RAMBOLL



BOTTOM ELEVATION OF MODEL LAYER 2

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

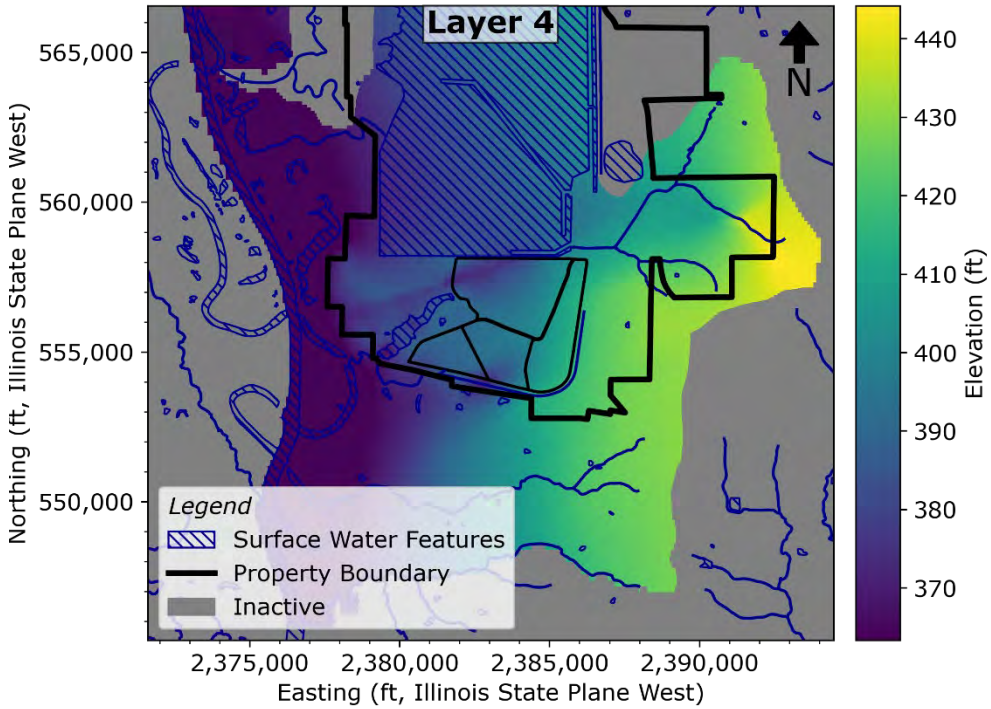
RAMBOLL



BOTTOM ELEVATION OF MODEL LAYER 3

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

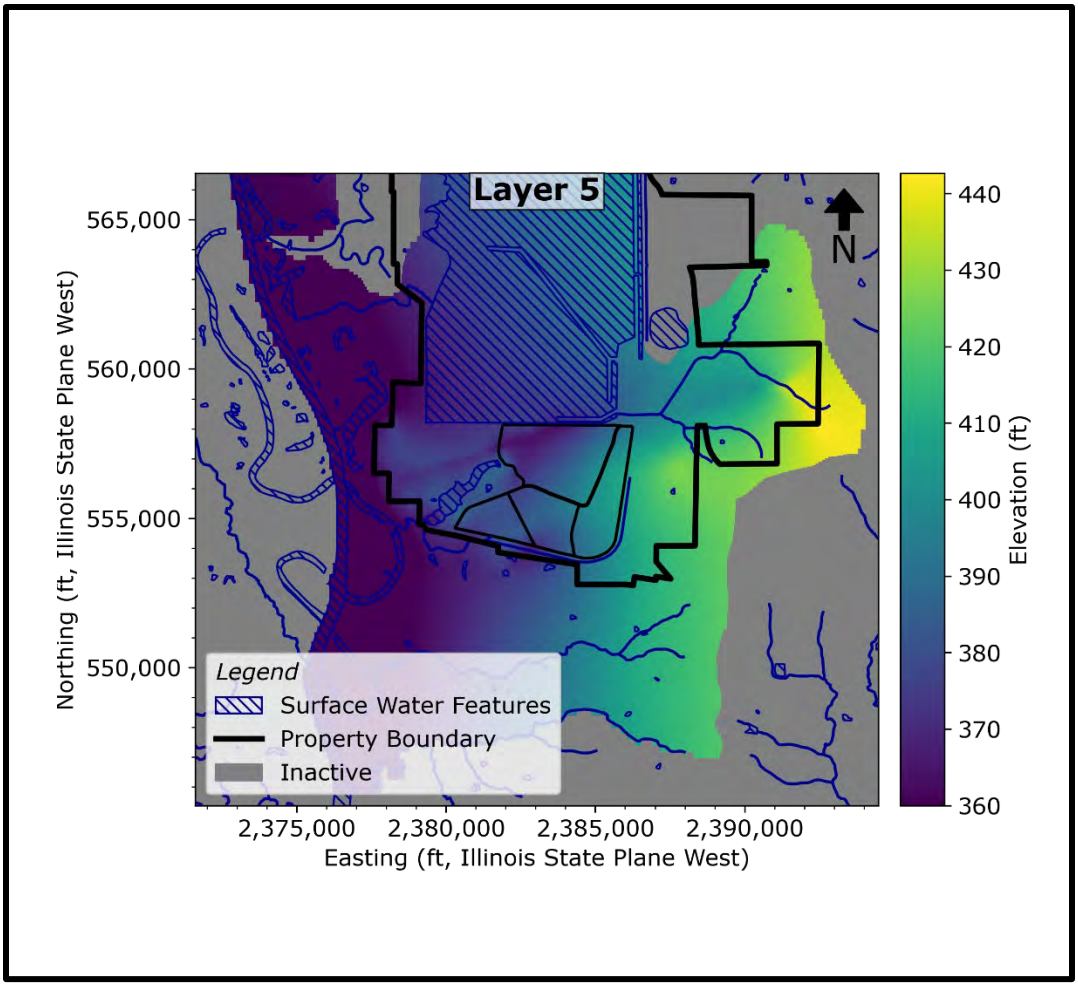
RAMBOLL



BOTTOM ELEVATION OF MODEL LAYER 4

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

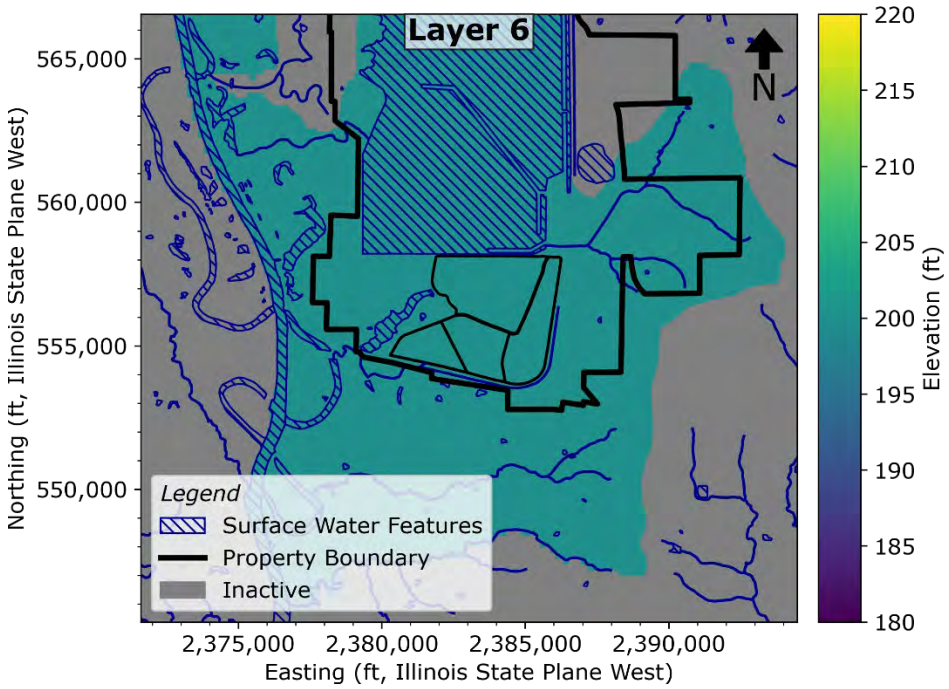
RAMBOLL



BOTTOM ELEVATION OF MODEL LAYER 5

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

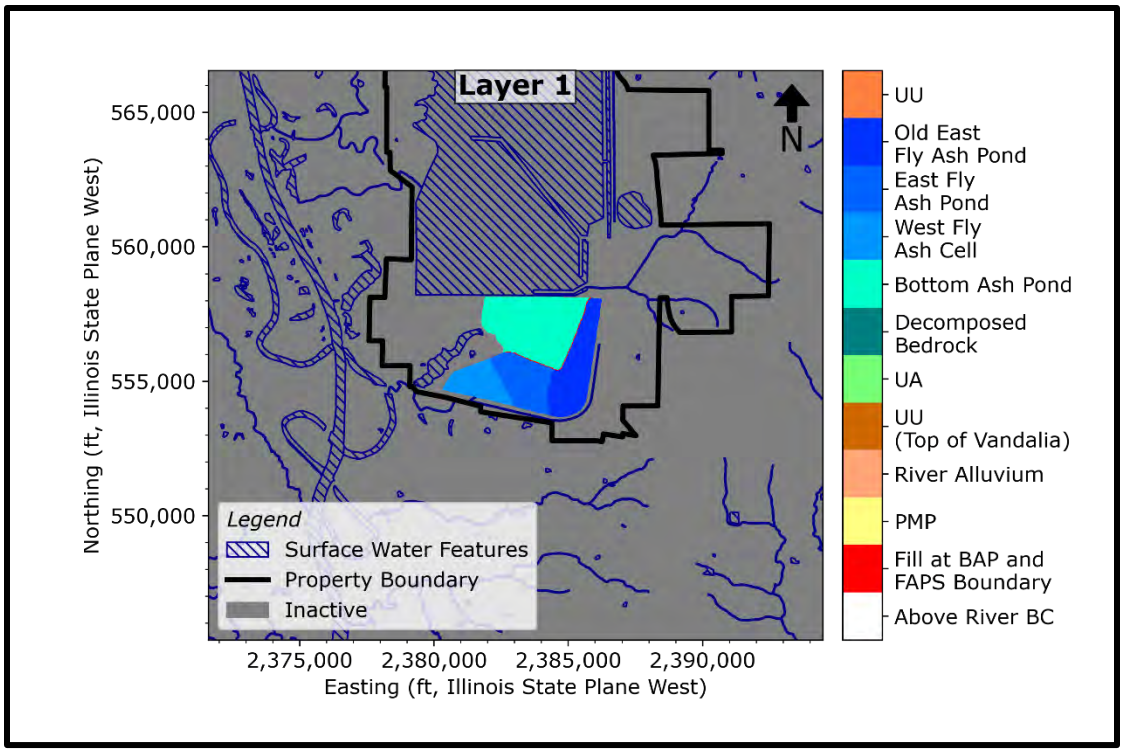
RAMBOLL



BOTTOM ELEVATION OF MODEL LAYER 6

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

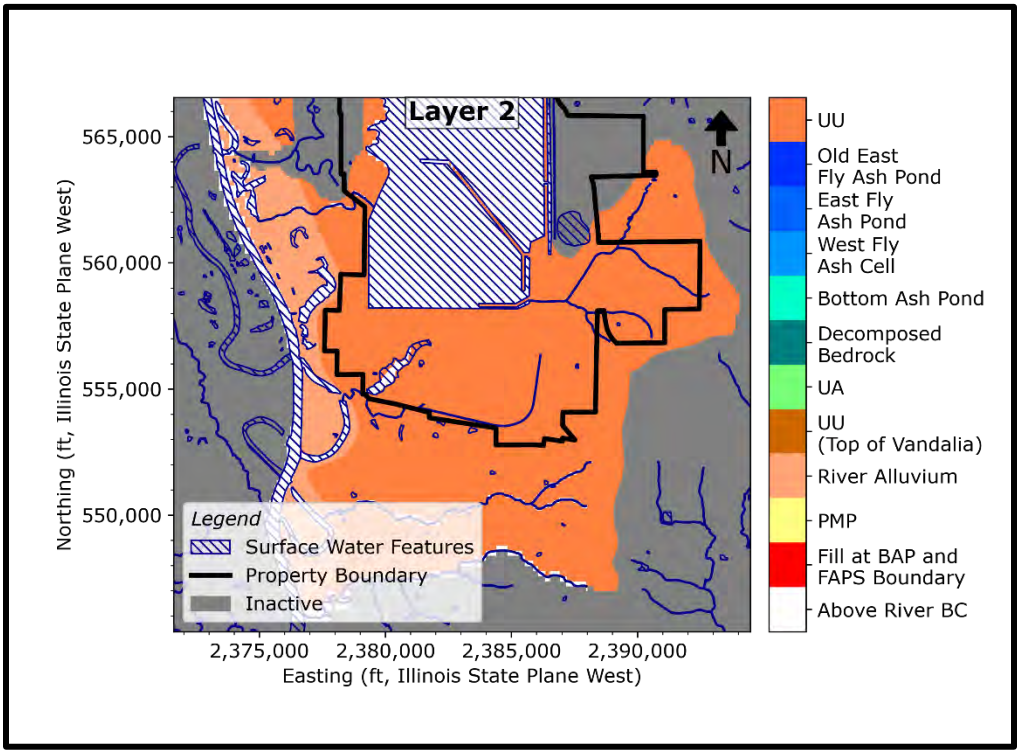
RAMBOLL



SPATIAL DISTRIBUTION OF HYDRAULIC CONDUCTIVITY ZONES FOR LAYER 1 IN THE NUMERICAL MODEL

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

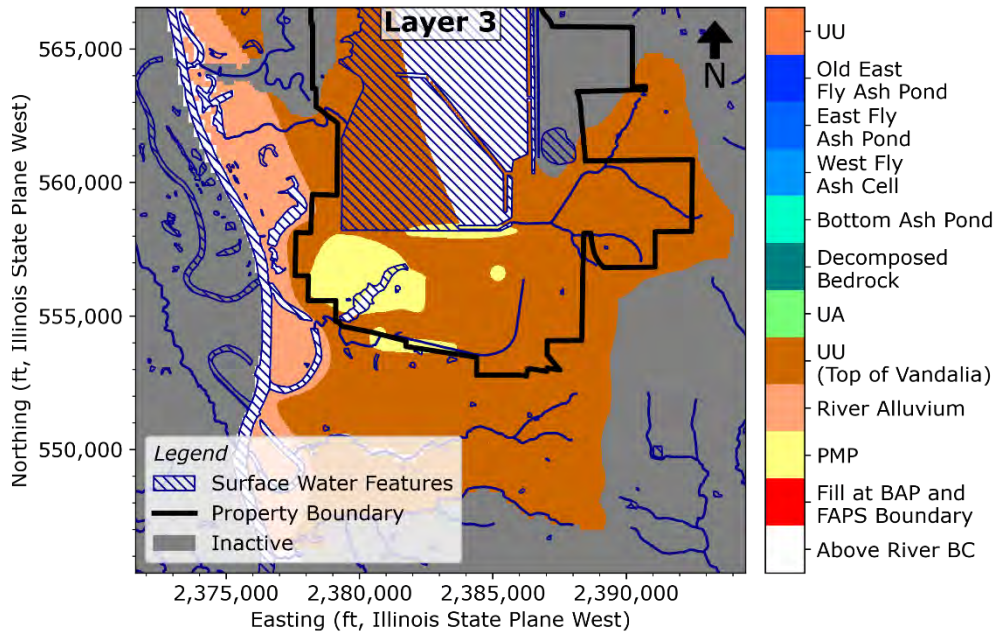
RAMBOLL



SPATIAL DISTRIBUTION OF HYDRAULIC CONDUCTIVITY ZONES FOR LAYER 2 IN THE NUMERICAL MODEL

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

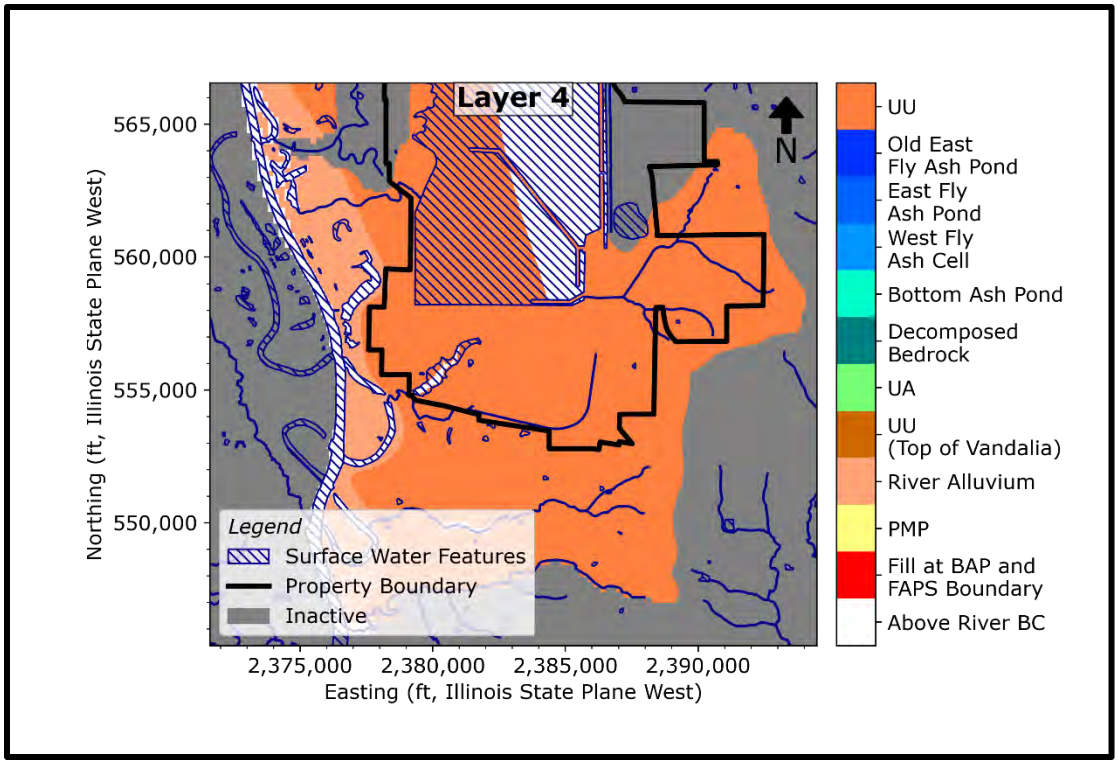
RAMBOLL



SPATIAL DISTRIBUTION OF HYDRAULIC CONDUCTIVITY ZONES FOR LAYER 3 IN THE NUMERICAL MODEL

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

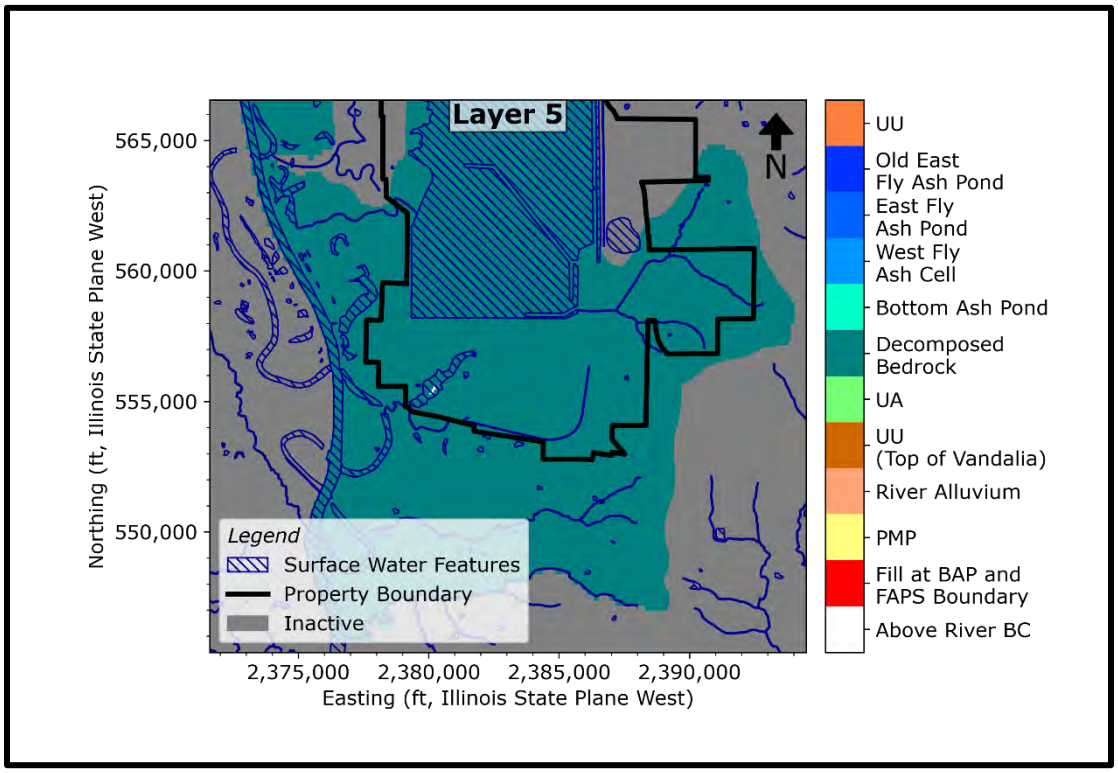
RAMBOLL



SPATIAL DISTRIBUTION OF HYDRAULIC CONDUCTIVITY ZONES FOR LAYER 4 IN THE NUMERICAL MODEL

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

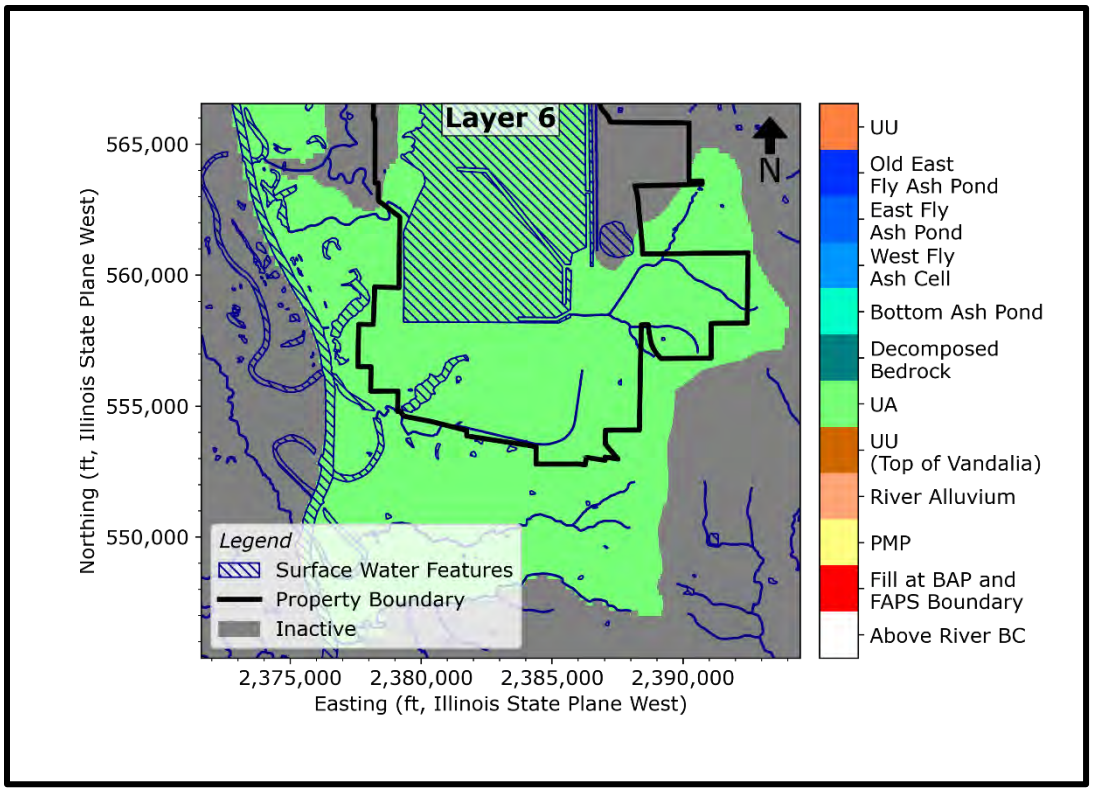
RAMBOLL



SPATIAL DISTRIBUTION OF HYDRAULIC CONDUCTIVITY ZONES FOR LAYER 5 IN THE NUMERICAL MODEL

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

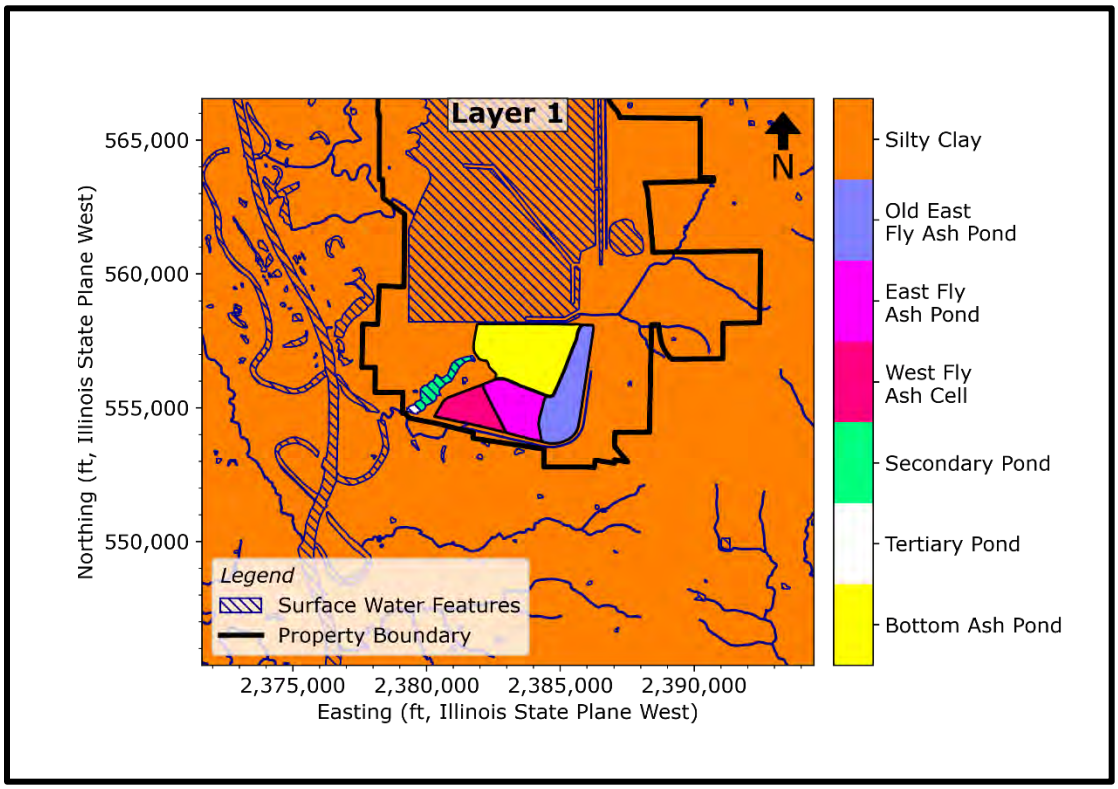
RAMBOLL



SPATIAL DISTRIBUTION OF HYDRAULIC CONDUCTIVITY ZONES FOR LAYER 6 IN THE NUMERICAL MODEL

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

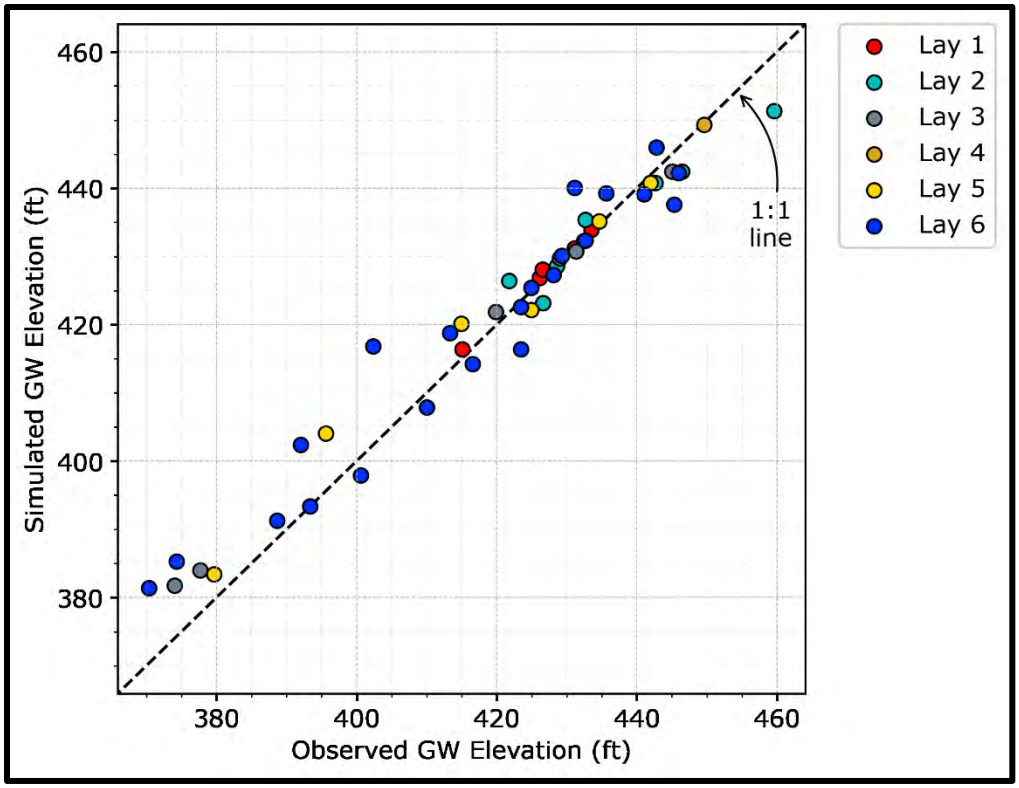
RAMBOLL



MODEL RECHARGE DISTRIBUTION (STEADY STATE CALIBRATION MODEL)

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

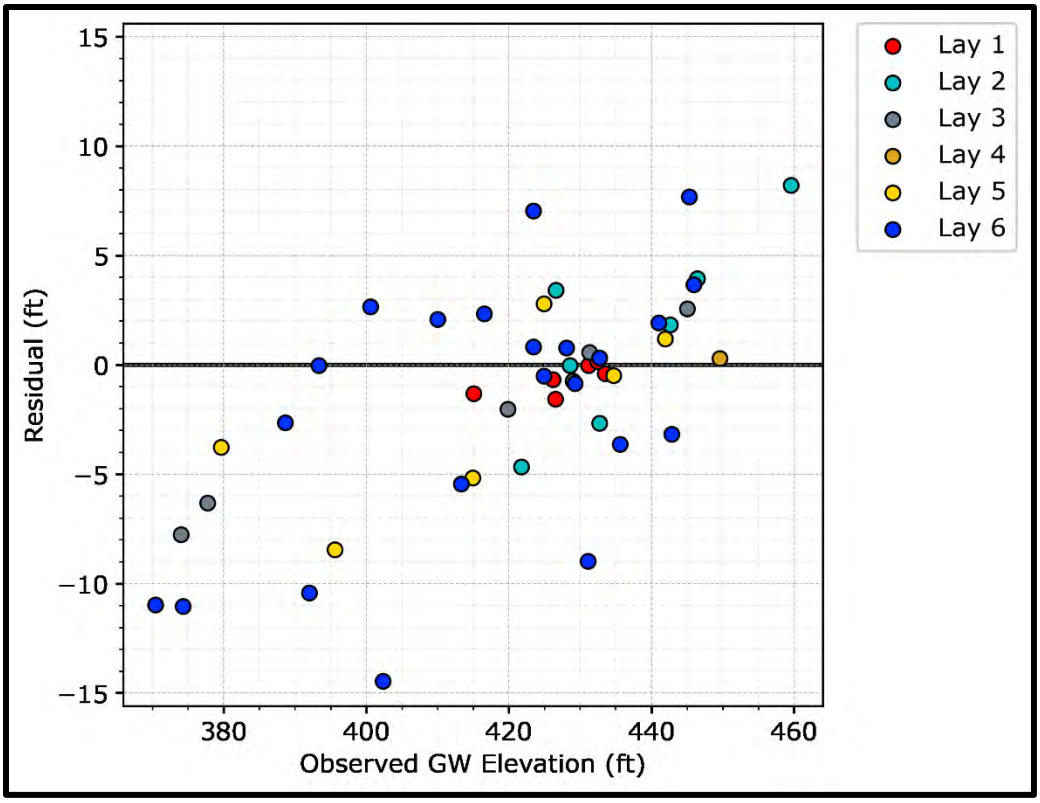
RAMBOLL



OBSERVED VERSUS SIMULATED STEADY STATE GROUNDWATER LEVELS FROM THE CALIBRATION MODEL

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

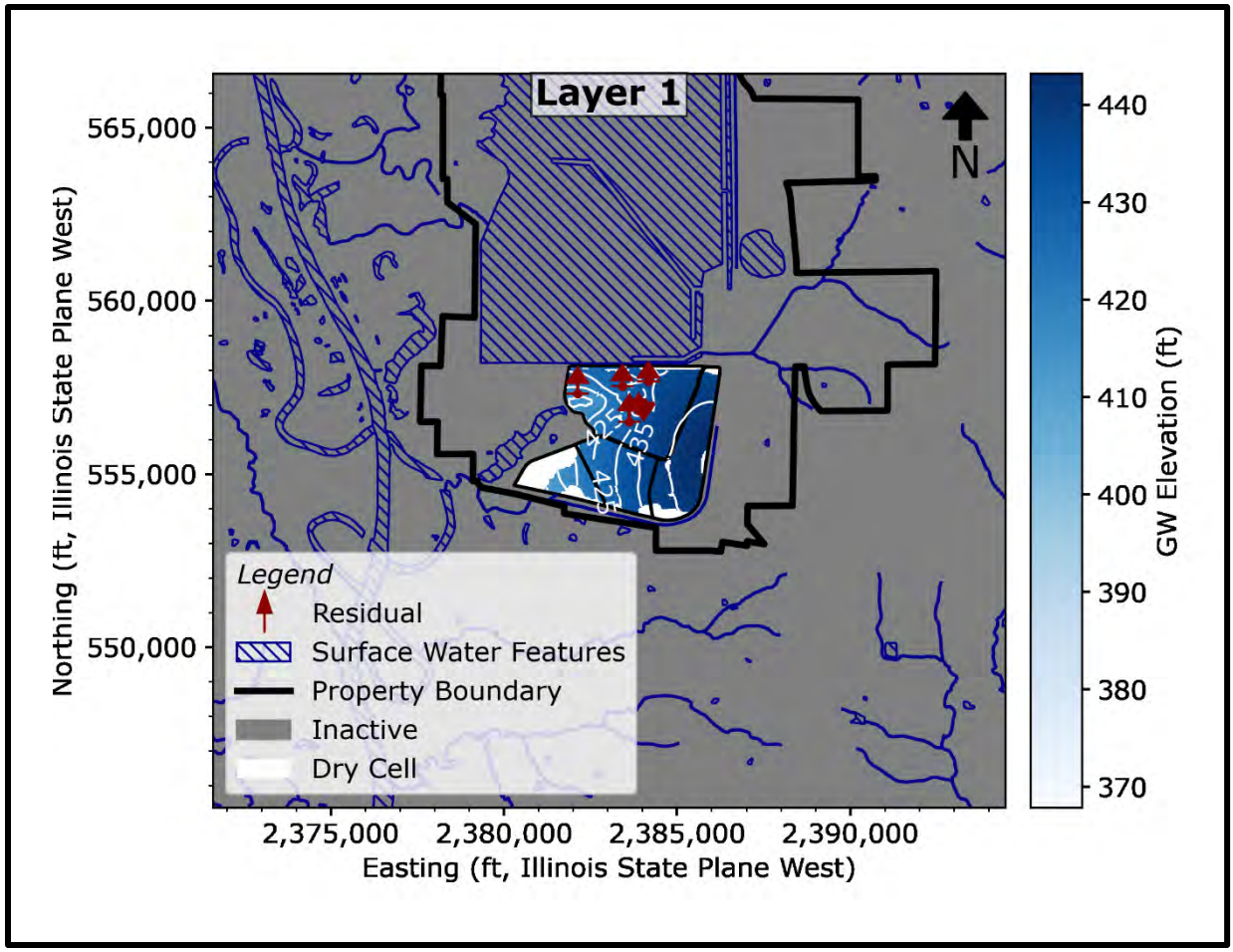
RAMBOLL



SIMULATED GROUNDWATER LEVEL RESIDUALS FROM THE CALIBRATED MODEL

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL

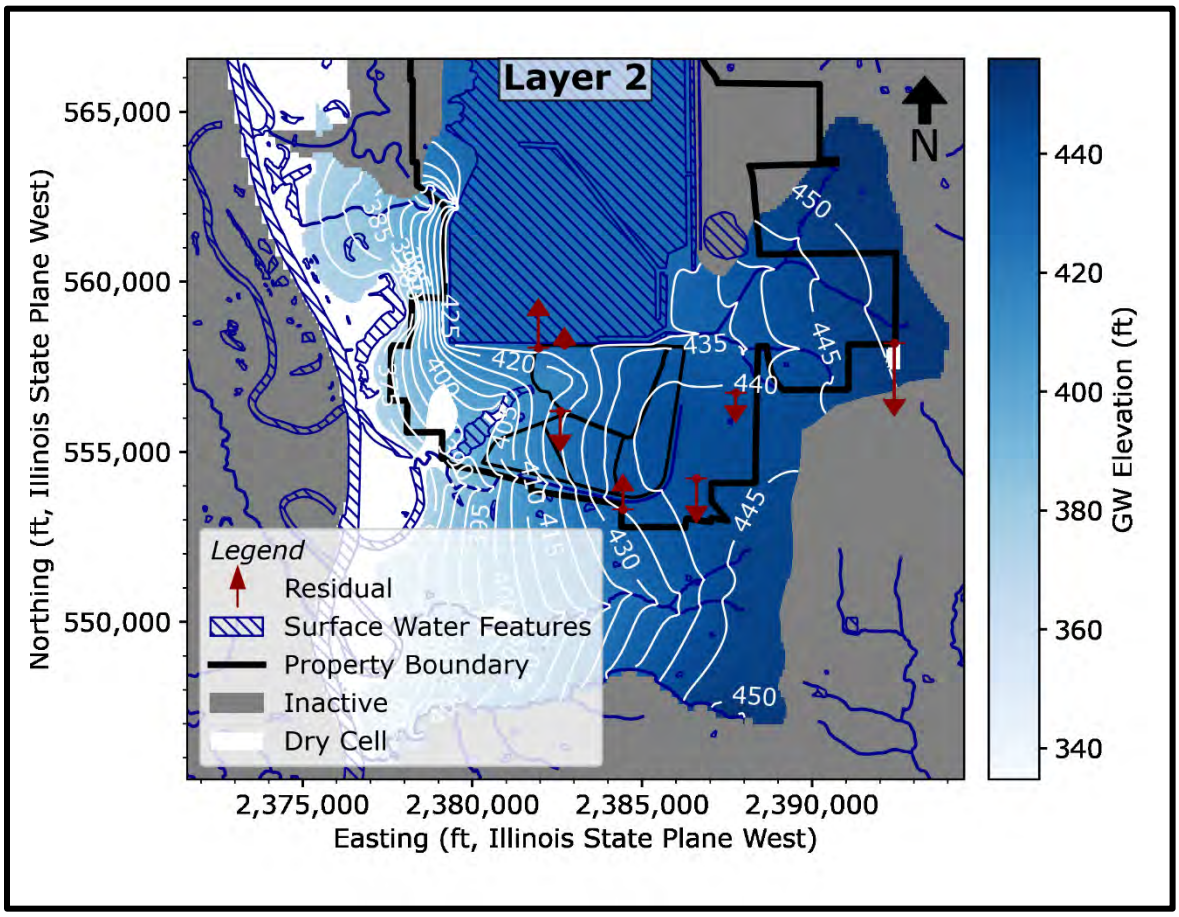


NOTE: RED DOTS INDICATE WELLS AND ARROW DIRECTION INDICATES BIAS IN SIMULATED GROUNDWATER LEVEL (NORTH ARROW = OVERESTIMATION, SOUTH ARROW = UNDERESTIMATION)

SIMULATED STEADY STATE GROUNDWATER LEVEL CONTOURS FROM LAYER 1 OF THE CALIBRATED MODEL

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL

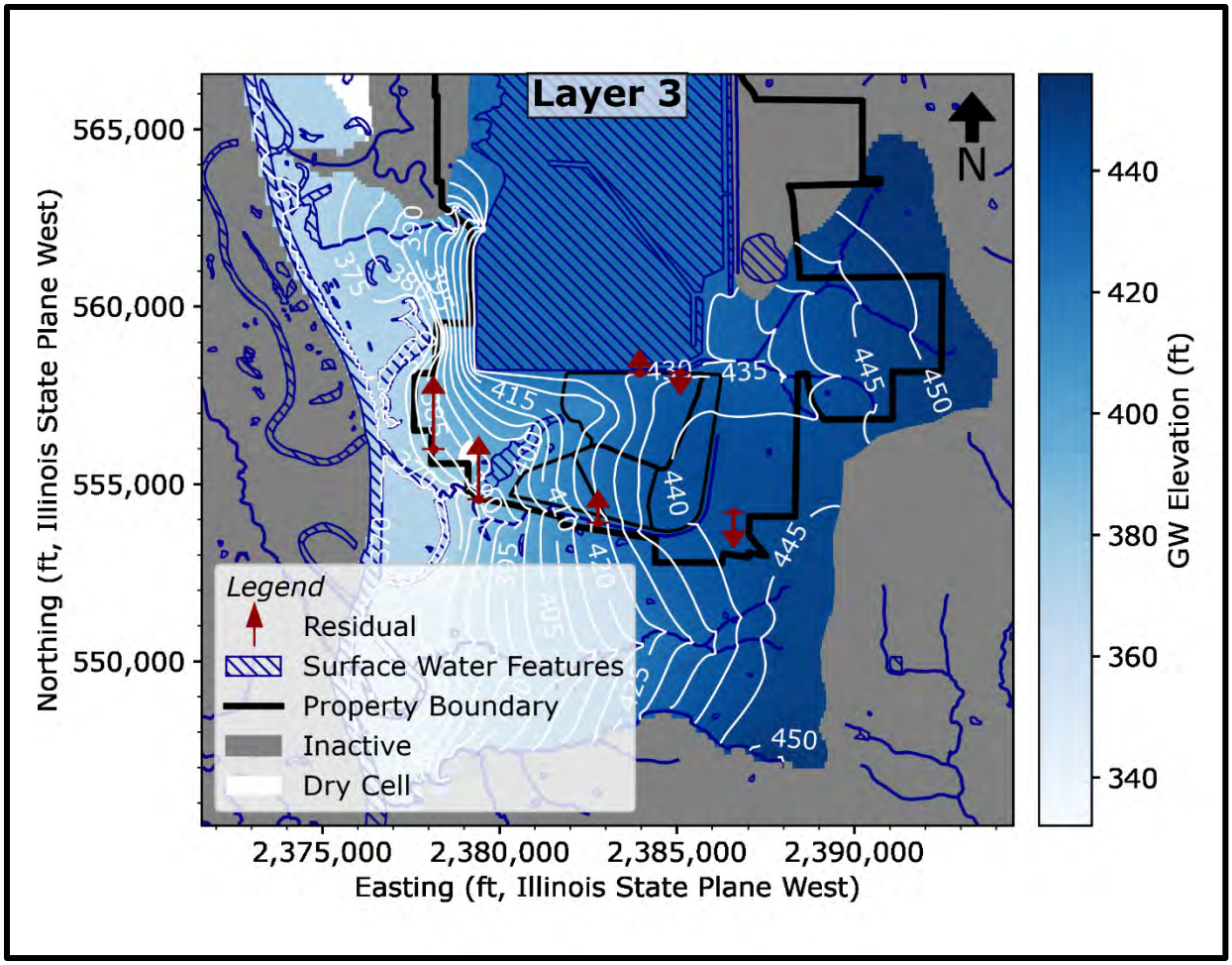


NOTE: RED DOTS INDICATE WELLS AND ARROW DIRECTION INDICATES BIAS IN SIMULATED GROUNDWATER LEVEL (NORTH ARROW = OVERESTIMATION, SOUTH ARROW = UNDERESTIMATION)

SIMULATED STEADY STATE GROUNDWATER LEVEL CONTOURS FROM LAYER 2 OF THE CALIBRATED MODEL

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL

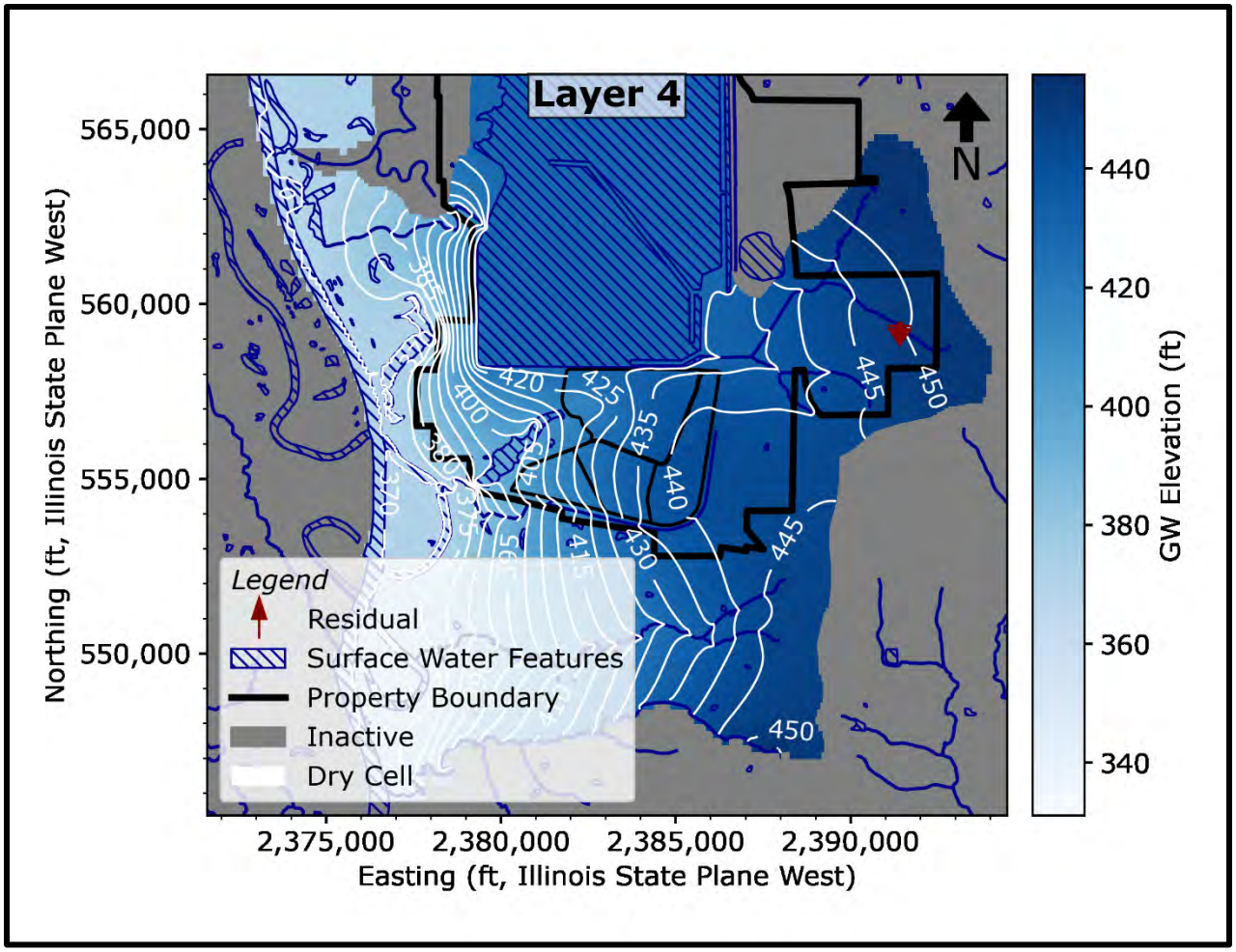


NOTE: RED DOTS INDICATE WELLS AND ARROW DIRECTION INDICATES BIAS IN SIMULATED GROUNDWATER LEVEL (NORTH ARROW = OVERESTIMATION, SOUTH ARROW = UNDERESTIMATION)

SIMULATED STEADY STATE GROUNDWATER LEVEL CONTOURS FROM LAYER 3 OF THE CALIBRATED MODEL

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL

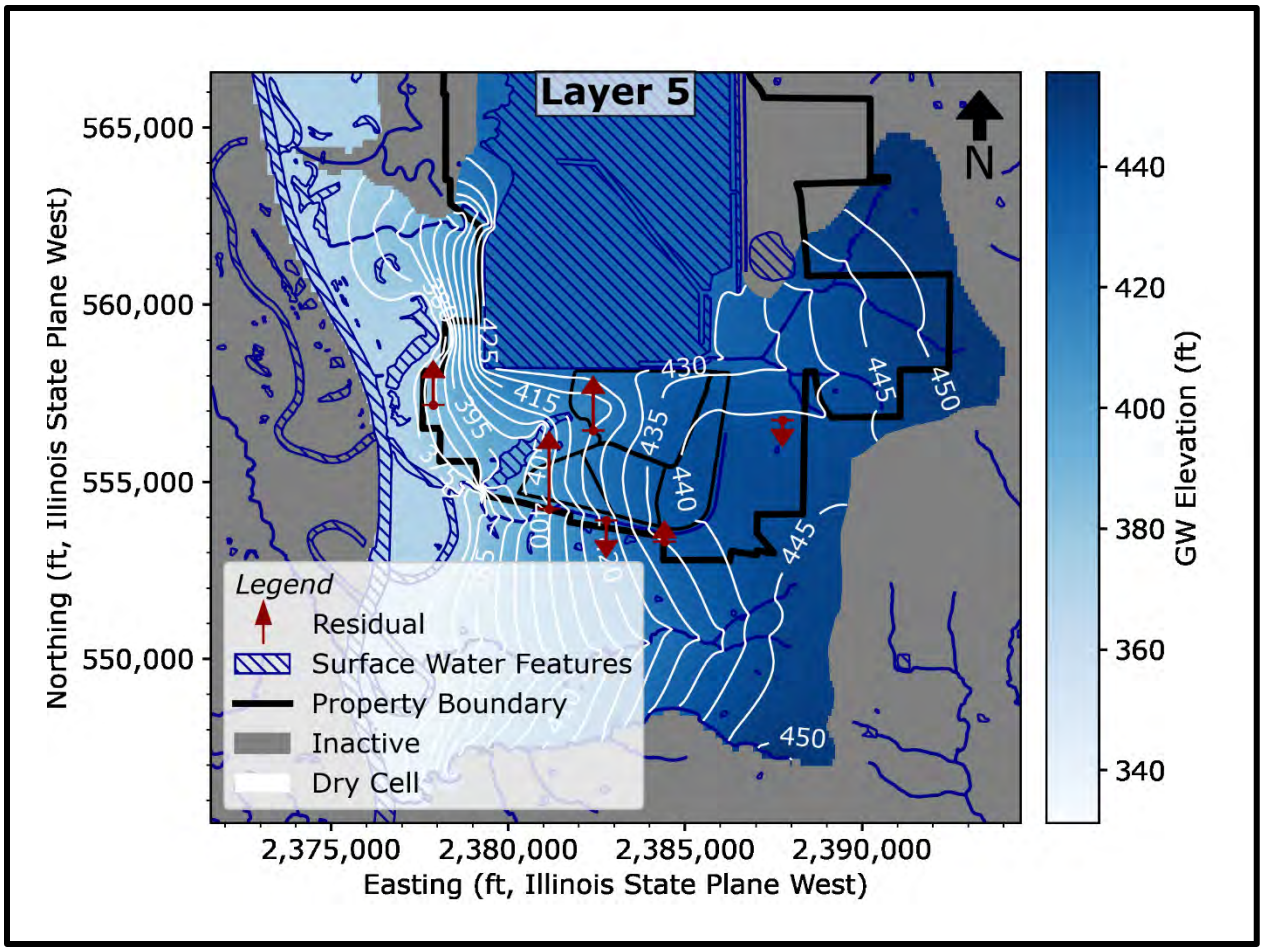


NOTE: RED DOTS INDICATE WELLS AND ARROW DIRECTION INDICATES BIAS IN SIMULATED GROUNDWATER LEVEL (NORTH ARROW = OVERESTIMATION, SOUTH ARROW = UNDERESTIMATION)

SIMULATED STEADY STATE GROUNDWATER LEVEL CONTOURS FROM LAYER 4 OF THE CALIBRATED MODEL

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL

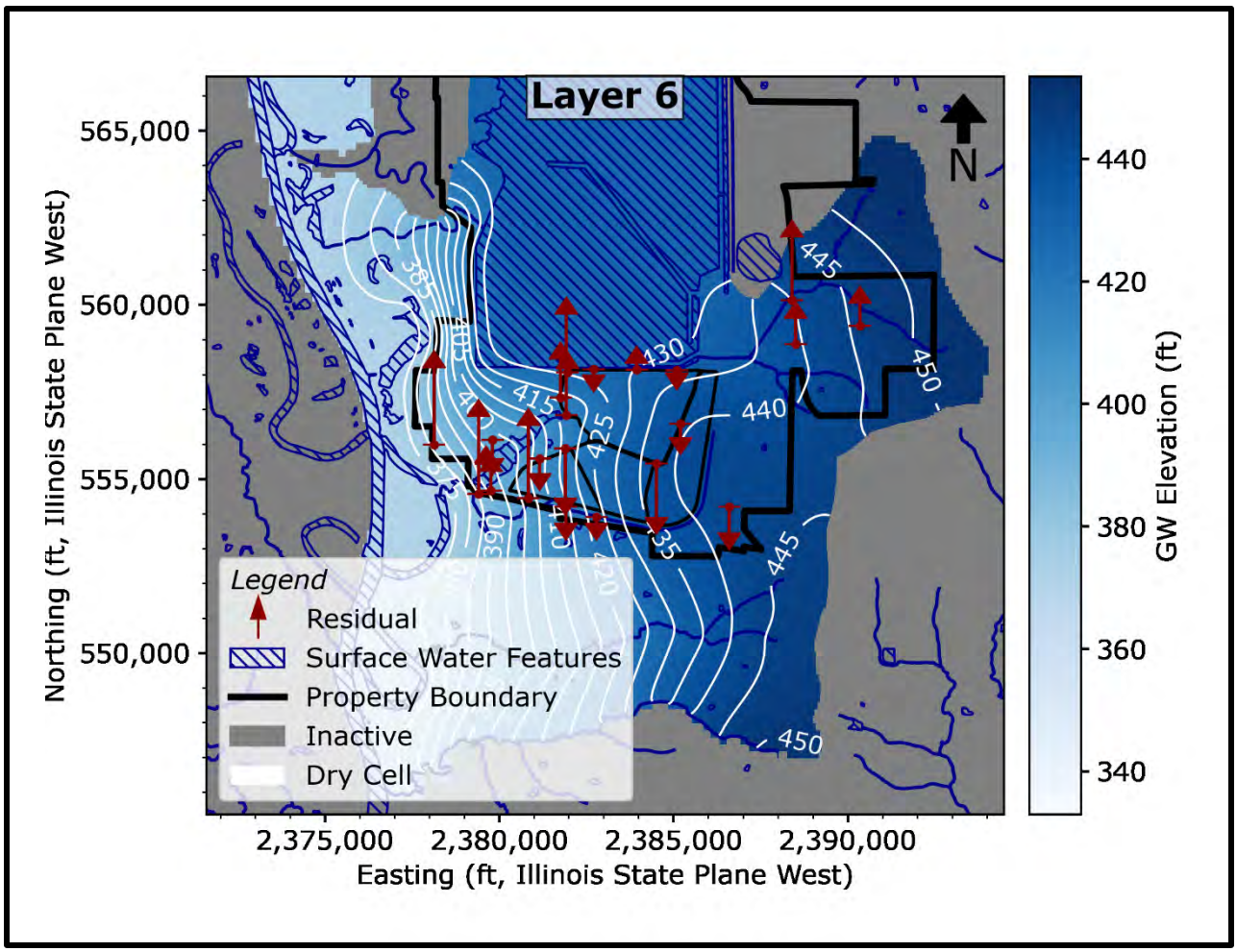


NOTE: RED DOTS INDICATE WELLS AND ARROW DIRECTION INDICATES BIAS IN SIMULATED GROUNDWATER LEVEL (NORTH ARROW = OVERESTIMATION, SOUTH ARROW = UNDERESTIMATION)

SIMULATED STEADY STATE GROUNDWATER LEVEL CONTOURS FROM LAYER 5 OF THE CALIBRATED MODEL

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL



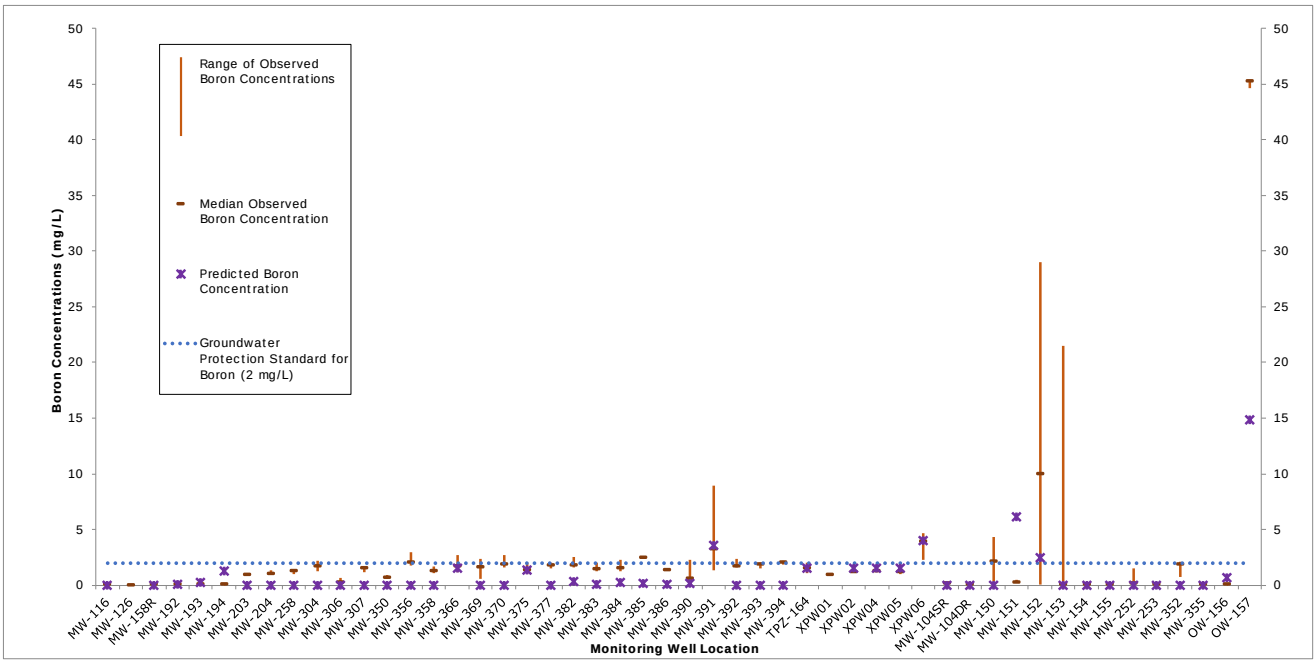
NOTE: RED DOTS INDICATE WELLS AND ARROW DIRECTION INDICATES BIAS IN SIMULATED GROUNDWATER LEVEL (NORTH ARROW = OVERESTIMATION, SOUTH ARROW = UNDERESTIMATION)

SIMULATED STEADY STATE GROUNDWATER LEVEL CONTOURS FROM LAYER 6 OF THE CALIBRATED MODEL

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL

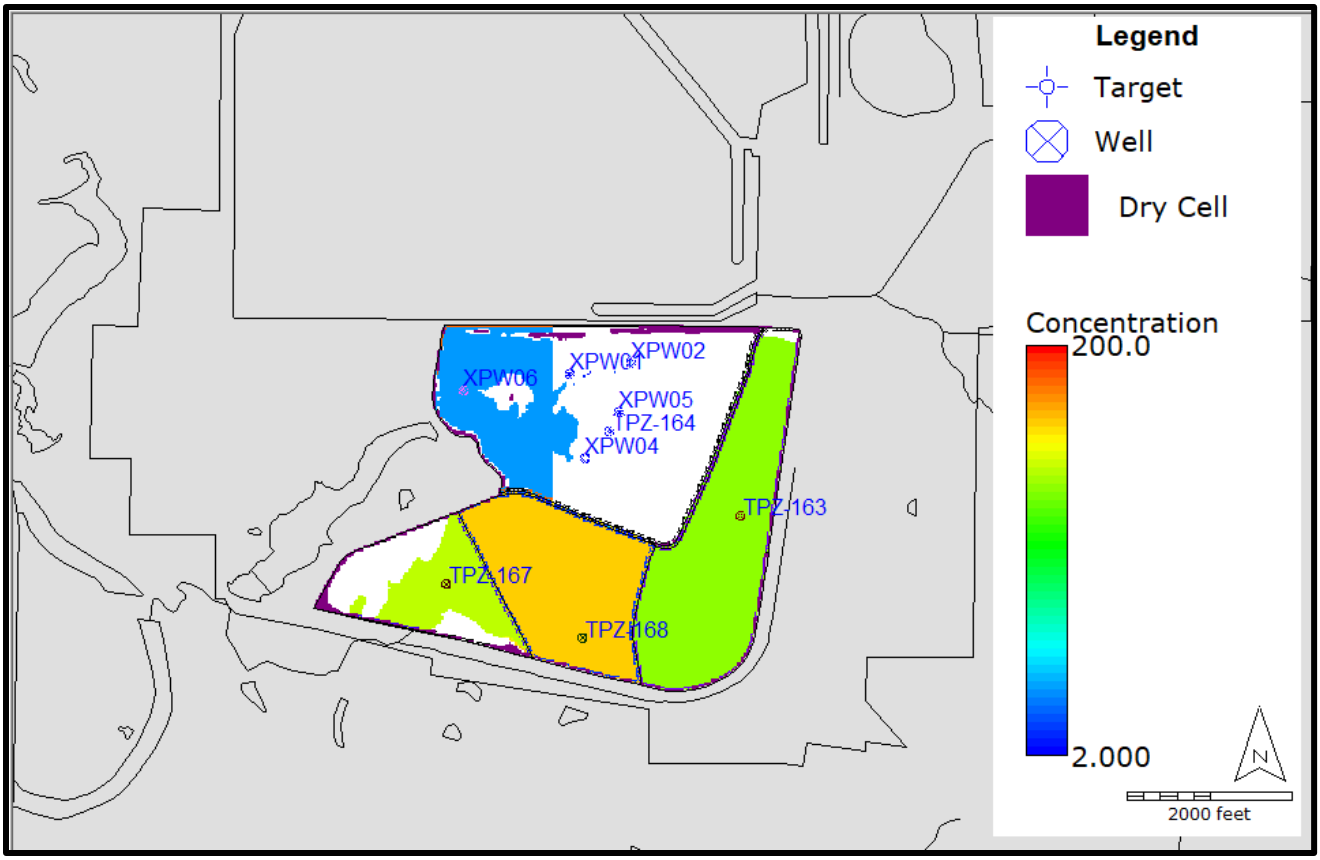
FIGURE 5-29



OBSERVED AND SIMULATED BORON CONCENTRATIONS (mg/L)

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

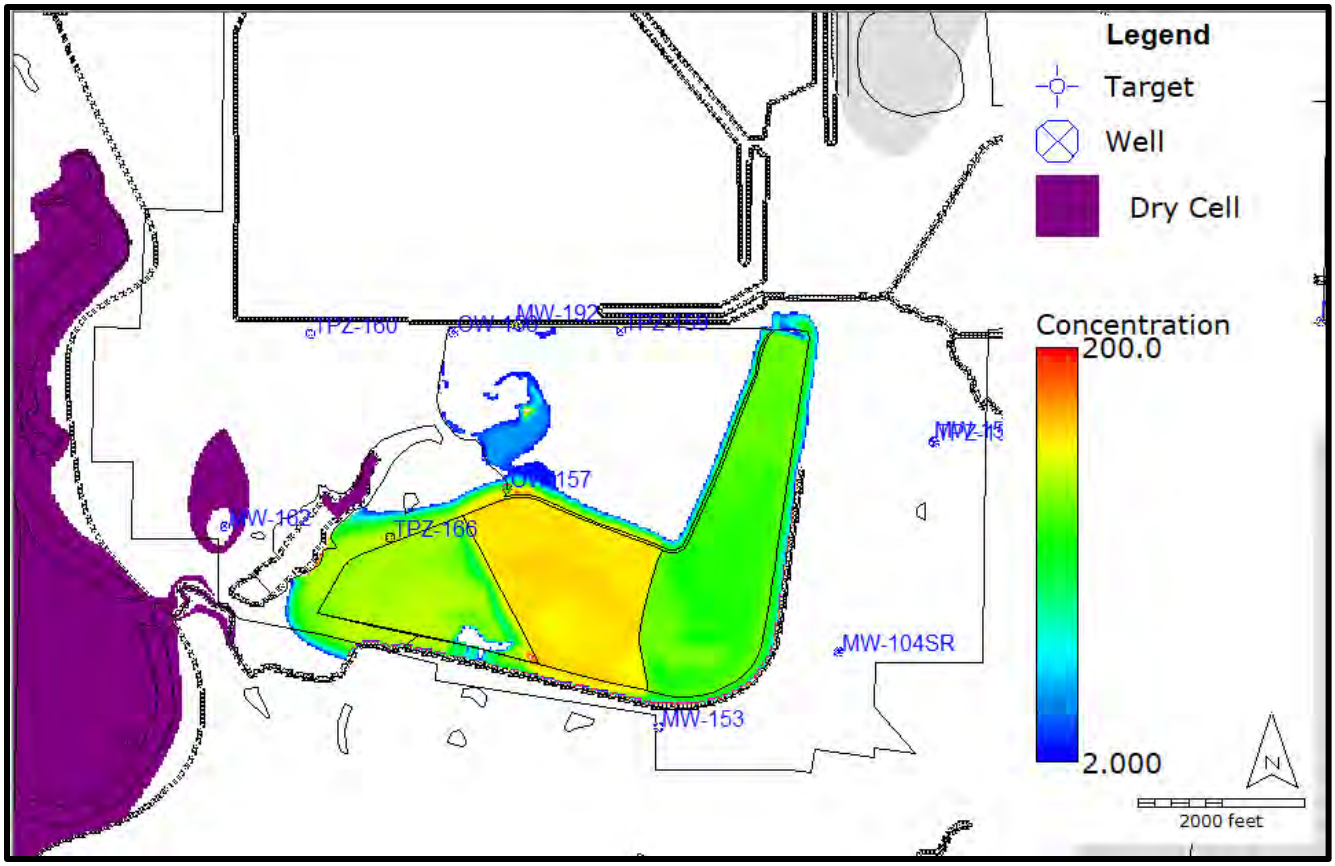
RAMBOLL



LAYER 1 DISTRIBUTION OF BORON CONCENTRATIONS (mg/L) IN THE CALIBRATED MODEL (CCR)

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

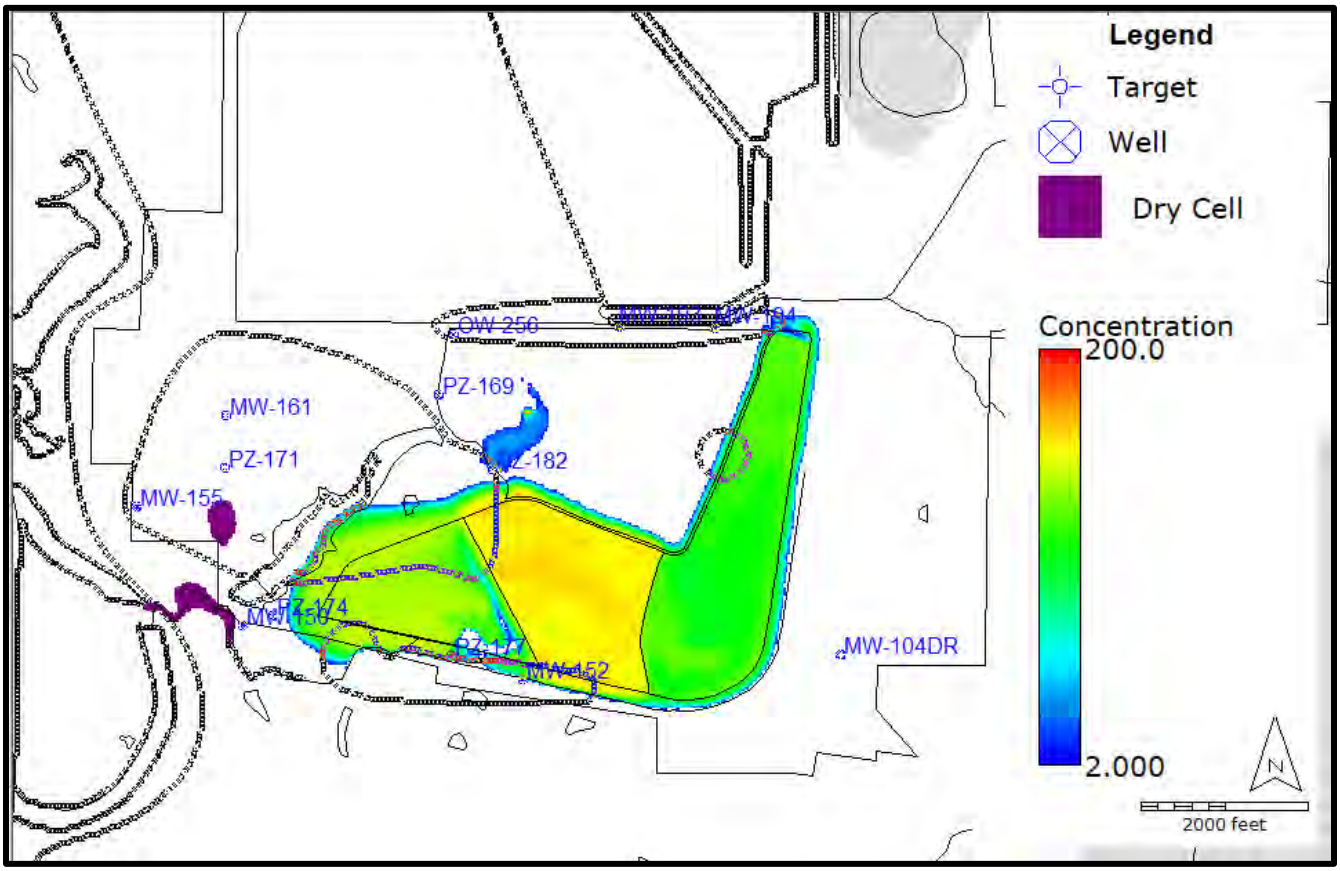
RAMBOLL



LAYER 2 DISTRIBUTION OF BORON CONCENTRATIONS (mg/L) IN THE CALIBRATED MODEL (UU [UPPER SILTY CLAY])

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

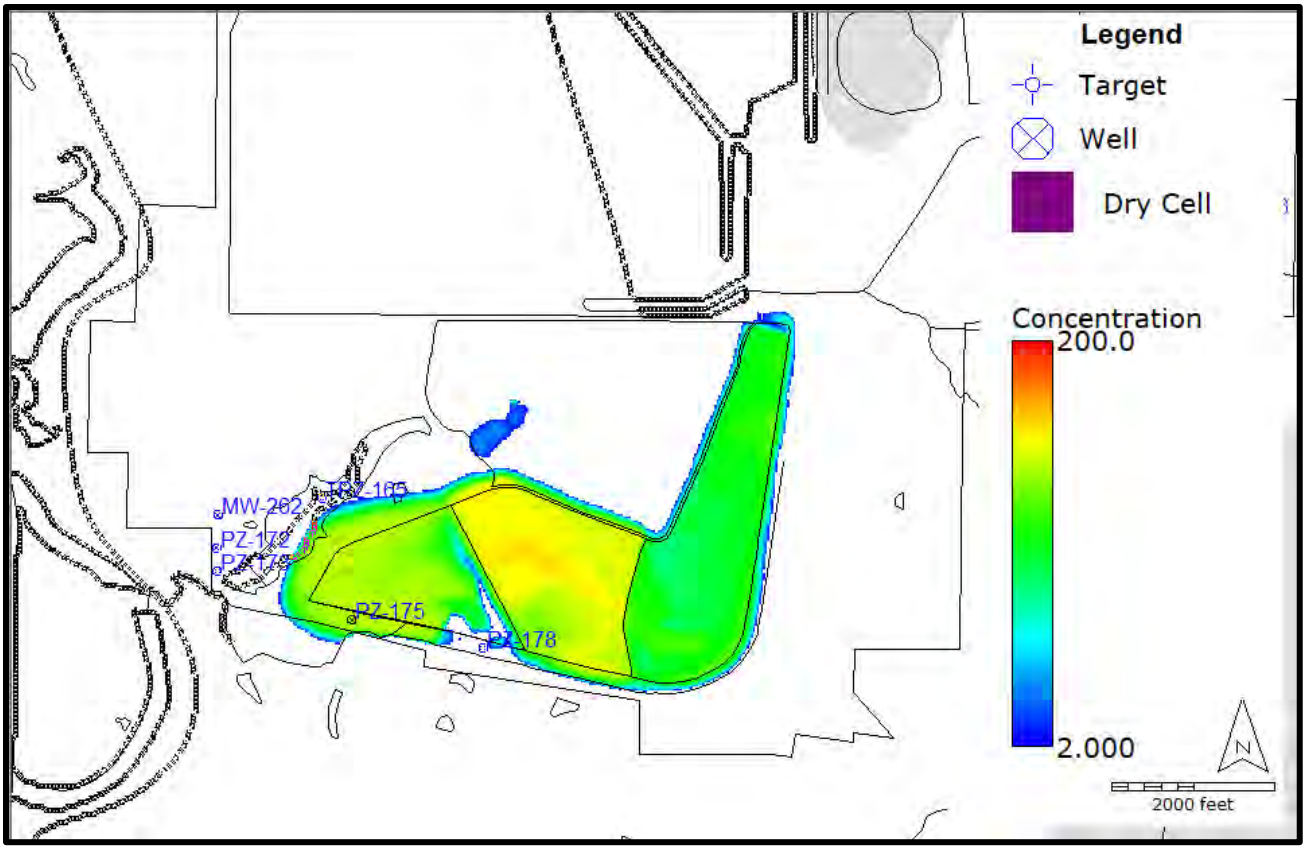
RAMBOLL



LAYER 3 DISTRIBUTION OF BORON CONCENTRATIONS (mg/L) IN THE CALIBRATED MODEL (UU [PMP/TOP OF VANDALIA])

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

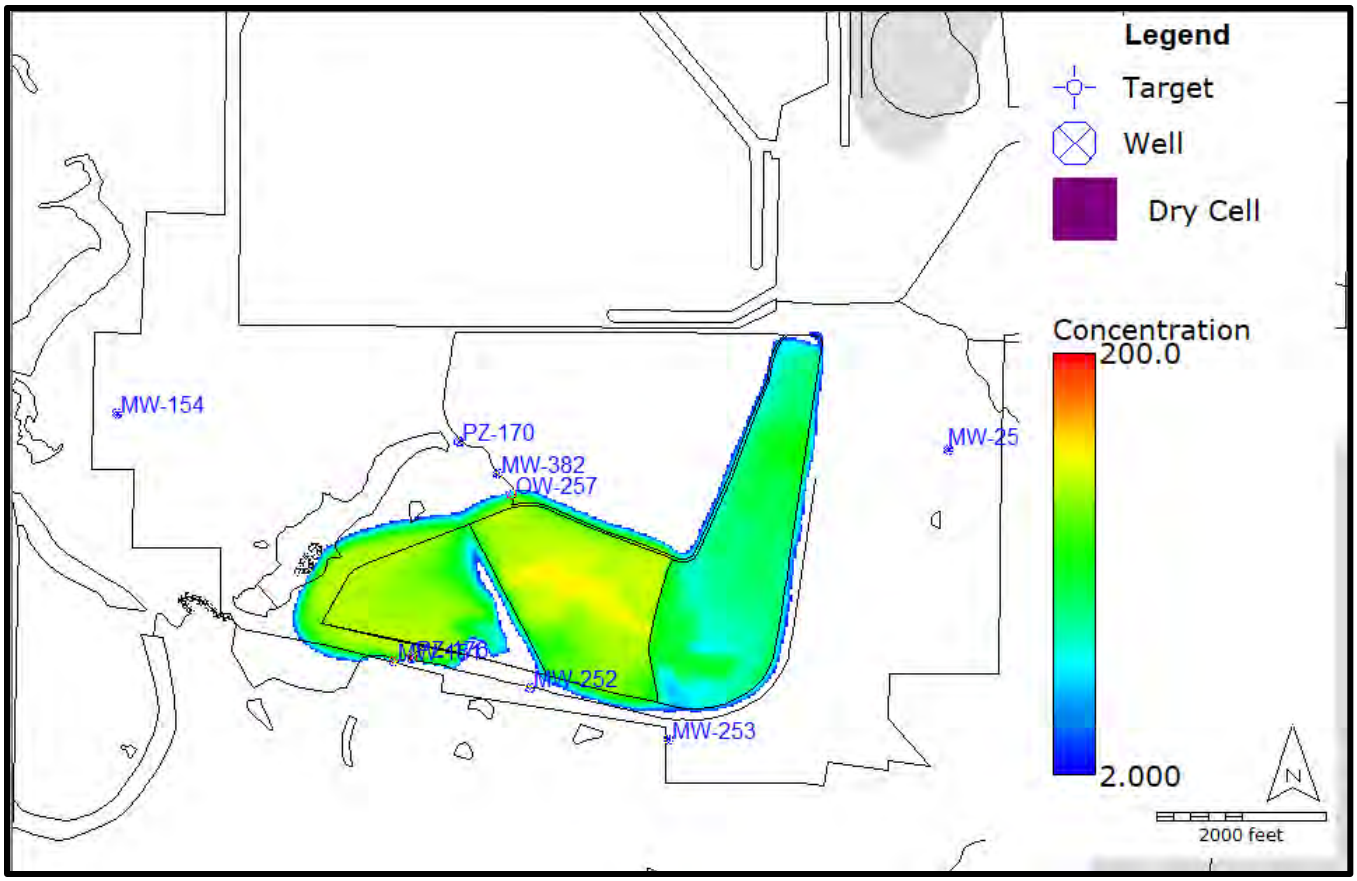
RAMBOLL



LAYER 4 DISTRIBUTION OF BORON CONCENTRATIONS (mg/L) IN THE CALIBRATED MODEL (UU [LOWER SILTY CLAY])

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

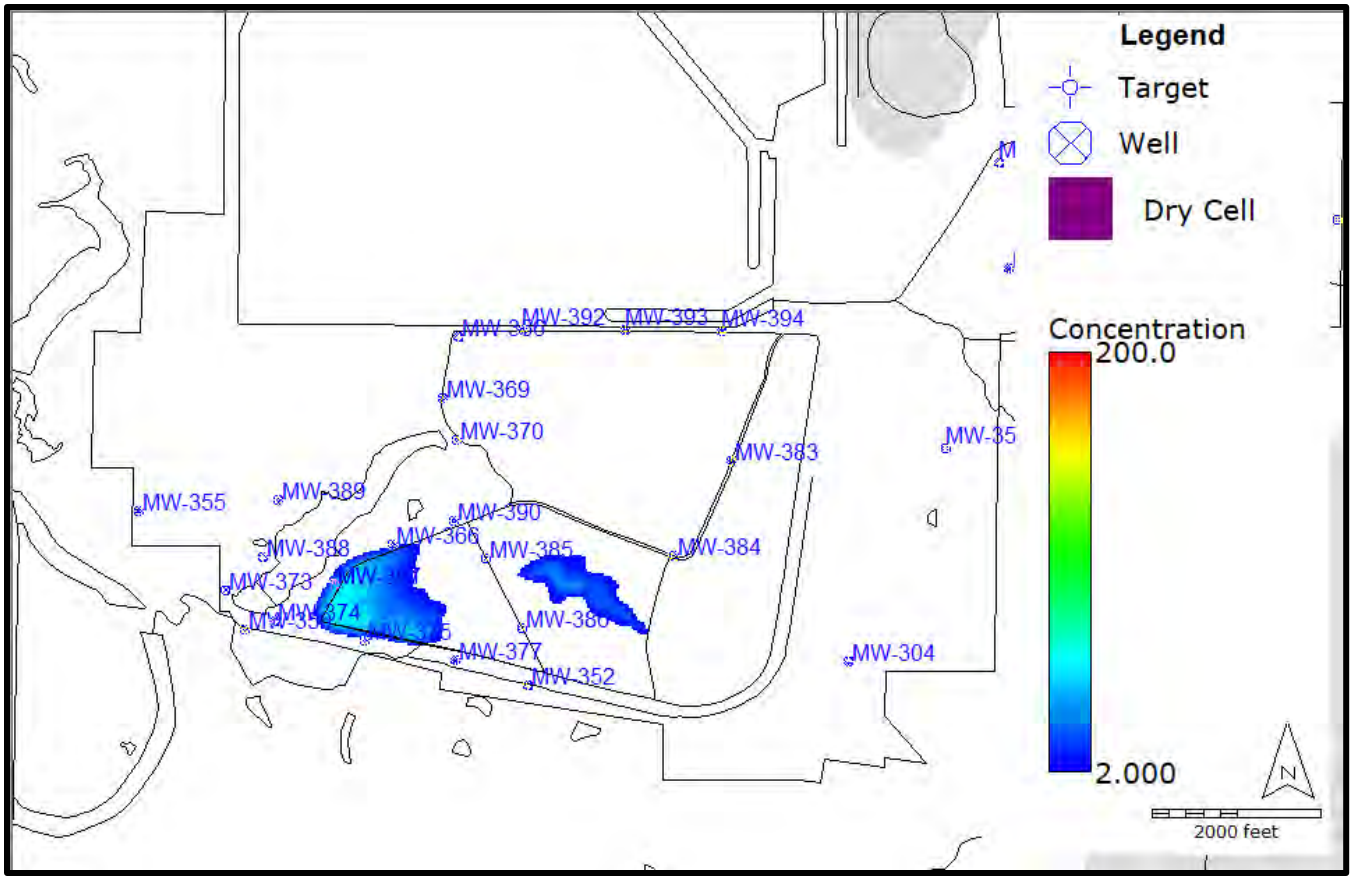
RAMBOLL



LAYER 5 DISTRIBUTION OF BORON CONCENTRATIONS (mg/L) IN THE CALIBRATED MODEL (UA [DECOMPOSED BEDROCK])

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

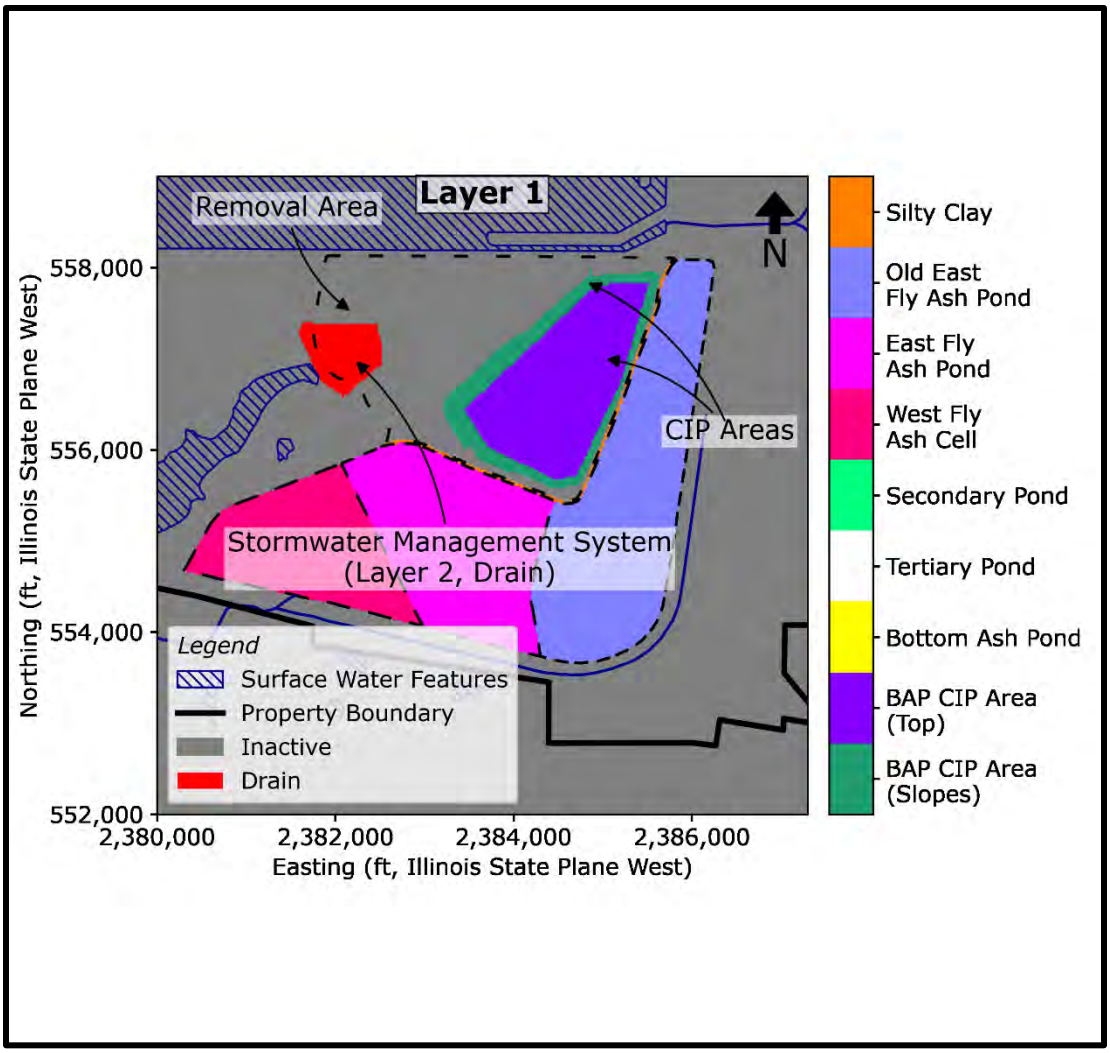
RAMBOLL



LAYER 6 DISTRIBUTION OF BORON CONCENTRATIONS (mg/L) IN THE CALIBRATED MODEL (UA)

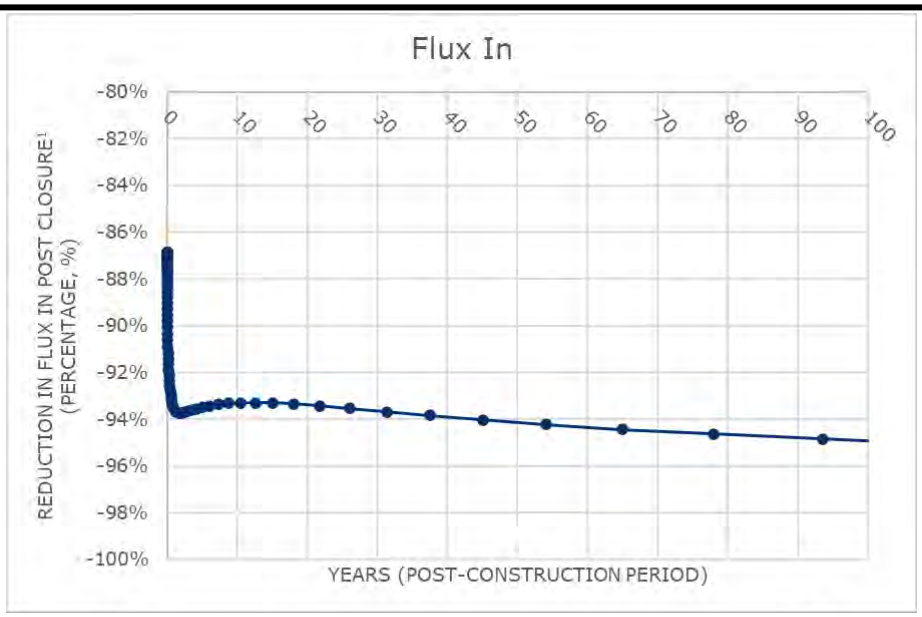
GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL

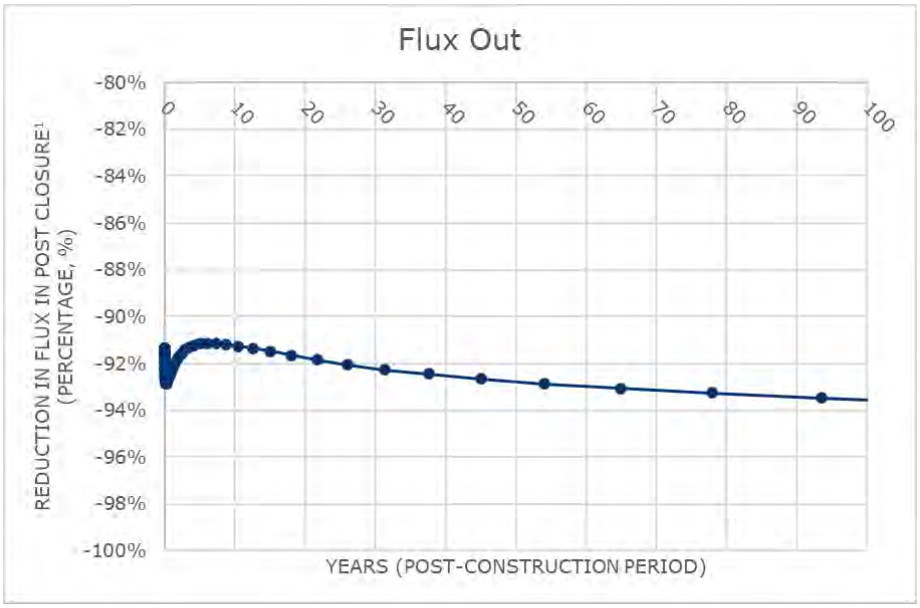


RECHARGE AND STORMWATER MANAGEMENT MODIFICATIONS FOR CLOSURE IN PLACE

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS



Notes:
1. Reduction in flux in as compared to flux in at the end of calibration model (model period of 53 years). Reduction in flux in are expressed as negative percentages to illustrate decreases in flux over time



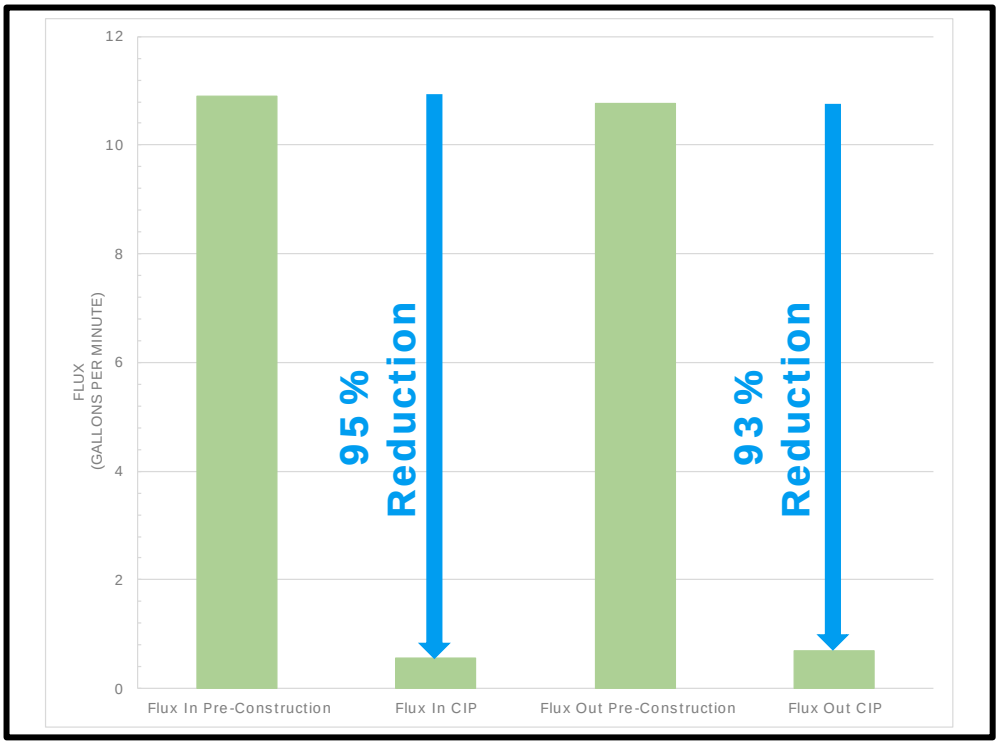
Notes:
1. Reduction in flux in as compared to flux out at the end of calibration model (model period of 53 years). Reduction in flux out are expressed as negative percentages to illustrate decreases in flux over time

REDUCTIONS IN TOTAL FLUX IN AND OUT OF CCR FOLLOWING IMPLEMENTATION OF THE CIP CLOSURE SCENARIO

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL

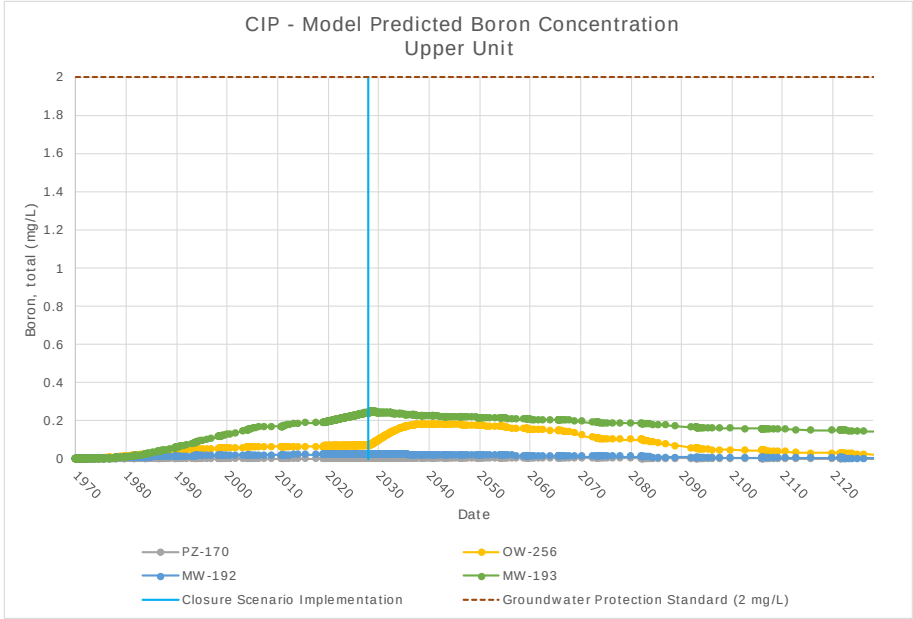
FIGURE 6-3

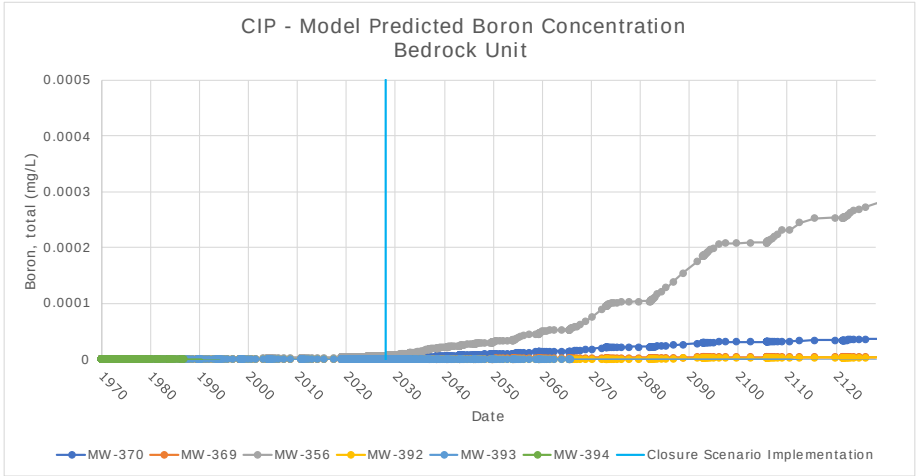


REDUCTIONS IN TOTAL FLUX IN AND OUT OF CCR 93 YEARS FOLLOWING IMPLEMENTATION OF THE CIP CLOSURE SCENARIO

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL

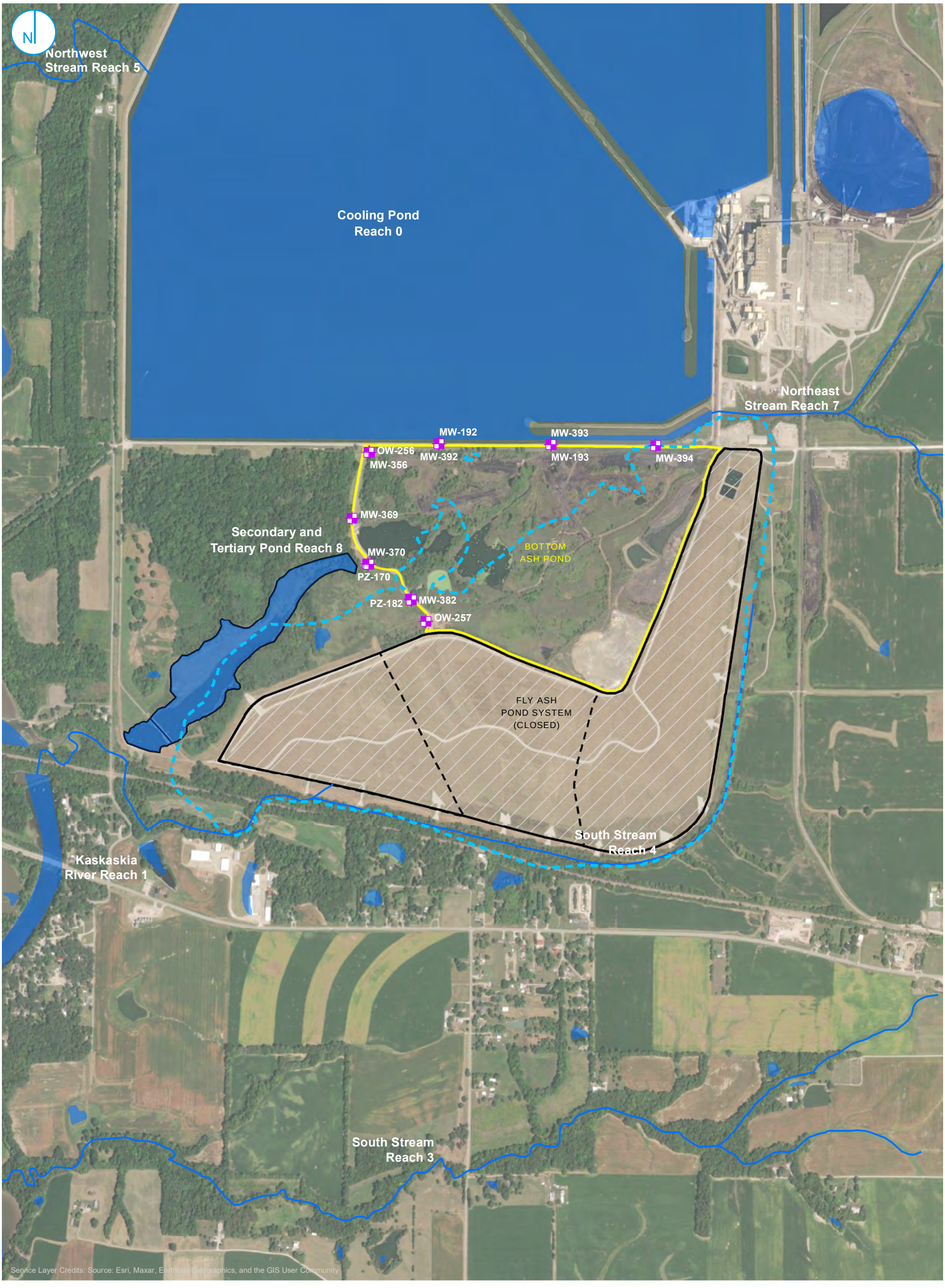




CIP - MODEL PREDICTED BORON CONCENTRATION

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL



35 I.A.C. § 845 REGULATED UNIT (SUBJECT UNIT)
FLY ASH POND SYSTEM
LIMITS OF FINAL COVER
SITE FEATURE
RIVER
WATERBODY

MAXIMUM EXTENT OF THE BORON PLUME ABOVE THE STANDARD GWPS FOR BORON (2 mg/L) AT 93 YEARS FOLLOWING IMPLEMENTATION OF THE CIP CLOSURE SCENARIO
PROPOSED BAP COMPLIANCE WELLS

0 500 1,000 Feet

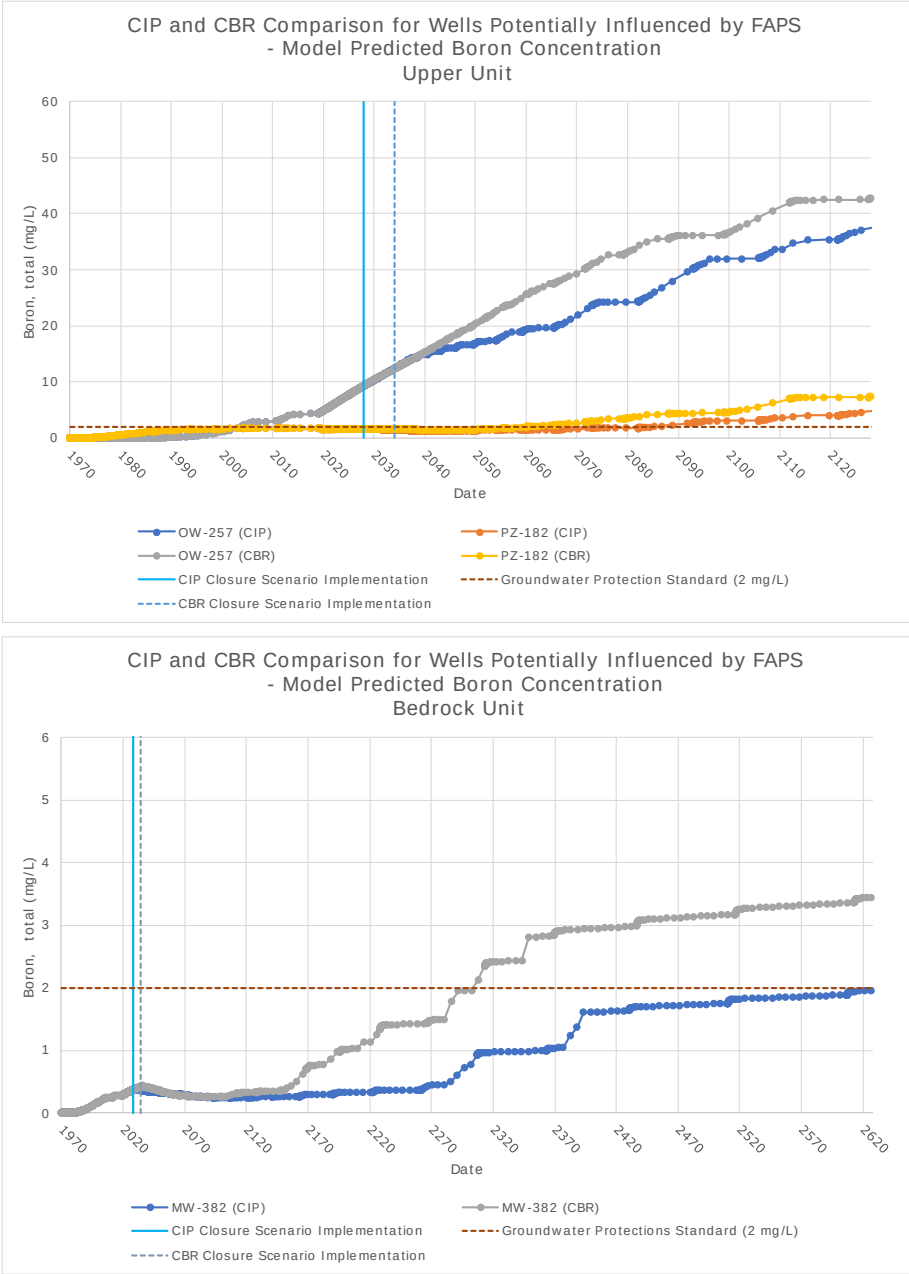
CIP - MODEL PREDICTED MAXIMUM BORON PLUME IN ALL LAYERS APPROXIMATELY 93 YEARS AFTER IMPLEMENTATION

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 6-5

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



CIP AND CBR - MODEL PREDICTED BORON CONCENTRATION AT PROPOSED BAP COMPLIANCE MONITORING WELLS PZ-182, OW-257, AND MW-382

GROUNDWATER MODELING REPORT
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL

APPENDICES

APPENDIX A
HISTORY OF POTENTIAL EXCEEDANCES
REVISION 1 (RAMBOLL, 2023c)

HISTORY OF POTENTIAL EXCEEDANCES REVISION 1
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

This revision of the History of Potential Exceedances, and any corrective action taken to remediate groundwater, is provided to meet the requirements of Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845.230(d)(2)(M) for the Baldwin Power Plant Bottom Ash Pond (BAP), Illinois Environmental Protection Agency (IEPA) ID No. W1578510001-06.

Note

Groundwater concentrations from 2015 to 2023 presented in the revised Hydrogeologic Site Characterization Report Revision 1 (HCR) Table 4-1, and evaluated and summarized in the following tables, are considered potential exceedances. DMG entered into a compliance commitment agreement (CCA) with IEPA on December 28, 2022. Groundwater monitoring in accordance with the CCA will follow the proposed groundwater monitoring plan and sampling methodologies provided in the operating permit application for the BAP and is scheduled to commence no later than the second quarter of 2023. After the BAP has been issued an approved operating permit, groundwater monitoring shall be conducted in accordance with that operating permit.

Alternate sources for potential exceedances as allowed by 35 I.A.C. § 845.650(e) have not yet been evaluated. These will be evaluated and presented in future submittals to IEPA as appropriate.

Table 1 summarizes how the potential exceedances were determined. Table 2 is a summary of all potential exceedances.

Background Concentrations

Background monitoring wells used to calculate background concentrations at the BAP include MW-304, MW-306, and MW-358.

For all monitoring wells presented in Tables 1 and 2, background concentrations calculated from sampling events in 2022 to 2023 were compared to the standards identified in 35 I.A.C. § 845.600(a)(1). For constituents with calculated background concentrations in greater than the standards in 35 I.A.C. § 845.600(a)(1), those calculated background concentrations were used as GWPSs for comparing to statistical calculation results for each well to determine potential exceedances. Statistical result calculations consider concentrations from all sampling events in 2015 through May of 2023.

Corrective Action

No corrective actions have been taken to remediate the groundwater.

TABLE 1. DETERMINATION OF POTENTIAL EXCEEDANCES
HISTORY OF POTENTIAL EXCEEDANCES
BALDWIN POWER PLANT
BOTTOM ASH POND
BALDWIN, ILLINOIS

Sample Location	HSU	Program	Constituent	Result Unit	Sample Date Range	Statistical Calculation	Statistical Result	GWPS	Background	Part 845 Standard	GWPS Source
MW-192	UU	845	Antimony, total	mg/L	10/27/2022 - 05/16/2023	CI around median	0.00100	0.006	0.0023	0.006	Standard
MW-192	UU	845	Arsenic, total	mg/L	10/27/2022 - 05/16/2023	CI around geomean	0.00146	0.010	0.010	0.01	Background
MW-192	UU	845	Barium, total	mg/L	10/27/2022 - 05/16/2023	CI around mean	0.0825	2.0	0.26	2	Standard
MW-192	UU	845	Beryllium, total	mg/L	10/27/2022 - 05/16/2023	All ND - Last	0.0005	0.004	0.0005	0.004	Standard
MW-192	UU	845	Boron, total	mg/L	10/27/2022 - 05/16/2023	CI around mean	0.0241	2.2	2.2	2	Background
MW-192	UU	845	Cadmium, total	mg/L	10/27/2022 - 05/16/2023	All ND - Last	0.002	0.005	0.002	0.005	Standard
MW-192	UU	845	Chloride, total	mg/L	10/27/2022 - 05/16/2023	CB around linear reg	18.9	1370	1370	200	Background
MW-192	UU	845	Chromium, total	mg/L	10/27/2022 - 05/16/2023	All ND - Last	0.005	0.10	0.013	0.1	Standard
MW-192	UU	845	Cobalt, total	mg/L	10/27/2022 - 05/16/2023	CI around mean	0.000910	0.006	0.0022	0.006	Standard
MW-192	UU	845	Fluoride, total	mg/L	10/27/2022 - 05/16/2023	CI around mean	0.403	4.0	3.8	4	Standard
MW-192	UU	845	Lead, total	mg/L	10/27/2022 - 05/16/2023	CI around median	0.00100	0.0075	0.0022	0.0075	Standard
MW-192	UU	845	Lithium, total	mg/L	10/27/2022 - 05/16/2023	CI around mean	0.00725	0.14	0.14	0.04	Background
MW-192	UU	845	Mercury, total	mg/L	10/27/2022 - 05/16/2023	All ND - Last	0.0002	0.002	0.0002	0.002	Standard
MW-192	UU	845	Molybdenum, total	mg/L	10/27/2022 - 05/16/2023	CI around mean	0.00248	0.10	0.078	0.1	Standard
MW-192	UU	845	pH (field)	SU	10/27/2022 - 05/16/2023	CI around median	6.5/7.0	6.5/11	7.5/11.1	6.5/9	Standard/Background
MW-192	UU	845	Radium 226 + Radium 228, total	pCi/L	10/27/2022 - 05/16/2023	CI around mean	0.244	5.0	3.8	5	Standard
MW-192	UU	845	Selenium, total	mg/L	10/27/2022 - 05/16/2023	All ND - Last	0.001	0.050	0.0032	0.05	Standard
MW-192	UU	845	Sulfate, total	mg/L	10/27/2022 - 05/16/2023	CB around linear reg	11.0	762	762	400	Background
MW-192	UU	845	Thallium, total	mg/L	10/27/2022 - 05/16/2023	All ND - Last	0.002	0.002	0.002	0.002	Standard
MW-192	UU	845	Total Dissolved Solids	mg/L	10/27/2022 - 05/16/2023	CI around mean	432	3260	3260	1200	Background
MW-193	UU	845	Antimony, total	mg/L	10/27/2022 - 05/15/2023	All ND - Last	0.001	0.006	0.0023	0.006	Standard
MW-193	UU	845	Arsenic, total	mg/L	10/27/2022 - 05/15/2023	CI around mean	0.00124	0.010	0.010	0.01	Background
MW-193	UU	845	Barium, total	mg/L	10/27/2022 - 05/15/2023	CI around mean	0.0703	2.0	0.26	2	Standard
MW-193	UU	845	Beryllium, total	mg/L	10/27/2022 - 05/15/2023	All ND - Last	0.0005	0.004	0.0005	0.004	Standard
MW-193	UU	845	Boron, total	mg/L	10/27/2022 - 05/15/2023	CI around mean	0.0287	2.2	2.2	2	Background
MW-193	UU	845	Cadmium, total	mg/L	10/27/2022 - 05/15/2023	All ND - Last	0.002	0.005	0.002	0.005	Standard
MW-193	UU	845	Chloride, total	mg/L	10/27/2022 - 05/15/2023	CI around mean	34.8	1370	1370	200	Background

TABLE 1. DETERMINATION OF POTENTIAL EXCEEDANCES
HISTORY OF POTENTIAL EXCEEDANCES
BALDWIN POWER PLANT
BOTTOM ASH POND
BALDWIN, ILLINOIS

Sample Location	HSU	Program	Constituent	Result Unit	Sample Date Range	Statistical Calculation	Statistical Result	GWPS	Background	Part 845 Standard	GWPS Source
MW-193	UU	845	Chromium, total	mg/L	10/27/2022 - 05/15/2023	CI around median	0.00150	0.10	0.013	0.1	Standard
MW-193	UU	845	Cobalt, total	mg/L	10/27/2022 - 05/15/2023	Most recent sample	0.00100	0.006	0.0022	0.006	Standard
MW-193	UU	845	Fluoride, total	mg/L	10/27/2022 - 05/15/2023	CB around linear reg	0.191	4.0	3.8	4	Standard
MW-193	UU	845	Lead, total	mg/L	10/27/2022 - 05/15/2023	All ND - Last	0.008	0.0075	0.0022	0.0075	Standard
MW-193	UU	845	Lithium, total	mg/L	10/27/2022 - 05/15/2023	CI around mean	0.00474	0.14	0.14	0.04	Background
MW-193	UU	845	Mercury, total	mg/L	10/27/2022 - 05/15/2023	All ND - Last	0.0002	0.002	0.0002	0.002	Standard
MW-193	UU	845	Molybdenum, total	mg/L	10/27/2022 - 05/15/2023	CI around median	0.00150	0.10	0.078	0.1	Standard
MW-193	UU	845	pH (field)	SU	10/27/2022 - 05/15/2023	CI around mean	6.7/7.2	6.5/11	7.5/11.1	6.5/9	Standard/Background
MW-193	UU	845	Radium 226 + Radium 228, total	pCi/L	10/27/2022 - 05/15/2023	CI around mean	0.376	5.0	3.8	5	Standard
MW-193	UU	845	Selenium, total	mg/L	10/27/2022 - 05/15/2023	All ND - Last	0.001	0.050	0.0032	0.05	Standard
MW-193	UU	845	Sulfate, total	mg/L	10/27/2022 - 05/15/2023	CI around mean	152	762	762	400	Background
MW-193	UU	845	Thallium, total	mg/L	10/27/2022 - 05/15/2023	All ND - Last	0.002	0.002	0.002	0.002	Standard
MW-193	UU	845	Total Dissolved Solids	mg/L	10/27/2022 - 05/15/2023	CI around mean	523	3260	3260	1200	Background
MW-194	UU	845	Antimony, total	mg/L	10/27/2022 - 05/15/2023	CI around median	0.00100	0.006	0.0023	0.006	Standard
MW-194	UU	845	Arsenic, total	mg/L	10/27/2022 - 05/15/2023	CB around linear reg	-0.000853	0.010	0.010	0.01	Background
MW-194	UU	845	Barium, total	mg/L	10/27/2022 - 05/15/2023	CI around mean	0.0844	2.0	0.26	2	Standard
MW-194	UU	845	Beryllium, total	mg/L	10/27/2022 - 05/15/2023	All ND - Last	0.0005	0.004	0.0005	0.004	Standard
MW-194	UU	845	Boron, total	mg/L	10/27/2022 - 05/15/2023	CI around median	0.0200	2.2	2.2	2	Background
MW-194	UU	845	Cadmium, total	mg/L	10/27/2022 - 05/15/2023	All ND - Last	0.002	0.005	0.002	0.005	Standard
MW-194	UU	845	Chloride, total	mg/L	10/27/2022 - 05/15/2023	CI around mean	28.0	1370	1370	200	Background
MW-194	UU	845	Chromium, total	mg/L	10/27/2022 - 05/15/2023	CI around median	0.00150	0.10	0.013	0.1	Standard
MW-194	UU	845	Cobalt, total	mg/L	10/27/2022 - 05/15/2023	CI around mean	0.000487	0.006	0.0022	0.006	Standard
MW-194	UU	845	Fluoride, total	mg/L	10/27/2022 - 05/15/2023	CI around mean	0.272	4.0	3.8	4	Standard
MW-194	UU	845	Lead, total	mg/L	10/27/2022 - 05/15/2023	CI around median	0.00100	0.0075	0.0022	0.0075	Standard
MW-194	UU	845	Lithium, total	mg/L	10/27/2022 - 05/15/2023	CI around mean	0.00580	0.14	0.14	0.04	Background
MW-194	UU	845	Mercury, total	mg/L	10/27/2022 - 05/15/2023	All ND - Last	0.0002	0.002	0.0002	0.002	Standard
MW-194	UU	845	Molybdenum, total	mg/L	10/27/2022 - 05/15/2023	CI around mean	0.00200	0.10	0.078	0.1	Standard

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BOTTOM ASH POND
BALDWIN, ILLINOIS

Sample Location	HSU	Program	Constituent	Result Unit	Sample Date Range	Statistical Calculation	Statistical Result	GWPS	Background	Part 845 Standard	GWPS Source
MW-194	UU	845	pH (field)	SU	10/27/2022 - 05/15/2023	CB around linear reg	6.3/6.9	6.5/11	7.5/11.1	6.5/9	Standard/Background
MW-194	UU	845	Radium 226 + Radium 228, total	pCi/L	10/27/2022 - 05/15/2023	CI around mean	0.160	5.0	3.8	5	Standard
MW-194	UU	845	Selenium, total	mg/L	10/27/2022 - 05/15/2023	All ND - Last	0.001	0.050	0.0032	0.05	Standard
MW-194	UU	845	Sulfate, total	mg/L	10/27/2022 - 05/15/2023	CB around linear reg	80.9	762	762	400	Background
MW-194	UU	845	Thallium, total	mg/L	10/27/2022 - 05/15/2023	All ND - Last	0.002	0.002	0.002	0.002	Standard
MW-194	UU	845	Total Dissolved Solids	mg/L	10/27/2022 - 05/15/2023	CI around mean	440	3260	3260	1200	Background
MW-356	UA	257	Antimony, total	mg/L	12/29/2015 - 05/16/2023	CI around median	0.00100	0.006	0.0023	0.006	Standard
MW-356	UA	257	Arsenic, total	mg/L	12/29/2015 - 05/16/2023	CI around median	0.00100	0.010	0.010	0.01	Background
MW-356	UA	257	Barium, total	mg/L	12/29/2015 - 05/16/2023	CI around median	0.0297	2.0	0.26	2	Standard
MW-356	UA	257	Beryllium, total	mg/L	12/29/2015 - 05/16/2023	All ND - Last	0.0005	0.004	0.0005	0.004	Standard
MW-356	UA	257	Boron, total	mg/L	12/29/2015 - 05/16/2023	CI around median	1.94	2.2	2.2	2	Background
MW-356	UA	257	Cadmium, total	mg/L	12/29/2015 - 05/16/2023	All ND - Last	0.002	0.005	0.002	0.005	Standard
MW-356	UA	257	Chloride, total	mg/L	12/29/2015 - 05/16/2023	CB around linear reg	28.6	1370	1370	200	Background
MW-356	UA	257	Chromium, total	mg/L	12/29/2015 - 05/16/2023	All ND - Last	0.005	0.10	0.013	0.1	Standard
MW-356	UA	257	Cobalt, total	mg/L	12/29/2015 - 05/16/2023	All ND - Last	0.001	0.006	0.0022	0.006	Standard
MW-356	UA	257	Fluoride, total	mg/L	12/29/2015 - 05/16/2023	CI around mean	1.92	4.0	3.8	4	Standard
MW-356	UA	257	Fluoride, total	mg/L	12/29/2015 - 05/16/2023	CI around mean	1.92	4.0	3.8	4	Standard
MW-356	UA	257	Lead, total	mg/L	12/29/2015 - 05/16/2023	CI around median	0.00100	0.0075	0.0022	0.0075	Standard
MW-356	UA	257	Lithium, total	mg/L	12/29/2015 - 05/16/2023	CB around linear reg	0.0551	0.14	0.14	0.04	Background
MW-356	UA	257	Mercury, total	mg/L	12/29/2015 - 05/16/2023	All ND - Last	0.0002	0.002	0.0002	0.002	Standard
MW-356	UA	257	Molybdenum, total	mg/L	12/29/2015 - 05/16/2023	CI around median	0.00150	0.10	0.078	0.1	Standard
MW-356	UA	257	pH (field)	SU	12/29/2015 - 05/16/2023	CI around median	7.7/7.8	6.5/11	7.5/11.1	6.5/9	Standard/Background
MW-356	UA	257	Radium 226 + Radium 228, total	pCi/L	12/29/2015 - 05/16/2023	CI around median	0.100	5.0	3.8	5	Standard
MW-356	UA	257	Selenium, total	mg/L	12/29/2015 - 05/16/2023	All ND - Last	0.001	0.050	0.0032	0.05	Standard
MW-356	UA	257	Sulfate, total	mg/L	12/29/2015 - 05/16/2023	CI around mean	44.4	758	758	400	Background
MW-356	UA	257	Thallium, total	mg/L	12/29/2015 - 05/16/2023	All ND - Last	0.002	0.002	0.002	0.002	Standard
MW-356	UA	257	Total Dissolved Solids	mg/L	12/29/2015 - 05/16/2023	CI around mean	663	3260	3260	1200	Background

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BALDWIN POWER PLANT
BOTTOM ASH POND
BALDWIN, ILLINOIS

Sample Location	HSU	Program	Constituent	Result Unit	Sample Date Range	Statistical Calculation	Statistical Result	GWPS	Background	Part 845 Standard	GWPS Source
MW-369	UA	257	Antimony, total	mg/L	12/29/2015 - 05/16/2023	CB around T-S line	-0.00196	0.006	0.0023	0.006	Standard
MW-369	UA	257	Arsenic, total	mg/L	12/29/2015 - 05/16/2023	CI around geomean	0.00151	0.010	0.010	0.01	Background
MW-369	UA	257	Barium, total	mg/L	12/29/2015 - 05/16/2023	CB around T-S line	0.0730	2.0	0.26	2	Standard
MW-369	UA	257	Beryllium, total	mg/L	12/29/2015 - 05/16/2023	All ND - Last	0.0005	0.004	0.0005	0.004	Standard
MW-369	UA	257	Boron, total	mg/L	12/29/2015 - 05/16/2023	CB around linear reg	-0.171	2.2	2.2	2	Background
MW-369	UA	257	Cadmium, total	mg/L	12/29/2015 - 05/16/2023	All ND - Last	0.002	0.005	0.002	0.005	Standard
MW-369	UA	257	Chloride, total	mg/L	12/29/2015 - 05/16/2023	CI around geomean	84.1	1370	1370	200	Background
MW-369	UA	257	Chromium, total	mg/L	12/29/2015 - 05/16/2023	CB around T-S line	0.00145	0.10	0.013	0.1	Standard
MW-369	UA	257	Cobalt, total	mg/L	12/29/2015 - 05/16/2023	CI around median	0.00100	0.006	0.0022	0.006	Standard
MW-369	UA	257	Fluoride, total	mg/L	12/29/2015 - 05/16/2023	CB around T-S line	-0.139	4.0	3.8	4	Standard
MW-369	UA	257	Fluoride, total	mg/L	12/29/2015 - 05/16/2023	CB around T-S line	-0.139	4.0	3.8	4	Standard
MW-369	UA	257	Lead, total	mg/L	12/29/2015 - 05/16/2023	CI around median	0.00100	0.0075	0.0022	0.0075	Standard
MW-369	UA	257	Lithium, total	mg/L	12/29/2015 - 05/16/2023	CI around mean	0.0212	0.14	0.14	0.04	Background
MW-369	UA	257	Mercury, total	mg/L	12/29/2015 - 05/16/2023	All ND - Last	0.0002	0.002	0.0002	0.002	Standard
MW-369	UA	257	Molybdenum, total	mg/L	12/29/2015 - 05/16/2023	CB around T-S line	-0.00666	0.10	0.078	0.1	Standard
MW-369	UA	257	pH (field)	SU	12/29/2015 - 05/16/2023	CB around linear reg	6.5/8.1	6.5/11	7.5/11.1	6.5/9	Standard/Background
MW-369	UA	257	Radium 226 + Radium 228, total	pCi/L	12/29/2015 - 05/16/2023	CI around mean	0.376	5.0	3.8	5	Standard
MW-369	UA	257	Selenium, total	mg/L	12/29/2015 - 05/16/2023	CB around T-S line	-0.0273	0.050	0.0032	0.05	Standard
MW-369	UA	257	Sulfate, total	mg/L	12/29/2015 - 05/16/2023	CB around T-S line	-73.6	758	758	400	Background
MW-369	UA	257	Thallium, total	mg/L	12/29/2015 - 05/16/2023	All ND - Last	0.002	0.002	0.002	0.002	Standard
MW-369	UA	257	Total Dissolved Solids	mg/L	12/29/2015 - 05/16/2023	CI around median	726	3260	3260	1200	Background
MW-370	UA	257	Antimony, total	mg/L	12/29/2015 - 05/16/2023	CB around T-S line	-0.000389	0.006	0.0023	0.006	Standard
MW-370	UA	257	Arsenic, total	mg/L	12/29/2015 - 05/16/2023	CB around T-S line	0.000139	0.010	0.010	0.01	Background
MW-370	UA	257	Barium, total	mg/L	12/29/2015 - 05/16/2023	CB around T-S line	0.0241	2.0	0.26	2	Standard
MW-370	UA	257	Beryllium, total	mg/L	12/29/2015 - 05/16/2023	All ND - Last	0.0005	0.004	0.0005	0.004	Standard
MW-370	UA	257	Boron, total	mg/L	12/29/2015 - 05/16/2023	CI around median	1.79	2.2	2.2	2	Background
MW-370	UA	257	Cadmium, total	mg/L	12/29/2015 - 05/16/2023	All ND - Last	0.002	0.005	0.002	0.005	Standard

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Sample Location	HSU	Program	Constituent	Result Unit	Sample Date Range	Statistical Calculation	Statistical Result	GWPS	Background	Part 845 Standard	GWPS Source
MW-370	UA	257	Chloride, total	mg/L	12/29/2015 - 05/16/2023	CB around linear reg	1380	1370	1370	200	Background
MW-370	UA	257	Chromium, total	mg/L	12/29/2015 - 05/16/2023	CB around T-S line	0.00142	0.10	0.013	0.1	Standard
MW-370	UA	257	Cobalt, total	mg/L	12/29/2015 - 05/16/2023	CI around median	0.00100	0.006	0.0022	0.006	Standard
MW-370	UA	257	Fluoride, total	mg/L	12/29/2015 - 05/16/2023	CB around linear reg	3.02	4.0	3.8	4	Standard
MW-370	UA	257	Fluoride, total	mg/L	12/29/2015 - 05/16/2023	CB around linear reg	3.02	4.0	3.8	4	Standard
MW-370	UA	257	Lead, total	mg/L	12/29/2015 - 05/16/2023	All ND - Last	0.008	0.0075	0.0022	0.0075	Standard
MW-370	UA	257	Lithium, total	mg/L	12/29/2015 - 05/16/2023	CI around mean	0.130	0.14	0.14	0.04	Background
MW-370	UA	257	Mercury, total	mg/L	12/29/2015 - 05/16/2023	All ND - Last	0.0002	0.002	0.0002	0.002	Standard
MW-370	UA	257	Molybdenum, total	mg/L	12/29/2015 - 05/16/2023	CB around linear reg	0.00644	0.10	0.078	0.1	Standard
MW-370	UA	257	pH (field)	SU	12/29/2015 - 05/16/2023	CB around linear reg	7.3/7.6	6.5/11	7.5/11.1	6.5/9	Standard/Background
MW-370	UA	257	Radium 226 + Radium 228, total	pCi/L	12/29/2015 - 05/16/2023	CI around geomean	0.517	5.0	3.8	5	Standard
MW-370	UA	257	Selenium, total	mg/L	12/29/2015 - 05/16/2023	Most recent sample	0.00100	0.050	0.0032	0.05	Standard
MW-370	UA	257	Sulfate, total	mg/L	12/29/2015 - 05/16/2023	CI around mean	248	758	758	400	Background
MW-370	UA	257	Thallium, total	mg/L	12/29/2015 - 05/16/2023	All ND - Last	0.002	0.002	0.002	0.002	Standard
MW-370	UA	257	Total Dissolved Solids	mg/L	12/29/2015 - 05/16/2023	CB around linear reg	2940	3260	3260	1200	Background
MW-382	UA	257	Antimony, total	mg/L	12/29/2015 - 05/16/2023	All ND - Last	0.001	0.006	0.0023	0.006	Standard
MW-382	UA	257	Arsenic, total	mg/L	12/29/2015 - 05/16/2023	CI around median	0.00110	0.010	0.010	0.01	Background
MW-382	UA	257	Barium, total	mg/L	12/29/2015 - 05/16/2023	CI around mean	0.0172	2.0	0.26	2	Standard
MW-382	UA	257	Beryllium, total	mg/L	12/29/2015 - 05/16/2023	CI around median	0.00100	0.004	0.0005	0.004	Standard
MW-382	UA	257	Boron, total	mg/L	12/29/2015 - 05/16/2023	CI around median	1.72	2.2	2.2	2	Background
MW-382	UA	257	Cadmium, total	mg/L	12/29/2015 - 05/16/2023	All ND - Last	0.002	0.005	0.002	0.005	Standard
MW-382	UA	257	Chloride, total	mg/L	12/29/2015 - 05/16/2023	CI around mean	34.9	1370	1370	200	Background
MW-382	UA	257	Chromium, total	mg/L	12/29/2015 - 05/16/2023	CB around linear reg	0.00577	0.10	0.013	0.1	Standard
MW-382	UA	257	Cobalt, total	mg/L	12/29/2015 - 05/16/2023	CB around T-S line	0.00100	0.006	0.0022	0.006	Standard
MW-382	UA	257	Fluoride, total	mg/L	12/29/2015 - 05/16/2023	CI around geomean	2.80	4.0	3.8	4	Standard
MW-382	UA	257	Fluoride, total	mg/L	12/29/2015 - 05/16/2023	CI around geomean	2.80	4.0	3.8	4	Standard
MW-382	UA	257	Lead, total	mg/L	12/29/2015 - 05/16/2023	CB around T-S line	0.00100	0.0075	0.0022	0.0075	Standard

TABLE 1. DETERMINATION OF POTENTIAL EXCEEDANCES
HISTORY OF POTENTIAL EXCEEDANCES
BALDWIN POWER PLANT
BOTTOM ASH POND
BALDWIN, ILLINOIS

Sample Location	HSU	Program	Constituent	Result Unit	Sample Date Range	Statistical Calculation	Statistical Result	GWPS	Background	Part 845 Standard	GWPS Source
MW-382	UA	257	Lithium, total	mg/L	12/29/2015 - 05/16/2023	CI around mean	0.0580	0.14	0.14	0.04	Background
MW-382	UA	257	Mercury, total	mg/L	12/29/2015 - 05/16/2023	All ND - Last	0.0002	0.002	0.0002	0.002	Standard
MW-382	UA	257	Molybdenum, total	mg/L	12/29/2015 - 05/16/2023	CB around T-S line	0.00222	0.10	0.078	0.1	Standard
MW-382	UA	257	pH (field)	SU	12/29/2015 - 05/16/2023	CI around mean	7.7/7.9	6.5/11	7.5/11.1	6.5/9	Standard/Background
MW-382	UA	257	Radium 226 + Radium 228, total	pCi/L	12/29/2015 - 05/16/2023	CI around geomean	0.289	5.0	3.8	5	Standard
MW-382	UA	257	Selenium, total	mg/L	12/29/2015 - 05/16/2023	All ND - Last	0.001	0.050	0.0032	0.05	Standard
MW-382	UA	257	Sulfate, total	mg/L	12/29/2015 - 05/16/2023	CB around linear reg	354	758	758	400	Background
MW-382	UA	257	Thallium, total	mg/L	12/29/2015 - 05/16/2023	All ND - Last	0.002	0.002	0.002	0.002	Standard
MW-382	UA	257	Total Dissolved Solids	mg/L	12/29/2015 - 05/16/2023	CB around linear reg	1060	3260	3260	1200	Background
MW-392	UA	845	Antimony, total	mg/L	10/27/2022 - 05/16/2023	CI around median	0.00100	0.006	0.0023	0.006	Standard
MW-392	UA	845	Arsenic, total	mg/L	10/27/2022 - 05/16/2023	CI around geomean	0.000901	0.010	0.010	0.01	Background
MW-392	UA	845	Barium, total	mg/L	10/27/2022 - 05/16/2023	CI around mean	0.0345	2.0	0.26	2	Standard
MW-392	UA	845	Beryllium, total	mg/L	10/27/2022 - 05/16/2023	All ND - Last	0.0005	0.004	0.0005	0.004	Standard
MW-392	UA	845	Boron, total	mg/L	10/27/2022 - 05/16/2023	CI around mean	1.58	2.2	2.2	2	Background
MW-392	UA	845	Cadmium, total	mg/L	10/27/2022 - 05/16/2023	All ND - Last	0.002	0.005	0.002	0.005	Standard
MW-392	UA	845	Chloride, total	mg/L	10/27/2022 - 05/16/2023	CI around median	334	1370	1370	200	Background
MW-392	UA	845	Chromium, total	mg/L	10/27/2022 - 05/16/2023	CI around median	0.00150	0.10	0.013	0.1	Standard
MW-392	UA	845	Cobalt, total	mg/L	10/27/2022 - 05/16/2023	CI around median	0.00100	0.006	0.0022	0.006	Standard
MW-392	UA	845	Fluoride, total	mg/L	10/27/2022 - 05/16/2023	CB around linear reg	3.63	4.0	3.8	4	Standard
MW-392	UA	845	Lead, total	mg/L	10/27/2022 - 05/16/2023	CI around median	0.00100	0.0075	0.0022	0.0075	Standard
MW-392	UA	845	Lithium, total	mg/L	10/27/2022 - 05/16/2023	CI around mean	0.0497	0.14	0.14	0.04	Background
MW-392	UA	845	Mercury, total	mg/L	10/27/2022 - 05/16/2023	All ND - Last	0.0002	0.002	0.0002	0.002	Standard
MW-392	UA	845	Molybdenum, total	mg/L	10/27/2022 - 05/16/2023	CI around median	0.00150	0.10	0.078	0.1	Standard
MW-392	UA	845	pH (field)	SU	10/27/2022 - 05/16/2023	CI around mean	7.3/7.9	6.5/11	7.5/11.1	6.5/9	Standard/Background
MW-392	UA	845	Radium 226 + Radium 228, total	pCi/L	10/27/2022 - 05/16/2023	CI around mean	0.237	5.0	3.8	5	Standard
MW-392	UA	845	Selenium, total	mg/L	10/27/2022 - 05/16/2023	All ND - Last	0.001	0.050	0.0032	0.05	Standard
MW-392	UA	845	Sulfate, total	mg/L	10/27/2022 - 05/16/2023	CI around geomean	45.9	762	762	400	Background

TABLE 1. DETERMINATION OF POTENTIAL EXCEEDANCES
HISTORY OF POTENTIAL EXCEEDANCES
BALDWIN POWER PLANT
BOTTOM ASH POND
BALDWIN, ILLINOIS

Sample Location	HSU	Program	Constituent	Result Unit	Sample Date Range	Statistical Calculation	Statistical Result	GWPS	Background	Part 845 Standard	GWPS Source
MW-392	UA	845	Thallium, total	mg/L	10/27/2022 - 05/16/2023	All ND - Last	0.002	0.002	0.002	0.002	Standard
MW-392	UA	845	Total Dissolved Solids	mg/L	10/27/2022 - 05/16/2023	CI around mean	1410	3260	3260	1200	Background
MW-393	UA	845	Antimony, total	mg/L	10/27/2022 - 05/15/2023	CI around median	0.00100	0.006	0.0023	0.006	Standard
MW-393	UA	845	Arsenic, total	mg/L	10/27/2022 - 05/15/2023	CI around median	0.00100	0.010	0.010	0.01	Background
MW-393	UA	845	Barium, total	mg/L	10/27/2022 - 05/15/2023	CI around geomean	0.0224	2.0	0.26	2	Standard
MW-393	UA	845	Beryllium, total	mg/L	10/27/2022 - 05/15/2023	All ND - Last	0.0005	0.004	0.0005	0.004	Standard
MW-393	UA	845	Boron, total	mg/L	10/27/2022 - 05/15/2023	CI around mean	1.47	2.2	2.2	2	Background
MW-393	UA	845	Cadmium, total	mg/L	10/27/2022 - 05/15/2023	All ND - Last	0.002	0.005	0.002	0.005	Standard
MW-393	UA	845	Chloride, total	mg/L	10/27/2022 - 05/15/2023	CB around linear reg	617	1370	1370	200	Background
MW-393	UA	845	Chromium, total	mg/L	10/27/2022 - 05/15/2023	CI around median	0.00150	0.10	0.013	0.1	Standard
MW-393	UA	845	Cobalt, total	mg/L	10/27/2022 - 05/15/2023	CI around median	0.00100	0.006	0.0022	0.006	Standard
MW-393	UA	845	Fluoride, total	mg/L	10/27/2022 - 05/15/2023	CB around linear reg	7.49	4.0	3.8	4	Standard
MW-393	UA	845	Lead, total	mg/L	10/27/2022 - 05/15/2023	All ND - Last	0.008	0.0075	0.0022	0.0075	Standard
MW-393	UA	845	Lithium, total	mg/L	10/27/2022 - 05/15/2023	CI around mean	0.0519	0.14	0.14	0.04	Background
MW-393	UA	845	Mercury, total	mg/L	10/27/2022 - 05/15/2023	All ND - Last	0.0002	0.002	0.0002	0.002	Standard
MW-393	UA	845	Molybdenum, total	mg/L	10/27/2022 - 05/15/2023	CI around mean	-0.000199	0.10	0.078	0.1	Standard
MW-393	UA	845	pH (field)	SU	10/27/2022 - 05/15/2023	CI around mean	7.7/8.4	6.5/11	7.5/11.1	6.5/9	Standard/Background
MW-393	UA	845	Radium 226 + Radium 228, total	pCi/L	10/27/2022 - 05/15/2023	CI around mean	0.0868	5.0	3.8	5	Standard
MW-393	UA	845	Selenium, total	mg/L	10/27/2022 - 05/15/2023	All ND - Last	0.001	0.050	0.0032	0.05	Standard
MW-393	UA	845	Sulfate, total	mg/L	10/27/2022 - 05/15/2023	CB around linear reg	104	762	762	400	Background
MW-393	UA	845	Thallium, total	mg/L	10/27/2022 - 05/15/2023	All ND - Last	0.002	0.002	0.002	0.002	Standard
MW-393	UA	845	Total Dissolved Solids	mg/L	10/27/2022 - 05/15/2023	CI around median	826	3260	3260	1200	Background
MW-394	UA	845	Antimony, total	mg/L	10/27/2022 - 05/15/2023	CI around mean	0.000850	0.006	0.0023	0.006	Standard
MW-394	UA	845	Arsenic, total	mg/L	10/27/2022 - 05/15/2023	CI around median	0.00100	0.010	0.010	0.01	Background
MW-394	UA	845	Barium, total	mg/L	10/27/2022 - 05/15/2023	CI around mean	0.0258	2.0	0.26	2	Standard
MW-394	UA	845	Beryllium, total	mg/L	10/27/2022 - 05/15/2023	All ND - Last	0.0005	0.004	0.0005	0.004	Standard
MW-394	UA	845	Boron, total	mg/L	10/27/2022 - 05/15/2023	CI around mean	1.53	2.2	2.2	2	Background

TABLE 1. DETERMINATION OF POTENTIAL EXCEEDANCES
HISTORY OF POTENTIAL EXCEEDANCES
BALDWIN POWER PLANT
BOTTOM ASH POND
BALDWIN, ILLINOIS

Sample Location	HSU	Program	Constituent	Result Unit	Sample Date Range	Statistical Calculation	Statistical Result	GWPS	Background	Part 845 Standard	GWPS Source
MW-394	UA	845	Cadmium, total	mg/L	10/27/2022 - 05/15/2023	All ND - Last	0.002	0.005	0.002	0.005	Standard
MW-394	UA	845	Chloride, total	mg/L	10/27/2022 - 05/15/2023	CI around mean	490	1370	1370	200	Background
MW-394	UA	845	Chromium, total	mg/L	10/27/2022 - 05/15/2023	CI around mean	-0.00000691	0.10	0.013	0.1	Standard
MW-394	UA	845	Cobalt, total	mg/L	10/27/2022 - 05/15/2023	CI around median	0.00100	0.006	0.0022	0.006	Standard
MW-394	UA	845	Fluoride, total	mg/L	10/27/2022 - 05/15/2023	CI around mean	3.25	4.0	3.8	4	Standard
MW-394	UA	845	Lead, total	mg/L	10/27/2022 - 05/15/2023	CI around median	0.00100	0.0075	0.0022	0.0075	Standard
MW-394	UA	845	Lithium, total	mg/L	10/27/2022 - 05/15/2023	CI around mean	0.0438	0.14	0.14	0.04	Background
MW-394	UA	845	Mercury, total	mg/L	10/27/2022 - 05/15/2023	All ND - Last	0.0002	0.002	0.0002	0.002	Standard
MW-394	UA	845	Molybdenum, total	mg/L	10/27/2022 - 05/15/2023	CI around mean	0.00443	0.10	0.078	0.1	Standard
MW-394	UA	845	pH (field)	SU	10/27/2022 - 05/15/2023	CI around mean	7.6/8.1	6.5/11	7.5/11.1	6.5/9	Standard/Background
MW-394	UA	845	Radium 226 + Radium 228, total	pCi/L	10/27/2022 - 05/15/2023	CI around mean	0.301	5.0	3.8	5	Standard
MW-394	UA	845	Selenium, total	mg/L	10/27/2022 - 05/15/2023	Most recent sample	0.00100	0.050	0.0032	0.05	Standard
MW-394	UA	845	Sulfate, total	mg/L	10/27/2022 - 05/15/2023	CB around linear reg	77.3	762	762	400	Background
MW-394	UA	845	Thallium, total	mg/L	10/27/2022 - 05/15/2023	All ND - Last	0.002	0.002	0.002	0.002	Standard
MW-394	UA	845	Total Dissolved Solids	mg/L	10/27/2022 - 05/15/2023	CI around mean	1770	3260	3260	1200	Background
OW-256	UU	257	Antimony, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.001	0.006	0.0023	0.006	Standard
OW-256	UU	257	Arsenic, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.0100	0.010	0.010	0.01	Background
OW-256	UU	257	Barium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.102	2.0	0.26	2	Standard
OW-256	UU	257	Beryllium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.0005	0.004	0.0005	0.004	Standard
OW-256	UU	257	Boron, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.187	2.2	2.2	2	Background
OW-256	UU	257	Cadmium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.002	0.005	0.002	0.005	Standard
OW-256	UU	257	Chloride, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	54.0	1370	1370	200	Background
OW-256	UU	257	Chromium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.005	0.10	0.013	0.1	Standard
OW-256	UU	257	Cobalt, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.00150	0.006	0.0022	0.006	Standard
OW-256	UU	257	Fluoride, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.250	4.0	3.8	4	Standard
OW-256	UU	257	Fluoride, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.250	4.0	3.8	4	Standard
OW-256	UU	257	Lead, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.008	0.0075	0.0022	0.0075	Standard

TABLE 1. DETERMINATION OF POTENTIAL EXCEEDANCES
HISTORY OF POTENTIAL EXCEEDANCES
BALDWIN POWER PLANT
BOTTOM ASH POND
BALDWIN, ILLINOIS

Sample Location	HSU	Program	Constituent	Result Unit	Sample Date Range	Statistical Calculation	Statistical Result	GWPS	Background	Part 845 Standard	GWPS Source
OW-256	UU	257	Lithium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.00500	0.14	0.14	0.04	Background
OW-256	UU	257	Mercury, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.0002	0.002	0.0002	0.002	Standard
OW-256	UU	257	Molybdenum, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.01	0.10	0.078	0.1	Standard
OW-256	UU	257	pH (field)	SU	03/14/2023 - 05/17/2023	Most recent sample	6.7/6.7	6.5/11	7.5/11.1	6.5/9	Standard/Background
OW-256	UU	257	Radium 226 + Radium 228, total	pCi/L	03/14/2023 - 05/17/2023	Most recent sample	0.717	5.0	3.8	5	Standard
OW-256	UU	257	Selenium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.001	0.050	0.0032	0.05	Standard
OW-256	UU	257	Sulfate, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	64.0	758	758	400	Background
OW-256	UU	257	Thallium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.002	0.002	0.002	0.002	Standard
OW-256	UU	257	Total Dissolved Solids	mg/L	03/14/2023 - 05/17/2023	Most recent sample	514	3260	3260	1200	Background
OW-257	UU	257	Antimony, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.00500	0.006	0.0023	0.006	Standard
OW-257	UU	257	Arsenic, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.103	0.010	0.010	0.01	Background
OW-257	UU	257	Barium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.975	2.0	0.26	2	Standard
OW-257	UU	257	Beryllium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.00970	0.004	0.0005	0.004	Standard
OW-257	UU	257	Boron, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.490	2.2	2.2	2	Background
OW-257	UU	257	Cadmium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.00450	0.005	0.002	0.005	Standard
OW-257	UU	257	Chloride, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	7.00	1370	1370	200	Background
OW-257	UU	257	Chromium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.214	0.10	0.013	0.1	Standard
OW-257	UU	257	Cobalt, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.203	0.006	0.0022	0.006	Standard
OW-257	UU	257	Fluoride, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.370	4.0	3.8	4	Standard
OW-257	UU	257	Fluoride, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.370	4.0	3.8	4	Standard
OW-257	UU	257	Lead, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.214	0.0075	0.0022	0.0075	Standard
OW-257	UU	257	Lithium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.207	0.14	0.14	0.04	Background
OW-257	UU	257	Mercury, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.0002	0.002	0.0002	0.002	Standard
OW-257	UU	257	Molybdenum, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.0100	0.10	0.078	0.1	Standard
OW-257	UU	257	pH (field)	SU	03/14/2023 - 05/17/2023	Most recent sample	6.8/6.8	6.5/11	7.5/11.1	6.5/9	Standard/Background
OW-257	UU	257	Radium 226 + Radium 228, total	pCi/L	03/14/2023 - 05/17/2023	Most recent sample	25.3	5.0	3.8	5	Standard
OW-257	UU	257	Selenium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.001	0.050	0.0032	0.05	Standard

TABLE 1. DETERMINATION OF POTENTIAL EXCEEDANCES
HISTORY OF POTENTIAL EXCEEDANCES
BALDWIN POWER PLANT
BOTTOM ASH POND
BALDWIN, ILLINOIS

Sample Location	HSU	Program	Constituent	Result Unit	Sample Date Range	Statistical Calculation	Statistical Result	GWPS	Background	Part 845 Standard	GWPS Source
OW-257	UU	257	Sulfate, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	118	758	758	400	Background
OW-257	UU	257	Thallium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.01	0.002	0.002	0.002	Standard
OW-257	UU	257	Total Dissolved Solids	mg/L	03/14/2023 - 05/17/2023	Most recent sample	1270	3260	3260	1200	Background
PZ-170	UU	257	Antimony, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.00100	0.006	0.0023	0.006	Standard
PZ-170	UU	257	Arsenic, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.01	0.010	0.010	0.01	Background
PZ-170	UU	257	Barium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.0975	2.0	0.26	2	Standard
PZ-170	UU	257	Beryllium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.0005	0.004	0.0005	0.004	Standard
PZ-170	UU	257	Boron, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.267	2.2	2.2	2	Background
PZ-170	UU	257	Cadmium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.002	0.005	0.002	0.005	Standard
PZ-170	UU	257	Chloride, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	35.0	1370	1370	200	Background
PZ-170	UU	257	Chromium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.00500	0.10	0.013	0.1	Standard
PZ-170	UU	257	Cobalt, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.00460	0.006	0.0022	0.006	Standard
PZ-170	UU	257	Fluoride, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.180	4.0	3.8	4	Standard
PZ-170	UU	257	Fluoride, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.180	4.0	3.8	4	Standard
PZ-170	UU	257	Lead, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.008	0.0075	0.0022	0.0075	Standard
PZ-170	UU	257	Lithium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.0291	0.14	0.14	0.04	Background
PZ-170	UU	257	Mercury, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.0002	0.002	0.0002	0.002	Standard
PZ-170	UU	257	Molybdenum, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.01	0.10	0.078	0.1	Standard
PZ-170	UU	257	pH (field)	SU	03/14/2023 - 05/17/2023	Most recent sample	6.5/6.5	6.5/11	7.5/11.1	6.5/9	Standard/Background
PZ-170	UU	257	Radium 226 + Radium 228, total	pCi/L	03/14/2023 - 05/17/2023	Most recent sample	0.181	5.0	3.8	5	Standard
PZ-170	UU	257	Selenium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.001	0.050	0.0032	0.05	Standard
PZ-170	UU	257	Sulfate, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	170	758	758	400	Background
PZ-170	UU	257	Thallium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.002	0.002	0.002	0.002	Standard
PZ-170	UU	257	Total Dissolved Solids	mg/L	03/14/2023 - 05/17/2023	Most recent sample	730	3260	3260	1200	Background
PZ-182	UU	257	Antimony, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.001	0.006	0.0023	0.006	Standard
PZ-182	UU	257	Arsenic, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.0100	0.010	0.010	0.01	Background
PZ-182	UU	257	Barium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.0692	2.0	0.26	2	Standard

TABLE 1. DETERMINATION OF POTENTIAL EXCEEDANCES
HISTORY OF POTENTIAL EXCEEDANCES
BALDWIN POWER PLANT
BOTTOM ASH POND
BALDWIN, ILLINOIS

Sample Location	HSU	Program	Constituent	Result Unit	Sample Date Range	Statistical Calculation	Statistical Result	GWPS	Background	Part 845 Standard	GWPS Source
PZ-182	UU	257	Beryllium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.0005	0.004	0.0005	0.004	Standard
PZ-182	UU	257	Boron, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.484	2.2	2.2	2	Background
PZ-182	UU	257	Cadmium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.002	0.005	0.002	0.005	Standard
PZ-182	UU	257	Chloride, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	88.0	1370	1370	200	Background
PZ-182	UU	257	Chromium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.005	0.10	0.013	0.1	Standard
PZ-182	UU	257	Cobalt, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.00100	0.006	0.0022	0.006	Standard
PZ-182	UU	257	Fluoride, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.190	4.0	3.8	4	Standard
PZ-182	UU	257	Fluoride, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.190	4.0	3.8	4	Standard
PZ-182	UU	257	Lead, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.00750	0.0075	0.0022	0.0075	Standard
PZ-182	UU	257	Lithium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.00690	0.14	0.14	0.04	Background
PZ-182	UU	257	Mercury, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.0002	0.002	0.0002	0.002	Standard
PZ-182	UU	257	Molybdenum, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.01	0.10	0.078	0.1	Standard
PZ-182	UU	257	pH (field)	SU	03/14/2023 - 05/17/2023	Most recent sample	6.6/6.6	6.5/11	7.5/11.1	6.5/9	Standard/Background
PZ-182	UU	257	Radium 226 + Radium 228, total	pCi/L	03/14/2023 - 05/17/2023	Most recent sample	0.925	5.0	3.8	5	Standard
PZ-182	UU	257	Selenium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.001	0.050	0.0032	0.05	Standard
PZ-182	UU	257	Sulfate, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	254	758	758	400	Background
PZ-182	UU	257	Thallium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.002	0.002	0.002	0.002	Standard
PZ-182	UU	257	Total Dissolved Solids	mg/L	03/14/2023 - 05/17/2023	Most recent sample	1120	3260	3260	1200	Background

TABLE 1. DETERMINATION OF POTENTIAL EXCEEDANCES
HISTORY OF POTENTIAL EXCEEDANCES
BALDWIN POWER PLANT
BOTTOM ASH POND
BALDWIN, ILLINOIS

Notes:

Potential exceedance of GWPS

HSU = hydrostratigraphic unit:
- UA = Uppermost Aquifer
- UU = Upper Unit

Program = regulatory program data were collected under:
- 257 = 40 C.F.R. Part 257 Subpart D (Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments)
- 845 = 35 I.A.C. Part 845 (Sampling events completed to assess well locations for inclusion in the Part 845 monitoring well network)

mg/L = milligrams per liter
pCi/L = picocuries per liter
SU = standard units
Sample Count = number of samples from Sampled Date Range used to calculate the Statistical Result
Statistical Calculation = method used to calculate the statistical result:
Statistical Result = calculated in accordance with Statistical Analysis Plan using constituent concentrations observed at monitoring well during all sampling events within the specified date range
For pH, the values presented are the lower / upper limits
GWPS = Groundwater Protection Standard
GWPS Source:
- Standard = standard specified in 35 I.A.C. § 845.600(a)(1)
- Background = background concentration (see cover page for additional information)

TABLE 2. SUMMARY OF POTENTIAL EXCEEDANCES
HISTORY OF POTENTIAL EXCEEDANCES
BALDWIN POWER PLANT
BOTTOM ASH POND
BALDWIN, ILLINOIS

Sample Location	HSU	Program	Constituent	Result Unit	Sample Date Range	Statistical Calculation	Statistical Result	GWPS	Background	Part 845 Standard	GWPS Source
MW-370	UA	257	Chloride, total	mg/L	12/29/2015 - 05/16/2023	CB around linear reg	1380	1370	1370	200	Background
MW-393	UA	845	Fluoride, total	mg/L	10/27/2022 - 05/15/2023	CB around linear reg	7.49	4.0	3.8	4	Standard
OW-257	UU	257	Arsenic, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.103	0.010	0.010	0.01	Background
OW-257	UU	257	Beryllium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.00970	0.004	0.0005	0.004	Standard
OW-257	UU	257	Chromium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.214	0.10	0.013	0.1	Standard
OW-257	UU	257	Cobalt, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.203	0.006	0.0022	0.006	Standard
OW-257	UU	257	Lead, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.214	0.0075	0.0022	0.0075	Standard
OW-257	UU	257	Lithium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.207	0.14	0.14	0.04	Background
OW-257	UU	257	Radium 226 + Radium 228, total	pCi/L	03/14/2023 - 05/17/2023	Most recent sample	25.3	5.0	3.8	5	Standard
OW-257	UU	257	Thallium, total	mg/L	03/14/2023 - 05/17/2023	Most recent sample	0.01	0.002	0.002	0.002	Standard

Notes:
HSU = hydrostratigraphic unit:
UA = Uppermost Aquifer
UU = Upper Unit
Program = regulatory program data were collected under:
257 = 40 C.F.R. Part 257 Subpart D (Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments)
845 = 35 I.A.C. Part 845 (Sampling events completed to assess well locations for inclusion in the Part 845 monitoring well network)
mg/L = milligrams per liter
pCi/L = picocuries per liter
SU = standard units
Sample Count = number of samples from Sampled Date Range used to calculate the Statistical Result
Statistical Calculation = method used to calculate the statistical result:
Statistical Result = calculated in accordance with Statistical Analysis Plan using constituent concentrations observed at monitoring well during all sampling events within the specified date range
For pH, the values presented are the lower / upper limits
GWPS = Groundwater Protection Standard
GWPS Source:
Standard = standard specified in 35 I.A.C. § 845.600(a)(1)
Background = background concentration (see cover page for additional information)

APPENDIX B
ALTERNATE SOURCE DEMONSTRATION
BALDWIN POWER PLANT, BOTTOM ASH POND, CCR UNIT 601 (RAMBOLL, 2023a)

Intended for
Dynegy Midwest Generation, LLC

Date
April 30, 2023

Project No.
1940102203-001

40 C.F.R. § 257.95(g)(3)(ii): ALTERNATE SOURCE DEMONSTRATION

BALDWIN POWER PLANT

BOTTOM ASH POND

CCR UNIT 601

RAMBOLL Bright ideas. Sustainable change.

CERTIFICATIONS

I, Brian G. Hennings, a professional geologist in good standing in the State of Illinois, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used other than for its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

_____
Brian G. Hennings
Professional Geologist
196.001482
Illinois
Ramboll Americas Engineering Solutions, Inc.
Date: April 30, 2023

I, Anne Frances Ackerman, a qualified professional engineer in good standing in the State of Illinois, certify that the information in this report is accurate as of the date of my signature below. The content of this report is not to be used other than for its intended purpose and meaning, or for extrapolations beyond the interpretations contained herein.

_____
Anne Frances Ackerman
Qualified Professional Engineer
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TABLES (IN TEXT)

Table A Summary Statistics for Lithium in MW-370 and BAP Porewater (December 2015 to March 2023).

FIGURES (IN TEXT)

Figure A Stiff Diagram Showing Ionic Composition of Samples of BAP Background (Brown), Compliance Groundwater (Blue), and upgradient groundwater (Tan).

FIGURES (ATTACHED)

Figure 1 Sampling Location Map
Figure 2 Potentiometric Surface Map – December 12, 2022
Figure 3 Cross Section Location Map
Figure 4 Cross Section A-A'

APPENDICES

Appendix A Technical Memorandum – Evaluation of Lithium Sources within Aquifer Solids, Baldwin Power Station – Bottom Ash Pond (Geosyntec Consultants, Inc., 2023)

ACRONYMS AND ABBREVIATIONS

40 C.F.R.	Title 40 of the Code of Federal Regulations
35 I.A.C.	Title 35 of the Illinois Administrative Code
A5D	Assessment Monitoring Sampling Event A5D
ASD	Alternate Source Demonstration
BAP	Bottom Ash Pond
bgs	below ground surface
BPP	Baldwin Power Plant
CCR	coal combustion residuals
cm/s	centimeters per second
FAPS	Fly Ash Pond System
GWPS	groundwater protection standard
IEPA	Illinois Environmental Protection Agency
LOE(s)	line(s) of evidence
mg/L	milligrams per liter
NAVD88	North American Vertical Datum of 1988
NRT	Natural Resource Technology, Inc.
NRT/OBG	Natural Resource Technology, an OBG Company
PMP	potential migration pathways
Ramboll	Ramboll Americas Engineering Solutions, Inc.
SEP	Sequential extraction procedure
SSI	statistically significant increase
SSL	statistically significant level
XRD	X-ray diffraction

1. INTRODUCTION

Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257.95(g)(3)(ii) allows the owner or operator of a coal combustion residuals (CCR) unit 90 days from the date of determination of statistically significant levels (SSLs) over groundwater protection standards (GWPS) of groundwater constituents listed in Appendix IV of 40 C.F.R. § 257 to complete a written demonstration that a source other than the CCR unit being monitored caused the SSL(s) (Alternate Source Demonstration [ASD]), or that the SSL(s) resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality.

This ASD has been prepared on behalf of Dynegy Midwest Generation, LLC, by Ramboll Americas Engineering Solutions, Inc. (Ramboll), to provide pertinent information pursuant to 40 C.F.R. § 257.95(g)(3)(ii) for the Baldwin Power Plant (BPP) Bottom Ash Pond (BAP) located near Baldwin, Illinois.

The most recent Assessment Monitoring sampling event (A5D) was completed on September 30, 2022, and analytical data was received on November 15, 2022. Additional background and compliance monitoring wells were installed around the BAP in September and October of 2022. Following the well installations, eight monthly rounds of groundwater sampling were initiated per 35 I.A.C. § 845. Analytical data from all monitoring events, from December 2015 through A5D, were evaluated in accordance with the Statistical Analysis Plan (Natural Resource Technology, an OBG Company [NRT/OBG], 2017a) to determine any statistically significant increases (SSIs) of Appendix III parameters over background concentrations or SSLs of Appendix IV parameters over GWPSs. That evaluation identified one SSL at a compliance monitoring well as follows:

- Lithium at well MW-370

Pursuant to 40 C.F.R. § 257.95(g)(3)(ii), the lines of evidence (LOEs) presented in **Section 3** demonstrate that sources other than the BAP were the cause of the lithium SSL listed above. This ASD was completed by April 30, 2023, within 90 days of determination of the SSLs (January 30, 2023), as required by 40 C.F.R. § 257.95(g)(3)(ii).

2. BACKGROUND

2.1 Site Location and Description

The BPP is located in southwest Illinois in Randolph and St. Clair Counties. The Randolph County portion of the BPP is located within Sections 2, 3, 4, 9, 10, 11, 14, 15, and 16 of Township 4 South and Range 7 West. The St. Clair County portion of the property is located within Sections 33, 34, and 35 of Township 3 South and Range 7 West. The BAP is approximately one-half mile west-northwest of the Village of Baldwin.

The BPP property is bordered to the west by the Kaskaskia River; to the east by Baldwin Road, farmland, and strip-mining areas; to the southeast by the Village of Baldwin; to the south by the Illinois Central Gulf railroad tracks, scattered residences, and State Route 154; and to the north by farmland. The St. Clair/Randolph County Line crosses east-west at approximately the midpoint of Baldwin Lake (Cooling Pond). **Figure 1** shows the location of the BAP, as well as the Fly Ash Pond System (FAPS), Secondary Pond, Tertiary Pond, and Baldwin Lake (Cooling Pond). The BAP is adjacent to the FAPS, which was approved for closure by Illinois Environmental Protection Agency (IEPA) on August 16, 2016.

2.2 Groundwater Monitoring

The BAP groundwater monitoring system for compliance with 40 C.F.R. § 257 consists of two background monitoring wells (MW-304 and MW-306) and four compliance monitoring wells (MW-356, MW-369, MW-370, and MW-382). A map showing the groundwater monitoring system, including the CCR unit and all background and compliance monitoring wells, is presented in **Figure 1**. **Figure 1** also shows porewater location TPZ-164, as well as the monitoring wells that were installed in 2022. New monitoring well MW-358 was installed in 2022 upgradient of the BAP and compliance monitoring well MW-370 (compliance monitoring well with identified lithium SSL) with a well screen (363.7 to 373.7 feet North American Vertical Datum of 1988 [NAVD88]) that overlaps with MW-370 well screen elevations (355.6 to 365.6 feet NAVD88).

Groundwater samples are collected and analyzed in accordance with the Sampling and Analysis Plan prepared for the BAP (NRT/OBG, 2017b). Statistical evaluation of analytical data is performed in accordance with the Statistical Analysis Plan (NRT/OBG, 2017a).

2.3 Site Hydrogeology and Stratigraphy

Three hydrostratigraphic units are present at the Site, including CCR, an upper unit, and a bedrock unit. These units are described in detail in the Supplemental Hydrogeologic Site Characterization and Groundwater Monitoring Plan (Natural Resources Technology, Inc. [NRT], 2016) and the Hydrogeologic Site Characterization Report (Ramboll, 2021); and are summarized below.

- **CCR:** CCR, consisting primarily of fly ash, bottom ash, and boiler slag. Also includes earthen fill deposits of predominantly clay and silt materials from on-site excavations that were used to construct berms and roads surrounding the various impoundments across the Site. The 2022 Site Investigation observed up to 28.2 feet of bottom ash towards the center of the BAP (XPW05).
- **Upper Unit:** Predominantly clay with some silt and minor sand, silt layers, and occasional sand lenses. Includes the lithologic layers identified as the Cahokia Alluvium, Peoria Loess,

Equality Formation, and Vandalia Till Member. This unit is composed of unlithified natural geologic materials and extends from the water table to the bedrock. Thin sand seams and the interface (contact) between the Upper Unit and bedrock have been identified as potential migration pathways (PMPs). No continuous sand seams were observed in the Upper Unit within or immediately adjacent to the BAP; however, the sand seams may act as a PMP due to relatively higher hydraulic conductivities (on the order of 10^{-4} centimeters per second [cm/s]) than the surrounding clays (on the order of 10^{-5} cm/s).

- **Bedrock Unit:** Shallow bedrock beneath the BAP yields small amounts of water from interconnected pores, cracks, fractures, crevices, joints, and bedding planes and is the only water-bearing unit that is continuous across the Site; this unit is considered the Uppermost Aquifer (UA) and is composed of Pennsylvanian and Mississippian-aged interbedded shale and limestone bedrock having a regional strike that is generally north to northeast with a dip of 2 to 3 degrees to the east into the Illinois Basin (Breeden et. al, 2018; Bristol and Howard, 1971). The surface elevation varies across the site, generally sloping downward from east to west, and the unlithified Upper Unit thins from east to west. The top of bedrock depth ranges between 12.5 feet below ground surface (bgs) near the Kaskaskia River and 70 feet bgs within the East Fly Ash Pond (part of the FAPS). Limestone layers intercepted at the Site are generally light to dark gray, fine-grained, thin bedded, banded, argillaceous, and competent except where weathered. Weathering of the limestone produces a calcareous clay. The limestone layers are interbedded with thin shale layers and are sometimes fossiliferous or sandy. The shale layers are generally weathered, competent, silty, slightly micaceous, fissile, and dark gray. Where highly weathered shale (*i.e.,* decomposed bedrock) was encountered, the shale was non-fissile and resembled an unlithified stiff clay with medium to high plasticity. Bedrock in the vicinity of

Water quality in the Uppermost Aquifer (*i.e.,* Pennsylvanian and Mississippian-aged bedrock) degrades with increasing depth as water becomes increasingly mineralized. Therefore, water quality at monitoring wells with screens placed in deeper bedrock layers (*e.g.,* MW-358 and MW-370) would be expected to demonstrate more influence from the naturally increased mineralization than wells screened shallower in the bedrock. Groundwater flow in bedrock is toward the northwest in the east and central areas of the BAP, and southwest in the east area of the FAPS. The Secondary and Tertiary ponds were created in a former drainage channel and bedrock groundwater flows toward these ponds as illustrated in **Figure 2**. Groundwater elevations vary seasonally, generally less than 7 feet, although flow directions are generally consistent. Groundwater elevations across the Site range between approximately 370 and 450 feet NAVD88.

3. ALTERNATE SOURCE DEMONSTRATION: LINES OF EVIDENCE

This ASD is based on the following LOEs:

1. The lithium concentration in the BAP porewater is lower than the concentrations observed in compliance monitoring well location MW-370.
2. Compliance monitoring well MW-370 has a similar ionic composition to upgradient monitoring well MW-358.
3. An aquifer solids evaluation identified naturally occurring lithium associated with the shale bedrock as a source for lithium in the Uppermost Aquifer.

These LOEs are described and supported in greater detail below. Monitoring wells and the BAP porewater sample locations are shown in **Figure 1**.

3.1 LOE #1: The lithium concentration in the BAP porewater is lower than the concentrations observed in compliance monitoring well location MW-370.

Table A below provides summary statistics for lithium in background wells, MW-370 and BAP porewater collected from TPZ-164, and the five new porewater wells installed in 2022.

Table A. Summary Statistics for Lithium in MW-370 and BAP Porewater (December 2015 to March 2023).

Sample Location	Lithium (milligrams per liter [mg/L])		
	Minimum	Maximum	Median
Background Groundwater[1]	0.010	0.096	0.055
Exceedance Groundwater (MW-370)	0.098	0.22	0.14
BAP Porewater[2]	<0.005	0.035	0.013

Notes:
[1]Background groundwater was collected at monitoring wells MW-304 and MW-306.
[2]BAP porewater was collected at TPZ-164 (September 2018 through November 2022), XPW01, XPW02, XPW04, XPW05, and XPW06 (October 2022 through January 2023).

The following observations can be made from **Table A** above:

- Concentrations of lithium in background wells ranged from 0.010 to 0.096 mg/L, with a median concentration of 0.055 mg/L.
- Concentrations of lithium in downgradient compliance monitoring well MW-370 ranged from 0.098 to 0.22 mg/L, with a median concentration of 0.14 mg/L.
- Concentrations of lithium in BAP porewater ranged from non-detect (<0.005 mg/L) to 0.035 mg/L, with a median concentration of 0.013 mg/L.
- The median lithium concentration observed in porewater is an order of magnitude lower than the median lithium concentrations observed in compliance monitoring well MW-370.
- The highest observed lithium concentration in porewater is approximately six times lower than the maximum concentration observed in compliance monitoring well MW-370.

If the BAP was the source of lithium in downgradient groundwater, BAP porewater concentrations of lithium would be expected to be higher than the groundwater concentrations. The median lithium concentration observed in porewater is below the median lithium concentrations observed in both background and compliance groundwater monitoring wells, indicating that lithium concentrations are not related to the BAP.

3.2 LOE #2: Compliance monitoring well MW-370 has a similar ionic composition to upgradient monitoring well MW-358.

Stiff diagrams graphically represent ionic composition of aqueous solutions. **Figure A** on the following page shows a series of Stiff diagrams that display the ionic compositions of groundwater from background monitoring wells (brown); compliance monitoring wells (blue); and upgradient monitoring well MW-358 (tan). Polygons with similar shapes on Stiff diagrams indicate solutions with similar ionic compositions, whereas polygons with different shapes indicate solutions with dissimilar ionic compositions. The larger the area of the polygon, the greater the concentration of the various ions. A Stiff diagram was included in **Figure A** for one out-of-network, upgradient, monitoring well, MW-358, due to similarities with MW-370 with respect to ionic composition, well screen elevation, and the composition of the bedrock material.

Compliance monitoring well MW-370 has chloride as the dominant anion and a substantially higher proportion of Na+K, similar to upgradient well MW-358. Upgradient monitoring well MW-358 is screened in a similar shaley bedrock material and at a similar elevation to MW-370 (**Figures 3 and 4**). The similarity in ionic composition in compliance well MW-370 and upgradient well MW-358 suggests that groundwater at these locations and depths is from a similar lithologic material that has undergone a similar amount of naturally occurring dissolution, and supports the conclusion that natural variability of groundwater in the Uppermost Aquifer is responsible for the lithium SSL at MW-370.

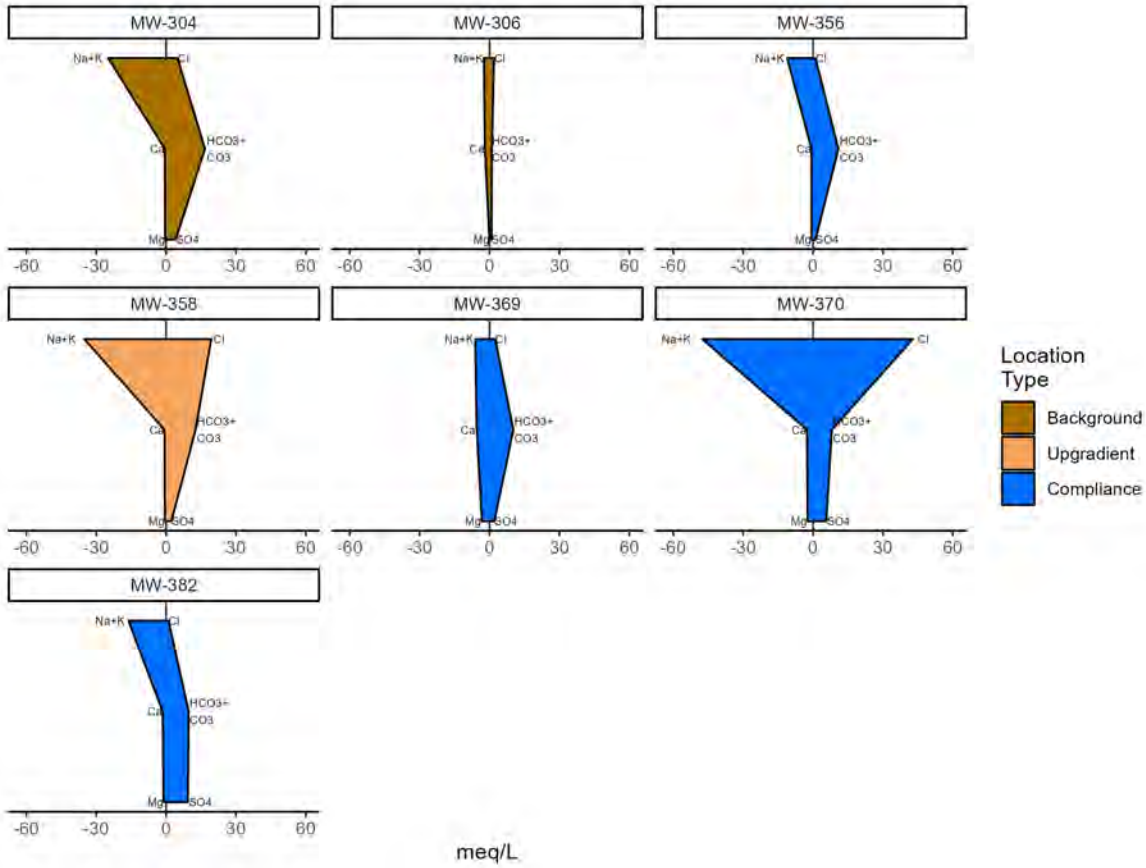

Figure A. Stiff Diagram Showing Ionic Composition of Samples of BAP Background (Brown), Compliance Groundwater (Blue), and Upgradient Groundwater (Tan).

3.3 LOE #3: An aquifer solids evaluation identified naturally occurring lithium associated with the shale bedrock as a source of lithium in the Uppermost Aquifer

Solid phase analyses were completed on samples collected from the Site to support the conclusion that lithium concentrations in groundwater at MW-370 are associated with naturally occurring lithium in the Uppermost Aquifer materials (limestone and shale bedrock formation). A review of the geochemical and site conditions was completed by Geosyntec Consultants, Inc. and is included as **Appendix A**. The following conclusions were made based on the results of the aquifer solids evaluation:

- Lithium host-minerals occur in the UA throughout the Site and constitute natural sources of lithium in BAP soils.
- Lithium is present in both upgradient and downgradient shale samples at the Site, with the largest concentrations observed in upgradient solids samples.
- Natural lithium occurrence in aquifer material from the Site is associated with multiple phases and therefore interacts with groundwater through different mechanisms at different locations and depths.

- Naturally occurring lithium associated with the shale bedrock comprising the UA at the Site was identified as a source of lithium in Site groundwater.

4. CONCLUSIONS

Based on the following three LOEs, it has been demonstrated that the lithium SSL at MW-370 is not due to the BAP:

1. The lithium concentration in the BAP porewater is lower than the concentrations observed in compliance monitoring well location MW-370.
2. Compliance monitoring well MW-370 has a similar ionic composition to upgradient monitoring well MW-358.
3. An aquifer solids evaluation identified naturally occurring lithium associated with the shale bedrock as a source for lithium in the Uppermost Aquifer.

This information serves as the written ASD prepared in accordance with 40 C.F.R. § 257.95(g)(3)(ii) that the SSL observed during the A5D sampling event was not due to the BAP. Therefore, a corrective measures assessment is not required, and the BAP will remain in assessment monitoring. Additional data is being collected to identify the source of the SSLs.

5. REFERENCES

Breeden, J.R., J.A. Devera, W.J. Nelson, and F.B. Denny, 2018. Bedrock Geology of Baldwin Quadrangle, Randolph and St. Clair Counties, Illinois: Illinois State Geological Survey, USGS-STATEMAP contract report, 2 sheets, 1:24,000.

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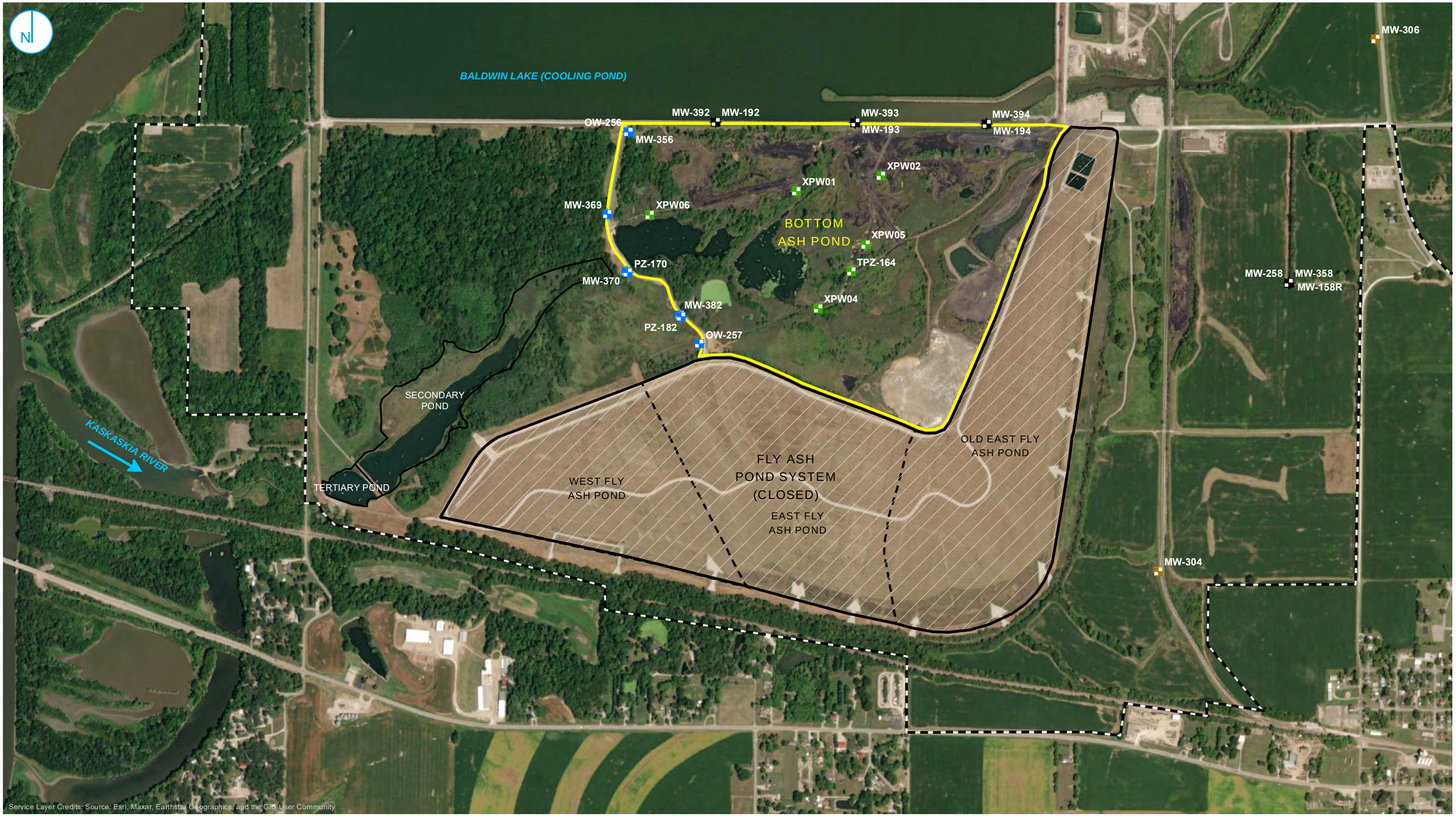
FIGURES

Y:\Mapping\Projects\22\2285\MXD\Alt_Source_Dem\Baldwin_AP\2023\Figure 1_Sampling Location Map.mxd



PROJECT: 169000XXXX | DATED: 4/25/2023 | DESIGNER: GALARNMC

- BACKGROUND WELL
- COMPLIANCE WELL
- MONITORING WELL
- PORE WATER WELL
- REGULATED UNIT (SUBJECT UNIT)
- FLY ASH POND SYSTEM (CLOSED)
- SITE FEATURE
- CAPPED AREA
- PROPERTY BOUNDARY

0 400 800 Feet

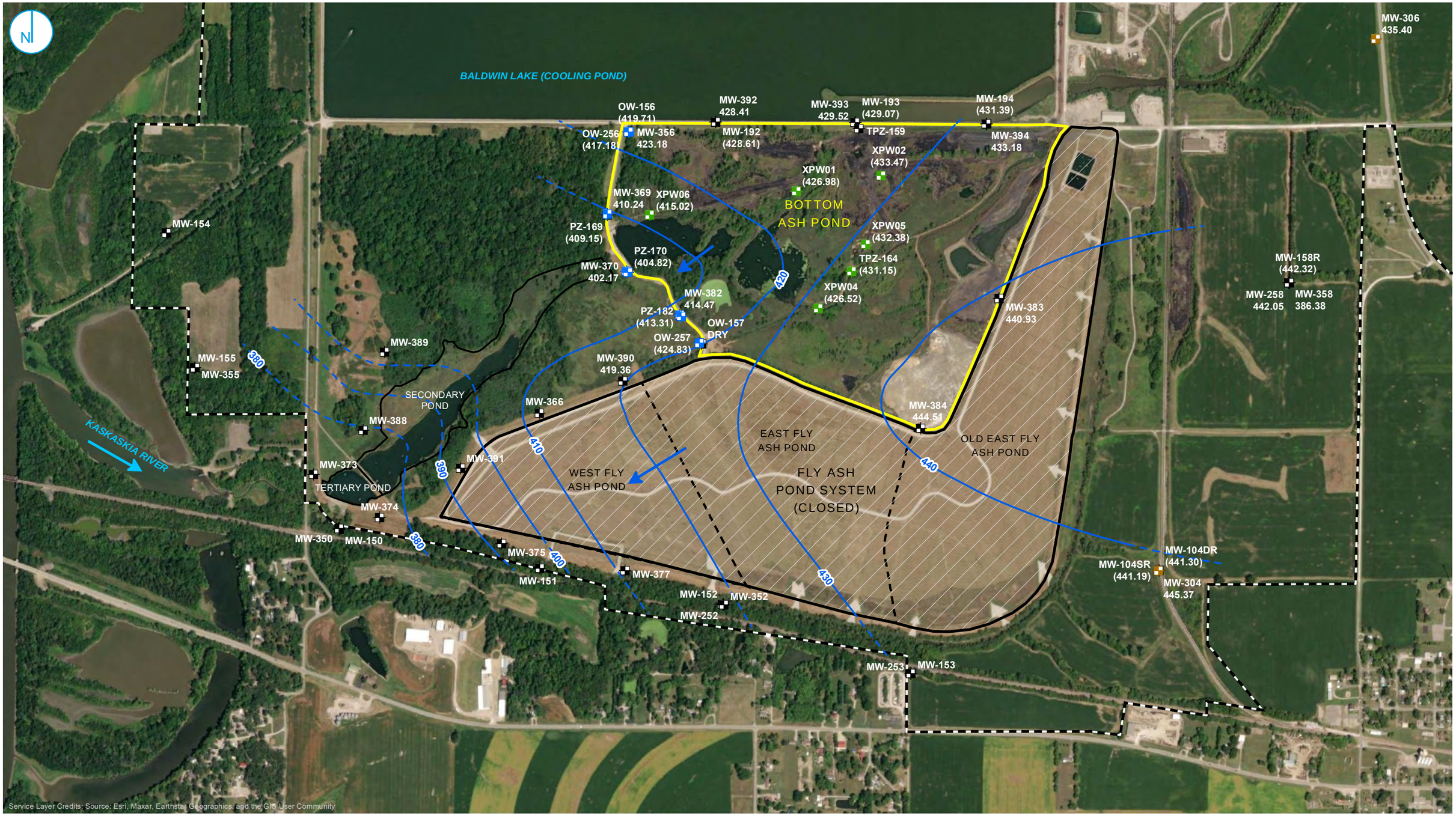
SAMPLING LOCATION MAP

ALTERNATE SOURCE DEMONSTRATION
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



Y:\Mapping\Projects\2222285\MXD\Alt_Source_Dem\Baldwin_AP2023\Figure 2_BAL BAP 601 845 Pot Surface 20221212.mxd

PROJECT: 169000XXXX | DATED: 4/20/2023 | DESIGNER: GALARNMC

- COMPLIANCE WELL
- BACKGROUND WELL
- PORE WATER WELL
- MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (10-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- PART 845 REGULATED UNIT (SUBJECT UNIT)
- FLY ASH POND SYSTEM (CLOSED)
- SITE FEATURE
- CAPPED AREA
- PROPERTY BOUNDARY

0 400 800 Feet

NOTES:
1. ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
2. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

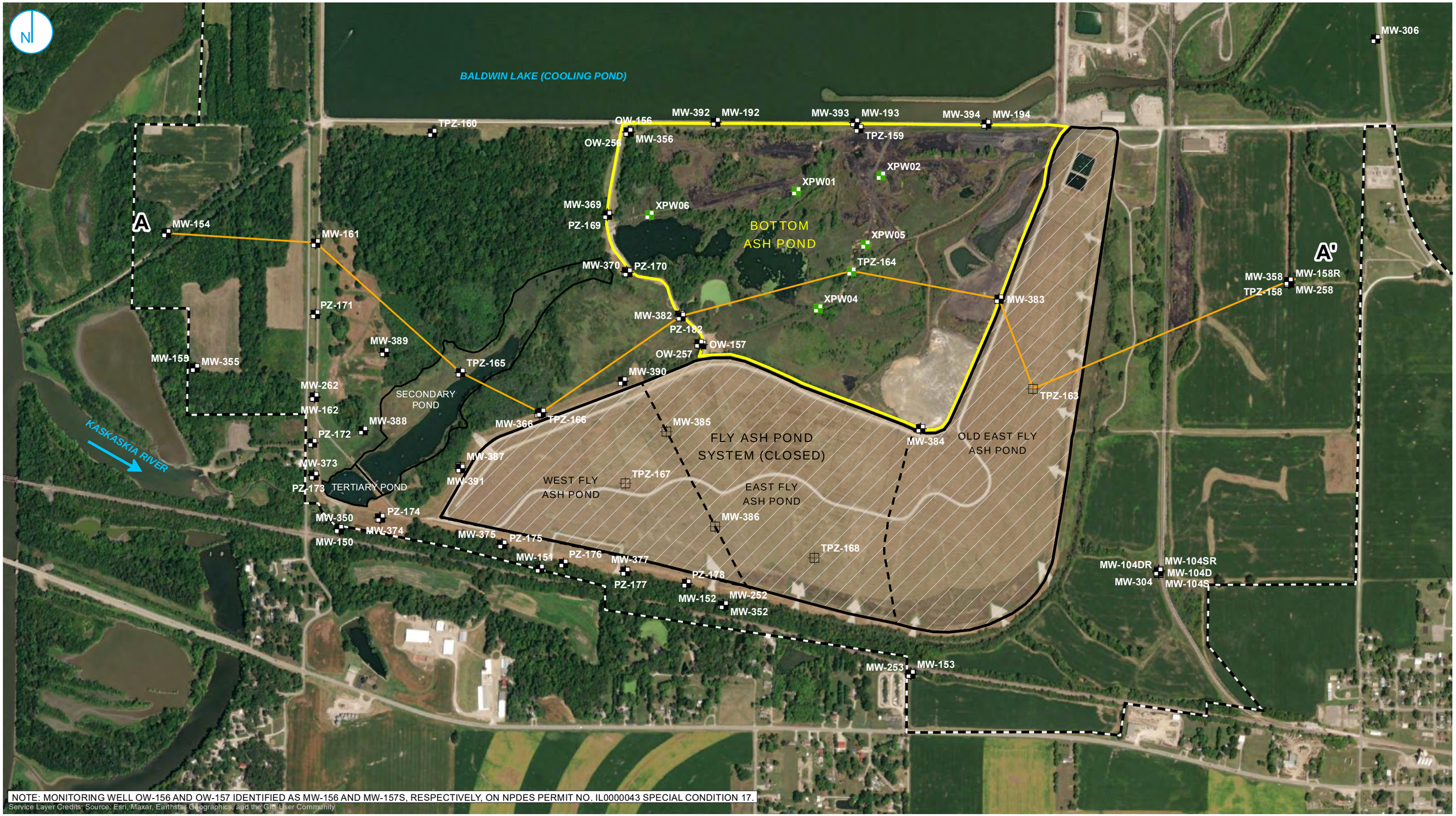
UPPERMOST AQUIFER POTENTIOMETRIC SURFACE MAP DECEMBER 12, 2022

ALTERNATE SOURCE DEMONSTRATION
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 2

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



NOTE: MONITORING WELL OW-156 AND OW-157 IDENTIFIED AS MW-156 AND MW-157S, RESPECTIVELY, ON NPDES PERMIT NO. IL0000043 SPECIAL CONDITION 17.

Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

PROJECT: 169000XXXX | DATED: 4/24/2023 | DESIGNER: GALARNMC

Y:\Mapping\Projects\22\2285\MXD\Alt_Source_Dem\Baldwin_AP\2023\Figure 3_Cross Section Locations.mxd

- MONITORING WELL AND PIEZOMETER LOCATION
- PORE WATER WELL
- CLOSED MONITORING WELL
- CCR SOURCEWATER SAMPLE

CROSS SECTION TRANSECT

- A to A'

0 400 800 Feet

- REGULATED UNIT (SUBJECT UNIT) FLY ASH
- POND SYSTEM (CLOSED)
- SITE FEATURE
- LIMITS OF FINAL COVER
- PROPERTY BOUNDARY

CROSS SECTION LOCATION MAP

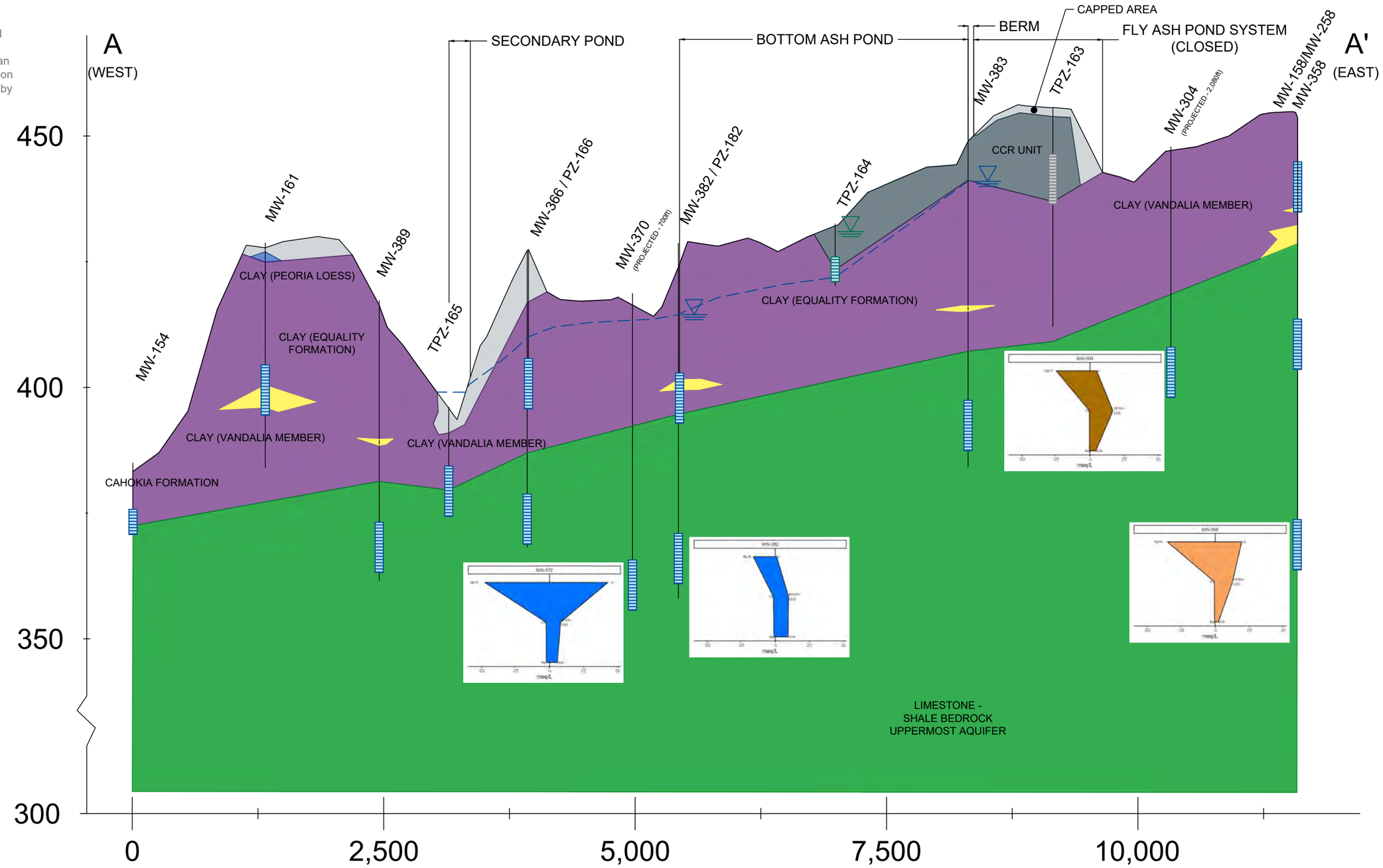
ALTERNATE SOURCE DEMONSTRATION
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 3

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

NOTES
1. This profile was developed by interpolation between widely spaced boreholes. Only at the borehole location should it be considered as an approximately accurate representation and then only to the degree implied by the notes on the borehole logs.
2. Scale is approximate.
3. Vertical scale is exaggerated 50X.
4. Groundwater elevations measured on December 12, 2022.



STIFF DIAGRAM LOCATION TYPE:
- BACKGROUND
- UPGRADIENT
- COMPLIANCE

LEGEND
- COAL COMBUSTION RESIDUALS (CCR)
- FILL
- CLAY (CL/CH)
- SILT (ML)
- SAND (SP/SM/SW)
- BEDROCK / WEATHERED BEDROCK (INTERBEDDED SHALE, LIMESTONE, SANDSTONE, V. LITTLE SS)
- WELL SCREEN INTERVAL
- UPPERMOST AQUIFER POTENTIOMETRIC SURFACE
- UPPERMOST AQUIFER GROUNDWATER ELEVATION
- POREWATER ELEVATION
- OTHER GROUNDWATER / SURFACE WATER ELEVATION(S)

20'
0
1,000'

CROSS SECTION A-A'

ALTERNATE SOURCE DEMONSTRATION BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILINNOIS

FIGURE 4

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL

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PROJECT: 1940100806 DATED: 4/24/2023 2:04 PM DESIGNER: ENGELHSA

APPENDIX A
TECHNICAL MEMORANDUM - EVALUATION OF LITHIUM SOURCES WITHIN AQUIFER SOLIDS, BALDWIN POWER STATION - BOTTOM ASH POND (GEOSYNTEC CONSULTANTS, INC., 2023)

Geosyntec consultants

500 W. Wilson Bridge Road, Suite 250
Worthington, Ohio 43085
PH 614.468.0421
FAX 614.468.0416
www.geosyntec.com

TECHNICAL MEMORANDUM

Date:	April 24, 2023
To:	Brian Voelker - Vistra
Copies to:	Stu Cravens and Phil Morris - Vistra
From:	Allison Kreinberg and Ryan Fimmen, Ph.D. - Geosyntec Consultants
Subject:	Evaluation of Lithium Sources within Aquifer Solids Baldwin Power Station – Bottom Ash Pond

Geosyntec Consultants, Inc. (Geosyntec) has completed a review of geochemical and site conditions at the Baldwin Power Plant Bottom Ash Pond (BAP; the Site) to evaluate the influence of the bedrock lithology on groundwater composition at downgradient monitoring well MW-370.

Alternate source demonstrations (ASDs) prepared by Ramboll Americas Engineering Solutions, Inc. (Ramboll) concluded that sources other than the BAP were the cause of statistically significant levels (SSL) of lithium at MW-370. This technical review has identified naturally occurring lithium associated with the shale bedrock as a source of elevated lithium in Site groundwater.

SITE CONDITIONS

The groundwater monitoring network for the BAP consists of four downgradient compliance wells (MW-356, MW-369, MW-370, and MW-382) and two upgradient background wells (MW-304 and MW-306). These monitoring locations are shown in the map provided as **Attachment 1**. Site geology consists of glacial drift deposits comprised of clastic material overlying Pennsylvanian and Mississippian-age bedrock (Ramboll, 2021). The geologic units comprising subsurface lithologies at the Site are listed in descending order:

- Equality Formation: predominantly clay and sandy clay, with intermittent sand lenses and some secondary carbonate concretions
- Pearl Formation: predominantly fine-medium grained sand with intermittent gravel
- Vandalia Till: clay and sandy clay diamicton with intermittent silt, sand, and gravel lenses
- Bedrock: Mississippian-age limestone and shale which underlies unconsolidated material beneath the western portion of the Site, and Pennsylvanian-age limestone and shale which underlies unconsolidated material beneath the eastern portion of the Site. The gradual

change from Mississippian bedrock to Pennsylvanian bedrock is believed to occur approximately beneath the central portion of the Site (Willman et al., 1967).

Limestone bedrock at the Site is generally thinly bedded, argillaceous, and competent, with localized areas of increased weathering (Ramboll, 2021). The result of this limestone weathering is a calcareous clay lithology. Layers of limestone bedrock are interbedded with thin shale layers which are sometimes calcareous and sometimes siliciclastic. The shale layers are generally more weathered than the limestone bedrock but are generally still competent. Locations of highly weathered, non-fissile, clay-like shale with medium to high plasticity have been observed.

The Uppermost Aquifer (UA) in the vicinity of the BAP is the shallow limestone/shale bedrock. Although sand lenses are present within the unconsolidated material overlying bedrock, these lenses have not been found to be laterally continuous. Groundwater in the vicinity of the BAP flows through bedrock from east to west primarily through secondary porosity features, predominantly joints and fractures, which are present at variable frequencies within the UA.

Geologic cross-sections of the lithology underlying the BAP are provided as **Attachment 2**. The fracture network within the deeper portions of the UA bedrock is overlain by unconsolidated, predominantly low permeability clay with some silt, resulting in confined to semi-confined groundwater conditions with mostly upward vertical gradients and or flowing artesian conditions observed in the unconsolidated and UA bedrock units across the Site. The observed upward vertical gradients (upwelling) result in deeper groundwater characteristic of older lithologies mixing with shallow formation water in the UA. The flat horizontal groundwater gradient beneath the Site and the mostly upward vertical gradients also suggests the BAP is not an area of significantly increased recharge or infiltration to the UA. Groundwater quality in the UA has observed to decrease with increasing depths as confined formation water is increasingly mineralized (Ramboll, 2021).

GROUNDWATER CONDITIONS

The observed lithium SSL was identified by comparing the reported groundwater concentrations at downgradient monitoring well MW-370 to the site-specific groundwater protection standard (GWPS). The site-specific GWPS for lithium was established at 0.0958 mg/L, as the Site background concentrations were greater than the health-based level of 0.040 mg/L established in 40 CFR § 257.95(h)(2). Groundwater samples collected from recently installed upgradient monitoring well MW-358, which is screened in the Mississippian-age limestone and shale bedrock strata, contained lithium concentrations ranging from 0.0592 to 0.0957 mg/L. These upgradient concentrations, as well as previously observed results from background well MW-304, are elevated with respect to the health-based GWPS. This observation indicates that lithium is present at concentrations across the Site which suggest that a naturally occurring geogenic source of lithium to groundwater is present in these strata.

AQUIFER SOLIDS EVALUATION

Geosyntec reviewed the results of analyses completed on solid phase samples collected from the Site to support the conclusion that the lithium concentrations in groundwater at MW-370 in excess of the site-specific GWPS are associated with the limestone and shale bedrock formation.

Samples were collected from soil borings advanced in September and October 2022 at one location upgradient of the BAP (MW-358) and three locations downgradient of the BAP (MW-392, MW-393, and MW-394). These boring logs, plus the boring log for monitoring well MW-370, are provided as **Attachment 3**. Additional information regarding monitoring well construction and lithology depths of these locations and MW-370 is provided in **Table 1**. Three samples each were collected from various depth intervals/lithologies at MW-358 and MW-392, and one sample each was collected from the unconsolidated overburden at MW-393 and MW-394[1]. The samples were submitted for analysis of mineralogy via X-ray diffraction (XRD), total lithium, and lithium distribution within the aquifer solids using sequential extraction procedure (SEP). SEP uses progressively stronger reagents to solubilize metals from increasingly recalcitrant phases. Although these procedures do not identify the specific metal phases in a soil/aquifer matrix, they do provide a means to evaluate association of constituents with different classes of solids (Tessier et al, 1979).

Results for total and SEP analyses of lithium in these samples are presented in **Table 2** and the analytical laboratory reports are provided as **Attachment 4**. As a first step to evaluate data quality in an SEP analysis, the sum of individual extraction steps from the SEP was compared to the total lithium concentration. The sum of the SEP procedure is not expected to be exactly equal to the total metals analysis but should generally be consistent with the total metals analysis. As can be seen in **Table 2**, the total lithium concentrations ranged from 6.0 micrograms per gram of material (µg/g) to 20 µg/g in the shale samples. The summed concentrations of lithium from the SEP analyses ranged from 7 to 73 µg/g. The results were generally consistent between the total metals analyses and the summed SEP steps, indicating good metals recovery and data quality. One notable exception is the sample collected from 86-88 feet (ft.) below ground surface (bgs) at upgradient location MW-358, which had a total lithium concentration of 20.0 µg/g and a summed SEP total of 73 µg/g. While a difference was observed, both results indicate lithium is present within shale materials upgradient of the Site.

These results indicate that lithium is present in both upgradient and downgradient shale samples at the Site, with the largest concentrations observed in upgradient samples. Most lithium in these samples was found to be associated with the residual metals fraction, which is typically considered to be immobile and not readily soluble. The abundance of lithium within the residual fraction

[1] Select samples, including those collected from MW-393 and MW-394, are excluded from subsequent results tables and discussion to emphasize findings associated with the bedrock lithologies.

indicates association with inseparable primary mineral phases such as clay minerals (Tessier et al., 1979). Lithium was also found to be associated with iron/manganese oxides in multiple samples (maximum of 25% associated with iron/manganese oxides in the sample collected from the 47-49 ft. bgs samples from MW-358), and a small component of lithium was found to be associated with organic material in the 86-88 ft. bgs sample collected from MW-358. These results indicate that natural lithium occurrence in aquifer material from the Site is associated with multiple phases and therefore interacts with groundwater through different mechanisms at different locations and depths.

Clay minerals are known to be common geosorbents for naturally occurring lithium (Starkey, 1982). Lithium is known to leach from lithium-hosting igneous rocks and micas through weathering processes. Mineral alteration reactions occurring in micas may result in lithium-rich micas transforming directly to illitic clays, and then to mixed-layer and smectite clays. The lithium within these primary minerals either becomes incorporated directly into the crystal structures of these clay minerals or is transported in solution and later concentrated in brines through evaporation (Ronov et al., 1970). Lithium-enriched brines constitute a common source of lithium in clay minerals, as eroded fine-grained materials deposited in these brines are capable of housing aqueous lithium within vacant sites in octahedral layers comprising their crystal structures (Schultz, 1969). SEP results from **Table 2** support the conclusion that naturally occurring lithium is observed in soils around the BAP, and that the majority of this lithium is associated with the residual solids fraction which consists of primary minerals. Field lithologic descriptions of samples indicate that nearly all of the samples collected and analyzed consist of clay or shale, both of which are comprised primarily of mica and clay minerals which are known to be hosts of natural lithium. Based on SEP results and lithologic observations, the data suggests that lithium in BAP soils is naturally occurring and primarily associated with micas and clays, with a smaller component associated with leachable oxides and organic material.

Mineralogical analyses were completed using X-ray diffraction (XRD) to evaluate whole rock mineralogy and evaluate the abundance of clays and micas within the aquifer solids. Whole rock mineralogy results are provided in **Table 3**. Sample mineralogy consists predominantly of quartz, mica (muscovite), feldspars (albite and microcline), and clay minerals (chlorite, kaolinite) (**Table 3**). Of these minerals, muscovite and clays are known hosts of natural lithium within their crystal structures (Zawidzki, 1976; Starkey, 1982). The combined abundances of muscovite or clay minerals account for between 30 to 49% of samples within the bedrock shale samples, with an average value of 43%. As indicated on **Table 3**, these minerals are present at sizeable abundances both upgradient and downgradient of the BAP, indicating that these lithium-host minerals occur in the UA throughout the Site and constitute natural sources of lithium.

MW-370 is screened from 53-63 ft. bgs within an interval of shaley limestone, with additional shale and clay directly overlying this material, as indicated by the boring log included in **Attachment 3**. It is likely that lithium-hosting micas and clay minerals are present within the

screened interval of this monitoring well, the leachable component of which may act as a geogenic source of lithium in groundwater. Additionally, groundwater downgradient of the BAP may be mixing with deeper groundwater in contact with lithium-bearing micas and clay minerals within the deep shale lithologies observed upgradient of the Site due to the observed upward vertical gradient within the bedrock unit.

CONCLUSION

Naturally occurring lithium associated with the shale bedrock comprising the UA at the Site was identified as a source for lithium in Site groundwater. Solid phase samples collected from upgradient and downgradient locations around the BAP contained variable lithium, with the highest total lithium concentration observed in the background deep shale sample. SEP analyses of the solid phase samples determined that the majority of lithium in the solid phase is associated with the residual metals fraction. The residual metals fraction corresponds to primary minerals such as micas and clay minerals, which are known to host natural lithium in their crystal structures, either as a result of mineral formation (micas) or depositional/alteration processes (clays). XRD confirmed the presence of micas and clay minerals in the aquifer solids at an average of 43% of the bedrock total mineralogy, suggesting an abundance of common lithium-hosting minerals which may release lithium to groundwater. This solid phase assessment supports the determination that MW-370 groundwater geochemistry appears to be related to shaley aquifer solid material.

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Willman, H.B., and others. 1967. Geologic Map of Illinois. Illinois State Geologic Survey. Champaign, Illinois.

Zawidzki, Pawel. 1976. Lithium distribution in micas and its bearing on the lithium geochemistry of granitoids. Polska Akademia Nauk, Archiwum Mineralogiczne. v. 32, p. 95-152.

TABLES

Table 1 - Relevant Monitoring Well Information
Baldwin Power Plant

Monitoring Well	Well Classification	Screened Interval	Depth of Well	Geologic Material Within Screened Interval	Interval of Observed Alluvial Clay	Interval of Observed Bedrock
MW-370	Downgradient	53-63	66	Shaley limestone, Limestone	0-28.5	28.5-66
MW-358	Upgradient	80-90	90	Limestone, Shale	4-21	21-90
MW-392	Downgradient	74-84	84	Shale, Limestone	1-33	52-84
MW-393	Downgradient	75-85	85	Shale	1-27, 31-40	57-85
MW-394	Downgradient	73-83	85	Shale, Limestone	3-20, 22-37	37-85

Notes:
Depths provided in units of feet below ground surface
Observed clay and bedrock intervals are based on the boring logs provided in Attachment 3.

Table 2 - Lithium SEP Results Summary
Baldwin Power Plant

Geosyntec Consultants, Inc.

Well ID	MW-358		MW-358		MW-392		MW-392	
Depth (ft)	(47-49)		(86-88)		(66-68)		(80-82)	
Location	Upgradient		Upgradient		Downgradient		Downgradient	
Boring Log Description	Shallow Shale		Deeper Shale Body		Shale		Shale transitioning to limestone	
Total Lithium	6.0		20.0		15.0		8.0	
SEP Results								
	Concentration	% of Total	Concentration	% of Total	Concentration	% of Total	Concentration	% of Total
Water Soluble Fraction	<2	--	<2	--	<2	--	<2	--
Exchangeable Metals Fraction	<2	--	<2	--	<2	--	<2	--
Metals Bound to Carbonates Fraction	<2	--	<2	--	<2	--	<2	--
Metals Bound to Fe/Mn Oxides Fraction	3.0	25%	5.0	7%	2.0	10%	<2	--
Bound to Organic Material Fraction	<2	--	3.0	4%	<2	--	<2	--
Residual Metals Fraction	9.0	75%	65.0	89%	19.0	90%	7.0	100%
SEP Total	12.0	100%	73.0	100%	21.0	100%	7.0	100%

Notes:
SEP - sequential extraction procedure
All results shown in microgram of lithium per gram of soil (µg/g).
Total lithium was analyzed using aqua regia digest, ICP-MS
Non-detect values are shown as less than the detection limit.
The lithium fraction associated with each SEP phase is shown.
% of total lithium is calculated from the sum of the SEP fractions.

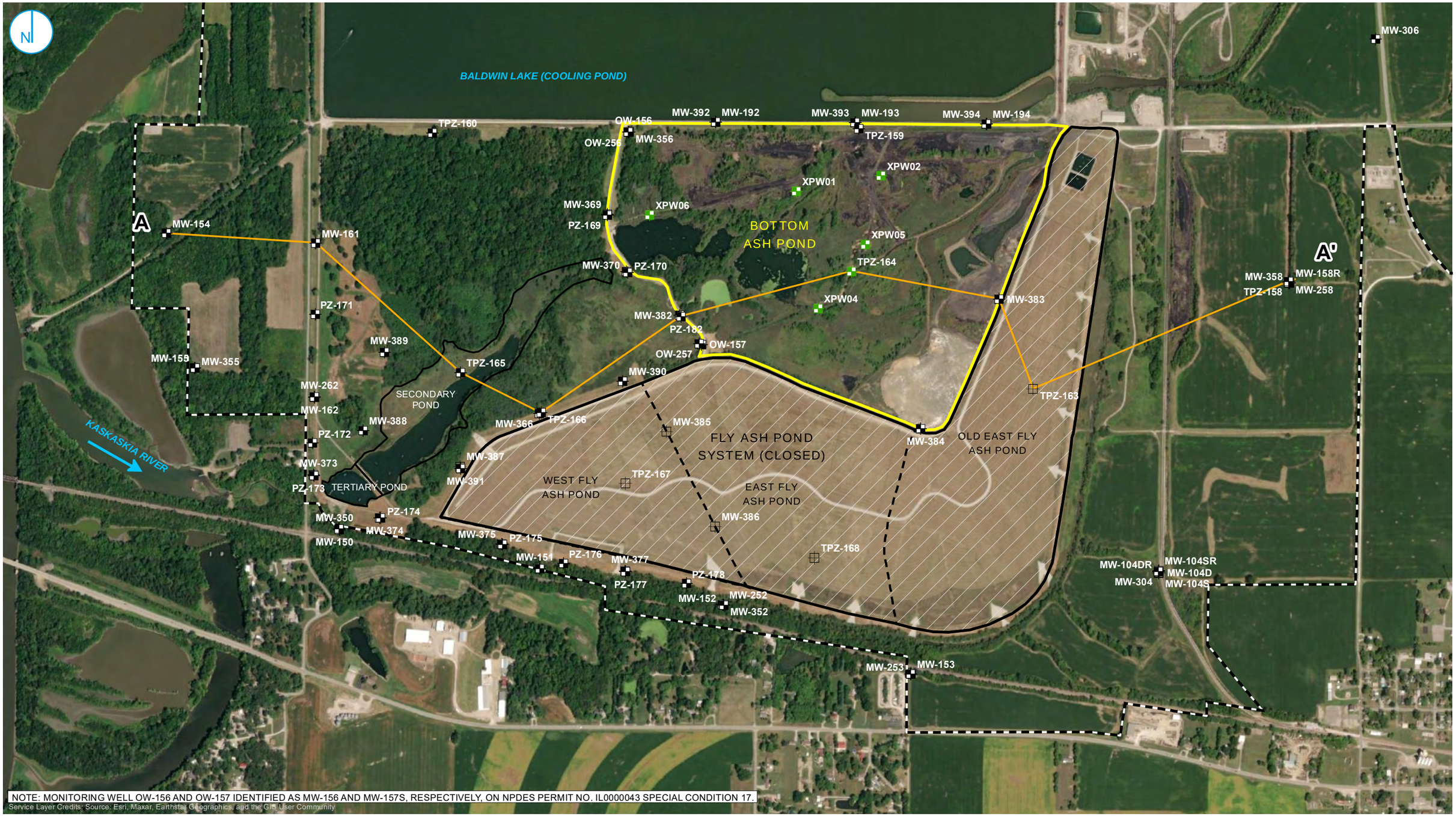
Table 3 - Summary of Rietveld Quantitative Analysis
X-Ray Diffraction Results
Baldwin Power Plant

Well ID			**MW-358**	**MW-358**	**MW-392**	**MW-392**
Depth (ft bgs)			**(47-49)**	**(86-88)**	**(66-68)**	**(80-82)**
Location			**Upgradient**	**Upgradient**	**Downgradient**	**Downgradient**
Boring Log Description			**Shallow Shale**	**Deeper Shale Body**	**Shale**	**Shale transitioning to limestone**
Mineral/Compound	**Formula**	**Mineral Type**	(wt %)	(wt %)	(wt %)	(wt %)
Quartz	SiO_2	Silicate	33.0	34.9	27.2	29.1
Muscovite	$KAl_2(AlSi_3O_{10})(OH)_2$	Mica	37.6	30.5	29.7	14.5
Albite	$NaAlSi_3O_8$	Feldspar	8.2	3.4	4.5	1.0
Microcline	$KAlSi_3O_8$	Feldspar	9.4	8.1	6.9	2.9
Chlorite	$(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$	Clay	-	-	16.3	6.8
Diaspore	aAlO.OH	Oxyhydroxide	-	-	-	-
Pyrite	FeS_2	Sulfide	1.0	0.8	-	1.2
Kaolinite	$Al_2Si_2O_5(OH)_4$	Clay	9.0	18.4	-	8.2
Calcite	$CaCO_3$	Carbonate	1.8	1.7	14.8	31.5
Anatase	TiO_2	Oxide	-	2.1	0.7	0.4
Leucite	$KAlSi_2O_6$	Zeolite	-	-	-	2.4
Siderite	$FeCO_3$	Carbonate	-	-	-	1.9
Dolomite	$CaMg(CO_3)_2$	Carbonate	-	-	-	-
Gypsum	$CaSO_4{\cdot}2H_2O$	Sulfate	-	-	-	-
Diopside	$CaMgSi_2O_6$	Pyroxene	-	-	-	-
Clay Minerals Total			9	18	16	15
Clays + Muscovite Total			47	49	46	30

Notes
Zero values indicate that the mineral was included in the refinement, but the calculated concentration is below a measurable value.
Dashes indicate that the mineral was not identified by the analyst and not included in the refinement calculation for the sample
The weight percent quantities indicated have been normalized to a sum of 100%. The quantity of amorphous material has not been determined.
Sample depths are shown in feet below ground surface (ft bgs).

ATTACHMENT 1

Cross Section Location Map



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CROSS SECTION TRANSECT

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- SITE FEATURE
- LIMITS OF FINAL COVER
- PROPERTY BOUNDARY

CROSS SECTION LOCATION MAP

ALTERNATE SOURCE DEMONSTRATION
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 3

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

ATTACHMENT 2

Cross Section A-A'

NOTES
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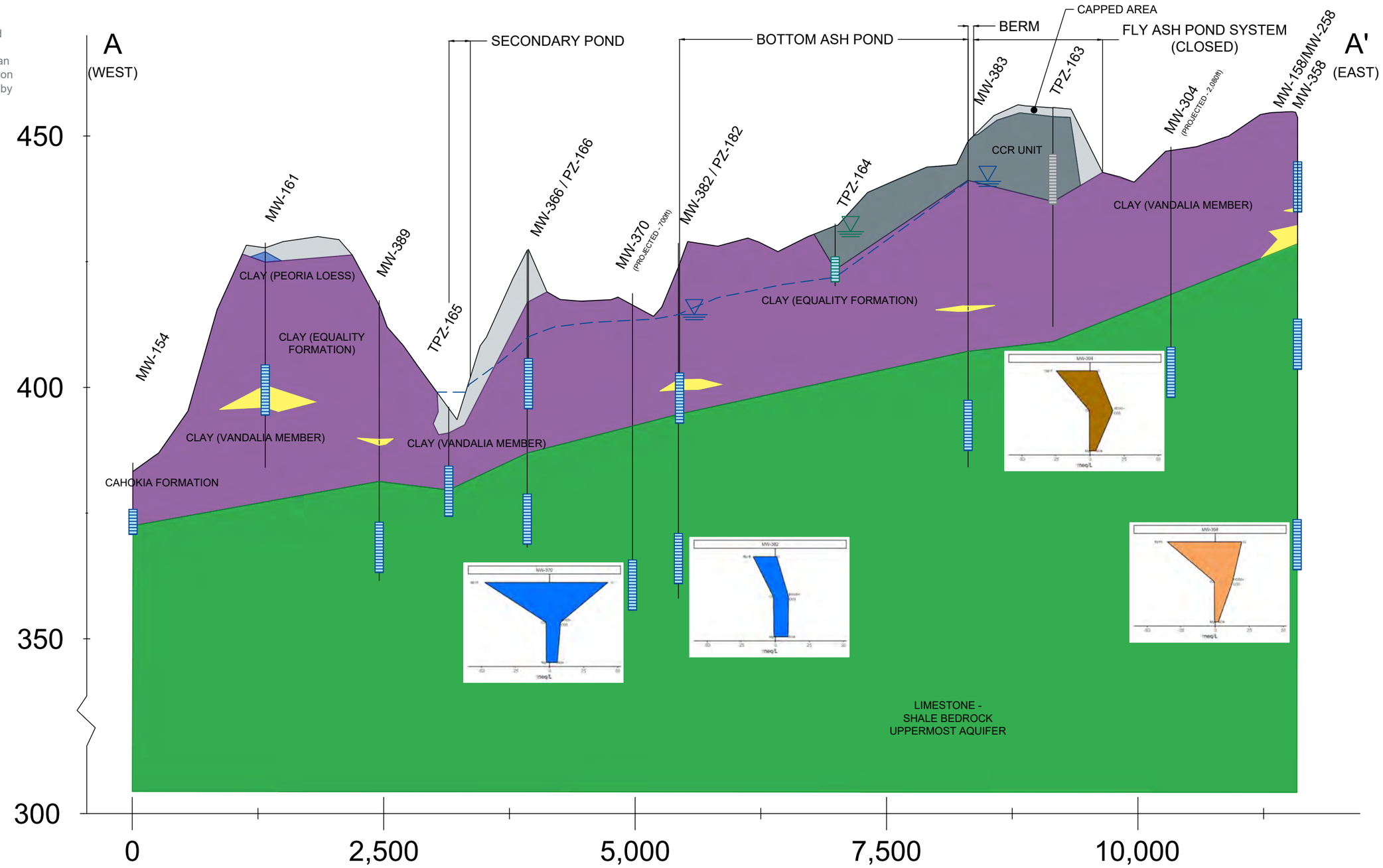

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LEGEND
- COAL COMBUSTION RESIDUALS (CCR)
- FILL
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- WELL SCREEN INTERVAL
- UPPERMOST AQUIFER POTENTIOMETRIC SURFACE
- UPPERMOST AQUIFER GROUNDWATER ELEVATION
- POREWATER ELEVATION
- OTHER GROUNDWATER / SURFACE WATER ELEVATION(S)

20'
0
1,000'

CROSS SECTION A-A'

ALTERNATE SOURCE DEMONSTRATION
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILINNOIS

FIGURE 4

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

C:\Users\Engelhsa\OneDrive - Ramboll\Projects\Vistra\EVS\Baldwin\Working Files\CAD\Baldwin Cross Sections.dwg
PROJECT: 1940100806 DATED: 4/24/2023 2:04 PM DESIGNER: ENGELHSA

ATTACHMENT 3
Boring Logs

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		MW-370

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Mark Baetje Bulldog Drilling	11/20/2015	11/24/2015	4 1/4 HSA and rotary

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-370	Feet (NAVD88)	418.67 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 556,826.50 N, 2,381,936.14 E E/W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 44.1702"

Long -89° 52' 10.8084"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample: Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			1	0 - 2' **SILTY CLAY** CL/ML.	CL/ML								0-28' Blind Drilled. See log PZ-170 for soil description.
			2	2 - 4' Shelby Tube Sample.									
			3										
			4	4 - 8' **SILTY CLAY** CL/ML.									
			5										
			6		CL/ML								
			7										
			8	8 - 10' **SILTY CLAY** to **LEAN CLAY:** CL/ML.									
			9		CL/ML								
			10	10 - 12' **LEAN CLAY:** CL.									
			11		CL								
			12										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Natural Resource Technology
234 W. Florida St., Fifth Floor, Milwaukee, WI 53204
Tel: (414) 837-3607
Fax: (414) 837-3608

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-370

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				12 - 14' Shelby Tube Sample.									
			13										
			14	14 - 24' **SILTY CLAY** CL/ML.									
			15										
			16										
			17										
			18										
			19		CL/ML								
			20										
			21										
			22										
			23										
			24	24 - 26' Shelby Tube Sample.									
			25										
			26	26 - 28' **SILTY CLAY** CL/ML.									
			27		CL/ML								
1 SS	10 10	23 50/4"	28	28 - 28.4' **LEAN CLAY:** CL, yellowish brown (10YR 5/4), trace angular limestone gravel, soft, medium plasticity, moist.	CL								
1 CORE	60 18.5		29	28.4 - 28.9' **SHALE:** BDX (SH), gray, highly decomposed, very weak.	BDX (SH)								Core 1, RQD=51%
			30	28.9 - 38.1' **SHALEY LIMESTONE:** BDX (LS/SH), light gray to gray, intensely fractured (extremely narrow to moderately narrow apertures), medium to thickly bedded, microcrystalline, moderately decomposed, very strong.	BDX (LS/SH)								
			31										
			32										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-370

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			33	28.9 - 38.1' **SHALEY LIMESTONE**: BDX (LS/SH), light gray to gray, intensely fractured (extremely narrow to moderately narrow apertures), medium to thickly bedded, microcrystalline, moderately decomposed, very strong. *(continued)*									
2 CORE	51.5 12		34	33.9' - 38.1' gray, greenish gray in fractures, trace fossils, moderately to highly decomposed, slightly to moderately disintegrated, clay in shoe with a hard, reddish brown inclusion.	BDX (LS/SH)								Core 2, RQD=0%
			35										
			36	36' - 37.9' vertical fracture.									
			37										
			38										
3 CORE	24 25		39	38.1 - 44' **SHALE**: BDX (SH), bluish gray, intensely fractured (extremely narrow to narrow apertures), highly decomposed, weak.									Core 3, RQD=40%
			40										
4 CORE	24 11												Core 4, RQD=0%
5 CORE	36 32		41	40.6' - 40.8 shaley limestone layer, light gray to gray, microcrystalline, moderately decomposed, very strong. 41.1' - 43.2 gray, moderately to highly decomposed.	BDX (SH)								Core 5, RQD=78%
			42										
			43										
			44										
6 CORE	12 28			44 - 45.7' **SHALEY LIMESTONE:** BDX (LS/SH), light gray to gray, intensely fractured (extremely narrow to narrow apertures), thin to medium bedded, microcrystalline, slightly decomposed, clay cement in apertures, very strong.	BDX (LS/SH)								Core 6, RQD=29%
			45										
7 CORE	45 27			45' shale layer, bluish gray, moderately fractured (extremely narrow to narrow apertures), highly decomposed, weak.									Core 7, RQD=65%
			46										
			47	45.7 - 52.2' **SHALE:** BDX (SH), bluish gray, moderately fractured (tight to narrow), highly decomposed, weak.									
			48										
			49		BDX (SH)								
8 CORE	24 30												Core 8, RQD=78%
			50										
			51										
9 CORE	24 24												Core 9, RQD=0%
			52										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-370

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				52' clay cement.									
10 CORE	24 36		53 54 55	52.2 - 61.7' **SHALEY LIMESTONE:** BDX (LS/SH), light gray to gray, intensely fractured (very narrow to narrow), thin to medium bedded, microcrystalline, slightly decomposed, cemented clay in apertures, very strong. 52.7' - 53' clayey sand in aperture. 53' - 53.1 shale bed, bluish gray, fossiliferous, moderately fractured (very narrow to narrow), highly decomposed, weak. 53.1' white to bluish gray, gray in the fractures (extremely narrow to moderately narrow apertures), thinly to medium bedded, slightly to moderately disintegrated.									Core 10, RQD=0%
11 CORE	24 30		56	55.7' moderately disintegrated.									Core 11, RQD=18%
			57		BDX (LS/SH)								
12 CORE	30 27		58 59 60	58.1' highly decomposed.									Core 12, RQD=39%
13 CORE	36 53		61										Core 13, RQD=89%
			62 63 64 65	61.7 - 65.3' **LIMESTONE:** BDX (LS).	BDX (LS)								
				65.3 - 66' Overdrilled for Well Installation.									
			66	66' End of Boring.									Bedrock corehole reamed 6" in diameter to 66' for well installation.

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Power Plant		MW358

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Blake Weller Cascade Drilling	10/5/2022	10/8/2022	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW358	Feet (NAVD88)	453.59 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 556,726.26 N, 2,387,756.63 E E/W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 42.9882"

Long -89° 50' 57.9018"

Local Grid Location ☐ N ☐ S Feet ☐ E ☐ W Feet

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	IL	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	180 97		1 2 3	0 - 3.8' **SILT:** ML, very dark grayish brown (10YR 3/2), organic material (0-10%), moist to wet. 2.1' dry.	ML									CS= Core Sample Measured Rock Quality Designation (RQD) was modified due to drilling methods, modified RQD equals the sum of recovered core sections greater than 4 inches in length divided by total core recovery.
			4 5 6 7 8	3.8 - 8.9' **CLAYEY SILT:** ML/CL, light gray (10YR 7/2), very dark grayish brown (10YR 3/2) and yellowish brown (10YR 5/8) mottling (20-30%), dry.	ML/CL									
			9 10 11 12	8.9 - 13' **SILTY CLAY WITH SAND:** (CL/ML)S, grayish brown (10YR 5/2), strong brown (7.5YR 5/6) and very dark brown (10YR 2/2) mottling (20-30%), organic material (0-10%), low toughness, low to medium plasticity, stiff.	(CL/ML)S									

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Ramboll
234 W Florida Street, 5th Floor, Milwaukee, WI 53204
Tel: (414)837-3607
Fax: (414)837-3608

Boring Number MW358

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
					(CL/ML)S									
			13	13 - 17.8' **SILTY CLAY:** CL/ML, grayish brown (10YR 5/2), strong brown (7.5YR 5/6) and very dark brown (10YR 2/2) mottling (20-30%), low toughness, medium to high plasticity, stiff to very stiff.										
			14											
2 CS	60 60		15		CL/ML									
			16	16.1' mottling discontinues.										
			17											
			18	17.8 - 21' **SILTY CLAY WITH SAND:** (CL/ML)S, brown (10YR 5/3), strong brown (7.5YR 5/6) and gray (10YR 6/1) mottling (20-30%), gravel (5-15%), no dilatancy, high toughness, low to medium plasticity, hard, moist.										
			19		(CL/ML)S									
3 CS	48 36		20											
			21	21 - 26.5' **SHALE:** BDX (SH), dark gray (GLEY 1 4/N), weathered, thin bedding, moderately fractured.										
			22											
			23											
4 CORE	36 32		24	24' -25.2' wet.	BDX (SH)									RUN #4: Modified RQD = (21/32) = 66%
			25											
			26											
5 CORE	36 29		27	26.5 - 27.5' **LIMESTONE:** BDX (LS), dark gray (5Y 4/1), shaley, fossiliferous, very strong.	BDX (LS)									RUN #5: Modified RQD = (0/29) = 0%
			28	27.5 - 31.3' **SHALE:** BDX (SH), grayish black (N2), weathered, highly decomposed to residual soil, wet to moist.										
			29	29.3' thinly bedded, moderately decomposed.	BDX (SH)									
6 CORE	72 60		30	30' slightly decomposed to competent, moderately fractured.										RUN #6: Modified RQD = (45/60) = 75%
			31											
				31.3 - 32' **COAL:** COAL, black (N1).	COAL									
			32											

Boring Number MW358

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				32 - 33' **SHALE:** BDX (SH), grayish black (N2), slightly decomposed to competent, moderately fractured, wet to moist.	BDX (SH)									
			33	33 - 36' **SHALEY LIMESTONE:** BDX (LS/SH), medium gray (N5), weathered, shaley, higly decomposed, slightly fractured.										
			34											
			35		BDX (LS/SH)									
7 CORE	72 71		36	36 - 40.8' **SHALEY LIMESTONE:** to **SHALE:** BDX (LS/SH), interbedded shale.										RUN #7: Modified RQD = (67/71) = 94%
			37											
			38		BDX (LS/SH)									
			39											
			40											
			41	40.8 - 42' **LIMESTONE:** BDX (LS), medium light gray (N6), strong to moderately fractured, slightly decomposed, narrow apertures.	BDX (LS)									
8 CORE	96 85		42	42 - 58.9' **SHALE:** BDX (SH), medium gray (N5) to medium dark gray (N4), weathered, weak, thinly bedded, moderately to highly fractured.										RUN #8: Modified RQD = (81/85) = 94%
			43											
			44											
			45											
			46											
			47		BDX (SH)									
			48	47.5' dark grayish brown (10YR 4/2), pale olive (5Y 6/4) discoloration, more competent.										
			49											
9 CORE	60 60		50	50.2' weak to moderate.										RUN #9: Modified RQD = (52/60) = 87%
			51	50.8' olive gray (5Y 5/2).										
			52											

Boring Number MW358

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				42 - 58.9' **SHALE:** BDX (SH), medium gray (N5) to medium dark gray (N4), weathered, weak, thinly bedded, moderately to highly fractured. *(continued)*										
			53	52.2' dark grayish green (5GY 4/2).										
			54	54.1' medium dark gray (N4) to medium gray (N5), weak, highly decomposed, no visible bedding, dry.										
10 CORE	60 58		55		BDX (SH)									RUN #10: Modified RQD = (42/58) = 72%
			56	55.7' dark grayish green (5GY 4/2).										
			57	57.2' light brownish gray (10YR 6/2), thinly bedded, laminated.										
			58	58.2' medium dark gray (N4), strong, intensely fractured, thinly bedded.										
			59	58.9 - 64' **LIMESTONE:** BDX (LS), medium gray (N5), very strong, moderately fractured, visible laminations.										
11 CORE	36 31		60											RUN #11: Modified RQD = (8/31) = 26%
			61		BDX (LS)									
			62											
12 CORE	36 36		63											RUN #12: Modified RQD = (31/36) = 86%
			64	64 - 75.3' **SHALE:** BDX (SH), medium dark gray (N4) to medium gray (N5), strong, thinly bedded to laminated, moderately fractured.										
			65	64.3' grayish green (5GY 5/2), weathered, weak, decomposed.										
13 CORE	48 48		66											RUN #13: Modified RQD = (43/48) = 90%
			67											
			68		BDX (SH)									
			69	69.3' medium dark gray (N4), weathered, moderate strength.										
14 CORE	60 58		70											RUN# 14: Modified RQD = (57/58) = 99%
			71											
			72											

Boring Number MW358

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			73	64 - 75.3' **SHALE:** BDX (SH), medium dark gray (N4) to medium gray (N5), strong, thinly bedded to laminated, moderately fractured. *(continued)*	BDX (SH)									
			74											
15 CORE	60 56		75											RUN #15: Modified RQD = Not Recorded
			76	75.3 - 77.1' **LIMESTONE:** BDX (LS), gray (5Y 6/1), fossiliferous, very strong.	BDX (LS)									
			77											
			78	77.1 - 78.2' **SHALE:** BDX (SH), medium dark gray (N4), weathered, weak to moderate strength, moderately decomposed.	BDX (SH)									
			79	78.2 - 84.8' **LIMESTONE:** BDX (LS), medium dark gray (N4) to medium gray (N5), shaley, fossiliferous, very strong, moderately fractured, laminations (0-5%).										
16 CORE	60 51		80											RUN #16: Modified RQD = (23/51) = 45%
			81		BDX (LS)									
			82											
			83											
			84											
17 CORE	60 60		85	84.8 - 90' **SHALE:** BDX (SH), dark gray (N3), weathered, weak to moderate strength, moderately decomposed, moderately fractured, thin bedding.										RUN #17: Modified RQD = (28/60) = 47%
			86											
			87		BDX (SH)									
			88											
			89											
			90	90' End of Boring.										

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Power Plant		MW392

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Blake Weller Cascade Drilling	9/9/2022	9/26/2022	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW392	Feet (NAVD88)	434.07 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 558,140.20 N, 2,382,717.92 E E/W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 57.132"

Long -89° 52' 0.9632"

Local Grid Location ☐ N ☐ S Feet ☐ E ☐ W Feet

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	IL	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	120 46		1	0 - 1.2' **FILL, WELL-GRADED GRAVEL WITH CLAY:** GW-GC, pinkish gray (7.5YR 6/2), angular, moist.	(FILL) GW-GC									CS= Core Sample
			2	1.2 - 16' **FILL, LEAN CLAY:** CL, light brown (7.5YR 6/4), sand (0-5%), no dilatancy, low to medium plasticity, moist.										Measured Rock Quality Designation (RQD) was modified due to drilling methods, modified RQD equals the sum of recovered core sections greater than 4 inches in length divided by total core recovery.
			3											
			4											
			5											
			6		(FILL) CL									
			7											
			8											
			9											
2 CS	120 62		10											
			11											
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Ramboll
234 W Florida Street, 5th Floor, Milwaukee, WI 53204
Tel: (414)837-3607
Fax: (414)837-3608

Boring Number MW392

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				1.2 - 16' **FILL, LEAN CLAY:** CL, light brown (7.5YR 6/4), sand (0-5%), no dilatancy, low to medium plasticity, moist. *(continued)*										
			13											
			14		(FILL) CL									
			15											
			16	16 - 20' **LEAN CLAY:** CL, light brown (7.5YR 6/4), sand (0-5%), no dilatancy, low to medium plasticity, moist.										
			17											
			18		CL									
			19											
3 CS	120 33		20	20 - 33' **LEAN CLAY:** CL, pinkish gray (7.5YR 6/2), sand (0-5%), medium to high plasticity, stiff, moist.										
			21											
			22											
			23											
			24											
			25											
			26		CL									
			27											
			28											
			29											
4 CS	120 104		30	30' increasing sand and gravel content.										
			31											
			32											

Boring Number MW392

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				20 - 33' **LEAN CLAY:** CL, pinkish gray (7.5YR 6/2), sand (0-5%), medium to high plasticity, stiff, moist. *(continued)*	CL									
			33	33 - 35' **WELL-GRADED SAND WITH SILT AND GRAVEL:** (SW-SM)g, fine to medium sand, dry.	(SW-SM)g									
			34											
			35	35 - 36.5' **SANDY SILT WITH GRAVEL:** s(ML)g, light yellowish brown (10YR 6/4), dry.	s(ML)g									
			36											
			37	36.5 - 39' **CLAYEY SILT:** ML/CL, gray (7.5YR 5/1), sand (5-10%), coal (0-5%), gravel (0-5%), dry.	ML/CL									
			38											
			39	39 - 40' **SILTY CLAY:** CL/ML, sand (0-5%), low to medium plasticity, stiff.	CL/ML									
5 CS	120 108		40	40 - 48' **SILT WITH SAND:** (ML)s, light brownish gray (10YR 6/2), dry.										
			41											
			42											
			43											
			44	44' increasing clay content.	(ML)s									
			45	45' (2.5Y 6/2).										
			46											
			47											
			48	48 - 52' **SILT:** ML, gray (2.5Y 5/1), sand (0-5%), dry.										
			49											
6 CS	84 81		50		ML									
			51											
			52											

Boring Number MW392

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				52 - 57' **SHALE:** BDX (SH), dark gray (5Y 4/1), highly weathered, hard, dry.										
			53	53' very dark gray (7.5YR 3/1).										
			54											
					BDX (SH)									
			55											
			56											
			57											
7 CORE	60 4			57 - 57.5' **LIMESTONE:** BDX (LS), gray (5Y 6/1), slightly fractured.	BDX (LS)									RUN #7: Modified RQD = 0% (No Solid Recovery > 4")
			58	57.5 - 70' **SHALE:** BDX (SH), dark gray (5Y 4/1), weathered, soft, moderately fractured to highly fractured limestone beds (0-5%).										
			59											
			60											
			61											
			62											
8 CORE	96 78													RUN #8: Modified RQD = (28/78) = 36%
			63											
			64		BDX (SH)									
			65											
			66											
				66.3' - 67.2' highly fractured, very soft, wet.										
			67											
			68											
			69											
			70											
9 CORE	120 62			70 - 74.4' **LIMESTONE:** BDX (LS), gray (5Y 6/1), moderately to intensely fractured, moderately wide apertures.										RUN #9: Modified RQD = (28/78) = 36%
			71		BDX (LS)									
			72											

Boring Number MW392

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				70 - 74.4' **LIMESTONE:** BDX (LS), gray (5Y 6/1), moderately to intensely fractured, moderately wide apertures. *(continued)*	BDX (LS)									
			73											
			74											
				74.4 - 81.8' **SHALE:** BDX (SH), medium dark gray (N4) to dark gray (N3), slightly weathered, moderately fractured, thinly bedded.	BDX (SH)									
			75											
			76											
			77											
			78											
			79											
10 CORE	48 48		80											RUN #10: Modified RQD = (28/48) = 58%
			81											
			82	81.8 - 84' **LIMESTONE:** BDX (LS), medium light gray (N6), shaley, fossiliferous, moderately fractured, thinly bedded.	BDX (LS)									
			83	83.2' medium gray (N5).										
			84	84' End of Boring.										

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Power Plant		MW393

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Blake Weller Cascade Drilling	9/9/2022	10/4/2022	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW393	Feet (NAVD88)	434.59 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 558,133.57 N, 2,383,944.49 E E/W
1/4 of 1/4 of Section , T N, R
Lat 38° 11' 57.027"
Long -89° 51' 45.5976"
Local Grid Location ☐ N ☐ S Feet ☐ E ☐ W Feet

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	IL	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	120 86			0 - 1' **FILL, WELL-GRADED GRAVEL:** GW, pinkish gray (7.5YR 6/2), angular, moist.	(FILL) GW									CS= Core Sample
			1	1 - 20' **FILL, LEAN CLAY:** CL, brown (7.5YR 6/4), sand (0-5%), no dilatancy, low to medium plasticity, moist.										Measured Rock Quality Designation (RQD) was modified due to drilling methods, modified RQD equals the sum of recovered core sections greater than 4 inches in length divided by total core recovery.
			2											
			3											
			4											
			5											
			6		(FILL) CL									
			7											
			8											
			9											
2 CS	120 120		10	10' sand (0-5%), iron concretions (0-5%).										
			11											
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Ramboll
234 W Florida Street, 5th Floor, Milwaukee, WI 53204
Tel: (414)837-3607
Fax: (414)837-3608

Boring Number MW393

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			13	1 - 20' **FILL, LEAN CLAY:** CL, brown (7.5YR 6/4), sand (0-5%), no dilatancy, low to medium plasticity, moist. *(continued)*										
			14											
			15											
			16		(FILL) CL									
			17											
			18	18' medium to high plasticity.										
			19											
3 CS	120 120		20	20 - 24' **LEAN CLAY:** CL, light brown (7.5YR 6/4), mottling, sand (0-5%), medium to high plasticity, cohesive, moist.										
			21											
			22		CL									
			23											
			24	24 - 27' **CLAYEY SAND:** SC, gray (10YR 6/1), fine to medium sand, wet.										
			25											
			26		SC									
			27	27 - 31' **SILT WITH SAND:** (ML)s, dark gray (7.5YR 4/1), sand (0-5%), moist.										
			28											
			29		(ML)s									
4 CS	120 105		30	30' coal fragments (0-5%).										
			31	31 - 40' **SILTY CLAY:** CL/ML, dark gray (7.5Y 4/1), organic material (0-5%), gravel (0-5%), stiff to very stiff, moist.	CL/ML									
			32											

Boring Number MW393

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				31 - 40' **SILTY CLAY:** CL/ML, dark gray (7.5Y 4/1), organic material (0-5%), gravel (0-5%), stiff to very stiff, moist. *(continued)*	CL/ML									
			33											
			34											
			35											
			36											
			37											
			38											
			39											
			40											
5 CS	120 120			40 - 50' **SILT:** ML, grayish brown (2.5Y 5/2), very stiff to hard, platy, dry.	ML									
			41											
			42											
			43											
			44											
			45											
			46											
			47											
			48											
			49											
			50											
6 CS	120 92			50 - 55' **SILT:** ML, dark gray (7.5YR 4/1), sand (0-5%), very stiff to hard, dry.	ML									
			51											
			52											

Boring Number MW393

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				50 - 55' **SILT:** ML, dark gray (7.5YR 4/1), sand (0-5%), very stiff to hard, dry. *(continued)*	ML									
			53											
			54											
			55	55 - 57' **CLAYEY SILT:** ML/CL, gray (10YR 6/1), sand (0-5%), gravel (0-5%), medium plasticity, moist.	ML/CL									
			56											
			57	57 - 60' **LIMESTONE:** BDX (LS), gray (10YR 6/1), rock flour and angular chips (<2").	BDX (LS)									
			58											
			59											
7 CORE	120 60		60	60 - 70' **SHALE:** BDX (SH), medium gray (N5), weathered, very weak, residual soil, soft, slightly fractured.	BDX (SH)									RUN #7: Modified RQD = (31/60) = 52%
			61											
			62											
			63											
			64											
			65											
			66											
			67											
			68											
			69											
8 CORE	42 40		70	70 - 73.5' **LIMESTONE:** BDX (LS), medium dark gray (N4), weathered, shaley, thinly bedded, moderately fractured.	BDX (LS)									RUN #8: Modified RQD = (32/40) = 80%
			71											
			72											

Boring Number MW393

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			73	70 - 73.5' **LIMESTONE:** BDX (LS), medium dark gray (N4), weathered, shaley, thinly bedded, moderately fractured. *(continued)* 72' medium gray (N5).	BDX (LS)									
9 CORE	78 40		74	73.5 - 85' **SHALE:** BDX (SH), medium gray (N5), weathered, moderately to slightly fractured, thinly laminated.										RUN #9: Modified RQD = (30/40) = 75%
			75											
			76											
			77											
			78											
			79		BDX (SH)									
10 CORE	60 45		80											RUN #10: Modified RQD = (34/45) = 76%
			81											
			82											
			83											
			84	83.5' more competent.										
			85	85' End of Boring.										

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Power Plant		MW394

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Blake Weller Cascade Drilling	9/25/2022	10/5/2022	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW394	Feet (NAVD88)	435.51 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 558,123.63 N, 2,385,095.76 E E /W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 56.8911"

Long -89° 51' 31.1756"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	IL	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	72 67		1 2	0 - 2.6' **FILL, WELL-GRADED GRAVEL WITH CLAY:** GW-GC, brown (10YR 4/3), angular, moist.	(FILL) GW-GC									CS= Core Sample
			3 4 5 6 7 8 9 10 11 12	2.6 - 20' **LEAN CLAY:** CL, brown (10YR 5/3), reddish brown bottling (20%), sand (0-5%), low to medium plasticity, very stiff to hard, moist.	CL				4					Measured Rock Quality Designation (RQD) was modified due to drilling methods, modified RQD equals the sum of recovered core sections greater than 4 inches in length divided by total core recovery.
2 CS	120 120								4					
									2.5					
									3.5					
				9.2' brown (7.5YR 5/3), medium to high plasticity.					2					
									2					
									3					
									2.25					

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Ramboll
234 W Florida Street, 5th Floor, Milwaukee, WI 53204
Tel: (414)837-3607
Fax: (414)837-3608

Boring Number MW394

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				2.6 - 20' **LEAN CLAY:** CL, brown (10YR 5/3), reddish brown bottling (20%), sand (0-5%), low to medium plasticity, very stiff to hard, moist. *(continued)*					2.25					
			13											
			14	14' low to medium plasticity.					2.5					
			15											
3 CS	120 120		16		CL									
			17	16.5' increasing sand and gravel content, gray (GLEY 1 5/1) iron concretions (50%).										
			18											
			19											
			20	20 - 22.1' **SILTY SAND:** SM, yellowish brown (10YR 5/6), fine sand, clay (0-5%), moist.	SM									
			21											
			22	22.1 - 36.8' **LEAN CLAY:** CL, dark yellowish brown (10YR 4/4), greenish gray (GLEY 1 5/10Y) and yellowish brown (10YR 5/6) mottling, sand (0-5%), medium to high plasticity, hard, moist.					4.5					
			23											
			24						4.5					
			25											
			26						4.5					
4 CS	120 112								4.5					
			27		CL									
			28						4.5					
			29						4.5					
			30						4.5					
			31						4.5					
			32						4.5					

Boring Number MW394

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			33	22.1 - 36.8' **LEAN CLAY:** CL, dark yellowish brown (10YR 4/4), greenish gray (GLEY 1 5/10Y) and yellowish brown (10YR 5/6) mottling, sand (0-5%), medium to high plasticity, hard, moist. *(continued)*					3.75					
			34						4.25					
				34.4' olive yellow (5Y 6/6), low to medium plasticity.	CL									
			35						4.5					
5 CS	120 113		36											
			37	36.8 - 48' **Weathered SHALE Bedrock:** BDX (SH), pale olive (5Y 6/3), weathered, argillaceous, fissile, moist.										
			38											
			39											
			40	40' olive gray (5Y 5/2).										
			41											
			42		BDX (SH)									
			43											
			44											
			45											
6 CS	96 96		46											
			47											
			48	48 - 58' **LIMESTONE:** to **SHALE:** BDX (LS), olive gray (5Y 4/2), interbedded limestone and shale, fissile.										
			49											
			50	50' - 50.2' limestone, very strong.	BDX (LS)									
			51											
			52											

Boring Number MW394

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				48 - 58' **LIMESTONE:** to **SHALE:** BDX (LS), olive gray (5Y 4/2), interbedded limestone and shale, fissile. *(continued)*										
			53											
7 CS	48 48		54	53.7' - 53.9' limestone, very strong. 54' - 55.6' dark gray (10YR 4/1) to gray (10YR 5/1), more competent.										
			55		BDX (LS)									
			56	55.6' gray (10YR 6/1) to dark gray (10YR 4/1), more competent.										
			57											
			58											
8 CORE	18 14			58 - 59.7' **LIMESTONE:** BDX (LS), medium gray (N5), shaley, laminated, moderately fractured.										RUN #8: Modified RQD = (4/14) = 29%
			59		BDX (LS)									
9 CORE	60 60		60	59.7 - 68' **SHALE:** BDX (SH), medium dark gray (N4), weathered, very weak to weak, thinly bedded, moderately fractured.										RUN #9: Modified RQD = (48/60) = 80%
			61											
			62											
			63											
			64		BDX (SH)									
10 CORE	57 56		65	64.5 - 67.2' highly decomposed, weathered, wet.										RUN #10: Modified RQD = Not Recorded
			66											
			67											
			68											
				68 - 68.4' **LIMESTONE:** BDX (LS), light olive gray (5Y 6/2) to olive gray (5/2).	BDX (LS)									
			69	68.4 - 70.8' **SHALE:** BDX (SH), medium dark gray (N4), weathered, very weak to weak, thinly bedded, moderately fractured.										
11 CORE	68 68		70		BDX (SH)									RUN #11: Modified RQD = (42/68) = 62%
			71	70.8 - 71' **LIMESTONE:** BDX (LS), dark gray (N3), shaley.	BDX (LS)									
				71 - 77.6' **SHALE:** BDX (SH), dark gray (N3),										
			72											

Boring Number MW394

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				strong, thinly bedded, moderately fractured. 71 - 77.6' **SHALE:** BDX (SH), dark gray (N3), strong, thinly bedded, moderately fractured. *(continued)*										
			73											
			74											
12 CORE	60 59		75		BDX (SH)									RUN #12: Modified RQD = (44/59) = 75%
			76											
			77											
			78	77.6 - 80' **LIMESTONE:** BDX (LS), medium gray (N5), shaley, weak, moderately fractured.	BDX (LS)									
			79											
13 CORE	60 48		80	80 - 85' **SHALE:** BDX (SH), medium dark gray (N4), weathered, weak, thinly bedded, moderately fractured, moist to wet.										RUN #13: Modified RQD = (40/48) = 83%
			81											
			82		BDX (SH)									
			83											
			84											
			85	85' End of Boring.										

ATTACHMENT 4
Analytical Laboratory Reports

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

28-February-2023

Ramboll Americas Engineering Solutions, Inc.
Attn : Evvan Plank

P.O# Box 4873
Syrascuse, New York
13221-7873, USA

Phone: 315-463-7554
Fax:

Date Rec. : 24 November 2022
LR Report: **CA19218-NOV22**
Reference: Baldwin Power Plant Drilling

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MW-358 (13-15)	6: MW-358 (47-49)	7: MW-358 (86-88)	8: MW-392 (80-82)
Sample Date & Time					05-Oct-22 14:05	06-Oct-22 15:00	08-Oct-22 18:00	26-Sep-22 16:00
Ag [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.05	< 0.05	< 0.05	< 0.05
Al [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	30	540	380	18
As [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.5	< 0.5	< 0.5	< 0.5
Ba [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	0.4	11	4.2	< 0.1
Be [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.02	0.06	0.05	< 0.02
B [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 1	8	10	3
Bi [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	21	300	140	75
Cd [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.05	< 0.05	< 0.05	< 0.05
Co [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.01	0.04	0.86	0.02
Cr [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.5	< 0.5	< 0.5	< 0.5
Cu [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.1	< 0.1	0.1	< 0.1
Fe [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	17	240	190	< 1
K [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	7	250	190	41
Li [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 2	< 2	< 2	< 2
Mg [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	9	210	150	19
Mn [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.5	0.6	0.9	< 0.5
Mo [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.1	< 0.1	< 0.1	< 0.1
Na [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	65	1800	1600	850
Ni [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.5	< 0.5	1.2	< 0.5
P [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 3	6	< 3	< 3
Pb [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.1	< 0.1	0.2	< 0.1
Si [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	100	950	750	59
Sb [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.7	< 0.7	< 0.7	< 0.7
Sr [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	0.1	13	5.9	1.4
Sn [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.5	< 0.5	< 0.5	< 0.5
Ti [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	1.1	0.6	0.5	0.6
Tl [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.002	0.006	0.029	< 0.002
V [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 3	< 3	< 3	< 3
Zn [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.7	< 0.7	< 0.7	< 0.7

OnLine LIMS

0003245943

Results relate only to the sample tested. Data reported represents the sample submitted to SGS. Reproduction of this analytical report in full or in part is prohibited without prior written approval. Please refer to SGS General Conditions of Services located at https://www.sgs.ca/en/terms-and-conditions (Printed copies are available upon request.)
Test method information available upon request. “Temperature Upon Receipt” is representative of the whole shipment and may not reflect the temperature of individual samples.
SGS Canada Inc. Environment-Health & Safety statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA19218-NOV22**

Analysis	9: MW-392 (32-33.5)	10: MW-393 (24-25.5)	11: MW-394 (20.5-22)	12: MW-392 (66-68)
Sample Date & Time	27-Sep-22 09:00	04-Oct-22 16:00	25-Sep-22 16:00	26-Sep-22 12:00
Ag [µg/g]	< 0.05	< 0.05	< 0.05	< 0.05
Al [µg/g]	33	26	24	59
As [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
Ba [µg/g]	0.5	0.3	0.3	0.3
Be [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02
B [µg/g]	< 1	< 1	< 1	5
Bi [µg/g]	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	130	28	25	89
Cd [µg/g]	< 0.05	< 0.05	< 0.05	< 0.05
Co [µg/g]	0.02	< 0.01	0.01	0.02
Cr [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
Cu [µg/g]	< 0.1	< 0.1	< 0.1	< 0.1
Fe [µg/g]	27	14	20	28
K [µg/g]	16	9	12	92
Li [µg/g]	< 2	< 2	< 2	< 2
Mg [µg/g]	40	12	12	44
Mn [µg/g]	1.4	0.7	0.6	< 0.5
Mo [µg/g]	< 0.1	< 0.1	< 0.1	< 0.1
Na [µg/g]	44	49	43	720
Ni [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
P [µg/g]	< 3	< 3	< 3	< 3
Pb [µg/g]	< 0.1	< 0.1	< 0.1	< 0.1
Si [µg/g]	100	80	91	140
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7
Sr [µg/g]	0.3	< 0.1	< 0.1	1.8
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
Ti [µg/g]	0.6	0.6	0.9	0.5
Tl [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	< 0.002	< 0.002	< 0.002	< 0.002
V [µg/g]	< 3	< 3	< 3	< 3
Zn [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7

Water Soluble Fraction

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0003245943

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Tessier Leach Fraction 2 - Exchangeable Metals

28-February-2023

Ramboll Americas Engineering Solutions, Inc.
Attn : Evvan Plank

P.O# Box 4873
Syrascuse, New York
13221-7873, USA

Phone: 315-463-7554
Fax:

Date Rec. : 24 November 2022
LR Report: **CA19219-NOV22**
Reference: Baldwin Power Plant Drilling

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MW-358 (13-15)	6: MW-358 (47-49)	7: MW-358 (86-88)	8: MW-392 (80-82)
Sample Date & Time					05-Oct-22 14:05	06-Oct-22 15:00	08-Oct-22 18:00	26-Sep-22 16:00
Ag [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.05	< 0.05	< 0.05	< 0.05
Al [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	9	17	8	9
As [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.5	< 0.5	< 0.5	< 0.5
Ba [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	48	55	15	3.0
Be [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.02	< 0.02	< 0.02	< 0.02
B [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 1	< 1	1	< 1
Bi [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	2000	2500	1300	3500
Cd [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.05	< 0.05	< 0.05	< 0.05
Co [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.01	< 0.01	0.58	0.24
Cr [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.5	< 0.5	< 0.5	< 0.5
Cu [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.1	< 0.1	< 0.1	< 0.1
Fe [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	2	21	< 1	12
K [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	37	430	300	160
Li [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 2	< 2	< 2	< 2
Mn [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	6.5	0.7	1.8	3.6
Mo [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	< 0.1	< 0.1	< 0.1	< 0.1
Na [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	45	3200	2600	420
Ni [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	< 0.5	< 0.5	< 0.5	0.7
Pb [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	< 0.1	< 0.1	< 0.1	< 0.1
P [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	< 3	4	< 3	43
Sb [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	11	100	52	76
Ti [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	0.9	0.3	0.2	0.1
Tl [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	< 0.002	0.009	0.006	0.043
V [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	< 3	< 3	< 3	< 3
Zn [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	< 0.7	< 0.7	< 0.7	< 0.7

OnLine LIMS

0002345960

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : CA19219-NOV22

Analysis	9: MW-392 (32-33.5)	10: MW-393 (24-25.5)	11: MW-394 (20.5-22)	12: MW-392 (66-68)
Sample Date & Time	27-Sep-22 09:00	04-Oct-22 16:00	25-Sep-22 16:00	26-Sep-22 12:00
Ag [µg/g]	< 0.05	< 0.05	< 0.05	< 0.05
Al [µg/g]	10	12	12	10
As [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
Ba [µg/g]	16	16	10	4.3
Be [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02
B [µg/g]	< 1	< 1	< 1	2
Bi [µg/g]	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	2500	1400	2100	3700
Cd [µg/g]	< 0.05	< 0.05	< 0.05	< 0.05
Co [µg/g]	0.02	< 0.01	< 0.01	0.02
Cr [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
Cu [µg/g]	< 0.1	< 0.1	< 0.1	< 0.1
Fe [µg/g]	8	9	8	10
K [µg/g]	44	35	60	360
Li [µg/g]	< 2	< 2	< 2	< 2
Mn [µg/g]	3.5	1.7	3.2	2.5
Mo [µg/g]	< 0.1	< 0.1	< 0.1	< 0.1
Na [µg/g]	17	22	30	480
Ni [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
Pb [µg/g]	< 0.1	< 0.1	< 0.1	< 0.1
P [µg/g]	< 3	< 3	4	< 3
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	6.5	4.3	7.4	75
Ti [µg/g]	0.1	0.6	0.3	< 0.1
Tl [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	< 0.002	< 0.002	< 0.002	0.004
V [µg/g]	< 3	< 3	< 3	< 3
Zn [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7

Fraction 2 Exchangeable Metals

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0003245960

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
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Tessier Leach Fraction 3 - Metals Bound to Carbonates

28-February-2023

Ramboll Americas Engineering Solutions, Inc.
Attn : Evvan Plank

P.O# Box 4873
Syrascuse, New York
13221-7873, USA

Phone: 315-463-7554
Fax:

Date Rec. : 24 November 2022
LR Report: **CA19220-NOV22**
Reference: Ramboll Power Plant Drilling

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MW-358 (13-15)	6: MW-358 (47-49)	7: MW-358 (86-88)	8: MW-392 (80-82)
Sample Date & Time					05-Oct-22 14:05	06-Oct-22 15:00	08-Oct-22 18:00	26-Sep-22 16:00
Ag [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	< 0.05	< 0.05	< 0.05	< 0.05
Al [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	30	55	56	25
As [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	< 0.5	< 0.5	< 0.5	< 0.5
Ba [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	25	23	6.9	2.8
Be [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	0.09	0.10	0.07	0.03
B [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	< 1	2	3	4
Bi [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	110	1300	770	52000
Cd [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	< 0.05	< 0.05	< 0.05	< 0.05
Co [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	0.04	0.02	2.3	1.0
Cr [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	< 0.5	< 0.5	< 0.5	< 0.5
Cu [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	0.6	0.2	0.6	0.2
Fe [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	40	45	42	25
K [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	15	180	120	90
Li [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	< 2	< 2	< 2	< 2
Mn [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	13	7.0	4.3	77
Mo [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	< 0.1	< 0.1	< 0.1	< 0.1
Ni [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	< 0.5	< 0.5	1.9	2.7
Pb [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	0.2	0.1	0.9	1.9
P [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	< 3	13	< 3	100
Sb [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	< 0.7	< 0.7	< 0.7	< 0.7
Si [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	96	160	150	33
Sn [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	0.5	10	7.3	99
Ti [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	0.8	0.6	0.5	1.0
Tl [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	0.19	0.094	0.13	0.31
V [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	< 3	< 3	< 3	< 3
Zn [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	< 0.7	< 0.7	< 0.7	3.7

OnLine LIMS

0003245975

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA19220-NOV22**

Analysis	9: MW-392 (32-33.5)	10: MW-393 (24-25.5)	11: MW-394 (20.5-22)	12: MW-392 (66-68)
Sample Date & Time	27-Sep-22 09:00	04-Oct-22 16:00	25-Sep-22 16:00	26-Sep-22 12:00
Ag [µg/g]	< 0.05	< 0.05	< 0.05	< 0.05
Al [µg/g]	30	28	23	28
As [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
Ba [µg/g]	19	15	12	5.0
Be [µg/g]	0.06	0.04	0.04	0.07
B [µg/g]	< 1	< 1	< 1	3
Bi [µg/g]	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	1500	56	140	35000
Cd [µg/g]	< 0.05	< 0.05	< 0.05	< 0.05
Co [µg/g]	0.05	0.02	0.03	0.27
Cr [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
Cu [µg/g]	0.8	0.2	0.2	0.6
Fe [µg/g]	9	14	10	300
K [µg/g]	16	10	15	130
Li [µg/g]	< 2	< 2	< 2	< 2
Mn [µg/g]	20	4.4	7.0	144
Mo [µg/g]	< 0.1	< 0.1	< 0.1	< 0.1
Ni [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
Pb [µg/g]	0.2	0.1	0.1	0.4
P [µg/g]	< 3	< 3	4	< 3
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7
Si [µg/g]	130	90	99	96
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	1.5	0.3	0.8	59
Ti [µg/g]	0.1	1.9	0.6	< 0.1
Tl [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	0.12	0.14	0.17	0.100
V [µg/g]	< 3	< 3	< 3	< 3
Zn [µg/g]	< 0.7	< 0.7	< 0.7	1.0

Fraction 3 Metals Bound to Carbonates

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0003245975

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Tessier Leach Fraction 4 - Metals Bound to Fe and Mn Oxides

28-February-2023

Ramboll Americas Engineering Solutions, Inc.
Attn : Evvan Plank

P.O# Box 4873
Syrascuse, New York
13221-7873, USA

Phone: 315-463-7554
Fax:

Date Rec. : 24 November 2022
LR Report: **CA19221-NOV22**
Reference: Baldwin Power Plant Drilling

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Completed Date	4: Analysis Completed Time	5: MW-358 (13-15)	6: MW-358 (47-49)	7: MW-358 (86-88)	8: MW-392 (80-82)	9: MW-392 (32-33.5)
Sample Date & Time			05-Oct-22 14:05	06-Oct-22 15:00	08-Oct-22 18:00	26-Sep-22 16:00	27-Sep-22 09:00
Ag [µg/g]	31-Jan-23	09:47	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Al [µg/g]	31-Jan-23	09:47	290	310	340	220	220
As [µg/g]	31-Jan-23	09:47	< 0.5	< 0.5	< 0.5	1.3	< 0.5
Ba [µg/g]	31-Jan-23	09:47	16	6.4	1.6	4.1	56
Be [µg/g]	31-Jan-23	09:47	0.26	0.16	0.15	0.15	0.21
B [µg/g]	31-Jan-23	09:47	< 1	5	6	6	< 1
Bi [µg/g]	31-Jan-23	09:47	< 0.09	< 0.09	< 0.09	0.14	< 0.09
Ca [µg/g]	31-Jan-23	09:47	71	320	250	130000	2300
Cd [µg/g]	31-Jan-23	09:47	< 0.05	< 0.05	< 0.05	0.13	0.18
Co [µg/g]	31-Jan-23	09:47	3.8	0.33	3.0	2.3	5.1
Cr [µg/g]	31-Jan-23	09:47	2.3	1.2	1.3	1.0	0.9
Cu [µg/g]	31-Jan-23	09:47	1.6	0.4	0.7	0.1	2.9
Fe [µg/g]	31-Jan-23	09:47	1600	1600	1200	1800	1100
K [µg/g]	31-Jan-23	09:47	16	140	110	43	19
Li [µg/g]	31-Jan-23	09:47	< 2	3	5	< 2	< 2
Mn [µg/g]	31-Jan-23	09:47	240	3.1	2.9	190	500
Mo [µg/g]	31-Jan-23	09:47	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Ni [µg/g]	31-Jan-23	09:47	3.1	2.7	4.5	6.5	3.1
Pb [µg/g]	31-Jan-23	09:47	3.3	0.2	1.2	8.4	3.7
P [µg/g]	31-Jan-23	09:47	19	110	77	400	31
Sb [µg/g]	31-Jan-23	09:47	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	31-Jan-23	09:47	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Si [µg/g]	31-Jan-23	09:47	920	910	710	270	600
Sn [µg/g]	31-Jan-23	09:47	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	31-Jan-23	09:47	0.4	3.1	2.8	237	1.7
Ti [µg/g]	31-Jan-23	09:47	0.4	0.1	0.3	< 0.1	< 0.1
Tl [µg/g]	31-Jan-23	09:47	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	31-Jan-23	09:47	0.26	0.068	0.17	0.62	0.15
V [µg/g]	31-Jan-23	09:47	5	< 3	< 3	< 3	3
Zn [µg/g]	31-Jan-23	09:47	2.9	1.9	1.9	13	3.8

OnLine LIMS

0003245982

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA19221-NOV22**

Analysis	10: MW-393 (24-25.5)	11: MW-394 (20.5-22)	12: MW-392 (66-68)
Sample Date & Time	04-Oct-22 16:00	25-Sep-22 16:00	26-Sep-22 12:00
Ag [µg/g]	< 0.01	0.02	< 0.01
Al [µg/g]	290	270	490
As [µg/g]	< 0.5	< 0.5	< 0.5
Ba [µg/g]	45	35	1.5
Be [µg/g]	0.16	0.18	0.18
B [µg/g]	< 1	< 1	4
Bi [µg/g]	< 0.09	< 0.09	0.14
Ca [µg/g]	100	350	7600
Cd [µg/g]	0.06	0.14	< 0.05
Co [µg/g]	4.3	3.5	0.62
Cr [µg/g]	1.2	1.2	2.0
Cu [µg/g]	1.5	2.0	0.9
Fe [µg/g]	1500	1200	2700
K [µg/g]	15	22	120
Li [µg/g]	< 2	< 2	2
Mn [µg/g]	380	260	63
Mo [µg/g]	< 0.1	< 0.1	< 0.1
Ni [µg/g]	3.2	3.7	2.5
Pb [µg/g]	3.5	2.1	0.9
P [µg/g]	17	91	110
Sb [µg/g]	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7
Si [µg/g]	660	850	650
Sn [µg/g]	< 0.5	< 0.5	< 0.5
Sr [µg/g]	0.5	1.3	26
Ti [µg/g]	0.3	0.2	0.2
Tl [µg/g]	< 0.02	< 0.02	< 0.02
U [µg/g]	0.12	0.18	0.082
V [µg/g]	< 3	5	< 3
Zn [µg/g]	4.3	7.8	2.8

Fraction 4 Metals Bound to Fe and Mn Oxides

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

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P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Tessier Leach Fraction 5 - Bound to Organic Material

28-February-2023

Ramboll Americas Engineering Solutions, Inc.
Attn : Evvan Plank

P.O# Box 4873
Syrascuse, New York
13221-7873, USA

Phone: 315-463-7554
Fax:

Date Rec. : 24 November 2022
LR Report: **CA19222-NOV22**
Reference: Baldwin Power plant Drilling

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Completed Date	4: Analysis Completed Time	5: MW-358 (13-15)	6: MW-358 (47-49)	7: MW-358 (86-88)	8: MW-392 (80-82)	9: MW-392 (32-33.5)
Sample Date & Time			05-Oct-22 14:05	06-Oct-22 15:00	08-Oct-22 18:00	26-Sep-22 16:00	27-Sep-22 09:00
Ag [µg/g]	31-Jan-23	09:48	0.14	0.15	0.08	0.07	0.06
Al [µg/g]	31-Jan-23	09:48	980	1300	1100	130	610
As [µg/g]	31-Jan-23	09:48	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ba [µg/g]	31-Jan-23	09:48	15	11	1.8	3.6	36
Be [µg/g]	31-Jan-23	09:48	0.13	0.32	0.16	0.07	0.12
B [µg/g]	31-Jan-23	09:48	< 1	2	2	2	< 1
Bi [µg/g]	31-Jan-23	09:48	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	31-Jan-23	09:48	160	490	220	8600	840
Cd [µg/g]	31-Jan-23	09:48	< 0.05	< 0.05	< 0.05	0.20	< 0.05
Co [µg/g]	31-Jan-23	09:48	1.4	0.45	9.7	3.3	1.3
Cr [µg/g]	31-Jan-23	09:48	2.1	1.0	1.2	< 0.5	1.6
Cu [µg/g]	31-Jan-23	09:48	0.5	1.0	1.8	1.9	0.4
Fe [µg/g]	31-Jan-23	09:48	150	610	1800	220	83
K [µg/g]	31-Jan-23	09:48	15	104	79	25	15
Li [µg/g]	31-Jan-23	09:48	< 2	< 2	3	< 2	< 2
Mg [µg/g]	31-Jan-23	09:48	170	1100	870	200	500
Mn [µg/g]	31-Jan-23	09:48	85	3.6	15	16	92
Mo [µg/g]	31-Jan-23	09:48	< 0.1	< 0.1	< 0.1	0.2	0.4
Na [µg/g]	31-Jan-23	09:48	110	180	150	90	75
Ni [µg/g]	31-Jan-23	09:48	1.9	4.3	13	15	2.1
Pb [µg/g]	31-Jan-23	09:48	1.6	0.1	1.6	3.8	1.3
P [µg/g]	31-Jan-23	09:48	< 3	< 3	< 3	290	5
Sb [µg/g]	31-Jan-23	09:48	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	31-Jan-23	09:48	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Si [µg/g]	31-Jan-23	09:48	590	480	420	130	530
Sn [µg/g]	31-Jan-23	09:48	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	31-Jan-23	09:48	0.5	5.1	2.8	48	0.9
Ti [µg/g]	31-Jan-23	09:48	0.7	< 0.1	< 0.1	< 0.1	2.9
Tl [µg/g]	31-Jan-23	09:48	< 0.02	< 0.02	0.02	0.05	< 0.02
U [µg/g]	31-Jan-23	09:48	0.17	0.13	0.19	0.25	0.060
V [µg/g]	31-Jan-23	09:48	< 3	< 3	< 3	< 3	3
Zn [µg/g]	31-Jan-23	09:48	1.4	< 0.7	1.8	41	1.7

OnLine LIMS

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LR Report : **CA19222-NOV22**

Analysis	10: MW-393 (24-25.5)	11: MW-394 (20.5-22)	12: MW-392 (66-68)
Sample Date & Time	04-Oct-22 16:00	25-Sep-22 16:00	26-Sep-22 12:00
Ag [µg/g]	< 0.05	< 0.05	< 0.05
Al [µg/g]	660	870	820
As [µg/g]	< 0.5	< 0.5	< 0.5
Ba [µg/g]	33	45	1.5
Be [µg/g]	0.08	0.15	0.18
B [µg/g]	< 1	< 1	2
Bi [µg/g]	< 0.09	< 0.09	< 0.09
Ca [µg/g]	88	300	2400
Cd [µg/g]	< 0.05	< 0.05	< 0.05
Co [µg/g]	1.2	2.3	0.68
Cr [µg/g]	1.2	1.5	1.1
Cu [µg/g]	0.3	0.8	1.4
Fe [µg/g]	93	120	680
K [µg/g]	14	21	70
Li [µg/g]	< 2	< 2	< 2
Mg [µg/g]	150	280	730
Mn [µg/g]	100	164	15
Mo [µg/g]	0.1	0.3	< 0.1
Na [µg/g]	48	170	95
Ni [µg/g]	1.6	3.5	2.9
Pb [µg/g]	1.7	1.3	0.9
P [µg/g]	4	8	< 3
Sb [µg/g]	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7
Si [µg/g]	470	650	470
Sn [µg/g]	< 0.5	< 0.5	< 0.5
Sr [µg/g]	0.3	1.2	9.8
Ti [µg/g]	2.1	2.5	< 0.1
Tl [µg/g]	< 0.02	< 0.02	< 0.02
U [µg/g]	0.065	0.16	0.080
V [µg/g]	< 3	4	< 3
Zn [µg/g]	1.6	4.0	0.9

Fraction 5 Bound to Organic Material

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

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28-February-2023

Ramboll Americas Engineering Solutions, Inc.
Attn : Evvan Plank

P.O# Box 4873
Syrascuse, New York
13221-7873, USA

Phone: 315-463-7554
Fax:

Date Rec. : 24 November 2022
LR Report: **CA19223-NOV22**
Reference: Baldwin Power Plant Drilling

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Completed Date	4: Analysis Completed Time	5: MW-358 (13-15)	6: MW-358 (47-49)	7: MW-358 (86-88)	8: MW-392 (80-82)	9: MW-392 (32-33.5)
Sample Date & Time			05-Oct-22 14:05	06-Oct-22 15:00	08-Oct-22 18:00	26-Sep-22 16:00	27-Sep-22 09:00
Ag [µg/g]	31-Jan-23	09:48	0.09	< 0.05	< 0.05	< 0.05	0.07
Al [µg/g]	31-Jan-23	09:48	44000	63000	71000	27000	45000
As [µg/g]	31-Jan-23	09:48	5.8	2.3	9.8	10	8.6
Ba [µg/g]	31-Jan-23	09:48	390	150	140	56	320
Be [µg/g]	31-Jan-23	09:48	0.65	1.4	1.5	0.68	0.87
B [µg/g]	31-Jan-23	09:48	13	60	62	26	21
Bi [µg/g]	31-Jan-23	09:48	0.25	0.26	0.18	0.14	0.25
Ca [µg/g]	31-Jan-23	09:48	2500	150	120	20000	1400
Cd [µg/g]	31-Jan-23	09:48	0.06	< 0.05	< 0.05	0.11	0.08
Co [µg/g]	31-Jan-23	09:48	3.3	7.2	6.4	2.0	6.4
Cr [µg/g]	31-Jan-23	09:48	34	69	75	37	40
Cu [µg/g]	31-Jan-23	09:48	10	9.9	5.7	7.2	15
Fe [µg/g]	31-Jan-23	09:48	22000	42000	22000	14000	28000
K [µg/g]	31-Jan-23	09:48	11000	18000	16000	5100	13000
Li [µg/g]	31-Jan-23	09:48	18	9	65	7	20
Mg [µg/g]	31-Jan-23	09:48	2700	7800	7600	4100	3300
Mn [µg/g]	31-Jan-23	09:48	110	70	51	50	130
Mo [µg/g]	31-Jan-23	09:48	0.9	0.3	0.1	0.1	0.9
Na [µg/g]	31-Jan-23	09:48	6700	560	830	550	5200
Ni [µg/g]	31-Jan-23	09:48	14	32	29	13	21
Pb [µg/g]	31-Jan-23	09:48	10	8.0	7.0	17	12
P [µg/g]	31-Jan-23	09:48	260	240	160	7200	300
Sb [µg/g]	31-Jan-23	09:48	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	31-Jan-23	09:48	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Si [µg/g]	31-Jan-23	09:48	160000	66000	51000	73000	65000
Sn [µg/g]	31-Jan-23	09:48	5.4	5.8	5.8	4.9	5.2
Sr [µg/g]	31-Jan-23	09:48	89	30	25	130	79
Ti [µg/g]	31-Jan-23	09:48	2400	670	570	520	980
Tl [µg/g]	31-Jan-23	09:48	0.47	0.42	0.42	0.17	0.51
U [µg/g]	31-Jan-23	09:48	1.3	0.30	0.99	2.7	1.1
V [µg/g]	31-Jan-23	09:48	54	73	86	95	57
Zn [µg/g]	31-Jan-23	09:48	37	47	32	43	53

OnLine LIMS

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Lakefield - Ontario - KOL 2HO
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LR Report : **CA19223-NOV22**

Analysis	10: MW-393 (24-25.5)	11: MW-394 (20.5-22)	12: MW-392 (66-68)
Sample Date & Time	04-Oct-22 16:00	25-Sep-22 16:00	26-Sep-22 12:00
Ag [µg/g]	< 0.05	< 0.05	< 0.05
Al [µg/g]	33000	45000	59000
As [µg/g]	10	9.8	0.9
Ba [µg/g]	300	410	93
Be [µg/g]	0.56	0.83	1.2
B [µg/g]	15	16	53
Bi [µg/g]	0.18	0.27	0.20
Ca [µg/g]	1700	3000	170
Cd [µg/g]	< 0.05	0.11	< 0.05
Co [µg/g]	3.2	5.0	6.4
Cr [µg/g]	24	35	71
Cu [µg/g]	9.9	13	12
Fe [µg/g]	19000	27000	43000
K [µg/g]	12000	14000	17000
Li [µg/g]	13	16	19
Mg [µg/g]	2200	3400	9500
Mn [µg/g]	80	140	47
Mo [µg/g]	0.7	2.7	0.2
Na [µg/g]	5100	7700	490
Ni [µg/g]	13	18	31
Pb [µg/g]	9.1	13	4.1
P [µg/g]	230	460	170
Sb [µg/g]	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7
Si [µg/g]	61000	43000	62000
Sn [µg/g]	4.6	5.2	5.6
Sr [µg/g]	70	110	22
Ti [µg/g]	780	1100	560
Tl [µg/g]	0.35	0.50	0.36
U [µg/g]	0.61	1.1	0.097
V [µg/g]	35	57	70
Zn [µg/g]	37	54	48

Fraction 6 Residual metals

Catharine Arnold

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Project Specialist,
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OnLine LIMS

0003246014

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28-February-2023

Ramboll Americas Engineering Solutions, Inc.
Attn : Evvan Plank

P.O# Box 4873
Syrascuse, New York
13221-7873, USA

Phone: 315-463-7554
Fax:

Date Rec. : 24 November 2022
LR Report: **CA19224-NOV22**
Reference: Baldwon Power Plant Drilling

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	6: MW-358 (47-49)	7: MW-358 (86-88)	8: MW-392 (80-82)	12: MW-392 (66-68)
Sample Date & Time					06-Oct-22 15:00	08-Oct-22 18:00	26-Sep-22 16:00	26-Sep-22 12:00
Hg MS [ug/g]	09-Dec-22	16:29	12-Dec-22	15:05	< 0.05	< 0.05	< 0.05	< 0.05
As [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	2.1	11	17	1.0
B [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	11	16	16	13
Ba [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	140	45	40	21
Be [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	0.85	0.67	0.85	0.70
Cd [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	< 0.02	< 0.02	0.36	0.09
Co [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	4.4	23	12	6.2
Cr [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	9.5	12	17	16
Li [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	6	20	8	15
Mo [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	0.3	0.3	0.3	0.3
Pb [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	5.7	9.6	17	4.9
Se [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	< 0.7	< 0.7	1.4	< 0.7
Tl [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	0.05	0.06	0.04	0.03

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0003246025

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LR Report : **CA19224-NOV22**

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Quantitative X-Ray Diffraction by Rietveld Refinement

Report Prepared for:	*Environmental Services*
Project Number/ LIMS No.	*Custom XRD/MI4508-DEC22*
Sample Receipt:	*December 7, 2022*
Sample Analysis:	*December 15, 2022*
Reporting Date:	*December 21, 2022*

Instrument:	BRUKER AXS D8 Advance Diffractometer
Test Conditions:	Co radiation, 35 kV, 40 mA; Detector: LYNXEYE Regular Scanning: Step: 0.02°, Step time: 0.75s, 2θ range: 6-80°
Interpretations :	PDF2/PDF4 powder diffraction databases issued by the International Center for Diffraction Data (ICDD). DiffracPlus Eva and Topas software.
Detection Limit :	0.5-2%. Strongly dependent on crystallinity.

Contents:

1) Method Summary
2) Quantitative XRD Results
3) XRD Pattern(s)

Kim Gibbs, H.B.Sc., P.Geo.
Senior Mineralogist

Huyun Zhou, Ph.D., P.Geo.
Senior Mineralogist

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Method Summary

The Rietveld Method of Mineral Identification by XRD (ME-LR-MIN-MET-MN-D05) method used by SGS Natural Resources is accredited to the requirements of ISO/IEC 17025.

Mineral Identification and Interpretation:

Mineral identification and interpretation involves matching the diffraction pattern of an unknown material to patterns of single-phase reference materials. The reference patterns are compiled by the Joint Committee on Powder Diffraction Standards - International Center for Diffraction Data (JCPDS-ICDD) database and released on software as Powder Diffraction Files (PDF).

Interpretations do not reflect the presence of non-crystalline and/or amorphous compounds, except when internal standards have been added by request. Mineral proportions may be strongly influenced by crystallinity, crystal structure and preferred orientations. Mineral or compound identification and quantitative analysis results should be accompanied by supporting chemical assay data or other additional tests.

Quantitative Rietveld Analysis:

Quantitative Rietveld Analysis is performed by using Topas 4.2 (Bruker AXS), a graphics based profile analysis program built around a non-linear least squares fitting system, to determine the amount of different phases present in a multicomponent sample. Whole pattern analyses are predicated by the fact that the X-ray diffraction pattern is a total sum of both instrumental and specimen factors. Unlike other peak intensity-based methods, the Rietveld method uses a least squares approach to refine a theoretical line profile until it matches the obtained experimental patterns.

Rietveld refinement is completed with a set of minerals specifically identified for the sample. Zero values indicate that the mineral was included in the refinement calculations, but the calculated concentration was less than 0.05wt%. Minerals not identified by the analyst are not included in refinement calculations for specific samples and are indicated with a dash.

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Summary of Rietveld Quantitative Analysis X-Ray Diffraction Results

Mineral/Compound	MW-358 (13-15) DEC4508-01 (wt %)	MW-358 (47-49) DEC4508-02 (wt %)	MW-358 (86-88) DEC4508-03 (wt %)	MW-392 (80-82) DEC4508-04 (wt %)
Quartz	58.9	33.0	34.9	29.1
Muscovite	11.2	37.6	30.5	14.5
Albite	13.3	8.2	3.4	1.0
Microcline	5.3	9.4	8.1	2.9
Chlorite	10.8	-	-	6.8
Diaspore	0.5	-	-	-
Pyrite	-	1.0	0.8	1.2
Kaolinite	-	9.0	18.4	8.2
Calcite	-	1.8	1.7	31.5
Anatase	-	-	2.1	0.4
Leucite	-	-	-	2.4
Siderite	-	-	-	1.9
Dolomite	-	-	-	-
Gypsum	-	-	-	-
Diopside	-	-	-	-
TOTAL	100	100	100	100

Zero values indicate that the mineral was included in the refinement, but the calculated concentration is below a measurable value.

Dashes indicate that the mineral was not identified by the analyst and not included in the refinement calculation for the sample.

The weight percent quantities indicated have been normalized to a sum of 100%. The quantity of amorphous material has not been determined.

Mineral/Compound	Formula
Quartz	SiO_2
Muscovite	$KAl_2(AlSi_3O_{10})(OH)_2$
Albite	$NaAlSi_3O_8$
Microcline	$KAlSi_3O_8$
Chlorite	$(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$
Diaspore	aAlO.OH
Pyrite	FeS_2
Kaolinite	$Al_2Si_2O_5(OH)_4$
Calcite	$CaCO_3$
Anatase	TiO_2
Leucite	$KAlSi_2O_6$
Siderite	$FeCO_3$
Dolomite	$CaMg(CO_3)_2$
Gypsum	$CaSO_4 \cdot 2H_2O$
Diopside	$CaMgSi_2O_6$

Summary of Rietveld Quantitative Analysis X-Ray Diffraction Results

Mineral/Compound	MW-392 (32-33.5) DEC4508-05 (wt %)	MW-393 (24-25.5) DEC4508-06 (wt %)	MW-394 (20.5-22) DEC4508-07 (wt %)	MW-392 (66-68) DEC4508-08 (wt %)
Quartz	53.5	68.2	54.9	27.2
Muscovite	13.1	13.0	11.7	29.7
Albite	8.5	7.4	13.1	4.5
Microcline	6.8	9.5	6.7	6.9
Chlorite	7.0	-	7.0	16.3
Diaspore	-	-	-	-
Pyrite	-	0.3	0.3	-
Kaolinite	7.5	-	5.0	-
Calcite	-	-	-	14.8
Anatase	-	-	-	0.7
Leucite	-	-	-	-
Siderite	-	-	-	-
Dolomite	1.2	-	-	-
Gypsum	0.4	-	-	-
Diopside	1.7	1.6	1.4	-
TOTAL	100	100	100	100

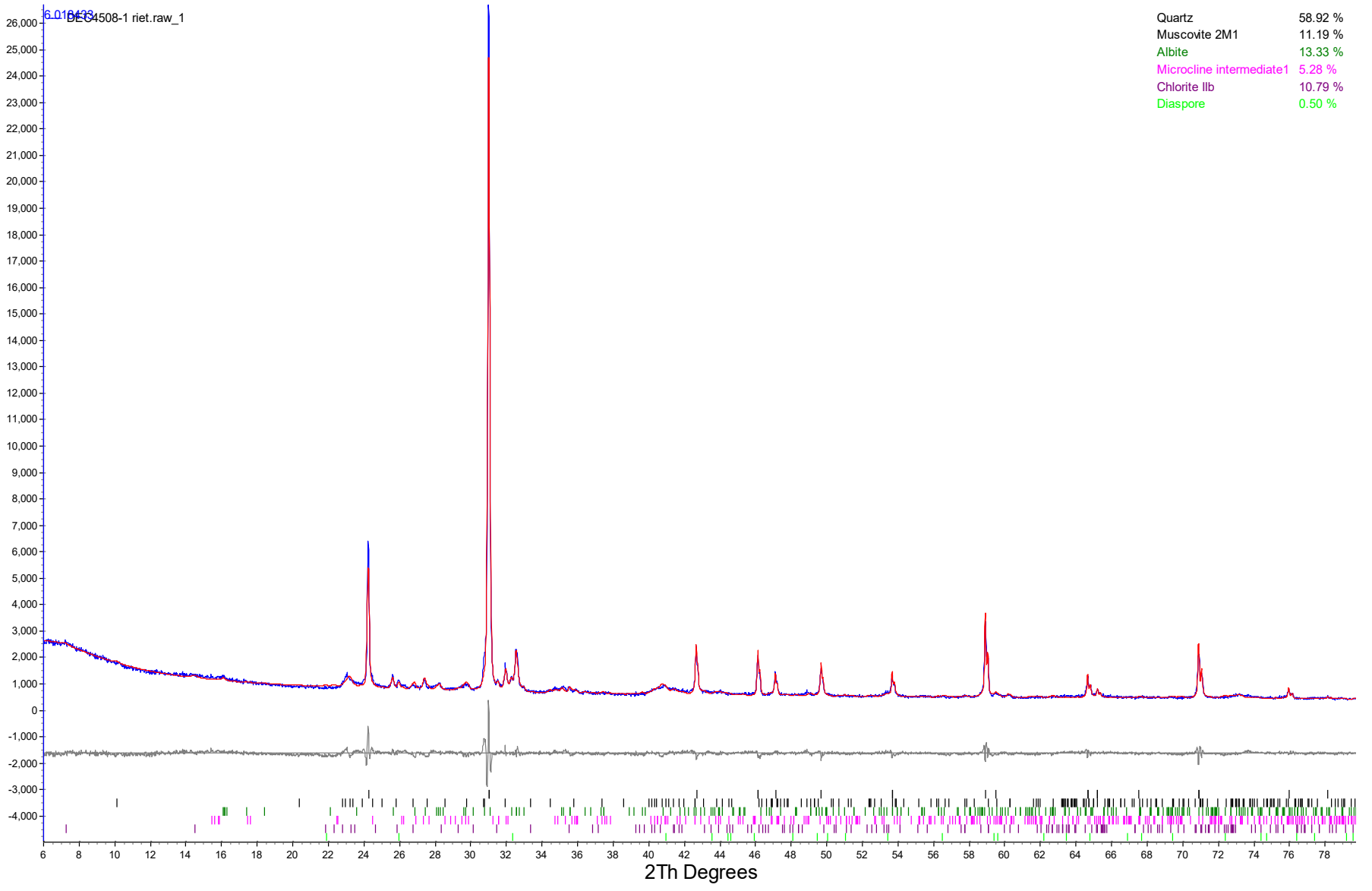
Zero values indicate that the mineral was included in the refinement, but the calculated concentration is below a measurable value.

Dashes indicate that the mineral was not identified by the analyst and not included in the refinement calculation for the sample.

The weight percent quantities indicated have been normalized to a sum of 100%. The quantity of amorphous material has not been determined.

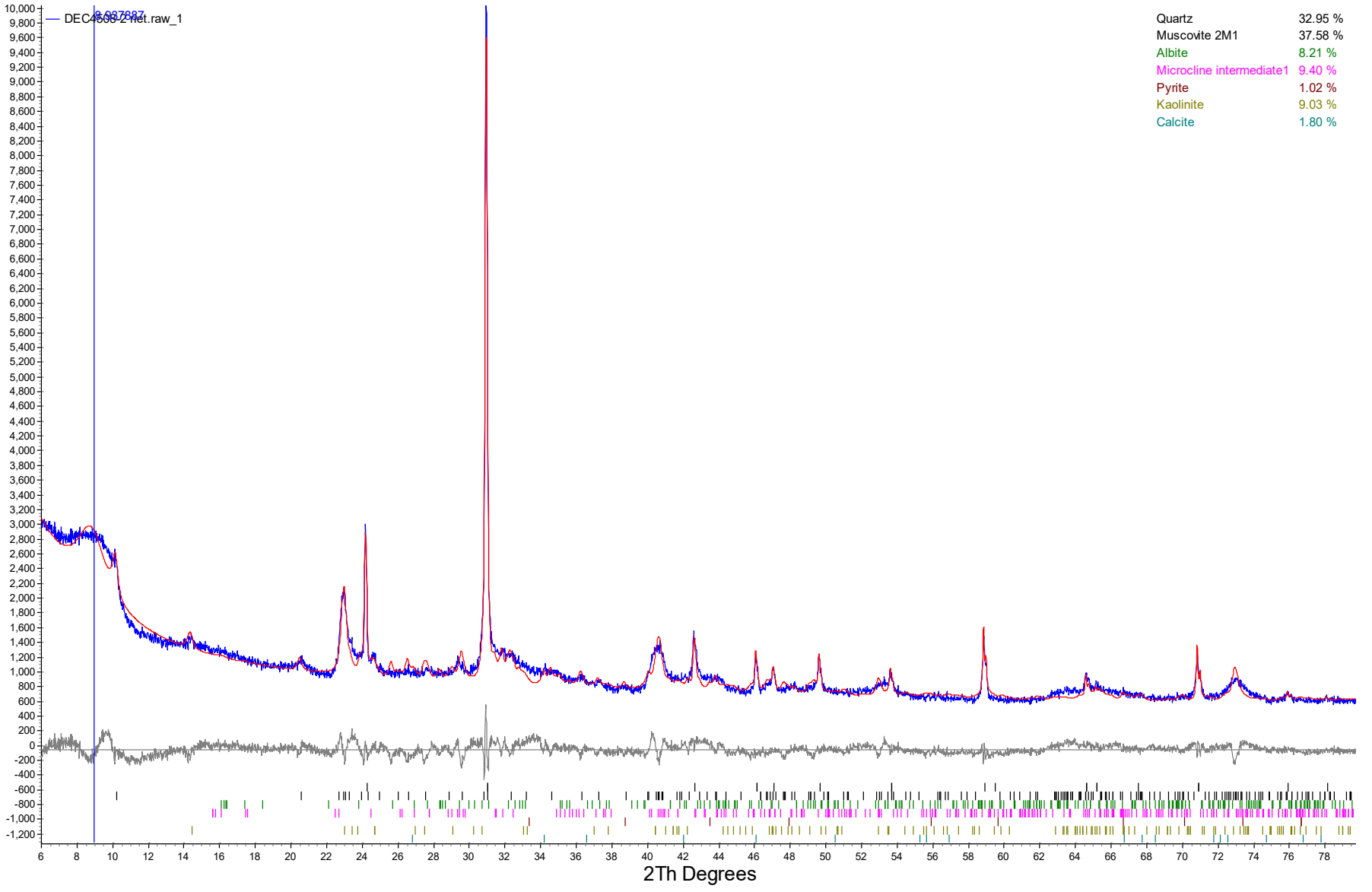
Mineral/Compound	Formula
Quartz	SiO_2
Muscovite	$KAl_2(AlSi_3O_{10})(OH)_2$
Albite	$NaAlSi_3O_8$
Microcline	$KAlSi_3O_8$
Chlorite	$(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$
Diaspore	aAlO.OH
Pyrite	FeS_2
Kaolinite	$Al_2Si_2O_5(OH)_4$
Calcite	$CaCO_3$
Anatase	TiO_2
Leucite	$KAlSi_2O_6$
Siderite	$FeCO_3$
Dolomite	$CaMg(CO_3)_2$
Gypsum	$CaSO_4 \cdot 2H_2O$
Diopside	$CaMgSi_2O_6$

MW-358 (13-15)



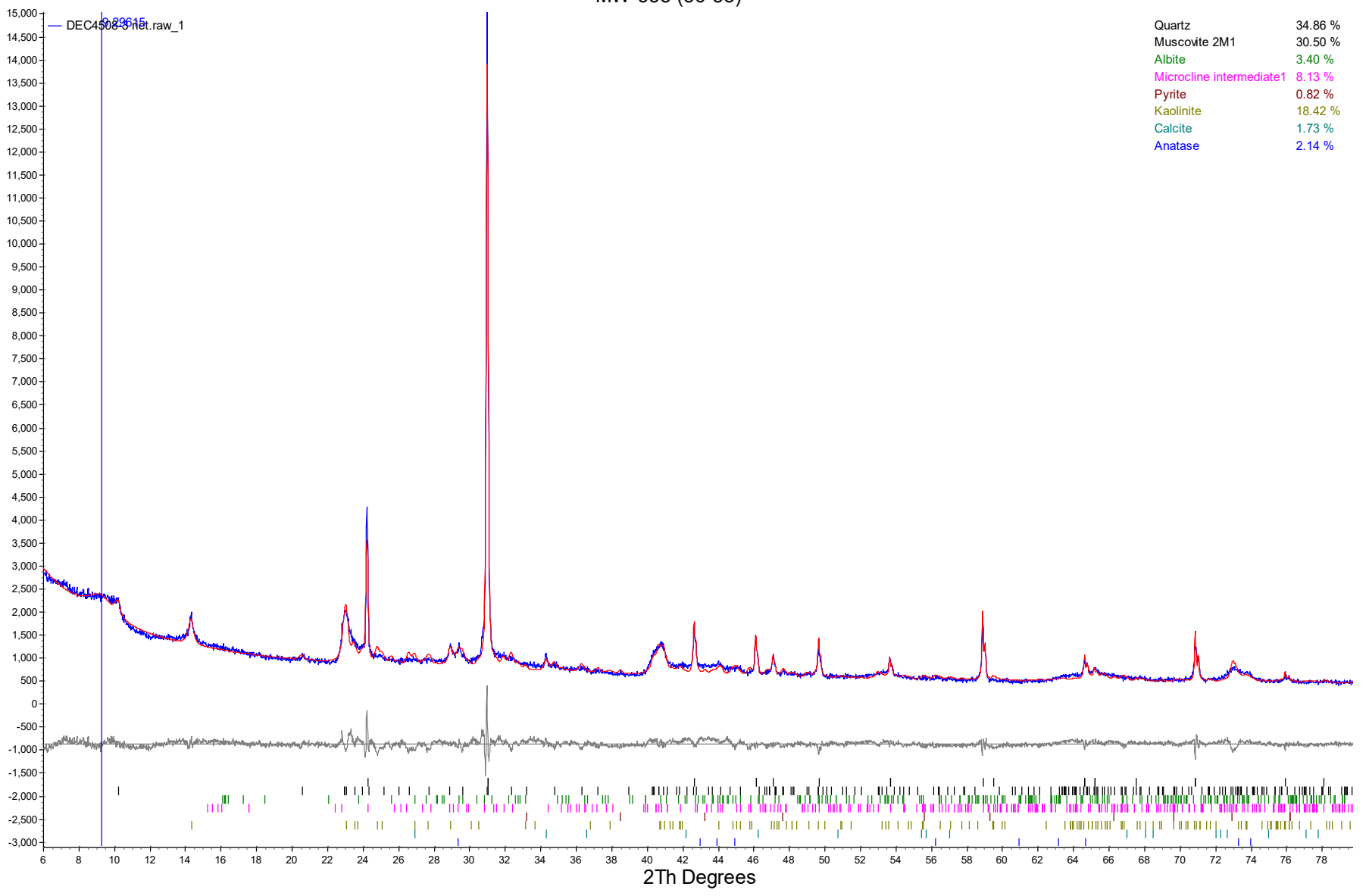
Quartz	58.92 %
Muscovite 2M1	11.19 %
Albite	13.33 %
Microcline intermediate1	5.28 %
Chlorite IIb	10.79 %
Diaspore	0.50 %

MW-358 (47-49)



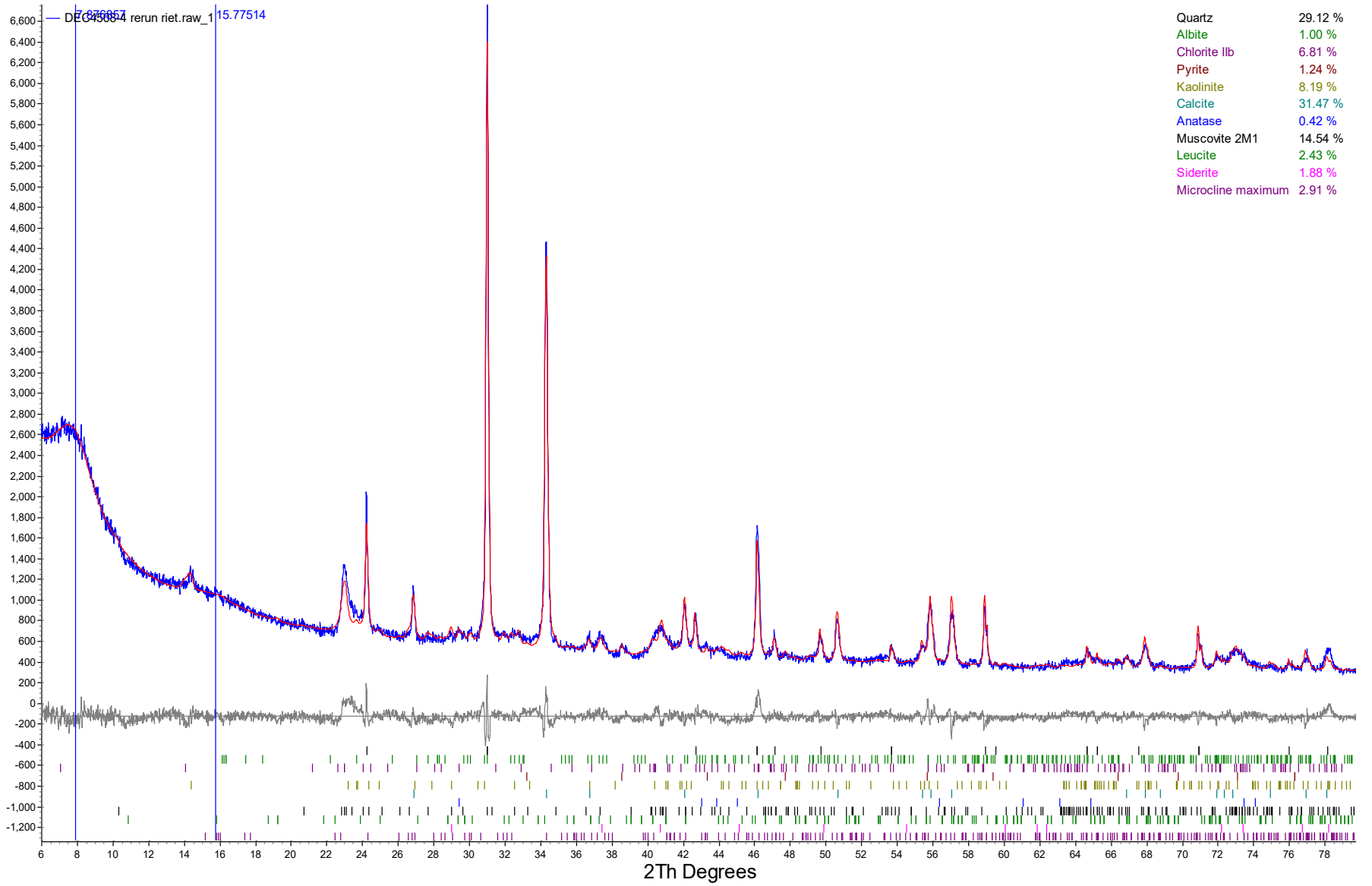
Quartz	32.95 %
Muscovite 2M1	37.58 %
Albite	8.21 %
Microcline intermediate1	9.40 %
Pyrite	1.02 %
Kaolinite	9.03 %
Calcite	1.80 %

MW-358 (86-88)



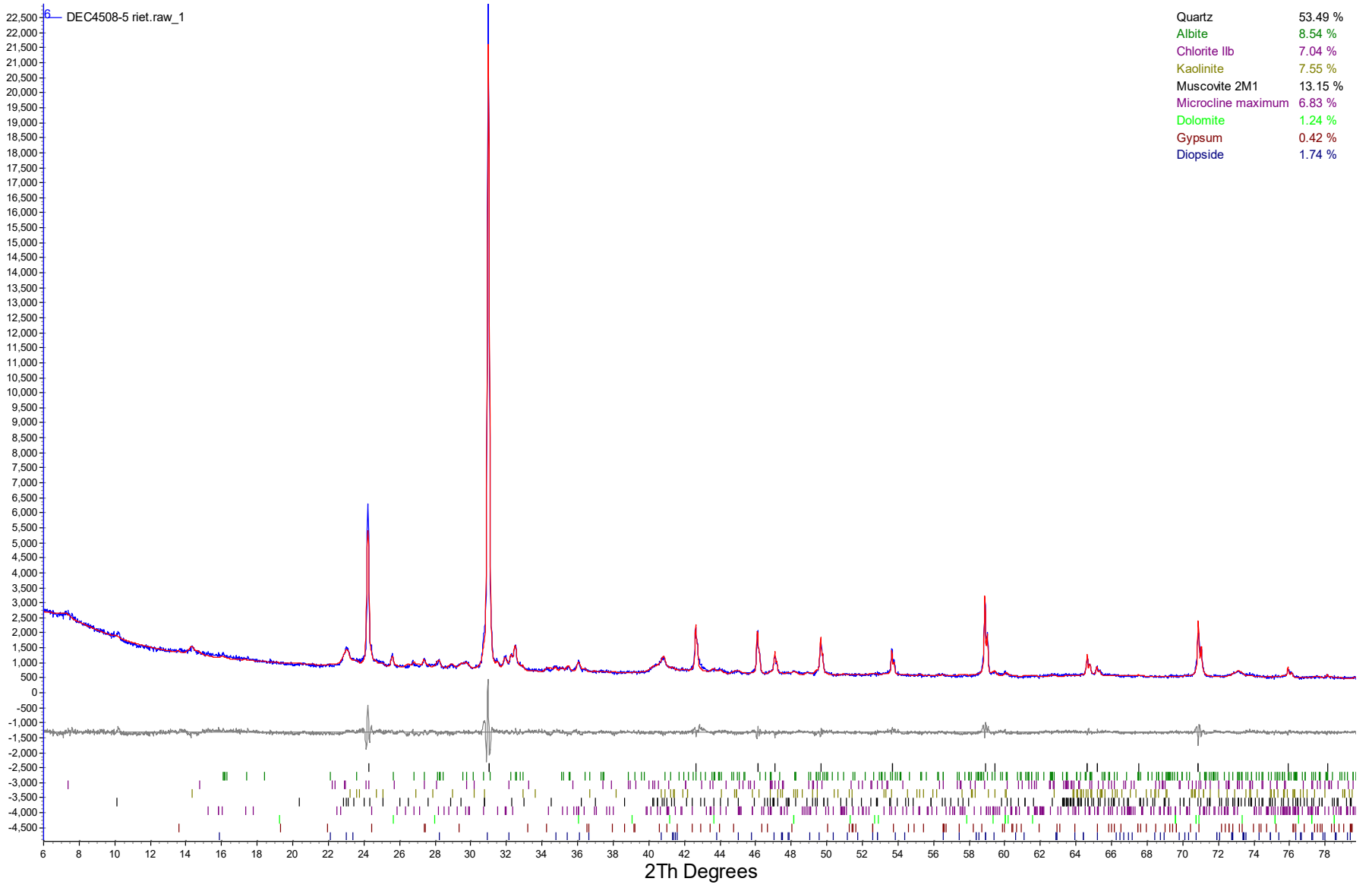
Quartz	34.86 %
Muscovite 2M1	30.50 %
Albite	3.40 %
Microcline intermediate1	8.13 %
Pyrite	0.82 %
Kaolinite	18.42 %
Calcite	1.73 %
Anatase	2.14 %

MW-392 (80-82)



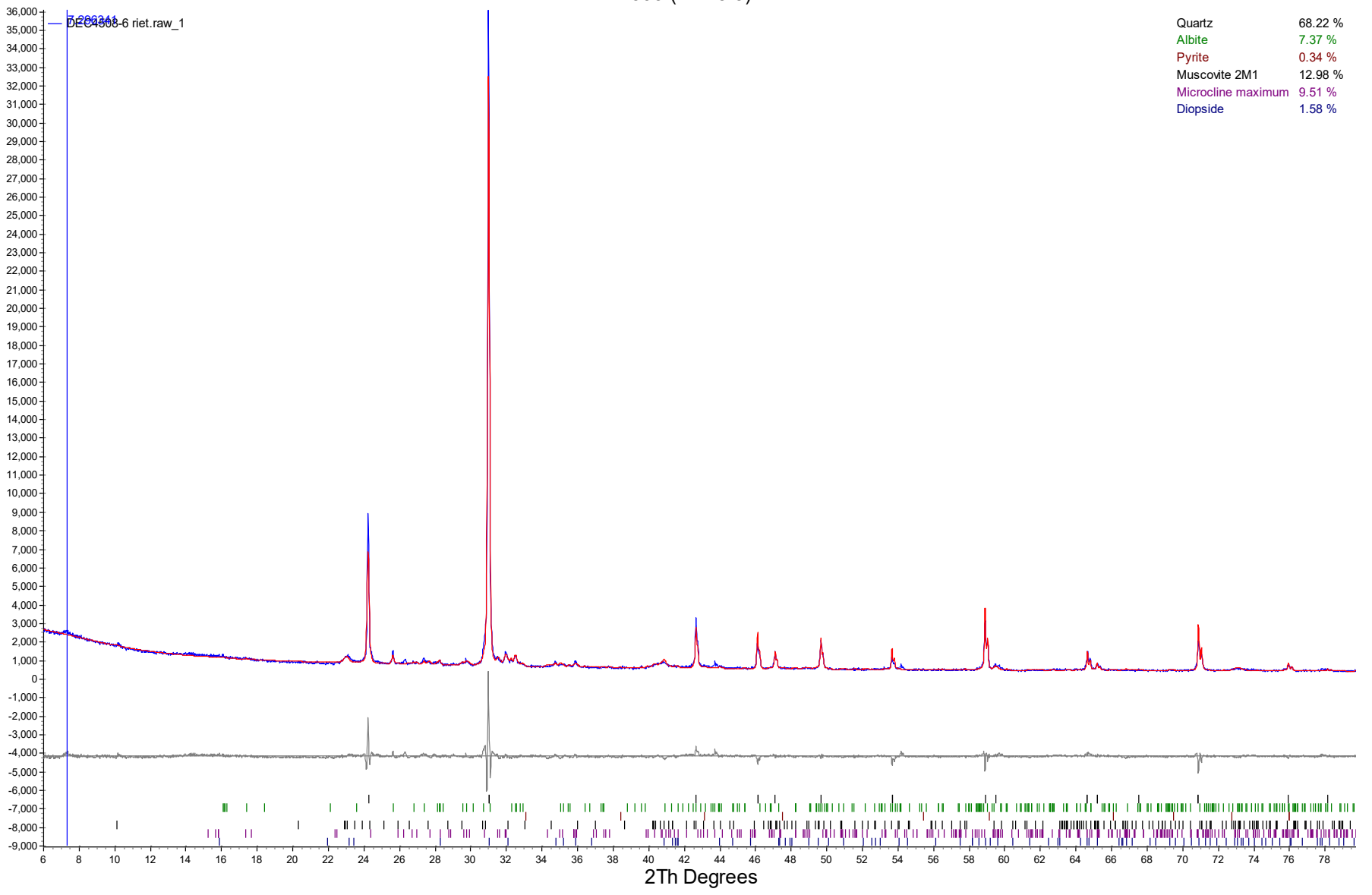
Quartz	29.12 %
Albite	1.00 %
Chlorite IIb	6.81 %
Pyrite	1.24 %
Kaolinite	8.19 %
Calcite	31.47 %
Anatase	0.42 %
Muscovite 2M1	14.54 %
Leucite	2.43 %
Siderite	1.88 %
Microcline maximum	2.91 %

MW-392 (32-33.5)



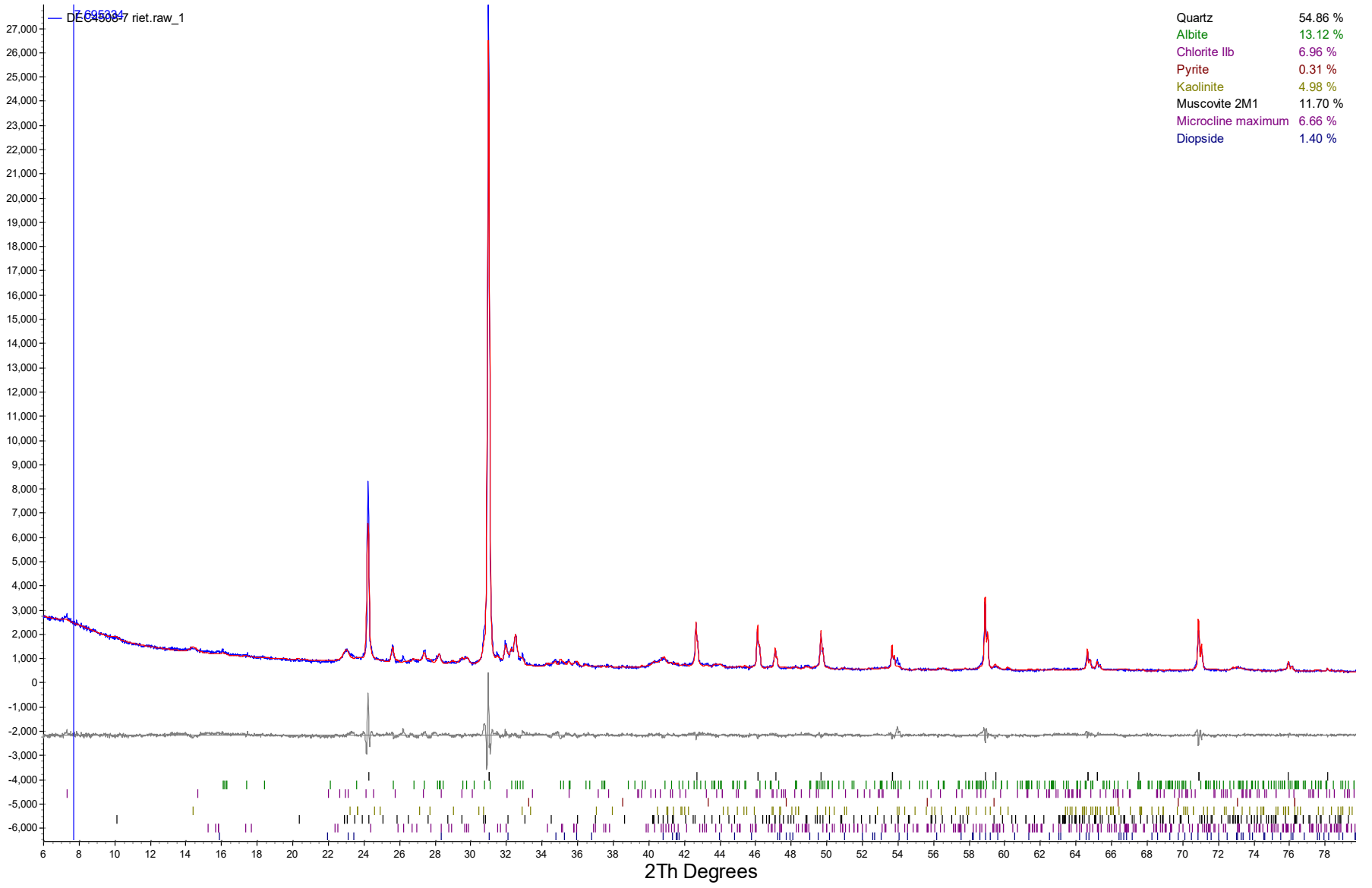
Quartz	53.49 %
Albite	8.54 %
Chlorite IIb	7.04 %
Kaolinite	7.55 %
Muscovite 2M1	13.15 %
Microcline maximum	6.83 %
Dolomite	1.24 %
Gypsum	0.42 %
Diopside	1.74 %

MW-393 (24-25.5)



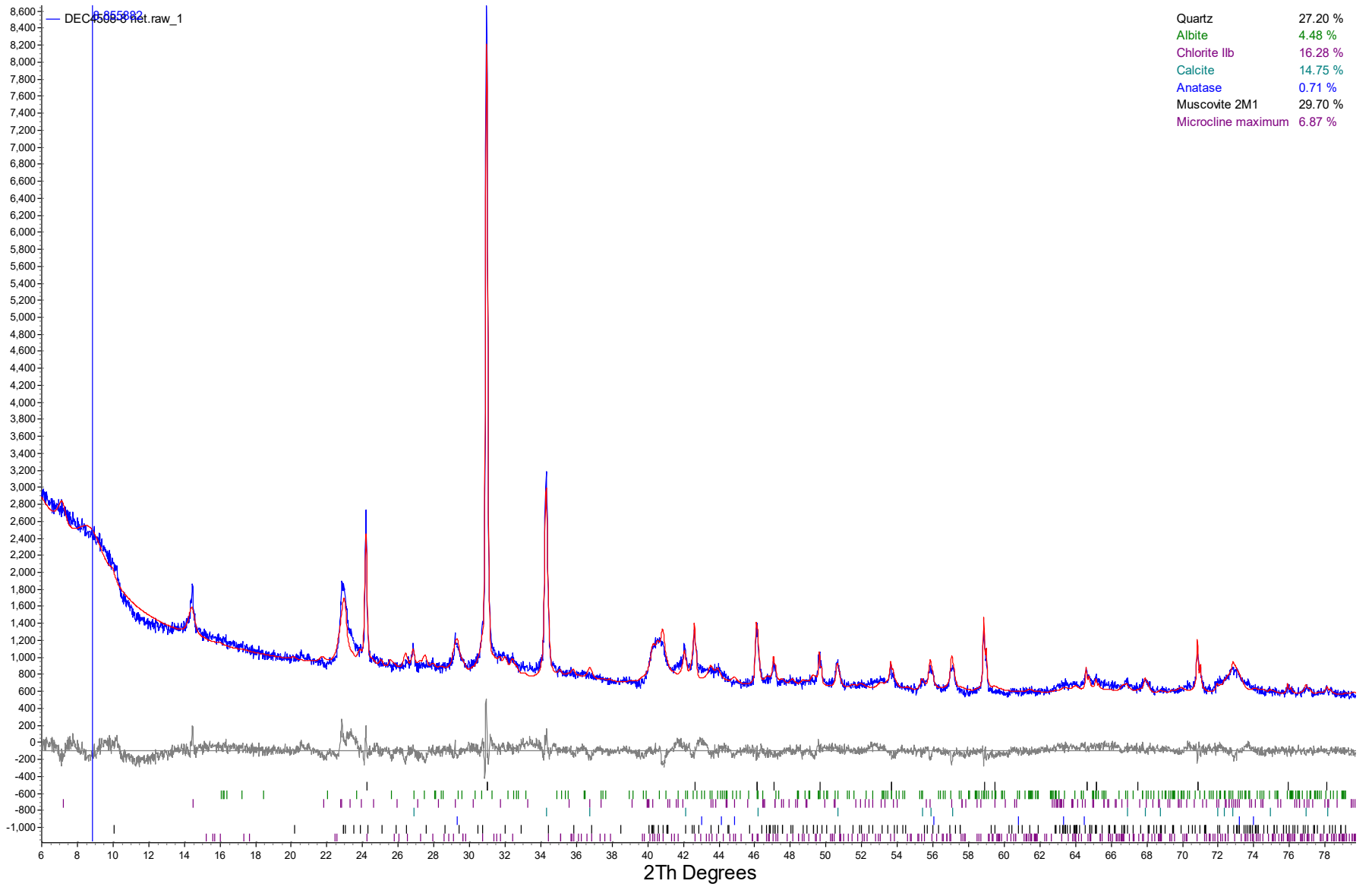
Quartz	68.22 %
Albite	7.37 %
Pyrite	0.34 %
Muscovite 2M1	12.98 %
Microcline maximum	9.51 %
Diopside	1.58 %

MW-394 (20.5-22)



Quartz	54.86 %
Albite	13.12 %
Chlorite IIb	6.96 %
Pyrite	0.31 %
Kaolinite	4.98 %
Muscovite 2M1	11.70 %
Microcline maximum	6.66 %
Diopside	1.40 %

MW-392 (66-68)



Quartz	27.20 %
Albite	4.48 %
Chlorite IIb	16.28 %
Calcite	14.75 %
Anatase	0.71 %
Muscovite 2M1	29.70 %
Microcline maximum	6.87 %

APPENDIX C
MODFLOW, HELP MODEL, AND FLUX EVALUATION DATA EXPORT FILES (ELECTRONIC ONLY)

APPENDIX D
HELP MODEL OUTPUT FILES

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: BAL BAP CIP Cons Slopes **Simulated On:** 1/6/2023 7:23

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
SiCL - Silty Clay Loam (Moderate)
Material Texture Number 26

Thickness	=	6	inches
Porosity	=	0.445	vol/vol
Field Capacity	=	0.393	vol/vol
Wilting Point	=	0.277	vol/vol
Initial Soil Water Content	=	0.3673	vol/vol
Effective Sat. Hyd. Conductivity	=	1.90E-06	cm/sec

Layer 2
Type 1 - Vertical Percolation Layer
SiC - Silty Clay (Moderate)
Material Texture Number 28

Thickness	=	18	inches
Porosity	=	0.452	vol/vol
Field Capacity	=	0.411	vol/vol
Wilting Point	=	0.311	vol/vol
Initial Soil Water Content	=	0.3948	vol/vol
Effective Sat. Hyd. Conductivity	=	1.20E-06	cm/sec

Layer 3
Type 2 - Lateral Drainage Layer
Drainage Net (0.5 cm)
Material Texture Number 20

Thickness	=	0.2	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.01	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	25	%
Drainage Length	=	150	ft

Layer 4

Type 4 - Flexible Membrane Liner
LDPE Membrane
Material Texture Number 36

Thickness	=	0.04	inches
Effective Sat. Hyd. Conductivity	=	4.00E-13	cm/sec
FML Pinhole Density	=	1	Holes/Acre
FML Installation Defects	=	1	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 1 - Vertical Percolation Layer (Waste)
Electric Plant Coal Bottom Ash
Material Texture Number 83

Thickness	=	231.72	inches
Porosity	=	0.578	vol/vol
Field Capacity	=	0.076	vol/vol
Wilting Point	=	0.025	vol/vol
Initial Soil Water Content	=	0.076	vol/vol
Effective Sat. Hyd. Conductivity	=	5.29E-04	cm/sec

Note: Initial moisture content of the layers and snow water were computed as nearly steady-state values by HELP.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	91.1	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	21.39	acres
Evaporative Zone Depth	=	18	inches
Initial Water in Evaporative Zone	=	6.845	inches
Upper Limit of Evaporative Storage	=	8.094	inches
Lower Limit of Evaporative Storage	=	5.394	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	26.923	inches
Total Initial Water	=	26.923	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	38.18	Degrees
Maximum Leaf Area Index	=	4.5	
Start of Growing Season (Julian Date)	=	104	days

End of Growing Season (Julian Date)	=	285	days
Average Wind Speed	=	8	mph
Average 1st Quarter Relative Humidity	=	72	%
Average 2nd Quarter Relative Humidity	=	64	%
Average 3rd Quarter Relative Humidity	=	71	%
Average 4th Quarter Relative Humidity	=	72	%

Note: Evapotranspiration data was obtained for Baldwin, Illinois

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.421014	2.032335	4.330912	4.401604	4.511846	4.068128
4.023992	2.88724	2.952714	2.941943	4.289265	2.800511

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 38.18/-89.85

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
35	44.8	49.4	61.2	72.7	82.1
84.9	81.7	72.6	59.4	50.1	43.9

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 38.18/-89.85
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 38.18/-89.85

Average Annual Totals Summary

Title: BAL BAP CIP Cons Slopes
Simulated on: 1/6/2023 7:24

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	41.66	[4.8]	3,234,836.6	100.00
Runoff	16.562	[3.613]	1,285,952.1	39.75
Evapotranspiration	24.541	[2.705]	1,905,475.7	58.90
Subprofile1				
Lateral drainage collected from Layer 3	0.5339	[0.485]	41,451.4	1.28
Percolation/leakage through Layer 4	0.000007	[0.000006]	0.5720	0.00
Average Head on Top of Layer 4	0.0002	[0.0002]	---	---
Subprofile2				
Percolation/leakage through Layer 5	0.000007	[0.000007]	0.5716	0.00
Water storage				
Change in water storage	0.0252	[0.7492]	1,956.9	0.06

* Note: Average inches are converted to volume based on the user-specified area.

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: BAL BAP CIP Cons Top **Simulated On:** 1/6/2023 7:18

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
SiCL - Silty Clay Loam (Moderate)
Material Texture Number 26

Thickness	=	6	inches
Porosity	=	0.445	vol/vol
Field Capacity	=	0.393	vol/vol
Wilting Point	=	0.277	vol/vol
Initial Soil Water Content	=	0.3673	vol/vol
Effective Sat. Hyd. Conductivity	=	1.90E-06	cm/sec

Layer 2
Type 1 - Vertical Percolation Layer
SiC - Silty Clay (Moderate)
Material Texture Number 28

Thickness	=	18	inches
Porosity	=	0.452	vol/vol
Field Capacity	=	0.411	vol/vol
Wilting Point	=	0.311	vol/vol
Initial Soil Water Content	=	0.3951	vol/vol
Effective Sat. Hyd. Conductivity	=	1.20E-06	cm/sec

Layer 3
Type 2 - Lateral Drainage Layer
16 oz Nonwoven Geotextile
Material Texture Number 43

Thickness	=	0.11	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.01	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-01	cm/sec
Slope	=	2	%
Drainage Length	=	600	ft

Layer 4

Type 4 - Flexible Membrane Liner
LDPE Membrane
Material Texture Number 36

Thickness	=	0.04	inches
Effective Sat. Hyd. Conductivity	=	4.00E-13	cm/sec
FML Pinhole Density	=	1	Holes/Acre
FML Installation Defects	=	1	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 1 - Vertical Percolation Layer (Waste)
Electric Plant Coal Bottom Ash
Material Texture Number 83

Thickness	=	545.28	inches
Porosity	=	0.578	vol/vol
Field Capacity	=	0.076	vol/vol
Wilting Point	=	0.025	vol/vol
Initial Soil Water Content	=	0.076	vol/vol
Effective Sat. Hyd. Conductivity	=	5.29E-04	cm/sec

Note: Initial moisture content of the layers and snow water were computed as nearly steady-state values by HELP.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	89.8	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	53.73	acres
Evaporative Zone Depth	=	18	inches
Initial Water in Evaporative Zone	=	6.849	inches
Upper Limit of Evaporative Storage	=	8.094	inches
Lower Limit of Evaporative Storage	=	5.394	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	50.759	inches
Total Initial Water	=	50.759	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	38.18	Degrees
Maximum Leaf Area Index	=	4.5	
Start of Growing Season (Julian Date)	=	104	days

End of Growing Season (Julian Date)	=	285	days
Average Wind Speed	=	8	mph
Average 1st Quarter Relative Humidity	=	72	%
Average 2nd Quarter Relative Humidity	=	64	%
Average 3rd Quarter Relative Humidity	=	71	%
Average 4th Quarter Relative Humidity	=	72	%

Note: Evapotranspiration data was obtained for Baldwin, Illinois

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.421014	2.032335	4.330912	4.401604	4.511846	4.068128
4.023992	2.88724	2.952714	2.941943	4.289265	2.800511

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 38.18/-89.85

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
35	44.8	49.4	61.2	72.7	82.1
84.9	81.7	72.6	59.4	50.1	43.9

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 38.18/-89.85
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 38.18/-89.85

Average Annual Totals Summary

Title: BAL BAP CIP Cons Top
Simulated on: 1/6/2023 7:19

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	41.66	[4.8]	8,125,655.5	100.00
Runoff	16.544	[3.658]	3,226,692.1	39.71
Evapotranspiration	24.605	[2.679]	4,798,963.4	59.06
Subprofile1				
Lateral drainage collected from Layer 3	0.4260	[0.3581]	83,079.3	1.02
Percolation/leakage through Layer 4	0.061216	[0.074113]	11,939.6	0.15
Average Head on Top of Layer 4	0.7474	[0.9614]	---	---
Subprofile2				
Percolation/leakage through Layer 5	0.000239	[0.000259]	46.6	0.00
Water storage				
Change in water storage	0.0865	[0.7368]	16,874.2	0.21

* Note: Average inches are converted to volume based on the user-specified area.

APPENDIX E
FLUX EVALUATION DATA

APPENDIX E. FLUX EVALUATION DATA

GROUNDWATER MODELING REPORT

BALDWIN POWER PLANT

BOTTOM ASH POND

BALDWIN, ILLINOIS

Calibration Model					
Model	**Years (Model Period)**	**HSU**	**Total Flux In[1] (ft^3/d)**	**Total Flux In (gpm)**	
Calibration Model	53	CCR	2098.27	10.90	
Model	**Years (Model Period)**	**HSU**	**Total Flux Out[1] (ft^3/d)**	**Total Flux Out (gpm)**	
Calibration Model	53	CCR	-652.13	-3.39	
Model	**Model Period**	**Boundary Condition**	**Total Flux Out[1] (ft^3/d)**	**Total Flux Out (gpm)**	
Calibration Model	53	Constant Head (Stormwater Management within Active BAP)	-1420.44	-7.38	
Scenario: CIP (CCR removal from the western areas of the BAP, consolidation to the southeast, and eventually northeastern portions of the BAP, and construction of a cover system over the remaining CCR)					
Prediction Model	**Years (Post-Construction Period)**	**HSU**	**Total Flux In[1] (ft^3/d)**	**Total Flux In (gpm)**	**Reduction in Flux In Post Closure[2] (Percentage, %)**
CIP	93	CCR	108.27	0.56	95%
Prediction Model	**Years (Post-Construction Period)**	**HSU**	**Total Flux Out[1] (ft^3/d)**	**Total Flux Out (gpm)**	**Reduction in Flux Out Post Closure[2] (Percentage, %)**
CIP	93	CCR	-135.25	-0.70	93%

[O: JJW 1/5/23; C: EGP 1/6/23; C: BGH 1/19/23; U: JJW 5/17/23 C: EGP 5/23/23]

Notes:

1. Reduction in flux as compared to flux at the end of calibration model (model period of 53 years) including flux through constant head boundary conditions in the calibration model when applicable (flux out).
2. Total flux in and out source data provided in flux calculation data files included in Appendix C.

BAP = Bottom Ash Pond
CCR = coal combustion residuals
CIP = closure in place
HSU = Hydrostratigraphic Unit
% = percentage
ft^3/d = cubic feet per day
gpm = gallons per minute

APPENDIX B
MODFLOW, MT3DMS, HELP MODEL, AND FLUX EVALUATION DATA EXPORT FILES

(ELECTRONIC ONLY)

APPENDIX C
HELP MODEL INPUTS AND OUTPUTS

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: BAL FAPS - As-Is - K3 **Simulated On:** 6/5/2024 12:20

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
SiL - Silty Loam
Material Texture Number 9

Thickness	=	6	inches
Porosity	=	0.501	vol/vol
Field Capacity	=	0.284	vol/vol
Wilting Point	=	0.135	vol/vol
Initial Soil Water Content	=	0.501	vol/vol
Effective Sat. Hyd. Conductivity	=	1.90E-04	cm/sec

Layer 2
Type 3 - Barrier Soil Liner
Silty Clay
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.427	vol/vol
Field Capacity	=	0.418	vol/vol
Wilting Point	=	0.367	vol/vol
Initial Soil Water Content	=	0.427	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-07	cm/sec

Layer 3
Type 1 - Vertical Percolation Layer (Waste)
Unsaturated CCR Material (HELP Waste)
Material Texture Number 83

Thickness	=	306.6	inches
Porosity	=	0.541	vol/vol
Field Capacity	=	0.187	vol/vol
Wilting Point	=	0.047	vol/vol
Initial Soil Water Content	=	0.1888	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-04	cm/sec

Note: Initial moisture content of the layers and snow water were computed as nearly steady-state values by HELP.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	80	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	232	acres
Evaporative Zone Depth	=	6	inches
Initial Water in Evaporative Zone	=	3.006	inches
Upper Limit of Evaporative Storage	=	3.006	inches
Lower Limit of Evaporative Storage	=	0.81	inches
Initial Snow Water	=	0.21492	inches
Initial Water in Layer Materials	=	68.58	inches
Total Initial Water	=	68.795	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	38.18	Degrees
Maximum Leaf Area Index	=	4.5	
Start of Growing Season (Julian Date)	=	97	days
End of Growing Season (Julian Date)	=	300	days
Average Wind Speed	=	8	mph
Average 1st Quarter Relative Humidity	=	72	%
Average 2nd Quarter Relative Humidity	=	64	%
Average 3rd Quarter Relative Humidity	=	71	%
Average 4th Quarter Relative Humidity	=	72	%

Note: Evapotranspiration data was obtained for ,

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.360428	2.90231	3.416467	4.240202	4.279031	4.261632
4.118166	2.73529	2.651068	3.526861	4.231645	3.374315

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 38.18/-89.85

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
35	37.6	48	58.5	73.8	82.1
84.5	83.4	74.7	61.4	51.2	40.3

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 38.18/-89.85
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 38.18/-89.85

Average Annual Totals Summary

Title: BAL FAPS - As-Is - K3
Simulated on: 6/5/2024 12:23

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	42.10	[5.94]	35,452,759.3	100.00
Runoff	10.656	[4.485]	8,973,742.1	25.31
Evapotranspiration	30.469	[4.137]	25,659,382.5	72.38
Subprofile1				
Percolation/leakage through Layer 2	0.983323	[0.103717]	828,115.5	2.34
Average Head on Top of Layer 2	2.1299	[0.3463]	---	---
Subprofile2				
Percolation/leakage through Layer 3	0.816873	[0.220265]	687,937.5	1.94
Water storage				
Change in water storage	0.1564	[0.9348]	131,697.2	0.37

* Note: Average inches are converted to volume based on the user-specified area.

APPENDIX D
FLUX EVALUATION DATA

APPENDIX D. FLUX EVALUATION DATA
GROUNDWATER MODELING TECHNICAL MEMORANDUM
BALDWIN POWER PLANT
FLY ASH POND SYSTEM
BALDWIN, ILLINOIS

Calibration Model 1 (pre-closure FAPS model)					
Model	**Modeled Year**	**HSU**	**Total Flux In[1] (ft^3/d)**	**Total Flux In (gpm)**	
Calibration Model	2020	CCR	4836.47	25.12	
Model	**Modeled Year**	**Boundary Condition**	**Total Flux In[1] (ft^3/d)**	**Total Flux In (gpm)**	
Calibration Model	2020	Constant Head (Stormwater Management within Active FAPS)	577.57	3.00	
Model	**Modeled Year**	**HSU**	**Total Flux Out[1,3] (ft^3/d)**	**Total Flux Out[3] (gpm)**	
Calibration Model	2020	CCR	-5342.95	-27.76	
Alternative 3 – Source Control with a Groundwater Management System (GMS)					
Prediction Model	**Years (Post-Construction Period)**	**HSU**	**Total Flux In[1] (ft^3/d)**	**Total Flux In (gpm)**	**Reduction in Flux In Post Closure[2] (Percentage, %)**
Alternative 3	106	CCR	2098.87	10.90	61%
Prediction Model	**Years (Post-Construction Period)**	**HSU**	**Total Flux Out[1,3] (ft^3/d)**	**Total Flux Out[3] (gpm)**	**Reduction in Flux Out Post Closure[2] (Percentage, %)**
Alternative 3	106	CCR	-2171.46	-11.28	59%
Prediction Model	**Years (Post-Construction Period)**	**HSU**	**Total Flux In[1] (ft^3/d)**	**Total Flux In (gpm)**	**Reduction in Flux In Post Closure[2] (Percentage, %)**
Alternative 3 - Sensitivity Model	106	CCR	3125.70	16.24	42%
Prediction Model	**Years (Post-Construction Period)**	**HSU**	**Total Flux Out[1,3] (ft^3/d)**	**Total Flux Out[3] (gpm)**	**Reduction in Flux Out Post Closure[2] (Percentage, %)**
Alternative 3 - Sensitivity Model	106	CCR	-1468.16	-7.63	73%

[O: JJW 1/14/25 C: KLT 1/31/2025]

Notes:
1. Total flux in and out source data provided in flux calculation data files included in Appendix B.
2. Reduction in flux as compared to flux at the end of Calibration Model 1 (model period of 51 years) including flux through constant head boundary conditions in the calibration model when applicable (flux in).
3. Flux out expressed as negative values.

% = percentage
FAPS = Fly Ash Pond System
CCR = coal combustion residuals
ft^3/d = cubic feet per day
gpm = gallons per minute
GMS = groundwater management system
HSU = Hydrostratigraphic Unit

APPENDIX C
MATERIAL QUANTITY, LABOR, AND MILEAGE ESTIMATES FOR ALTERNATIVE 2 AND ALTERNATIVE 3 REMEDIES

DYNEGY MIDWEST GENERATION, LLC. - BALDWIN POWER PLANT
CORRECTIVE ACTION ALTERNATIVES ANALYSIS SUPPORTING INFORMATION REPORT (CAAA-SIR)
ALTERNATIVE 2 - SOURCE CONTROL WITH CUTOFF WALL (CW)[1]

ITEM NO.	ENGINEERING, PRE-CONSTRUCTION, AND CONSTRUCTION SUPPORT TASKS	Units	Quantity	Crew	Daily Output	Labor Hours	Equipment Hours	Notes
1	Pre-Design Investigation, Final Cutoff Wall Design and Bid Support	LS	1	-	-	-	-	Assumed based on Ramboll previous project experience.
2	Engineering Support and CQA During Construction	LS	1	Eng	-	2,865	1,146	Assumed based on Ramboll previous project experience.
	ENGINEERING, PRE-CONSTRUCTION, AND CONSTRUCTION SUPPORT TASKS ESTIMATED SUBTOTAL					**2,865**	**1,146**	
ITEM NO.	**SITE PREPARATION**	**Units**	**Quantity**	**Crew**	**Daily Output**	**Labor Hours**	**Equipment Hours**	**Notes**
3	Mobilization and De-Mobilization	LS	1	-	-	-	-	Mobilization/demobilization estimated based on previous Ramboll experience.
	General Construction Mobilization and De-Mobilization	LS	1	-	-	-	-	Assumed based on Ramboll previous project experience.
	Trenching Equipment Mobilization, Assembly, and De-Mobilization	LS	1	-	-	-	-	One-pass technology specific equipment mobilization derived from ROM cost provided by specialty contractor.
4	Staging/Laydown Area Preparation	-	-	-	-	1,235	382	Assumes 3-acre staging areas will be needed for construction of the cutoff wall.
	Staging Area Grading	EA	1.0	B11L	1.8	8.9	4.4	312213200200: Rough grade open sites 10,000-20,000 S.F., grader. This total includes working pad only.
	Subgrade Stabilization Nonwoven Geotextile	SY	14,520	2 Clab	2500	93	0.0	313219161550: Geosynthetic soil stabilization, geotextile fabric, non-woven, 120 lb tensile strength includes scarifying and compaction; assume we need for 3-acre staging/laydown area. This total includes working pad only.
	Install Crushed Gravel Road (18" Thick) - Staging Area	SY	14,520	B14	615	1,133	378	015523500100: Temporary, roads, gravel fill, 18" gravel depth (scaled), excluding surfacing. Assumes 3-acre staging/laydown area. This total includes working pad only.
5	Preparation Work Pad and Temporary Roads	-	-	-	-	4,177	1,323	Assumes the general work area associated with the cutoff wall will have temporary access roads installed in order to make way for construction equipment needed for the install.
	Access Roads and Work Pad Grading	EA	21	B11L	1.8	189	94	312213200200: Rough grade open sites 10,000-20,000 S.F, grader, work pad area, access road. Assumes grading will be needed for the 7,000-ft by 50-ft cutoff wall alignment and 1,500-ft by 50-ft access road.
	Subgrade Stabilization Nonwoven Geotextile	SY	47,222	2 Clab	2500	302	0.0	313219161550: Geosynthetic soil stabilization, geotextile fabric, non-woven, 120 lb tensile strength includes scarifying and compaction; for the 7,000-ft by 50-ft cutoff wall alignment and 1,500-ft by 50-ft access road.
	Install Crushed Gravel Road (18" Thick) - Temporary Roads	SY	47,222	B14	615	3,686	1,229	015523500100: Temporary, roads, gravel fill, 18" gravel depth (scaled), excluding surfacing. Spanning the 7,000-ft by 50-ft cutoff wall alignment and 1,500-ft by 50-ft access road.
6	Construction Soil Erosion & Sediment Controls	-	-	-	-	1,380	460	Assumes soil erosion and sediment controls will be implemented only during the cutoff wall construction.
	Silt Fence	LF	36,892	B62	650	1,362	454	312514161000: Synthetic erosion control, silt fence, install and remove, 3' high. Assumes silt fence is installed down both sides of the cutoff wall alignment, both sides of the access road, and around 3-acre staging/laydown area (approx. 1500 LF perimeter). Assumes the silt fence will get replaced once during construction.
	Sediment Log, Filter Sock	LF	738	A2	1000	18	5.9	312514160705: Sediment Log, Filter Sock, 9." Assume filter socks are needed along perimeter of cutoff wall, access road and staging/laydown area at an occurrence of 1 every 50 feet. Assumes the sediment log, filter sock will get replaced once during construction.
7	Construction Facilities	MO - in use	-	-	-	-	-	Includes monthly rentals associated with one (1) office trailer, three (3) storage trailers, and four (4) portable toilets.
	Office Trailer	MO - in use	24	-	-	-	-	015213200350: Office trailer, furnished, no hookups, 32' x 8', rent per month. Assume quantity of one (1).
	Storage Trailers	MO - in use	72	-	-	-	-	015213201350: Storage boxes, 40' x 8', rent per month. Assume quantity of three (3).
	Portable Toilet	MO - in use	96	-	-	-	-	015433406410: Rent toilet, portable chemical. Assume quantity of four (4).
8	Geotechnical Monitoring	LS	-	GM	-	600	0.0	Assumes installation of inclinometers, survey prisms, and settlement monitoring devices along the southern trench where the dike will be modified for work pad installation. Assumes a 4-person crew installs the monitoring system over a period of 3 weeks. Based on Ramboll experience.
	SITE PREPARATION ESTIMATED SUBTOTAL					**7,392**	**2,165**	

ITEM NO.	CUTOFF WALL CONSTRUCTION	Units	Quantity	Crew	Daily Output	Labor Hours	Equipment Hours	Notes
9	Installation of Cutoff Wall	LF	7,000	B12H	80	1,400	700	Information provided by subsurface contractor. Spoils to be disposed of in offsite landfill. Assumes 7,000-foot wall alligment. Crew code selected to mimic the proposed crew provided by specialty contractor.
10	Spoils Management and Disposal	CY - in place	70,000	-	-	6,372	9,526	Hauling and management of trench excavation spoils to the AP for placement beneath the final cover system.
	Excavation and Loading of Material	CY - as excavated	77,000	B14B	5000	185	123	312316435320: Excavating, large volume projects; excavation with truck loading; excavator, 6 C.Y. bucket, 100% fill factor (assume 10% fluff factor from ground to excavated).
	Pushing Materials to Excavator	CY - as excavated	77,000	B10B	1000	924	616	312323170020: Spread dumped material, no compaction, by dozer. Dozer support for excavation. Daily output edited to match excavation based on experience.
	Hauling and Dumping Onsite of Material for Moisture Conditioning	CY - as excavated	77,000	B34G	850	725	725	312323206170: Hauling; no loading equipment, including hauling, waiting, loading/dumping; 34 C.Y. off-road, 15 min wait/ld/uld., 15 MPH, cycle 2 mile.
	Spreading/Drying Moisture Conditioning	CY - as excavated	38,500	B10B	1000	462	308	312323170020: Spread dumped material, no compaction, by dozer. Daily output edited to match excavation based on experience.
	Dust Control Moisture Conditioning Prior to Loading	CY - as excavated	21,000	B45	1888	178	178	312323239000: Water, 3000 gal. truck, 3 mile haul. Assume 30% of volume will need to be wetted.
	Loading of Material	CY - as excavated	77,000	B14B	5605	165	110	312316434420: Excavating, large volume projects; restricted loading trucks; loader, 6 C.Y. bucket, 95% fill factor (assume 10% fluff factor from ground to excavated).
	Hauling Material to Landfill	CY - as excavated	77,000	B34C	165	3,733	7,467	312323203080: Hauling; no loading equipment, including hauling, waiting, loading/dumping; 16.5 C.Y. truck off-road, 15 min wait/ld/uld., 40 MPH, cycle 20 miles
	Landfill Tipping	TON	88,358	-	-	-	-	Information gathered from four local landfills with an average unit weight of 85 pcf. Assumes material is classified as non-hazardous waste.
	CUTOFF WALL CONSTRUCTION					**7,772**	**10,226**	

ITEM NO.	SITE RESTORATION	Units	Quantity	Crew	Daily Output	Labor Hours	Equipment Hours	Notes
11	Site Restoration	-	-	-	-	115	115	Assumes restoration of grade surface following cutoff wall installation.
	Lime	MSF	556	B66	700	6.4	6.4	329113234250: Soil preparation, structural soil mixing, spread soil conditioners, ground limestone, 1#/S.Y., tractor spreader. Unit multiplied by 1.1 to account for soils possibly being void of nutrients.
	Fertilizer	MSF	556	B66	700	6.4	6.4	329113234150: Soil preparation, structural soil mixing, spread soil conditioners, fertilizer, 0.2#/S.Y., tractor spreader. Unit multiplied by 1.1 to account for soils possibly being void of nutrients.
	Grassland Mix	MSF	556	B66	52	85	85	329219142300: Seeding athletic fields, seeding fescue, tall, 5.5 lb. per M.S.F., tractor spreader. Quantity all disturbed areas minus wetland area, pollinator area, and 15-acre pond in consolidated area.
	Mulch	MSF	556	B65	530	17	17	329113160350: Mulching, Hay, 1" deep, power mulcher, large.
	SITE RESTORATION ESTIMATED SUBTOTAL					**115**	**115**	
	TOTAL CONSTRUCTION ESTIMATED SUBTOTAL					**15,278**	**12,507**	

	Total Labor Hours	Total Equipment Hours
ENGINEERING AND CONSTRUCTION SUBTOTAL	**18,100**	**13,700**
CORRECTIVE ACTION OPERATION AND MAINTENANCE SUBTOTAL	**-**	**-**
ALTERNATIVE 2 SUBTOTAL	**18,100**	**13,700**

NOTES:

1. Alternative 2: Source Control with cut off wall estimated to take approximately 1,000 years to achieve groundwater protection standards (GWPS-35 I.A.C Section 845.600) at all perimeter wells associated with the Fly Ash Pond System (FAPS). For the purpose of this assessment, a total duration of 30 years is used.
2. RS Means refers to the 2024 Quarter 4 online edition of RS Means Commercial New Construction.
3. See crew tab (Alt 2-Crew) for assumptions regarding crew size, total labor hours and required construction equipment, as needed, for each task.
4. See mileage tab (Alt 2-Mileage) for assumptions regarding total mileage for tasks outlined in this alternative.

ACRONYMS:

CW = Cutoff Wall
CY = Cubic Yard
EA = Each
FAPS = Fly Ash Pond System
GWPS = Groundwater Protection Standards
LB = Pounds
LF = Linear Foot
LS = Lump Sum
MO = Month
MSF = Square Feet Divided by 1000
O&M = Operation and Maintenance
PCF = Pounds per Cubic Foot
SY = Square Yards

CREW CODES
DYNEGY MIDWEST GENERATION, LLC. - BALDWIN POWER PLANT
CORRECTIVE ACTION ALTERNATIVES ANALYSIS SUPPORTING INFORMATION REPORT (CAAA-SIR)
ALTERNATIVE 2 - SOURCE CONTROL WITH CUTOFF WALL (CW)

							Project Total	
Item No.	**Crew Code**	**Labor**	**Daily Labor Hours**	**Equipment**	**Daily Equipment Hours**	**Crew Size**	**Onsite Labor Hours**	**Onsite Heavy Equipment Hours**
Construction								
4,5,7	2 Clab	Laborer x2	16	None	0	2	395	0
6	A2	Laborer x2 Truck Driver x1	24	Flatbed Truck, Gas, 1.5 ton	8	3	18	6
10	B10B	Operator x1 Laborer x0.5	12	Dozer, 200 H.P.	8	1.5	1,386	924
4,5	B11L	Operator (med) x 1 Laborer x 1	16	Grader, 30,000lb	8	2	198	99
9	B12H	Laborer x1 Operator x1	16	1 Crawler Crane, 25 Ton 1 Clamshell Bucket, 1 C.Y.	8	2	1,400	700
4,5,7	B14	Labor Foreman x 1 Operator (light) x1 Laborer x 4	48	Backhoe Loader, 48 H.P.	16	6	4,819	1,606
10	B14B	Operator x1 Laborer x0.5	12	Hyd. Excavator, 6 C.Y.	8	1.5	350	233
10	B34C	Truck Driver (heavy) x 1	8	Tractor Truck, 380 H.P. x 1 Dump Trailer, 16.5 C.Y. x 1	16	1	3,733	7,467
10	B34G	Truck Driver x1	8	Dump Truck, Off Hwy., 50 ton	8	1	725	725
10	B45	Operator (medium) x 1 Truck Driver (heavy) x 1	16	3000 Gallon Tanker x 1 Truck Tractor, 380 H.P. x 1	16	1	178	178
6	B62	Laborer x2 Operator x 1	24	Loader, Skid Steer, 30 H.P.	8	3	1,362	454
11	B65	Laborer x1 Truck Driver (light) x1	16	1 Power Mulcher (large) 1 Flatbed Truck, Gas, 1.5 ton	16	2	17	17
11	B66	Operator (light) x1	8	1 Loader-Backhoe, 40 H.P.	8	1	98	98
2	Eng	Engineering Staff x1.2	10	Side by Side x1	4	1.2	2,865	1,146
8	GM	Operator x1 Engineering Staff x3	32	Service Vehicle	0	1.2	600	0
				Construction Subtotals			18,100	13,700
						Totals	**18,100**	**13,700**

Note: Blue shaded crew codes were created by Ramboll based on experience (not pulled from RS Means).

CONSTRUCTION MILEAGE AND LABOR ESTIMATES
DYNEGY MIDWEST GENERATION, LLC. - BALDWIN POWER PLANT
CORRECTIVE ACTION ALTERNATIVES ANALYSIS SUPPORTING INFORMATION REPORT (CAAA-SIR)
ALTERNATIVE 2 - SOURCE CONTROL WITH CUTOFF WALL (CW)

Item	Quantity	Assumptions
Labor Total Hours	18,144	Per projected construction total (does not include contingency)
Duration of Onsite Construction Days	287	Total calendar days
Average Daily Crew Size	11.3	Assumes multiple crew sizes and a 10 hour work day Assumes 1 Ramboll personnel daily for construction oversight
Daily Labor Mobilization Miles	7,749	Includes mob/demob from STL (82 miles round trip) and local daily commute mileage (40 miles per day)
Vehicle Miles Onsite	48,713	1 mile per day round trip from gate to parking 5 miles per day for onsite miles 9 miles per day local trips (Vil. of Baldwin) No contingency included
Equipment Mobilization Miles - Unloaded	28,655	Average of 500 miles round trip for equipment hauling Average 1 load of equipment per working week
Equipment Mobilization Miles - Loaded	28,655	Average of 500 miles round trip for equipment hauling Average 1 load of equipment per working week
Onsite Haul Truck Miles - Unloaded	4,529	34 CY Off Road Dump Truck 2 miles round trip per load
Onsite Haul Truck Miles - Loaded	4,529	34 CY Off Road Dump Truck 2 miles round trip per load
Offsite Haul Truck Miles - Unloaded	337,097	Assumes 16 CY loads of material are delivered to the site from a regional supplier located within 50 miles of the site
Offsite Haul Truck Miles - Loaded	337,097	Assumes truck is returning to the regional supplier located within 50 miles of the site
Material Delivery Miles - Unloaded	57,310	Misc. construction materials (cement, bales, etc) Assumes 200 mile round trip on a daily basis
Material Delivery Miles - Loaded	57,310	Misc. construction materials (cement, bales, etc) Assumes 200 mile round trip on a daily basis

O&M Mileage and Labor Estimates

Item	Quantity	Assumptions
Labor Total Hours	0	No O&M for Alt 2
Duration of Onsite O&M Days	0	-
Average Daily Crew Size	0	-
Daily Labor Mobilization Miles	0	-
Vehicles Miles Onsite	0	-
Equipment Mobilization Miles - Unloaded	0	-
Equipment Mobilization Miles - Loaded	0	-
Onsite Haul Truck Miles - Unloaded	0	-
Onsite Haul Truck Miles - Loaded	0	-
Offsite Haul Truck Miles - Unloaded	0	-
Offsite Haul Truck Miles - Loaded	0	-
Material Delivery Miles - Unloaded	0	-
Material Delivery Miles - Loaded	0	-

ACRONYMS:
O&M = Operation and Maintenance

RAMBOLL

DYNEGY MIDWEST GENERATION, LLC. - BALDWIN POWER PLANT
CORRECTIVE ACTION ALTERNATIVES ANALYSIS SUPPORTING INFORMATION REPORT (CAAA-SIR)
ALTERNATIVE 3 - SOURCE CONTROL WITH GROUNDWATER MANAGEMENT SYSTEM (GMS)[1]

ITEM NO.	ENGINEERING, PRE-CONSTRUCTION, AND CONSTRUCTION SUPPORT TASKS	Units	Quantity	Crew	Daily Output	Labor Hours	Equipment Hours	Notes
1	Pre-Design Investigation, Final Groundwater Extraction Trench Design, and Bid Support	LS	1	-	-	0	0	Assumed based on Ramboll previous project experience.
2	Engineering Support and CQA During Construction	LS	1	Eng	-	1,810	724	Assumed based on Ramboll previous project experience.
	ENGINEERING, PRE-CONSTRUCTION, AND CONSTRUCTION SUPPORT ESTIMATED SUBTOTAL					**1,810**	**720**	
ITEM NO.	**SITE PREPARATION**	**Units**	**Quantity**	**Crew**	**Daily Output**	**Labor Hours**	**Equipment Hours**	**Notes**
3	Mobilization and De-Mobilization	LS	-	-	-	-	-	Assumed based on Ramboll previous project experience.
	General Construction Mobilization and De-Mobilization	LS	1	-	-	-	-	Assumed based on Ramboll previous project experience.
	Trenching Equipment Mobilization, Assembly, and De-Mobilization	LS	1	-	-	-	-	One-pass technology specific equipment mobilization derived from ROM cost provided by specialty contractor.
4	Staging Area and Settling Pond Area Preparation	-	-	-	-	1,362	257	Assumes construction of a 3-acre staging area and 4-acre settling pond. Once prepared, surface grading and stabilization will be completed in this 7-acre area.
	Staging Area and Pond Base Grading	EA	15	B11L	1.8	136	68	312213200200: Rough grade open sites 10,000-20,000 S.F., grader. Assumes grading will be needed for the 4-acre settling pond, and 3-acre staging/laydown area.
	Subsurface Stabilization Nonwoven Geotextile - Staging Area	SY	14,520	2 Clab	2500	93	0.0	313219161550: Geosynthetic soil stabilization, geotextile fabric, non-woven, 120 lb tensile strength includes scarifying and compaction. Assumes 3 acre staging area will need geosynthetic.
	Install Crushed Gravel Road (18" Thick) - Staging Area	SY	14,520	B14	615	1,133	189	015523500100: Temporary, roads, gravel fill, 18" gravel depth (scaled), excluding surfacing. Assumes 3 acre staging area will include a gravel base.
5	Access Road and Work Pad Preparation	-	-	-	-	4,275	725	Assumes construction of a 8,200-ft long and 50-ft wide work pad along the groundwater management system trench alignment and a 500-ft long and 50-ft wide access road leading to the fly ash pond. Once prepared, surface grading and stabilization will be completed in this 3-acre area.
	Access Roads and Work Pad Grading	EA	22	B11L	1.8	193	97	312213200200: Rough grade open sites 10,000-20,000 S.F., grader., work pad area, access road. Assumes grading of 50-ft wide work pad along the (8,200 ft) alignment and (500 ft) access road.
	Subsurface Stabilization Nonwoven Geotextile	SY	48,333	2 Clab	2500	309	-	313219161550: Geosynthetic soil stabilization, geotextile fabric, non-woven, 120 lb tensile strength includes scarifying and compaction; grading along the (8,200 ft) alignment and (500 ft) access road.
	Install Crushed Gravel Trench Work Pad (18" Thick)	SY	48,333	B14	615	3,772	629	015523500100: Temporary, roads, gravel fill, 18" gravel depth (scaled), excluding surfacing. Assumes grading along the (8,200 ft) alignment and (500 ft) access road.
6	Construction Soil Erosion & Sediment Controls	-	-	-	-	1,541	514	Assumes construction of a 50-ft wide work pad/access road for the full length of the groundwater management system collection trench and other earthwork areas. Once prepared, surface grading and stabilization will be completed along the trench work pad/acess road.
	Silt Fence	LF	41,200	B62	650	1,521	507	312514161000: Synthetic erosion control, silt fence, install and remove, 3' high. Assumes silt fence is installed on both sides of the filtrate collection trench alignments [8,200 ft], on both sides of the access road [500 ft]. around the perimeter of the 3 - acre staging area [1,500 ft], and around the perimeter of the 4-acre settling pond [1,700 ft]. Assumes the silt fence will get replaced once during construction.
	Sediment Log, Filter Sock	LF	824	A2	1000	20	6.6	312514160705: Sediment Log, Filter Sock, 9". Assume sediment log is needed along both sides of alignment of extraction trench (8,200 LF long), staging area, and settling pond perimeter (1,670 LF). Assume one filter sock is needed for every 50 ft of silt fence. Assumes the sediment log, filter sock will get replaced once during construction.
7	Construction Facilities	-	-	-	-	-	-	Includes monthly rentals associated with one (1) office trailer, two (2) storage trailers, and four (4) portable toilets for one year of construction activities.
	Office Trailer	MO - in use	24	-	-	-	-	015213200350: Office trailer, furnished, no hookups, 32' x 8', rent per month. Assume quantity of one (1).
	Storage Trailers	MO - in use	48	-	-	-	-	015213201350: Storage boxes, 40' x 8', rent per month. Unit rate doubled to assume quantity of two (2) boxes onsite.
	Portable Toilet	MO - in use	96	-	-	-	-	015433406410: Rent toilet, portable chemical. Unit rate multiplied by 4 to assume quantity of four (4) units onsite.
	SITE PREPARATION ESTIMATED SUBTOTAL					**7,178**	**1,496**	

ITEM NO.	Groundwater Management System Construction	Units	Quantity	Crew	Daily Output	Labor Hours	Equipment Hours	Notes
8	Installation of Groundwater Management System Trench (one pass)	LF	8,200	B12H	80	1,640	1,640	Installation of groundwater managment system trench using one-pass technology performed by a specialty contractor. Information provided by specialty contractor. Assumes one trench totaling 8,200 ft in length with an approximate depth of 50 ft (depth varies). Crew code selected to mimic the proposed crew provided by specialty contractor.
9	Trench Spoils Excavation and Disposal	CY - in place	45,556	-	-	4,147	3,770	Hauling and management of trench excavation spoils to the AP for placement beneath the final cover system.
	Excavation and Loading of Material	CY - as excavated	50,111	B14B	5000	120	80	312316435320: Excavating, large volume projects; excavation with truck loading; excavator, 6 C.Y. bucket, 100% fill factor (assume 10% fluff factor from ground to excavated).
	Pushing Materials to Excavator	CY - as excavated	50,111	B10B	1000	601	401	312323170020: Spread dumped material, no compaction, by dozer. Dozer support for excavation. Daily output edited to match excavation based on experience.
	Hauling and Dumping Onsite of Material for Moisture Conditioning	CY - as excavated	50,111	B34G	850	472	472	312323206170: Hauling; no loading equipment, including hauling, waiting, loading/dumping; 34 C.Y. off-road, 15 min wait/ld/uld., 15 MPH, cycle 2 mile.
	Spreading/Drying Moisture Conditioning	CY - as excavated	25,056	B10B	1000	301	200	312323170020: Spread dumped material, no compaction, by dozer. Daily output edited to match excavation based on experience.
	Dust Control Moisture Conditioning Prior to Loading	CY - as excavated	13,667	B45	1888	116	116	312323239000: Water, 3000 gal. truck, 3 mile haul. Assume 30% of volume will need to be wetted.
	Loading of Material	CY - as excavated	50,111	B14B	5605	107	72	312316434420: Excavating, large volume projects; restricted loading trucks; loader, 6 C.Y. bucket, 95% fill factor (assume 10% fluff factor from ground to excavated).
	Hauling Material Offsite	CY - as excavated	50,111	B34C	165	2,430	2,430	312323203080: Hauling; no loading equipment, including hauling, waiting, loading/dumping; 16.5 C.Y. truck off-road, 15 min wait/ld/uld., 40 MPH, cycle 20 miles.
	Landfill Tipping	CY - as excavated	50,111	-	-	-	-	Assumed landfill tipping.
10	Groundwater Mangagement System Mechanical Installation	-	-	-	-	1,160	195	Installation of a system to pump and convey extracted groundwater from the trenches to the new settling pond and associated discharge.
	Install Sump Pumps	EA	18	Q1	1.8	162	0.0	221429132010: Wet-pit-mounted, vertical sump pump, single stage, 25 GPM, 1 HP, 1-1/2" discharge. Assumes one pump per 450 ft of groundwater management system trench.
	Install Equalization Tank	EA	8	B6	1.0	192	64	Lump sum for installation of equalization tank at each trench and associated site preparation and instrumentation. Assumes 2 days for installation.
	Install Transfer Pumps and Controllers	EA	8	R30	1.0	208	0.0	Lump sum for installation of transfer pump and pump controller at each extraction trench to convey water from settling pond to discharge outfall based on Ramboll project experience. Assumes inclusion of housing structure and 2 days for installation.
	Excavate Utility Trench for Lines for Component Electric Hookup	LF	7,200	B54	860	67	67	312316142750: Utility trench excavating, chain trencher, 40 HP operator riding, 12" wide trench and backfill, 18" deep. Trench installed from power drop/compressor shed to groundwater management trench to supply compressed air and power to sump pits.
	Install Mechanical Elements and Piping	EA	8	R30	-	390	0.0	Assumes lump sum for furnishing all mechanical elements (air compressors, sump pumps, transfer pumps) and associated HDPE housing piping for distribution of power and housing of mechanical elements throughout the groundwater management system trench system. Assumes approximately 15 days of work.
	Excavate Utility Trench for Conveyance to Settling Pond	LF	1,000	B54	860	9.3	9.3	312316142750: Utility trench excavating, chain trencher, 40 HP operator riding, 12" wide trench and backfill, 18" deep. Utility trench installed from groundwater extraction trench to convey extracted water to the settling pond.
	Install 8" HDPE Conveyance Pipe to Settling Pond	LF	1,000	B22A	320	125	50	331413350300: Water supply distribution piping, piping HDPE, butt fusion joints, 40' lengths, 8" diameter, SDR 21. Includes labor, materials, and machine for installation and welding of HDPE pipe for conveying extracted water from trenches to settling pond.
	Backfill Utility Trench with Granular Trench Backfill	CY - as excavated	56	B10R	100	6.7	4.4	312316133060: Backfill trench, F.E. loader, wheel mtd., 1 C.Y. bucket, 200' haul. Backfill with granular trench backfill. Quantity based on trench dimensions 12" wide, 18" deep, 1,000 ft long.
11	Electrical Installation	-	-	-	-	1,073	432	Electrical Installation activities include 15 kV distribution, local transformers at each compressor shed supplying 480/277VAC power on the secondary side of the transformer.
	Installing Medium Voltage along Trench Allignment	LF	7,200	R15	1,850	187	62	2650513166450: Medium-cable single cable, copper XLP shielding, 15 kV, 250 kcmil, direct curial, excludes splicing & terminations. Labor and equipment hours were estimated assuming that four (4) 250 kcmil cables will be needed to supply three phase power to the compressor sheds.
	Pad Mounted Transformer Installation	EA	8	R3	0.65	246	49	261219100100: Transformer, oil filled, 5 kV or 15 kV, with taps, 277/480VAC secondary, 3 phase, 150 kVA pad monuted. Assumes a 15 kV pad mounted transformer will be placed at each compressor shed to supply power to shed components.
	Compressor Shed Electrical and Controls	EA	8	2 Elec	0.2	640	320	Assumes 2 electricians will install all electrical distribution equipment to compressor shed components and each shed will take 1-week of labor to complete.
12	Construction of Compressor & Mechanical Sheds	-	-	-	-	540	180	Lump sum based on Ramboll experience for construction of housing unit for air compressor sheds.
	Construct Compressor Shed	EA	8	B6	-	540	180	Assumes pre-fabricated mechnical instrumentation shelter, installed primarily by hand with light equipment assistance. Hours are based on Ramboll experience. Sheds will be fitted with hydraulic transfer equipment (air compressor and transfer pump) and will be located along the trench allignment.
13	Installation of Settling Pond	-	-	-	-	5,326	2,721	Quantity based on 4-acre pond, 5 feet deep. Assume all excavated material is reused for berm construction.
	Excavation of Settling Pond	BCY	32,267	B12C	1320	391	196	312316420260: Excavating, bulk bank measure, hydraulic, crawler mtd., 2 C.Y. cap (165 CY/hr). 15% addition included for loading of material onto trucks. Assumes size of settling pond to be 4 acres and 5 feet deep.
	Loading of Material	CY - as excavated	35,493	B14B	5605	76	51	312316434420: Excavating, large volume projects; restricted loading trucks; loader, 6 C.Y. bucket, 95% fill factor (assume 10% fluff factor from ground to excavated).
	Hauling Material Offsite	CY - as excavated	35,493	B34C	165	1,721	1,721	312323203080: Hauling; no loading equipment, including hauling, waiting, loading/dumping; 16.5 C.Y. truck off-road, 15 min wait/ld/uld., 40 MPH, cycle 20 miles.
	Landfill Tipping	CY - as excavated	35,493	-	-	-	-	Assumed landfill tipping generated used IEPA landfill tipping table. Assumes material is clasified as non-hazardous waste.
	Subsurface Stabilization Nonwoven Geotextile	SY	19,360	2 Clab	2500	124	0.0	313219161550: Geosynthetic soil stabilization, geotextile fabric, non-woven, 120 lb tensile strength includes scarifying and compaction. Assumes 4 acre settling pond.
	Settling Pond Liner	SF	174,240	B63B	1850	3,014	753	310519531100: Reservoir liners, membrane lining, 40 mil, LLDPE. Assumes 4 acre ft print.
	GROUNDWATER MANAGEMENT SYSTEM TRENCH CONSTRUCTION				-	**13,885**	**8,937**	

ITEM NO.	SITE RESTORATION	Units	Quantity	Crew	Daily Output	Labor Hours	Equipment Hours	Notes
14	Site Restoration	-	-	-	-	136	135	Assumes restoration of grade surface following groundwater management system trench installation activities.
	Lime	MSF	650	B66	700	8.0	7.4	329113234250: Soil preparation, structural soil mixing, spread soil conditioners, ground limestone, 1#/S.Y., tractor spreader. Unit multiplied by 1.1 to account for soils possibly being void of nutrients. Quantity assumes areas include staging area, temporary roads, as well as areas adjacent to sediment pond.
	Fertilizer	MSF	650	B66	700	8.0	7.4	329113234150: Soil preparation, structural soil, mixing, spread soil conditioners, fertilizer, 0.2#/S.Y., tractor spreader. Unit multiplied by 1.1 to account for soils possibly being void of nutrients. Quantity assumes areas include staging area, temporary roads, as well as areas adjacent to sediment pond.
	Grassland Mix	MSF	650	B66	52	100	100	329219142300: Seeding athletic fields, seeding fescue, tall, 5.5 lb. per M.S.F., tractor spreader. Quantity assumes areas include staging area, temporary roads, as well as areas adjacent to sediment pond.
	Mulch	MSF	650	B65	530	20	20	329113160350: Mulching, Hay, 1" deep, power mulcher, large. Quantity assumes areas include staging area, temporary roads, as well as areas adjacent to sediment pond.
15	Final Cover Restoration	-	-	-	-	3,350	3,242	Assumes restoration of 18" thick X 50' wide clay cap footprint following groundwater management system trench installation activities.
	Clay	CY	22,778	B13D	376	969	969	Imported clay for south area ramp. Assumes 8000 CY. Based on Ramboll experience. Assumes 18" cap and 50' wide restoration.
	Haul Material to Site	CY - as excavated	22,778	B34C	99	1,841	1,841	312323203104: Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 16.5 C.Y. truck, cycle 50 miles, 45 mph, excludes loading equipment.
	Hauling Stockpiled Clay	CY - as excavated	22,778	B34G	850	214.4	214.4	312323206170: Hauling; no loading equipment, including hauling, waiting, loading/dumping; 34 C.Y. off-road, 15 min wait/ld./uld., 15 MPH, cycle 2 mile.
	Spread Lifts for Clay	CY - as excavated	22,778	B10B	1000	273	182.2	312323170020: Spread dumped material, no compaction, by dozer. Daily output edited to match excavation based on experience.
	Compaction of Clay	CY - in place	22,778	B10Y	5200	52.6	35.0	312323235060: Compaction; Riding, vibrating roller, 12" lifts, 2 passes. RS Means Crew is B10Y. RS Means unit rate halved for 24" lifts.
	SITE RESTORATION ESTIMATED SUBTOTAL				-	**3,486**	**3,376**	
	TOTAL CONSTRUCTION ESTIMATED SUBTOTAL				**-**	**26,400**	**14,500**	
ITEM NO.	**CORRECTIVE ACTION OPERATION AND MAINTENANCE**	**Units**	**Quantity**	**Crew**	**Daily Output**	**Labor Hours**	**Equipment Hours**	**Notes**
16	Groundwater Extraction Trench Operation & Maintenance	-	-	-	-	9,600	0.0	Assumes routine monitoring, maintenance, and electrical service charges for the duration of system operation.
	Field Maintenance	Days	480	TM	-	9,600	0.0	Assumes quarterly maintenance on pneumatic pumps and air compressors over 30 years of operation. Each quarterly maintenance event assumes 2 staff for 4 days to check, clean, and service all mechanical parts.
	Electrical Distribution and Service Charges	MO	360	-	-	-	-	Monthly electrical distribution and usage for operating the extraction and transfer pumps.
17	Non-routine System O&M	-	-	-	-	9,600	3,000	Assumes non-routine tasks including flushing of groundwater conveyance lines and periodic site visits (e.g., alarm responses or equipment troubleshooting).
	Groundwater Conveyance Line Flushing - Vacuum Truck	LF	492,000	VT	-	6,000	3,000	330130116140: Pipe, internal cleaning and inspection, cleaning, power rodder with header & cutts, 4"-12" diameter. Assumes one 5-day cleaning event of 8,200 LF of 8" HDPE pipe twice per year for a total of 30 years.
	Non-Routine Site Visits/Alarm Responses	LS	360	OM	-	3,600	0.0	Assumes 12 non-routine site visits per year over 30 years of operation. Each non-routine event assumes 2 staff for 1 day.
18	Engineering Oversight/Support	LS	30	-	-	-	-	Assumes office-based engineering support over 30 years of operation.
	CORRECTIVE ACTION OPERATION AND MAINTENANCE SUBTOTAL			-	-	**19,200**	**3,000**	
						Total Labor Hours	**Total Equipment Hours**	
	ENGINEERING AND CONSTRUCTION SUBTOTAL			**-**	**-**	**26,400**	**14,500**	
	CORRECTIVE ACTION OPERATION AND MAINTENANCE SUBTOTAL			**-**	**-**	**19,200**	**3,000**	
	SUBTOTAL					**45,600**	**17,500**	

NOTES:

1. Alternative 3: Groundwater Management System is estimated to take approximately 1,000+ years to achieve groundwater protection standards (GWPS-35 I.A.C Section 845.600) at all perimeter wells associated with the Fly Ash Pond System (FAPS). For the purpose of this assessment, a total duration of 30 years is used.
2. RS Means refers to the 2024 Quarter 4 online edition of RS Means Commercial New Construction.
3. See crew tab (Alt 3 - Crews) for assumptions regarding crew size, total labor hours and required construction equipment, as needed, for each task.
4. See mileage tab (Alt 3 - Mileage and Labor) for assumptions regarding total mileage for tasks outlined in this alternative.

ACRONYMS:

CY = Cubic Yard
Bank: Material in natural compacted state
EA = Each
FAPS = Fly Ash Pond System
GMS = Groundwater Management System
GWPS = Groundwater Protection Standards
LB = Pound
LF = Linear Foot
LS = Lump Sum
MO = Month
MSF = square feet divided by 1000
O&M = Operation and Maintenance
SF = Square Feet
SY = Square Yard

CREW CODES
DYNEGY MIDWEST GENERATION, LLC. - BALDWIN POWER PLANT
CORRECTIVE ACTION ALTERNATIVES ANALYSIS SUPPORTING INFORMATION REPORT (CAAA-SIR)
ALTERNATIVE 3 - SOURCE CONTROL WITH GROUNDWATER MANAGEMENT SYSTEM

Item No.	Crew Code	Labor	Daily Labor Hours	Equipment	Daily Equipment Hours	Onsite Labor Hours	Onsite Heavy Equipment Hours
Construction							
4,5,13	2 Clab	Laborer x 2	16	None	0	526	0
11	2 Elec	Electrician x 2	16	Crew Truck x 1	8	640	320
6	A2	Laborer x 2 Truck Driver (light) x 1	24	Flatbed Truck, Gas, 1.5 ton	8	20	7
10,12	B6	Laborer x 2 Operator (light) x 1	24	Backhoe Loader, 48 H.P.	8	732	244
9,15	B10B	Operator (med) x1 Laborer x0.5	12	Dozer, 200 H.P.	8	1,175	784
10	B10R	Operator (med) x 1 Laborer x 0.5	12	Frontend loader, W.M., 1 C.Y.	8	7	4
15	B10Y	Operator (med) x1 Laborer x0.5	12	1 Vibr. Roller, Towed, 12 ton	8	53	35
4,5	B11L	Operator (med) x 1 Laborer x 1	16	Grader, 30,000lb	8	329	164
13	B12C	Operator (med) x 1 Laborer x 1	16	Hydraulic excavator, 2 C.Y.	8	391	196
8	B12H	Operator (crane) x 1 Laborer x 1	16	Crawler Crane, 25-ton, x 1 Clamshell Bucket, 1 C.Y. x 1	16	1,640	1,640
15	B13D	Operator (crane) x 1 Laborer x 1	16	Hydraulic excavator, 1 C.Y. Trench Box	16	969	969
4,5	B14	Labor Foreman x 1 Operator (light) x1 Laborer x 4	48	Backhoe Loader, 48 H.P.	8	4,906	818
9,13	B14B	Operator (crane) x 1 Laborer x 0.5	12	Hydraulic excavator, 6. C.Y.	8	304	202
10	B22A	Labor Foreman x 1 Skilled Worker x 1 Laborer x 2 Operator (crane) x 1	40	S.P. Crane, 4x4, 5 ton Butt Fusion Machine, 4-12" diam.	16	125	50
9,13,15	B34C	Truck Driver x 1	8	Truck Tractor, 6x4, 380 H.P. Dump Trailer, 16.5 C.Y.	8	5,991	5,991
9,15	B34G	Truck Driver x 1	8	Dump Truck, Off Hwy., 50 ton	8	686	686
9	B45	Operator (medium) x 1 Truck Driver (heavy) x 1	16	3000 Gallon Tanker x 1 Truck Tractor, 380 H.P. x 1	16	116	116
10	B54	Operator (light) x 1	8	Trencher, Chain, 40 H.P.	8	76	76
6	B62	Laborer x 2 Operator (light) x 1	24	Loader, Skid Steer, 30 H.P.	8	1,521	507
13	B63B	Labor Foreman x 1 Laborer x 2 Operator (light) x 1	32	Loader, Skid Steer, 78 H.P.	8	3,014	753
14	B65	Laborer x1 Truck Driver (light) x 1	16	Power Mulcher (large) Flatbed Truck, Gas, 1.5 ton	16	20	20
14	B66	Operator (light) x 1	8	Loader-Backhoe, 40 H.P.	8	116	115
10	Q1	Plumber x1 Plumber Apprentice x1	16	None	0	162	0
11	R3	Electrician Foreman x1 Electrician x1 Electrician Operators x0.5	20	S.P. Crane 4x4	4	246	49
11	R15	Electrician Foreman x1 Electrician x4 Electrician Operators x1	48	Crew Truck x2	16	187	62
10	R30	Electrician Foreman x 0.25 Electrician x 1 Laborer (Semi-Skilled) x 2	26	None	0	598	0
2	Eng	Engineering Staff x 1.2	10	Side by Side x1	4	1,810	724
				Construction Subtotals		26,400	14,500
Corrective Action Operation & Maintenance							
17	OM	Laborer x 1	10	Service Truck x1	0	3,600	0
16	TM	Maintenance Crew x 2	20	Service Truck x2 Hand Tools	0	9,600	0
17	VT	Laborer x 1 Operator x 1	20	Vacuum Truck with Flushing Capabilities	10	6,000	3,000
				O&M Subtotals		19,200	3,000
					Totals	**45,600**	**17,500**

Note: Blue shaded crew codes were created by Ramboll based on experience (not pulled from RS Means).

ACRONYMS:
O&M = Operation and Maintenance

CONSTRUCTION MILEAGE AND LABOR ESTIMATES
DYNEGY MIDWEST GENERATION, LLC. - BALDWIN POWER PLANT
CORRECTIVE ACTION ALTERNATIVES ANALYSIS SUPPORTING INFORMATION REPORT (CAAA-SIR)
ALTERNATIVE 3 - SOURCE CONTROL WITH GROUNDWATER MANAGEMENT SYSTEM

Item	Quantity	Assumptions
Labor Total Hours	26,400	Per projected construction total (does not include contingency or O&M labor hours)
Duration of Onsite Construction Days	181	Total calendar days
Average Daily Crew Size	13	Assumes multiple crew sizes and a 10 hour work day Assumes 1 Ramboll personnel daily for construction oversight
Daily Labor Mobilization Miles	10,132	Includes mob/demob from STL (82 miles round trip) and local daily commute mileage (40 miles per day)
Vehicles Miles Onsite	35,296	1 mile per day round trip from gate to parking 5 miles per day for onsite miles 9 miles per day local trips (Vil. of Baldwin) No contingency included
Equipment Mobilization Miles - Unloaded	18,100	Average of 500 miles one-way trip for equipment hauling Average 1 load of equipment per working week for a 5 day work week.
Equipment Mobilization Miles - Loaded	18,100	Average of 500 miles one-way trip for equipment hauling Average 1 load of equipment per working week for a 5 day work week.
Onsite Haul Truck Miles - Unloaded	4,288	34 CY Off Road Dump Truck 2 miles per trip per load
Onsite Haul Truck Miles - Loaded	4,288	34 CY Off Road Dump Truck 2 miles per trip per load
Offsite Haul Truck Miles - Unloaded	436,903	16 CY loads of material are delivered to the site from a regional supplier located within 50 miles of the site. Assumes truck is returning to the origin location.
Offsite Haul Truck Miles - Loaded	436,903	16 CY loads of material are delivered to the site from a regional supplier located within 50 miles of the site. Assumes truck is returning to the origin location.
Material Delivery Miles - Unloaded	36,201	Misc. construction materials (erosion controls, piping, geotextile) Assumes 200 mile round trip on a daily basis
Material Delivery Miles - Loaded	36,201	Misc. construction materials (erosion controls, piping, geotextile) Assumes 200 mile round trip on a daily basis

O&M Mileage and Labor Estimates

Item	Quantity	Assumptions
Labor Total Hours	19,200	Per projected O&M total in cost estimate (does not include contingency)
Duration of Onsite O&M Days	960	Total days
Average Daily Crew Size	2	Assumes multiple crew sizes and a 10 hour work day
Daily Labor Mobilization Miles	40,649	Includes mob/demob from STL (82 miles round trip) and local daily commute mileage (40 miles per day)
Vehicles Miles Onsite	28,800	1 mile per day round trip from gate to parking 5 miles per day for onsite miles 9 miles per day local trips (Vil. of Baldwin) No contingency included
Equipment Mobilization Miles - Unloaded	15,000	Average of 500 miles one-way trip for equipment hauling Average 1 load of equipment per year
Equipment Mobilization Miles - Loaded	15,000	Average of 170 miles one-way trip for equipment hauling Average 1 load of equipment per year
Onsite Haul Truck Miles - Unloaded	0	No material hauling onsite will occur under this alternative
Onsite Haul Truck Miles - Loaded	0	No material hauling onsite will occur under this alternative
Offsite Haul Truck Miles - Unloaded	0	No material hauling offsite will occur under this alternative
Offsite Haul Truck Miles - Loaded	0	No material hauling offsite will occur under this alternative
Material Delivery Miles - Unloaded	0	No materials will be delivered during O&M
Material Delivery Miles - Loaded	0	No materials will be delivered during O&M

ACRONYMS:
O&M = Operation and Maintenance

Appendix C

Corrective Measures Assessment

Intended for
Dynegy Midwest Generation, LLC

Date
April 24, 2024

Project No.
1940103584-001

35 I.A.C. § 845 CORRECTIVE MEASURES ASSESSMENT

FLY ASH POND SYSTEM

BALDWIN POWER PLANT

BALDWIN, ILLINOIS

IEPA ID: W1578510001-01/02/03

RAMBOLL Bright ideas. Sustainable change.

35 I.A.C. § 845 CORRECTIVE MEASURES ASSESSMENT BALDWIN POWER PLANT FLY ASH POND SYSTEM

Project name	**Baldwin Power Plant Fly Ash Pond System**
Project no.	**1940103584-001**
Recipient	**Dynegy Midwest Generation, LLC**
Document type	**35 I.A.C. § 845 Corrective Measures Assessment**
Revision	**FINAL**
Date	**April 24, 2024**
Prepared by	**Frances Ackerman, RG, PE**
Checked by	**Lucas P. Carr, PE**
Approved by	**Brian G. Hennings, PG**

Frances Ackerman, RG, PE
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FIGURES

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Figure 2-2 Site Map
Figure 2-3 Uppermost Aquifer Potentiometric Surface Map - May 15-17, 2023
Figure 2-4 Monitoring Well Location Map

ACRONYMS AND ABBREVIATIONS

35 I.A.C.	Title 35 of the Illinois Administrative Code
40 C.F.R.	Title 40 of the Code of Federal Regulations
ASD	Alternative Source Demonstration
BPP	Baldwin Power Plant
BAP	Bottom Ash Pond
CAAA	Corrective Action Alternatives Analysis
CAP	Corrective Action Plan
CCR	coal combustion residuals
CIP	closure-in-place
CMA	assessment of groundwater corrective measures
cm/s	centimeters per second
CSM	conceptual site model
DMG	Dynegy Midwest Generation, LLC
E001	Event 1; quarter 2, 2023
E002	Event 2; quarter 3, 2023
E003	Event 3; quarter 4, 2023
EPRI	Electric Power Research Institute
FAPS	Fly Ash Pond System
GMP	groundwater monitoring plan
GWPS	groundwater protection standard(s)
HCR	Hydrogeologic Site Characterization Report
ID	identification
IDNR	Illinois Department of Natural Resources
IEPA	Illinois Environmental Protection Agency
ITRC	National Research Council, Interstate Technology & Regulatory Council
IX	Ion Exchange
NID	National Inventory of Dams
No.	number
NPDES	National Pollutant Discharge Elimination System
NRT	Natural Resource Technology
NRT/OBG	Natural Resource Technology, an OBG Company
PMP	Potential Migration Pathway
PRB	permeable reactive barrier
Ramboll	Ramboll Americas Engineering Solutions, Inc.
SI	surface impoundment
UA	uppermost aquifer
UU	Upper Unit
USEPA	United States Environmental Protection Agency
ZVI	zero-valent iron

1. INTRODUCTION

Ramboll Americas Engineering Solutions, Inc. (Ramboll) has developed this assessment of groundwater corrective measures (CMA) on behalf of the Baldwin Power Plant (BPP), owned by Dynegy Midwest Generation, LLC (DMG), to assist in the compliance with the requirements of Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845. This assessment applies specifically to the coal combustion residuals (CCR) surface impoundment (SI) referred to as the Fly Ash Pond System (FAPS), also referred to as Vistra Identification (ID) Number (No.) 605, Illinois Environmental Protection Agency (IEPA) ID Nos. W1578510001-01, W1578510001-02, and W1578510001-03, and National Inventory of Dams (NID) No. IL50721. This report addresses content requirements specific to 35 I.A.C. § 845.660 (Assessment of Corrective Measures) for exceedances of boron and sulfate at the FAPS.

1.1 Source Control and Residual Plume Management

DMG completed significant source control and residual plume management efforts in 2020 as part of final closure of the FAPS (DMG, 2020). The final closure was performed in accordance with the Closure and Post-Closure Care Plan (AECOM, 2016) that was developed in accordance with Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257 and submitted to IEPA for review. IEPA found "*…that the plan…represent an appropriate means by which to close the Baldwin Fly Ash Pond System which is comprised of the East Fly Ash Pond, the Old East Fly Ash Pond and the West Fly Ash Pond*" (IEPA, 2016). The final closure was addressed in accordance with the IEPA Water Pollution Control permit 2020-EA-65016.

The FAPS closure construction included closure-in-place (CIP) of the entire FAPS. This was accomplished by removing impounded water and constructing a final cover system in accordance with 40 C.F.R. § 257.102 to minimize water infiltration into the closed FAPS and improve surface water drainage off the cover system, thus reducing generation of potentially impacted water and ultimately reducing the extent of CCR impacts to groundwater. The source control was predicted to lower water levels, decrease the potential transport of CCR constituents off-site and prevent groundwater protection standards (GWPS) from being exceeded in any water supply wells (Natural Resource Technology [NRT], 2014a). These source control activities will serve as the primary groundwater corrective measure at the FAPS. The potentially feasible corrective measures presented herein are intended to be supplementary to the primary source control and are intended to serve as management measures to address any residual plume that may remain after completion of source control.

1.2 Adaptive Site Management

Adaptive site management strategies will be employed as an integral part of ongoing corrective action at the FAPS. The adaptive site management approach will allow timely incorporation of new site information over the closure and post-closure life cycle of the FAPS to ensure the achievement of the GWPS. The adaptive site management approach is proposed to expedite progress toward meeting the GWPS while acknowledging uncertainties, such as the persistence of current groundwater flow directions and flux quantities and potential related changes in geochemical conditions. A structured decision-making process and explicitly planned iterations between the implemented corrective measures and monitoring results will ensure that active remediation is occurring. System performance and the condition of the residual plume will be monitored as the corrective measure(s) selected through the 35 I.A.C. § 845.710 Corrective

Action Plan (CAP) process are implemented to supplement the source control measures described above. If the groundwater concentrations do not decrease consistent with modeling predictions, the adaptive site management approach will facilitate timely modifications or enhancements to the corrective measure(s), as needed, in accordance with 35 I.A.C. § 845.680(b). this approach will be employed to provide continuous improvement to the FAPS groundwater remediation in response to new site information and/or the performance of the selected corrective measure(s).

The planned adaptive site management strategies are generally consistent with National Research Council, Interstate Technology & Regulatory Council (ITRC) and United States Environmental Protection Agency (USEPA) methodologies developed to address sites with long remediation times and high levels of uncertainty regarding the remedial actions necessary to achieve final and protective remediation goals (USEPA, 2022). The elements of the proposed adaptive site management strategy at the FAPS will be responsive to the changing conditions associated with pond closure and performance of the selected corrective measure(s) and will include the following:

1. Implementing the groundwater corrective measure(s) selected as part of the CAP for the current conditions at the FAPS. The selected corrective measures may include a combination of the technologies presented in this CMA.
2. Establishing both the absolute remedial objective and functional (interim) goals to monitor progress toward the remedial objective. Achieving the GWPS for 35 I.A.C. § 845.600 constituents at the downgradient waste boundary is the remedial objective for the FAPS. Specific functional goals will be developed as part of the CAP process. The functional goals will be measurable thresholds for future action and may include short-term or technology-specific objectives and triggers. Functional goals may vary for different locations, CCR constituents or other site-specific considerations (ITRC, 2017) and will serve as benchmarks for comparison to ongoing groundwater monitoring at the FAPS.
3. Ongoing groundwater monitoring at the FAPS will continue throughout the implementation of source control and residual plume management activities. Post-closure monitoring will continue for a period of at least 30 years, in accordance with 35 I.A.C. § 845.780. A comprehensive groundwater monitoring plan (GMP) will be developed as part of the CAP process in accordance with 35 I.A.C. § 845.670 and 35 I.A.C. § 845.220(c)(4). The GMP will include the functional goals and proposed action levels.
4. Groundwater monitoring information will be used to guide decisions regarding whether progress toward the remedial goal is advancing as expected and/or whether additional actions may be needed to achieve the remedial objective, in conjunction with IEPA, as required by 35 I.A.C. § 845.680(b).

2. SITE INFORMATION

The BPP is located in southwest Illinois in Randolph and St. Clair Counties. The FAPS is approximately one-half mile west-northwest of the Village of Baldwin (**Figure 2-1**). The FAPS is a closed CCR SI consisting of three closed, unlined CCR sub-units identified as follows: Old East Fly Ash Pond (IEPA Unit ID W1578510001-01), the East Fly Ash Pond (IEPA Unit ID W1578510001-02), and West Fly Ash Pond (IEPA Unit ID W1578510001-03). The three sub-units comprise the FAPS and are surrounded by a continuous earthen embankment. Prior to closure, the sub-units were divided utilizing internal splitter dikes to support plant operations. The combined surface area of the FAPS is approximately 232 acres (**Figure 2-2**).

A Closure and Post-Closure Care Plan (AECOM, 2016), which included a groundwater monitoring program sufficient for long-term, post-closure monitoring, was developed and approved by IEPA in a letter to DMG dated August 16, 2016 (IEPA, 2016). Closure activities, which included constructing a final cover system to control the potential for water infiltration into the closed CCR unit, were completed by November 17, 2020 (IEPA, 2016).

2.1 Conceptual Site Model

Significant site investigation has been completed at the BPP to characterize the geology, hydrogeology, and groundwater quality. Based on the extensive investigation and monitoring, the FAPS has been well characterized, as detailed in the Hydrogeologic Site Characterization Report (HCR; Ramboll, 2021) and HCR Revision 1 (Ramboll, 2023a), prepared to comply with the requirements specified in 35 I.A.C. § 845.620. The HCR and revised HCR expand upon the Hydrogeologic Monitoring Plan (Natural Resource Technology, an OBG Company [NRT/OBG], 2017). The conceptual site model (CSM) is presented below.

The following two distinct hydrostratigraphic units have been identified beneath the FAPS, based on stratigraphic relationships and common hydrogeologic characteristics:

- **Upper Unit (UU)/Potential Migration Pathway (PMP):** Predominantly clay with some silt and minor sand, silt layers, and occasional sand lenses. This unit is composed of unlithified natural geologic materials and extends from the upper saturated materials to the bedrock. Thin sand seams and the interface (*i.e.,* contact) between the UU and bedrock have been identified as PMPs. No continuous sand seams were observed within or immediately adjacent to the FAPS; however, the sand seams may act as a PMP due to relatively higher hydraulic conductivities.
- **Bedrock Unit:** This unit is considered the uppermost aquifer (UA) and is composed of interbedded shale and limestone bedrock, which underlies and is continuous across the entire Site.

Lateral groundwater flow in the shallow unlithified materials and bedrock is generally to the west and southwest across the Site toward the Kaskaskia River. Groundwater flow in bedrock is toward the northwest in the east and central areas of the FAPS, and southwest to northwest on the east area of the FAPS. Once groundwater reaches the bedrock valley feature underlying the Secondary and Tertiary Ponds (non-CCR units), located west of the Bottom Ash Pond (BAP) and FAPS, the flow direction veers towards this bedrock surface low. Groundwater elevations and contours for the May 15-17, 2023 monitoring event (Event 1 [E001]) are presented in **Figure 2-3**.

2.2 Groundwater Quality

Groundwater monitoring in accordance with the proposed GMP and sampling methodologies provided in the operating permit application for the FAPS began in the second quarter of 2023.The 35 I.A.C. § 845 groundwater monitoring system is displayed on **Figure 2-4** and consists of two background monitoring wells screened in the bedrock (*i.e.,* UA), nine compliance wells installed in the bedrock (*i.e.,* UA), and six compliance wells installed within the unlithified UU/PMP. The groundwater samples collected from the 17 wells are used to monitor and evaluate groundwater quality and demonstrate compliance with the groundwater quality standards listed in 35 I.A.C. § 845.600(a). The monitoring wells yield groundwater samples that represent the quality of downgradient groundwater at the CCR boundary (as required in 35 I.A.C. § 845.630(a)(2)).

The E001 sampling event was completed on May 23, 2023. In accordance with 35 I.A.C. § 845.610(b)(3)(C), statistically derived values were compared with the GWPSs summarized in 35 I.A.C. § 845.600 to determine exceedances of the GWPS (Ramboll, 2023b). The statistical determination identified the following GWPS exceedances at compliance groundwater monitoring wells:

- Boron at PMP well MW-150 and UA well MW-391;
- Sulfate at PMP well MW-150;

Subsequent compliance sampling events for Quarter 3 and Quarter 4 2023 (Event 2 [E002] and Event 3 [E003]) were completed in August and November 2023 and groundwater samples were evaluated for exceedances of the GWPS as described in 35 I.A.C. § 845.600 (Ramboll, 2023c; Ramboll, 2024). Additional exceedances were identified during the E002 and E003 monitoring events:

- Boron at PMP well MW-152
- pH at PMP well MW-253

An alternative source determination (ASD), as allowed by 35 I.A.C. § 845.650(e), was completed for the pH exceedance at well MW-253 (Geosyntec Consultants, Inc., 2024) and received concurrence in a letter from the IEPA dated March 7, 2024 (IEPA, 2024). Therefore, this CMA will address identified GWPS exceedances, exclusive of pH exceedance at MW-253, in accordance with 35 I.A.C. § 845.660.

3. CORRECTIVE MEASURES ASSESSMENT METHODOLOGY

This section describes the CMA methodology initiated in response to the identification of exceedances of the GWPSs for 35 I.A.C. § 845.600 constituents at the downgradient waste boundary of the FAPS during the E001 groundwater monitoring event (Ramboll, 2023b). The CMA was initiated on November 26, 2023, within 90 days after the detection of boron and sulfate exceedance(s) of GWPS. Under 35 I.A.C. § 845, owners and operators of existing CCR SIs must initiate the CMA in accordance with 35 I.A.C. § 845.660 if one or more constituents are detected, and confirmed by an immediate resample, to be in exceedance of a GWPS in 35 I.A.C. § 845.600, and the owner or operator has not demonstrated that: a source other than the CCR SI caused the exceedance, or that the exceedance of the GWPS resulted from error in sampling, analysis, statistical evaluation, natural variation in groundwater quality or a change in the potentiometric surface and groundwater flow direction (*i.e.,* ASD).

The CMA is the first step in developing a long-term CAP to address the GWPS exceedances at CCR SIs. The process provides a systematic, rational method for evaluating potential corrective measures by first identifying potentially viable technologies and assessing them using qualitative information to eliminate from consideration infeasible or otherwise unacceptable remedial technologies (*i.e.,* the 35 I.A.C. § 845.660 CMA). The remaining technologies will be evaluated individually, or assembled into combined alternatives, and further evaluated under the 35 I.A.C. § 845.670 CAP process.

This CMA identified applicable corrective measure technologies and evaluated them for viability, given the site-specific conditions and considerations at the FAPS, by addressing the following 35 I.A.C. § 845.660 evaluation criteria:

- Performance, reliability, ease of implementation and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;
- Time required to begin and complete the CAP; and
- Institutional requirements, such as State or local permit requirements or other environmental or public health requirements, that may substantially affect implementation of the CAP.

The evaluation included qualitative and/or semi-quantitative screening of the potential corrective measures (technologies) relative to their general performance, reliability, and ease of implementation characteristics and their potential impacts, timeframes, and institutional requirements to assess the viability of each technology to address the GWPS exceedances at the FAPS. This approach provided a reasoned set of corrective measures that could be used, either individually or in combination, to supplement the completed source control measures described in **Section 1.1**. This set of corrective measures will be further evaluated through the CAP process.

4. DESCRIPTION OF POTENTIAL CORRECTIVE MEASURE TECHNOLOGIES

The potential groundwater corrective measures summarized below are applicable to the FAPS and were included in the CMA development and analysis. Site-specific considerations provided in **Section 2** were used to evaluate potential groundwater corrective measures. Each of the corrective measures evaluated may be capable of satisfying the requirements and objectives, listed in **Section 3**, to varying degrees of effectiveness. The corrective measure review process was intended to yield a set of applicable corrective measures that could be used to supplement the primary corrective action, namely the completed source control activities described in **Section 1.1** (CIP with final cover system). The completed source control has significantly reduced infiltration rates relative to pre-closure conditions. Ongoing monitoring will be an integral part of all corrective measures to verify and document the remedial process. The corrective measures ultimately advanced to the Corrective Action Alternatives Analysis (CAAA) and selected in the CAP will be used to enhance the effectiveness of the completed source control and may be used independently or combined into specific remedial alternatives to leverage the advantages of multiple corrective measures to attain GWPSs.

Source control measures were completed in 2020 at the FAPS, as described in **Section 1.1**; all of the evaluated corrective measure technologies are proposed to be supplemental and complementary to source control activities. The following potential corrective measures, commonly used to mitigate groundwater impacts, were considered as a part of the CMA process:

- Source Control with Groundwater Polishing;
- Source Control with Groundwater Extraction (groundwater pumping wells or collection trenches);
- Source Control with a Cutoff Wall; and
- Source Control with In-Situ Treatment (Permeable Reactive Barrier [PRB] or In-Situ Chemical Treatment).

4.1 Source Control with Groundwater Polishing

Both federal and state regulators have long recognized that natural geochemical processes can be an acceptable component of a remedial action when it can achieve remedial action objectives in a reasonable timeframe. In 1999, USEPA published a final policy directive for groundwater remediation and described the process as follows:

- *"The reliance on natural attenuation processes (within the context of a carefully controlled and monitored site cleanup approach) to achieve site-specific remediation objectives within a time frame that is reasonable compared to that offered by other more active methods. The 'natural attenuation processes' that are at work in such a remediation approach include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. These in-situ processes include biodegradation; dispersion; dilution; sorption; volatilization; radioactive decay; and chemical or biological stabilization, transformation, or destruction of contaminants."* (USEPA, 1999).

The USEPA has stated that source control is the most effective means of ensuring the timely attainment of remediation objectives (USEPA, 1999). Natural geochemical processes may be appropriate as a "finishing step" after effective source control implementation (*i.e.*, groundwater polishing), to reduce the residual mass remaining in the groundwater after closure, if there are no risks to receptors and/or the contaminant plume is not expanding. Thus, groundwater polishing would be used in conjunction with the significant planned source control effort at the site, which consisted of a hybrid consolidate-and-cap approach with a final cover system described in **Section 1.1**.

In 2015, USEPA addressed remediation of inorganic compounds in groundwater and noted that the use of natural geochemical processes to address inorganic contaminants: (1) is not intended to constitute a treatment process for inorganic contaminants; (2) when appropriately implemented, can help to restore an aquifer to beneficial uses by immobilizing contaminants onto aquifer solids and providing the primary means for attenuation of contaminants in groundwater; and (3) is not intended to be a "do nothing" response (USEPA, 2015). Rather, documenting the applicability of natural geochemical processes for groundwater remediation should be thoroughly and adequately supported with site-specific characterization data and analysis (USEPA, 1999; USEPA, 2007; USEPA, 2015).

Both physical and chemical processes can contribute to the reduction in mass, toxicity, mobility, volume, or concentration of contaminants in groundwater. Physical processes applicable to CCR include dilution, dispersion, and flushing. Chemical processes applicable to CCR constituents in groundwater include precipitation and coprecipitation (*e.g.,* incorporation into sulfide minerals), sorption (*e.g.,* to iron, manganese, aluminum; to other metal oxides or oxyhydroxides; or to sulfide minerals or organic matter), and ion exchange.

All inorganic compounds are subject to physical processes, and under typical environmental conditions the physical mechanisms most often exert the dominant control on the CCR constituents of interest, such as sulfate and chloride, and lithium to a more variable degree. Chemical mechanisms are also likely to be active, though not often dominant, such as adsorption, ion exchange, and organic complexation. In combination with source control, these natural controls can provide an effective means to polish residual loading and achieve the GWPS in a reasonable timeframe. Additional data collection and analysis may be required to support the USEPA's evaluation framework (USEPA, 2015) and obtain regulatory approval.

4.2 Source Control with Groundwater Extraction

Groundwater extraction is one of the most widely used groundwater corrective technologies and has a long history of performance. This corrective measure includes installation of one or more groundwater pumping wells or an extraction trench to control and extract impacted groundwater. Groundwater extraction captures and contains impacted groundwater and can limit plume expansion and/or off-site migration. Construction of a groundwater extraction system typically includes, but is not limited to, the following primary components:

- Designing and constructing a groundwater extraction system consisting of one or more extraction wells or trenches and operating at a rate to allow capture of CCR impacted groundwater within the UA and or the UD/PMP.
- Management of extracted groundwater, which may include modification to the existing National Pollutant Discharge Elimination System (NPDES) permit.

- Ongoing inspection and maintenance of the groundwater extraction system.

Remediation of inorganics by groundwater extraction can be effective, but systems do not always perform as expected. A combination of factors, including geologic heterogeneities, difficulty in flushing low-permeability zones, and rates of contaminant desorption from aquifer solids can limit effectiveness. Groundwater extraction systems require ongoing operation and maintenance to address issues such as iron bacteria and well fouling and to ensure optimal performance. The extracted groundwater must be managed, either by ex-situ treatment or disposal.

Groundwater extraction may reduce the timeframe to achieve GWPS and contain the groundwater constituents that exceed the GWPS. Extraction could be accomplished using a groundwater pumping well system or an extraction trench.

4.3 Source Control with a Cutoff Wall

Since the late 1970s and early 1980s, vertical cutoff walls have been used to control and/or isolate impacted groundwater. Low-permeability cutoff walls can be used to prevent horizontal off-site migration of potentially impacted groundwater. Cutoff walls act as barriers to lateral transport of impacted groundwater and can isolate soils that have been impacted by CCR to prevent mixing with unimpacted groundwater. Cutoff walls are often used in conjunction with an interior pumping system to establish an inward gradient within the cutoff wall. The gradient imparted by the pumping system maintains an inward flow through the wall, keeping it from acting as a groundwater dam and controlling potential end-around or breakout flow of contaminated groundwater. Constructing the cutoff wall such that it intersects a low-permeability material at its base, referred to as "keying", greatly increases its effectiveness.

A commonly used cutoff wall construction technology is the slurry trench method, which consists of excavating a trench and backfilling it with a soil-bentonite mixture, often created with the excavated soils, or, for deeper walls, a cement-bentonite mixture that is produced at an onsite batch plant. The trench is temporarily supported with bentonite slurry pumped into the trench during excavation (D'Appolonia and Ryan, 1979). Cutoff wall excavation uses conventional hydraulic excavators, hydraulic excavators equipped with specialized booms to extend their reach (*i.e.,* long-stick excavators), clamshells, or more specialized equipment such as hydromills or secant-pile drill rigs, depending upon trench depth, material excavated, and type of material that the wall is keyed into.

Cutoff walls are a widely accepted technology for containing impacted groundwater. Combining groundwater polishing with a limited cutoff wall and groundwater extraction in specific areas may provide advantages over independent use of these potential corrective technologies. Cutoff walls can be used in combination with groundwater extraction or as part of a PRB system (as the "funnel" in a funnel-and-gate system; **Section 3.4**).

4.4 Source Control with In-Situ Chemical Treatment

The use of in-situ treatment, either by injection or PRBs, is a widely used technology for treating impacted groundwater. However, in-situ treatment techniques for boron and sulfate are not well established; therefore, performance is unknown.

Chemical treatment could consist of injection of reactive materials into the subsurface to treat contaminants at specific, targeted locations. Alternatively, treatment could be accomplished via PRB, where subsurface barriers (*i.e.,* cutoff walls) are placed at locations designed to direct the

contaminant plume along a flow path through the reactive media. In either system, the contaminants are transformed or otherwise rendered into environmentally acceptable forms to attain remediation concentration goals downgradient of the barrier (Electric Power Research Institute [EPRI], 2006).

As groundwater passes through the PRB under natural gradients, dissolved constituents in the groundwater react with the reactive media and are transformed or immobilized. A variety of media have been used or proposed for use in PRBs. Zero-valent iron (ZVI) has been shown to effectively immobilize some CCR constituents, including arsenic, chromium, cobalt, molybdenum, selenium, and sulfate. Use of a combination media consisting of ZVI and a boron-selective ion exchange resin to treat boron has been documented in a pilot-scale test (EPRI, 2006).

System configurations include continuous PRBs, in which the reactive media extends across the entire path of the contaminant plume; and funnel-and-gate systems, where low-permeability barriers are installed to control groundwater flow through a permeable gate containing the reactive media. Continuous PRBs intersect the entire contaminant plume and do not materially impact the groundwater flow system. Design may or may not include keying the PRB into a low-permeability unit at depth. Funnel-and-gate systems utilize a system of barriers to groundwater flow (funnels) to direct the contaminant plume through the reactive gate. The barriers, typically some form of cutoff wall, are keyed into a low-permeability unit at depth to prevent short circuiting of the plume. Funnel-and-gate design must consider the residence time to allow chemical reactions to occur. Directing the contaminant plume through the reactive gate can significantly increase the flow velocity, thus reducing residence time.

Design of in-situ treatment systems requires rigorous site investigation to characterize the site hydrogeology and to delineate the contaminant plume. A thorough understanding of the geochemical and redox characteristics of the plume is critical to assess the feasibility of the process and select appropriate reactive media. Laboratory studies, including batch studies and column studies using samples of site groundwater, are needed to determine the effectiveness of the selected reactive media at the site (EPRI, 2006). The main considerations in selecting reactive media are as follows (Gavaskar et al., 1998 as cited by EPRI, 2006):

- Reactivity - The media should be of adequate reactivity to immobilize a contaminant within the residence time of the design.
- Hydraulic performance - The media should provide adequate flow through the PRB, meaning a greater particle size than the surrounding aquifer materials. Alternatively, gravel beds have been emplaced in front of barriers to direct flow through the barrier.
- Stability - The media should remain reactive for an amount of time that makes its use economically advantageous over other technologies.
- Environmentally compatible by-products - Any by-products of media reaction should be environmentally acceptable. For example, iron released by zero-valent iron corrosion should not occur at levels exceeding regulatory acceptance levels.

Availability and price: The media should be easy to obtain in large quantities at a price that does not negate the economic feasibility of using a PRB.

5. ASSESSMENT OF CORRECTIVE MEASURE TECHNOLOGIES

This CMA was initiated to address exceedances of the 35 I.A.C. § 845.600 GWPS at the downgradient waste boundary of the FAPS (**Section 2.2**).

5.1 Requirements

The potential groundwater corrective technologies described in the previous section were evaluated relative to the requirements presented in **Section 1.1** and reiterated below:

- Performance, reliability, ease of implementation and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;
- Time required to begin and complete the CAP; and
- Institutional requirements, such as State or local permit requirement or other environmental or public health requirements that may substantially affect implementation of the CAP.

Table 5-1 presents the qualitative CMA evaluation of each corrective technology relative to these requirements, as well as their ability to address boron and sulfate GWPS exceedances. The following sections provide a summary of these evaluations and a discussion of the potential groundwater corrective measure technologies that may be viable, either independently or in combination, to address GWPS exceedances. This section also provides a summary of corrective measure technologies that have been retained and advanced for evaluation as part of the CAAA process for selecting the final remedy for the FAPS per 35 I.A.C. § 845.670.

5.2 Groundwater Corrective Technology Assessment

Source control, consisting of CIP and capping with a final cover system, is the primary groundwater corrective measure for the FAPS and was completed in 2020. Each of the potential groundwater corrective measure technologies would supplement the positive impact of prior closure activities. The following sections evaluate groundwater corrective measure technologies that, when combined with the completed source control, may be viable to address the boron and sulfate GWPS exceedances. Technologies that are not viable for addressing exceedances of GWPS at the FAPS will be eliminated from further evaluation and viable technologies will be advanced for further evaluation as part of the CAAA process per 35 I.A.C. § 845.600.

5.2.1 Source Control with Groundwater Polishing

Completed source control corrective measures (**Section 1.1**) have reduced the mass loading to the groundwater system. Performance of groundwater polishing, which may be currently ongoing at the site, may be limited in the low permeability UU. The time estimated for plume contraction at the FAPS is relatively long, based on previous groundwater modeling (NRT, 2014a; NRT, 2014b). Groundwater polishing may not significantly reduce the time required to attain the GWPS in either the UA or the overlying UU/PMP due to the low permeability of both these hydrostratigraphic units.

Groundwater polishing by natural geochemical processes is a widely accepted component of groundwater remediation and is routinely approved by the USEPA when paired with source

control. The performance of groundwater polishing as a groundwater corrective measure varies based on site-specific conditions and additional data collection may be needed to support the design and achieve regulatory approval. The low permeability of the UU and bedrock UA suggests performance by physical processes may be limited in addressing the boron in the UA. The chemical processes in the fine-grained UU require further evaluation.

Naturally occurring geochemical process are currently ongoing at the post-closure FAPS and will continue to affect post-closure groundwater constituent concentrations. Ongoing monitoring of groundwater conditions is needed to better understand the mechanisms and efficacy of the groundwater polishing process and to confirm the effectiveness over time. Thus, additional groundwater sample collection and analyses would be required to characterize potential mechanisms, as discussed above, and to provide long term monitoring of the remedial progress. Enhancements to the groundwater monitoring system may be required to ensure that groundwater polishing is occurring as predicted, consistent with the adaptive site management approach. The reliability of groundwater polishing as a groundwater corrective measure is high because operation and maintenance requirements are limited. However, the reliability can also vary based on site-specific hydrogeologic and geochemical conditions.

Following characterization and approval of the CAP, monitoring of the groundwater polishing processes and comparison to functional goals established to monitor progress toward the remedial objective could begin as quickly as within a few months of CAP approval.

No potential safety impacts or exposure to human health or environmental receptors are expected to result from implementing the groundwater polishing processes. Timeframes to achieve GWPS are dependent on site-specific conditions, which require detailed technical analysis which are ongoing and will be evaluated in connection with the CAAA. Selecting groundwater polishing as a corrective measure for the FAPS will require CAP permit by the IEPA.

Monitoring the groundwater polishing to track progress toward achievement of the GWPS, in conjunction with source control at the FAPS, would require long-term maintenance and monitoring of the groundwater monitoring system to confirm source control and verify the effectiveness in reducing groundwater concentrations to levels below the GWPS. Monitoring activities could be initiated immediately after approval of the CAP permit.

Groundwater polishing processes will continue to occur naturally at the FAPS. It may be a viable corrective measure for the boron and sulfate exceedances at the FAPS. Therefore, it is being advanced to the CAAA for further evaluation.

5.2.2 Source Control with Groundwater Extraction

Source control will reduce the mass loading to the groundwater system and implementing a groundwater extraction system may reduce the time required to attain the GWPS in the UA and reduce the potential for off-site migration. However, the groundwater impacts already present in the low permeability UU may limit the reduction in time to attain the GWPS that can be achieved by a groundwater extraction system. A groundwater collection trench may be feasible to mitigate potential plume migration to the south and west.

Groundwater extraction is a widely accepted corrective measure with a long track record of performance and reliability. It is routinely approved by the IEPA. For a corrective measure using groundwater extraction to effectively control off-site flow and/or to remove potentially

contaminated groundwater, horizontal and vertical capture zone(s) must be created. However, the low permeability UU and UA may restrict the ability to pump at rates high enough to establish the required capture zone(s) or would require a high density of wells. Alternatively, a groundwater collection trench could be utilized. Other means to enhance the effects of groundwater extraction could also be used, such as maintaining lower water levels in the downgradient Tertiary and Secondary Ponds, thereby increasing hydraulic gradients, and potentially accelerating the time to attain GWPS. However, performance of groundwater extraction in the UA may not address CCR constituents in the UU due to the UU's low permeability.

Implementation of a groundwater extraction system presents design challenges due to the hydraulic conditions of the UU and the UA and the plume configuration. Extracted groundwater would need to be managed, which may include modification of the existing NPDES permit and treatment prior to discharge, if necessary. Specialized treatment equipment may be required, and ongoing operations and maintenance activities would be necessary.

There could be some impacts associated with constructing and operating a groundwater extraction system, including some limited exposure to extracted groundwater. Additional data collection and analyses would be required to design an extraction system. Construction could be completed within 1 to 3 years. Time of implementation is approximately 3 to 4 years after approval of the CAP permit, including characterization, design, permitting, and construction. Timeframes to achieve GWPS are dependent on site-specific conditions. An extraction system may reduce the post-closure time to attain GWPS in the UA. However, accelerated attainment of the GWPS is expected to be limited in the UU. The model-predicted times to achieve the GWPS in the UU, potentially hundreds of years, may result in a correspondingly long operations and maintenance program for any groundwater extraction system.

Implementing a groundwater extraction system at the FAPS would require IEPA approval of the CAP permit, and discharge of extracted groundwater would require a modification to the NPDES permit. Depending upon the location of the extraction system, an Illinois Department of Natural Resources (IDNR) dam safety modification permit may also be required to construct the system.

The viability of groundwater extraction in combination with other corrective measure(s) will be further evaluated as part of the CAAA, potentially using groundwater fate and transport modeling. Therefore, the groundwater extraction is being advanced to the CAAA for further evaluation.

5.2.3 Source Control with Groundwater Cutoff Wall

Source control will reduce the mass loading to the groundwater system and implementing additional groundwater corrective measures may reduce the time required to attain the GWPS in the UA. However, the groundwater impacts already present in the low permeability UU may limit the reduction in time to attain the GWPS. Groundwater cutoff walls are a widely accepted corrective measure used to control and/or isolate impacted groundwater and are routinely approved by the IEPA. Cutoff walls have a long history of reliable performance as hydraulic barriers, provided they are properly designed and constructed. However, if not coupled with a groundwater extraction system, a cutoff wall will provide directional groundwater control only and may result in redistribution of contaminants and potentially GWPS exceedances at new locations.

The effectiveness of a cutoff wall as a hydraulic barrier relies on the contrast between the hydraulic conductivity of the native geologic materials (*i.e.,* the UU and/or UA) and the cutoff wall. The most effective barriers have hydraulic conductivity values that are several orders of magnitude lower than the geologic materials they are in contact with. The effectiveness of a cutoff wall, typically designed with hydraulic conductivity of 1×10^{-7} centimeters per second (cm/s), constructed in the low permeability UU and/or UA, would be limited. Construction of a cutoff wall extending into the bedrock UA would likely require specialized equipment and may prove difficult, potentially requiring several years of continuous construction.

Cutoff walls are designed to act as hydraulic barriers; as a result, cutoff walls inherently alter the existing groundwater flow system. Changes to the existing groundwater flow system may need to be controlled to maximize the effectiveness of the remedy by, for example, combining a cutoff wall with groundwater extraction to control build-up of hydraulic head upgradient and around the cutoff walls. Additional data collection and analyses would be required to design a cutoff wall. Construction of only the cutoff wall could be completed within 2 to 3 years. Constructing a cutoff wall at the FAPS would require IEPA approval of the CAP permit and, depending on the location, an IDNR dam safety modification permit may be required.

To attain GWPS, cutoff walls require a separate groundwater corrective measure to operate in concert with the cutoff wall(s). A cutoff wall at the FAPS alone would not be a viable corrective measure for the boron and sulfate exceedances. Cutoff walls are commonly coupled with groundwater polishing and/or groundwater extraction, possibly with treatment of extracted groundwater, to attain GWPS. Use of a cutoff wall coupled with groundwater extraction/treatment to supplement the ongoing groundwater polishing may provide improvement over source control in accelerating the time to attain GWPS. Time of implementation for the cutoff wall, hydraulic head control (*i.e.,* groundwater extraction), and any necessary treatment is approximately 5 to 8 years, including characterization, design, permitting, and construction. The viability of a cutoff wall in combination of other corrective measure(s) will be further evaluated as part of the CAAA, potentially using groundwater fate and transport modeling. Therefore, the cutoff wall is being advanced to the CAAA for further evaluation.

5.2.4 Source Control with In-Situ Chemical Treatment

Source control will reduce the mass loading to the groundwater system and implementing additional groundwater corrective measures may reduce the time required to attain the GWPS in the UA. Use of in-situ treatment, either through targeted injection of reactive media or in PRB systems, to transform contaminants into environmentally acceptable forms to attain the GWPS was considered.

In-situ treatment using ion exchange to address boron and sulfate exceedances in groundwater is not an established or widely accepted groundwater corrective measure; therefore, its performance and reliability are unknown. Regulatory acceptance of this innovative approach to achieving the GWPS is uncertain.

In-situ treatment presents design and construction challenges, including targeted reactive media delivery via injection to the UU and/or UA. Construction of a PRB system would have the same limitations as a cutoff wall due to the similarity between the low hydraulic conductivity of the PRB and the UU. Injection or a PRB may not be feasible in the bedrock UA. Depending upon the

location of the PRB system, construction may affect the FAPS embankment and/or final cover system and periodic change-outs of ion exchange (IX) resin media may be required.

Additional data collection and analyses would be required to design an in-situ treatment system and bench scale and/or pilot scale testing may be required to demonstrate performance and reliability. Time of implementation is approximately 4 to 6 years after approval of the CAP permit, including characterization, design, permitting, and construction. Timeframes to achieve GWPS are dependent on demonstrations of performance and reliability along with regulatory acceptance. It is not known whether in-situ treatment would reduce the time to attain GWPS in the UA relative to the expected long post-closure timeframe predicted by the groundwater modeling.

Due to the uncertain performance, reliability and potential for regulatory hurdles, in-situ chemical treatment is not a viable corrective measure for the boron and sulfate exceedances at the FAPS and is not being advanced to the CAAA for further evaluation.

5.3 Technologies Advanced to CAAA

Based on the evaluations presented above, the following potential corrective technologies are being advanced to the CAAA for more detailed evaluations, individually or in combination, and cost estimation:

- Source control with groundwater polishing;
- Source control with groundwater extraction; and
- Source control with a groundwater cutoff wall.

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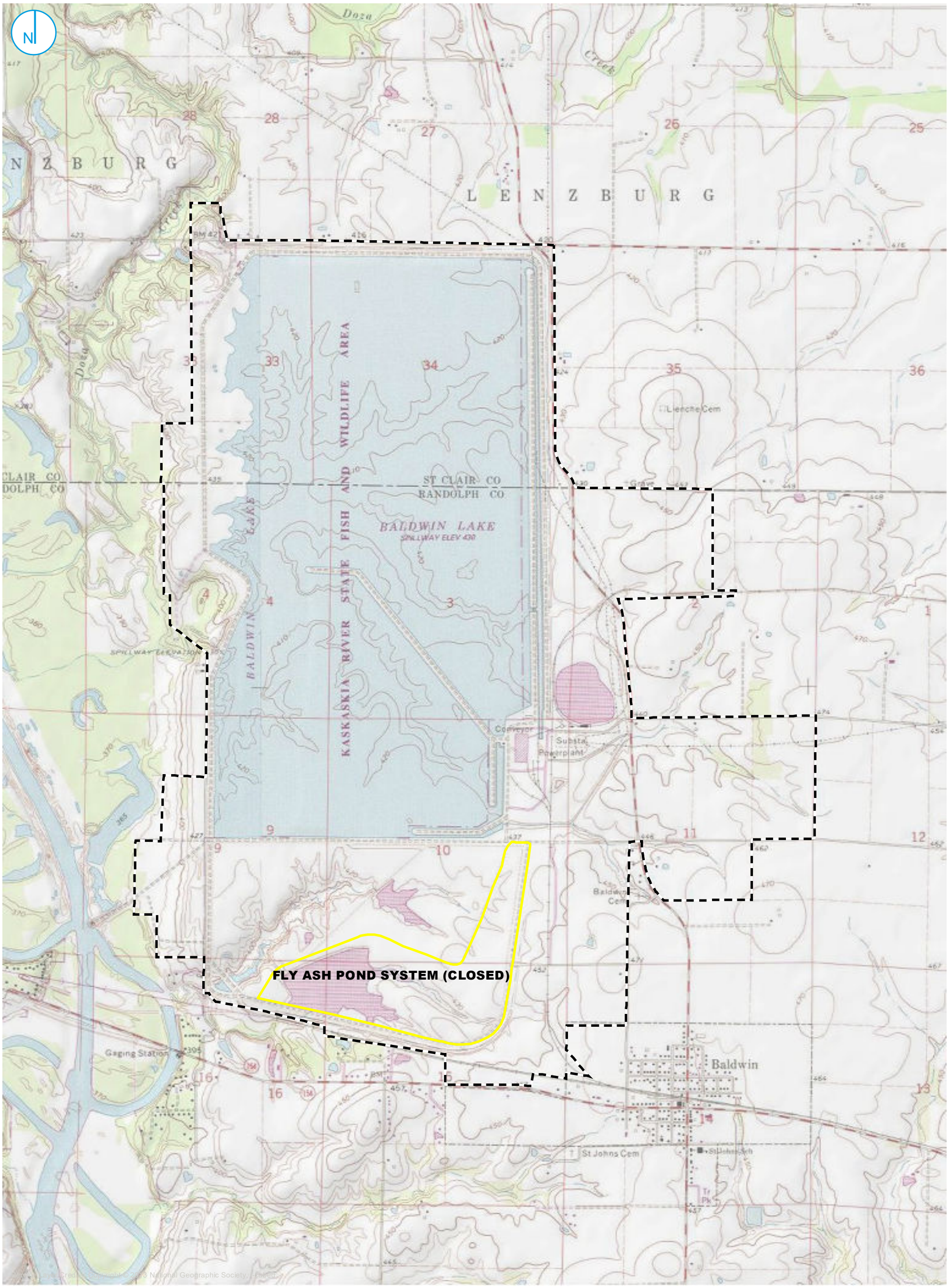
TABLES

TABLE 5-1.
35 I.A.C. PART 845 CORRECTIVE MEASURES ASSESSMENT MATRIX
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

Remedy	Evaluation Factors						
	Performance	**Reliability**	**Ease of Implementation**	**Potential Impacts of Remedy (safety impacts, cross-media impacts, control of exposure to any residual contamination)**	**Time Required to Begin and Implement Remedy[1]**	**Time to Attain Groundwater Protection Standards**	**Institutional Requirements (state/local permit requirements, environmental/public health requirements that affect implementation of remedy)**
Source Control with Groundwater Polishing	Performs best paired with source control, which was completed at the site using a clay cap in 2020. Sequential extraction data will be obtained as part of the ongoing evaluation. Limited potential for physical processes in the low permeability uppermost aquifer (UA).	Ongoing analysis will evaluate whether the geochemical mechanisms have low reversibility, the aquifer has sufficient capacity, and the hydrogeology is favorable for physical processes.	Evaluation is underway and is expected to be completed in 2024. Long-term monitoring would be required. Implementing would not require extensive specialized equipment or contractors.	None identified.	Approximately 90 days after Corrective Action Plan (CAP) permit approval.	Dependent on site-specific conditions including source decay rate. Attainment of groundwater protection standards (GWPS) will be limited by the low permeability UU and bedrock UA. Hence timeframes for groundwater polishing and other measures may be similar.	Illinois Environmental Protection Agency (IEPA) approval of the CAP is required.
Source Control with Groundwater Extraction	Widely accepted, routinely approved; variable performance based on site-specific conditions. May be limited by low permeability upper unit (UU) and bedrock UA. A groundwater collection trench may be feasible to mitigate plume migration near the southern site boundary.	Reliable if properly designed, constructed, and maintained. Groundwater treatment prior to discharge can be considered if indicated by performance monitoring.	Specialized contractors may be necessary for construction of the groundwater extraction system. Design challenges due to hydraulic conditions of UU and bedrock UA and the plume configuration. Extracted groundwater would require management. Groundwater treatment, if needed, may require specialized equipment/contractors.	Alters groundwater flow system. Potential for some limited exposure to extracted groundwater. Groundwater extraction may induce settlement, which could cause structural impacts to the embankments, existing final cover system, and/or adjacent structures.	Design, permitting and construction is expected to take 3 to 4 years after CAP permit approval.	Dependent on site-specific conditions. Attainment of GWPS will be limited by the low permeability UU and bedrock UA.	IEPA approval of the CAP is required. Extracted groundwater discharge may require a National Pollution Discharge Elimination System (NPDES) permit modification. A Illinois Department of Natural Resources (IDNR) dam safety modification permit might also be required, depending on location of wells and settlement potential. Cutoff wall may also require an evaluation and/or permitting of wetlands and/or Waters of the US impacts, if determined to be necessary.
Source Control with Groundwater Cutoff Wall	Widely accepted, routinely approved, good performance if properly designed and constructed, however may not be feasible for the UU and bedrock UA.	Reliable for groundwater flow directional control if properly designed and constructed.	Widely used, established technology. If feasible to construct a cutoff wall in the bedrock of the UA, construction would likely require specialized equipment and delay implementation (compared to groundwater extraction only).	Alters groundwater flow system but does not provide any treatment. Can result in unintended consequences resulting from redirecting contaminants to areas where they are not currently present. May cause structural impacts to the embankment or existing final cover system, depending on the location of the wall.	Design, permitting and construction are expected to take 5 to 8 years after CAP permit approval.	Provides groundwater directional control only. Combination with another groundwater corrective measure, such as groundwater extraction or a permeable reactive barrier, would reduce time to achieve and maintain GWPS.	IEPA approval of the CAP is required. An IDNR dam safety permit may also be required depending on the location of the cutoff wall. Cutoff wall may also require an evaluation and/or permitting of wetlands and/or Waters of the US impacts, if determined to be necessary.
Source Control with In-Situ Treatment (Permeable Reactive Barrier or In-situ Chemical Treatment)	In-Situ treatment using ion exchange (IX) resins not well established for boron or sulfate, therefore performance is unknown.	Variable reliability based on site-specific physical and geochemical conditions. May not be feasible in bedrock UA. Unknown reliability for boron and sulfate.	Design challenges associated with groundwater hydraulics. May not be feasible in bedrock UA. Could require periodic change-outs of IX resin media.	Alters groundwater flow system. PRB may cause structural impacts to the embankment dike or existing final cover system, depending on the location of the barrier.	May require bench scale and/or pilot scale testing as part of design. Design, permitting and construction are expected to take 7 to 8 years after CAP approval.	There is uncertainty regarding whether a permeable reactive barrier would reduce sulfate and boron concentrations to achieve the GWPS. Dependent on conditions specific to the reactive media used and the site. Treatment technology not well understood. GWPS attainment will be limited by low permeability bedrock UA.	IEPA approval of the CAP permit is required. IEPA approval of this innovative and relatively unproven solution may be challenging. A IDNR dam safety permit modification may also be required, depending on the location of the permaeable reaction barrier (PRB). PRB may also require an evaluation and/or permitting of wetlands and/or waters of the US impacts, if determined to be necessary.

Notes: [1] Time required to begin and implement remedy includes design, permitting and construction.

FIGURES



REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY

0 1,000 2,000 Feet

SITE LOCATION MAP

FIGURE 2-1

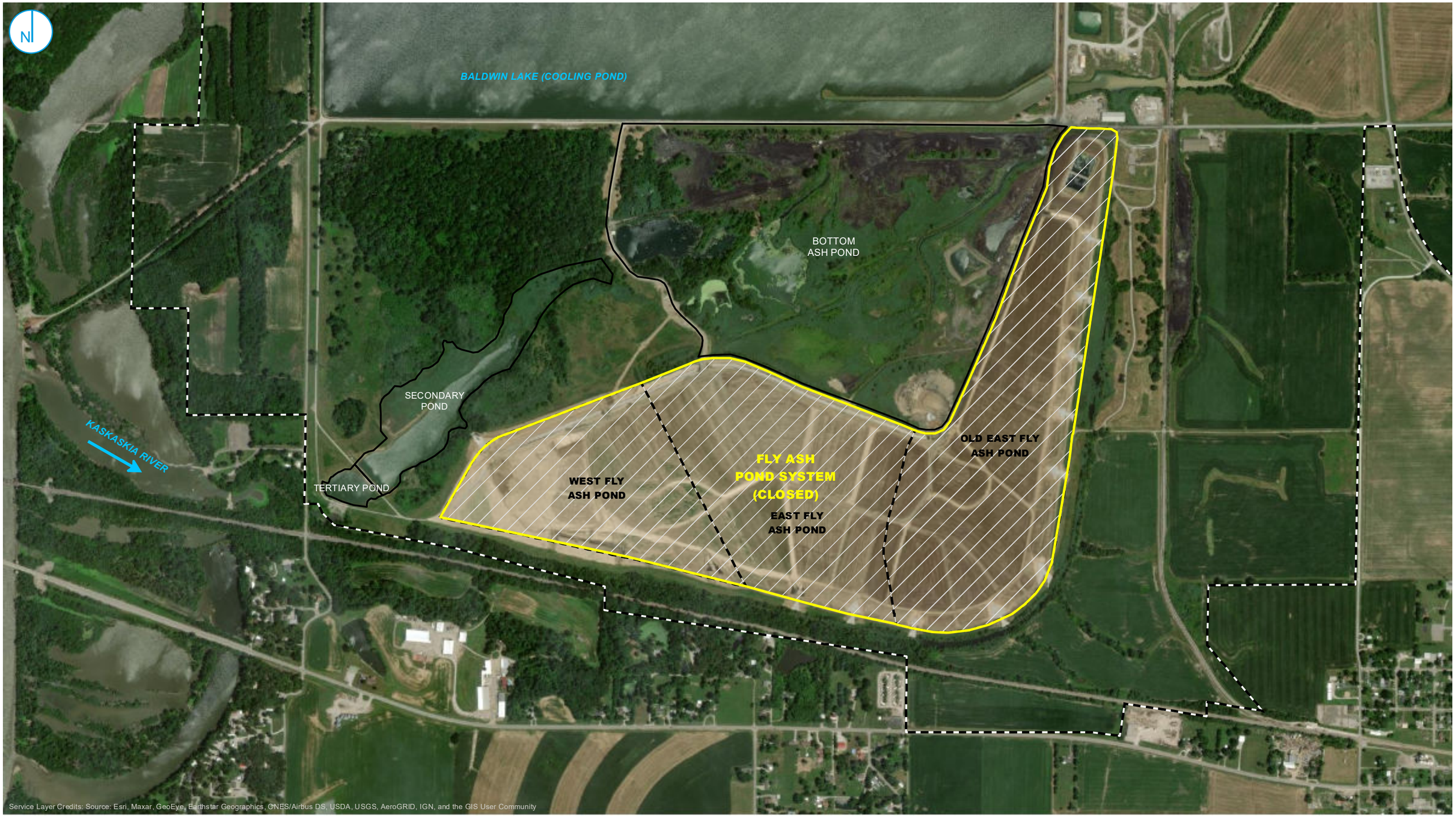
35 I.A.C. § 845 CORRECTIVE MEASURES ASSESSMENT
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

Y:\Mapping\Projects\2212285Baldwin\MXD\GMP_Addendum\FAPS\Figure 1-2_Site Map.mxd

PROJECT: 169000XXXX | DATED: 10/15/2021 | DESIGNER: HOTCALD



REGULATED UNIT (SUBJECT UNIT) FLY ASH POND SYSTEM (CLOSED)

SITE FEATURE

LIMITS OF FINAL COVER

PROPERTY BOUNDARY

0 400 800 Feet

SITE MAP

35 I.A.C. § 845 CORRECTIVE MEASURES ASSESSMENT
FLY ASH POND SYSTEM

BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 2-2

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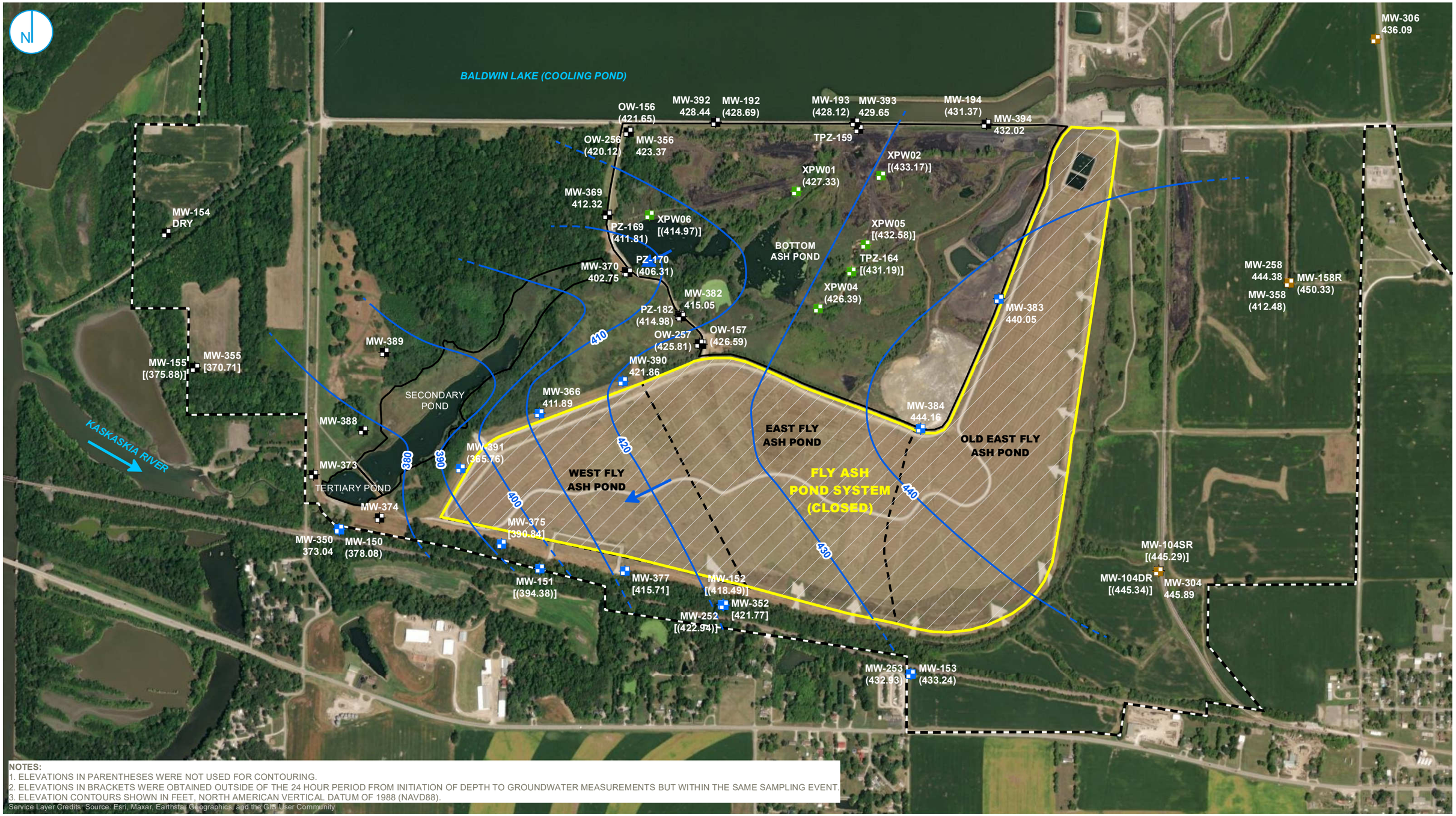
RAMBOLL



NOTES:
1. ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
2. ELEVATIONS IN BRACKETS WERE OBTAINED OUTSIDE OF THE 24 HOUR PERIOD FROM INITIATION OF DEPTH TO GROUNDWATER MEASUREMENTS BUT WITHIN THE SAME SAMPLING EVENT.
3. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

PROJECT: 169000XXXX | DATED: 10/31/2023 | DESIGNER: GALARNMC

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- COMPLIANCE MONITORING WELL
- BACKGROUND MONITORING WELL
- MONITORING WELL
- PORE WATER WELL
- GROUNDWATER ELEVATION CONTOUR (10-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- CAPPED AREA
- PROPERTY BOUNDARY

0 400 800 Feet

POTENTIOMETRIC SURFACE MAP
MAY 15-17, 2023

2023 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 2-3

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

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Y:\Mapping\Projects\22\2285\MXD\845_Operating_Permit\Baldwin\FAPS\GMP\Figure 2-2_BAL FAPS Expanded Monitoring Well Network.mxd

PROJECT: 169000XXXX | DATED: 7/31/2023 | DESIGNER: GALARNMC

BACKGROUND MONITORING WELL
COMPLIANCE MONITORING WELL
REGULATED UNIT (SUBJECT UNIT) SITE
FEATURE
CAPPED AREA
PROPERTY BOUNDARY

0 400 800 Feet

MONITORING WELL LOCATION MAP

35 I.A.C. § 845 CORRECTIVE MEASURES ASSESSMENT
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 2-4

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Appendix D

Nature and Extent Report

Intended for
Dynegy Midwest Generation, LLC
10901 Baldwin Road
Baldwin, IL 62217

Date
April 24, 2024

Project No.
1940103584-001

NATURE AND EXTENT REPORT

BALDWIN POWER PLANT, FLY ASH POND SYSTEM, IEPA ID NO. W1578510001-01, W1578510001-02, AND W1578510001-03

RAMBOLL Bright ideas. Sustainable change.

NATURE AND EXTENT REPORT
BALDWIN POWER PLANT, FLY ASH POND SYSTEM, IEPA ID NO. W1578510001-01, W1578510001-02, AND W1578510001-03

Project name	**Baldwin Power Plant Fly Ash Pond System**
Project no.	**1940103584-001**
Recipient	**Dynegy Midwest Generation, LLC**
Document type	**Nature and Extent Report**
Revision	**FINAL**
Date	**April 24, 2024**
Prepared by	**Nathaniel Keller and Alison O'Connor**
Checked by	**Melanie Conklin**
Approved by	**Brian G. Hennings, PG**

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ACRONYMS AND ABBREVIATIONS

35 I.A.C.	Title 35 of the Illinois Administrative Code
ASD	Alternative Source Demonstration
BPP	Baldwin Power Plant
CCR	coal combustion residuals
Closure Plan	Closure and Post-Closure Care Plan for the Baldwin Fly Ash Pond System
CMA	Corrective Measures Assessment
cm/s	centimeters per second
CSM	conceptual site model
E001	Event 1
E002	Event 2
E003	Event 3
FAPS	Fly Ash Pond System
GCSM	geochemical conceptual site model
GWPS	groundwater protection standard
IEPA	Illinois Environmental Protection Agency
LCL	lower confidence limit
mg/L	milligrams per liter
NAVD88	North American Vertical Datum 1988
PMP	potential migration pathway
SI	surface impoundment
UA	uppermost aquifer
UU	Upper Unit
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey

EXECUTIVE SUMMARY

Groundwater samples collected at the Baldwin Power Plant (BPP) Fly Ash Pond System (FAPS) during May 2023 for the Quarter 2, 2023 compliance sampling event (Event 1 [E001]) were evaluated for exceedances of the groundwater protection standards (GWPS) described in Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845.600. Exceedances were identified in the following hydrostratigraphic units and wells:

- Detected Upper Unit (UU) and Potential Migration Pathway (PMP) Exceedances:
  - Boron and sulfate at MW-150
- Detected Uppermost Aquifer (UA) (Bedrock Unit) Exceedances:
  - Boron at MW-391

As a result of the identified E001 exceedances, a Corrective Measures Assessment (CMA) was initiated on November 26, 2023 in accordance with 35 I.A.C. § 845.660 and was submitted April 24, 2024 [1]. The subsequent compliance sampling events for the Quarter 3 and Quarter 4 2023 sampling events (Event 2 [E002] and Event 3 [E003]) were completed in August and November 2023 and groundwater samples were evaluated for exceedances of the GWPS as described in 35 I.A.C. § 845.600. In addition to the exceedances listed above, the following exceedances were identified in the following hydrostratigraphic units and wells during the E002 Event:

- Detected UU and PMP Exceedances:
  - Boron at MW-152
  - pH at MW-253

Exceedances identified during the E003 event were consistent with those listed above.

An alternative source demonstration (ASD) was completed for the pH exceedance at well MW-253 and received concurrence in a letter from the Illinois Environmental Protection Agency (IEPA) dated March 7, 2024 [2]. Therefore, the pH exceedance at well MW-253 was not incorporated into the CMA per 35 I.A.C. § 845.650(e)(3). The remaining E002 exceedance (boron at MW-152) was evaluated with respect to the groundwater model, feasible alternatives, and remedy extents and was determined to not substantially affect the findings and conclusions of the previously initiated CMA evaluations and has therefore been incorporated into the CMA and this report.

As required by 35 I.A.C. § 845.650(d)(1) this report characterizes the nature and extent of boron and sulfate to support a complete and accurate assessment of the corrective measures. The report also evaluates relevant site conditions to determine how they may affect the corrective measures ultimately selected for the FAPS and documents the additional measures taken in accordance with 35 I.A.C. § 845.650(d).

Boron was detected above the GWPS within two hydrostratigraphic units: the shallow UU and in the deeper UA. The lateral and downgradient extent of boron in the UU is being further evaluated but is adequately defined by sampling of historical piezometers as well as results from the Kaskaskia River [3]. The vertical migration of boron concentrations above the GWPS in the UU is limited by low hydraulic conductivity clay and silt of the UU and the underlying shale bedrock. Samples from deeper nested monitoring wells, which have reported no exceedances following comparison of the lower confidence limits (LCLs) to the GWPSs described in 35 I.A.C. § 845.600

provide evidence that boron impacts are not migrating downward. The lateral and downgradient extent of boron in the UA is limited by the Secondary Pond directly adjacent to MW-391 to the west and along with groundwater quality data from monitoring wells in the UA that did not report exceedances following comparison of LCLs to the GWPSs described in 35 I.A.C. § 845.600. Samples collected from the Secondary and Tertiary Ponds, as well as the Kaskaskia River indicate all boron concentrations in surface water are below 1.2 milligrams per liter (mg/L) [3].

Sulfate was detected above the GWPS within the UU at a single location. The lateral and downgradient extent of sulfate in the UU is being further evaluated but is adequately defined by sampling of historical piezometers as well as results from the Kaskaskia River [3]. The vertical migration of sulfate in the UU is limited by low hydraulic conductivities of the UU and underlying shale bedrock and supported by the results of nested monitoring well MW-350 which has reported no exceedances following comparison to the GWPSs described in 35 I.A.C. § 845.600. Samples collected from the Secondary and Tertiary Ponds as well as the Kaskaskia River indicate all sulfate concentrations in surface water are below 200 mg/L [3].

1. INTRODUCTION

35 I.A.C. § 845.650(d)(1) requires the owner or operator of a coal combustion residuals (CCR) surface impoundment (SI) to characterize the nature and extent of a release and relevant site conditions that may affect the remedy ultimately selected for a CCR SI if any constituent regulated under 35 I.A.C. § 845 is found to exceed the GWPS. This report documents the nature and extent of constituents detected above the GWPS that are attributable to the BPP FAPS.

The groundwater data and analysis in this report includes results from historical sampling (initiated in 2015) through E003, which was completed on November 3, 2023. Results of events E001, E002, and E003 were submitted and placed in the facility's operating record within 60 days of receiving final laboratory analytical data [4, 5, 6] as required by 35 I.A.C. § 845.800(d)(15). The statistical determination presented in the report identified the following exceedances of the GWPS at compliance groundwater wells in the following hydrostratigraphic units:

- Detected UU and PMP Exceedances:
  - Boron at MW-150 and MW-152
  - pH at MW-253
  - Sulfate at MW-150
- Detected UA (Bedrock Unit) Exceedances:
  - Boron at MW-391

An ASD, as allowed by 35 I.A.C. § 845.650(e), was completed for the pH exceedance at UA monitoring well MW-253 [2] and received concurrence in a letter from the IEPA dated March 7, 2024 [7].

This Nature and Extent Report discusses in detail the extent of the boron and sulfate exceedances as well as a geochemical conceptual site model (GCSM) describing the nature of these exceedances.

2. BACKGROUND

2.1 Site Location and Description

The BPP is located in southwest Illinois in Randolph and St. Clair Counties. The Randolph County portion of the BPP is located within Sections 2, 3, 4, 9, 10, 11, 14, 15, and 16 of Township 4 South and Range 7 West. The St. Clair County portion of the property is located within Sections 33, 34, and 35 of Township 3 South and Range 7 West. The FAPS is approximately one-half mile west-northwest of the Village of Baldwin (**Figure 2-1**).

The BPP property is bordered to the west by the Kaskaskia River; to the east by Baldwin Road, farmland, and strip-mining areas; to the southeast by the village of Baldwin; to the south by the Illinois Central Gulf railroad tracks, scattered residences, and State Route 154; and to the north by farmland. The St. Clair/Randolph County Line crosses east-west at approximately the midpoint of Baldwin Lake (*i.e.,* Cooling Pond). **Figure 2-1** shows the location of the BPP; **Figure 2-2** is a site map showing the location of the FAPS, Bottom Ash Pond (BAP), Secondary Pond, Tertiary Pond, and Cooling Pond. The combined area, including the BAP, FAPS, Secondary Pond, and Tertiary Pond, will hereinafter be referred to as the Site.

2.2 Description of CCR SI

The BPP began operation in 1970 and initially burned bituminous coal from Illinois, switching to subbituminous coal in 1999. The FAPS is a closed Multi-Unit CCR SI consisting of three unlined SIs: Old East Fly Ash Pond (IEPA Unit ID W1578510001-01), East Fly Ash Pond (IEPA Unit ID W1578510001-02), and West Fly Ash Pond (IEPA Unit ID W1578510001-03), with a combined surface area of approximately 263 acres. The external perimeter of the three subunits within the FAPS was originally constructed in 1969. The Old East Fly Ash Pond and East Fly Ash Pond were used to store and dispose of fly ash from the BPP, while the West Fly Ash Pond was used to store and dispose of dry-stacked fly ash and to clarify CCR contact stormwater [8].

AECOM submitted the Closure and Post-Closure Care Plan for the Baldwin Fly Ash Pond System (Closure Plan) dated March 2016 to the IEPA, and it was approved on August 16, 2016 [9]. The Closure Plan included the Groundwater Monitoring Plan [10] which defined groundwater monitoring for the FAPS following approval of the Closure Plan. Dewatering of the FAPS was initiated in 2018 and closure of the FAPS was completed on November 17, 2020, as documented in the Notification of Completion of Closure [11].

The CCR unit consists primarily of fly ash, bottom ash, and boiler slag and may be present from the pre-closure surface (ranging from approximately 418 to 466 feet[1]) to a minimum elevation of approximately 401 feet along a historic drainage feature that runs approximately through the center of the FAPS (**Figure 2-3**). The unit is encompassed by earthen fill deposits of predominantly clay and silt materials from on-site excavations that were used to construct berms and roads surrounding the various impoundments across the Site.

2.3 Geology and Hydrogeology

The information used to describe the hydrogeology is based on the local geology obtained from published sources, hydrogeologic investigation data, and boring data collected from Site

[1] All elevations in this report are referenced to North American Vertical Datum of 1988 (NAVD88) unless otherwise noted.

investigations conducted from 2010 to 2023 [12, 10, 13]. Note that information collected from the adjacent BAP is incorporated into this document where appropriate because it is representative of the Site conditions.

2.3.1 Hydrostratigraphic Units

In addition to CCR, materials at the BPP have been categorized into two hydrostratigraphic units at the FAPS based on stratigraphic relationships, geologic composition, and common hydrogeologic properties. The units, listed from surface downward, are summarized as follows:

- **UU:** Predominantly clay with some silt and minor sand, silt layers, and occasional sand lenses. Includes the lithologic layers identified as the Cahokia Alluvium, Peoria Loess, Equality Formation, and Vandalia Till Member. This unit is composed of unlithified natural geologic materials present above the top of bedrock, ranging in thickness at the Site between 17 and 56 feet. Thin sand seams within the unit and the interface (contact) between the UU and bedrock have been identified as potential migration pathways. No continuous sand seams were observed within or immediately adjacent to the FAPS; however, the sand seams on Site may act as a PMP due to relatively higher hydraulic conductivities. The acronym UU and the materials it contains is synonymous with Upper Groundwater Unit used in previous documents.
- **Bedrock Unit:** This unit is considered the UA. Pennsylvanian and Mississippian-aged bedrock is composed of interbedded shale and limestone bedrock, which underlies and is continuous across the entire Site (**Appendix A**). Review of regional literature [14] indicates that three formations are present at the bedrock surface onsite including (from youngest [eastern portions of site] to oldest [western portion of the site]): Menard Formation; Waltersburg, Vienna, and Tar Springs Formation; and Glen Dean and Hardinsburg Formation. In many of the boring logs from the Site [12], the bedrock is described as highly weathered.

2.3.2 Uppermost Aquifer

Off-site, immediately upgradient and downgradient of the BPP property boundaries, both the shallow glacial deposits and the shallow bedrock have served as a source of water supply [12]. The shallow unlithified deposits off-Site have yielded water through intermittent, discontinuous sand lenses and, in the bedrock, through fractured sandstone and limestone. In general, within the boundaries of the Site, the UU (shallow unlithified deposits) consists of low permeability clays and silts. Within the UU, only thin and intermittent sand lenses are present within predominantly clay deposits; thus, the unlithified materials do not represent a continuous aquifer unit (**Figure 2-4**). Thin, non-continuous sandy deposits (*i.e.,* PMPs) that exist across the Site do not appear to extend to the FAPS as evidenced by soil borings adjacent to the CCR unit in which no sand was observed.

Based on the above, the Bedrock Unit is the only viable aquifer in the vicinity of the Site and was designated as the UA in the Supplemental Hydrogeologic Site Characterization and Groundwater Monitoring Plan [10], consistent with the USEPA definition in Title 40 of the Code of Federal Regulations § 257.53 [15].

The UA at the Site is the shallow Pennsylvanian and Mississippian -aged bedrock that immediately underlies the unlithified deposits. The top of the UA (bedrock surface) is provided in **Figure 2-5**. Based on the geologic information, the top of the aquifer is highest in elevation near the eastern portion of the Old East Fly Ash Pond, with an elevation of approximately 415 feet,

and slopes downward to the west and south to approximately 380 feet near MW-352 and MW-375. The shallow bedrock yields water through interconnected secondary porosity features (*e.g.,* cracks, fractures, crevices, joints, bedding planes, and other secondary openings). The shallow bedrock is the only water-bearing unit that is continuous across the Site. Groundwater in the Pennsylvanian and Mississippian-aged bedrock mainly occurs under semi-confined to confined conditions, with the overlying unlithified unit behaving as the upper confining unit to the UA.

Water quality in the UA (*i.e.,* Pennsylvanian and Mississippian-aged bedrock) decreases with increasing depth as water becomes increasingly mineralized [16]. Further, the ability of the unit to store and transmit water is dependent on the density of bedrock features that contribute to secondary porosities and whether those features are interconnected enough to yield water. Therefore, the lower limit of the UA is the depth at which either the groundwater is mineralized to a point that it is no longer a useable water source, or the secondary porosities do not yield a sufficient volume of groundwater to produce a useable water supply.

2.3.3 Potential Migration Pathways

Thin, non-continuous sandy deposits (*i.e.,* PMPs) appear disseminated across the Site and range from a single locally continuous unsaturated sand seam up to 7.9 feet in thickness to isolated, discontinuous thin seams of 0.2 to 1 feet in thickness. Two overlapping sand seams that appear to be continuous between adjacent borings occur to the west of the Secondary Pond (**Figure 2-4**) and are vertically separated by at least 6 feet of clay. The shallower sand seam, at elevations between 395 to 403 feet NAVD88, is not saturated. In addition to these sand seams identified adjacent to the BAP, the contacts between the unlithified material and bedrock have been identified as a PMP, where horizontal hydraulic conductivity data in Site monitoring wells with screens and/or filter packs across or immediately above the bedrock are higher than the surrounding clays [12].

2.3.4 Regional Bedrock Geology

Bedrock within the vicinity of the BPP varies depending on proximity relative to the Kaskaskia River [17, 18, 19]. Underlying the BPP Site and Cooling Pond and the Kaskaskia River Bottomlands are Pennsylvanian and Mississippian bedrock, which primarily consists of limestone and shale with some sandstone. Bedrock generally occurs within 50 feet of the ground surface; with the uppermost Mississippian bedrock being the Menard Formation (up to 60 feet thick), Tar Springs, Vienna, and Waltersburg units (up to approximately 90 feet thick) and Glen Dean and Hardinsburg Formation which is up to 100 feet thick. These formations consist of variable amounts of shale, mudstone, limestone, and siltstone with minor amounts of sandstone; the Glen Dean and Hardinsburg Formations predominate under the eastern portion of the Site and Cooling Pond, and the Waltersburg, Vienna, and Tar Springs Formations are located under the eastern half of the FAPS and background locations. Areas to the east of the Site are immediately underlain by the Carbondale Formation, which pinches out towards the west.

2.3.5 Water Table Elevation and Groundwater Flow Direction

Historically elevated heads within the pond resulted in migration of impacted water into the UU and UA. Following closure, heads within the pond were predicted to decline over a period of approximately 2-4 years until they reach equilibrium [20].

As indicated in **Section 2.3.2,** the groundwater in the UA is separated from overlying CCR material by the UU, consisting of low permeability material ranging in thickness from 17 feet east

of the FAPS to 56 feet north and west of the FAPS. Groundwater flow in the UU is generally to the west and southwest across the Site, towards the Kaskaskia River (*i.e.,* regional receiving body) (**Figure 2-6**). Similar to groundwater flow in the shallow unlithified materials, flow direction in the bedrock is generally to the west and southwest across the Site (**Figure 2-7**). In the east and central areas of the BAP, groundwater flow in the bedrock is northwest, and in the east area of the FAPS, flow is both southwest to northwest. As groundwater approaches the bedrock valley feature underlying the Secondary and Tertiary Ponds west of the BAP and FAPS, the flow direction veers toward this bedrock surface low. Groundwater elevations exhibit seasonal variation, generally less than 7 feet per year and maintains generally consistent flow directions. Following the initiation of closure and dewatering, groundwater elevations in monitoring wells along the northwest side of the FAPS (MW-366 and MW-390) began to exhibit seasonal variability, while MW-391 had a significant increase in 2017-2018 during closure dewatering activities before returning to historical levels (**Appendix B**). These wells generally occur along a small bedrock peninsula, where bedrock slopes downward, both to the north and south of these locations. South of the FAPS, groundwater elevations in bedrock monitoring wells (MW-350, MW-352, MW-375, and MW-377) exhibit less seasonal variability and have generally declined following closure (**Appendix B**).

Spatially across the FAPS, groundwater elevations range from 370 feet in the southwestern portion of the Site to 450 feet in the eastern portion of the Site (**Table 2-1**). The piezometric head at locations MW-252 and MW-352 are generally above ground surface throughout the year, and MW-152 tends to be above ground surface during the spring.

2.3.5.1 Vertical Hydraulic Gradients

Vertical hydraulic gradients were calculated based on available groundwater elevation data during the March 2016 to August 2023 monitoring period at nested well pairs both within the unlithified deposits (shallow and deep) and between the unlithified deposits and bedrock. Vertical gradients within the UU vary from strong upward gradients (indicating confining and even artesian conditions) to semi-confined conditions with both upward and downward gradients. Vertical gradients between the bedrock and the UU also vary in direction and strength. Results of the vertical hydraulic gradient observations across the Site are included in **Appendix C** and presented below:

- UU (*i.e.,* PMP) to UA:
  - Gradients calculated between MW-104DR (PMP) and MW-304 (UA) were seasonally variable, consistently upward during winter events and consistently downward across summer events.
  - Gradients calculated between MW-158R (PMP) and MW-258 (UA) were consistently downward across monitored events.
  - Gradients calculated between MW-252 (PMP) and MW-352 (UA) were consistently downwards across monitored events.
  - Gradients calculated between MW-150 (PMP) and MW-350 (UA) were consistently downwards across monitored events.
  - Gradients calculated between MW-155 (PMP) and MW-355 (UA) were mostly downward, with some observations of upward gradients.

- Gradients calculated between PZ-182 (PMP) and MW-382 (UA) were slightly downward across most monitored events, with some observations of upward gradients.

2.3.5.2 Impact of Surface Water Bodies on Groundwater Flow

Baldwin Lake (Cooling Pond) is the largest water body in the vicinity of the BPP. The surface water elevation of Baldwin Lake is maintained at approximately 429 to 430 feet. Potentiometric surface elevations of downgradient/side-gradient wells near Baldwin Lake range from 422 to 430 feet. Groundwater flow in the UA generally flows perpendicular to and away from Baldwin Lake across the BAP and FAPS. The Secondary Pond and Tertiary Pond do not appear to be altering groundwater flow direction in the UU or UA. The primary influence of groundwater flow direction in the UU and UA is flow toward the Kaskaskia River, topographic lows, and localized bedrock topographic lows associated with former drainage features.

2.3.6 Hydraulic Conductivities

2.3.6.1 Field Hydraulic Conductivities

Field hydraulic conductivity tests were conducted at the FAPS by Natural Resource Technology during 2014 investigation activities [21]. The results are summarized in **Table 2-2**, and discussed below:

- **CCR**: No field hydraulic conductivity tests were performed within the CCR.
- **UU**: Field hydraulic conductivity tests conducted in wells screened within the UU (MW-104DR, MW-151, MW-152, MW-156, MW-157, MW-161, TPZ-166, MW-252, MW-253, OW-256, OW-257, and MW-262) ranged from 3.5×10^{-7} to 6.8×10^{-4} centimeters per second (cm/s), with a geometric mean of 3.2×10^{-5} cm/s.
- **UA**: Results of field hydraulic conductivity tests conducted in wells screened within the UA (MW-350, MW-352, and MW-355) ranged from 1.7×10^{-6} to 3.5×10^{-5} cm/s, with a geometric mean of 5.0×10^{-6} cm/s.

2.3.6.2 Laboratory Hydraulic Conductivities

Falling head permeability tests (ASTM D5084 Method F) were performed in the laboratory on samples collected during the 2014 investigations [21]. The results are summarized in **Table 2-3** and discussed below.

- **CCR**: Four samples were collected from CCR borings TPZ-163, TPZ-164, TPZ-167, and TPZ-168. Samples were collected in CCR materials at 1.5 to 3.5, 3.0 to 5.0, 29.0 to 30.0, and 3.0 to 5.0 feet below ground surface (bgs), respectively. Laboratory falling head permeability test results for the four CCR samples indicated a geometric mean vertical hydraulic conductivity of 1.6×10^{-4} cm/s with a range of 9.7×10^{-6} to 6.5×10^{-4} cm/s.
- **UU**: Laboratory falling head permeability results of two samples collected from the Cahokia Formation indicated a geometric mean vertical hydraulic conductivity of 1.6×10^{-6} cm/s and ranged from 7.8×10^{-6} to 3.4×10^{-7} cm/s. One sample was collected from the Equality Formation at boring location TPZ-164. Laboratory falling head permeability test results for this sample of the Equality Formation indicated a vertical hydraulic conductivity of 1.3×10^{-6} cm/s. Laboratory falling head permeability results of five samples collected from the Vandalia till indicated a geometric mean vertical hydraulic conductivity of 6.1×10^{-7} cm/s with a range from 6.3×10^{-9} to 4.2×10^{-4} cm/s.

- **Bedrock**: No laboratory hydraulic conductivity tests were performed on bedrock samples.

2.4 Groundwater Monitoring

The proposed monitoring system for the FAPS at the time the exceedances were reported is shown on **Figure 2-8** and consists of three background monitoring wells (MW-304, MW-306, and MW-358) installed in bedrock, nine compliance wells (MW-350, MW-352, MW-366, MW-375, MW-377, MW-383, MW-384, MW-390, and MW-391) installed in bedrock, and six compliance wells (MW-150, MW-151, MW-152, MW-153, MW-252, and MW-253) installed within the unlithified materials, considered to be the PMP.

2.5 Hydrogeologic Conceptual Site Model

The Hydrogeologic Site Characterization Report [22] and information provided above forms the foundation of the FAPS hydrogeological setting. The FAPS overlies a potential recharge area for the underlying transmissive geologic media, which are composed of unlithified deposits (*i.e.,* low permeability clays of the UU and PMP). Recharge migrates downward, into and through the UU and PMP into the UA. Groundwater may also enter the system through the Cooling Pond, Secondary and Tertiary Ponds, the Kaskaskia River, or the many tributary streams located near the FAPS.

Groundwater in the unlithified areas consistently flows east to west towards the Kaskaskia River, with localized variations towards surficial drainage. Groundwater flow in bedrock is northwest in the east and central areas of the BAP, and southwest to northwest on the east area of the FAPS until groundwater reaches the bedrock valley feature underlying the Secondary and Tertiary Ponds west of the BAP and FAPS, at which point the flow direction veers towards this bedrock surface low at the southwestern corner of the Site.

The geologic conceptual model for the Site used for the groundwater modeling [23] consists of the following layers:

- CCR – consisting of primarily fly ash, bottom ash, and boiler slag, within the limits of the BAP and FAPS.
- UU:
  - Upper silty clay - composed of the Cahokia Formation, Peoria Loess, and Equality Formation.
  - PMP – Thin, non-continuous sandy deposits disseminated across the Site.
  - Lower silty clay – Vandalia Till
- Decomposed Bedrock – decomposed interbedded shale and limestone bedrock of the UA at the contact between the Vandalia Till and deep bedrock.
- Deep Bedrock – Deep competent bedrock of the UA yielding small amounts of water from interconnected pores, cracks, fractures, crevices, joints, and bedding planes.

The United States Geological Survey (USGS) National Map places the BPP within the lower Kaskaskia watershed subbasin (Hydrologic Unit Code 07140204) [24]. The FAPS hydrogeologic conceptual site model (CSM) extent is bounded by a hydrological catchment (watershed) divide to the west based on watershed data from USGS. Kaskaskia River is the receiving body of water for surface water.

Precipitation infiltrates and recharges the groundwater table throughout the Site and upgradient. Groundwater in the UU migrates downward into the clay and discontinuous sands of the Cahokia Formation, Peoria Loess, and Equality Formation. Where these sands are present, they are considered a PMP for groundwater adjacent to the FAPS and localized lateral migration of groundwater may occur. The weathered bedrock of the UA is separated from the PMP sands and the base of CCR in the FAPS by the laterally continuous low permeability UU (Vandalia Till). The bedrock in the vicinity of the FAPS yields small amounts of water from interconnected pores, cracks, fractures, crevices, joints, and bedding planes. The shallow bedrock is the only water-bearing unit that is continuous across the Site. Shallow sandstone and creviced limestone may yield small supplies in some areas, but water quality becomes poorer (*i.e.,* highly mineralized) with increasing depth.

Based on the geology and hydrogeology, monitoring wells at the FAPS can be separated into four distinct groupings which exhibit similar geologic and hydraulic characteristics. Monitoring well groupings are summarized as follows:

- UU/PMP wells: shallow wells (less than 40 feet bgs) screened in low to moderate permeability materials (generally ≤ 10^{-5} cm/s) downgradient of the FAPS including MW-150, MW-151, MW-152, MW-153, MW-252, MW-253. Based on the water levels measured within the FAPS, UU/PMP wells are downgradient of the FAPS.
- Eastern UA wells: wells located on the eastern half of the FAPS (including background wells MW-304, MW-306, and MW-358; and northern downgradient wells MW-383, and MW-384) where the top of the UA is slightly shallower (approximately 30 to 50 feet bgs). Groundwater flow directions indicate these wells are currently upgradient of the former drainage feature that was present prior to construction of the FAPS. Groundwater elevations in MW-383 and 384 exhibit limited seasonal variability and have generally declined following dewatering and closure.
- Northwest UA wells: wells located along the northwest side of the FAPS (MW-366, MW-390, and MW-391) where the top of the UA is slightly deeper (approximately 40 to 60 feet bgs), but the bedrock surface resembles a peninsula, with the surface sloping down both north towards the secondary pond and south towards the former drainage feature. Groundwater flow directions indicate these wells are at a position where flow begins to converge toward the bedrock low, and represents groundwater from the western portion of the FAPS. Groundwater elevations at MW-366 and MW-391 begin to show seasonal variability following initiation of dewatering and closure in 2017-2018. Elevations at MW-391 spiked significantly between 2017 and 2018 to levels consistent with the UU/PMP wells, suggesting that a connection between these units may have been present or created during construction dewatering and management of water.
- Southern UA wells: wells located along the southern boundary and also southwest of the FAPS (MW-350, MW-352, MW-374, MW-375, and MW-377) where the top of the UA is slightly deeper (approximately 40 to 60 feet bgs), and the wells are in a location where the bedrock surface is sloping to the south. Groundwater elevations measured in these wells show little seasonal variability and overall have declined slightly since dewatering and closure was initiated in 2017-2018.

3. OCCURRENCE AND DISTRIBUTION OF GROUNDWATER EXCEEDANCES (EXTENT)

As described in Section 1, exceedances from sample events E001, E002, and E003, performed at the FAPS, and for which an ASD was not completed, include the following parameters and wells by hydrostratigraphic unit:

- Detected UU/PMP Exceedances:
  - Boron at MW-150, and MW-152
  - Sulfate at MW-150
- Detected UA (Bedrock Unit) Exceedances:
  - Boron at MW-391

The extents of exceedances discussed below were defined using existing monitoring wells, including wells present onsite (**Table 3-1**) that may not be included in the 35 I.A.C. § 845 monitoring program.

3.1 Additional Investigation to Define Nature and Extent

Solid phase data were evaluated to assess potential geological sources of exceedance parameters and to inform the GCSM (discussed further in **Section 4**). Solid phase data were not collected from the CCR source material prior to completion of closure of the unit in 2020. Four borings were advanced in 2022 and 2023 at the FAPS and solid samples were collected from both the UA and the UU adjacent to paired monitoring wells MW-150 and MW-350 and solid samples were collected from the UA adjacent to three monitoring wells (MW-352, MW-366, and MW-391). Borings were also advanced adjacent to four additional locations at the BPP BAP, with solids collected from the UU and UA at three locations (MW-358, MW-392, and MW-393) and solids collected from the UU at MW-394. These solids were characterized using a variety of analytical techniques including the following:

- Loss on Ignition;
- Total Organic Carbon Analysis;
- Cation Exchange Capacity Analysis;
- EPA 6010A for Total Metals (35 I.A.C. § 845.600 parameters plus aluminum, bismuth, copper, iron, magnesium, manganese, nickel, potassium, silver, strontium, tin, titanium, uranium, vanadium, yttrium, and zinc and boron via Bulk Characterization;
- EPA 6010B for 6-step sequential extraction (boron and iron; on only MW-358, MW-392, MW393, and MW-394));
- Bulk Mineralogy by Rietvelt X-ray diffraction analysis; and,
- Bulk Elemental Composition by X-ray fluorescence analysis.

Historically, an offsite investigation was completed to evaluate the potential migration of boron and sulfate to the south and southwest of the FAPS ([25], **Appendix D**). The investigation included the installation of eight temporary piezometers to evaluate concentrations of boron, sulfate, and total dissolved solids downgradient of UU wells MW-150 and MW-152.

3.2 Extents in the Upper Unit (PMP)

Exceedances are identified quarterly following comparison to the GWPSs described in 35 I.A.C. § 845.600. The LCLs vary as the dataset is updated to include additional quarterly events (**Table 3-2**). The discussion below includes ranges of concentrations measured in wells with exceedances, because there is no single value for statistical evaluations.

3.2.1 Boron

Boron concentrations in monitoring wells MW-150 and MW-152 resulted in identified exceedances of the GWPS (2.16 mg/L, **Figure 3-1**). The concentrations and extent of boron exceedances at the FAPS are summarized as follows:

- MW-150 – Exceedances were reported in all three compliance sampling events with concentrations ranging from 2.87 to 4.37 mg/L. The primary source and lateral and downgradient extent of boron concentrations in proximity to MW-150 is currently being evaluated. In March 2012, dissolved concentrations of boron and sulfate in temporary piezometer BPZ7 were reported at 0.252 mg/L and 215 mg/L, respectively (**Appendix D**). Concentrations of boron and sulfate in MW-150 during the same timeframe were 0.56 mg/L and 584 mg/L, respectively. The extent is ultimately limited by an oxbow of the Kaskaskia River approximately 900 feet to the west/southwest of MW-150 in connection with the Kaskaskia River. Samples collected within the river [3] indicate boron concentrations are less than 0.05 mg/L.

  Vertically, the extent of boron is limited by low hydraulic conductivity of the UU with a range of 6.3×10^{-9} to 4.2×10^{-4} cm/s (**Section 2.3.6**). The concentration of boron at MW-150 is also defined vertically by MW-350, a deeper well nested with MW-150 and screened in the UA. At MW-350 the maximum measured concentration of boron was 0.585 mg/L, which was measured during E002.

- MW-152 – Concentrations resulting in a GWPS exceedance determination were only measured in MW-152 during compliance sampling event E002, with a reported result for boron of 9.09 mg/L (**Table 3-2**[2]). The concentrations of boron at this location are highly variable and have been attributed to seasonal groundwater elevations (**Figure 3-2**). Concentrations are lowest in the spring when groundwater elevations are higher, and higher in the fall when groundwater elevations are low. The downgradient extent is bounded to the west by monitoring well MW-151, with a maximum concentration of 0.89 mg/L during E003 (**Table 3-3**). In March 2012, concentrations of dissolved boron southwest (BPZ4) and southeast (BPZ1) of MW-152 were 0.0435 mg/L and 0.0096 mg/L, respectively (**Appendix D**). The concentration of dissolved boron at MW-152 during the same time frame was approximately 18 mg/L. The observed reduction in concentrations at MW-152 indicates that higher concentrations are not expected off-Site.

  Vertically, the extent of boron is limited by low hydraulic conductivity of the UU with a range 6.3×10^{-9} to 4.2×10^{-4} cm/s (Section 2.3.6). MW-152 is also defined vertically by monitoring wells MW-252 and MW-352, deeper wells nested with MW-152 and screened below MW-152 in the UU and UA, respectively. MW-252 and MW-352 concentrations were not identified as exceedances following comparison to the GWPSs described in 35 I.A.C. § 845.600.

[2] The negative LCL calculated for boron at MW-152 at E003 represents the confidence interval around the mean. When the standard deviation (*i.e.*, variability) of data is high, the calculated lower confidence level may be less than 0.

3.2.2 Sulfate

Sulfate concentrations in monitoring well MW-150 resulted in identified exceedances of the GWPS (762 mg/L). The concentrations and extent of the sulfate exceedance at the FAPS are summarized as follows (**Figure 3-1**):

- MW-150 – Exceedances were reported in compliance sampling events E001 and E002. The primary source, transport mechanism, and lateral and downgradient distribution of sulfate concentrations in proximity to MW-150 are currently being evaluated. Concentrations of dissolved sulfate in MW-150 have increased from 584 mg/L to 1,050 mg/L between 2012 and 2023. In BPZ7 in 2012, the concentration of sulfate was 215 mg/L (**Appendix D**). The downgradient extent is ultimately limited by an oxbow of the Kaskaskia River, approximately 900 feet to the west/southwest of MW-150.

  Vertically, the extent of sulfate is limited by low hydraulic conductivity of the UU, with a range 6.3×10^{-9} to 4.2×10^{-4} cm/s (Section 2.3.6). Concentrations of sulfate in MW-150 is also defined vertically by MW-350, a deeper well nested with MW-150 screened in the UA. The maximum concentration of sulfate detected in MW-350 was 102 mg/L (**Table 3-3**), which was detected during E002.

3.3 Extent in Uppermost Aquifer (Bedrock Unit)

Exceedances are identified quarterly following comparison to the GWPSs described in 35 I.A.C. § 845.600. The LCLs vary as the dataset is updated to include additional quarterly events (**Table 3-2**). The discussion below includes ranges of concentrations measured in wells with exceedances, because there is no single value for LCLs.

3.3.1 Boron

Concentrations of boron resulted in exceedances of the GWPS (2.16 mg/L) at UA well MW-391 (**Figure 3-3**). Concentrations and the extent of boron at this location is summarized as follows:

- MW-391 - Exceedances were determined in all three compliance sampling events. The lateral and downgradient extent of boron concentrations in proximity to MW-391 are limited by the Secondary and Tertiary Ponds immediately adjacent to the monitoring well to the west. Downgradient extent is additionally bound by MW-350 with a maximum measured concentration of 0.585 mg/L boron detected during E002.

  Vertically, the extent of the boron impacts are limited by the low permeability shale bedrock which decreases with depth as the secondary porosities do not yield a sufficient volume of groundwater to produce a useable water supply. In addition, water quality decreases with increasing depth as water becomes increasingly mineralized [16].

4. GEOCHEMICAL CONCEPTUAL SITE MODEL (NATURE)

A GCSM was developed to describe the conditions of the groundwater in the vicinity of the BPP FAPS in support of the CMA and is summarized here (full analysis presented in **Appendix E**). The GCSM describes the geochemical processes that contribute to the mobilization, distribution, and attenuation of chemicals in the environment. As discussed in previous sections, the exceedances observed at the FAPS include boron and sulfate.

The GCSM includes two hydrostratigraphic units: the shallow UU PMP and the deeper UA. The primary source of boron and sulfate to groundwaters of the UA and UU PMP within the monitoring system is the FAPS CCR source water. CCR source water samples, collected from the porewater monitoring wells screened within the CCR materials at the FAP, and the FAP relationship to hydrogeological patterns at the Site, are the primary factors defining the distribution of boron and sulfate concentrations at the Site. Boron was identified within UA solids at concentrations that suggest that aquifer solids could provide an additional potential natural geogenic source of boron to groundwater, and groundwater from background wells consistently exhibited boron concentrations consistent with a natural geogenic source. The observation of pyrite within solids of shale portions of the UA could provide an additional source of sulfate to groundwater via pyrite oxidation, as pyrite is not expected to be a stable mineral phase under observed groundwater redox conditions and sulfate concentrations at background wells are indicative of a potential additional natural source.

Boron and sulfate in the groundwater system may be attenuated via surface complexation reactions within portions of the UU PMP and the UA. Conditions within groundwater from both the UA and UU PMP are typically predicted to favor amorphous iron oxide stability at most locations, and the presence of iron oxides in some Site solids supporting the occurrence of this mechanism. Limited variability in pH or redox conditions is observed between upgradient background and downgradient locations. Boron may be further attenuated via interactions with clay minerals, which are observed in solids across both the UU and UA. The observation of gypsum, although limited to the shale bedrock portions of the UA, indicates that precipitation of gypsum may be another potential attenuation mechanism for sulfate at locations near the FAPS.

5. COMBINED GEOCHEMICAL AND HYDROGEOLOGIC CONCEPTUAL SITE MODELS

5.1 Boron Conceptual Site Model

The CSM describing current conditions at the FAPS combining the hydrogeologic and geochemical CSMs for boron is as follows. Water that may come into contact with CCR in the FAPS becomes porewater within the unlined CCR unit. Porewater (i.e., CCR source water) containing elevated concentrations of boron mixes with groundwater underlying and adjacent to the UU. Groundwater within the UU/PMP in the vicinity of the FAPS travels horizontally outward from the FAPS, migrating toward the Secondary Pond or the drainage ditch to the south, but ultimately toward the Kaskaskia River. Groundwater may also migrate vertically into the clay of the UU that separates the UU from the UA. If groundwater reaches the UA, it migrates slowly in the formation due to the low permeability of the shale bedrock. Boron concentrations are attenuated physically through dilution and dispersion; and may be chemically attenuated via surface complexation to iron oxides and clay minerals, which are observed in solids within both the UU and UA.

The distribution of boron exceedances is being further refined but the extent is currently defined by a combination of wells in the UU and UA with concentrations below the GWPS and ultimately by the concentrations observed in surface water [3]. The presence or absence of exceedances can be attributed to variability in the geology and porewater concentrations, changes in groundwater elevations and flow directions, and the extent of water migration between the UU and UA.

5.2 Sulfate Conceptual Site Model

The CSM describing current conditions at the FAPS combining the hydrogeologic and geochemical CSMs for sulfate is as follows. Water that may come into contact with CCR in the FAPS becomes porewater within the unlined CCR unit. Porewater containing elevated concentrations of sulfate mixes with groundwater underlying and adjacent to the UU. Groundwater within the UU/PMP in the vicinity of the FAPS travels horizontally outward from the FAPS, migrating toward the Secondary Pond or the drainage ditch to the south, but ultimately toward the Kaskaskia River. Groundwater may also migrate vertically into the clay of the UU that separates the UU from the UA. If it reaches the UA, it migrates slowly in the formation due to the low permeability of the shale bedrock. Sulfate concentrations are attenuated physically through dilution and dispersion and may be geochemically attenuated via surface complexation to iron oxides within portions of the UU PMP and the UA. The observation of gypsum, although limited to the shale bedrock portions of the UA, indicates that precipitation of gypsum may be another potential attenuation mechanism for sulfate at locations near the FAPS.

The limit of sulfate exceedances is being further evaluated but is currently defined by a combination of wells in the UU and UA with concentrations below the GWPS and ultimately by the concentrations observed in surface water [3]. The presence or absence of exceedances can be attributed to variability in the geology and CCR source water (porewater) concentrations, changes in groundwater elevations and flow directions, and the extent of water migration between the UU and UA.

6. CONCLUSIONS AND FUTURE ACTIVITIES

In accordance with 35 I.A.C. § 845.650(d)(1), the nature and extent of GWPS exceedances of boron and sulfate have been described in sufficient detail to support a complete and accurate assessment of the corrective measures necessary to effectively clean up all releases from the FAPS.

As discussed in Sections 3.3.1 and 3.3.2, additional refinement of the distribution of boron and sulfate near MW-150 and boron near MW-152 is ongoing in UU wells. Additional investigation is planned to further evaluate the boron exceedance in MW-391 as well as understand the mechanisms that potentially influence groundwater elevations and boron concentrations. Activities include:

- Evaluation of MW-391 to determine if the well has been compromised and identify potential mechanisms causing the rapid water elevation shifts during dewatering and closure.
- Sampling of additional piezometers in the UU near MW-150 and MW-152.
- Survey and water elevation monitoring of the drainage ditch near MW-152 to further evaluate how the ditch may interact with shallow groundwater.
- Pending access agreement with adjacent property owner, installation of additional wells south of the western limit of the FAPS to evaluate potential migration of boron and sulfate in the UU near MW-150.

Findings from sampling of these additional wells and other activities will be incorporated into the final Corrective Action Plan Permit application, which will be submitted in 2025.

Boron was selected for modeling source control presented in the Final Closure Plan and is considered a surrogate for sulfate. For modeling purposes, it was assumed that boron would not significantly sorb or chemically react with aquifer solids (soil adsorption coefficient was set to 0 milliliters per gram) which is a conservative estimate for predicting contaminant transport times in the model. Additional geochemical modeling will be completed to evaluate how sorption to solid phases may affect sulfate mobility and therefore the time to reach the GWPS for this parameter.

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TABLES

Table 2-1. Summary of Groundwater Elevations
Nature and Extent Report
Baldwin Power Plant
Fly Ash Pond System
Baldwin, Illinois

DATE LOCATION	1/10/2023	2/20/2023	3/13/2023 - 3/15/2023	4/16/2023	5/16/2023	5/17/2023 - 5/19/2023	5/22/2023 - 5/23/2023	6/16/2023 - 6/22/2023	7/10/2023	7/16/2023	8/2/2023 - 8/3/2023	8/7/2023	9/30/2023	10/30/2023	11/6/2023 - 11/7/2023	12/13/2023
MW-104DR	446.91	--	447.67	--	--	--	445.34	--	--	--	441.67	--	--	438.82	438.71	--
MW-104SR	446.74	--	447.62	--	--	--	445.29	--	--	--	441.64	--	--	--	438.59	--
MW-150	--	--	378.83	379.52	378.08	377.87	--	376.63	--	375.98	375.89	--	--	375.92	376.01	376.34
MW-151	--	--	395.30	--	--	394.38	--	--	394.18	--	391.89	--	--	392.38	392.49	392.51
MW-152	--	--	419.44	--	--	418.49	--	--	--	--	416.80	--	416.92	416.80	417.05	417.13
MW-153	--	--	434.85	435.60	433.24	--	432.81	430.17	429.17	429.09	429.48	--	428.56	427.83	427.74	427.69
MW-154	--	--	--	--	--	--	--	--	--	--	--	--	--	--	372.70	--
MW-155	--	--	376.21	--	--	--	375.88	--	--	--	--	373.60	--	--	371.64	--
MW-252	--	--	420.39	423.30	--	422.94	--	--	--	--	422.26	--	--	421.77	421.61	421.68
MW-253	--	--	433.51	435.50	432.93	--	432.24	--	--	--	429.69	--	--	428.77	423.19	428.37
MW-304	445.57	445.84	445.97	445.91	445.89	--	445.96	445.66	--	445.5	445.65	--	445.18	445.24	445.00	445.15
MW-306	435.31	435.97	436.07	436.19	436.09	--	436.06	435.75	--	435.61	435.68	--	--	433.21	435.14	435.04
MW-350	--	--	372.71	373.27	373.04	373.06	--	373.06	--	372.83	372.91	--	372.69	372.47	368.02	371.87
MW-352	--	--	424.39	--	--	421.77	--	--	419.72	--	411.55	--	--	418.76	407.37	414.59
MW-355	--	--	371.11	--	--	--	370.71	--	--	--	--	368.43	--	363.75	368.78	--
MW-358	386.37	442.61	442.83	399.36	412.48	412.81	--	413.89	--	421.07	424.63	--	422.57	427.56	420.88	415.65
MW-366	--	--	410.28	--	411.89	--	--	--	--	--	406.82	--	--	406.07	405.83	--
MW-375	--	--	391.25	--	--	390.84	--	--	--	--	389.49	--	--	387.81	385.64	387.37
MW-377	--	--	415.80	--	--	--	415.71	--	--	--	415.19	--	--	414.52	414.30	414.30
MW-383	440.48	--	441.17	439.08	440.05	--	440.33	436.30	--	439.05	439.57	--	439.08	439.37	433.41	438.70
MW-384	444.14	--	444.80	444.34	444.16	--	444.26	443.77	--	443.79	443.85	--	--	443.25	452.76	442.75
MW-390	420.46	--	422.75	--	--	421.86	--	--	--	--	419.17	--	--	418.03	418.26	418.06
MW-391	--	--	367.93	365.58	365.76	365.89	--	360.73	--	360.94	361.21	--	360.35	358.63	355.48	355.81
OW-156	421.25	--	424.14	--	421.65	--	--	--	--	--	--	--	--	417.67	418.21	--
OW-157	426.92	--	427.48	--	426.59	--	--	--	--	--	--	--	--	423.12	423.80	--

Notes:
-- = Not Measured
All groundwater elevation data are presented relative to the North American Vertical Datum 1988 (NAVD88).

Table 2-2. Field Horizontal Hydraulic Conductivities
Nature and Extent Report
Baldwin Power Plant
Fly Ash Pond System
Baldwin, Illinois

Monitoring Well Number	Depth Interval Tested (feet)	Analysis Method	Lithologic Layer	Primary Lithologies within Screened Well Interval	Horizontal Hydraulic Conductivity (cm/s)
Upper Unit					
MW-104DR	23.2 - 28.2	Bouwer-Rice	Vandalia Till Member	Sand (fine-medium), Sandy Clay, and Silty Clay	6.8E-04
MW-151	6.1 - 15.8	Bouwer-Rice	Cahokia Formation	Sandy Clay, Silty Clay, and Clay	1.1E-05
MW-152	7.5 - 16.7	Bouwer-Rice	Equality Formation	Clay, Sand, and Sandy Clay	7.0E-05
MW-161	23.3 - 32.8	Bouwer-Rice	Equality Formation	Silty Clay, Sand with Silt	8.1E-05
MW-252	44.4 - 49.0	Bouwer-Rice	Vandalia Till Member	Clay	1.9E-06
MW-253	29.9 - 34.5	Bouwer-Rice	Vandalia Till Member	Clay, shaley	3.5E-07
MW-262	42.1 - 46.6	Bouwer-Rice	Vandalia Till Member	Sand with Silt, Sandy Silt, Silty Clay, and Sand (fine-coarse)	6.0E-04
OW-156	7.9 - 17.2	Bouwer-Rice	Equality Formation	Clay and Silty Clay	4.3E-05
OW-157	7.8 - 17.1	Bouwer-Rice	Equality Formation	Clay with Silt, Clay with Sand, and Clay	1.3E-04
OW-256	28.0 - 32.5	Bouwer-Rice	Vandalia Till Member	Silty Clay, Sand (fine-medium)	2.2E-04
OW-257	34.0 - 38.5	Bouwer-Rice / KGS Model	Vandalia Till Member	Silty Clay, Shale and Clay	3.3E-06
TPZ-166	15.3 - 24.7	Bouwer-Rice	Vandalia Till Member	Silty Clay	1.9E-05
				Geometric Mean Hydraulic Conductivity	**3.2E-05**
Uppermost Aquifer					
MW-350	41.6 - 46.2	Bouwer-Rice	Mississippian Bedrock	Limestone, massive, hard to very hard; RQD = 96% (Excellent)	2.1E-06
MW-352	67.9 - 72.5	Bouwer-Rice	Pennsylvanian or Mississippian Bedrock	Limestone, medium hard to hard; RQD = 57% (Fair)	1.7E-06
MW-355	27.4 - 32.0	Bouwer-Rice	Mississippian Bedrock	Limestone, medium soft, fossiliferous; RQD = 57% (Fair)	3.5E-05
				Geometric Mean Hydraulic Conductivity	**5.0E-06**

[O: JJW 4/12/21, U: CJC 4/15/24, C: EGP 4/15/24]

Notes:
cm/s = centimeters per second

Reference:
Bouwer-Rice = Bouwer and Rice Analytical Method for Unconfined Aquifers, 1976. (note: also used for Confined Aquifers)
KGS Model = KGS overdamped slug test analysis model (Hyder et al., 1994)
Data source was the Groundwater Quality Assessment and Phase II Hydrogeologic Investigation (NRT, 2014)

Table 2-3. Laboratory Vertical Hydraulic Conductivities
Nature and Extent Report
Baldwin Power Plant
Fly Ash Pond System
Baldwin, Illinois

Monitoring Well Number	Depth Interval Tested (feet)	Analysis Method	Lithologic Layer	Primary Lithologies within Sample Interval	Horizontal Hydraulic Conductivity (cm/s)
Fill Unit (CCR)					
TPZ-163	1.5 - 3.5	Geotechnology (2013)	Ash Pond System: Fly Ash / Bottom Ash	Ash (USCS classification: Silty Sand, fine grained)	2.5E-04
TPZ-164	3.0 - 5.0	Geotechnology (2013)	Ash Pond System: Bottom Ash	Ash (USCS classification: Sandy Silt, fine grained sand)	6.5E-04
TPZ-167	29.0 - 30.0	Geotechnology (2013)	Ash Pond System: Fly Ash	Ash (USCS classification: Silt)	9.7E-06
TPZ-168	3.0 - 5.0	Geotechnology (2013)	Ash Pond System: Fly Ash	Ash (USCS classification: Sandy Silt, fine-medium grained sand)	4.2E-04
				Geometric Mean Hydraulic Conductivity	**1.6E-04**
Upper Unit					
MW-154	8.0 - 9.2	Shively Geotechnical (2010)	Cahokia Formation	Sandy Clay with Gravel	7.8E-06
MW-252	44.0 - 46.0	Shively Geotechnical (2010)	Vandalia Member	Clay	6.3E-09
MW-262	33.5 - 35.5	Geotechnology (2013)	Vandalia Member	Clay	9.9E-09
Uppermost Aquifer					
MW-350	18.0 - 20.0	Shively Geotechnical (2010)	Cahokia Formation	Clay	3.4E-07
TPZ-163	28.0 - 30.0	Geotechnology (2013)	Vandalia Member	Clay, trace fine sand	4.2E-04
TPZ-164	10.0 - 12.0	Geotechnology (2013)	Equality Formation	Clay	1.3E-06
TPZ-165	8.0 - 10.0	Geotechnology (2013)	Vandalia Member	Clay, trace sand	5.3E-06
TPZ-167	32.0 - 34.0	Geotechnology (2013)	Vandalia Member	Clay with sand	6.2E-07
				Geometric Mean Hydraulic Conductivity	**8.6E-07**

[O: JJW 4/12/21, U: CJC 4/15/24, C: EGP 4/15/24]

Notes:
cm/s = centimeters per second

Reference:
Shively Geotechnical (2010): see Appendix C of Baldwin Bottom Ash Pond System Hydrogeologic Characterization Report, Revision 1 (Ramboll, 2023)
Geotechnology (2013): see Appendix C of Baldwin Bottom Ash Pond System Hydrogeologic Characterization Report, Revision 1 (Ramboll, 2023)
Data source was the Groundwater Quality Assessment and Phase II Hydrogeologic Investigation (NRT, 2014)

Table 3-1. Monitoring Well Construction Details
Nature and Extent Report
Baldwin Power Plant
Fly Ash Pond System
Baldwin, Illinois

Location	HSU	Date Constructed	Top of PVC Elevation (ft)	Measuring Point Elevation (ft)	Measuring Point Description	Ground Elevation (ft)	Screen Top Depth (ft bgs)	Screen Bottom Depth (ft bgs)	Screen Top Elevation (ft)	Screen Bottom Elevation (ft)	Well Depth (ft bgs)	Bottom of Boring Elevation (ft)	Screen Length (ft)	Screen Diameter (inches)	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
MW-150	PMP	2010-09-01	396.5	396.7	Top of PVC	393.8	15	24.7	378.8	369.2	25.2	368.7	9.6	2	38.189401	-89.878468
MW-151	PMP	2010-09-01	400.0	400.1	Top of PVC	397.2	6.1	15.8	391.1	381.4	16.3	380.9	9.6	2	38.188449	-89.872354
MW-152	PMP	2010-09-01	425.0	425.2	Top of PVC	422.2	7.5	16.7	414.7	405.5	17.2	405.0	9.3	2	38.187569	-89.866764
MW-153	PMP	2010-09-01	445.7	445.8	Top of PVC	442.8	10.4	20	432.4	422.8	20.5	422.3	9.6	2	38.185884	-89.86101
MW-252	PMP	2010-09-01	425.1	425.2	Top of PVC	422.3	44.4	49	377.9	373.2	49.5	372.7	4.6	2	38.187563	-89.866745
MW-253	PMP	2010-09-01	445.8	446.0	Top of PVC	442.7	29.9	34.5	412.8	408.2	35	407.7	4.6	2	38.185885	-89.861026
MW-304	UA	2015-10-20	455.5	455.4	Top of PVC	453.0	45	55	408.0	398.0	55	317.6	10	2	38.188332	-89.853441
MW-350	UA	2010-09-01	396.8	397.0	Top of PVC	394.1	41.6	46.2	352.5	347.9	46.6	347.4	4.6	2	38.189416	-89.878477
MW-352	UA	2010-09-01	425.0	425.2	Top of PVC	422.4	67.9	72.5	354.5	349.8	73	348.6	4.6	2	38.187554	-89.866729
MW-358	UA	2022-10-08	455.7	455.9	Top of PVC	453.6	80	90	373.7	363.7	90	363.6	10	2	38.195275	-89.849417
MW-366	UA	2015-12-04	425.1	425.2	Top of PVC	422.5	42	52	380.5	370.5	52	368.2	10	2	38.192191	-89.872345
MW-375	UA	2015-11-06	423.1	423.2	Top of PVC	420.5	57	67	363.5	353.5	67	335.8	10	2	38.189045	-89.873514
MW-377	UA	2015-11-02	421.4	421.5	Top of PVC	418.8	46	56	372.8	362.8	56	360.5	10	2	38.188386	-89.869742
MW-383	UA	2015-12-21	459.5	459.7	Top of PVC	457.2	58	68	399.2	389.2	68	384.2	10	2	38.194913	-89.858286
MW-384	UA	2015-12-18	458.9	459.1	Top of PVC	456.7	60.5	70.5	396.2	386.2	70.5	362.6	10	2	38.191789	-89.860699
MW-390	UA	2016-03-04	428.1	427.8	Top of PVC	426.0	50	65	376.0	361.0	65	358.0	15	2	38.192956	-89.869793
MW-391	UA	2016-03-10	426.6	426.8	Top of PVC	424.2	55	70	369.2	354.2	70	349.8	15	2	38.190869	-89.874759

Notes:
All elevation data are presented relative to the North American Vertical Datum 1988 (NAVD88), GEOID 12A
bgs = below ground surface
ft = foot or feet
HSU = Hydrostratigraphic Unit
UA = Uppermost Aquifer
PMP = Potential Migration Pathway
PVC = polyvinyl chloride

Table 3-2. Exceedance Parameter Statistical Results
Nature and Extent Report
Baldwin Power Plant
Fly Ash Pond System
Baldwin, Illinois

Location	Parameter	Unit	Groundwater Protection Standard	2023 Q2 LCL	2023 Q3 LCL	2023 Q4 LCL
MW-150	Boron, total	mg/L	2.16	4.12	4.38	2.87
MW-152	Boron, total	mg/L	2.16	0.515	9.09	-13.3
MW-391	Boron, total	mg/L	2.16	2.42	2.41	2.50
MW-150	Sulfate, total	mg/L	762	970	852	749
MW-253	pH (field)	SU	6.5/11.1		11.3/11.8	11.2/11.7

Notes:
LCL = Lower Confidence Level
mg/L = milligrams per liter
SU = standard unit

Table 3-3. Summary of Groundwater Data
Nature and Extent Report
Baldwin Power Plant
Fly Ash Pond System
Baldwin, Illinois

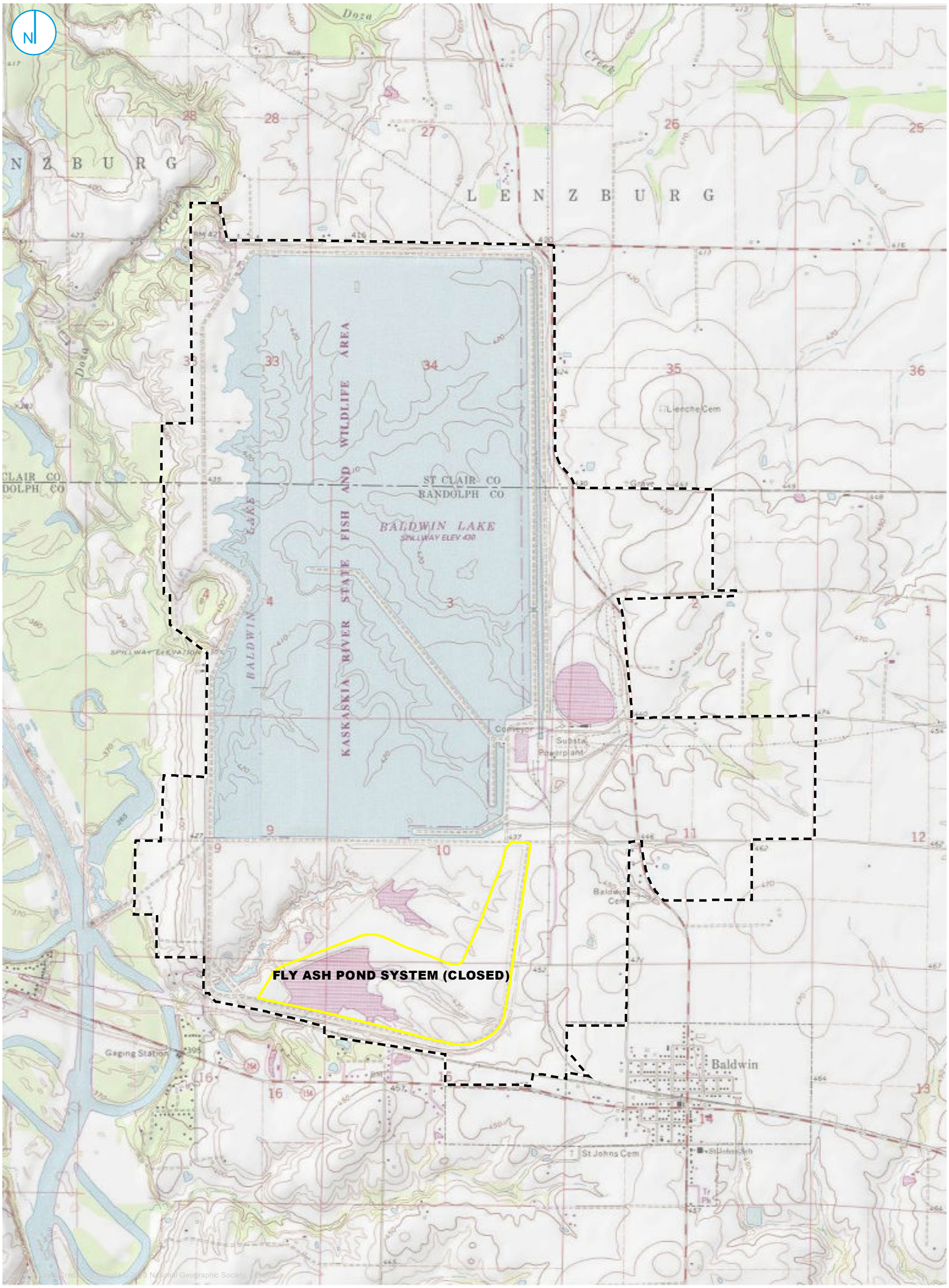
HSU	Location	Well Type	Parameter	Unit	Sample Count	Non-Detect Results	Percent Non-Detect Results	First Sample	Last Sample	Minimum	Median	Mean	Maximum
PMP	MW-150	C	Boron, total	mg/L	4	0	0	2023/03/15	2023/11/03	3.43	3.9	3.9	4.38
PMP	MW-150	C	Sulfate, total	mg/L	4	0	0	2023/03/15	2023/11/03	832	890	900	970
PMP	MW-150	C	pH (field)	SU	36	0	0	2015/03/25	2023/11/03	6.7	7.2	7.1	7.5
PMP	MW-151	C	Boron, total	mg/L	5	0	0	2023/03/15	2023/10/31	0.345	0.75	0.67	0.889
PMP	MW-151	C	Sulfate, total	mg/L	5	0	0	2023/03/15	2023/10/31	74.0	82	85	95.0
PMP	MW-151	C	pH (field)	SU	29	0	0	2017/03/16	2023/10/31	6.7	6.9	6.9	7.2
PMP	MW-152	C	Boron, total	mg/L	4	0	0	2023/03/15	2023/10/31	0.477	4.8	7.5	19.8
PMP	MW-152	C	Sulfate, total	mg/L	4	0	0	2023/03/15	2023/10/31	242	550	580	988
PMP	MW-152	C	pH (field)	SU	36	0	0	2015/03/25	2023/10/31	6.6	6.9	6.9	7.5
PMP	MW-153	C	Boron, total	mg/L	5	4	80	2023/03/15	2023/11/03	<0.009	0.030	0.059	<0.013
PMP	MW-153	C	Sulfate, total	mg/L	5	0	0	2023/03/15	2023/11/03	62.0	68.0	66	75.0
PMP	MW-153	C	pH (field)	SU	37	0	0	2015/03/25	2023/11/03	6.1	7.1	7.1	7.4
PMP	MW-252	C	Boron, total	mg/L	4	0	0	2023/03/15	2023/10/31	0.143	0.16	0.16	0.174
PMP	MW-252	C	Sulfate, total	mg/L	4	0	0	2023/03/15	2023/10/31	437	450	450	474
PMP	MW-252	C	pH (field)	SU	36	0	0	2015/03/25	2023/10/31	6.6	6.8	6.9	7.6
PMP	MW-253	C	Boron, total	mg/L	3	1	33	2023/03/15	2023/11/03	<0.02	0.070	0.055	0.0853
PMP	MW-253	C	Sulfate, total	mg/L	3	0	0	2023/03/15	2023/11/03	140	150	160	174
PMP	MW-253	C	pH (field)	SU	35	0	0	2015/03/25	2023/11/03	9.8	12	11	12.4
UA	MW-304	B	Boron, total	mg/L	29	0	0	2015/12/29	2023/11/01	1.27	1.7	1.7	2.16
UA	MW-304	B	Sulfate, total	mg/L	29	0	0	2015/12/29	2023/11/01	157	190	190	231
UA	MW-304	B	pH (field)	SU	40	0	0	2015/12/29	2023/11/01	7.4	7.9	7.9	8.2
UA	MW-358	B	Boron, total	mg/L	10	0	0	2022/10/27	2023/11/01	1.10	1.4	1.4	1.67
UA	MW-358	B	Sulfate, total	mg/L	10	2	20	2022/10/27	2023/11/01	8.00	24	40	108
UA	MW-358	B	pH (field)	SU	10	0	0	2022/10/27	2023/11/01	7.6	7.9	7.9	8.4
UA	MW-350	C	Boron, total	mg/L	10	0	0	2020/03/26	2023/11/03	0.538	0.62	0.63	0.900
UA	MW-350	C	Sulfate, total	mg/L	10	0	0	2020/03/26	2023/11/03	52.0	92	87	113
UA	MW-350	C	pH (field)	SU	38	0	0	2015/03/25	2023/11/03	8.0	12	11	12.8
UA	MW-352	C	Boron, total	mg/L	5	0	0	2023/03/15	2023/10/31	1.88	2.1	2.2	2.77
UA	MW-352	C	Sulfate, total	mg/L	5	1	20	2023/03/15	2023/10/31	6.00	7.0	7.6	<6
UA	MW-352	C	pH (field)	SU	37	0	0	2015/03/25	2023/10/31	6.7	7.6	7.7	9.0
UA	MW-366	C	Boron, total	mg/L	23	0	0	2016/01/20	2023/11/02	1.19	1.7	1.7	2.70
UA	MW-366	C	Sulfate, total	mg/L	23	0	0	2016/01/20	2023/11/02	33.0	430	340	700
UA	MW-366	C	pH (field)	SU	23	0	0	2016/01/20	2023/11/02	6.7	7.0	7.0	7.5
UA	MW-375	C	Boron, total	mg/L	23	0	0	2016/01/20	2023/11/03	0.979	1.4	1.4	2.06
UA	MW-375	C	Sulfate, total	mg/L	23	0	0	2016/01/20	2023/11/03	83.0	120	140	243
UA	MW-375	C	pH (field)	SU	23	0	0	2016/01/20	2023/11/03	7.0	7.8	7.7	7.9

Table 3-3. Summary of Groundwater Data
Nature and Extent Report
Baldwin Power Plant
Fly Ash Pond System
Baldwin, Illinois

HSU	Location	Well Type	Parameter	Unit	Sample Count	Non-Detect Results	Percent Non-Detect Results	First Sample	Last Sample	Minimum	Median	Mean	Maximum
UA	MW-377	C	Boron, total	mg/L	23	0	0	2016/01/19	2023/11/03	1.54	1.7	1.7	2.01
UA	MW-377	C	Sulfate, total	mg/L	23	0	0	2016/01/19	2023/11/03	37.0	39	40	51.0
UA	MW-377	C	pH (field)	SU	23	0	0	2016/01/19	2023/11/03	6.9	7.2	7.2	7.7
UA	MW-383	C	Boron, total	mg/L	23	0	0	2016/01/21	2023/11/01	1.16	1.4	1.4	2.05
UA	MW-383	C	Sulfate, total	mg/L	23	0	0	2016/01/21	2023/11/01	150	180	180	212
UA	MW-383	C	pH (field)	SU	23	0	0	2016/01/21	2023/11/01	7.3	7.6	7.6	7.8
UA	MW-384	C	Boron, total	mg/L	23	0	0	2016/01/21	2023/11/01	1.26	1.5	1.5	2.26
UA	MW-384	C	Sulfate, total	mg/L	23	0	0	2016/01/21	2023/11/01	30.0	100	94	178
UA	MW-384	C	pH (field)	SU	23	0	0	2016/01/21	2023/11/01	7.2	8.0	7.9	8.1
UA	MW-390	C	Boron, total	mg/L	23	0	0	2016/03/22	2023/11/02	0.175	0.55	0.86	2.30
UA	MW-390	C	Sulfate, total	mg/L	23	0	0	2016/03/22	2023/11/02	102	150	160	234
UA	MW-390	C	pH (field)	SU	23	0	0	2016/03/22	2023/11/02	6.8	7.2	7.2	7.8
UA	MW-391	C	Boron, total	mg/L	17	0	0	2016/12/22	2023/11/03	1.30	3.2	4.0	8.91
UA	MW-391	C	Sulfate, total	mg/L	17	0	0	2016/12/22	2023/11/03	426	760	910	1,760
UA	MW-391	C	pH (field)	SU	18	0	0	2016/12/22	2023/11/03	7.3	7.7	7.7	8.2

Notes:
B = Background
C = Compliance
HSU = Hydrostratigraphic Unit
mg/L = milligrams per liter
PMP = Potential Migration Pathway
SU = standard unit
UA = Uppermost Aquifer

FIGURES



FLY ASH POND SYSTEM
PROPERTY BOUNDARY

0 1,000 2,000 Feet

SITE LOCATION MAP

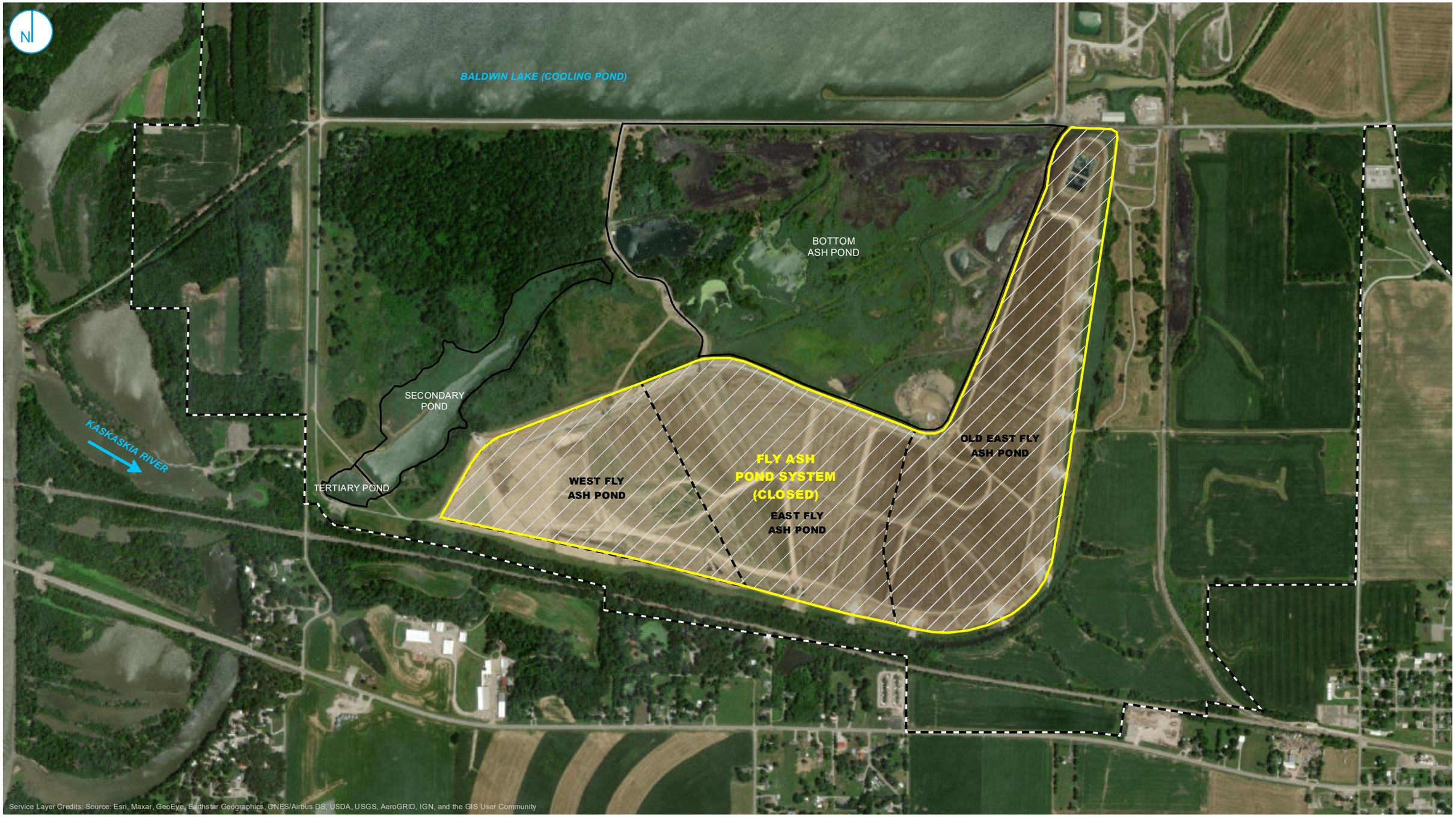
FIGURE 2-1

NATURE AND EXTENT REPORT
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

Y:\Mapping\Projects\2212285Baldwin\MXD\GMP_Addendum\FAPS\Figure 1-2_Site Map.mxd



PROJECT: 169000XXXX | DATED: 10/15/2021 | DESIGNER: HOTCALD

REGULATED UNIT (SUBJECT UNIT) FLY ASH POND SYSTEM (CLOSED)

SITE FEATURE

LIMITS OF FINAL COVER

PROPERTY BOUNDARY

0 400 800 Feet

SITE MAP

NATURE AND EXTENT REPORT
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

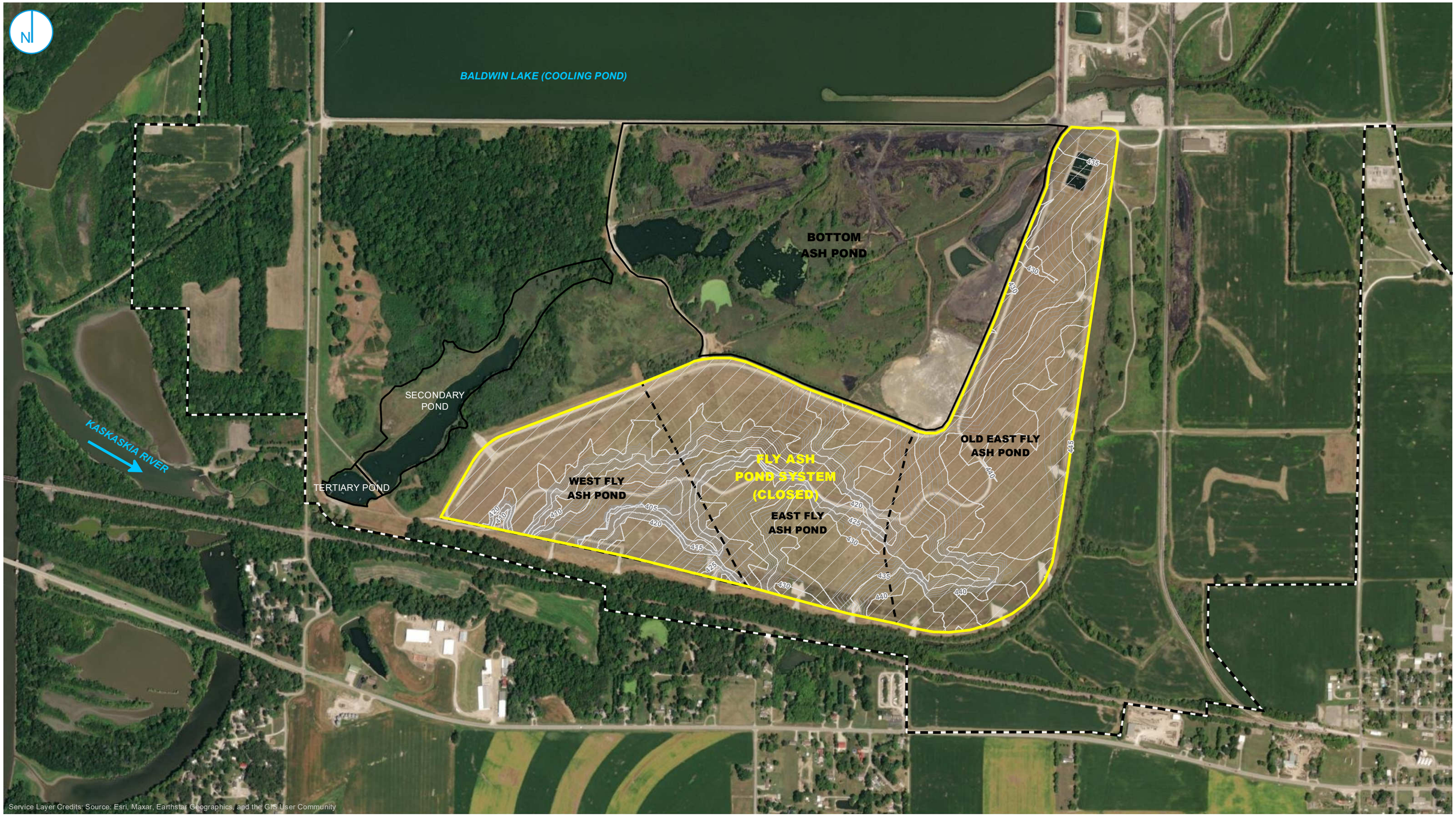
FIGURE 2-2

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL

Y:\Mapping\Projects\22\2285\MXD\Nature_and_Extent\BAL\Nature_and_Extent_Report\Figure 1_BAL FAPS BOA.mxd

PROJECT: 169000XXXX | DATED: 4/11/2024 | DESIGNER: galarnmc



5FT TOPOGRAPHIC CONTOUR
1FT TOPOGRAPHIC CONTOUR
REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
CAPPED AREA
PROPERTY BOUNDARY

0 400 800 Feet

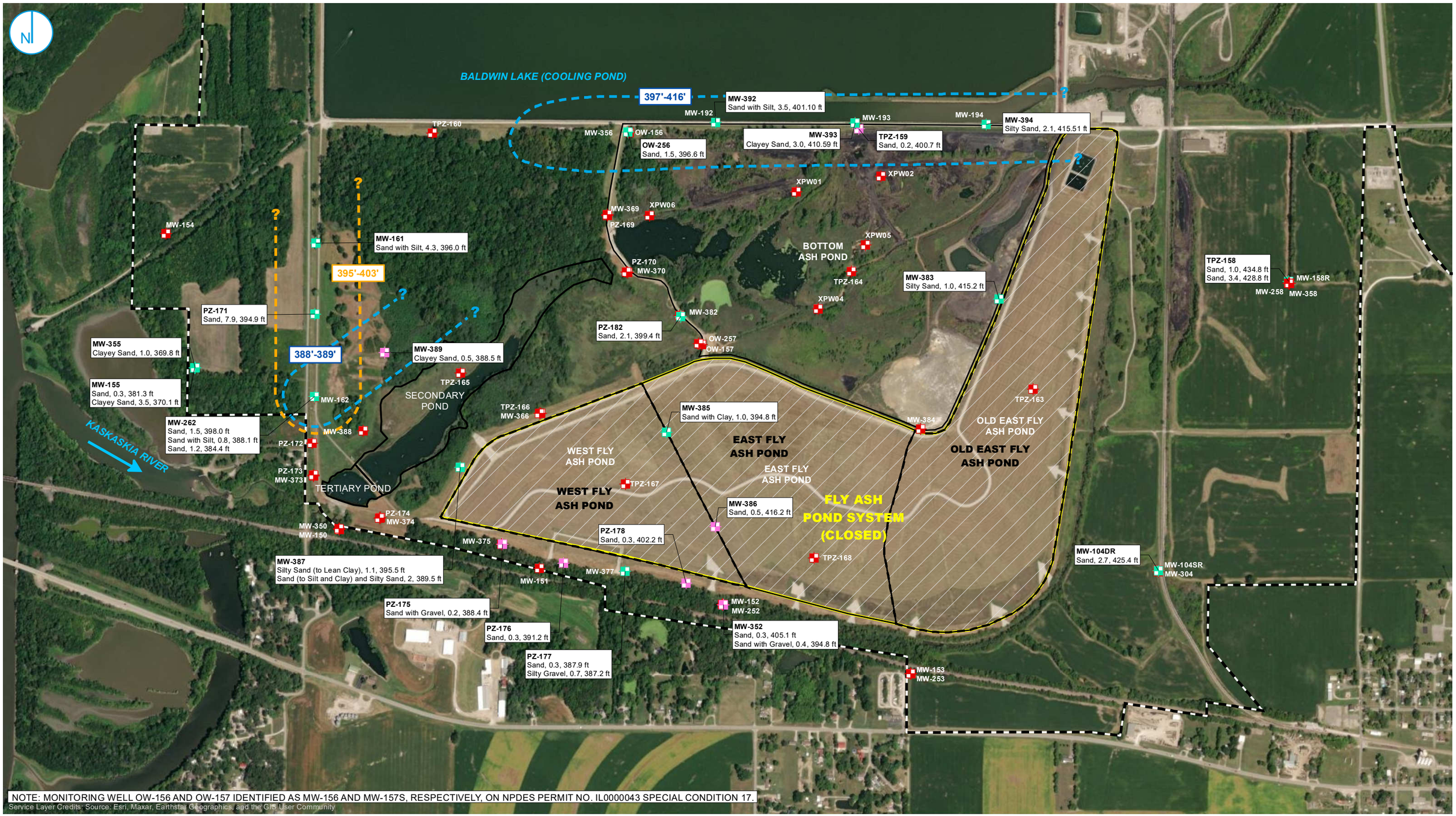
BASE OF CCR

FIGURE 2-3

NATURE AND EXTENT REPORT
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



NOTE: MONITORING WELL OW-156 AND OW-157 IDENTIFIED AS MW-156 AND MW-157S, RESPECTIVELY, ON NPDES PERMIT NO. IL0000043 SPECIAL CONDITION 17.

Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

PROJECT: 169000XXXX | DATED: 4/17/2024 | DESIGNER: galammc

Y:\Mapping\Projects\22\2285\MXD\Nature_and_Extent\BAL\Nature_and_Extent_Report\Figure 2-4_Sand Seam Observations Thickness and Elevations.mxd

- BORING LOCATION WITH OBSERVED SAND SEAM > 0.5 FT
- BORING LOCATION WITH OBSERVED SAND SEAM =< 0.5 FT
- BORING LOCATION WITH NO OBSERVED SAND SEAM

BORING/WELL NUMBER
SEAM DESCRIPTION, SEAM THICKNESS (FT), SEAM BASE ELEVATION

AREAS OF POTENTIALLY INTERCONNECTED SAND SEAMS AND SEAM ELEVATION INTERVAL

- UNSATURATED SAND SEAM
- SATURATED SAND SEAM

- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- LIMITS OF FINAL COVER
- PROPERTY BOUNDARY

0 400 800 Feet

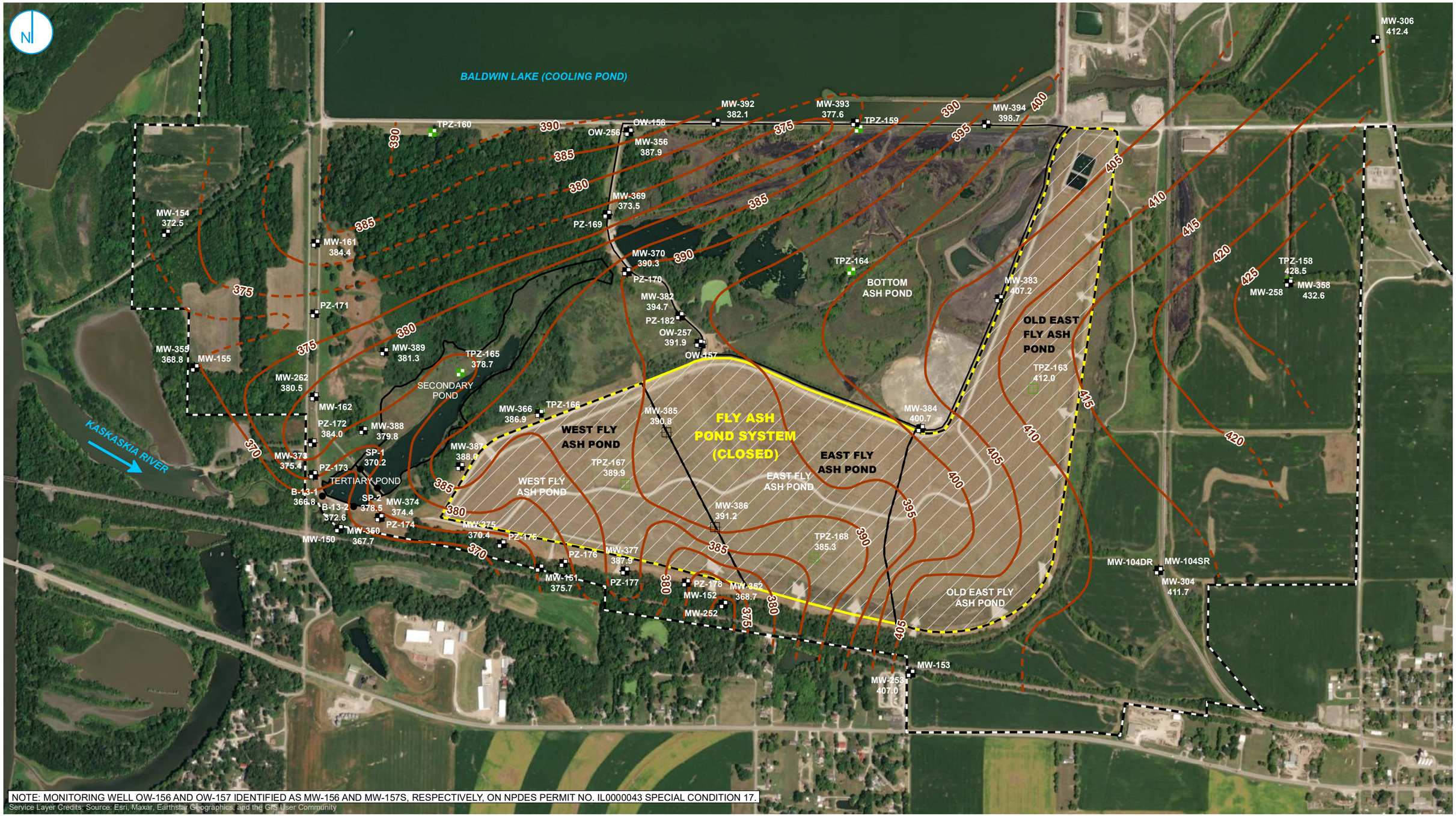
SAND SEAM OBSERVATIONS, THICKNESS AND ELEVATIONS

NATURE AND EXTENT REPORT
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 2-4

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



NOTE: MONITORING WELL OW-156 AND OW-157 IDENTIFIED AS MW-156 AND MW-157S, RESPECTIVELY, ON NPDES PERMIT NO. IL0000043 SPECIAL CONDITION 17.

Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

PROJECT: 169000XXXX | DATED: 4/11/2024 | DESIGNER: galarnmc

Y:\Mapping\Projects\22\2285\MXD\Nature_and_Extent\BAL\Nature_and_Extent_Report\Figure 2-6_Bedrock Topography.mxd

- MONITORING WELL
- PORE WATER WELL
- CLOSED MONITORING WELL
- CLOSED PORE WATER WELL
- AECOM BORING LOCATION
- BEDROCK ELEVATION CONTOUR
- INFERRED BEDROCK ELEVATION CONTOUR
- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- LIMITS OF FINAL COVER
- PROPERTY BOUNDARY

0 400 800 Feet

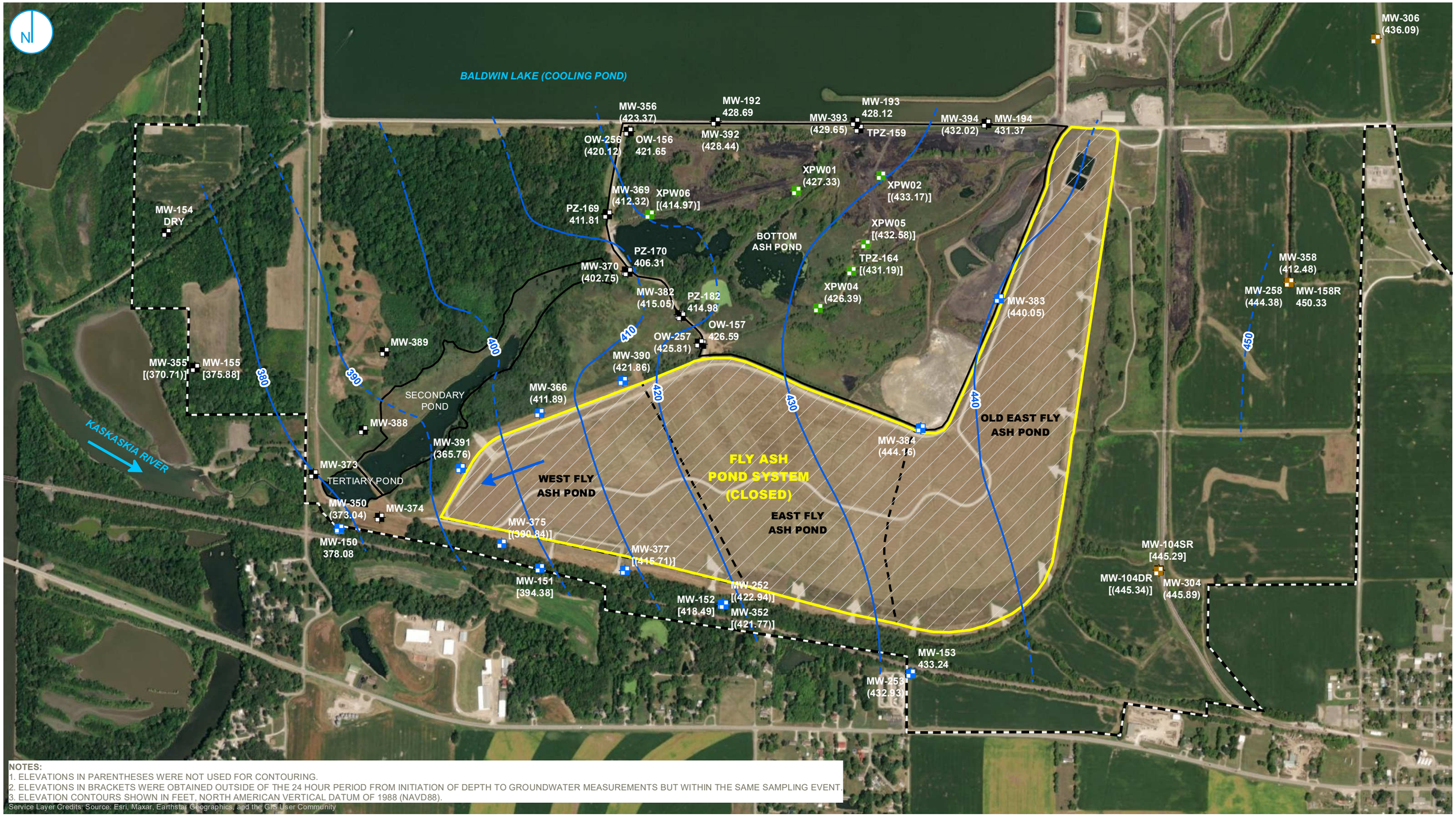
TOP OF UPPERMOST AQUIFER

NATURE AND EXTENT REPORT
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 2-5

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



NOTES:
1. ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
2. ELEVATIONS IN BRACKETS WERE OBTAINED OUTSIDE OF THE 24 HOUR PERIOD FROM INITIATION OF DEPTH TO GROUNDWATER MEASUREMENTS BUT WITHIN THE SAME SAMPLING EVENT.
3. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Y:\Mapping\Projects\22\2285\MXD\GW_Contours\Round_2023\Baldwin\FAPS_605\BAL 605 FAPS Unlith Pot Surface 20230516.mxd

PROJECT: 169000XXXX | DATED: 12/21/2023 | DESIGNER: GALARNMC

- COMPLIANCE MONITORING WELL
- BACKGROUND MONITORING WELL
- MONITORING WELL
- PORE WATER WELL
- GROUNDWATER ELEVATION CONTOUR (10-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- CAPPED
- PROPERTY BOUNDARY

0 400 800 Feet

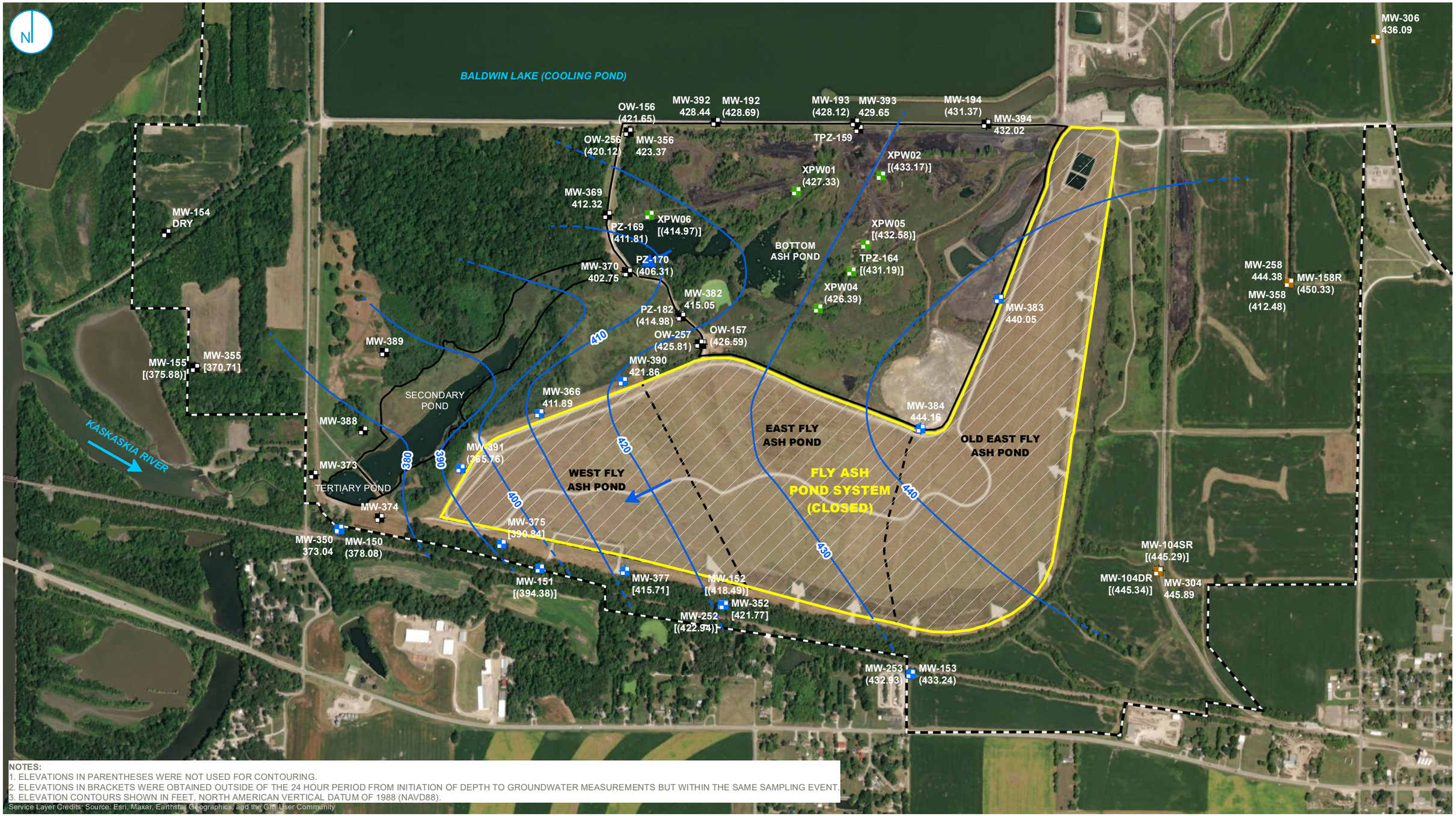
SHALLOW UNLITHIFIED POTENTIOMETRIC SURFACE MAP, MAY 2023 (E001)

NATURE AND EXTENT REPORT
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 2-6

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



NOTES:
1. ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
2. ELEVATIONS IN BRACKETS WERE OBTAINED OUTSIDE OF THE 24 HOUR PERIOD FROM INITIATION OF DEPTH TO GROUNDWATER MEASUREMENTS BUT WITHIN THE SAME SAMPLING EVENT.
3. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

PROJECT: 169000XXXX | DATED: 10/31/2023 | DESIGNER: GALARNMC

Y:\Mapping\Projects2\22285\MXD\GW_Contours\Round_2023\Baldwin\FAPS_605\BAL 605 FAPS Pot Surface 20230516.mxd

- COMPLIANCE MONITORING WELL
- BACKGROUND MONITORING WELL
- MONITORING WELL
- PORE WATER WELL
- GROUNDWATER ELEVATION CONTOUR (10-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- CAPPED AREA
- PROPERTY BOUNDARY

0 400 800 Feet

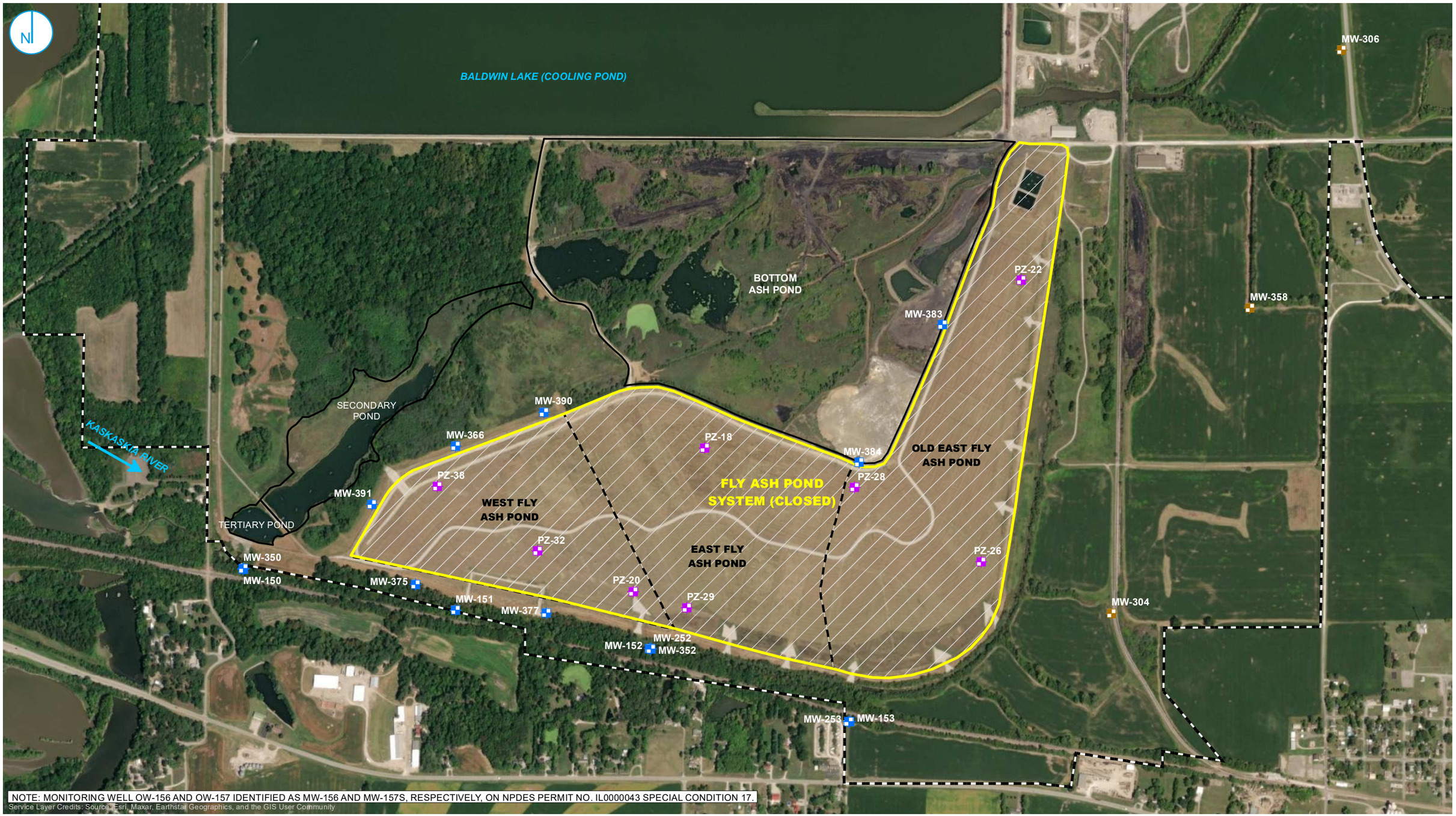
UPPERMOST AQUIFER POTENTIOMETRIC SURFACE MAP, MAY 2023 (E001)

NATURE AND EXTENT REPORT
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 2-7

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



Y:\Mapping\Projects\22\2285\MXD\Nature_and_Extent\BALL\Nature_and_Extent_Report\Figure 2-8. Monitoring Well Location Network.mxd

PROJECT: 169000XXXX | DATED: 4/17/2024 | DESIGNER: galammc

- COMPLIANCE MONITORING WELL
- BACKGROUND MONITORING WELL
- SUPPLEMENTAL PIEZOMETER
- REGULATED UNIT (SUBJECT UNIT)
- FLY ASH POND SYSTEM (CLOSED)
- SITE FEATURE
- LIMITS OF FINAL COVER
- PROPERTY BOUNDARY

0 400 800 Feet

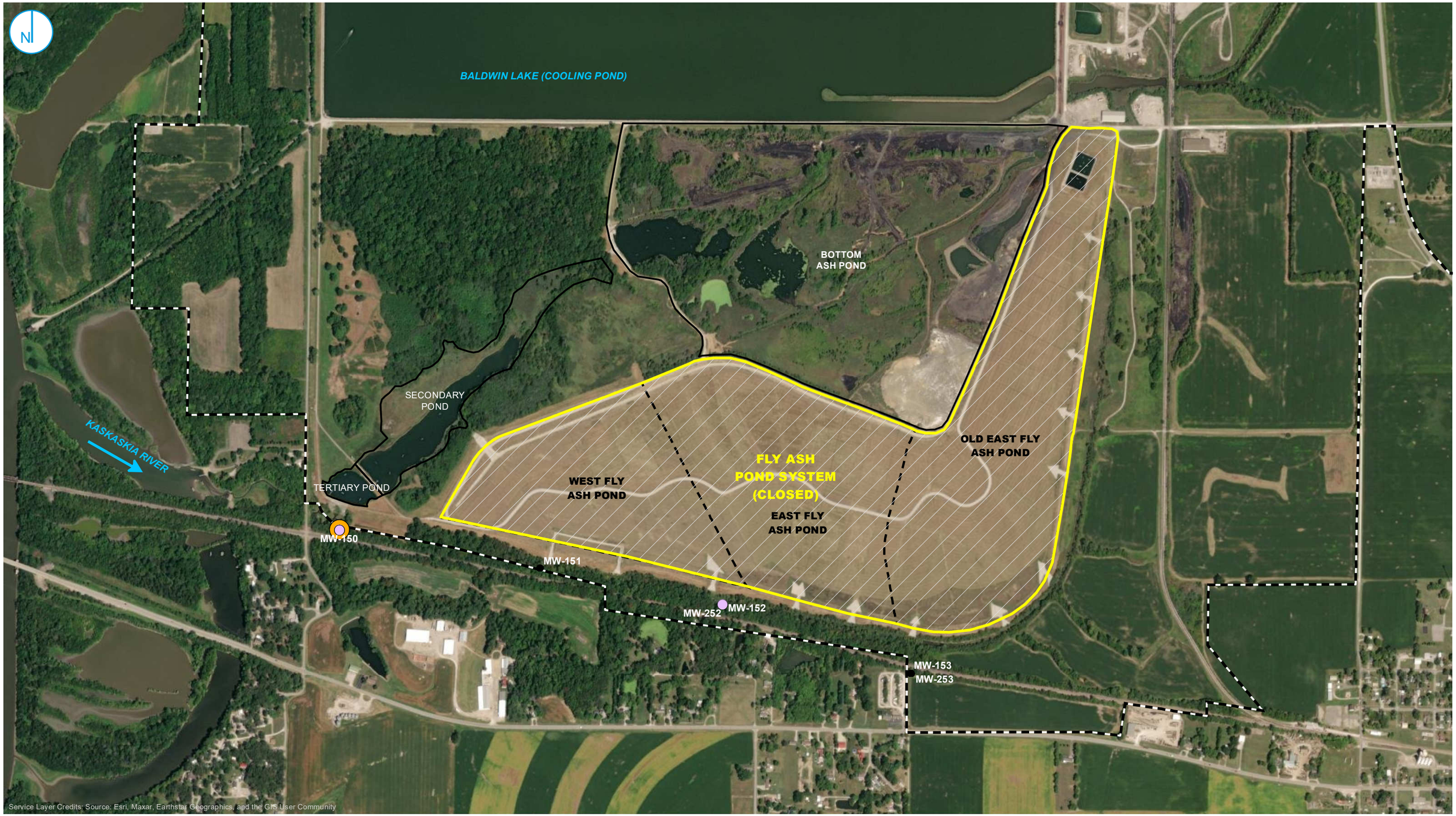
MONITORING WELL LOCATION MAP

NATURE AND EXTENT REPORT
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 2-8

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



PROJECT: 169000XXXX | DATED: 4/15/2024 | DESIGNER: galarnmc

Y:\Mapping\Projects\22\2285\MXD\Nature_and_Extent\BAL\Nature_and_Extent_Report\Figure 3-2. BAL 605 GWPS UU.mxd

- TOTAL BORON EXCEEDANCE
- TOTAL SULFATE EXCEEDANCE
- COMPLIANCE WELL WITHOUT EXCEEDANCE
- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- CAPPED AREA
- PROPERTY BOUNDARY

0 400 800 Feet

GWPS EXCEEDANCE MAP UPPER UNIT

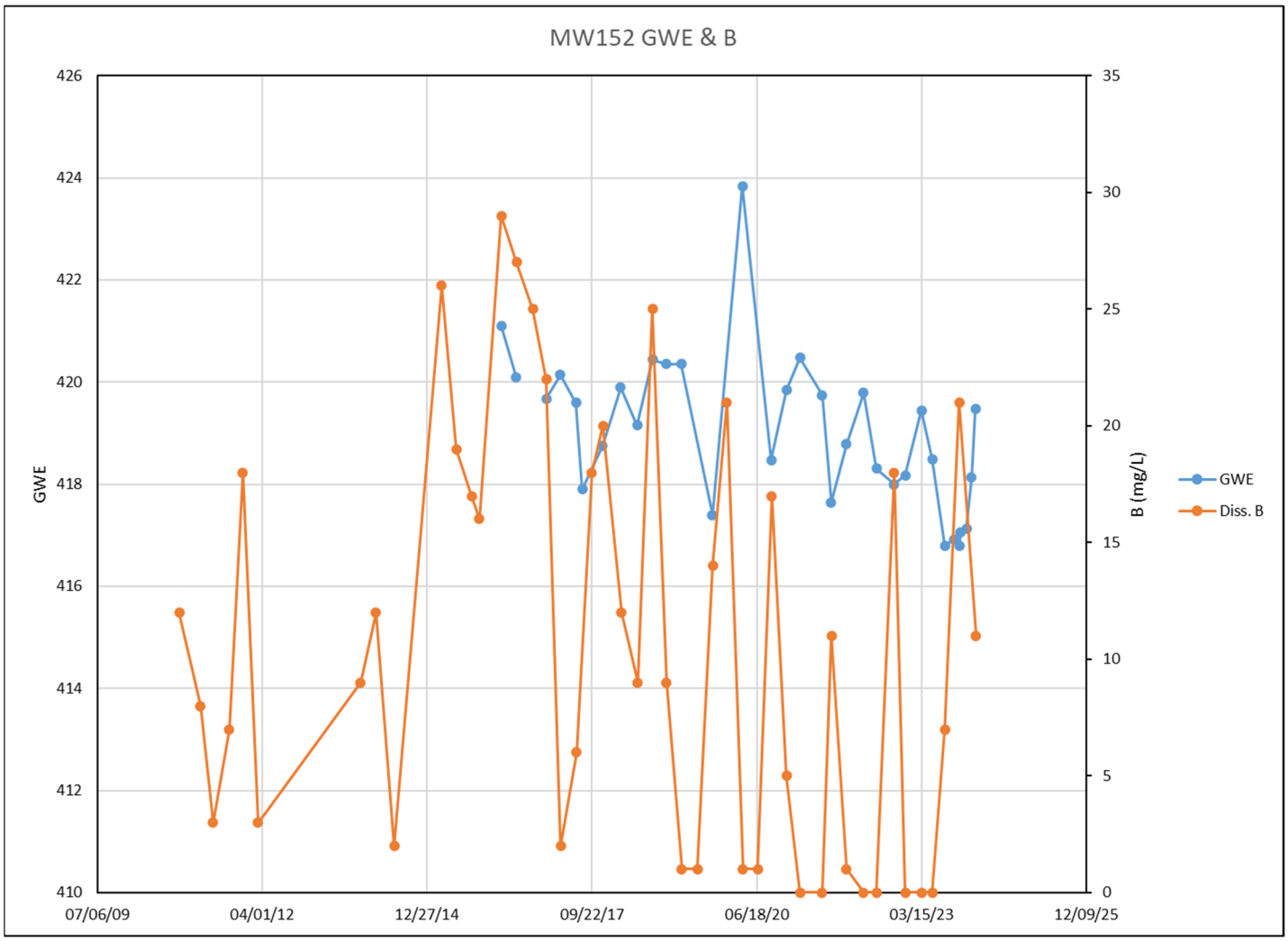
NATURE AND EXTENT REPORT
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 3-1

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL

FIGURE 3-2

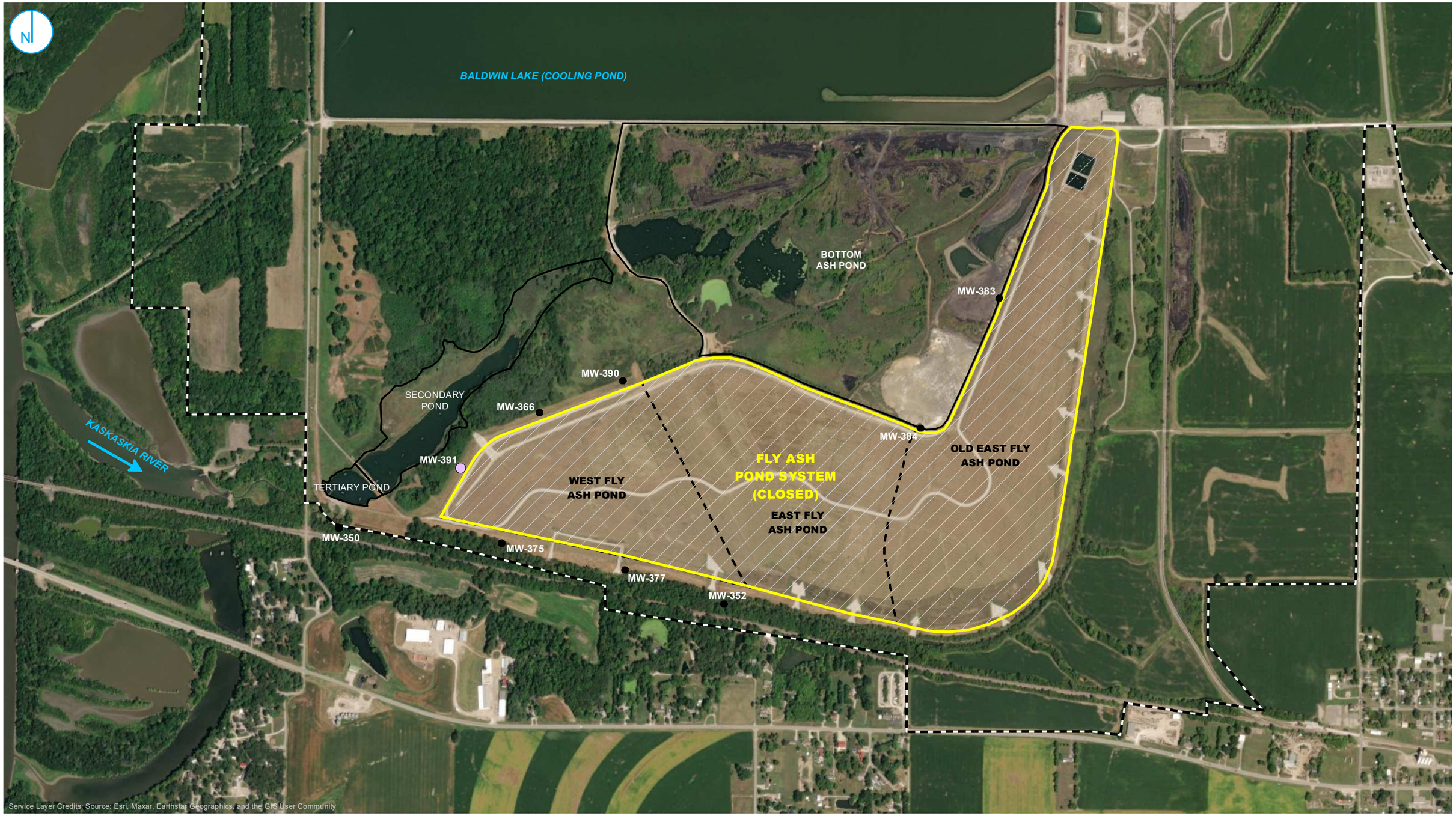


GROUNDWATER ELEVATIONS AND BORON CONCENTRATIONS IN MW-152

NATURE AND EXTENT REPORT
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

Notes:
Groundwater elevation (GWE) data are presented relative to the North American Vertical Datum 1988.
Dissolved boron (Diss B) data are presented in milligrams per liter.

RAMBOLL



PROJECT: 169000XXXX | DATED: 4/15/2024 | DESIGNER: galarnmc

Y:\Mapping\Projects\22\2285\MXD\Nature_and_Extent\BAL\Nature_and_Extent_Report\Figure 3-1_BAL_605 GWPS UA.mxd

- TOTAL BORON EXCEEDANCE
- COMPLIANCE WELL WITHOUT EXCEEDANCE
- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- CAPPED AREA
- PROPERTY BOUNDARY

0 400 800 Feet

GWPS EXCEEDANCE MAP UPPERMOST AQUIFER

NATURE AND EXTENT REPORT
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

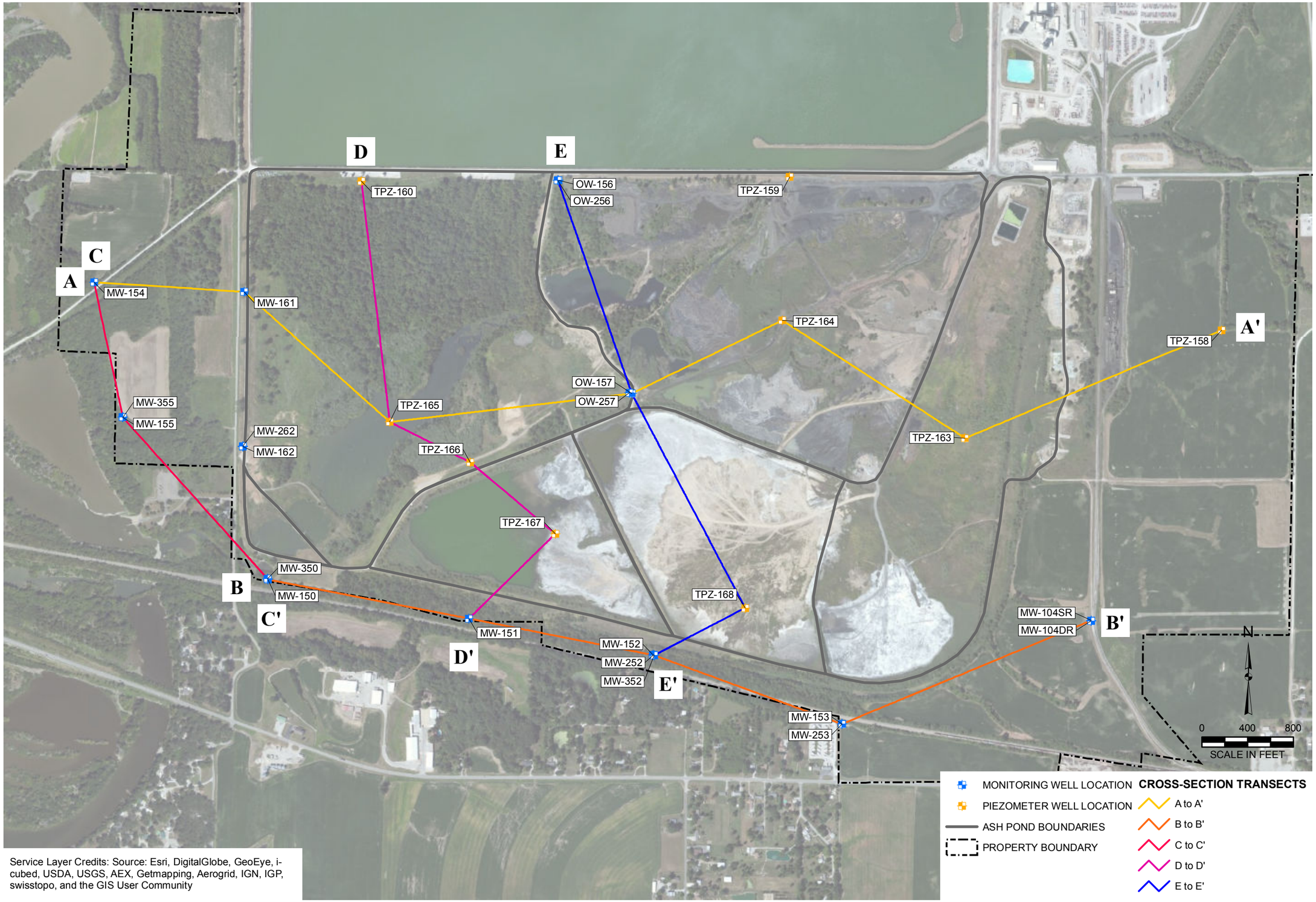
FIGURE 3-3

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

APPENDICES

APPENDIX A
Geologic Cross-Sections



Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Y:\Mapping\Projects\212189\MXD\HydroGeo_Rpt\Figure 7_Cross Section Location Map.mxd Author: tcushman; Date/Time: 6/10/2014, 9:16:53 AM

DRAWN BY/DATE:
TDC 4/30/14
REVIEWED BY/DATE:
SJC 4/27/14
APPROVED BY/DATE:
SJC 6/9/14

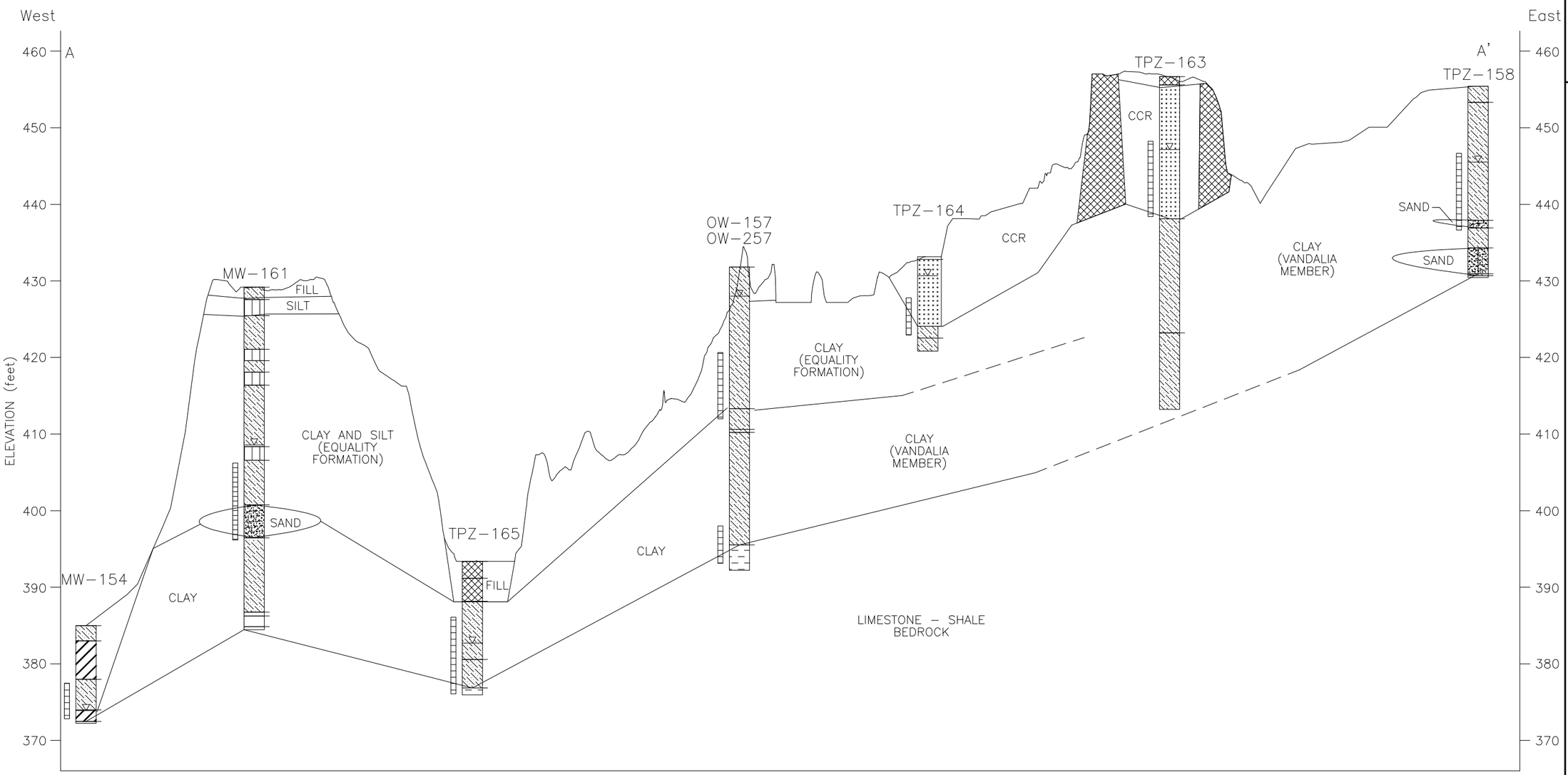
CROSS SECTION LOCATION MAP

GROUNDWATER QUALITY ASSESSMENT AND PHASE II HYDROGEOLOGIC INVESTIGATION
BALDWIN ASH POND SYSTEM, BALDWIN ENERGY COMPLEX
10901 BALDWIN ROAD BALDWIN, ILLINOIS 62217

PROJECT NO: 2189

FIGURE NO: 7

NATURAL RESOURCE TECHNOLOGY



LEGEND

WELL SCREEN INTERVAL

FILL

CLAY, CL

CLAY, CH

SAND, SP/SM/SW

SHALE

SILT, ML

COAL COMBUSTION RESIDUALS, CCRs

NOTE: This profile was developed by interpolation between widely spaced boreholes. Only at the borehole location should it be considered as an approximately accurate representation and then only to the degree implied by the notes on the borehole logs.

0 400 800
FEET

(HORIZONTAL SCALE IS APPROXIMATE)

DRAWN BY/DATE: TDC 5/15/14
REVIEWED BY/DATE: SJC 5/16/14
APPROVED BY/DATE: SJC 6/9/14

GEOLOGIC CROSS SECTION A-A'

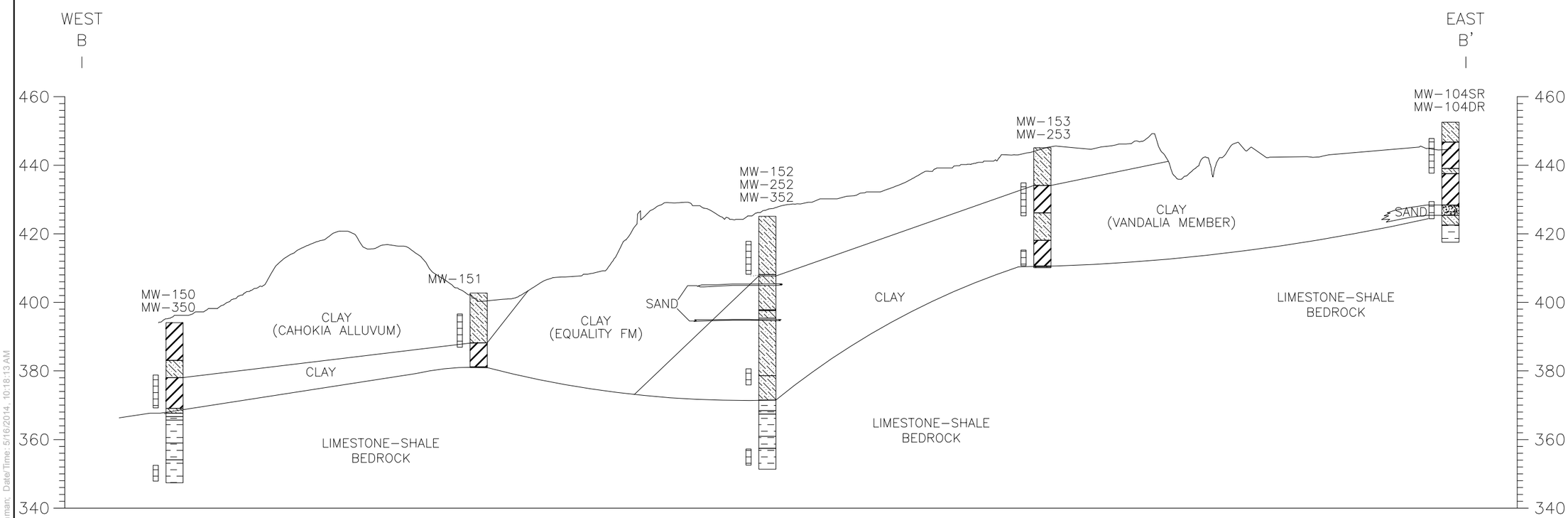
GROUNDWATER QUALITY ASSESSMENT AND PHASE II HYDROGEOLOGIC INVESTIGATION
BALDWIN ASH POND SYSTEM, BALDWIN ENERGY COMPLEX
10901 BALDWIN ROAD BALDWIN, ILLINOIS 62217

PROJECT NO: 2189

FIGURE NO: 8A

NATURAL RESOURCE TECHNOLOGY

Y:\Mapping\Projects\212189\MXD\HydroGeo_Rpt\Figure 8_Geologic Cross Section.mxd Author: tcushman Date/Time: 5/16/2014, 10:18:13 AM



LEGEND

WELL SCREEN INTERVAL

FILL

CLAY, CL

CLAY, CH

SAND, SP/SM/SW

SHALE

SILT, ML

COAL COMBUSTION RESIDUALS, CCRs

NOTE: This profile was developed by interpolation between widely spaced boreholes. Only at the borehole location should it be considered as an approximately accurate representation and then only to the degree implied by the notes on the borehole logs.

0 300 600
FEET
(HORIZONTAL SCALE IS APPROXIMATE)

DRAWN BY/DATE: TDC 5/15/14
REVIEWED BY/DATE: SJC 5/16/14
APPROVED BY/DATE: SJC 6/9/14

GEOLOGIC CROSS SECTION B-B'

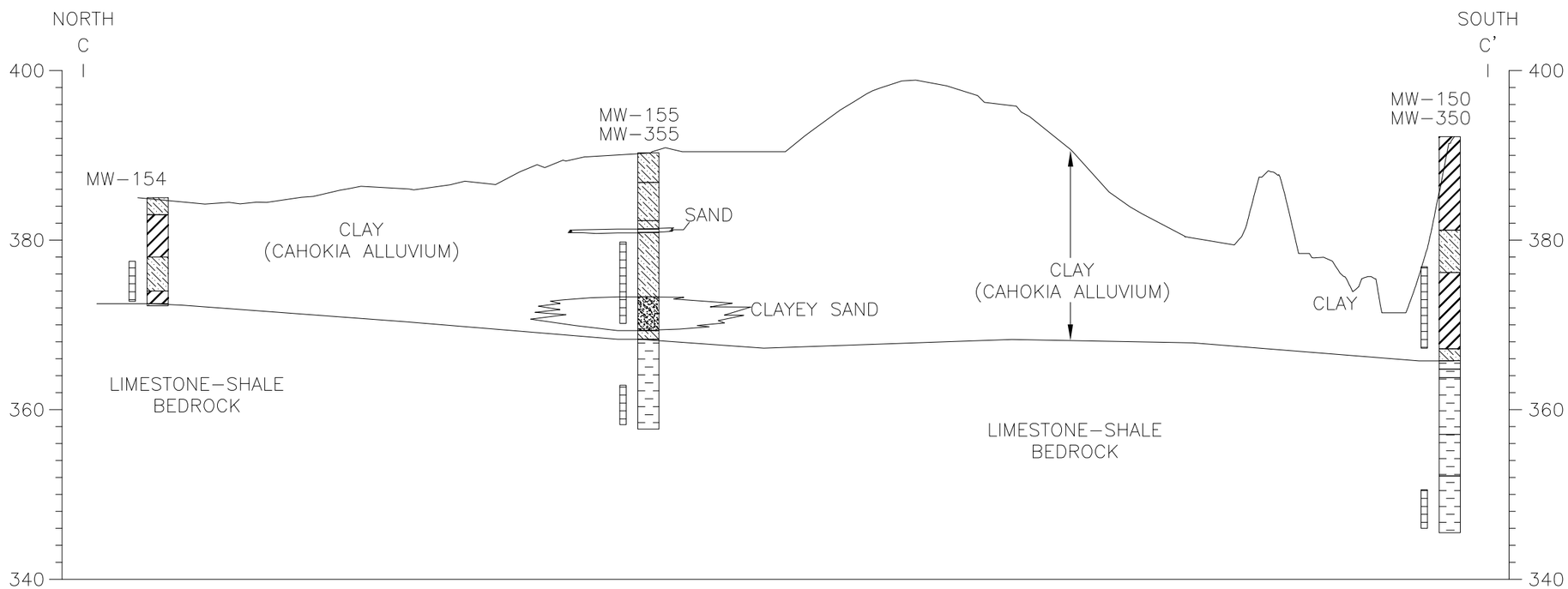
GROUNDWATER QUALITY ASSESSMENT AND PHASE II HYDROGEOLOGIC INVESTIGATION
BALDWIN ASH POND SYSTEM, BALDWIN ENERGY COMPLEX
10901 BALDWIN ROAD BALDWIN, ILLINOIS 62217

PROJECT NO: 2189

FIGURE NO: 8B

NATURAL RESOURCE TECHNOLOGY

Y:\Mapping\Projects\212189\MXD\HydroGeo_Rpt\Figure 8_Geologic Cross Section.mxd Author: tcushman Date/Time: 5/16/2014, 10:18:13 AM



LEGEND

WELL SCREEN INTERVAL

FILL

CLAY, CL

CLAY, CH

SAND, SP/SM/SW

SHALE

SILT, ML

COAL COMBUSTION RESIDUALS, CCRs

NOTE: This profile was developed by interpolation between widely spaced boreholes. Only at the borehole location should it be considered as an approximately accurate representation and then only to the degree implied by the notes on the borehole logs.

0 150 300
FEET
(HORIZONTAL SCALE IS APPROXIMATE)

DRAWN BY/DATE: TDC 5/15/14
REVIEWED BY/DATE: SJC 5/16/14
APPROVED BY/DATE: SJC 6/9/14

GEOLOGIC CROSS SECTION C-C'

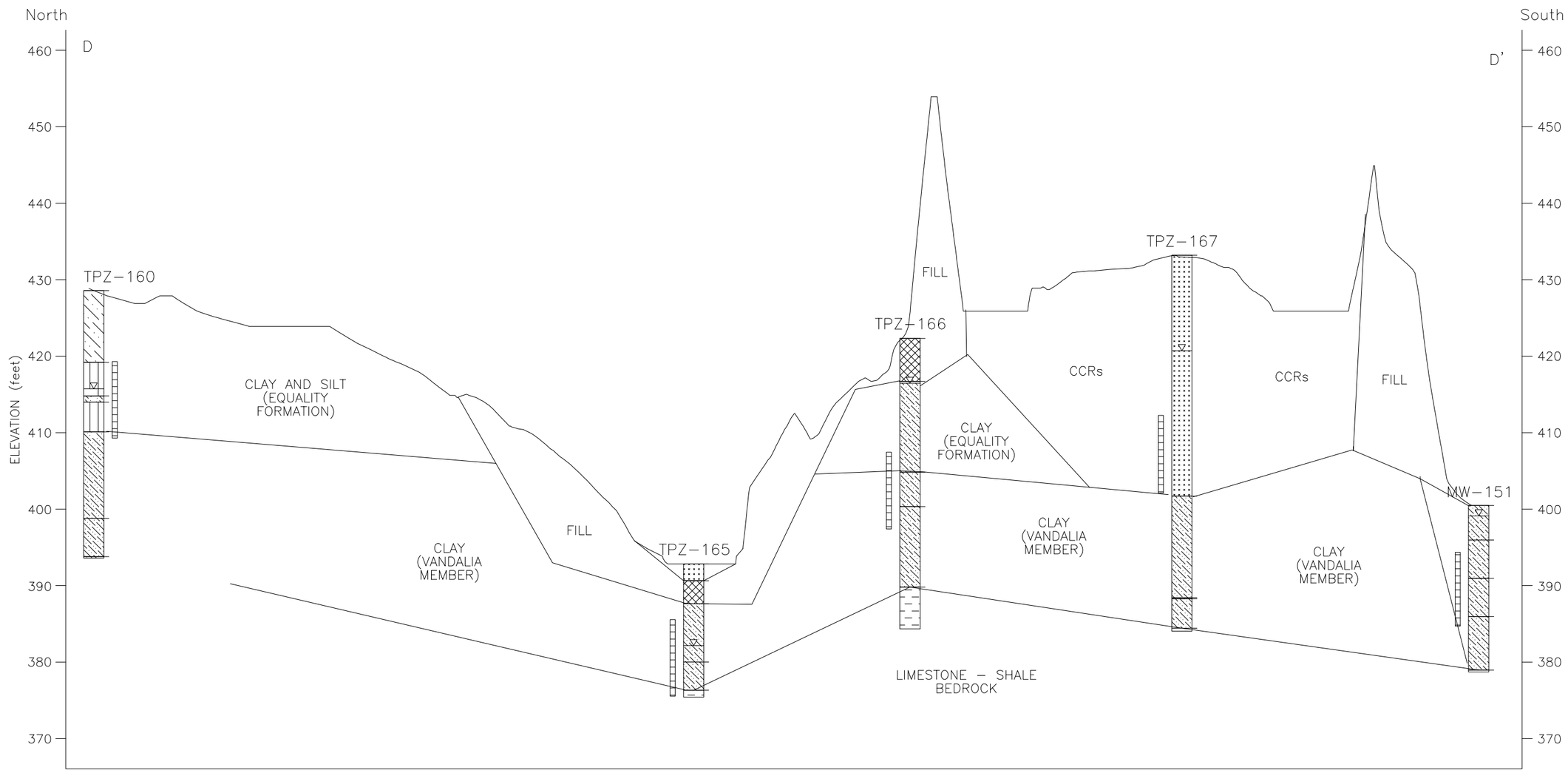
GROUNDWATER QUALITY ASSESSMENT AND PHASE II HYDROGEOLOGIC INVESTIGATION
BALDWIN ASH POND SYSTEM, BALDWIN ENERGY COMPLEX
10901 BALDWIN ROAD BALDWIN, ILLINOIS 62217

PROJECT NO: 2189

FIGURE NO: 8C

NATURAL RESOURCE TECHNOLOGY

Y:\Mapping\Projects\212189\MXD\HydroGeo_Rpt\Figure 8_Geologic Cross Section.mxd Author: tcushman Date/Time: 5/16/2014, 10:18:13 AM



LEGEND

- WELL SCREEN INTERVAL
- FILL
- CLAY, CL
- CLAY, CH
- SAND, SP/SM/SW
- SHALE
- SILT, ML
- COAL COMBUSTION RESIDUALS, CCRs

NOTE: This profile was developed by interpolation between widely spaced boreholes. Only at the borehole location should it be considered as an approximately accurate representation and then only to the degree implied by the notes on the borehole logs.

0 200 400
FEET
(HORIZONTAL SCALE IS APPROXIMATE)

DRAWN BY/DATE: TDC 5/15/14
REVIEWED BY/DATE: SJC 5/16/14
APPROVED BY/DATE: SJC 6/9/14

GEOLOGIC CROSS SECTION D-D'

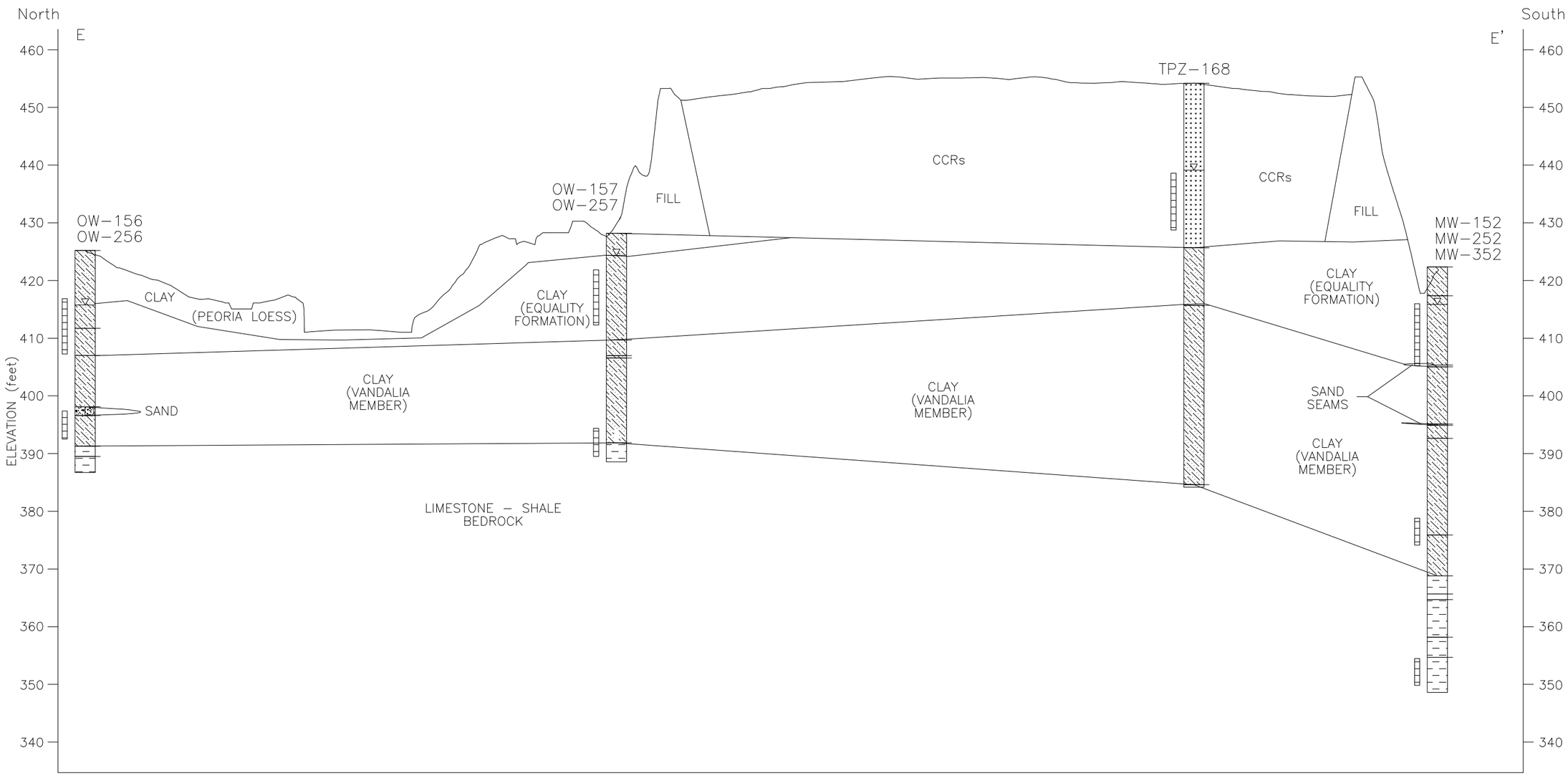
GROUNDWATER QUALITY ASSESSMENT AND PHASE II HYDROGEOLOGIC INVESTIGATION
BALDWIN ASH POND SYSTEM, BALDWIN ENERGY COMPLEX
10901 BALDWIN ROAD BALDWIN, ILLINOIS 62217

PROJECT NO: 2189

FIGURE NO: 8D

NATURAL RESOURCE TECHNOLOGY

Y:\Mapping\Projects\211\2189\MXD\HydroGeo_Rpt\Figure 8_Geologic Cross Section.mxd Author: tcushman; Date/Time: 5/16/2014, 10:18:13 AM



LEGEND

- WELL SCREEN INTERVAL
- FILL
- CLAY, CL
- CLAY, CH
- SAND, SP/SM/SW
- SHALE
- SILT, ML
- COAL COMBUSTION RESIDUALS, CCRs

NOTE: This profile was developed by interpolation between widely spaced boreholes. Only at the borehole location should it be considered as an approximately accurate representation and then only to the degree implied by the notes on the borehole logs.

0 200 400
FEET
(HORIZONTAL SCALE IS APPROXIMATE)

DRAWN BY/DATE: TDC 5/15/14
REVIEWED BY/DATE: SJC 5/16/14
APPROVED BY/DATE: SJC 6/9/14

GEOLOGIC CROSS SECTION E-E'

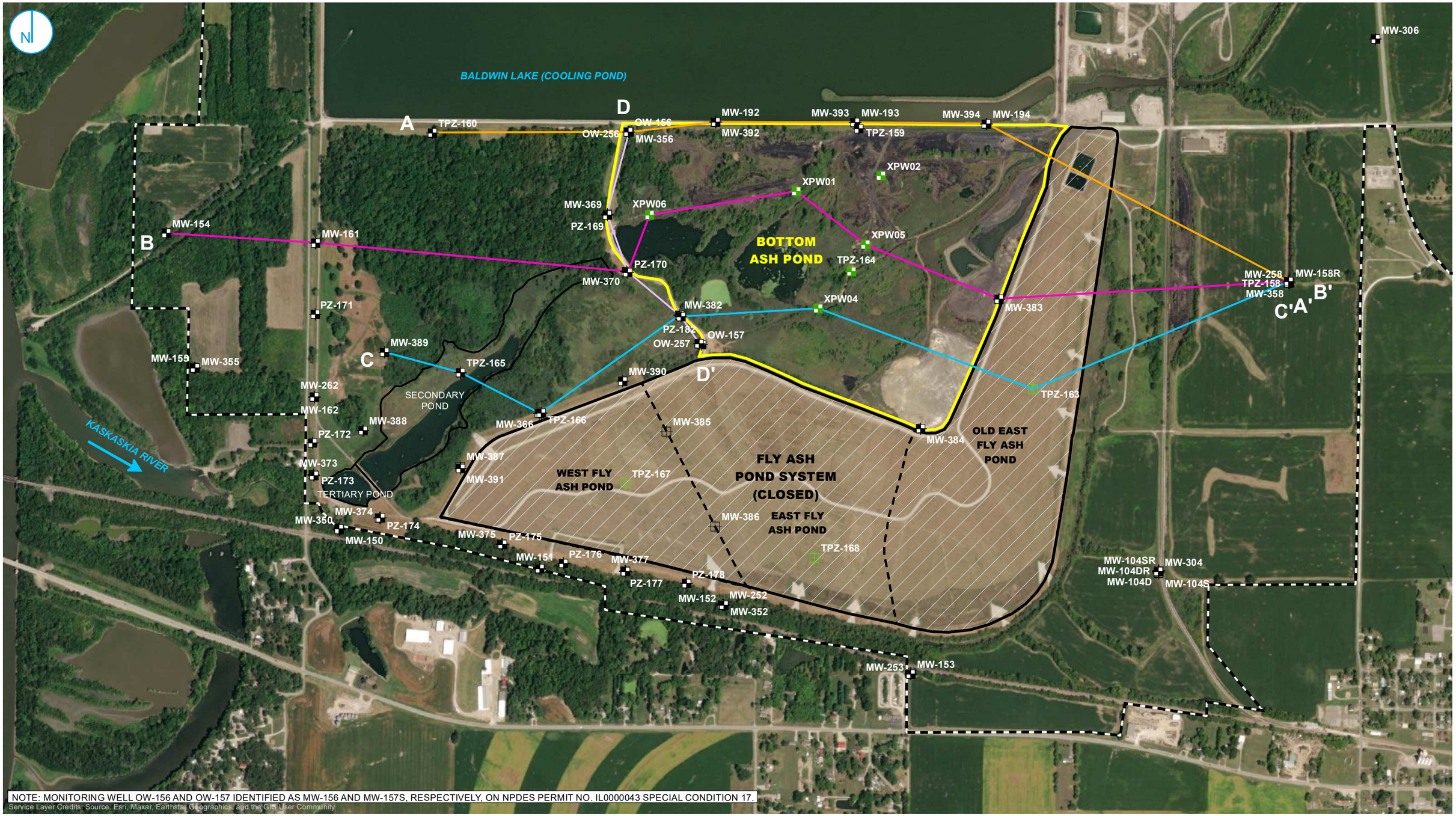
GROUNDWATER QUALITY ASSESSMENT AND PHASE II HYDROGEOLOGIC INVESTIGATION
BALDWIN ASH POND SYSTEM, BALDWIN ENERGY COMPLEX
10901 BALDWIN ROAD BALDWIN, ILLINOIS 62217

PROJECT NO: 2189

FIGURE NO: 8E

NATURAL RESOURCE TECHNOLOGY

Y:\Mapping\Projects\2112189\MXD\HydroGeo_Rpt\Figure 8_Geologic Cross Section.mxd Author: tcushman; Date/Time: 5/16/2014, 10:18:13 AM



NOTE: MONITORING WELL OW-156 AND OW-157 IDENTIFIED AS MW-156 AND MW-157S, RESPECTIVELY, ON NPDES PERMIT NO. IL0000043 SPECIAL CONDITION 17.

Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

PROJECT: 169000XXXX | DATED: 5/9/2023 | DESIGNER: GALARNMC

Y:\Mapping\Projects\22\2285\MXD\845_Operating_Permit\Baldwin\BAP\2023_Update\Figure 2-6_Cross Section Locations.mxd

- MONITORING WELL AND PIEZOMETER LOCATION
- PORE WATER WELL
- CLOSED MONITORING WELL
- CLOSED PORE WATER WELL

CROSS SECTION TRANSECT

- A to A'
- B to B'
- C to C'
- D to D'

- REGULATED UNIT (SUBJECT UNIT)
- FLY ASH POND SYSTEM (CLOSED)
- SITE FEATURE
- LIMITS OF FINAL COVER
- PROPERTY BOUNDARY

0 400 800 Feet

CROSS SECTION LOCATION MAP

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT REVISION 1
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

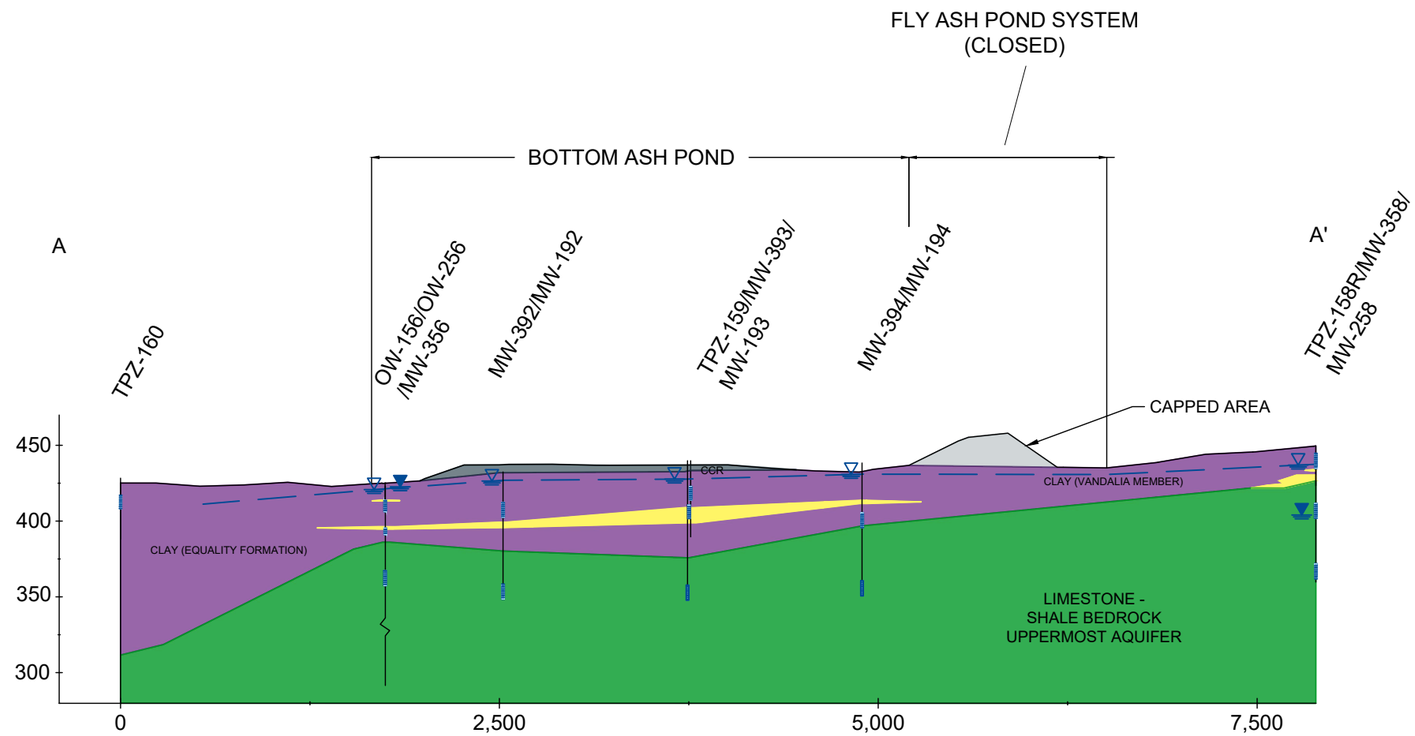
FIGURE 2-6

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

NOTES

1. This profile was developed by interpolation between widely spaced boreholes. Only at the borehole location should it be considered as an approximately accurate representation and then only to the degree implied by the notes on the borehole logs.
2. Scale is approximate.
3. Vertical scale is exaggerated 10X.
4. Groundwater elevations measured on March 15, 2023.



LEGEND

- COAL COMBUSTION RESIDUALS (CCR)
- FILL
- CLAY
- SILT
- SAND
- BEDROCK / WEATHERED BEDROCK (INTERBEDDED SHALE, LIMESTONE)
- WELL SCREEN INTERVAL
- UPPERMOST AQUIFER POTENTIOMETRIC SURFACE
- UPPERMOST AQUIFER GROUNDWATER ELEVATION
- OTHER GROUNDWATER / SURFACE WATER ELEVATION(S)

100' 0 1,000'

CROSS SECTIONS A-A'

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT REVISION 1
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILINNOIS

FIGURE 2-7

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL

C:\Users\Engelhsa\OneDrive - Ramboll\Projects\Vistra\Modeling & Calcs\BAL\CAD\2023_CrossSections\Baldwin Cross Sections.dwg
PROJECT: 1940100806 DATED: 6/26/2023 11:34 PM DESIGNER: ENGELHSA

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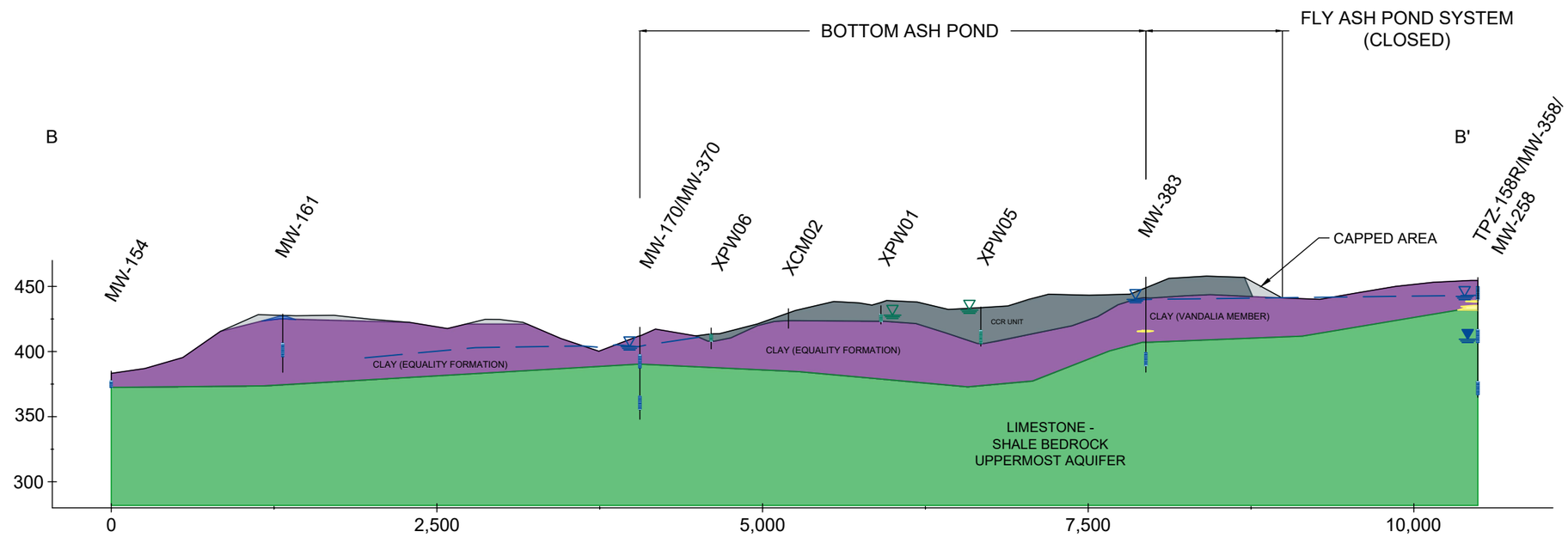
PROJECT: 1940100806 DATED: 6/26/2023 11:34 PM DESIGNER: ENGELHSA



NOTES

1. These profiles were developed by interpolation between widely spaced boreholes. Only at the borehole location should it be considered as an approximately accurate representation and then only to the degree implied by the notes on the borehole logs.
2. Scale is approximate.
3. Vertical scale is exaggerated 10X.
4. Groundwater elevations measured on March 15, 2023.

LEGEND

- COAL COMBUSTION RESIDUALS (CCR)
- FILL
- CLAY
- SILT
- SAND
- BEDROCK / WEATHERED BEDROCK (INTERBEDDED SHALE, LIMESTONE)
- WELL SCREEN INTERVAL
- UPPERMOST AQUIFER POTENTIOMETRIC SURFACE
- UPPERMOST AQUIFER GROUNDWATER ELEVATION
- POREWATER ELEVATION
- OTHER GROUNDWATER / SURFACE WATER ELEVATION(S)

100' 0 1,000'

CROSS SECTIONS B-B'

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT REVISION 1 BOTTOM ASH POND

BALDWIN POWER PLANT
BALDWIN, ILINNOIS

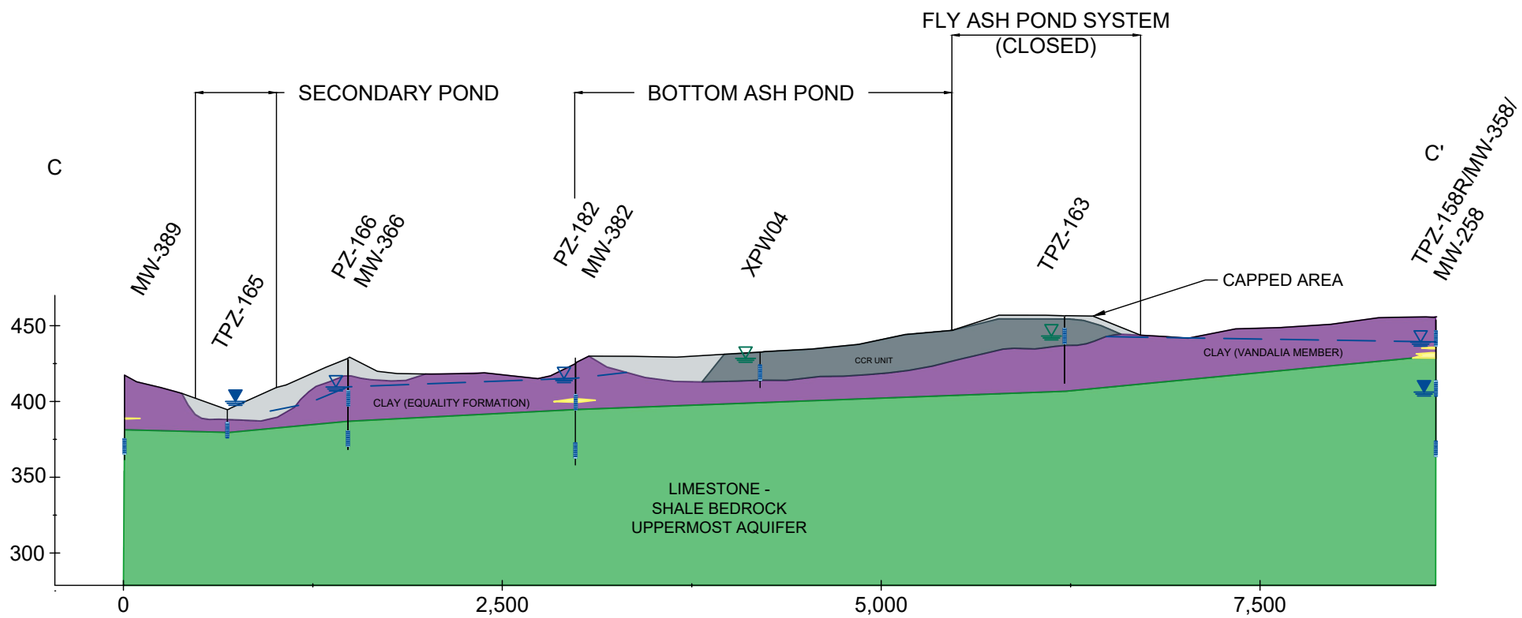
FIGURE 2-8

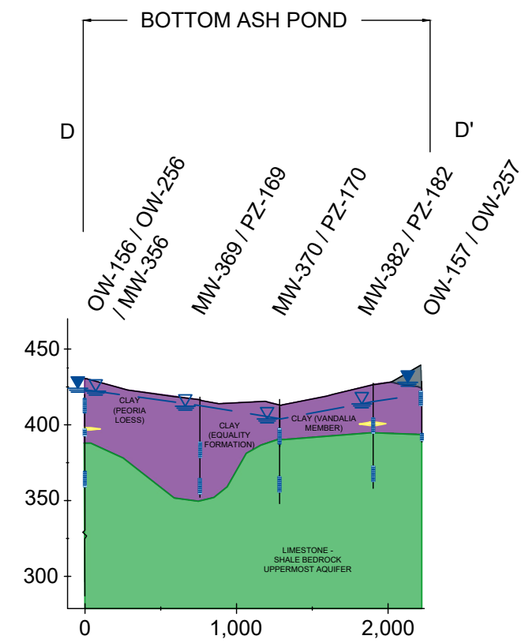
RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL

NOTES

1. This profile was developed by interpolation between widely spaced boreholes. Only at the borehole location should it be considered as an approximately accurate representation and then only to the degree implied by the notes on the borehole logs.
2. Scale is approximate.
3. Vertical scale is exaggerated 10X.
4. Groundwater elevations measured on March 15, 2023.





LEGEND

- COAL COMBUSTION RESIDUALS (CCR)
- FILL
- CLAY
- SILT
- SAND
- BEDROCK / WEATHERED BEDROCK (INTERBEDDED SHALE, LIMESTONE)
- WELL SCREEN INTERVAL
- UPPERMOST AQUIFER POTENTIOMETRIC SURFACE
- UPPERMOST AQUIFER GROUNDWATER ELEVATION
- POREWATER ELEVATION
- OTHER GROUNDWATER / SURFACE WATER ELEVATION(S)

100' 0 1,000'

CROSS SECTIONS C-C' AND D-D'

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT REVISION 1
BOTTOM ASH POND
BALDWIN POWER PLANT
BALDWIN, ILINNOIS

FIGURE 2-9

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL

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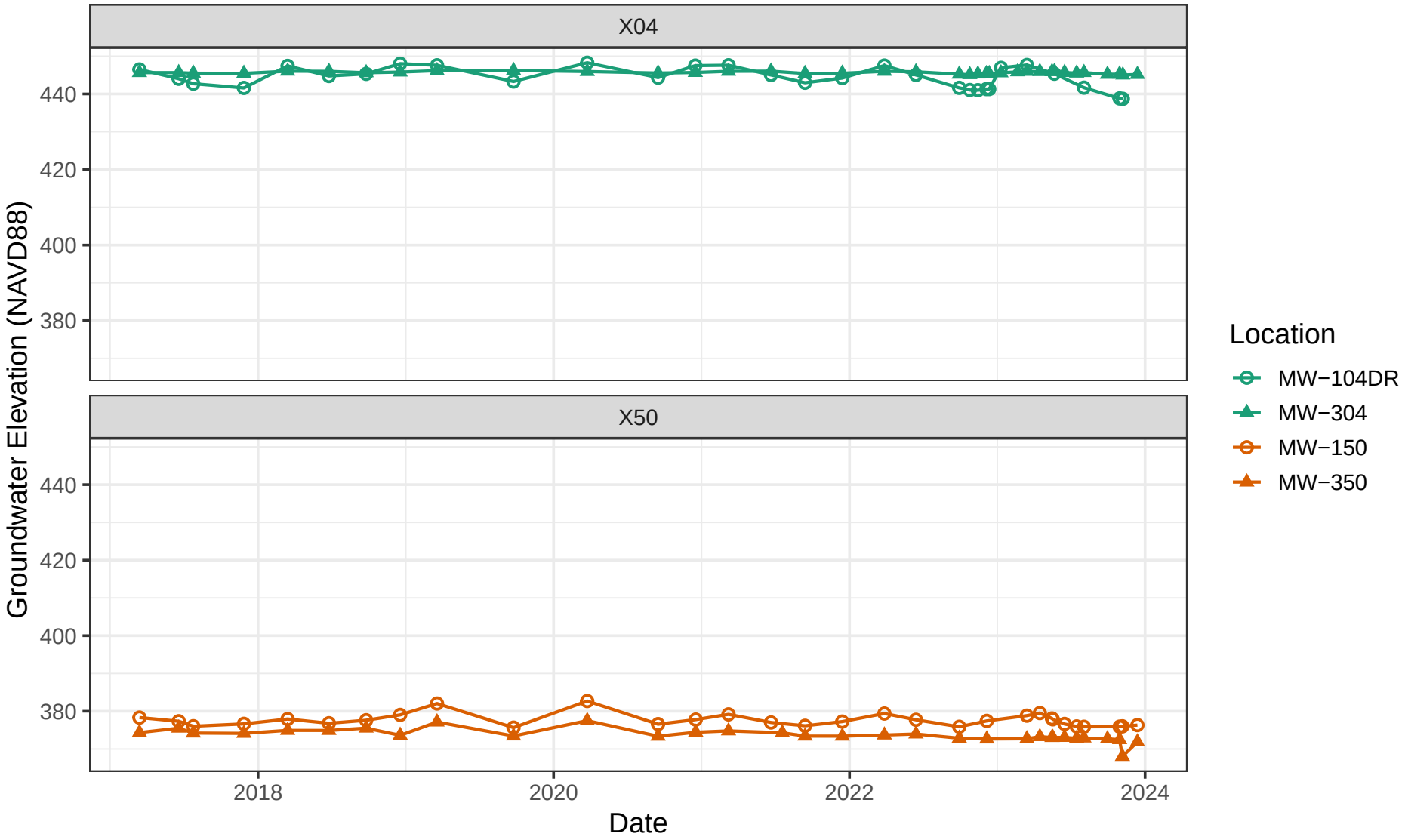
PROJECT: 1940100806 DATED: 6/26/2023 11:34 PM DESIGNER: ENGELHSA

APPENDIX B
Select Hydrographs

Path: dara/Vistra − 845/Corrective Action Assessment/Nature and Extent/Hydrographs

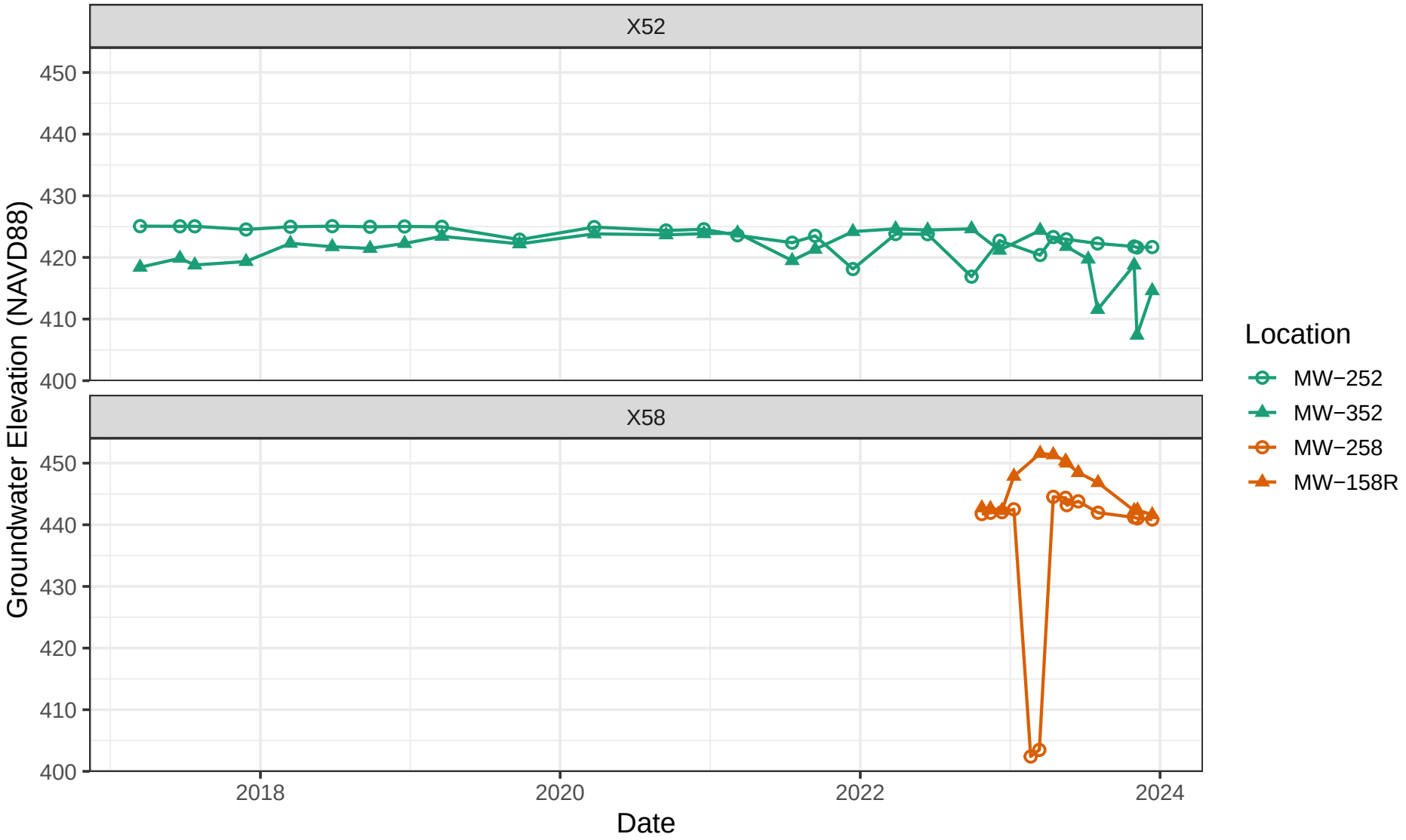


RAMBOLL

Hydrographs
Nature and Extent Report
Baldwin Fly Ash Pond System
Baldwin, IL

Figure
1

Drafter: AOC Date: 2024−04−17 Contract Number: 1940103584

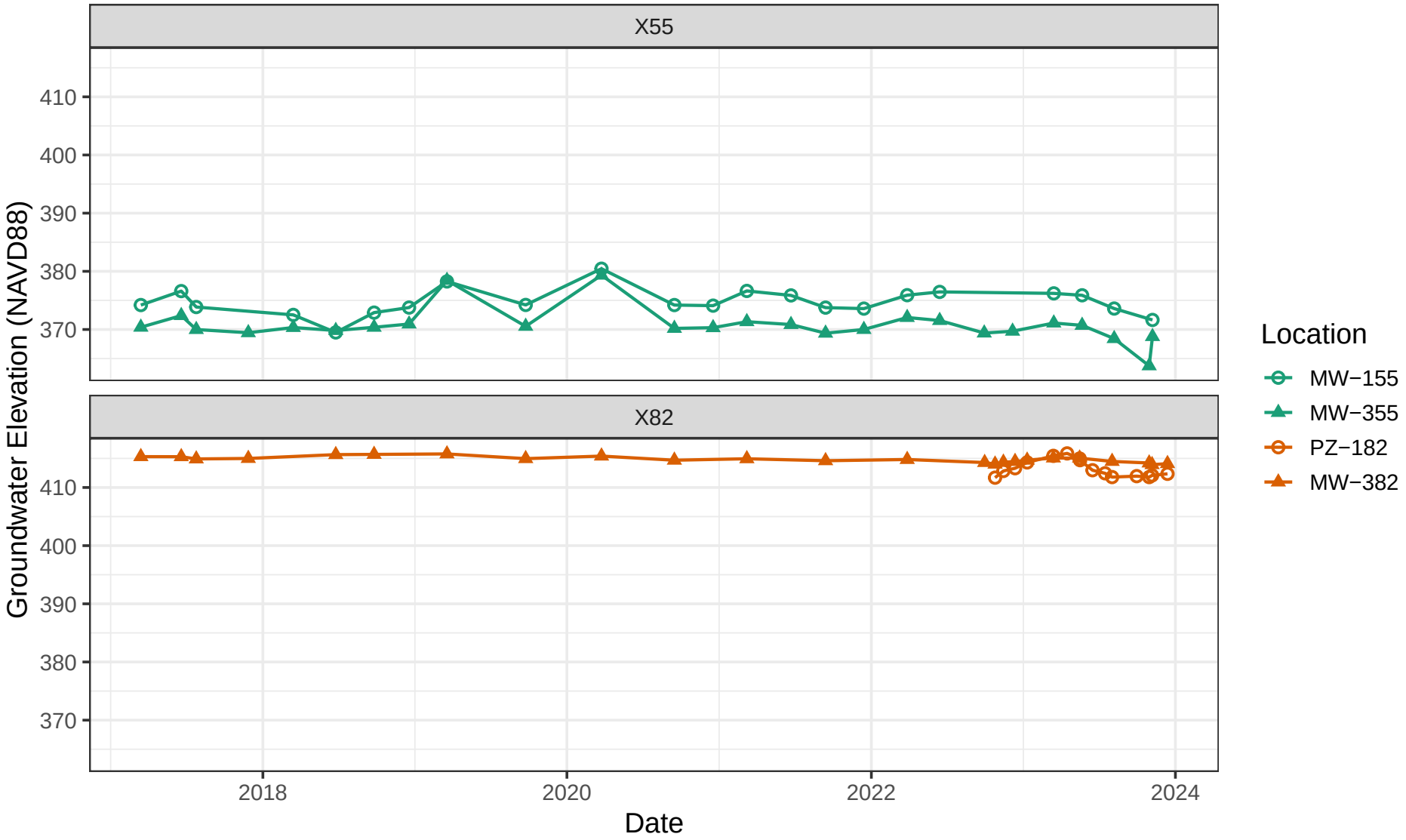


RAMBOLL

Hydrographs
Nature and Extent Report
Baldwin Fly Ash Pond System
Baldwin, IL

Figure
2

Drafter: AOC Date: 2024−04−17 Contract Number: 1940103584



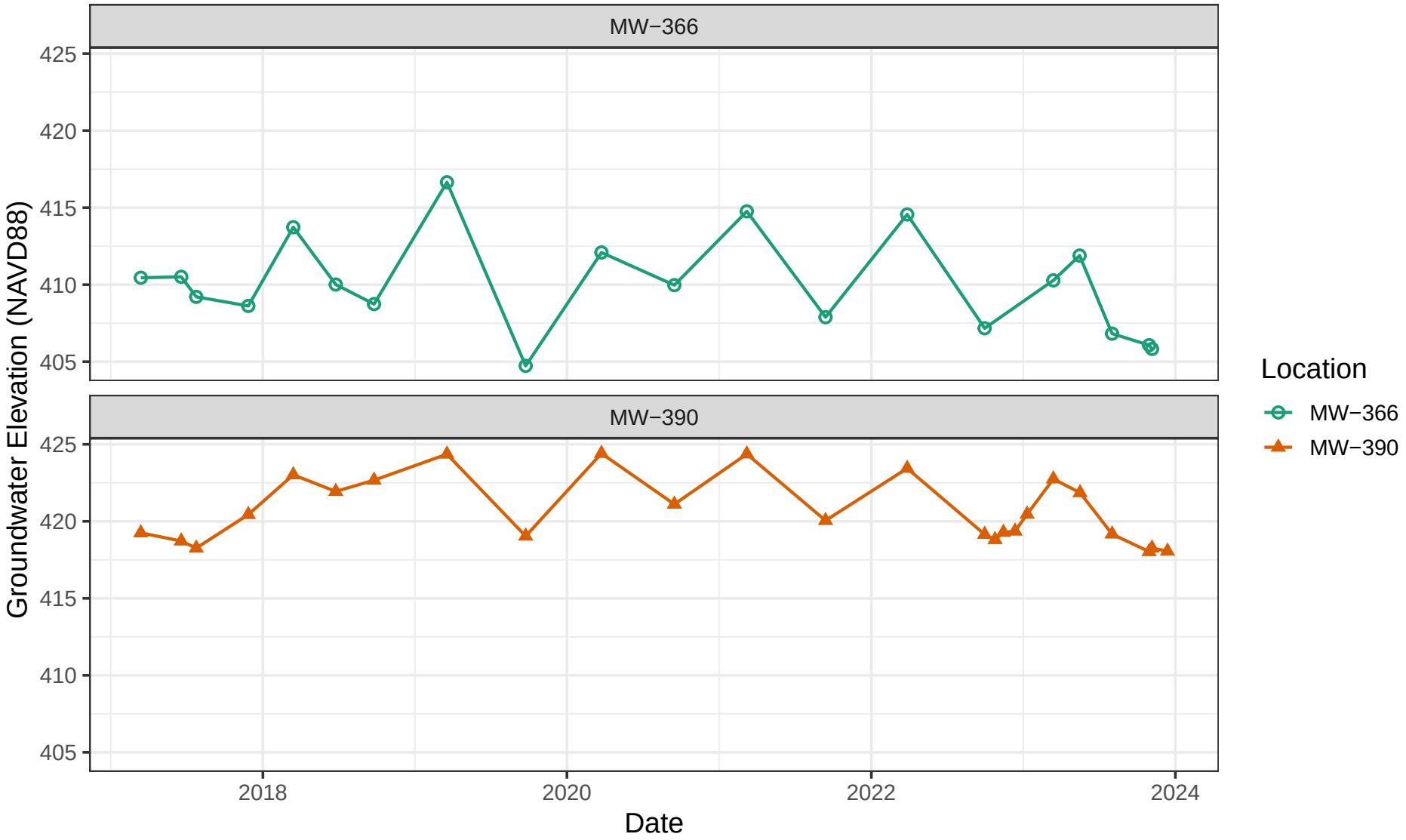
RAMBOLL

Hydrographs
Nature and Extent Report
Baldwin Fly Ash Pond System
Baldwin, IL

Figure
3

Drafter: AOC Date: 2024−04−17 Contract Number: 1940103584

Path: dara/Vistra − 845/Corrective Action Assessment/Nature and Extent/Hydrographs



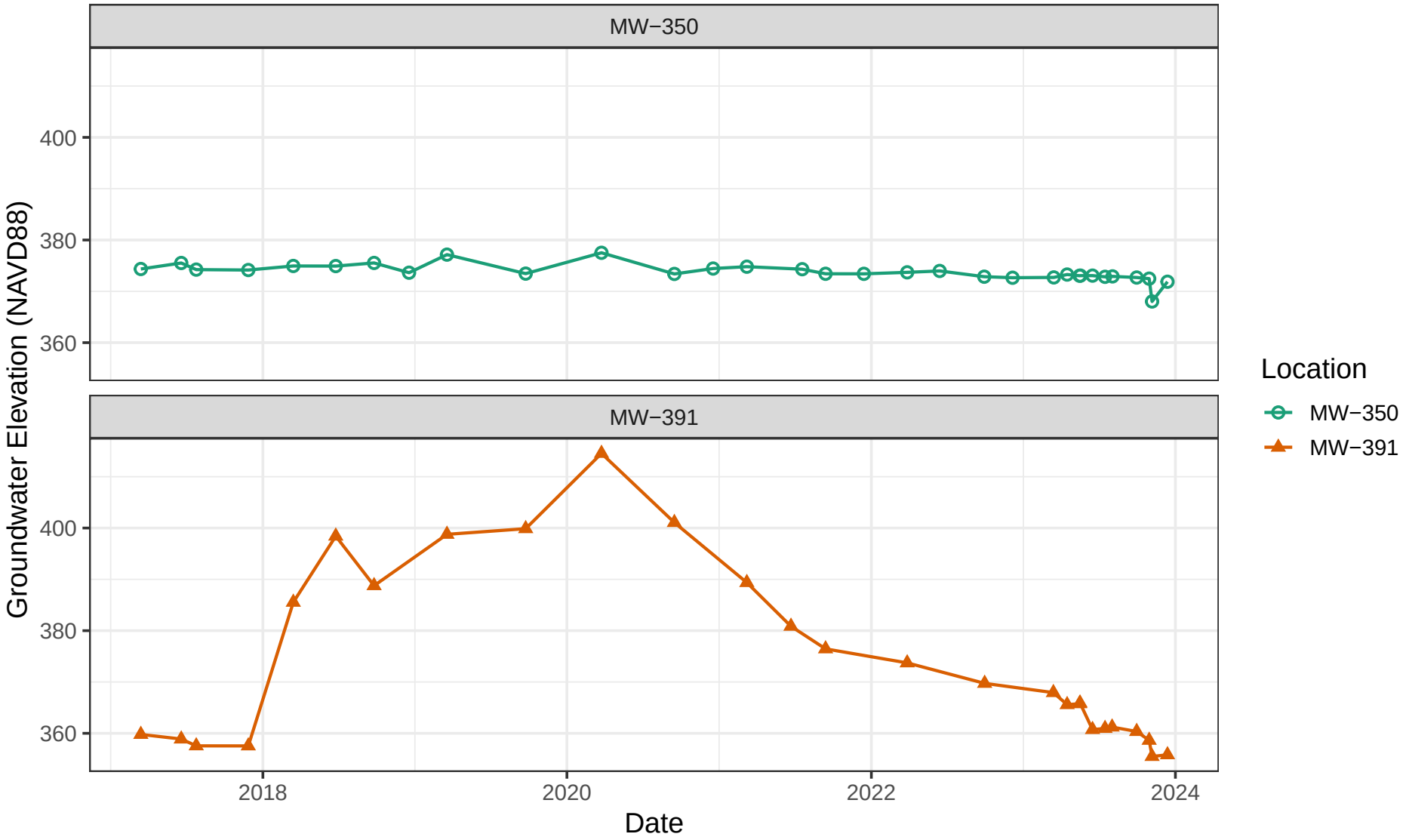
RAMBOLL

Hydrographs
Nature and Extent Report
Baldwin Fly Ash Pond System
Baldwin, IL

Figure
4

Drafter: AOC Date: 2024−04−17 Contract Number: 1940103584

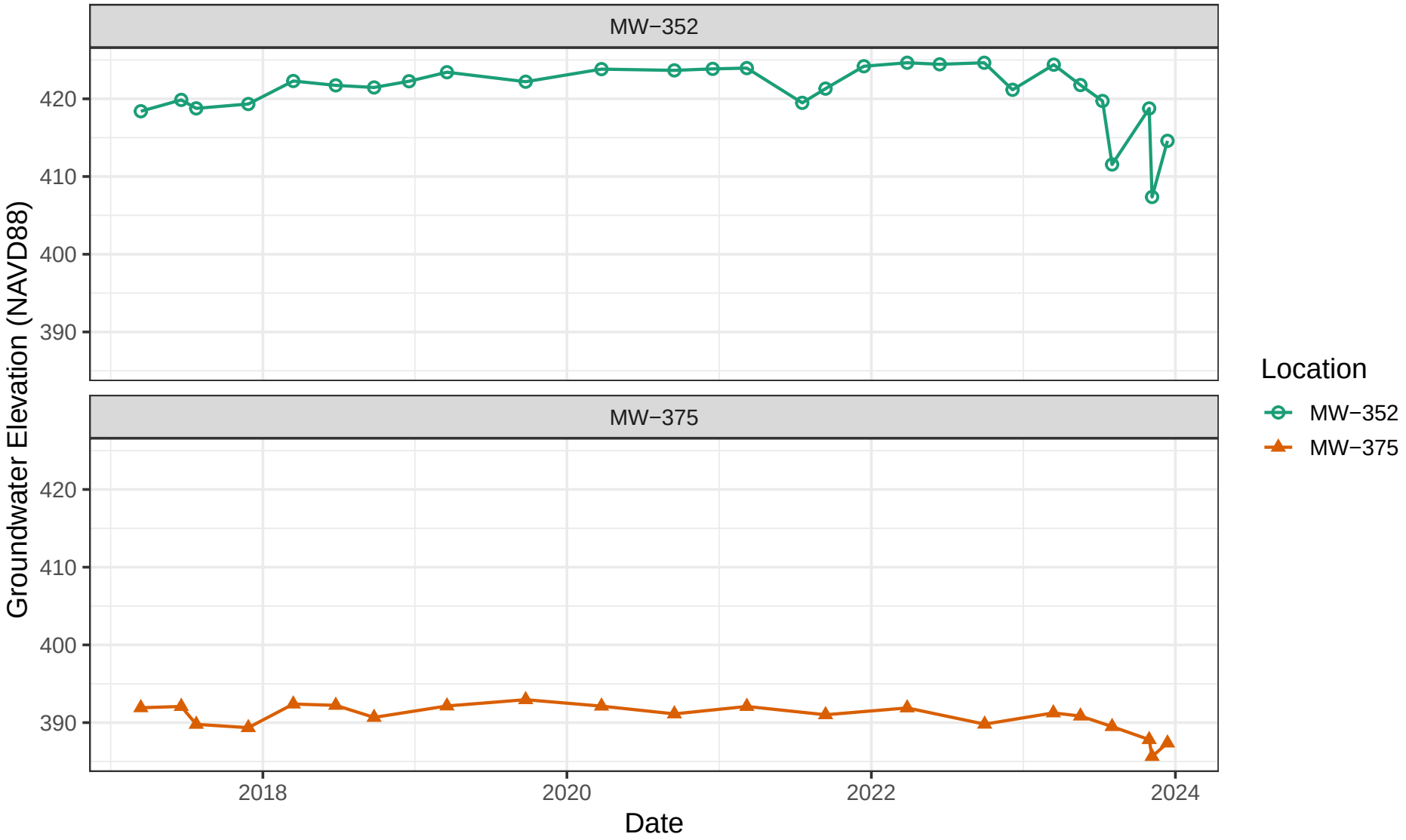
Path: dara/Vistra − 845/Corrective Action Assessment/Nature and Extent/Hydrographs



Hydrographs
Nature and Extent Report
Baldwin Fly Ash Pond System
Baldwin, IL

Figure
5

Drafter: AOC Date: 2024−04−17 Contract Number: 1940103584



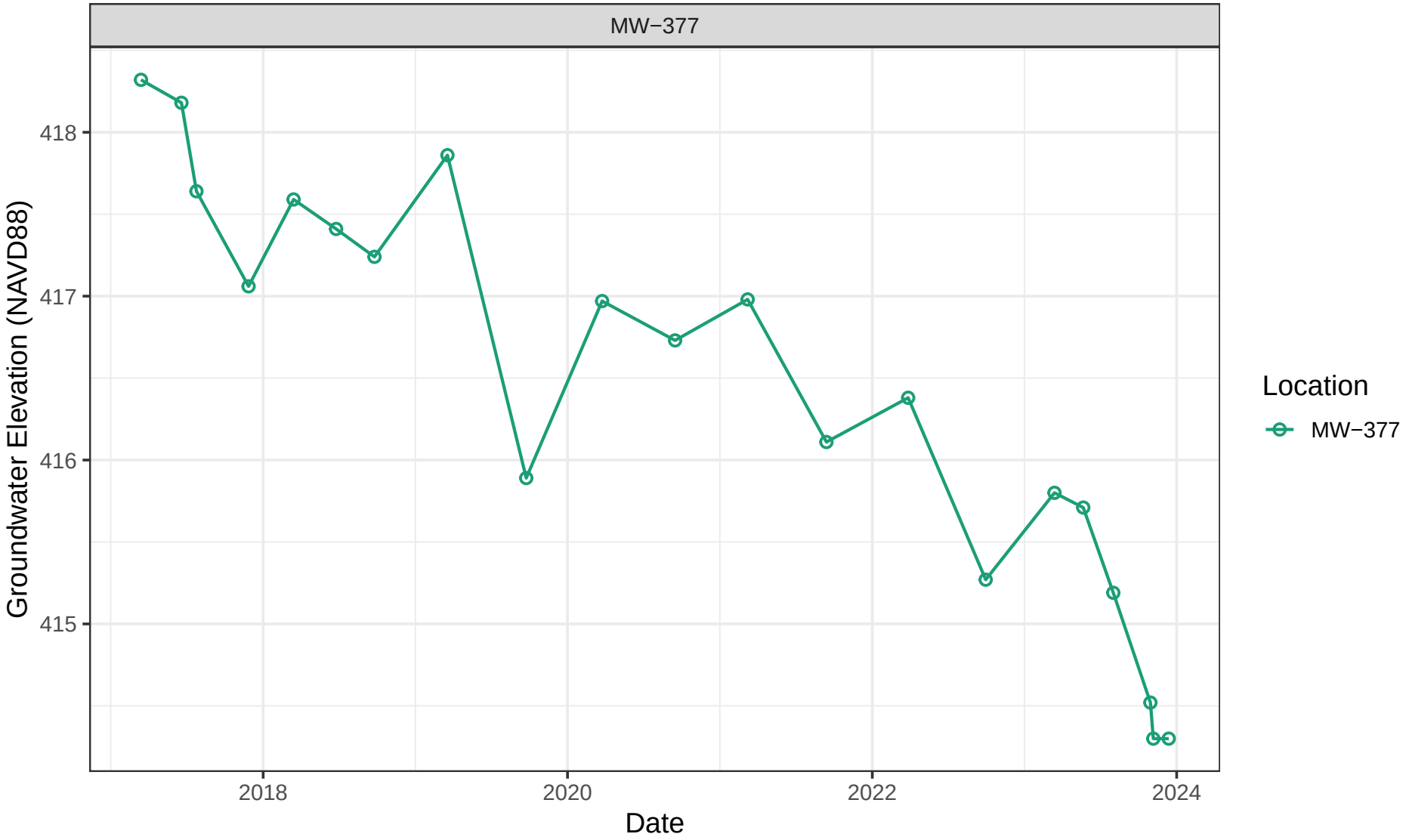
RAMBOLL

Hydrographs
Nature and Extent Report
Baldwin Fly Ash Pond System
Baldwin, IL

Figure
6

Drafter: AOC Date: 2024−04−17 Contract Number: 1940103584

Path: dara/Vistra − 845/Corrective Action Assessment/Nature and Extent/Hydrographs



RAMBOLL

Hydrographs
Nature and Extent Report
Baldwin Fly Ash Pond System
Baldwin, IL

Figure
7

Drafter: AOC Date: 2024−04−17 Contract Number: 1940103584

APPENDIX C
Vertical Hydraulic Gradients

APPENDIX C. VERTICAL HYDRAULIC GRADIENTS

NATURE AND EXTENT REPORT

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, ILLINOIS

Date	MW-104SR Groundwater Elevation (ft NAVD88)	MW-104DR Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UU (Vandalia)	UU (Vandalia)				
3/21/2016	447.33	447.39	-0.06	20.41	-0.003	up
6/21/2016	445.22	445.27	-0.05	18.30	-0.003	up
9/19/2016	447.05	447.12	-0.07	20.13	-0.003	up
12/21/2016	444.45	444.52	-0.07	17.53	-0.004	up
3/14/2017	446.42	446.48	-0.06	19.50	-0.003	up
6/19/2017	443.95	444.02	-0.07	17.03	-0.004	up
7/25/2017	442.66	442.72	-0.06	15.74	-0.004	up
11/27/2017	441.54	441.60	-0.06	14.62	-0.004	up
3/15/2018	447.34	447.42	-0.08	20.42	-0.004	up
6/25/2018	444.68	444.75	-0.07	17.76	-0.004	up
9/25/2018	445.24	445.31	-0.07	18.32	-0.004	up
12/18/2018	447.91	448.01	-0.10	15.83	-0.006	up
3/19/2019	447.54	447.59	-0.05	20.62	-0.002	up
9/24/2019	443.29	443.30	-0.01	16.37	-0.001	flat
3/24/2020	448.20	448.26	-0.06	15.83	-0.004	up
9/15/2020	444.29	444.32	-0.03	17.37	-0.002	up
12/16/2020	447.46	447.50	-0.04	20.54	-0.002	up
3/8/2021	447.54	447.60	-0.06	20.62	-0.003	up
6/21/2021	445.24	445.01	0.23	18.32	0.013	down
9/14/2021	442.91	442.97	-0.06	15.99	-0.004	up
12/14/2021	444.15	444.20	-0.05	17.23	-0.003	up
3/28/2022	447.51	447.52	-0.01	20.59	0.000	flat
6/14/2022	444.99	445.02	-0.03	18.07	-0.002	up
9/29/2022	444.09	441.62	2.47	17.17	0.144	down
12/5/2022	441.24	441.30	-0.06	14.32	-0.004	up
			Middle of screen elevation MW-104SR			442.8
			Middle of screen elevation MW-104DR			426.9
			Top of screen elevation MW-104SR			447.8
			Top of screen elevation MW-104DR			429.4

APPENDIX C. VERTICAL HYDRAULIC GRADIENTS

NATURE AND EXTENT REPORT

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, ILLINOIS

Date	MW-104DR Groundwater Elevation (ft NAVD88)	MW-304 Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UU (Vandalia)	BU				
3/21/2016	447.39	445.08	2.31	23.89	0.097	down
6/21/2016	445.27	445.08	0.19	23.89	0.008	down
9/19/2016	447.12	444.97	2.15	23.89	0.090	down
12/21/2016	444.52	444.97	-0.45	23.89	-0.019	up
3/14/2017	446.48	445.64	0.84	23.89	0.035	down
6/19/2017	444.02	445.64	-1.62	23.89	-0.068	up
7/25/2017	442.72	445.48	-2.76	23.89	-0.116	up
11/27/2017	441.60	445.44	-3.84	23.89	-0.161	up
3/15/2018	447.42	446.02	1.40	23.89	0.059	down
6/25/2018	444.75	445.98	-1.23	23.89	-0.051	up
9/25/2018	445.31	445.60	-0.29	23.89	-0.012	up
12/18/2018	448.01	445.78	2.23	23.89	0.093	down
3/19/2019	447.59	446.16	1.43	23.89	0.060	down
9/24/2019	443.30	446.19	-2.89	23.89	-0.121	up
3/24/2020	448.26	445.93	2.33	23.89	0.098	down
9/15/2020	444.32	445.52	-1.20	23.89	-0.050	up
12/16/2020	447.50	445.67	1.83	23.89	0.077	down
3/8/2021	447.60	445.99	1.61	23.89	0.067	down
6/21/2021	445.01	446.02	-1.01	23.89	-0.042	up
9/14/2021	442.97	445.40	-2.43	23.89	-0.102	up
12/14/2021	444.20	445.47	-1.27	23.89	-0.053	up
3/28/2022	447.52	445.99	1.53	23.89	0.064	down
6/14/2022	445.02	445.86	-0.84	23.89	-0.035	up
9/29/2022	441.62	434.04	7.58	23.89	0.317	down
12/5/2022	441.30	445.35	-4.05	23.89	-0.170	up
			Middle of screen elevation MW-104DR			426.9
			Middle of screen elevation MW-304			403.0
			Top of screen elevation MW-104DR			429.4
			Top of screen elevation MW-304			408.0

APPENDIX C. VERTICAL HYDRAULIC GRADIENTS

NATURE AND EXTENT REPORT

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, ILLINOIS

Date	MW-153 Groundwater Elevation (ft NAVD88)	MW-253 Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UU (Vandalia)	UU (Vandalia)				
3/21/2016	435.58	435.89	-0.31	17.07	-0.018	up
6/21/2016	432.92	434.66	-1.74	17.07	-0.102	up
9/19/2016	436.69	435.27	1.42	17.07	0.083	down
12/21/2016	432.55	434.51	-1.96	17.07	-0.115	up
3/14/2017	434.19	435.09	-0.90	17.07	-0.053	up
6/22/2017	431.88	432.76	-0.88	21.35	-0.041	up
7/25/2017	430.10	432.76	-2.66	19.57	-0.136	up
11/27/2017	430.37	431.33	-0.96	19.84	-0.048	up
3/15/2018	434.62	434.74	-0.12	17.07	-0.007	up
6/25/2018	432.15	432.89	-0.74	21.62	-0.034	up
9/25/2018	432.69	433.73	-1.04	17.07	-0.061	up
12/18/2018	437.62	436.55	1.07	17.07	0.063	down
3/19/2019	439.02	437.82	1.20	17.07	0.070	down
9/24/2019	429.90	431.38	-1.48	19.37	-0.076	up
3/24/2020	439.75	438.73	1.02	17.07	0.060	down
9/15/2020	431.37	431.93	-0.56	20.84	-0.027	up
12/17/2020	434.36	433.57	0.79	17.07	0.046	down
3/8/2021	436.65	435.69	0.96	17.07	0.056	down
6/22/2021	432.07	432.56	-0.49	21.54	-0.023	up
9/16/2021	430.47	431.19	-0.72	19.94	-0.036	up
12/15/2021	431.60	431.62	-0.02	21.07	-0.001	flat
3/29/2022	436.77	435.11	1.66	17.07	0.097	down
6/15/2022	432.49	432.86	-0.37	17.07	-0.022	up
9/29/2022	428.82	429.86	-1.04	18.29	-0.057	up
12/6/2022	429.67	430.09	-0.42	19.14	-0.022	up
			Middle of screen elevation MW-153			427.6
			Middle of screen elevation MW-253			410.5
			Top of screen elevation MW-153			432.4
			Top of screen elevation MW-253			412.8

APPENDIX C. VERTICAL HYDRAULIC GRADIENTS

NATURE AND EXTENT REPORT

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, ILLINOIS

Date	MW-152 Groundwater Elevation (ft NAVD88)	MW-252 Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UU (Equality)	UU (Vandalia)				
3/21/2016	421.10	424.93	-3.83	34.54	-0.111	up
6/21/2016	420.09	424.57	-4.48	34.54	-0.130	up
12/21/2016	419.67	425.06	-5.39	34.54	-0.156	up
3/14/2017	420.14	425.07	-4.93	34.54	-0.143	up
6/19/2017	419.59	425.05	-5.46	34.54	-0.158	up
7/25/2017	417.90	425.05	-7.15	34.54	-0.207	up
11/27/2017	418.76	424.53	-5.77	34.54	-0.167	up
3/15/2018	419.89	424.97	-5.08	34.54	-0.147	up
6/25/2018	419.15	425.07	-5.92	34.54	-0.171	up
9/25/2018	420.44	424.97	-4.53	34.54	-0.131	up
12/18/2018	420.35	425.02	-4.67	34.54	-0.135	up
3/19/2019	420.35	424.97	-4.62	34.54	-0.134	up
9/24/2019	417.40	422.88	-5.48	34.54	-0.159	up
3/24/2020	423.84	424.92	-1.08	34.54	-0.031	up
9/15/2020	418.47	424.37	-5.90	34.54	-0.171	up
12/16/2020	419.84	424.57	-4.73	34.54	-0.137	up
3/8/2021	420.48	423.59	-3.11	34.54	-0.090	up
7/19/2021	419.74	422.39	-2.65	34.54	-0.077	up
9/14/2021	417.26	423.50	-6.24	34.54	-0.181	up
12/14/2021	418.78	418.11	0.67	34.54	0.019	down
3/28/2022	419.79	423.79	-4.00	34.54	-0.116	up
6/14/2022	418.31	423.77	-5.46	34.54	-0.158	up
9/29/2022	418.00	416.88	1.12	34.54	0.032	down
12/6/2022	418.17	422.72	-4.55	34.54	-0.132	up
			Middle of screen elevation MW-152			410.1
			Middle of screen elevation MW-252			375.6
			Top of screen elevation MW-152			414.7
			Top of screen elevation MW-252			377.9

APPENDIX C. VERTICAL HYDRAULIC GRADIENTS

NATURE AND EXTENT REPORT

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, ILLINOIS

Date	MW-252 Groundwater Elevation (ft NAVD88)	MW-352 Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UU (Vandalia)	BU				
3/21/2016	424.93	423.88	1.05	23.41	0.045	down
6/21/2016	424.57	424.34	0.23	23.41	0.010	down
12/21/2016	425.06	422.54	2.52	23.41	0.108	down
3/14/2017	425.07	418.40	6.67	23.41	0.285	down
6/19/2017	425.05	419.86	5.19	23.41	0.222	down
7/25/2017	425.05	418.77	6.28	23.41	0.268	down
11/27/2017	424.53	419.33	5.20	23.41	0.222	down
3/15/2018	424.97	422.29	2.68	23.41	0.114	down
6/25/2018	425.07	421.73	3.34	23.41	0.143	down
9/25/2018	424.97	421.46	3.51	23.41	0.150	down
12/18/2018	425.02	422.26	2.76	23.41	0.118	down
3/19/2019	424.97	423.42	1.55	23.41	0.066	down
9/24/2019	422.88	422.20	0.68	23.41	0.029	down
3/24/2020	424.92	423.82	1.10	23.41	0.047	down
9/15/2020	424.37	423.66	0.71	23.41	0.030	down
12/16/2020	424.57	423.85	0.72	23.41	0.031	down
3/8/2021	423.59	423.95	-0.36	23.41	-0.015	up
7/19/2021	423.95	423.50	0.45	23.41	0.019	down
9/14/2021	419.48	418.11	1.37	23.41	0.059	down
12/14/2021	421.31	423.79	-2.48	23.41	-0.106	up
3/28/2022	424.19	423.77	0.42	23.41	0.018	down
6/14/2022	424.64	416.88	7.76	23.41	0.331	down
9/29/2022	424.44	422.72	1.72	23.41	0.073	down
12/6/2022	425.00	421.16	3.84	23.41	0.164	down
			Middle of screen elevation MW-252			375.6
			Middle of screen elevation MW-352			352.2
			Top of screen elevation MW-252			377.9
			Top of screen elevation MW-352			354.5

APPENDIX C. VERTICAL HYDRAULIC GRADIENTS

NATURE AND EXTENT REPORT

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, ILLINOIS

Date	MW-150 Groundwater Elevation (ft NAVD88)	MW-350 Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UU (Cahokia)	BU				
3/21/2016	379.22	374.57	4.65	23.79	0.195	down
6/21/2016	377.59	375.26	2.33	27.38	0.085	down
12/21/2016	377.70	374.66	3.04	27.49	0.111	down
3/14/2017	378.32	374.35	3.97	28.11	0.141	down
6/19/2017	377.35	375.52	1.83	27.14	0.067	down
7/25/2017	376.04	374.23	1.81	25.83	0.070	down
11/27/2017	376.66	374.15	2.51	26.45	0.095	down
3/15/2018	377.93	374.94	2.99	27.72	0.108	down
6/25/2018	376.82	374.92	1.90	26.61	0.071	down
9/25/2018	377.62	375.53	2.09	27.41	0.076	down
12/18/2018	379.03	373.63	5.40	23.79	0.227	down
3/19/2019	382.04	377.15	4.89	23.79	0.206	down
9/24/2019	375.67	373.45	2.22	25.46	0.087	down
3/24/2020	382.70	377.51	5.19	23.79	0.218	down
9/15/2020	376.58	373.39	3.19	26.37	0.121	down
12/17/2020	377.79	374.44	3.35	27.58	0.121	down
3/8/2021	379.17	374.80	4.37	23.79	0.184	down
6/21/2021	377.03	--	--	--	--	--
9/14/2021	376.15	373.42	2.73	25.94	0.105	down
12/14/2021	377.26	373.11	4.15	27.05	0.153	down
3/28/2022	379.39	373.70	5.69	23.79	0.239	down
6/14/2022	377.74	--	--	--	--	--
9/29/2022	375.89	372.85	3.04	25.68	0.118	down
12/6/2022	377.44	372.65	4.79	27.23	0.176	down
			Middle of screen elevation MW-150			374.0
			Middle of screen elevation MW-350			350.2
			Top of screen elevation MW-150			378.8
			Top of screen elevation MW-350			352.5

APPENDIX C. VERTICAL HYDRAULIC GRADIENTS

NATURE AND EXTENT REPORT

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, ILLINOIS

Date	MW-155 Groundwater Elevation (ft NAVD88)	MW-355 Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UU (Cahokia)	BU				
3/21/2016	376.85	373.83	3.02	15.74	0.192	down
6/21/2016	375.80	371.14	4.66	14.69	0.317	down
9/19/2016	373.85	372.22	1.63	12.74	0.128	down
12/21/2016	373.39	370.23	3.16	12.28	0.257	down
3/14/2017	374.20	370.39	3.81	13.09	0.291	down
6/19/2017	376.60	372.39	4.21	15.49	0.272	down
7/25/2017	373.86	369.99	3.87	12.75	0.304	down
3/15/2018	372.51	370.34	2.17	11.40	0.190	down
6/25/2018	369.49	369.82	-0.33	8.38	-0.039	up
9/25/2018	372.90	370.38	2.52	11.79	0.214	down
12/18/2018	373.77	370.94	2.83	12.66	0.224	down
3/19/2019	378.26	378.44	-0.18	17.15	-0.010	up
9/24/2019	374.22	370.54	3.68	13.11	0.281	down
3/24/2020	380.45	379.34	1.11	14.39	0.077	down
9/15/2020	374.20	370.19	4.01	13.09	0.306	down
12/17/2020	374.10	370.31	3.79	12.99	0.292	down
3/8/2021	376.63	371.34	5.29	15.52	0.341	down
6/22/2021	375.86	370.85	5.01	14.75	0.340	down
9/16/2021	373.76	369.36	4.40	12.65	0.348	down
12/14/2021	373.59	370.00	3.59	12.48	0.288	down
3/29/2022	375.90	372.06	3.84	14.79	0.260	down
6/15/2022	376.46	371.54	4.92	15.35	0.321	down
			Middle of screen elevation MW-155			375.5
			Middle of screen elevation MW-355			361.1
			Top of screen elevation MW-155			380.3
			Top of screen elevation MW-355			363.4

APPENDIX C. VERTICAL HYDRAULIC GRADIENTS

NATURE AND EXTENT REPORT

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, ILLINOIS

Date	OW-156 Groundwater Elevation (ft NAVD88)	MW-356 Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UU (Equality)	BU				
3/21/2016	420.78	424.77	-3.99	48.42	-0.082	up
6/21/2016	421.10	424.89	-3.79	48.42	-0.078	up
9/19/2016	423.33	425.03	-1.70	48.42	-0.035	up
12/21/2016	422.10	424.82	-2.72	48.42	-0.056	up
3/14/2017	423.45	425.06	-1.61	48.42	-0.033	up
6/19/2017	423.70	425.20	-1.50	48.42	-0.031	up
7/25/2017	419.17	425.05	-5.88	48.42	-0.121	up
11/27/2017	419.82	424.88	-5.06	48.42	-0.105	up
6/25/2018	420.06	425.06	-5.00	48.42	-0.103	up
9/25/2018	421.74	425.03	-3.29	48.42	-0.068	up
3/19/2019	424.35	424.95	-0.60	48.42	-0.012	up
9/24/2019	418.48	424.58	-6.10	48.42	-0.126	up
3/24/2020	424.87	424.37	0.50	48.42	0.010	down
9/15/2020	419.68	423.98	-4.30	48.42	-0.089	up
12/17/2020	422.85	--	--	--	--	--
3/8/2021	424.22	423.66	0.56	48.42	0.012	down
6/22/2021	420.04	--	--	--	--	--
9/15/2021	418.49	423.61	-5.12	48.42	-0.106	up
3/29/2022	424.27	423.40	0.87	48.42	0.018	down
9/30/2022	420.85	423.28	-2.43	48.42	-0.050	up
			Middle of screen elevation OW-156			412.6
			Middle of screen elevation MW-356			364.2
			Top of screen elevation OW-156			380.3
			Top of screen elevation MW-356			363.4

APPENDIX C. VERTICAL HYDRAULIC GRADIENTS

NATURE AND EXTENT REPORT

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, ILLINOIS

Date	MW-158R Groundwater Elevation (ft NAVD88)	MW-258 Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UU (Equality)	BU				
10/27/2022	442.74	441.74	1.00	34.15	0.029	down
11/17/2022	442.63	441.95	0.68	34.04	0.020	down
12/13/2022	442.32	442.05	0.27	33.73	0.008	down
1/11/2023	447.87	442.52	5.35	31.97	0.167	down
2/20/2023	--	442.92	--	31.97	--	--
			Middle of screen elevation MW-158R			440.6
			Middle of screen elevation MW-258			408.6
			Top of screen elevation MW-158R			445.6
			Top of screen elevation MW-258			413.6

Date	PZ-170 Groundwater Elevation (ft NAVD88)	MW-370 Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UU (Equality)	BU				
10/27/2022	404.21	401.72	2.49	31.80	0.078	down
11/16/2022	404.41	401.78	2.63	31.80	0.083	down
12/13/2022	404.82	402.17	2.65	31.80	0.083	down
1/12/2023	406.02	402.60	3.42	31.80	0.108	down
2/20/2023	--	402.75	--	31.80	--	--
			Middle of screen elevation PZ-170			392.5
			Middle of screen elevation MW-370			360.7
			Top of screen elevation PZ-170			397.5
			Top of screen elevation MW-370			365.7

Date	PZ-182 Groundwater Elevation (ft NAVD88)	MW-382 Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UU (Equality)	BU				
10/25/2022	411.69	414.01	-2.32	-31.80	0.073	down
11/14/2022	412.84	414.34	-1.50	-31.80	0.047	down
12/12/2022	413.31	414.47	-1.16	-31.80	0.036	down
1/10/2023	414.31	414.69	-0.38	-31.80	0.012	down
3/14/2023	415.44	415.07	0.37	-31.80	-0.012	up
			Middle of screen elevation PZ-182			367.7
			Middle of screen elevation MW-382			399.5
			Top of screen elevation PZ-182			372.7
			Top of screen elevation MW-382			404.5

APPENDIX C. VERTICAL HYDRAULIC GRADIENTS

NATURE AND EXTENT REPORT

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, ILLINOIS

Date	MW-192 Groundwater Elevation (ft NAVD88)	MW-392 Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UU (Equality)	BU				
10/27/2022	428.41	427.68	0.73	53.97	0.014	down
11/16/2022	428.57	428.08	0.49	53.97	0.009	down
12/13/2022	428.61	428.41	0.20	53.97	0.004	down
1/12/2023	428.91	428.61	0.30	53.97	0.006	down
2/20/2023	428.94	428.97	-0.03	53.97	-0.001	flat
			Middle of screen elevation MW-192			409.0
			Middle of screen elevation MW-392			355.1
			Top of screen elevation MW-192			414.0
			Top of screen elevation MW-392			360.1

Date	MW-193 Groundwater Elevation (ft NAVD88)	MW-393 Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UU (Equality)	BU				
10/27/2022	428.95	427.06	1.89	52.93	0.036	down
11/16/2022	429.02	429.29	-0.27	52.93	-0.005	up
12/13/2022	429.07	429.52	-0.45	52.93	-0.009	up
1/12/2023	429.30	429.51	-0.21	52.93	-0.004	up
2/20/2023	431.24	429.35	1.89	52.93	0.036	down
			Middle of screen elevation MW-193			407.5
			Middle of screen elevation MW-393			354.6
			Top of screen elevation MW-193			412.5
			Top of screen elevation MW-393			359.6

APPENDIX C. VERTICAL HYDRAULIC GRADIENTS

NATURE AND EXTENT REPORT

BALDWIN POWER PLANT

FLY ASH POND SYSTEM

BALDWIN, ILLINOIS

Date	MW-194 Groundwater Elevation (ft NAVD88)	MW-394 Groundwater Elevation (ft NAVD88)	Head Change (ft)	Distance Change [1] (ft)	Vertical Hydraulic Gradient [2] (dh/dl)	
	UU (Equality)	BU				
10/27/2022	430.43	431.52	-1.09	44.72	-0.024	up
11/16/2022	431.32	432.69	-1.37	44.72	-0.031	up
12/13/2022	431.39	433.18	-1.79	44.72	-0.040	up
1/12/2023	431.60	432.99	-1.39	44.72	-0.031	up
2/20/2023	431.69	432.91	-1.22	44.72	-0.027	up
			Middle of screen elevation MW-194			407.2
			Middle of screen elevation MW-394			362.5
			Middle of screen elevation MW-194			402.4
			Middle of screen elevation MW-394			357.5

[O: EGP 4/27/23, C: SSW 5/2/23]

Notes:

[1] Distance change was calculated using the midpoint of the piezometer screen and water table surface. If the water table surface was above the top of the monitoring well screen, then distance change was calculated using the midpoint of both screens.

[2] Vertical gradients between ±0.0015 are considered flat, and typically have less than 0.02 foot difference in groundwater elevation between wells.

BU = bedrock unit

dh = head change

dl = distance change

ft = foot/feet

NAVD88 = North American Vertical Datum of 1988

PMP = potential migration pathway

UU = upper unit

APPENDIX D
Off-Site Groundwater Quality Results (Kelron, 2012)

kelron1@comcast.net | 217 390.1503

April 16, 2012

Rick Diericx, Senior Director
Environmental Compliance Group
Dynegy Operating Company
604 Pierce Blvd
O'Fallon, IL 62269

Dear Mr. Diericx:

Subject: Off-Site Groundwater Quality Results
Baldwin Energy Complex, Baldwin, Illinois

This groundwater report has been prepared by Kelron Environmental (Kelron) on behalf of Dynegy Operating Company to present the results of an off-site groundwater quality investigation near the Baldwin Energy Complex's (BEC's) ash pond system, which is owned and operated by Dynegy Midwest Generation, LLC. The purpose of the investigation was to assess shallow off-site groundwater quality for the presence of inorganic parameters related to coal combustion residuals (CCRs).

METHODS OF INVESTIGATION

This investigation was targeted specifically to assess groundwater quality off-site to the south and southwest of the BEC's ash pond system. A total of eight shallow temporary piezometers were installed – six to the south of existing on-site monitoring well MW-152 and two to the west and southwest of on-site monitoring well MW-150. The temporary piezometers were installed on March 5 and 6, 2012 using an AMS PowerProbe 9500-VTR rig using direct push methods for both soil sampling and temporary piezometer installation. All drilling and well installations were performed by Terra Drill, Inc. of Dupo, Illinois under the direct supervision of Kelron. Each direct-push probe hole was continuously sampled to determine the geology and into each a 1-inch diameter pre-packed screened piezometer was installed and completed with a flushmount well vault. The pre-pack well screens consisted of 5-foot lengths of Schedule 40 polyvinyl chloride (PVC) with 0.010-inch slots and a pre-pack of ultrafine (120 mesh) silica sand with two layers of nylon mesh. Total open area of each well screen was approximately 2 percent. The boring and temporary piezometer logs are provided in Attachment 3. Well construction details are summarized on Table 1 (Attachment 1).

Following completion of all eight piezometers they were located in the field with a handheld GPS system and surveyed for elevation to an accuracy of 0.01 foot relative to the nearest benchmarks at the BEC. Due to the very low permeability of the predominantly clay materials within which most of the piezometers were installed, groundwater samples were not collected from the eight wells until static groundwater levels were reached. All wells were sampled on March 15, 2012 using a peristaltic pump with ¼-inch inner-diameter low density polyethylene (LDPE) tubing. During pumping of each well the groundwater was monitored for the field parameters of temperature, specific conductance, pH, and groundwater depth, with all data recorded on field data sheets (Attachment 4). A field duplicate (sample identification BPZ93) was collected from temporary piezometer BPZ3 for quality assurance/quality control purposes. Groundwater samples were collected in laboratory prepared bottles with the appropriate preservatives, placed in an iced cooler, and delivered to Teklab, Inc. in Collinsville, Illinois for analysis of total boron, total sulfate,

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and total dissolved solids (TDS). The laboratory analytical report and chain of custody are provided in Attachment 5.

PIEZOMETER LOCATIONS AND GROUNDWATER LEVELS

The off-site temporary piezometer locations are shown on Figure 1 (Attachment 2) relative to the approximate property boundary of the BEC. Two north-south lines of temporary piezometers were installed along Magnolia Drive (BPZ1, BPZ2, BPZ3) to the east, and Ruby Lane (BPZ4, BPZ5, BPZ6) to the west, of on-site monitoring well nest MW-152, MW-252, and MW-352. Two temporary piezometers were installed along Conservation Road to the southwest (BPZ7) and northwest (BPZ8) of on-site monitoring well nest MW-150 and MW-350. An elevation cross-section of the eight temporary piezometers (Figure 2 [Attachment 2]) shows that ground surface elevation decreases significantly from south to north towards the BEC property along both Magnolia Drive and Ruby Lane. In order to intercept groundwater the piezometer screens were installed to successively greater depths from south to north towards the BEC.

Groundwater levels were measured on three occasions (Table 2 [Attachment 1]): following completion of the eight temporary piezometers (March 6, 2012); approximately 24 hours after installation (March 7, 2012); and prior to sampling on March 15, 2012. Upon initial completion five of the eight piezometers were dry, with no groundwater in the wells. One day after completion there was still one dry piezometer (BPZ5), four with very deep and non-static water levels (i.e., groundwater levels still recovering), and three with static water levels. Nine days after installation the groundwater levels in all eight temporary piezometers had reached static levels, at which time they were all measured for groundwater elevation prior to collection of groundwater samples.

The shallow groundwater elevation map shown on Figure 3 (Attachment 2) was prepared utilizing groundwater levels measured at both the BEC ash pond system network of monitoring wells and the eight off-site temporary piezometers. Groundwater elevations at temporary piezometers BPZ1 through BPZ6 decrease from south to north and from east to west, with the shallow groundwater flow direction towards the west and northwest. Groundwater flow in the vicinity of the south-central property boundary of the BEC converges towards a perennial earthen drainage channel that is present north of the railroad tracks and south of the ash pond system. The drainage channel and low lying area south of the ash ponds and adjacent to the railroad tracks acts as a groundwater capture zone for topographically higher areas to the north (i.e., ash ponds) and south of the railroad tracks.

Groundwater flow in the vicinity of off-site temporary piezometers BPZ7 and BPZ8 is towards the west and southwest.

GROUNDWATER QUALITY RESULTS

Table 3 (Attachment 1) summarizes the groundwater quality data for the eight temporary piezometers for the March 15, 2012 sampling event. The concentrations for the field measured parameter of pH and the laboratory analyzed parameters of total sulfate, total boron, and total dissolved solids are provided on the table and compared to the State of Illinois groundwater quality standards for Class I potable resource groundwater (IAC 35 Part 620 Section 410). The Class I standards were exceeded in groundwater at two temporary piezometers. Piezometer BPZ4 exceeded the sulfate standard with a concentration of 817 milligrams per Liter (mg/L) versus the Class I standard of 400 mg/L, and the TDS standard with a concentration of 1,640 mg/L versus the Class I standard of 1,200 mg/L. Piezometer BPZ7 exceeded the TDS standard with a concentration of 1,220 mg/L. No other parameters at any other piezometers exceeded Class I standards.

With the exception of piezometer BPZ4, all other samples collected from the piezometers along Magnolia Drive and Ruby Lane were below the total sulfate and TDS standards. Total boron concentrations, the primary indicator of the presence of CCR leachate, were below the Class I standard in the samples collected from all six piezometers along Magnolia Drive and Ruby Lane and were similar to what has been analyzed at groundwater monitoring wells MW-104S and MW-104D, which are upgradient to the BEC ash pond system. Groundwater elevations in the area along the BEC south property line and railroad tracks reflect the ground surface topography, with the dominant groundwater flow direction being from both the north and the south towards the earthen east-west drainage channel between the railroad tracks and ash ponds. Groundwater flow within the low-lying area south of the ash ponds and adjacent to the railroad tracks is toward the west-northwest, with the low topographic area along the drainage channel acting as a groundwater capture zone. Piezometer BPZ4 is topographically the lowest of all the piezometers as it is nearest to this drainage channel. The other five piezometers are at higher topographic elevations and upgradient from the railroad tracks and drainage channel. No potable or non-potable water wells have been documented in the area south of the BEC ash pond system.

The other location with a Class I groundwater exceedance was at temporary piezometer BPZ7, which had a TDS concentration (1,220 mg/L) slightly greater than the groundwater standard (1,200 mg/L). All other parameter concentrations in the groundwater at this location and BPZ8 were less than Class I standards. The geology in the vicinity of these piezometers is characterized by low permeability clay and shale-limestone bedrock within 25 feet of ground surface. No potable or non-potable water wells have been documented in this area southwest of the BEC ash pond system.

Should you have any questions about the material presented in this summary letter, please contact us at your convenience.

Sincerely,

Stuart J. Cravens, ILPG / CGWP
Senior Hydrogeologist

Attachments:
1. Tables
2. Figures
3. Boring and Temporary Piezometer Logs
4. Water Sample Field Data Sheets
5. Laboratory Analytical Report and Chain of Custody

ATTACHMENT 1

Table 1. Temporary Piezometer Construction Details

Table 2. Groundwater Levels and Elevations: March 2012

Table 3. Groundwater Quality Data – March 15, 2012 Sampling Event

Table 1. Temporary Piezometer Construction Details
Off-Site Groundwater Quality Investigation - Baldwin Ash Pond System
Baldwin Energy Complex; Baldwin, IL

Temporary Piezometer Number	Installation Date	Driller	Piezometer Top Elevation	Ground Elevation	Screen Top Depth (BGS)	Screen Bottom Depth (BGS)	Screen Top Elevation	Screen Bottom Elevation	Screen Length	Probehole Depth from Ground Surface	Bottom of Probehole Elevation	Piezometer Depth from Ground Surface	Piezometer Depth from Top of Casing
BPZ1	03/06/12	Terra Drill	434.53	434.77	12.88	17.88	421.89	416.89	5.00	20.0	414.8	17.98	17.74
BPZ2	03/06/12	Terra Drill	439.84	440.10	9.41	14.41	430.69	425.69	5.00	15.0	425.1	14.51	14.25
BPZ3	03/06/12	Terra Drill	450.39	450.58	14.77	19.77	435.81	430.81	5.00	20.0	430.6	19.87	19.68
BPZ4	03/06/12	Terra Drill	429.01	429.32	18.08	23.08	411.24	406.24	5.00	30.0	399.3	23.18	22.87
BPZ5	03/06/12	Terra Drill	432.49	432.65	14.61	19.61	418.04	413.04	5.00	20.0	412.7	19.71	19.55
BPZ6	03/06/12	Terra Drill	437.48	437.73	14.47	19.47	423.26	418.26	5.00	20.0	417.7	19.57	19.32
BPZ7	03/05/12	Terra Drill	397.39	397.70	17.53	22.53	380.17	375.17	5.00	25.0	372.7	22.63	22.32
BPZ8	03/05/12	Terra Drill	393.06	393.51	10.67	15.67	382.84	377.84	5.00	18.0	375.5	15.77	15.32

Notes:

All depth and elevation measurements are in feet.

All elevations as measured on 03/09/12.

All piezometers constructed with Schedule 40 PVC, 1-inch diameter, 10-slot screens with pre-pack of ultrafine (120 mesh) silica sand with 2 layers of nylon mesh; open area = 2%.

Table 2. Groundwater Levels and Elevations: March 2012
Off-Site Groundwater Quality Investigation - Baldwin Ash Pond System
Baldwin Energy Complex, Baldwin, Illinois

Temporary Piezometer Number	Ground Surface Elevation (feet NGVD)	Measuring Point Elevation (feet NGVD)	Piezometer Depth from Top of Casing (feet)	Groundwater Depth (feet below MP)			Groundwater Elevation (feet NGVD)		
				1 03/06/12 15:10 - 15:40	2 03/07/12 14:50 - 16:02	3 03/15/12 09:00 - 12:00	1 03/06/12 15:10 - 15:40	2 03/07/12 14:50 - 16:02	3 03/15/12 09:00 - 12:00
BPZ1	434.77	434.53	17.74	Dry	14.66 ns	6.62	- -	- -	427.91
BPZ2	440.10	439.84	14.25	3.40	1.37	1.21	436.44	438.47	438.63
BPZ3	450.58	450.39	19.68	4.45	1.76	1.65	445.94	448.63	448.74
BPZ4	429.32	429.01	22.87	Dry	21.79 ns	17.59	- -	- -	411.42
BPZ5	432.65	432.49	19.55	Dry	Dry	14.67	- -	- -	417.82
BPZ6	437.73	437.48	19.32	Dry	17.51 ns	11.47	- -	- -	426.01
BPZ7	397.70	397.39	22.32	Dry	22.19 ns	19.03	- -	- -	378.36
BPZ8	393.51	393.06	15.32	2.90	3.00	3.04	390.16	390.06	390.02

Notes:
All depth and elevation measurements are in feet.

- -	No groundwater elevation provided for non-static groundwater level.
MP	Measuring Point (top of well casing).
NGVD	Vertical elevation relative to the National Geodetic Vertical Datum.
ns	Non-static water level.

Table 3. Groundwater Quality Data - March 15, 2012 Sampling Event
Off-Site Groundwater Quality Investigation - Baldwin Ash Pond System
Baldwin Energy Complex; Baldwin, Illinois

Parameter, Unit	Class I Groundwater Standard[1]	Temporary Piezometer Number							
		BPZ1	BPZ2	BPZ3	BPZ4	BPZ5	BPZ6	BPZ7	BPZ8
Field Parameters									
pH (standard units)	6.5 / 9.0*	7.48	7.21	6.96	7.14	7.39	7.30	6.85	7.55
General Chemistry Parameters									
Total Sulfate (mg/L)	400	119	92	85	817	27	70	215	76
Total Dissolved Solids, mg/L	1,200	502	676	500	1,640	394	664	1,220	434
Metals									
Total Boron (mg/l)	2.0	0.0096	0.012	0.011	0.0435	0.0314	0.010	0.252	0.0354

Notes:

[1] Groundwater quality standards for Class I: Potable Resource Groundwater (IAC 35 Part 620 Section 410).

* Lower and Upper limits for pH is the Class I groundwater quality standard of 6.5 and 9.0 Standard Units.

< = Below method reporting limit.

mg/L = milligrams per Liter.

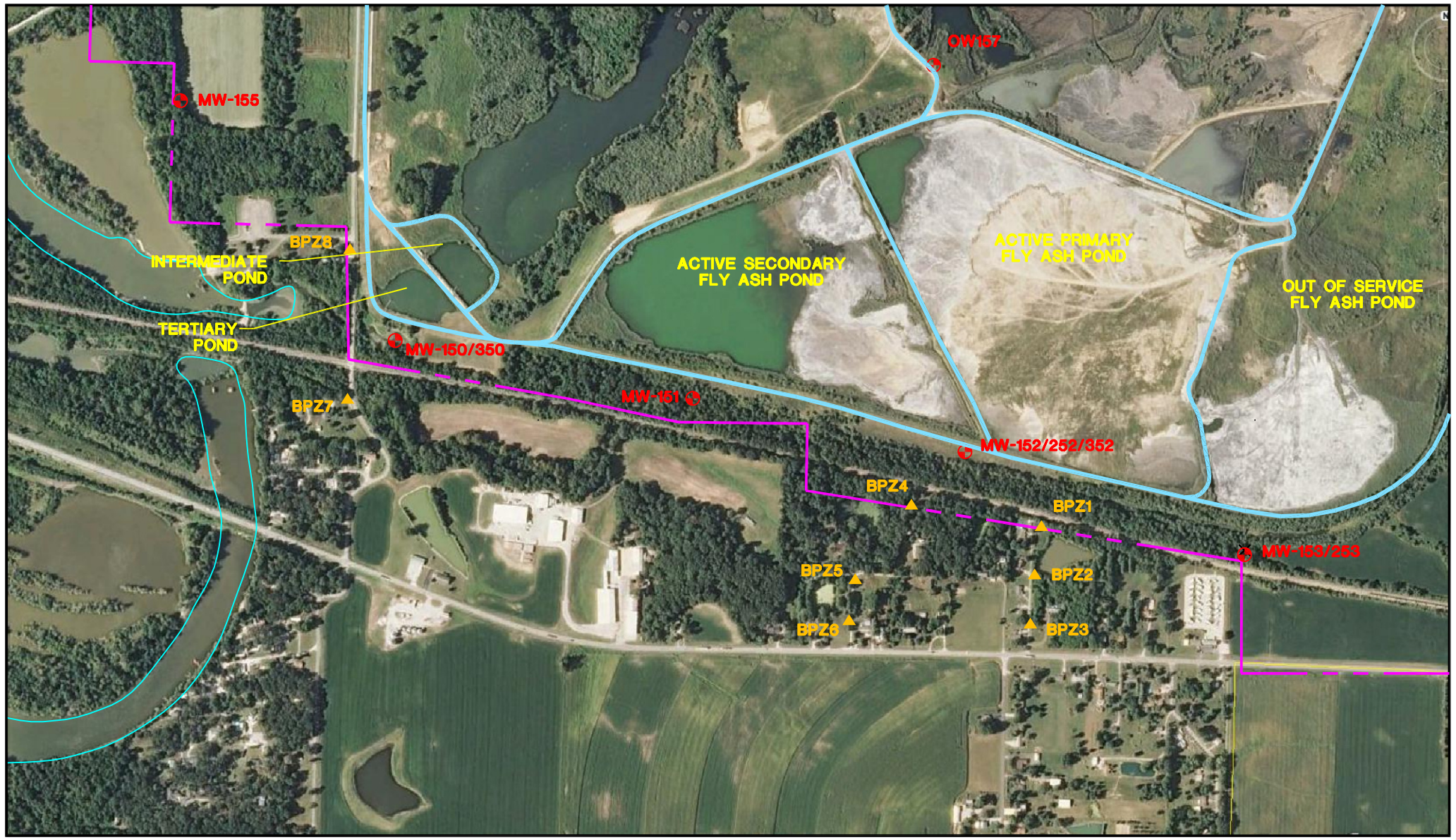
Exceeds Class I Groundwater Quality Standard.

ATTACHMENT 2

Figure 1. Temporary Off-Site Piezometer Locations

Figure 2. Temporary Piezometer Screen Elevations

Figure 3. Baldwin Ash Pond System Shallow Groundwater Elevation Map: March 6 – 15, 2012



LEGEND

MW-111	MONITORING WELL LOCATION AND NUMBER
BPZ1	TEMPORARY PIEZOMETER LOCATION AND NUMBER
	ASH POND
	APPROXIMATE PROPERTY BOUNDARY, BALDWIN ENERGY COMPLEX, BALDWIN, ILLINOIS

0 800
FEET

N

KELRON environmental

TITLE:
TEMPORARY OFF-SITE PIEZOMETER LOCATIONS
BALDWIN ASH POND SYSTEM
BALDWIN, ILLINOIS

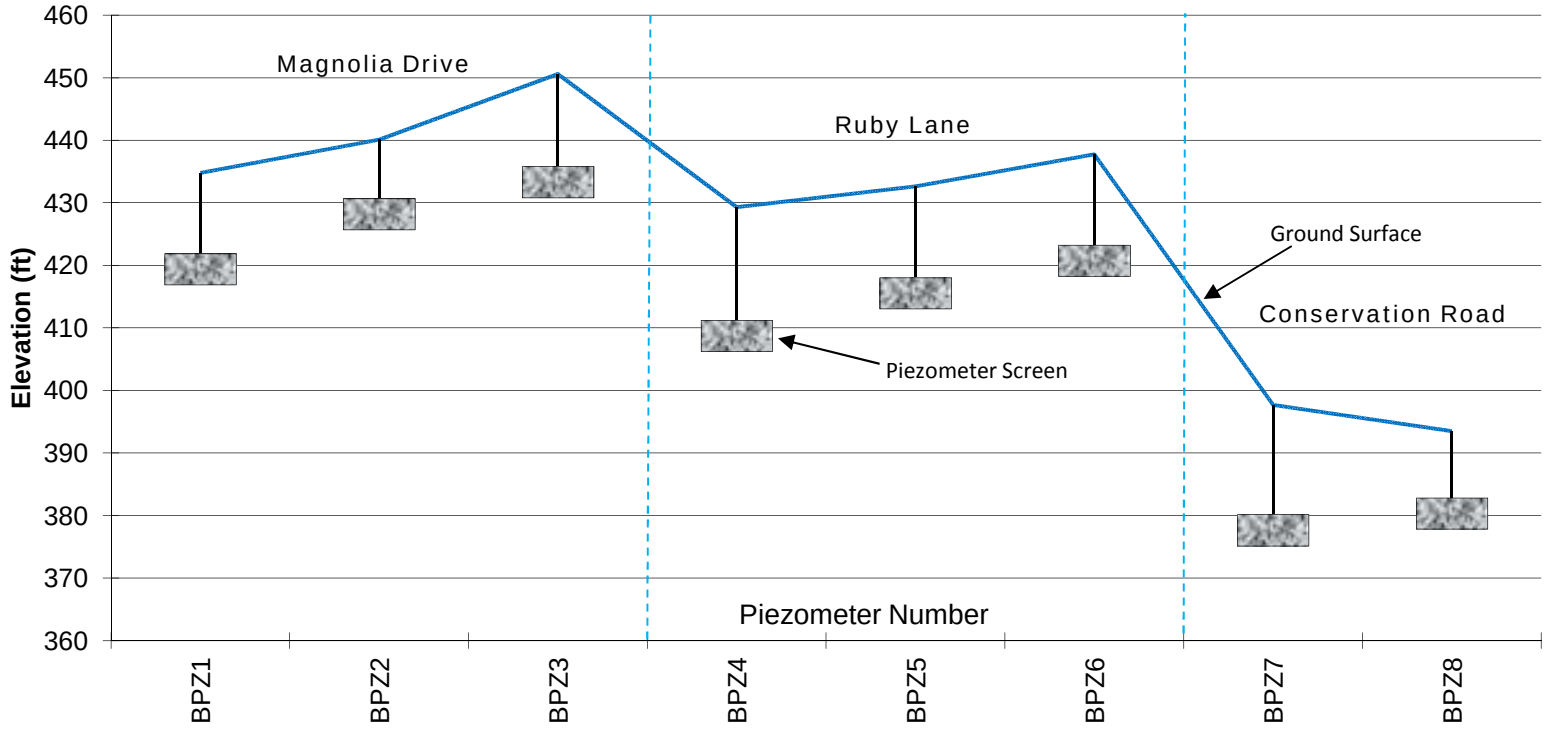
DWN: TMM	DES: SC
CHKD:	APPD:
DATE: 3/22/12	REV: 0

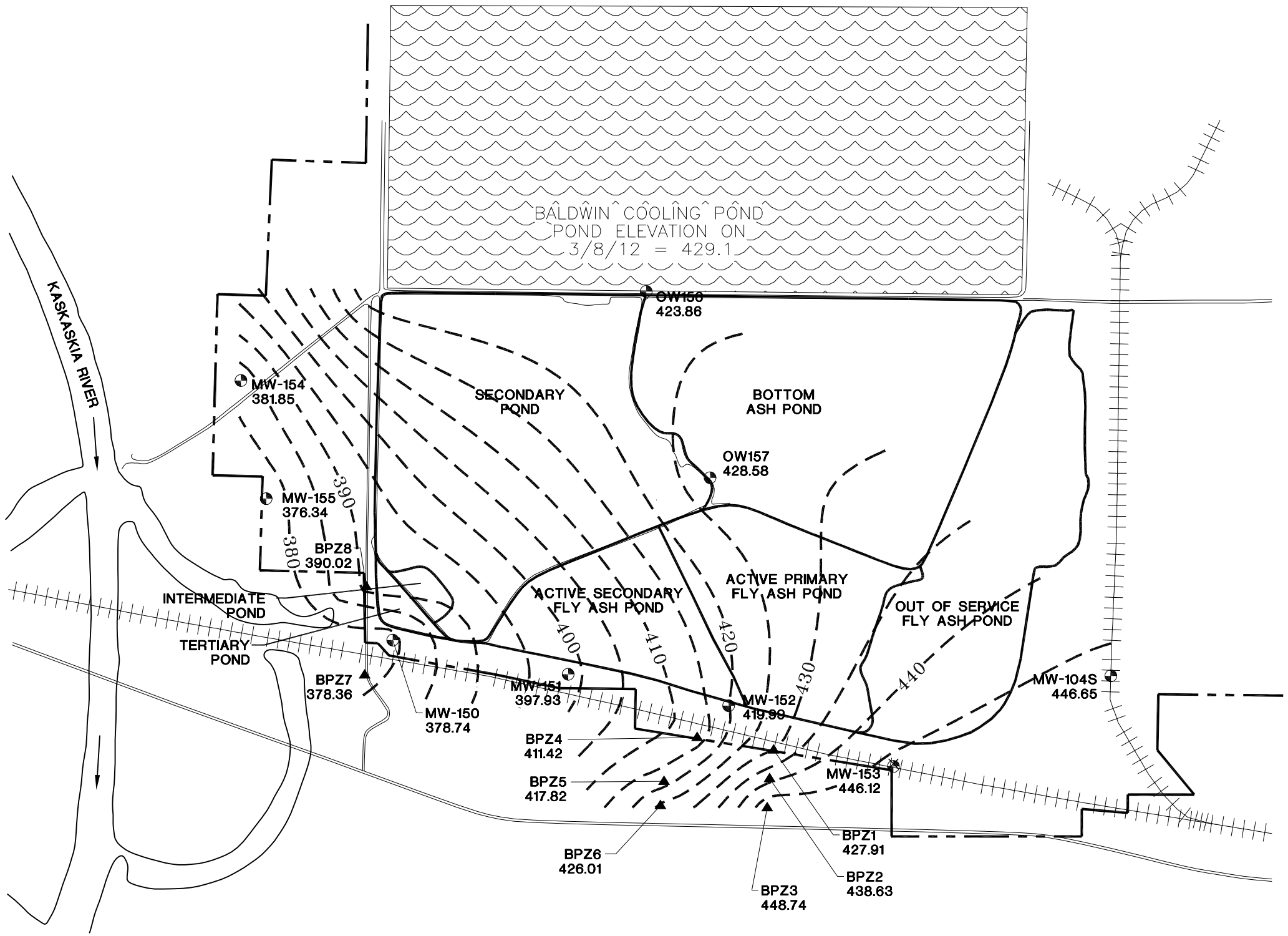
PROJECT NO: 62410020011
DYNEGY MIDWEST GENERATION, LLC.
BALDWIN, ILLINOIS

FIGURE 1

COL. 62410\020011A-008

Figure 2. Temporary Piezometer Screen Elevations
Off-Site Groundwater Quality Investigation - Baldwin Ash Pond System
Baldwin Energy Complex; Baldwin, Illinois
Dynegy Midwest Generation, LLC





LEGEND

MW-111	MONITORING WELL LOCATION AND NUMBER
BPZ1	TEMPORARY PIEZOMETER LOCATION AND NUMBER
444	POTENTIOMETRIC SURFACE CONTOUR (FEET)
— — —	APPROXIMATE PROPERTY BOUNDARY, BALDWIN ENERGY COMPLEX, BALDWIN, ILLINOIS

NOTES:
1. Elevations are in feet with respect to Mean Sea Level.
2. Elevation contours are based on interpolation between widely spaced well locations. Only at the well is the elevation actually known.

0 1200
FEET

N

KELRON environmental

TITLE:
BALDWIN ASH POND SYSTEM SHALLOW GROUNDWATER
ELEVATION MAP – MARCH 6–15, 2012

DWN: TMM	DES: SC
CHKD:	APPD:
DATE: 3/22/12	REV: 0

PROJECT NO: 62410020011
DYNEGY MIDWEST GENERATION, LLC.
BALDWIN, ILLINOIS

FIGURE 3

COL. 62410\020011A-007

ATTACHMENT 3

Boring and Temporary Piezometer Logs

KELRON ENVIRONMENTAL
INCORPORATED

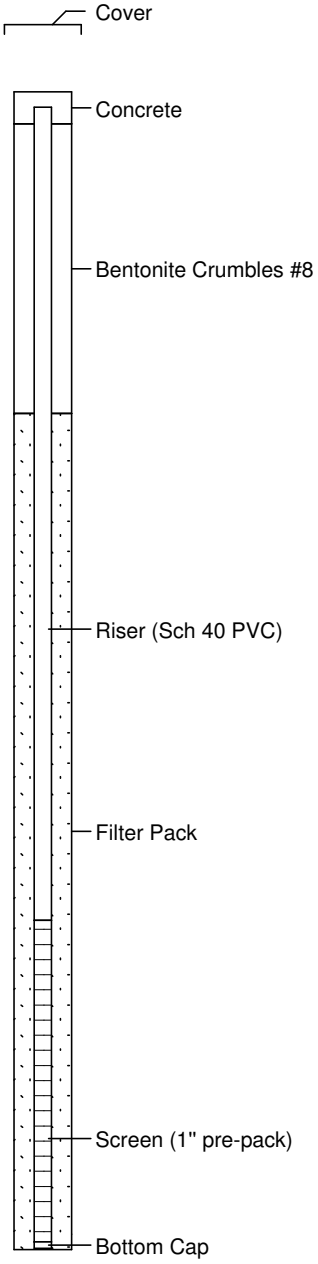
LOG OF BORING BPZ1

Off-Site Groundwater Quality Investigtion
BaldwinAsh Pond System
Baldwin Energy Complex, Baldwin, IL
Dynegy Midwest Generation,LLC

Date Completed	: 03/06/2012	Driller	: Jim Dittmaier
Hole Diameter	: 2.75"	Geologist	: S. Cravens (Kelron Env)
Drilling Method	: AMS PowerProbe 9500-VTR	Land Surface Elevation	: 434.77
Sampling Method	: MacroCore (1.25" ID)	Top of Casing Elevation	434.53
Drilling Company	: Terra Drill	X,Y Coordinates	:

Depth in Feet	DESCRIPTION	Surf. Elev. 434.77	Samples	Recovery inches	USCS	GRAPHIC
0	SILTY CLAY, very soft, high plasticity, olive brown, moist		1	13/48	CL	
		432				
	- stiff, light gray w/ brown mottling (10-25%)		2	48/48		
5						
		427				
	- soft to very soft		3	48/48		
	- trace sand, stiff to very stiff, medium to high plasticity, moist					
10						
	- olive brown					
		422	4	48/48		
	SILTY CLAY, trace sand and gravel (fine-crse), very stiff to hard, medium to high plasticity, light gray w/ brown mottling (10-25%), moist (TILL)				CL	
15						
	- 25-75% brown mottling					
		417	5	48/48		
	END BOREHOLE AT 20 FEET BLS					
20						

Well: BPZ1
Elev.: 434.53



KELRON ENVIRONMENTAL
INCORPORATED

LOG OF BORING BPZ2

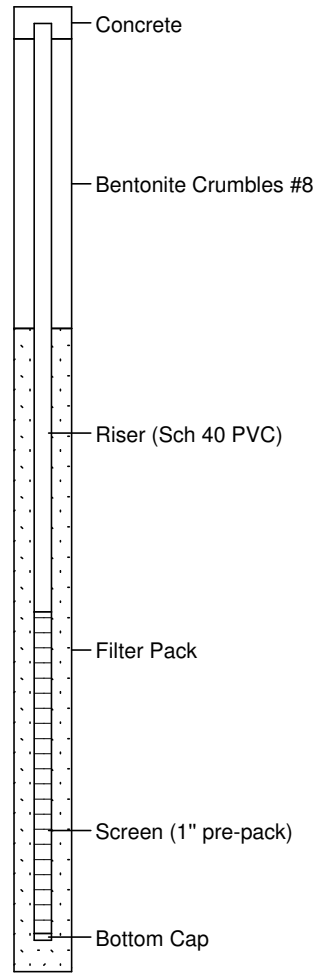
Off-Site Groundwater Quality Investigtion
BaldwinAsh Pond System
Baldwin Energy Complex, Baldwin, IL
Dynegy Midwest Generation,LLC

Date Completed	: 03/06/2012	Driller	: Jim Dittmaier
Hole Diameter	: 2.75"	Geologist	: S. Cravens (Kelron Env)
Drilling Method	: AMS PowerProbe 9500-VTR	Land Surface Elevation	: 440.10
Sampling Method	: MacroCore (1.25" ID)	Top of Casing Elevation	439.84
Drilling Company	: Terra Drill	X,Y Coordinates	:

Depth in Feet	DESCRIPTION	Surf. Elev. 440.10	Samples	Recovery inches	USCS
0	SILTY CLAY, very soft, high plasticity, yellow brown, moist - light gray w/ brown mottling (10-25%)	440	1	36/48	CL
5	SANDY CLAY (fine-crse sand), yellow-brown, wet	435	2	34/48	CL
	SILTY CLAY, trace sand, very soft, high plasticity, light gray w/ brown mottling, moist - stiff to very stiff				
10		430	3	42/48	CL
			4	36/36	
15	END BOREHOLE AT 15 FEET BLS	425			
20					

GRAPHIC

Well: BPZ2
Elev.: 439.84



KELRON ENVIRONMENTAL
INCORPORATED

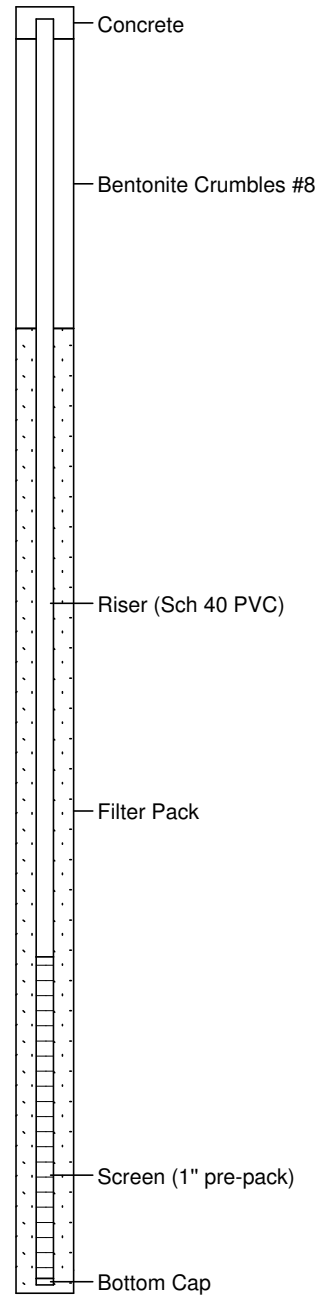
LOG OF BORING BPZ3

Off-Site Groundwater Quality Investigtion
BaldwinAsh Pond System
Baldwin Energy Complex, Baldwin, IL
Dynegy Midwest Generation,LLC

Date Completed	: 03/06/2012	Driller	: Jim Dittmaier
Hole Diameter	: 2.75"	Geologist	: S. Cravens (Kelron Env)
Drilling Method	: AMS PowerProbe 9500-VTR	Land Surface Elevation	: 450.58
Sampling Method	: MacroCore (1.25" ID)	Top of Casing Elevation	450.39
Drilling Company	: Terra Drill	X,Y Coordinates	:

Depth in Feet	DESCRIPTION	Surf. Elev. 450.58	Samples	Recovery inches	USCS
0	SILTY CLAY, high organics, soft to very soft, high plasticity, olive brown, moist	450			
	- stiff, light gray w/ brown mottling (10-25%)		1	30/48	
	- soft to very soft				
5		445	2	42/48	
	- brown grading to olive brown				CL
	- trace sand, stiff to very stiff, medium plasticity				
10		440	3	48/48	
	- light gray w/ brown mottling		4	48/48	
15	SILTY CLAY, few sand and gravel (fine-crse, angular to sub-angular), hard, medium to low plasticity, light gray w/ brown mottling grading to yellow-brown highly oxidized, moist (TILL)	435			
	- very soft, high plasticity, olive brown				CL
	- trace sand and gravel, very stiff to hard, medium to high plasticity, light gray w/ brown mottling (50-90%)		5	48/48	
20	END BOREHOLE AT 20 FEET BLS				

GRAPHIC



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KELRON ENVIRONMENTAL
INCORPORATED

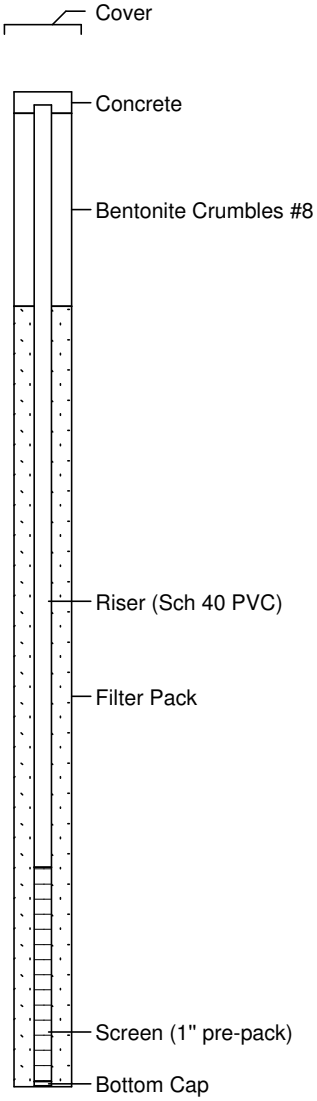
LOG OF BORING BPZ4

Off-Site Groundwater Quality Investigtion
BaldwinAsh Pond System
Baldwin Energy Complex, Baldwin, IL
Dynegy Midwest Generation,LLC

Date Completed	: 03/06/2012	Driller	: Jim Dittmaier
Hole Diameter	: 2.75"	Geologist	: S. Cravens (Kelron Env)
Drilling Method	: AMS PowerProbe 9500-VTR	Land Surface Elevation	: 429.32
Sampling Method	: MacroCore (1.25" ID)	Top of Casing Elevation	429.01
Drilling Company	: Terra Drill	X,Y Coordinates	:

Depth in Feet	DESCRIPTION	Surf. Elev. 429.32	Samples	Recovery inches	USCS	GRAPHIC
0	SILTY CLAY, medium soft, medium to high plasticity, yellow brown, moist	428	1	48/48	CL	
	- soft, high plasticity, light gray w/ brown mottling					
5		423	2	48/48		
10	- light gray w/ brown mottling		3	48/48		
	- very soft, brown	418				
	SILTY CLAY, trace sand, high organics, medium to stiff, medium plasticity, moist (TILL)		4	48/48	CL	
15		413				
			5	48/48		
20		408	6	48/48		
	- very stiff to hard					
25		403	7	48/48		
	- trace sand and gravel, soft to medium, medium to high plasticity, light gray w/ brown mottling		8	24/24		
30	END BOREHOLE AT 30 FEET BLS					

Well: BPZ4
Elev.: 429.01



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KELRON ENVIRONMENTAL
INCORPORATED

LOG OF BORING BPZ5

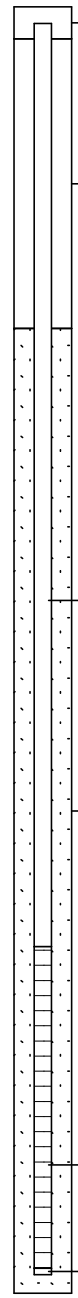
Off-Site Groundwater Quality Investigtion
BaldwinAsh Pond System
Baldwin Energy Complex, Baldwin, IL
Dynegy Midwest Generation,LLC

Date Completed	: 03/06/2012	Driller	: Jim Dittmaier
Hole Diameter	: 2.75"	Geologist	: S. Cravens (Kelron Env)
Drilling Method	: AMS PowerProbe 9500-VTR	Land Surface Elevation	: 432.65
Sampling Method	: MacroCore (1.25" ID)	Top of Casing Elevation	432.49
Drilling Company	: Terra Drill	X,Y Coordinates	:

Depth in Feet	DESCRIPTION	Surf. Elev. 432.65	Samples	Recovery inches	USCS
0	SILTY CLAY, trace sand, medium hardness, high plasticity, light gray w/ brown mottling, moist		1	39/48	CL
		430			
5			2	44/48	
		425			
	- soft, medium to high plasticity				
10	- stiff to very stiff, medium plasticity		3	48/48	
		420			
	- very soft, hight plasticity		4	48/48	
15					
	SILTY CLAY, few sand and gravel (fine-crse), very stiff, medium plasticity, light gray w/ brown mottling, moist (TILL)	415	5	48/48	CL
20	END BOREHOLE AT 20 FEET BLS				

GRAPHIC

Well: BPZ5
Elev.: 432.49



KELRON ENVIRONMENTAL
INCORPORATED

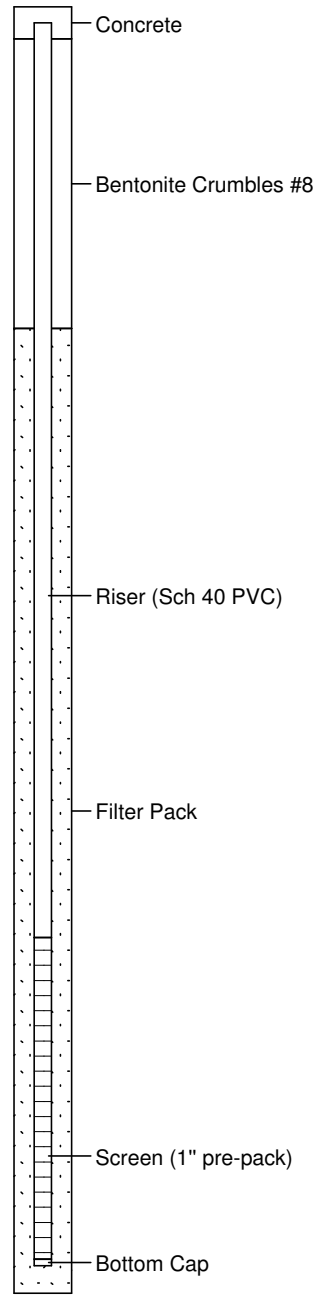
LOG OF BORING BPZ6

Off-Site Groundwater Quality Investigtion
BaldwinAsh Pond System
Baldwin Energy Complex, Baldwin, IL
Dynegy Midwest Generation,LLC

Date Completed	: 03/06/2012	Driller	: Jim Dittmaier
Hole Diameter	: 2.75"	Geologist	: S. Cravens (Kelron Env)
Drilling Method	: AMS PowerProbe 9500-VTR	Land Surface Elevation	: 437.73
Sampling Method	: MacroCore (1.25" ID)	Top of Casing Elevation	437.48
Drilling Company	: Terra Drill	X,Y Coordinates	:

Depth in Feet	DESCRIPTION	Surf. Elev. 437.73	Samples	Recovery inches	USCS	GRAPHIC
0	SILTY CLAY, soft, high plasticity, light gray w/ brown mottling, moist					
		435	1	26/48		
5			2	44/48		
		430				
	- medium to stiff, medium plasticity					
	- trace sand and gravel, stiff to very stiff, medium to high plasticity, light gray w/ brown mottling (25-50%), moist				CL	
10			3	48/48		
	- few sand and gravel					
	- very stiff to hard					
		425				
			4	48/48		
15						
	SANDY CLAY, few gravel (fine), soft, low to medium plasticity, light gray w/ brown mottling, moist	420	5	48/48	CL	
	- wet at 19.4'					
20	END BOREHOLE AT 20 FEET BLS					

Well: BPZ6
Elev.: 437.48



KELRON ENVIRONMENTAL
INCORPORATED

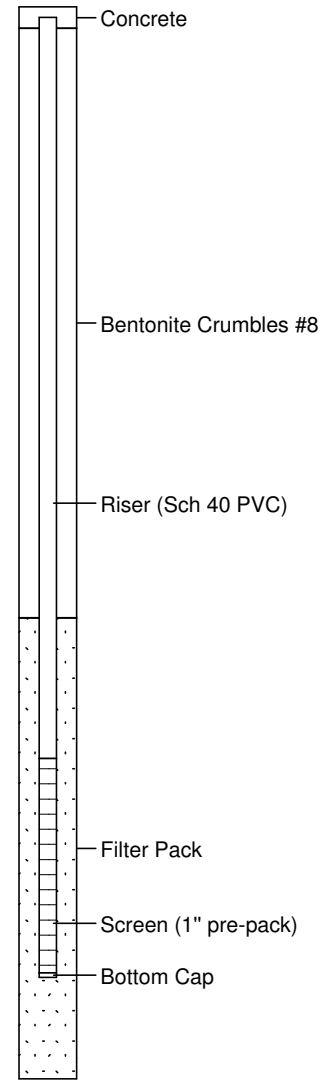
LOG OF BORING BPZ7

Off-Site Groundwater Quality Investigtion
BaldwinAsh Pond System
Baldwin Energy Complex, Baldwin, IL
Dynegy Midwest Generation,LLC

Date Completed	: 03/05/2012	Driller	: Jim Dittmaier
Hole Diameter	: 2.75"	Geologist	: S. Cravens (Kelron Env)
Drilling Method	: AMS PowerProbe 9500-VTR	Land Surface Elevation	: 397.70
Sampling Method	: MacroCore (1.25" ID)	Top of Casing Elevation	397.39
Drilling Company	: Terra Drill	X,Y Coordinates	:

Depth in Feet	DESCRIPTION	Surf. Elev. 397.70	Samples	Recovery inches	USCS	GRAPHIC
0	FILL - gravel and clay - silty clay with sand, trace gravel, dry, moist	395	1	30/60	FL	
5	- brown, wet	390	2	4/60		
10	- olive brown to black - slag and coal	385	3	60/60		
	CLAY, medium hardness, high plasticity, olive brown grading to light gray, moist				CL	
15	SILTY CLAY, very soft, high plasticity, light gray with brown mottling, moist	380	4	41/60	CL	
20		375	5	40/60		
25	SHALE, weathered, gray, dry LIMESTONE, very hard, light gray				SH LS	
	END BOREHOLE AT 25 FEET BLS	370				
30						

Well: BPZ7
Elev.: 397.39



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KELRON ENVIRONMENTAL
INCORPORATED

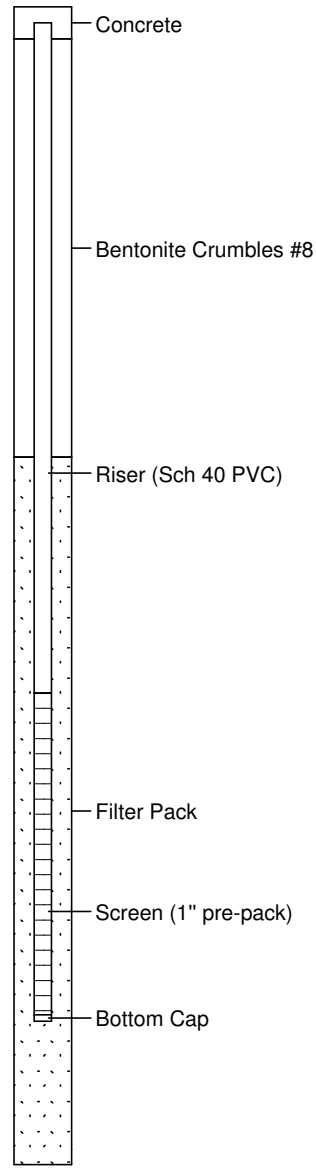
LOG OF BORING BPZ8

Off-Site Groundwater Quality Investigtion
BaldwinAsh Pond System
Baldwin Energy Complex, Baldwin, IL
Dynegy Midwest Generation,LLC

Date Completed	: 03/05/2012	Driller	: Jim Dittmaier
Hole Diameter	: 2.75"	Geologist	: S. Cravens (Kelron Env)
Drilling Method	: AMS PowerProbe 9500-VTR	Land Surface Elevation	: 393.51
Sampling Method	: MacroCore (1.25" ID)	Top of Casing Elevation	393.06
Drilling Company	: Terra Drill	X,Y Coordinates	:

Depth in Feet	DESCRIPTION	Surf. Elev. 393.51	Samples	Recovery inches	USCS	GRAPHIC
0	SILTY CLAY, trace sand, high plasticity, light gray w/ brown mottling, moist					
	- high organics, stiff, olive brown	390	1	60/60	CL	
5						
	- soft to very soft	385				
	SILT, with clay, light gray w/ brown mottling, wet				ML	
10	SILTY CLAY, very soft, high plasticity, gray w/ brown mottling, moist		2	60/60	CL	
		380				
15			3	60/60		
	SHALE and LIMESTONE, weathered shale with limestone interlayer at 17.1 to 17.4', dry				SH/LS	
	END BOREHOLE AT 18 FEET BLS	375				
20						

Well: BPZ8
Elev.: 393.06



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ATTACHMENT 4

Water Sample Field Data Sheets

Location No. BP21

WATER SAMPLING DATA

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other _____ Date 3/15/12

Project Name BEC Off-Site Groundwater Investigation Project No. 47602

Project Manager Stuart Cravens Phase Task No. _____

Site Address ☐ Ruby Lane ☒ Magnolia Drive ☐ Conservation Road Baldwin, Illinois

Sampling Specifications

Requested Sampling Depth Interval (feet) _____

Requested Wait Following Development/Purging (hours) _____

Initial Measurements

Time Elapsed From Final Development/Purging (hours) _____

Initial Water Depth (feet) 6.62 mp @ 1000

Nonaqueous Liquids Present (Describe) _____

Water Quality/Water Collection

Spec Cond. = Specific Conductivity

Date	Time	Sampler Initials	Water Quality Readings				Water Collection Data					Notes (Explain in Comments Below)
			Temp. (°C)	pH		Spec Cond. (µmhos/cm)	Volume Removed (gallons)	Removal Rate (gal/min)	Pump Intake Depth (ft)	Bail	Final Water Depth ft)	
3-15-12	1004	SJC	18.2	7.66		899	0.10		17.6'		—	Clear
"	1008	SJC	18.0	7.63		891	0.20		↓		—	SAA
"	1010	SJC	15.2	7.48		611	0.50		↓		13.55'	SAA

Container Type: G = Clear Glass; A = Amber Glass; P = Plastic; V = VOA Vial (Glass); O = Other (Specify)

Sample Containers

Preservatives: H = HCl; N = HNO_3; S = H_2SO_4; A = NaOH; O = Other (Specify); — = None

Analytical Parameter List	Container			Field Filtered		Preserved	Cooled During Collection		Comments
	Number	Type	Volume (mL)	Yes	No		Yes	No	
SO4/TDS	1	500P	500		X	—	X		Sample BP21@ 1010
BUNA	1	250P	250		X	N	X		

Filter Type _____ Chain-of-Custody Form Number _____

Comments well Depth = 17.74' mp

Signature [signature] Date 3/15/12 Reviewer _____ Date _____

Location No. BPZ2

WATER SAMPLING DATA

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other _____ Date 3/15/12

Project Name BEC Off-Site Groundwater Investigation Project No. 47602

Project Manager Stuart Cravens Phase Task No. _____

Site Address ☐ Ruby Lane ☒ Magnolia Drive ☐ Conservation Road Baldwin, Illinois

Sampling Specifications

Requested Sampling Depth Interval (feet) _____

Requested Wait Following Development/Purging (hours) _____

Initial Measurements

Time Elapsed From Final Development/Purging (hours) _____

Initial Water Depth (feet) 10.21' mp @ 0935

Nonaqueous Liquids Present (Describe) _____

Water Quality/Water Collection

Spec Cond. = Specific Conductivity

Date	Time	Sampler Initials	Water Quality Readings				Water Collection Data					Notes (Explain in Comments Below)
			Temp. (°C)	pH		Spec Cond. (µmhos/cm)	Volume Removed (gallons)	Removal Rate (gal/min)	Pump Intake Depth (ft)	Bail	Final Water Depth ft)	
3/15/12	0934	SJZ	13.5	7.40		—	0.10		13.25'			Clear
"	0942	SJZ	13.0	7.32		1,120	0.25		↓			Lt. brown
"	0944	SJZ	13.3	7.21		1,117	0.40		↓		11.77	SAA

Container Type: G = Clear Glass; A = Amber Glass; P = Plastic; V = VOA Vial (Glass); O = Other (Specify)

Sample Containers

Preservatives: H = HCl; N = HNO_3; S = H_2SO_4; A = NaOH; O = Other (Specify); — = None

Analytical Parameter List	Container			Field Filtered		Preserved	Cooled During Collection		Comments
	Number	Type	Volume (mL)	Yes	No		Yes	No	
SO4/TDS	1	500	P		X	—	X		Sample BPZ2 @ 0944
Boron	1	250	P		X	N	X		

Filter Type _____ Chain-of-Custody Form Number _____

Comments well Depth = 14.25' mp

Signature [signature] Date 3/15/12 Reviewer _____ Date _____

Location No. BPZ 3

WATER SAMPLING DATA

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other _____ Date 3-15-12

Project Name BEC Off-Site Groundwater Investigation Project No. 47602

Project Manager Stuart Cravens Phase Task No. _____

Site Address ☐ Ruby Lane ☒ Magnolia Drive ☐ Conservation Road Baldwin, Illinois

Sampling Specifications

Requested Sampling Depth Interval (feet) _____

Requested Wait Following Development/Purging (hours) _____

Initial Measurements

Time Elapsed From Final Development/Purging (hours) _____

Initial Water Depth (feet) 1.65' mp @ 0900

Nonaqueous Liquids Present (Describe) _____

Water Quality/Water Collection

Spec Cond. = Specific Conductivity

Date	Time	Sampler Initials	Water Quality Readings				Water Collection Data					Notes (Explain in Comments Below)
			Temp. (°C)	pH		Spec Cond. (µmhos/cm)	Volume Removed (gallons)	Removal Rate (gal/min)	Pump Intake Depth (ft)	Bail	Final Water Depth ft)	
3-15-12	0900	SJR	—	—		—	0		19.5			
"	0903	SJR	18.2	7.16		898	0.25		↓			clear
"	0910	SJR	17.9	6.96		1,080	0.50		↓		11.07'	clear

Container Type: G = Clear Glass; A = Amber Glass; P = Plastic; V = VOA Vial (Glass); O = Other (Specify)

Sample Containers

Preservatives: H = HCl; N = HNO_3; S = H_2SO_4; A = NaOH; O = Other (Specify); — = None

Analytical Parameter List	Container			Field Filtered		Preserved	Cooled During Collection		Comments
	Number	Type	Volume (mL)	Yes	No		Yes	No	
SO4/TDS	1	HDPE	500		X	—	X		Sample BPZ3 @ 0918
Boron	1	HDPE	250		X	N	X		Sample BPZ 93 @ 0920
SO4/TDS	1	P	500		X	—	X		
Boron	1	P	250		X	N	X		

Filter Type _____ Chain-of-Custody Form Number _____

Comments weather - cldy, ~ 68°F, wind < 5 mph
well depth = 19.68' mp

Signature [signature] Date 3/15/12 Reviewer _____ Date _____

Location No. BP24

WATER SAMPLING DATA

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other _____ Date 3/15/12

Project Name BEC Off-Site Groundwater Investigation Project No. 47602

Project Manager Stuart Cravens Phase Task No. _____

Site Address ☒ Ruby Lane ☐ Magnolia Drive ☐ Conservation Road Baldwin, Illinois

Sampling Specifications

Requested Sampling Depth Interval (feet) _____

Requested Wait Following Development/Purging (hours) _____

Initial Measurements

Time Elapsed From Final Development/Purging (hours) _____

Initial Water Depth (feet) 17.59' mp @ 1103

Nonaqueous Liquids Present (Describe) _____

Water Quality/Water Collection

Spec Cond. = Specific Conductivity

Date	Time	Sampler Initials	Water Quality Readings				Water Collection Data					Notes (Explain in Comments Below)
			Temp. (°C)	pH		Spec Cond. (µmhos/cm)	Volume Removed (gallons)	Removal Rate (gal/min)	Pump Intake Depth (ft)	Bail	Final Water Depth ft)	
3/15/12	1108	SJR	17.1	7.41		2,165	0.1		22.7'			Clear
"	1110	SJR	17.0	7.38		2,160	0.25		"			Clear
"	1112	SJR	17.4	7.44		3,082	—		"		20.79	Clear

Container Type: G = Clear Glass; A = Amber Glass; P = Plastic; V = VOA Vial (Glass); O = Other (Specify)

Sample Containers

Preservatives: H = HCl; N = HNO_3; S = H_2SO_4; A = NaOH; O = Other (Specify); — = None

Analytical Parameter List	Container			Field Filtered		Preserved	Cooled During Collection		Comments
	Number	Type	Volume (mL)	Yes	No		Yes	No	
SO4/TDS	1	P	500		X	—	X		Sample BP24
Boron	1	P	250		X	N	X		@ 1110

Filter Type _____ Chain-of-Custody Form Number _____

Comments Cldy, Rain/Thunder, ~70°F, wind S-10S, well Depth = 22.87' mp

Signature [signature] Date 3/15/12 Reviewer _____ Date _____

Location No. BP25

WATER SAMPLING DATA

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other _____ Date 3-15-12

Project Name BEC Off-Site Groundwater Investigation Project No. 47602

Project Manager Stuart Cravens Phase Task No. _____

Site Address ☒ Ruby Lane ☐ Magnolia Drive ☐ Conservation Road Baldwin, Illinois

Sampling Specifications

Requested Sampling Depth Interval (feet) _____

Requested Wait Following Development/Purging (hours) _____

Initial Measurements

Time Elapsed From Final Development/Purging (hours) _____

Initial Water Depth (feet) 14.67' mp @ 1042

Nonaqueous Liquids Present (Describe) _____

Water Quality/Water Collection

Spec Cond. = Specific Conductivity

Date	Time	Sampler Initials	Water Quality Readings				Water Collection Data					Notes (Explain in Comments Below)
			Temp. (°C)	pH		Spec Cond. (µmhos/cm)	Volume Removed (gallons)	Removal Rate (gal/min)	Pump Intake Depth (ft)	Bail	Final Water Depth ft)	
3-15-12	1044	SJC	17.2	7.54		802	0.10		19.0'		—	clear
3-15-12	1048	SJC	16.9	7.39		567	0.25		↓		18.25	clear

Container Type: G = Clear Glass; A = Amber Glass; P = Plastic; V = VOA Vial (Glass); O = Other (Specify)

Sample Containers

Preservatives: H = HCl; N = HNO_3; S = H_2SO_4; A = NaOH; O = Other (Specify); — = None

Analytical Parameter List	Container			Field Filtered		Preserved	Cooled During Collection		Comments
	Number	Type	Volume (mL)	Yes	No		Yes	No	
SO4/TDS	1	P	500		X	—	X		Sample BP25
Boron	1	P	250		X	N	X		@ 1048

Filter Type _____ Chain-of-Custody Form Number _____

Comments cldy, rain/thunder, 70°F, wind 5-10 S. well depth = 19.55' mp

Signature [signature] Date 3/15/12 Reviewer _____ Date _____

Location No. BP26

WATER SAMPLING DATA

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other _____ Date 3-15-12

Project Name BEC Off-Site Groundwater Investigation Project No. 47602

Project Manager Stuart Cravens Phase Task No. _____

Site Address ☒ Ruby Lane ☐ Magnolia Drive ☐ Conservation Road Baldwin, Illinois

Sampling Specifications

Requested Sampling Depth Interval (feet) _____

Requested Wait Following Development/Purging (hours) _____

Initial Measurements

Time Elapsed From Final Development/Purging (hours) _____

Initial Water Depth (feet) 11.47 @ 1022

Nonaqueous Liquids Present (Describe) _____

Water Quality/Water Collection

Spec Cond. = Specific Conductivity

Date	Time	Sampler Initials	Water Quality Readings				Water Collection Data					Notes (Explain in Comments Below)
			Temp. (°C)	pH		Spec Cond. (µmhos/cm)	Volume Removed (gallons)	Removal Rate (gal/min)	Pump Intake Depth (ft)	Bail	Final Water Depth ft)	
3-15-12	1026	SJZ	17.2	7.60		1,049	0.25		14.0'			clear
"	1031	SJZ	15.4	7.30		1,053	0.40		"		18.05	cldy

Container Type: G = Clear Glass; A = Amber Glass; P = Plastic; V = VOA Vial (Glass); O = Other (Specify)

Sample Containers

Preservatives: H = HCl; N = HNO_3; S = H_2SO_4; A = NaOH; O = Other (Specify); — = None

Analytical Parameter List	Container			Field Filtered		Preserved	Cooled During Collection		Comments
	Number	Type	Volume (mL)	Yes	No		Yes	No	
SO4/TDS	1	P	500		X	—	X		Sample BP26 @ 1032
Boron	1	P	250		X	N	X		

Filter Type _____ Chain-of-Custody Form Number _____

Comments Drizzle, ~72°F, SE 5 mph wind, well Depth = 19.32' mp

Signature [signature] Date 3/15/12 Reviewer _____ Date _____

Location No. BP27

WATER SAMPLING DATA

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other _____ Date 3-15-12

Project Name BEC Off-Site Groundwater Investigation Project No. 47602

Project Manager Stuart Cravens Phase Task No. _____

Site Address ☐ Ruby Lane ☐ Magnolia Drive ☒ Conservation Road Baldwin, Illinois

Sampling Specifications

Requested Sampling Depth Interval (feet) _____

Requested Wait Following Development/Purging (hours) _____

Initial Measurements

Time Elapsed From Final Development/Purging (hours) _____

Initial Water Depth (feet) 19.03' mp @ 1149

Nonaqueous Liquids Present (Describe) _____

Water Quality/Water Collection

Spec Cond. = Specific Conductivity

Date	Time	Sampler Initials	Water Quality Readings				Water Collection Data					Notes (Explain in Comments Below)
			Temp. (°C)	pH		Spec Cond. (µmhos/cm)	Volume Removed (~~gallons~~)	Removal Rate (gal/min)	Pump Intake Depth (ft)	Bail	Final Water Depth ft)	
3-15-12	1153	SJR	18.0	7.01		1,749	100mL		22.0'			Clear
"	1155	SJR	17.7	6.85		1,721	200mL		"		21.53	Clear

Container Type: G = Clear Glass; A = Amber Glass; P = Plastic; V = VOA Vial (Glass); O = Other (Specify)

Sample Containers

Preservatives: H = HCl; N = HNO_3; S = H_2SO_4; A = NaOH; O = Other (Specify); — = None

Analytical Parameter List	Container			Field Filtered		Preserved	Cooled During Collection		Comments
	Number	Type	Volume (mL)	Yes	No		Yes	No	
SO4/TDS	1	P	500		X	—	X		Sample BP27
Boron	1	P	250		X	N	X		@ 1155

Filter Type _____ Chain-of-Custody Form Number _____

Comments Cldy, 78°F, wind < 5mph SW. well Depth = 22.32' mp.

Signature [signature] Date 3/15/12 Reviewer _____ Date _____

Location No. BP28

WATER SAMPLING DATA

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other _____ Date 3-15-12

Project Name BEC Off-Site Groundwater Investigation Project No. 47602

Project Manager Stuart Cravens Phase Task No. _____

Site Address ☐ Ruby Lane ☐ Magnolia Drive ☒ Conservation Road Baldwin, Illinois

Sampling Specifications

Requested Sampling Depth Interval (feet) _____

Requested Wait Following Development/Purging (hours) _____

Initial Measurements

Time Elapsed From Final Development/Purging (hours) _____

Initial Water Depth (feet) 3.04' @ 1131

Nonaqueous Liquids Present (Describe) _____

Water Quality/Water Collection

Spec Cond. = Specific Conductivity

Date	Time	Sampler Initials	Water Quality Readings				Water Collection Data					Notes (Explain in Comments Below)
			Temp. (°C)	pH		Spec Cond. (µmhos/cm)	Volume Removed (gallons)	Removal Rate (gal/min)	Pump Intake Depth (ft)	Bail	Final Water Depth ft)	
3/15/12	1135	SJR	17.2	7.64		705	0.25		15.0'		—	clear
"	1137	SJR	15.1	7.55		694	0.50		"		13.76	cldy

Container Type: G = Clear Glass; A = Amber Glass; P = Plastic; V = VOA Vial (Glass); O = Other (Specify)

Sample Containers

Preservatives: H = HCl; N = HNO_3; S = H_2SO_4; A = NaOH; O = Other (Specify); — = None

Analytical Parameter List	Container			Field Filtered		Preserved	Cooled During Collection		Comments
	Number	Type	Volume (mL)	Yes	No		Yes	No	
SO4/TDS	1	P	500		X	—	X		Sample BP28
BOD5	1	P	250		X	N	X		@ 1138

Filter Type _____ Chain-of-Custody Form Number _____

Comments Cldy, 73°F, wind 15 mph SW. well Depth = 15.32' TOC

Signature [signature] Date 3/15/12 Reviewer _____ Date _____

ATTACHMENT 5

Laboratory Analytical Report and Chain of Custody

March 23, 2012

Stu Cravens
Kelron Environmental
1213 Dorchester
Champaign, IL 61821
TEL: (217) 390-1503
FAX: (217) 355-1385

RE: BEC Offsite/47602 **WorkOrder:** 12030744

Dear Stu Cravens:

TEKLAB, INC received 9 samples on 3/15/2012 2:41:00 PM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Elizabeth A. Hurley

Elizabeth A. Hurley
Project Manager
(618)344-1004 ex 33
ehurley@teklabinc.com

Definitions

Client: Kelron Environmental

Work Order: 12030744

Client Project: BEC Offsite/47602

Report Date: 23-Mar-12

Abbr Definition

CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilutions factors.
DNI	Did not ignite
DUP	Laboratory duplicate is an aliquot of a sample taken from the same container under laboratory conditions for independent processing and analysis independently of the original aliquot.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample, spiked with verified known amounts of analytes, is analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. The acceptable recovery range is in the QC Package (provided upon request).
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MB	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	Method detection limit means the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix type containing the analyte.
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions. The acceptable recovery range is listed in the QC Package (provided upon request).
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TNTC	Too numerous to count (> 200 CFU)

Qualifiers

# -	Unknown hydrocarbon	B -	Analyte detected in associated Method Blank
E -	Value above quantitation range	H -	Holding times exceeded
J -	Analyte detected below quantitation limits	M -	Manual Integration used to determine area response
ND -	Not Detected at the Reporting Limit	R -	RPD outside accepted recovery limits
S -	Spike Recovery outside recovery limits	X -	Value exceeds Maximum Contaminant Level

Client: Kelron Environmental

Client Project: BEC Offsite/47602

Work Order: 12030744

Report Date: 23-Mar-12

Cooler Receipt Temp: 5.8 °C

Locations and Accreditations

Collinsville		Springfield		Kansas City	
Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425	Address	3920 Pintail Dr Springfield, IL 62711-9415	Address	8421 Nieman Road Lenexa, KS 66214
Phone	(618) 344-1004	Phone	(217) 698-1004	Phone	(913) 541-1998
Fax	(618) 344-1005	Fax	(217) 698-1005	Fax	(913) 541-1998
Email	jhriley@teklabinc.com	Email	kmcclain@teklabinc.com	Email	dthompson@teklabinc.com

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2013	Collinsville
Kansas	KDHE	E-10374	NELAP	1/31/2013	Collinsville
Louisiana	LDEQ	166493	NELAP	6/30/2012	Collinsville
Louisiana	LDEQ	166578	NELAP	6/30/2012	Springfield
Arkansas	ADEQ	88-0966		3/14/2012	Collinsville
Illinois	IDPH	17584		4/30/2012	Collinsville
Kentucky	UST	0073		5/26/2012	Collinsville
Missouri	MDNR	00930		4/13/2013	Collinsville
Oklahoma	ODEQ	9978		8/31/2012	Collinsville

Laboratory Results

http://www.teklabinc.com/

Client: Kelron Environmental
Work Order: 12030744
Client Project: BEC Offsite/47602
Report Date: 23-Mar-12
Lab ID: 12030744-001
Client Sample ID: BPZ3
Matrix: AQUEOUS
Collection Date: 03/15/2012 9:18

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 18TH ED. 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**500**	mg/L	1	03/16/2012 10:29	R161252
SW-846 9036 (TOTAL)								
Sulfate	NELAP	75		**85**	mg/L	1	03/19/2012 12:17	R161318
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)								
Boron	NELAP	0.0200	J	**0.011**	mg/L	1	03/19/2012 17:13	76111

Laboratory Results

http://www.teklabinc.com/

Client: Kelron Environmental
Work Order: 12030744
Client Project: BEC Offsite/47602
Report Date: 23-Mar-12
Lab ID: 12030744-002
Client Sample ID: BPZ93
Matrix: AQUEOUS
Collection Date: 03/15/2012 9:20

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 18TH ED. 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**500**	mg/L	1	03/16/2012 10:29	R161252
SW-846 9036 (TOTAL)								
Sulfate	NELAP	75		**87**	mg/L	1	03/19/2012 12:19	R161318
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)								
Boron	NELAP	0.0200	J	**0.016**	mg/L	1	03/19/2012 17:30	76111

Laboratory Results

http://www.teklabinc.com/

Client: Kelron Environmental
Work Order: 12030744
Client Project: BEC Offsite/47602
Report Date: 23-Mar-12
Lab ID: 12030744-003
Client Sample ID: BPZ2
Matrix: AQUEOUS
Collection Date: 03/15/2012 9:44

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 18TH ED. 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**676**	mg/L	1	03/16/2012 10:30	R161252
SW-846 9036 (TOTAL)								
Sulfate	NELAP	75		**92**	mg/L	1	03/19/2012 12:25	R161318
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)								
Boron	NELAP	0.0200	J	**0.012**	mg/L	1	03/19/2012 17:35	76111

Laboratory Results

http://www.teklabinc.com/

Client: Kelron Environmental
Work Order: 12030744
Client Project: BEC Offsite/47602
Report Date: 23-Mar-12
Lab ID: 12030744-004
Client Sample ID: BPZ1
Matrix: AQUEOUS
Collection Date: 03/15/2012 10:10

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 18TH ED. 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**502**	mg/L	1	03/16/2012 10:30	R161252
SW-846 9036 (TOTAL)								
Sulfate	NELAP	75		**119**	mg/L	1	03/19/2012 12:27	R161318
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)								
Boron	NELAP	0.0200	J	**0.0096**	mg/L	1	03/19/2012 17:41	76111

Laboratory Results

http://www.teklabinc.com/

Client: Kelron Environmental
Work Order: 12030744
Client Project: BEC Offsite/47602
Report Date: 23-Mar-12
Lab ID: 12030744-005
Client Sample ID: BPZ6
Matrix: AQUEOUS
Collection Date: 03/15/2012 10:32

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 18TH ED. 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**664**	mg/L	1	03/16/2012 10:31	R161252
SW-846 9036 (TOTAL)								
Sulfate	NELAP	75	J	**70**	mg/L	1	03/19/2012 12:30	R161318
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)								
Boron	NELAP	0.0200	J	**0.010**	mg/L	1	03/19/2012 17:46	76111

Laboratory Results

http://www.teklabinc.com/

Client: Kelron Environmental
Work Order: 12030744
Client Project: BEC Offsite/47602
Report Date: 23-Mar-12
Lab ID: 12030744-006
Client Sample ID: BPZ5
Matrix: AQUEOUS
Collection Date: 03/15/2012 10:48

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 18TH ED. 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**394**	mg/L	1	03/16/2012 10:32	R161252
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**27**	mg/L	2	03/22/2012 16:31	R161459
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)								
Boron	NELAP	0.0200		**0.0314**	mg/L	1	03/19/2012 17:52	76111

Laboratory Results

http://www.teklabinc.com/

Client: Kelron Environmental
Work Order: 12030744
Client Project: BEC Offsite/47602
Report Date: 23-Mar-12
Lab ID: 12030744-007
Client Sample ID: BPZ4
Matrix: AQUEOUS
Collection Date: 03/15/2012 11:10

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 18TH ED. 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**1640**	mg/L	1	03/16/2012 10:33	R161252
SW-846 9036 (TOTAL)								
Sulfate	NELAP	750		**817**	mg/L	10	03/19/2012 13:23	R161318
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)								
Boron	NELAP	0.0200		**0.0435**	mg/L	1	03/19/2012 18:08	76111

Laboratory Results

http://www.teklabinc.com/

Client: Kelron Environmental
Work Order: 12030744
Client Project: BEC Offsite/47602
Report Date: 23-Mar-12
Lab ID: 12030744-008
Client Sample ID: BPZ8
Matrix: AQUEOUS
Collection Date: 03/15/2012 11:38

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 18TH ED. 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**434**	mg/L	1	03/16/2012 10:39	R161252
SW-846 9036 (TOTAL)								
Sulfate	NELAP	75		**76**	mg/L	1	03/19/2012 12:41	R161318
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)								
Boron	NELAP	0.0200		**0.0354**	mg/L	1	03/19/2012 18:13	76111

Laboratory Results

http://www.teklabinc.com/

Client: Kelron Environmental
Work Order: 12030744
Client Project: BEC Offsite/47602
Report Date: 23-Mar-12
Lab ID: 12030744-009
Client Sample ID: BPZ7
Matrix: AQUEOUS
Collection Date: 03/15/2012 11:55

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 18TH ED. 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**1220**	mg/L	1	03/16/2012 10:40	R161252
SW-846 9036 (TOTAL)								
Sulfate	NELAP	75		**215**	mg/L	1	03/19/2012 12:46	R161318
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)								
Boron	NELAP	0.0200		**0.252**	mg/L	1	03/19/2012 18:19	76111

Receiving Check List

http://www.teklabinc.com/

Client: Kelron Environmental

Work Order: 12030744

Client Project: BEC Offsite/47602

Report Date: 23-Mar-12

Carrier: Employee

Received By: HLR

Completed by:
On:
15-Mar-12
Timothy W. Mathis

Reviewed by:
On:
15-Mar-12
Michael L. Austin

Pages to follow: Chain of custody 1 Extra pages included 0

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C 5.8
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☑	No ☐		
Reported field parameters measured:	Field ☐	Lab ☐	NA ☑	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐		

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	

Any No responses must be detailed below or on the COC.

CHAIN OF CUSTODY

pg. 1 of 1 Work Order # 2117 12030744

TEKLAB, INC. 5445 Horseshoe Lake Road ~ Collinsville, IL 62234 ~ Phone: (618) 344-1004 ~ Fax: (618) 344-1005

Client: Stuart Cravens
Address: Kelron Environmental, 1213 Dorchester Dr
City / State / Zip: Champaign, IL 61821-7031
Contact: Cravens Phone: 217-390-1503
E-Mail: kelron1@comcast.net Fax: —

Samples on: ☒ Ice ☐ Blue Ice ☐ No Ice 5.8 °C
Preserved in: ☐ Lab ☒ Field FOR LAB USE ONLY
Lab Notes: TM 3-15-12

Comments:

- Are these samples known to be involved in litigation? If yes, a surcharge will apply. ☐ Yes ☐ No
- Are these samples known to be hazardous? ☐ Yes ☐ No
- Are there any required reporting limits to be met on the requested analysis? If yes, please provide limits in comment section. ☐ Yes ☐ No

Project Name / Number: BEC OFFSITE / 47602
Sample Collector's Name: S. Cravens
Results Requested: ☒ Standard ☐ 1-2 Day (100% Surcharge) ☐ Other_____ ☐ 3 Day (50% Surcharge)
Billing Instructions: Kelron / Cravens

Lab Use Only	Sample Identification	Date/Time Sampled	UNPRES	HNO_3	NaOH	H_2SO_4	HCL	MeOH	$NaHSO_4$	Other	Water	Drinking Water	Soil	Sludge	Sp. Waste	Sulfate (T)	TDS	Boron (T)
12030744 001	BPZ3	3-15-12/0918	1	1							X					X	X	X
002	BPZ93	0920	1	1							X					X	X	X
003	BPZ2	0944	1	1							X					X	X	X
004	BPZ1	1010	1	1							X					X	X	X
005	BPZ6	1032	1	1							X					X	X	X
006	BPZ5	1048	1	1							X					X	X	X
007	BPZ4	1110	1	1							X					X	X	X
008	BPZ8	1138	1	1							X					X	X	X
009	BPZ7	3-15-12/1155	1	1							X					X	X	X

Relinquished By	Date / Time	Received By	Date / Time
[signature]	3-15-12/1441	Heather Kitz	3/15/12 1441

The individual signing this agreement on behalf of client acknowledges that he/she has read and understands the terms and conditions of this agreement, on the reverse side, and that he/she has the authority to sign on behalf of client.

WHITE & YELLOW – LAB PINK – SAMPLER'S COPY

APPENDIX E
Geochemical Conceptual Site Model

Geosyntec consultants

engineers | scientists | innovators

Geochemical Conceptual Site Model

Baldwin Power Plant – Fly Ash Pond System

(CCR Unit #605)

Prepared for

Dynegy Midwest Generation, LLC
1500 Eastport Plaza Drive
Collinsville, Illinois 62234

Prepared by

Geosyntec Consultants, Inc.
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Chicago, Illinois 60602

Project Number: GLP8068

April 2024

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ACRONYMS AND ABBREVIATIONS

BAP	Bottom Ash Pond
BPP	Baldwin Power Plant
bgs	below ground surface
CEC	cation exchange capacity
CCR	coal combustion residuals
cm/s	centimeters per second
COCs	constituents of concern
FAPS	Fly Ash Pond System
HSU	hydrostratigraphic unit
GCSM	geochemical conceptual site model
GWPS	groundwater protection standards
I.A.C.	Illinois Administrative Code
IEPA	Illinois Environmental Protection Agency
LOI	loss on ignition
meq/100 g	milliequivalents per 100 grams
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
N&E	nature and extent
ORP	oxidation-reduction potential
PMP	potential migration pathway
SEP	sequential extraction procedure
SU	standard units
UA	uppermost aquifer
USEPA	United States Environmental Protection Agency
UU	upper unit
XRD	X-Ray diffraction
XRF	X-Ray fluorescence

1. EXECUTIVE SUMMARY

This report documents the development of a geochemical conceptual site model (GCSM) to describe subsurface conditions at the Baldwin Power Plant (BPP) Fly Ash Pond System (FAPS) coal combustion residuals (CCR) unit (Unit #605). A GCSM describes the geochemical processes that contribute to the mobilization, distribution, and attenuation of chemicals in the environment. The GCSM was prepared in support of an evaluation of the nature and extent (N&E) of exceedances of constituents of concern (COCs) above the groundwater protection standards (GWPS) at the FAPS.

The exceedances observed at the FAPS were boron and sulfate. Constituents of concern (COC) exceedances are present in two hydrostratigraphic units at the site: the upper unit (UU) potential migration pathway (PMP), comprised predominantly of clay with silt and minor sand, silt layers, and occasional sand lenses, and the uppermost aquifer (UA), comprised of Pennsylvanian and Mississippian-aged interbedded shale and limestone bedrock.

The primary source of boron and sulfate to groundwaters of the UA and UU PMP within the monitoring network is the FAPS coal combustion residual porewater (i.e., CCR source water), based on COC concentrations within the source and relationships to hydrogeological patterns at the site. Boron was identified within UA solids at concentrations that suggest that aquifer solids could provide an additional potential natural geogenic source of boron to groundwater, and groundwater from background wells consistently exhibited boron concentrations consistent with a natural geogenic source. The observation of pyrite within solids of shale portions of the UA could provide an additional source of sulfate to groundwater via pyrite oxidation, as pyrite is not expected to be a stable mineral phase under observed groundwater redox conditions and sulfate concentrations at background wells are indicative of a potential additional natural source.

Boron and sulfate in the groundwater system may be attenuated via surface complexation reactions within portions of the UU PMP and the UA. Conditions within groundwater from both the UA and UU PMP are typically predicted to favor amorphous iron oxide stability at most locations, and the presence of iron oxides in some site solids supporting the occurrence of this mechanism. Limited variability in pH or redox conditions is observed between upgradient background and downgradient locations. Boron may be further attenuated via interactions with clay minerals, which are observed in solids across both the UU and UA. The observation of gypsum, although limited to the shale bedrock portions of the UA, indicates that precipitation of gypsum may be another potential attenuation mechanism for sulfate at locations near the FAPS.

2. INTRODUCTION

This report documents the development of a geochemical conceptual site model (GCSM) to describe subsurface conditions at the Baldwin Power Plant (BPP) Fly Ash Pond System (FAPS) coal combustion residuals (CCR) unit (Unit #605). A GCSM describes the geochemical processes that contribute to the mobilization, distribution, and attenuation of chemicals in the environment. The GCSM was prepared in support of an evaluation of the nature and extent (N&E) of exceedances of constituents of concern (COCs) above the groundwater protection standards (GWPS) at the FAPS. The document has been prepared as an appendix to the BPP FAPS N&E Report prepared by Ramboll Americas Engineering Solutions. Inc. (Ramboll). Parameters with exceedances above the GWPS at the Baldwin FAPS for the second, third, and fourth quarters of 2023 (Q2 2023, Q3, 2023, and Q4 2023) sampling events completed under Illinois Administrative Code (I.A.C.) Title 35 § 845.630 are boron and sulfate. Exceedances of boron were observed at compliance monitoring wells MW-150, MW-152, and MW-391 and an exceedance of sulfate was observed at MW-150. The boron and sulfate exceedances are present in the upper unit (UU) potential migration pathway (PMP) at MW-150 and for boron at MW-152. The boron exceedance at MW-391 is present within the uppermost aquifer (UA).

An exceedance of pH was observed at compliance monitoring well MW-252 during the Q3 2023 sampling event. However, an alternative source demonstration (ASD), as allowed by I.A.C. 845.650(e), was completed for the pH exceedance (Geosyntec 2024). The pH ASD was accepted by IEPA on March 7, 2024 (IEPA 2024); therefore, pH is not included as a COC in this GCSM.

3. SITE BACKGROUND

3.1 Site Overview

An overview of site characteristics and hydrogeology is presented in the BPP FAPS N&E Report. A site layout figure is provided in Attachment A.[1] Briefly, the Baldwin FAPS impoundment is located to the south of the Bottom Ash Pond (BAP) CCR unit (Unit # 601). The BPP property is bordered by Baldwin Road to the east; the village of Baldwin to the southeast; Illinois Central Gulf railroad tracks, State Road 154, and scattered residences to the south; the Kaskaskia River to the west; and farmland to the north. The FAPS was closed in-place in 2020 in accordance with the closure plan approved by the Illinois Environmental Protection Agency (IEPA) on August 16, 2016 (IEPA 2016). Prior to closure, the FAPS comprised the West Fly Ash Pond, East Fly Ash Pond, and Old East Fly Ash Pond.

A Supplemental Hydrogeologic Site Characterization and Groundwater Monitoring Plan (Natural Resource Technology, Inc. [NRT] 2016) and the Hydrogeologic Site Characterization Report (Ramboll 2021) have previously described the hydrostratigraphic units (HSUs) present in the vicinity of the BPP FAPS, which consist of the UU and a Bedrock Unit. The UU is predominantly clay with silt and minor sand, silt layers, and occasional sand lenses. The UU includes lithologies identified as the Cahokia Formation, Peoria Loess, Equality Formation, and Vandalia Till. Thin sand seams present at the contact between the UU and Bedrock Unit have been identified as potential migration pathways (PMPs) due to higher hydraulic conductivities in comparison to those in the surrounding clays (e.g., 10^{-4} centimeters per second [cm/s] in sands compared with 10^{-5} cm/s in clays) (Ramboll 2023a). Continuous sand seams have not been observed in the UU. Due to the predominance of clay and only thin and intermittent sand lenses, this unit is not considered a continuous aquifer unit within the site boundary (NRT 2016; Ramboll 2021).

Pennsylvanian and Mississippian-aged interbedded shale and limestone bedrock, which comprise the Bedrock Unit, continuously underlies the BPP and is considered the uppermost aquifer (UA) at the site. The top of the Bedrock Unit ranges from 12.5 feet below ground surface (bgs) near the Kaskaskia River to 70 feet bgs under the footprint of the former East Fly Ash Pond (part of the FAPS). The Bedrock Unit is the UA.

3.2 Groundwater Monitoring Network

A groundwater monitoring network was proposed in accordance with I.A.C. Title 35 Section 845.630 to monitor groundwater quality which passes the waste boundary as part of the Operating Permit application to IEPA for the FAPS (Ramboll 2023b). Monitoring well locations at the BPP, including those not included in the proposed groundwater monitoring network, are shown in Attachment B. Well construction information is provided in Attachment C.[2]

---

[1] This figure is also provided as Figure 2-1 of the BPP FAPS N&E Report.
[2] This table is also provided as Table 3-1 of the BPP FAPS N&E Report.

Groundwater flow in the UA is southwest to northwest in the east area of the FAPS until groundwater reaches the bedrock valley feature underlying the Secondary and Tertiary Ponds west of the FAPS, at which point the flow direction becomes southwest following this low bedrock surface. Groundwater flow directions are generally consistent across seasons. A detailed discussion of the hydrogeology of the Site is presented in Section 2 of the BPP FAPS N&E Report.

4. GEOCHEMICAL SITE CONDITIONS

4.1 Constituent Transport and Fate

Boron is primarily present in groundwater as boric acid (H_3BO_3) or borate ($B[OH]^{4-}$) (Bolan et al. 2023). The speciation of boron depends on pH: at pH below 9.2 standard units (SU), H_3BO_3 is the dominant species (NCBI 2024a). Boron is not subject to oxidation/reduction reactions (Lemarchand et al. 2015; Bolan et al. 2023). Boron primarily sorbs to positively charged sites on solid metal oxide phases, including iron and aluminum oxides (Goldberg and Glaubig 1985; Bolan et al. 2023). Boron sorbs most extensively to amorphous metal oxides between pH 7 SU and 8 SU (Goldberg and Glaubig, 1985). Boron can also sorb to organic surfaces such as humic acids or coal under favorable conditions, most extensively between pH 8 and 10 SU (LeMarchand et al. 2015). Clay minerals have been correlated with boron sorption in soils (Goldberg, 1997), with this sorption mechanism presenting an additional potential attenuation mechanism for boron under favorable geochemical conditions.

Sulfate is the primary form of oxidized sulfur (S(VI)) in the environment and is a divalent oxyanion at pH values greater than 2 SU (Stumm and Morgan 1996). Sulfate in groundwater may sorb onto positively charged sites on solid metal oxide phases, most commonly iron and manganese oxides (Brown et al. 1999). The extent and strength of sulfate sorption to metal oxide surfaces depends on pH, ionic strength, and oxide surface area available for sorption. Sulfate can also form insoluble complexes such as barite ($BaSO_4$) (NCBI 2024b). Sulfate in groundwater may be reduced to elemental sulfur (S(0)) or sulfide (S(-II)) under sufficiently reducing conditions, a process governed by local microbial communities (Stumm and Morgan 1996). Generally, reduced sulfur is less mobile in groundwater than sulfate. Reduced sulfur readily precipitates as metal sulfides and sorbs to solid phases such as iron and manganese oxides (Stumm and Morgan 1996).

4.2 Site Solids Characterization

Solid phase data were not collected from the CCR source material prior to completion of unit closure in 2020.

Solids from across the Site were characterized to determine the type and abundance of minerals present in the UU and the UA, their geochemical properties, and their effect on the geochemistry of the groundwater system. Solids were characterized using a variety of analytical techniques, the results of which are presented in Tables 1 through 5. Solids were collected from four locations adjacent to existing wells in the FAPS monitoring network as follows:

- MW-150/MW-350, a co-located well pair located downgradient and west of the FAPS. Solids were collected from two intervals within the UU that represent the PMP and two intervals to represent predominantly shale and limestone lithologies within the UA. Exceedances of boron and sulfate in groundwater were identified at MW-150 during the Q2 2023 statistical evaluation.

- MW-352, located downgradient and south of the FAPS. Solids were collected from two intervals that represent both predominantly shale and limestone lithologies within the UA. Samples were not collected from intervals representative of UU for the paired location MW-152, because the boron exceedance at MW-152 was first identified in the Q3 2023 statistical evaluation.

- MW-366, located downgradient of the FAPS and northwest of the former West Fly Ash Pond, with solids collected from the UA shale.

- MW-391, located downgradient and west of the FAPS, with solids collected from three intervals that represent predominantly shale, weathered shale, and limestone lithologies within the UA. An exceedance of boron was identified at MW-391 during the Q2 2023 statistical evaluation.

The monitoring well locations are shown on Attachment 2. Boring logs for these locations are provided in Attachment D.

Samples from four additional locations across the site were analyzed as part of investigations at the BPP BAP but the materials are representative of conditions within the same HSUs beneath the FAPS as these HSUs are observed continuously across the Site. These solids were collected from multiple intervals adjacent to existing wells, specifically:

- MW-358, located upgradient and east of the FAPS and representative of background conditions for both the FAPS and BAP. Solids were collected within three intervals – one from the UU which represents the PMP and two from shale of the UA ;

- MW-392, located sidegradient and north of the BAP, with solids collected from three intervals – one within clay/sand of the UU and two within the UA shale;

- MW-393, located sidegradient and north of the BAP, with solids collected from two intervals – one within clay/sand of the UU and one within the UA shale;

- MW-394, located sidegradient and north of the BAP, with solids collected from sand within the UU.

Boring logs for these locations are also provided in Attachment D.

4.2.1 Loss on Ignition, Total Organic Carbon, and Cation Exchange Capacity

Loss on ignition (LOI) represents the combustible portions of a solid material and is often used as an approximation of organic matter in a sample. This can also be estimated via measurement of total organic carbon (TOC). The cation exchange capacity (CEC) of a solid represents the total negative surface charge of that material, which is related to the material's surface potential to sorb cations. Amorphous iron hydroxides, organic matter, and clays all tend to possess high negative surface charges and therefore tend to contribute to higher CEC values. The CEC and LOI values

for solids are presented in Table 1 and laboratory analytical results are provided in Attachment E. CEC and LOI values are both consistently high in the vicinity of the FAPS (CEC: 12.94 – 173.79 milliequivalents per 100 g of sample [meq/100 g]; LOI: 8.4 – 40.5 percent by dry weight [% wt]), indicating that the solids have significant organic matter present, likely associated with the shale lithologies. Where measured, the TOC content for shale varied between 0.16 – 1.4 % wt (Table 1). Solids at MW-150 exhibited the lowest CEC and LOI values in the vicinity of the FAPS, consistent with the sandy clay substrate of the UU PMP. All other samples in the vicinity of the FAPS were collected from the UA solids. Samples collected from lithologies identified as predominantly limestone exhibit the highest CEC and LOI values (CEC: 164.7 – 173.79 meq/100g; LOI: 37.1 – 40.5% wt) analyzed at the site, which suggests significant contribution of organic matter from the observed interbedded thin shale layers within the limestone bedrock. UU PMP solids collected near the BAP exhibited similarly low LOI values, while shales collected at MW-392 displayed lower CEC values than those observed near the FAPS, which may be related to variable degrees of weathering within the HSUs.

4.2.2 Total Metals and Boron via Bulk Characterization

Total metals were analyzed to determine the major and trace metal content of the solids. Total iron concentrations in UA solids sampled from across the Site range from 5,300 milligrams per kilogram [mg/kg] to 23,000 mg/kg and total iron is observed to be elevated within the UU PMP solids (19,000 and 38,000 mg/kg) relative to UA solids (Table 2; Attachment E). UA samples from limestone lithologies have lower iron concentrations (5,300 mg/kg to 5,600 mg/kg) than shale samples (11,000 mg/kg to 23,000 mg/kg). The abundance of iron within the bulk solids matrix of both the UA and UU PMP indicates that iron-bearing minerals are likely present within the system. Total manganese concentrations are relatively low in UA solids (190 mg/kg to 1,200 mg/kg), and higher in UU solids (770 and 830 mg/kg) (Table 2; Attachment E). Total aluminum concentrations were lowest in limestone lithologies of the UA (4,800 to 5,900 mg/kg), and relatively higher in both shale lithologies of the UA (16,000 to 81,000 mg/kg) and the UU PMP (42,000 to 66,000 mg/kg) (Table 2; Attachment E). Boron concentrations within solids were analyzed in the vicinity of the BAP, with concentrations in the UA ranging from 11 to 16 mg/kg. Sulfate concentrations within UA solids, as measured in leachate after HCl digestion of solids for samples from MW-358 and MW-392, ranged between 50 to 620 mg/kg (Table 2, Attachment E).

X-Ray fluorescence (XRF) was conducted for identification of the bulk elemental composition of solids (Table 3; Attachment F). Solids from the UU PMP are predominantly composed of silicon (52.3 to 79.7 wt %) and aluminum (8.1 to 11.7 wt %) consistent with the sand and clay lithologies described for the UU. UA solids are predominantly composed of aluminum (1.0 to 19.2 wt %), silicon (6.7 to 59.6 wt %), and calcium (0.5 to 49.4 wt %), consistent with the shale and limestone expected within the bedrock locations. Iron is observed within all solid phase samples, ranging from 0.7 to 7.7 wt %. Manganese was observed in all UU solids and 12 out of 14 UA solids. Manganese was observed at low abundances in both the UU and UA, ranging from 0.02 to 0.18 wt %.

4.2.3 Sequential Extraction Procedure Analysis of Metals and Boron

Samples of composited material from select BAP-associated boring locations were submitted to SGS Canada (Lakefield, ON) for sequential extraction procedure (SEP). SEPs are chemical extractions used to dissolve metals from specific solid-associated phases. SEPs use progressively stronger reagents to solubilize metals from increasingly recalcitrant phases. Although these procedures do not identify the discrete solid phases in a soil/aquifer matrix, they do provide a means to evaluate the class of solids and relative stability in relation to general solubility, changes in oxidation/reduction (redox) potential, and pH fluctuations (Tessier et al. 1979, Kuo et al. 1983, Sposito et al. 1984, Hickey and Kittrick 1984, Gruebel et al. 1988). Therefore, SEP data are useful to infer the mechanism and potential reversibility of attenuation processes. The results of the 6-step extraction procedure and analysis are provided in Table 4 and Attachment G.

Boron was detected in the residual metals fraction of all samples (13 to 62 mg/kg, comprising 63 to 100% of the extracted boron), which may be associated with the presence of micas and clays within both the UA and UU. All UA solids also had detectable amounts of boron in the water soluble, carbonate-bound, iron or manganese oxide bound, and organic material bound fractions at relatively low proportions of the total boron (typically <10% in a given fraction). The observation of detectable concentrations of boron in relatively mobile fractions (e.g. water soluble and carbonate-bound) at the MW-358 background location is consistent with a potential native geogenic source of boron within the UA at the site.

The vast majority of iron within solids from both the UA (>87%) and UU PMP (>92%) is bound within the residual metals fraction, consistent across both background and compliance locations (Table 4). Iron was also identified in the fraction typically associated with iron or manganese oxides, with proportions ranging from 3.8 to 7.3% in UU PMP solids and 3.6 to 11.2% of total iron within UA solids. UA solids collected within shale lithologies also displayed iron associated with the organic material bound fraction (1.4 to 7.1%), consistent with the increased sorptive capacity associated with the organic matter content whose presence is indicated by the high LOI values of these solids.

4.2.4 Mineralogical Analysis

X-Ray diffraction (XRD) with Rietveld refinement was conducted for identification of minerals in solid samples. XRD is an analytical technique that provides information about the identity of the crystalline material within a sample but does not provide information about non-crystalline or amorphous phases. XRD results are normalized to 100% of the total weight, meaning that material not characterized by XRD is ignored in the percent calculation. Solids from the UU PMP (MW-150, MW-358, MW-392, MW-393, and MW-394) were predominantly composed of quartz, ranging from 32.4 to 64.1% of the minerals present (Table 5a; Attachment H). Muscovite (2.0 to 9.1%), feldspar minerals including albite (6.4 to 12.8%) and microcline (6.5 to 10.1%), and a variety of clays (10.4 to 15.9% total) were observed as additional primary crystalline mineral phases. These results are consistent with the field observations documented in the boring logs

provided in Attachment D. Low abundances of magnetite (detected to 0.9%) were observed, but otherwise crystalline forms of iron oxides were not observed in UU PMP solids. Combined with XRF data observations of iron abundances between 2.8 to 5.0 wt % in solids across the UU PMP and limited observations of other iron-bearing crystalline minerals (e.g. ankerite), these results provide evidence that the majority of iron within UU PMP solids is present as non-crystalline or amorphous phases. Diaspore, an aluminum oxide, was detected at low abundances (0.2 to 0.5%) within UU PMP solids, including at background well MW-358.

Solids from shale-dominated portions of the UA (MW-350, MW-352, MW-358, MW-366, MW-391, and MW-392) exhibited mixed mineral compositions, with significant proportions of clay minerals (3.4 to 41.2%), quartz (11.2 to 30.7%), muscovite (4.3 to 19.7%) and calcite (0.5 to 74.9%). Solids from limestone dominated portions of the UA (MW-350 and MW-391) were predominantly calcite (80.5 to 90.2 %) and quartz (5.2 to 10.7%), with low proportions of clays (1.6 to 3.5%) (Table 5b; Attachment H). These results are consistent with the field observations documented in the boring logs provided in Attachment D. Gypsum was observed at low abundance (1.92 wt %) in the shale bedrock at MW-350, which suggests that precipitation of sulfate is possible under some aquifer conditions. Iron oxides, including magnetite (0.2 to 1.4%) and hematite (0.2 – 0.4%) were observed in low abundances in the shale portions of the UA. No crystalline iron oxides were observed in the limestone dominated portions of the UA. Both ankerite (0.2 to 10.0%) and pyrite (0.1 to 1.6%) are observed in solids across the UA, suggesting that a significant portion of the total iron within UA solids could be associated with minerals other than crystalline iron oxides, consistent with observation of iron abundances between 0.7 to 7.7 wt % for UA XRF results. Rhodochrosite was observed at low abundance (0.7%) at MW-350 within a shale-dominated depth interval. Crystalline manganese-bearing mineral phases were not identified in other solid samples, consistent with the low elemental abundances of manganese observed in the XRF results for UA samples. While diaspore was detected at one location in the UA, MW-392, crystalline aluminum-oxide mineral phases do not appear to be widely distributed.

Kaolinite, montmorillonite, and illite have been correlated with boron retention in soils (Goldberg 1997). Of those three clay types, illite exhibits the greatest rate of boron adsorption, and was observed in each solid sample from both the UA and UU at abundances ranging from 0.6 to 15.0%. Montmorillonite and kaolinite were also present in the majority of solids (0.2 to 14.0% and 0.5 to 15.0%, respectively). The abundance of clay minerals within solids presents an additional potential attenuation mechanism for boron within the UA and UU.

4.3 Aqueous Geochemistry

FAPS porewater (i.e., CCR source water) and groundwater from wells across the UA and UU were analyzed for a range of geochemical parameters and presented in Figures 1a through 10b. FAPS porewater was collected and analyzed during two periods – prior to unit closure (September 2013 to June 2014) from three locations and a one-time collection of porewater from sumps during

closure activities in May 2020.[3] The United States Environmental Protection Agency (USEPA) considers the use of porewater data as the most appropriate approach to estimate constituent fluxes to groundwater from CCR surface impoundments. As per USEPA, "this is because porewater better represents the leachate seeping from the bottom of the impoundment than impoundment water samples" (USEPA 2015). For clarity in interpretation, the figures present data from the UA and UU well locations separately. UA well locations are shown with circular symbology on the figures, whereas UU locations are shown as triangles. The groundwater data used in the site evaluation is summarized in Attachment I.

An ASD, submitted on 8 February 2024 and accepted by IEPA on 7 March 2024, indicated that groundwater data from MW-253 was impacted by well construction issues, resulting in anomalously high pH values (~10-12 SU) (Geosyntec 2024). A review of groundwater data at the site found that background well MW-306 and downgradient compliance well MW-350 also appear to be impacted by well construction issues based on their anomalously high pH values. Because these infrastructure issues are anticipated to potentially impact groundwater geochemistry, these three wells (MW-253, MW-306, MW-350) have been excluded from the following discussion, tables, and figures.

4.3.1 Redox/pH Summary

The oxidation-reduction (redox) potential (ORP) and pH in aqueous systems are major controls on the speciation of redox-active chemicals such as iron, manganese, and sulfate.

Within the FAPS prior to closure, CCR porewater exhibited a wide range of pH values, from 7.7 to 11.9 SU (Table 6). In wells across the groundwater monitoring network, pH values appear to be stable and circumneutral (Figures 1a & 1b for the UA and UU PMP, respectively). UA groundwater pH values largely range between 7 to 8 SU, consistent with the high buffering capacity expected from the limestone lithologies of the bedrock. Background wells MW-304 and MW-358 range between pH 7.5 to 8.4 SU, similar to observations at downgradient compliance wells MW-375, MW-384, and MW-391 and above the range observed at downgradient compliance wells MW-366, MW-377, and MW-390, which exhibit pH values between 6.75 and 7.25 SU. UU well groundwater pH varies between 6.5 to 7.5 (Figure 1b), consistent with the lower buffering capacity expected with the sandy clay substrate of the UU PMP as compared to the shale and limestone lithologies of the UA.

Groundwater within the UA background well locations upgradient of the FAPS (MW-304 and MW-358) exhibits a range of redox conditions, with fluctuations between reducing and oxidizing conditions observed (Figure 2a). These fluctuating conditions within unaffected portions of UA groundwater do not appear to follow a seasonal pattern and have occurred at MW-304 for the entirety of the monitoring record (Figure 2a). Groundwater at all compliance wells downgradient of the FAPS within the UA follow a similar pattern, with fluctuations between reducing and

[3] FAPS porewater data are excluded from the time series graphs and provided in Table 6 due to the limited number of available data points and relevant constituents.

oxidizing conditions occurring frequently. Observation of this pattern across the UA monitoring network indicates that redox fluctuations are driven by HSU characteristics and are not reflective of FAPS porewater influences. Groundwater within the UU typically exhibits consistently oxidizing conditions, except for MW-150 which exhibits more variable redox conditions which may be related to the location of MW-150 downgradient of the Secondary and Tertiary Ponds. (Figure 2b).

4.3.2 Exceedance Parameters

4.3.2.1 FAPS Porewater

Prior to unit closure, FAPS porewater (i.e., CCR source water) exhibited total boron concentrations from 0.663 to 102 milligrams per liter (mg/L) and total sulfate concentrations that ranged from 750 to 2,630 mg/L, consistent with leachate from CCR units (Table 6) (EPRI 2017). Dissolved boron concentrations (ranging from 36.3 to 94.7 mg/L) and dissolved sulfate concentrations (495 to 2,820 mg/L) were similarly elevated where analyzed, indicating a majority of boron and sulfate within the porewater are in the dissolved fraction. Results for both total and dissolved boron are notably higher than concentrations reported in groundwater (Sections 4.3.2.2 and 4.3.2.3). Concentrations of both boron and sulfate were consistently lower at TPZ-163 (located within the Old East Fly Ash Pond portion of the FAPS); these lower concentrations may be related to an early cessation of material deposition within this portion of the FAPS. Porewater collected from sumps during closure exhibited similarly elevated total sulfate and boron concentrations (1,080 to 1,840 mg/L and 10.6 to 60.3 mg/L, respectively), except at Sump 13 (84 mg/L and 0.66 mg/L, respectively), suggesting potential dilution from unaffected waters during closure activities at this location.

4.3.2.2 UA

UA background wells MW-304 and MW-358 exhibited a range of boron concentrations in groundwater, with MW-304 exhibiting boron concentrations at or below the GWPS of 2.16 mg/L (1.27 to 2.16 mg/L), and MW-358 consistently below the GWPS (1.1 to 1.67 mg/L) (Figure 3a). Total boron concentrations in the UA remained generally stable through time across the site, with notable exceptions at MW-391, MW-390, and MW-366 as discussed below. Where analyzed, dissolved boron concentrations trends within the UA mirrored total boron concentration trends (Figure 3b).

Total sulfate concentration trends within UA background wells (MW-304 and MW-358) were consistent with those observed for boron concentrations, with MW-304 exhibiting relatively elevated concentrations (157 to 231 mg/L) and MW-358 exhibiting consistently lower concentrations (8 to 108 mg/L) (Figure 4a). Patterns of total sulfate concentrations in downgradient UA are generally consistent with those observed for total boron (Figure 4a). Where analyzed, dissolved sulfate concentrations within downgradient UA well locations were stable through time and relatively low, typically less than 250 mg/L (Figure 4b).

MW-391 exhibits a sharp increase in total boron (1.88 to 8.91 mg/L) and total sulfate (758 to 1,760 mg/L) concentrations between 2017 and 2018 sampling events. This is likely a result of water diversion activities completed as a part of dewatering within the FAPS during closure, as the increase in total boron and sulfate concentrations was concurrent with a change in groundwater elevation of nearly 40 feet at MW-391 (Figure 5a). The highest groundwater elevation at MW-391 (414.54 ft above mean sea level on 24 March 2020) is consistent with groundwater elevations recorded in the PMP (Figure 5b) and may have resulted in temporary connectivity with the UU PMP HSU.

Total sulfate concentrations in groundwater at MW-366 increased sharply (64 to 526 mg/L) over the same period as sulfate in MW-391 but did not show a similar change in total boron concentrations (1.66 to 1.53 mg/L). In contrast, MW-390 groundwater boron (1.3 to 0.21 mg/L) concentrations fell over the same period and remain low through recent sampling efforts, with sulfate concentrations remaining largely stable (233 to 141 mg/L). Neither MW-366 nor MW-390 exhibit changes in groundwater elevations concurrent with changes in sulfate and/or boron concentrations, but the location of all three of these monitoring locations on the northwest edge of the West Fly Ash Pond suggests that the geochemical changes observed are caused by a similar hydrologic driver.

4.3.2.3 UU PMP

Total boron data is limited to a few recent sampling events for UU PMP groundwater wells, but concentrations appear to be stable through time and well below the GWPS, except for at MW-150 where concentrations are above the GWPS (3.43 to 4.12 mg/L) (Figure 6a). Dissolved boron concentrations are also above the GWPS at MW-150 (Figure 6b), with observations of dissolved boron appearing to increase gradually over time. Dissolved boron concentrations are more than 50% of total boron concentrations at MW-150, such that dissolved boron is the predominant form of boron observed at this location. The gradual increase in dissolved boron concentrations in groundwater at MW-150 is being further evaluated to identify the primary source and transport mechanism but may be related to the low hydraulic conductivity in the UU PMP (Section 2.3.6 of the BPP FAPS N&E Report). Both total and dissolved sulfate concentrations within the UU PMP mirror patterns observed for boron (Figures 7a & 7b).

MW-152 currently exhibits a strong seasonal pattern with regard to dissolved boron and dissolved sulfate concentrations, with both analytes spiking well above the GWPS during September sampling efforts, then returning to much lower concentrations (below the GWPS for both boron and sulfate) by sampling during the following March. This pattern is observable in data from 2016 through the most recent sampling efforts. While statistically significant levels of sulfate have not been identified at MW-152 to date, a boron exceedance was noted during the Q3 2023 statistical evaluation. The observed pattern in concentrations correlates with groundwater elevations as discussed in Section 3.2.1 of the BPP N&E Report. A similar seasonal pattern is not observed at MW-352, the associated well within the UA.

4.3.3 Pourbaix Diagrams

Eh-pH (Pourbaix) diagrams can be used to illustrate the predicted stability of specific phases at thermodynamic equilibrium under the conditions observed for a groundwater sample. Select crystalline mineral species were suppressed to be representative of anticipated groundwater conditions (e.g. mineral formation not anticipated to be kinetically favored), except when identified in XRD data from solids in the site.

Using conditions observed at well MW-391 on 17 May 2023 to represent groundwater within the UA (Table 7), amorphous iron oxyhydroxides (represented by ferrihydrite) are predicted to be stable under groundwater conditions at some locations, while at other locations solid phase iron minerals are not expected to be stable (Figure 8a).[4] Conditions at MW-391, which had a boron exceedance, are favorable for ferrihydrite stability. Background well MW-304 exhibits conditions predicted to be stable for amorphous ferrihydrite formation for all recent monitoring events, while conditions at background well MW-358 indicate that groundwater at this well is experiencing dynamic equilibrium conditions in which chemical reactions between dissolved iron and amorphous iron oxyhydroxides can occur. This appears to be driven by the variable redox conditions observed across the UA (Section 4.3.1). Solids collected from background location MW-358 exhibited low abundances of magnetite (Table 5b), and when magnetite is not suppressed as a possible mineral species during modeling, magnetite is predicted to be stable at all locations across the UA (Figure 8b). Similarly, when hematite is not suppressed as a possible mineral phase during modeling, hematite is predicted to be stable across the UA (Figure 8c), consistent with the observation of low abundances of hematite in a subset of UA solids (Table 5b). Taken together, these modeling results suggest that iron oxides, whether amorphous or crystalline, are likely to be present in the UA under most aquifer conditions and may serve as reactive surfaces for potential attenuation. Neither ankerite nor pyrite, which were identified via XRD, are expected to be thermodynamically stable within the UA based upon the observed redox conditions (Figures 8a-8c), suggesting that dissolution of these minerals could provide a source of iron for formation of amorphous iron oxide coatings.

Similar aquifer conditions are predicted at locations within the UU PMP, modeled using groundwater conditions from MW-150 sampled on 18 May 2023 (Table 7; Figure 8d). As observed for the UA, ferrihydrite stability is variable, with stability predicted under HSU conditions at some locations (MW-151, MW-152, and MW-153), while at others amorphous iron minerals are not expected to be stable (MW-150 and MW-252). While variable boron and sulfate concentrations were observed at UU PMP well MW-152, these changes are not correlated to ferrihydrite stability at MW-152. Crystalline magnetite is expected to be stable at all PMP locations (Figure 8e), which is consistent with the low abundances of magnetite detected via XRD in solids near MW-150 (Table 5a). Ankerite is not expected to be thermodynamically stable within the UU PMP based upon the observed redox conditions; dissolution of ankerite could provide a source of iron for

[4] Field ORP measurements were converted to Eh by adding +200 millivolts to correct for the Ag/AgCl electrode.

formation of amorphous iron oxide coatings. Taken together, these modeling results suggest that iron oxides, whether amorphous or crystalline (e.g. magnetite), are present in the PMP under most groundwater conditions.

A review of Eh-pH conditions for manganese found that solid phase manganese minerals, including manganese oxides, are not predicted to be stable under conditions within either the UU PMP or UA across the site (Figures 9a and 9b, respectively).

4.3.4 Total and Dissolved Iron and Manganese Concentrations

The distribution of iron and manganese between total and dissolved phases can provide insights on site redox conditions and constituent behavior. A comparison of the total and dissolved iron and manganese data for the Q2 through Q4 2023 events is provided in Table 8. Total iron was detected at all locations analyzed during this time period, with reported values ranging from 0.014 mg/L at UA background well MW-304 to 25.2 mg/L at downgradient UU PMP well MW-151. UU PMP groundwaters exhibit greater total iron concentrations than UA wells, consistent with the greater concentrations of solid phase iron observed at these locations (Table 2). Background well MW-304 groundwater has consistently low total and dissolved iron, while background well MW-358 groundwater has some of the highest total iron concentrations observed for UA groundwaters (0.685 and 0.908 mg/L), with turbidity values similar at the two locations. This is consistent with the relatively high abundance of total iron in the solids at MW-358 (Table 3) and the greater relative stability of ferrihydrite at MW-358 (Figure 8a). Dissolved iron was detected at 8 of 15 locations analyzed, with reported values ranging from 0.024 mg/L to 0.619 mg/L. Where dissolved iron was detected, the dissolved concentration was typically less than 50% of the total iron value, providing evidence that iron is largely associated with particulates suspended in groundwater. This was not observed at MW-352, with dissolved iron a greater proportion of total iron at these locations, consistent with geochemical conditions which periodically favor dissolution of iron oxides (Figure 8a).

Total manganese was detected at all locations analyzed, with reported values ranging from 0.0028 mg/L at UU PMP well MW-150 to 1.68 mg/L at downgradient UA well MW-366 (Table 8). Dissolved manganese values ranged from 0.0013 mg/L at UA downgradient well MW-375 to 0.681 mg/L at downgradient UA well MW-390. At locations where dissolved manganese was detected, dissolved concentrations as percentage of total concentration varied widely across both the UU PMP (2 to 91 %) and UA (2 to greater than 100%). This is consistent with the predicted mobilization of manganese to the aqueous phase based on the Pourbaix diagrams (Figures 9a and 9b), and the lack of observed crystalline manganese-bearing minerals (like rhodochrosite) across most of the site (Tables 5a & 5b).

4.3.5 Major Ion Distribution and Groundwater Signatures

Piper diagrams were constructed using data from both HSUs to visualize major ion distributions in groundwater. Piper diagrams are a common tool for assessing geochemical similarities or differences in terms of the major ion distributions between aqueous samples. FAPS porewaters

exhibit major anion compositions that are sulfate-dominated (greater than 80%) and major cation compositions that are dominated by monovalent cations (sodium and potassium; Figures 10a & 10b). UA groundwaters exhibit a wider range of geochemical compositions than UU PMP waters, with many locations clustering near background wells MW-304 and MW-358 (Figure 10a). These wells are characterized by a major cation composition that is dominated by sodium and potassium, with relatively even proportions of major anions. MW-352, MW-366, MW-377 and MW-390 do not appear similar to this cluster of UA groundwaters, as they have greater contributions from divalent cations (magnesium and calcium). These wells do not have an identifiable shared hydrologic or geochemical characteristic that would alter the geochemical composition of the groundwater at these locations; they are dispersed across the Site, are screened within both shale and limestone lithologies, and do not exhibit redox conditions different from other locations within the UA.

UU PMP groundwaters exhibit relatively consistent major cation distributions with relatively even proportions of magnesium and calcium, and relatively lower proportions of sodium and potassium (Figure 10b). UU PMP groundwaters consistently have low contributions of chloride, but major anion compositions range from alkalinity-dominated (MW-151) to sulfate-dominated (MW-150), similar to FAPS porewater. The distribution of anions at MW-152 has variable contributions of sulfate and alkalinity, consistent with the observed seasonal variability in sulfate concentrations at this monitoring location (Figure 7b).

5. GEOCHEMICAL CONCEPTUAL SITE MODEL

5.1 Source and Mobilization Mechanisms

Boron is naturally abundant in coals and is concentrated within CCR, primarily as polyborate (B_2O_3) surface coatings on particles (EPRI 1998). Boron was identified in the CCR porewater at concentrations up to 102 mg/L. The likely primary source of boron to the UA and UU PMP is the FAPS CCR porewater based on boron concentrations within the source and relationships to hydrogeological patterns at the site (i.e., correlated increases between boron and groundwater elevation at MW-391). Boron was identified within UA solids at concentrations that suggest that aquifer solids could provide a secondary additional potential natural geogenic source of boron to groundwater, and groundwater from background wells consistently exhibited boron concentrations consistent with a natural geogenic source.

Reduced sulfur species (e.g. pyrite) can be naturally abundant in coals; after coal fly ash production, sulfate is the dominant sulfur species associated with fly ash. Sulfate is concentrated on the surface of fly ash particles and the majority of sulfate mineral phases are soluble under environmental conditions, such that sulfate associated with fly ash is leachable (Izquierdo and Querol 2012). The likely primary source of sulfate to the UA and UU is the FAPS CCR porewater. Sulfate was identified in the CCR porewater at concentrations up to 2,820 mg/L. Sulfate was identified within UA solids at background well locations at concentrations that indicate a potential natural source of sulfate to groundwater, although this sulfate was not observed in crystalline mineral phases at these locations. The observation of pyrite within solids of shale portions of the UA could provide a secondary additional source of sulfate to groundwater via pyrite oxidation, as pyrite is not expected to be a stable mineral phase under observed redox conditions (Figures 8a to 8c).

5.2 Potential and Observed Attenuation Mechanisms

Boron exceedances were identified in both the UA and PMP hydrologic units at the Site. Boron is anticipated to largely be present as the neutral $B(OH)_3$ boric acid species as groundwater pH values are below the pK_a for boric acid (9.2) in both HSUs. Conditions within groundwater from both the UA and UU PMP are typically predicted to favor amorphous ferrihydrite (iron oxide) stability at most locations, and the presence of iron oxides in some solids (Tables 5a & 5b) suggests a portion of the boron in the groundwater system may be attenuated via surface complexation reactions within portions of the UU PMP and the UA. Given the low abundance of total manganese in the solids (Table 1) and the predicted instability of solid manganese phases (Figures 5a and 5b), manganese oxides are not expected to be an important source of adsorption sites. Boron is also known to be attenuated via interactions with clay minerals (Goldberg 1997); the XRD results identified the presence of a number of clay minerals across both the UU and UA (Tables 5a & 5b). Observations of boron associated with the organic matter bound fraction in the SEP analysis (Table 4), as well as the high organic matter content inferred from LOI values indicates that organic matter could be an additional geosorbent for boron within both UU PMP and UA solids (Lemarchand et

al., 2015). Together, these factors suggest that chemical attenuation of boron via interactions with aquifer solid phases such as metal oxides or organic surfaces is possible at locations downgradient of the FAPS.

Sulfate exceedances are currently limited to MW-150, which is screened within the UU PMP. Sulfate is typically considered to be a conservative species within groundwater at circumneutral pH conditions, although precipitation of sulfate-containing mineral phases (e.g., gypsum) and sorption onto positively charged mineral surfaces are both potential attenuation mechanisms. Sulfate attenuation is expected to occur largely as the result of sorption onto iron oxides and oxyhydroxides associated with solids. Both SEP and XRD analyses (Tables 3, 5a, & 5b) support the presence of both crystalline and amorphous iron oxide phases across the Site in both the UU PMP and UA. While modeling of redox conditions within groundwater from MW-150 is not predicted to favor iron oxide stability, at most locations in both the UA and UU PMP redox conditions are typically predicted to favor iron oxide stability, including at background wells MW-304 and MW-358. The observation of gypsum, although limited to downgradient MW-350 in the shale bedrock portions of the UA, indicates that precipitation of gypsum may be another potential attenuation mechanism at locations near the FAPS.

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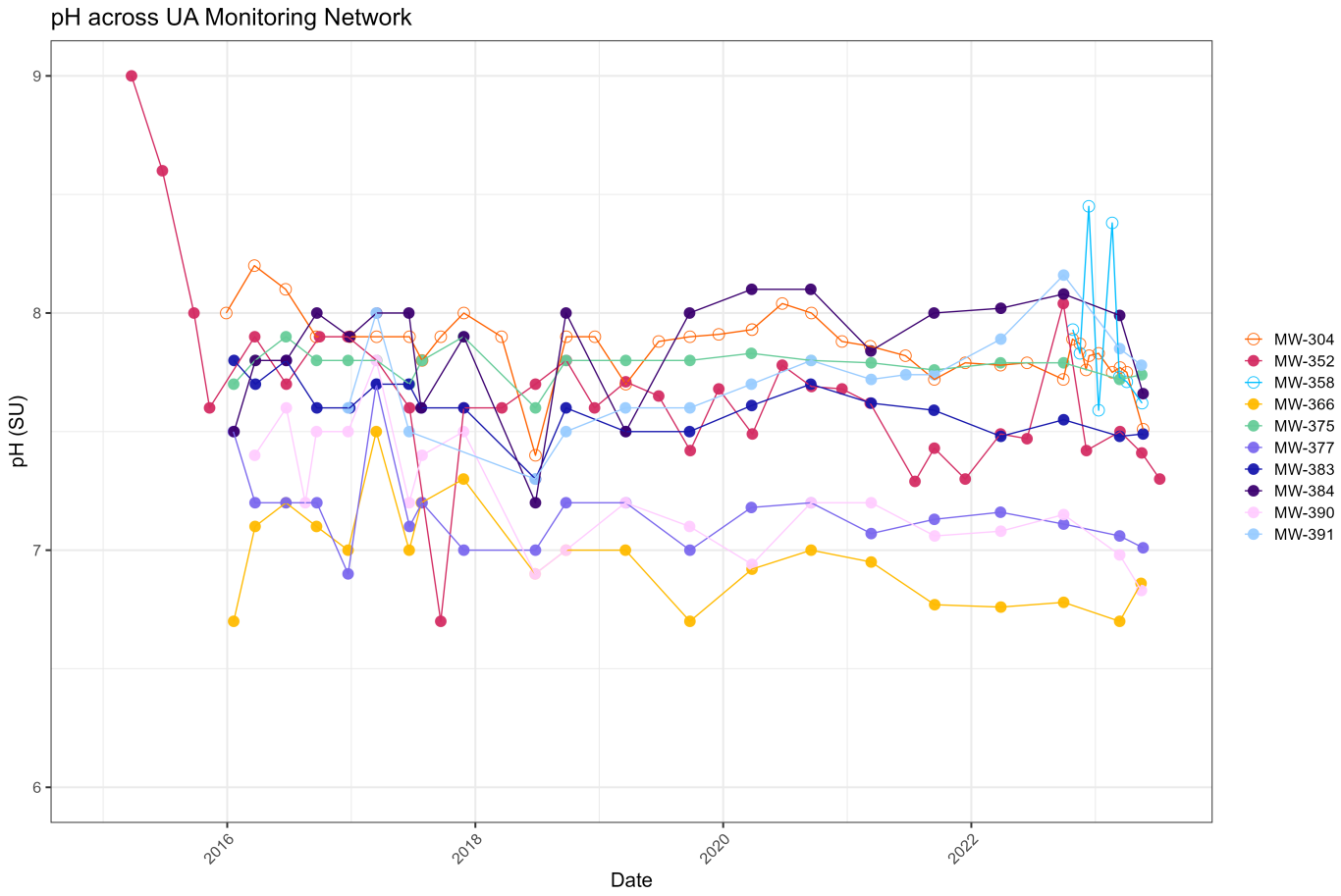
FIGURES



Notes:
SU: Standard Units
Background wells shown with open symbols.

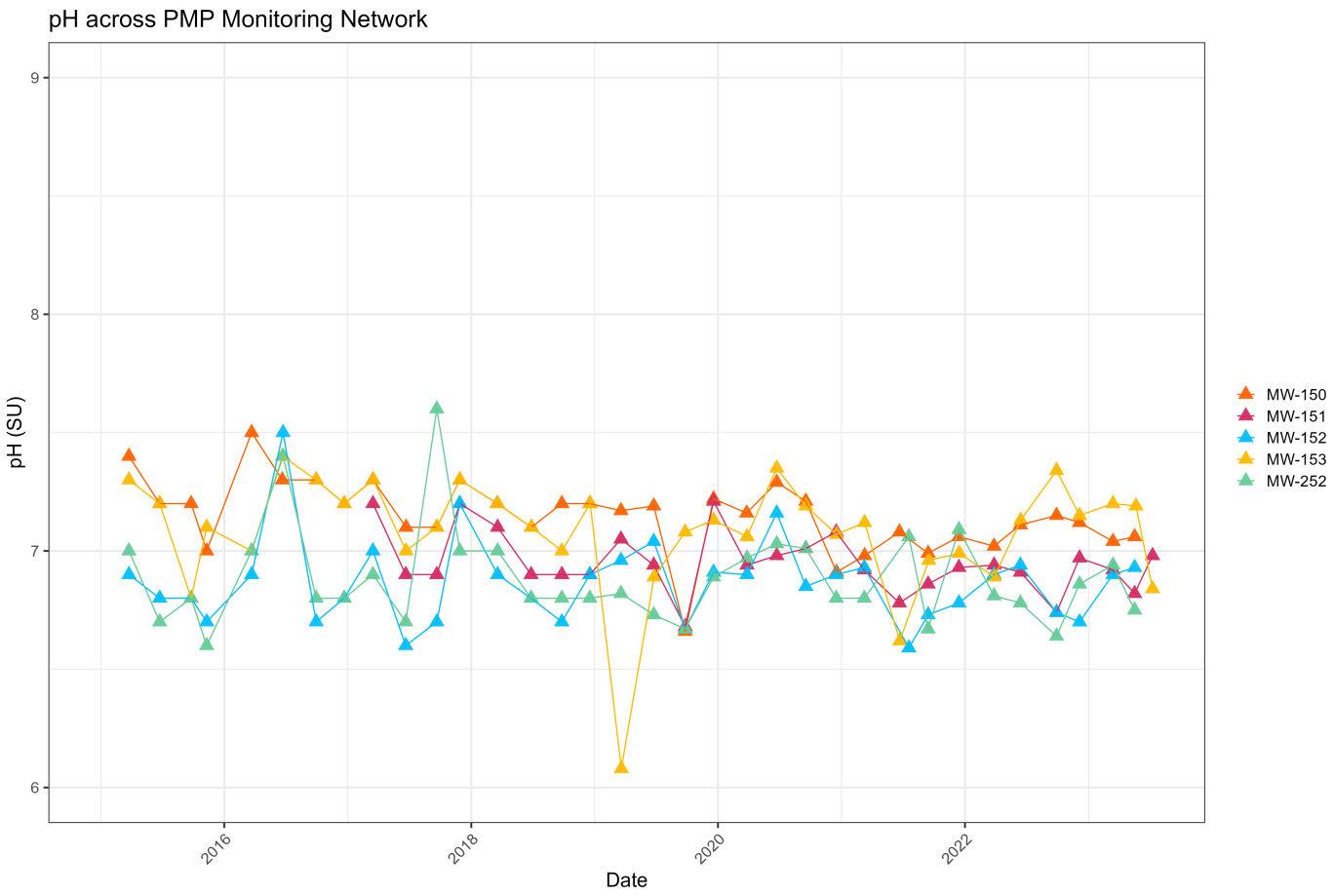
pH Time Series – Uppermost Aquifer

Baldwin Power Plant – Fly Ash Pond System

Geosyntec consultants

Columbus, Ohio | February 2024

Figure **1a**



Notes:
SU: Standard Units

pH Time Series – Potential Migration Pathway

Baldwin Power Plant – Fly Ash Pond System

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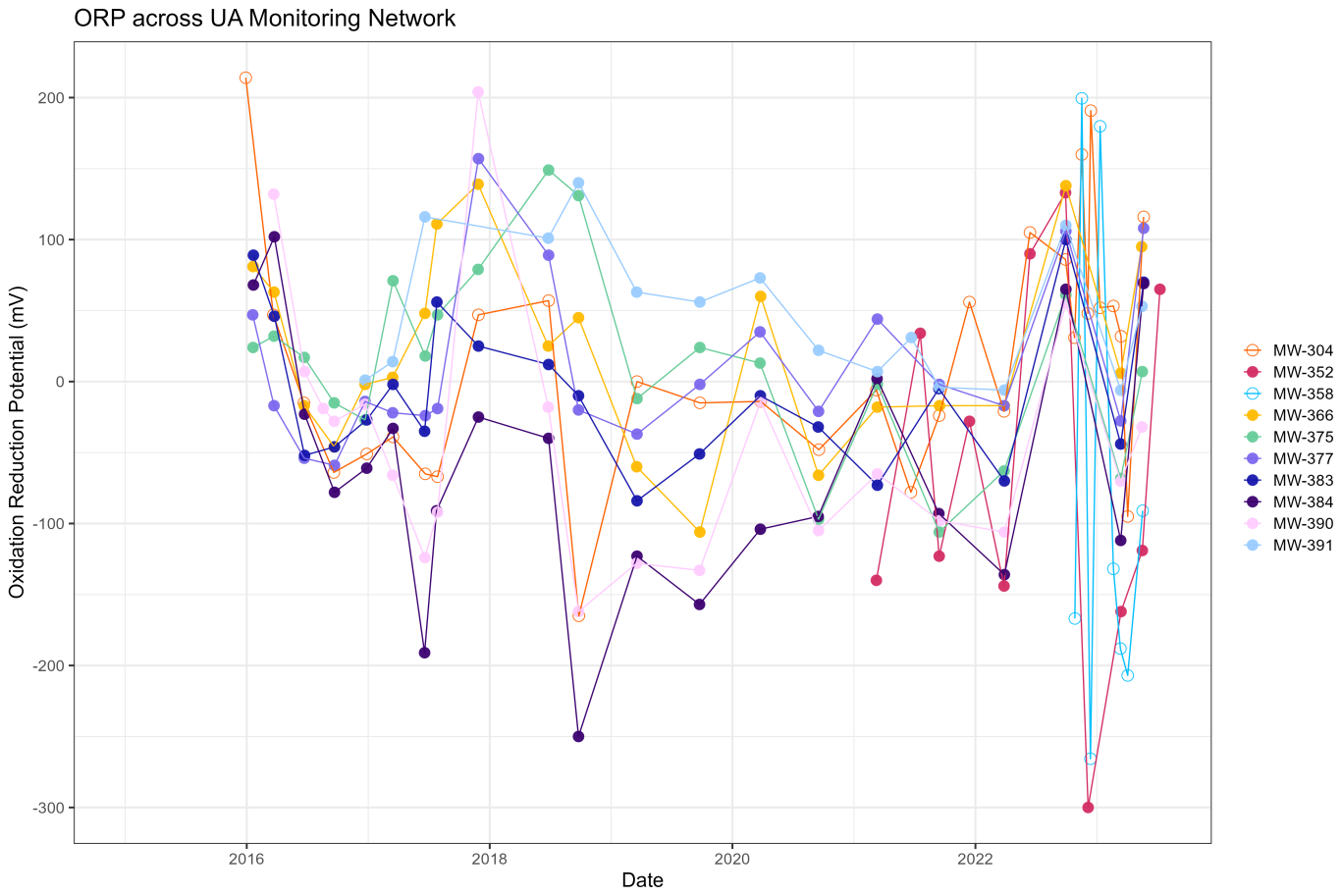
Figure **1b**



Notes:
mV: millivolts
Background wells shown with open symbols.

ORP Time Series – Uppermost Aquifer

Baldwin Power Plant – Fly Ash Pond System

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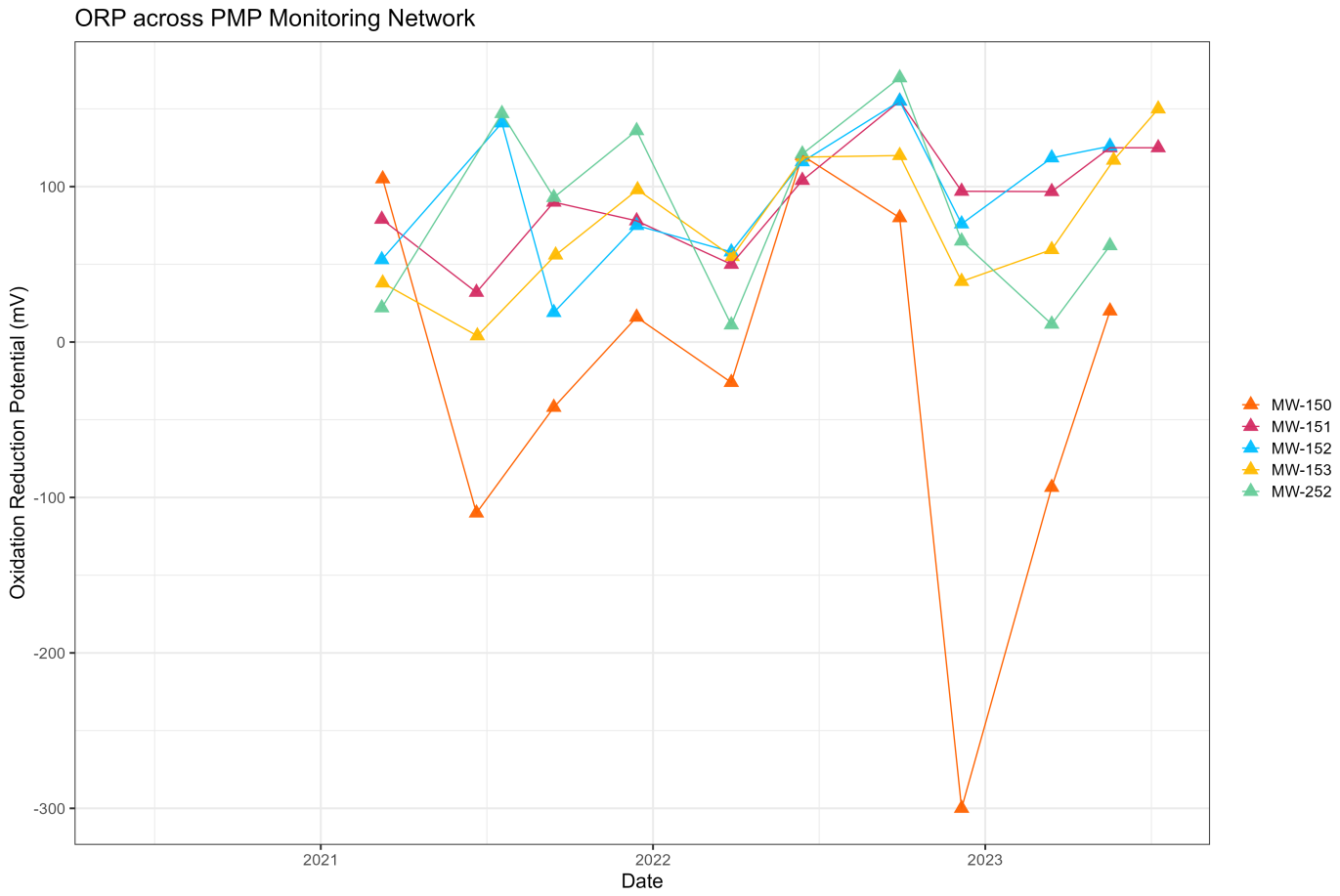
Figure **2a**



Notes:
mV: millivolts

ORP Time Series – Potential Migration Pathway

Baldwin Power Plant – Fly Ash Pond System

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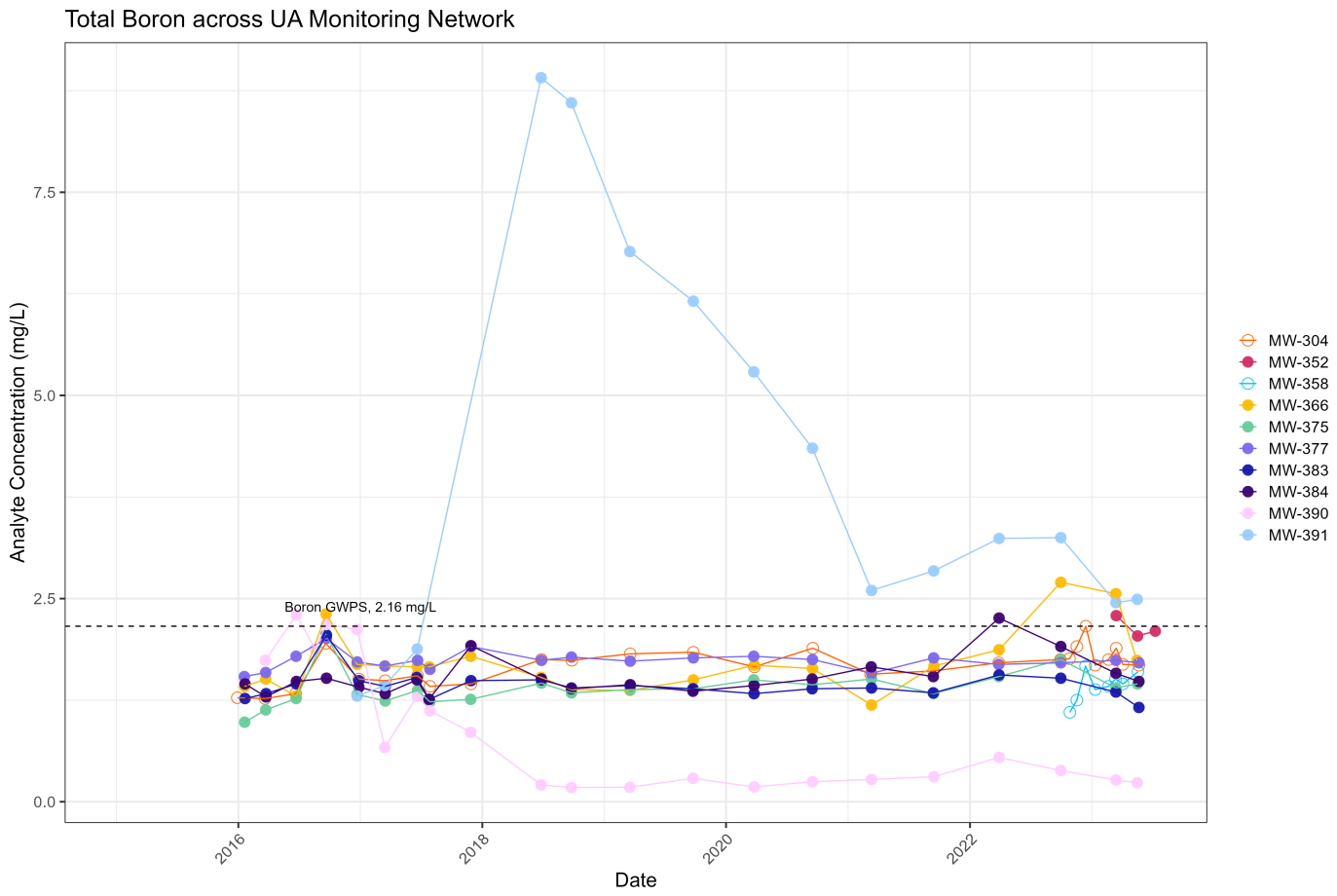
Figure **2b**



Notes:
mg/L: milligrams per liter
GWPS: Groundwater Protection Standard
Background wells shown with open symbols.

Boron Concentration Time Series – Uppermost Aquifer

Baldwin Power Plant – Fly Ash Pond System

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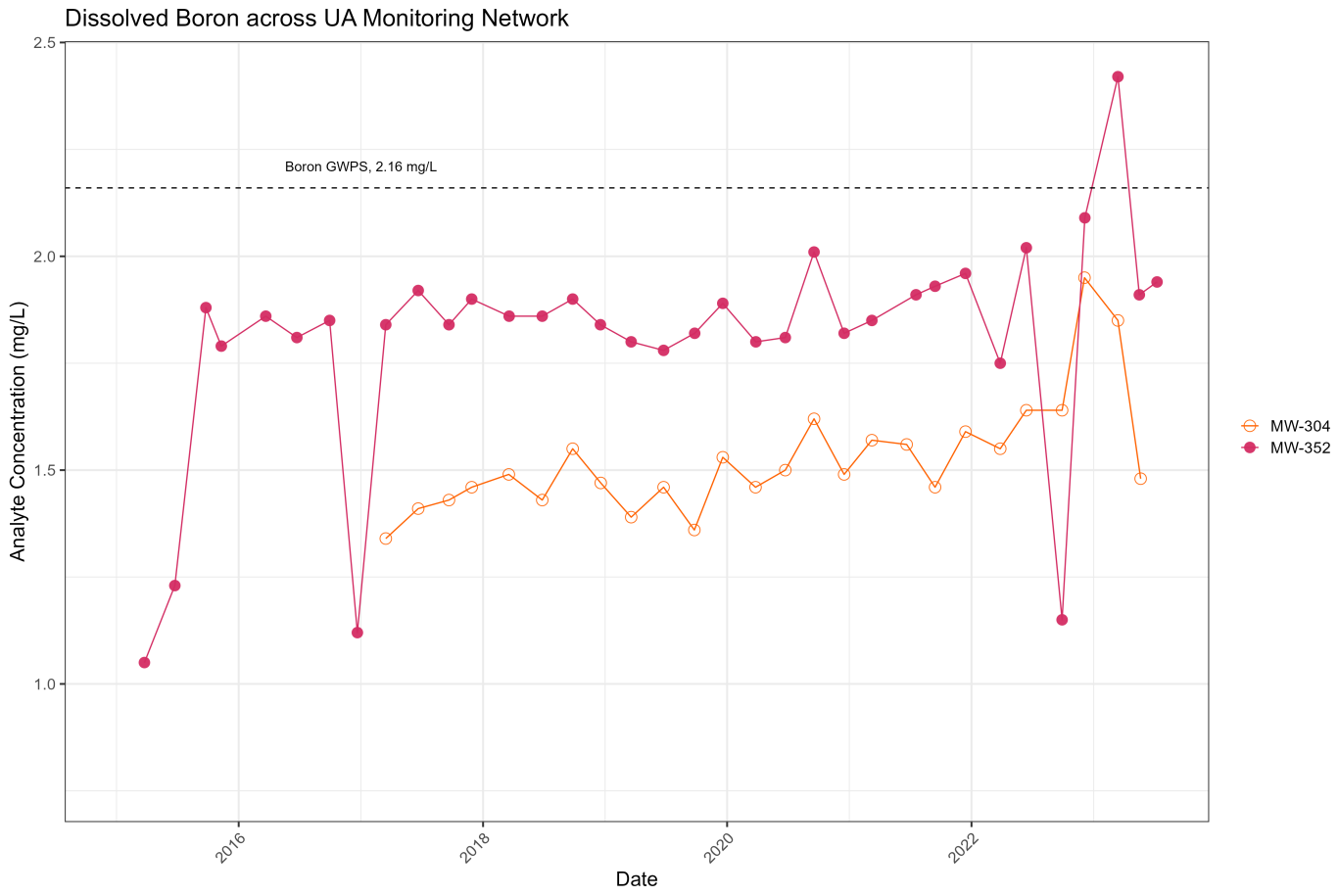
Figure **3a**



Notes:
mg/L: milligrams per liter
GWPS: Groundwater Protection Standard
Background wells shown with open symbols.

Dissolved Boron Concentration Time Series – Uppermost Aquifer

Baldwin Power Plant – Fly Ash Pond System

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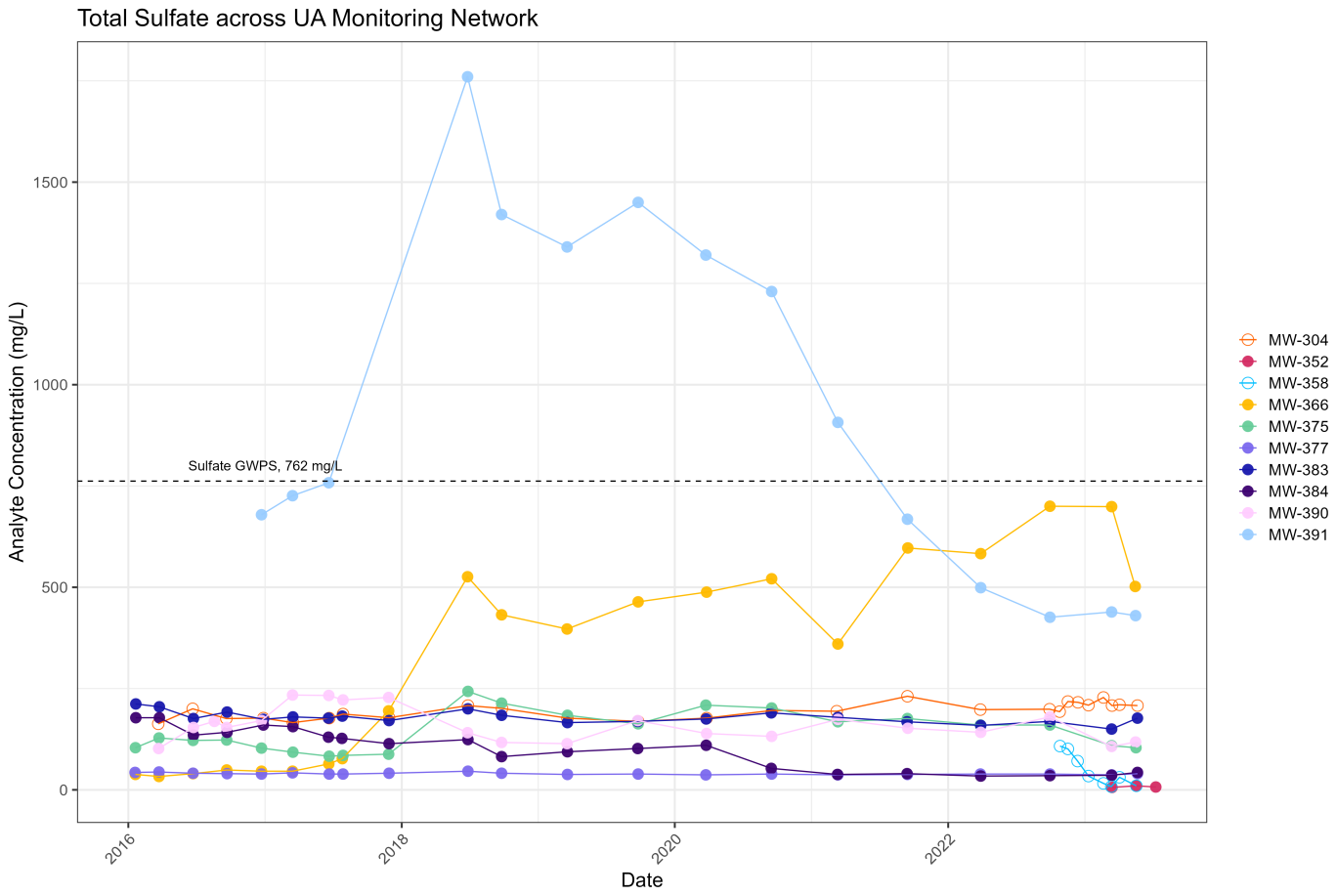
Figure **3b**



Notes:
mg/L: milligrams per liter
GWPS: Groundwater Protection Standard
Background wells shown with open symbols.

Sulfate Concentration Time Series – Uppermost Aquifer

Baldwin Power Plant – Fly Ash Pond System

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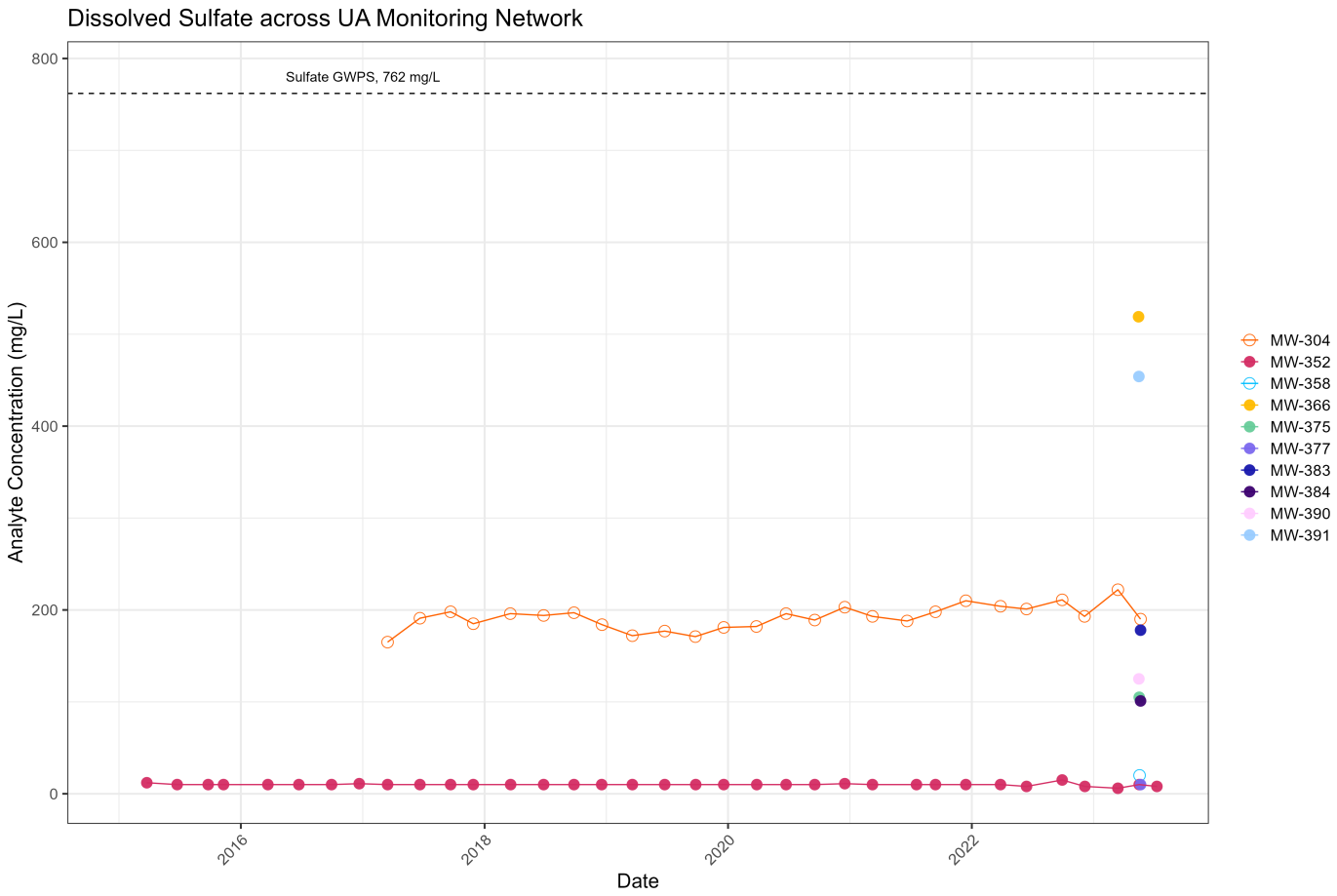
Figure **4a**



Notes:
mg/L: milligrams per liter
GWPS: Groundwater Protection Standard
Background wells shown with open symbols.

Dissolved Sulfate Concentration Time Series – Uppermost Aquifer

Baldwin Power Plant – Fly Ash Pond System

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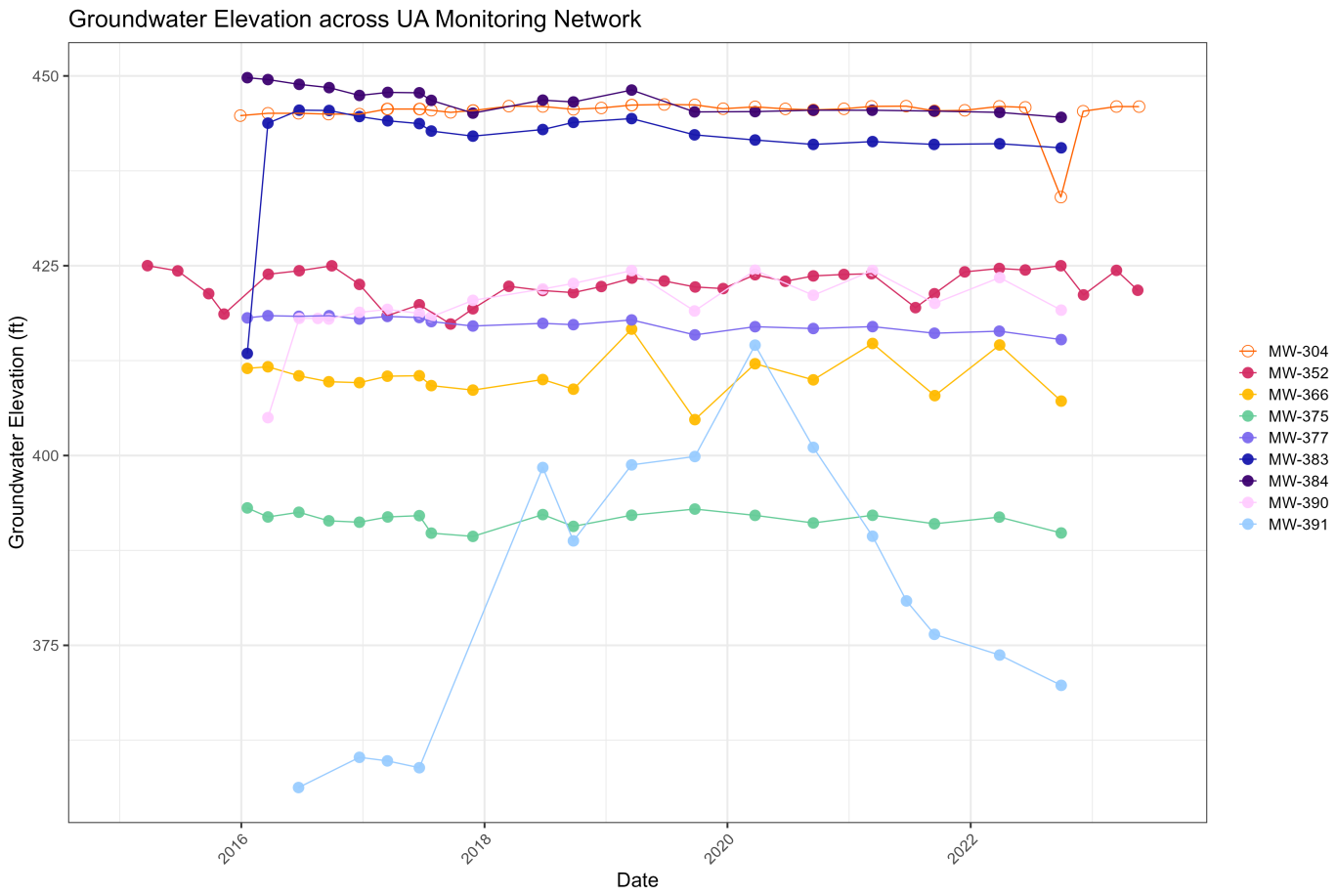
Figure **4b**



Notes:
ft: feet
Background wells shown with open symbols.

Groundwater Elevation Time Series – Uppermost Aquifer

Baldwin Power Plant – Fly Ash Pond System

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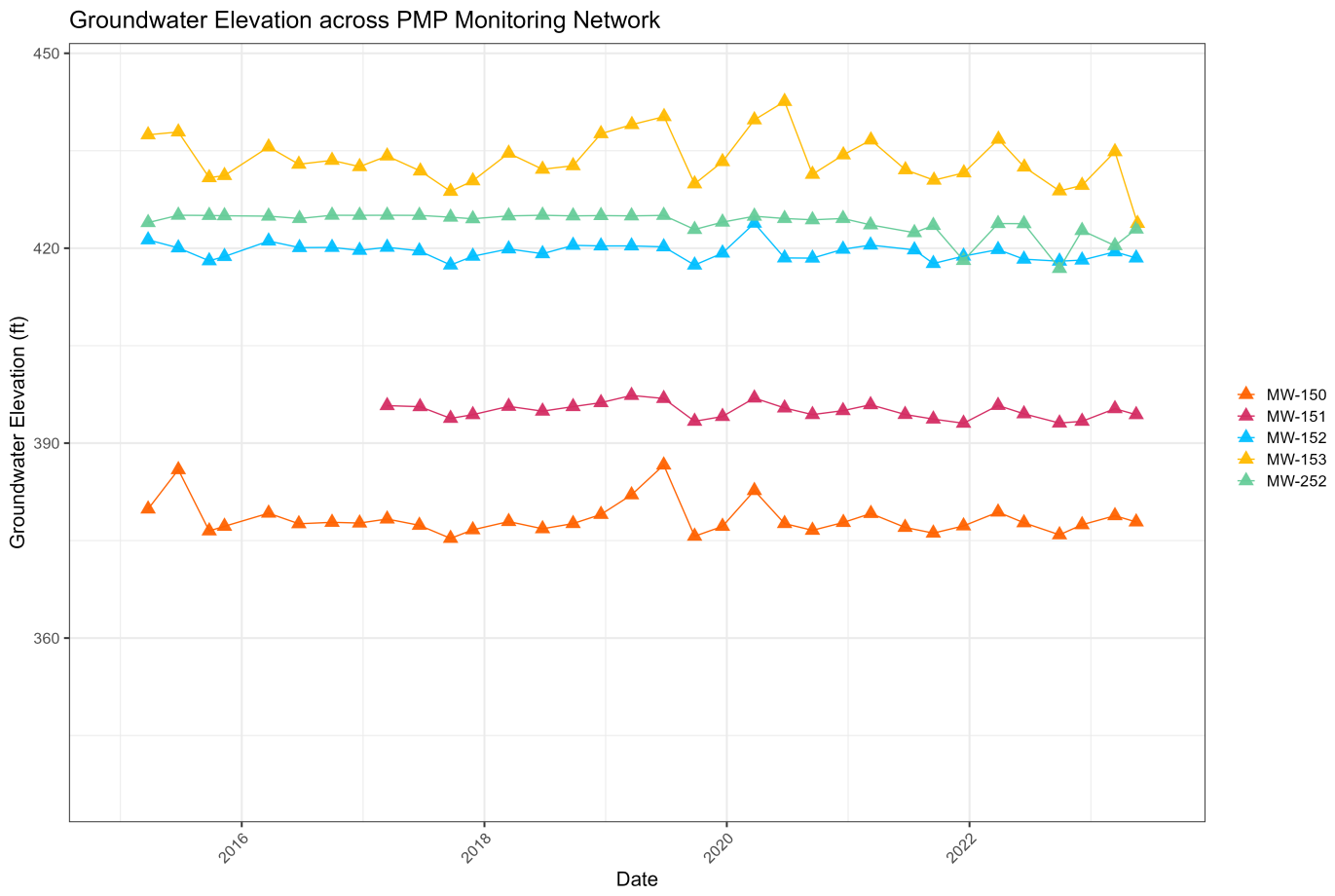
Figure **5a**



Notes:
ft: feet

Groundwater Elevation Time Series – Potential Migration Pathway

Baldwin Power Plant – Fly Ash Pond System

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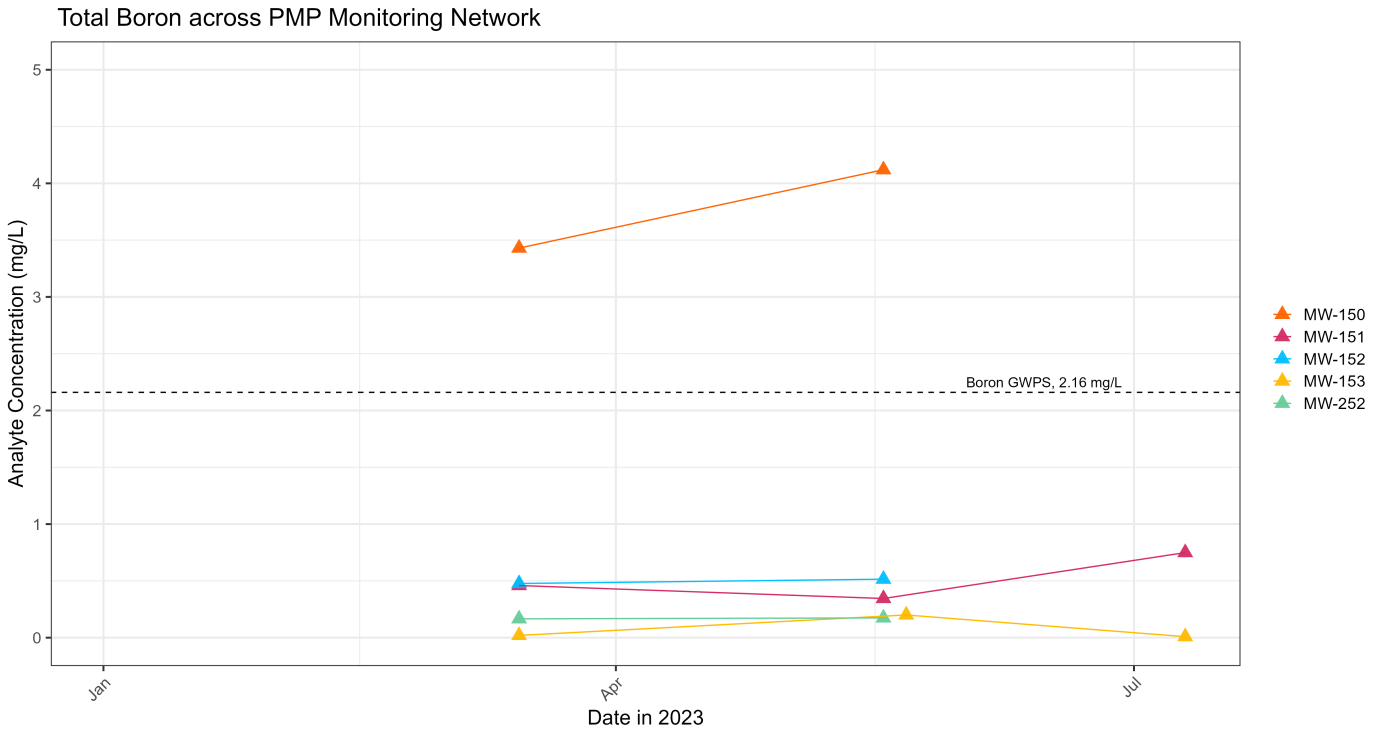
Figure **5b**



Notes:
mg/L: milligrams per liter
GWPS: Groundwater Protection Standard

Boron Concentration Time Series – Potential Migration Pathway
Baldwin Power Plant – Fly Ash Pond System

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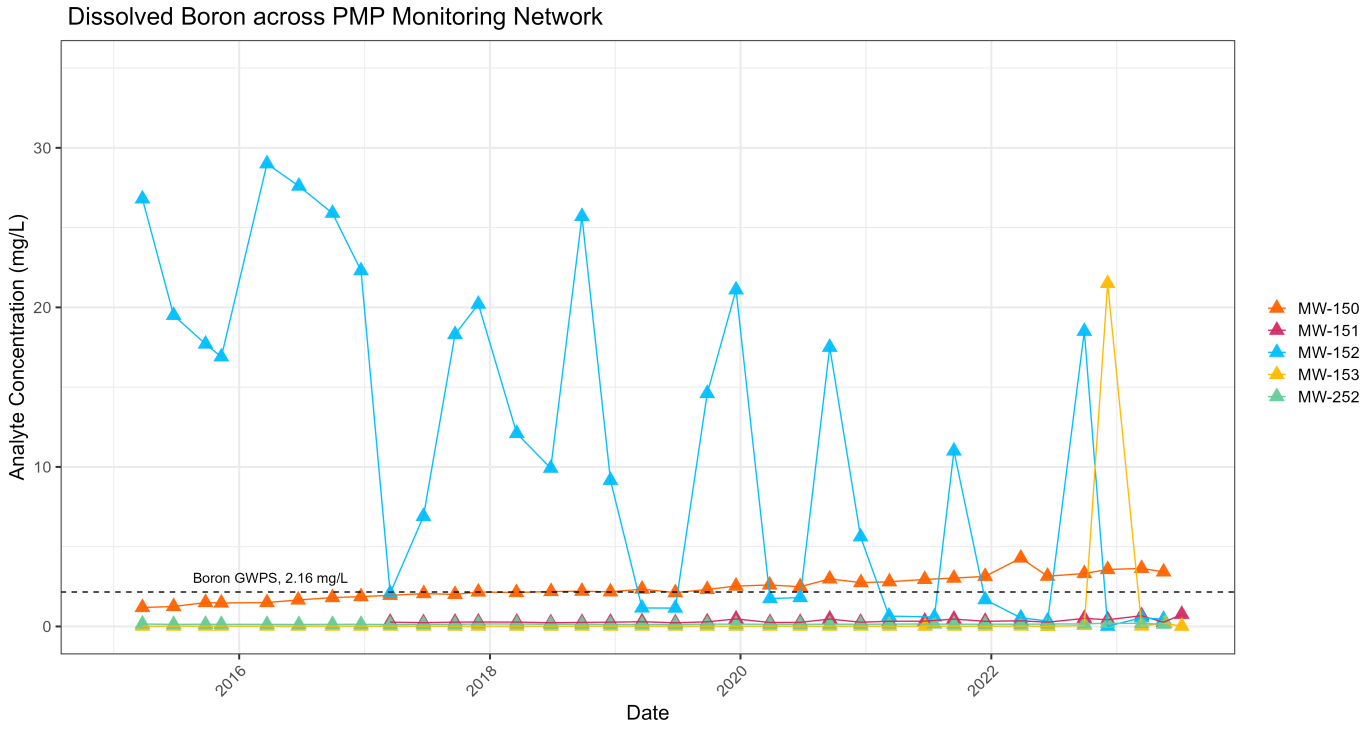
Figure **6a**



Notes:
mg/L: milligrams per liter
GWPS: Groundwater Protection Standard

Dissolved Boron Concentration Time Series – Potential Migration Pathway
Baldwin Power Plant – Fly Ash Pond System

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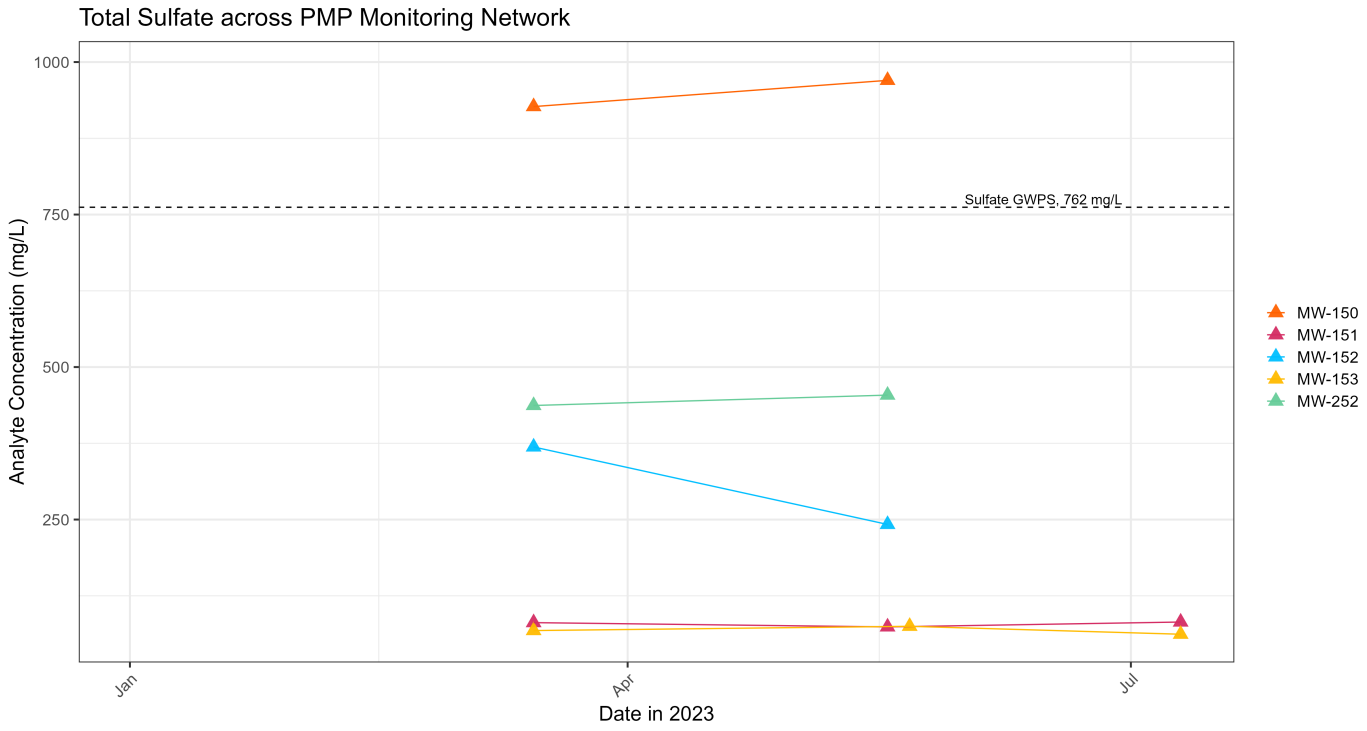
Figure **6b**



Notes:
mg/L: milligrams per liter
GWPS: Groundwater Protection Standard

Sulfate Concentration Time Series – Potential Migration Pathway
Baldwin Power Plant – Fly Ash Pond System

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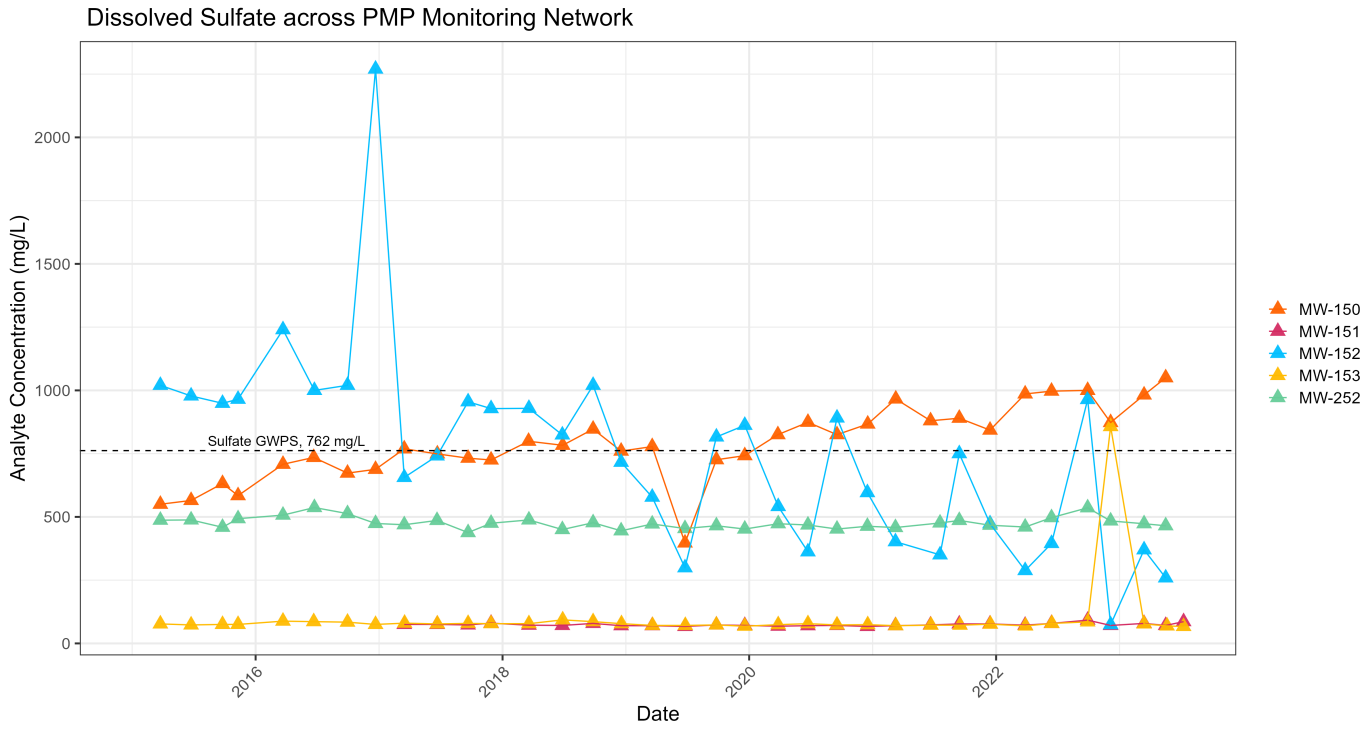
Figure **7a**



Notes:
mg/L: milligrams per liter
GWPS: Groundwater Protection Standard

Dissolved Sulfate Concentration Time Series – Potential Migration Pathway
Baldwin Power Plant – Fly Ash Pond System

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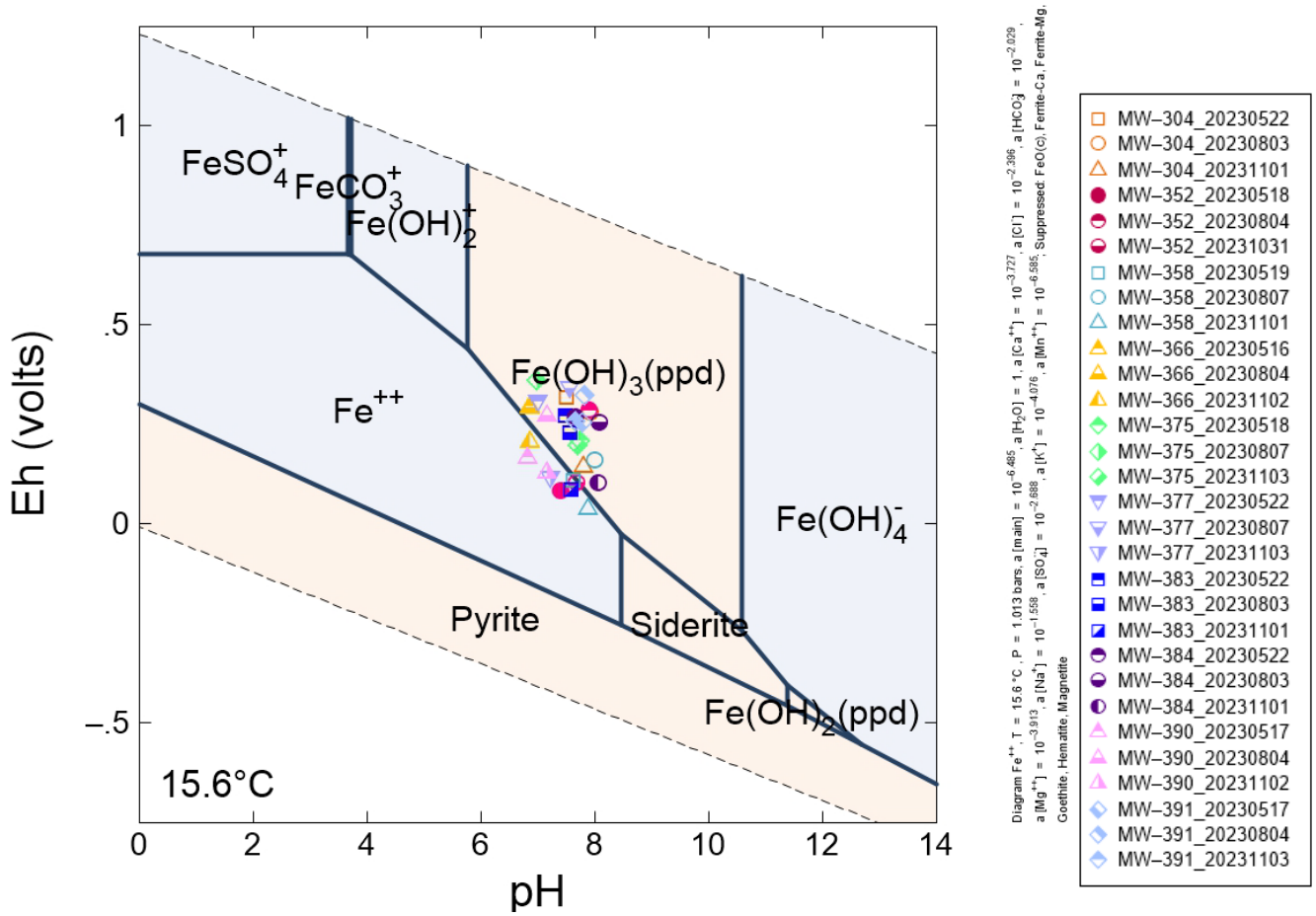
Figure **7b**



Notes:

1. Diagram was generated using conditions observed at well MW-391 on 5/17/23.
2. The three most recent available pH and ORP data points for each location are displayed.
3. Hematite, ferrite-Ca, ferrite-Mg, goethite, crystalline iron oxide, and magnetite were suppressed during model generation.

Iron Pourbaix Diagram, Ferrihydrite – Uppermost Aquifer

Baldwin Power Plant – Fly Ash Pond System

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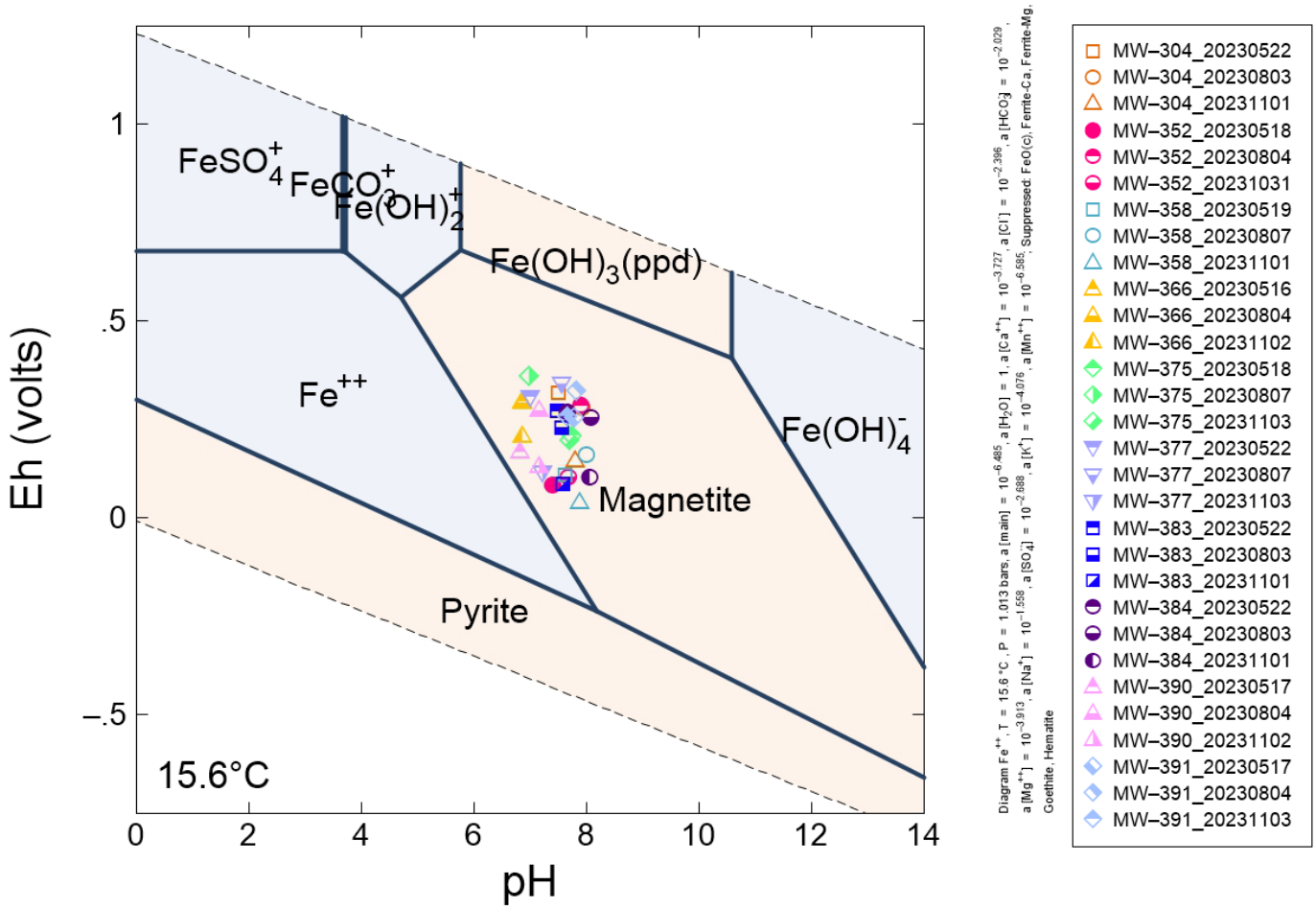
Figure **8a**



Notes:

1. Diagram was generated using conditions observed at well MW-391 on 5/17/23.
2. The three most recent available pH and ORP data points for each location are displayed.
3. Ferrite-Ca, ferrite-Mg, goethite, crystalline iron oxide, and hematite were suppressed during model generation.

Iron Pourbaix Diagram, Magnetite – Uppermost Aquifer

Baldwin Power Plant – Fly Ash Pond System

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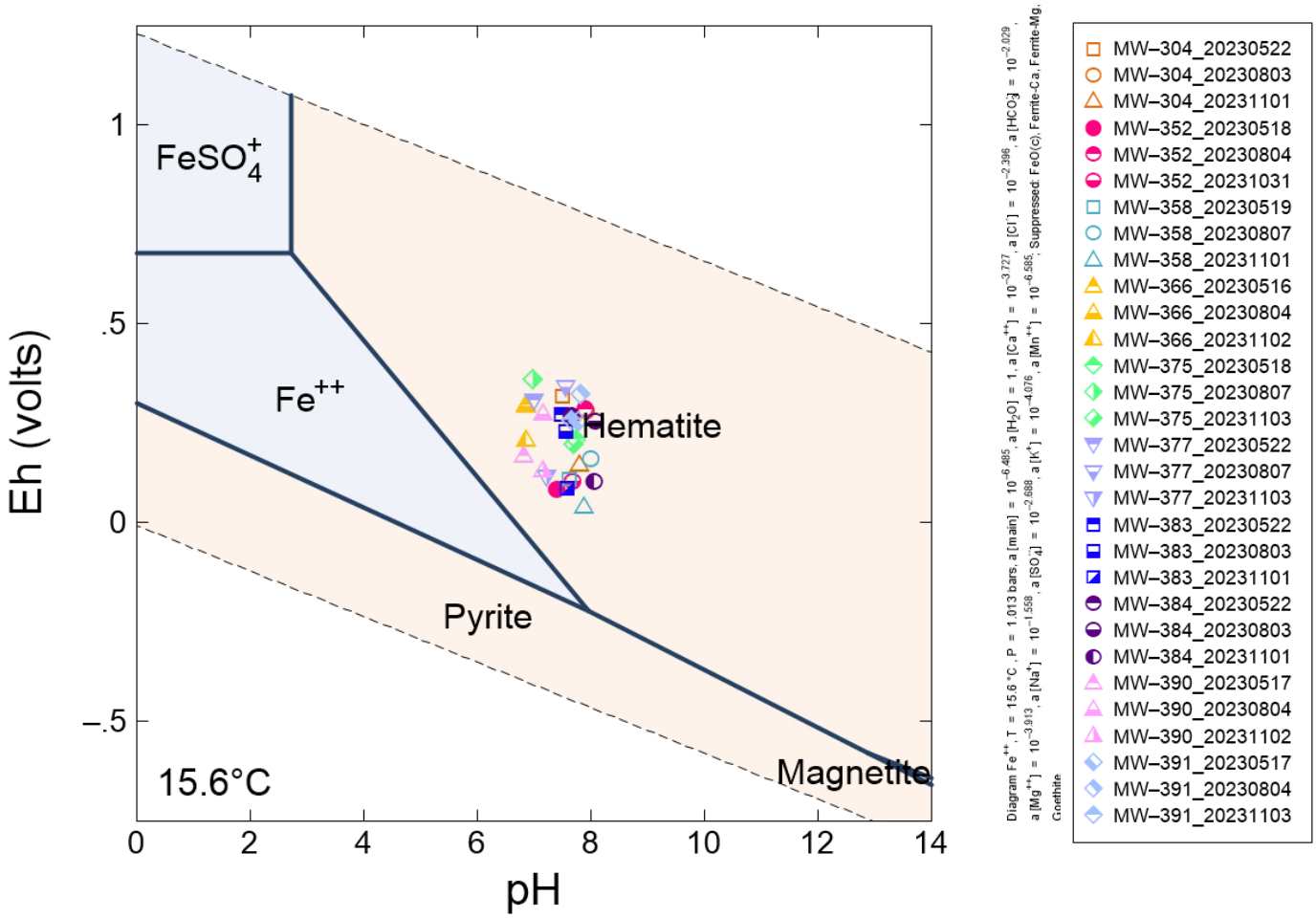
Figure **8b**



Notes:

1. Diagram was generated using conditions observed at well MW-391 on 5/17/23.
2. The three most recent available pH and ORP data points for each location are displayed.
3. Ferrite-Ca, ferrite-Mg, goethite, and crystalline iron oxide were suppressed during model generation.

Iron Pourbaix Diagram, Hematite – Uppermost Aquifer

Baldwin Power Plant – Fly Ash Pond System

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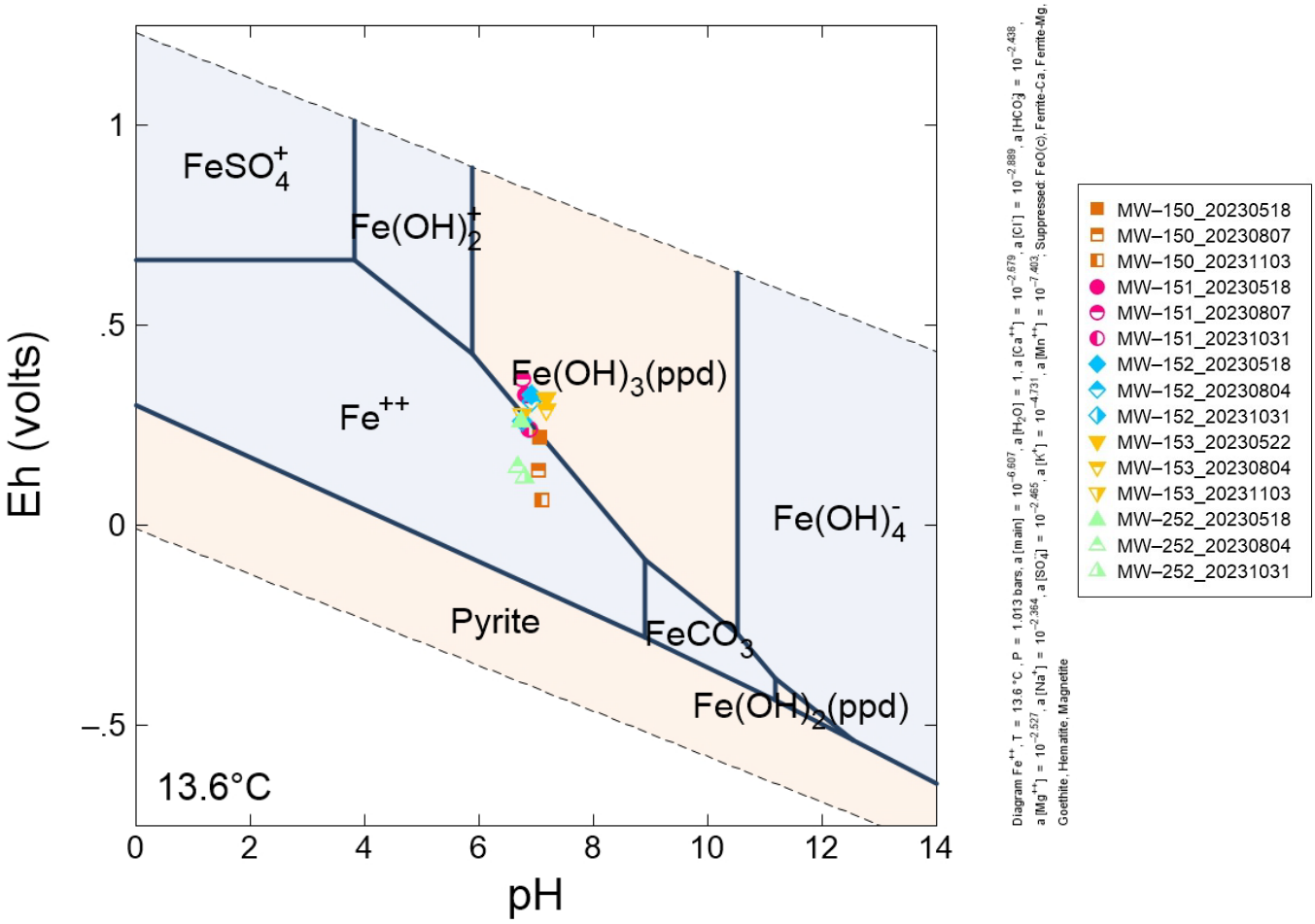
Figure **8c**



Notes:

1. Diagram was generated using conditions observed at well MW-150 on 5/18/23.
2. The three most recent available pH and ORP data points for each location are displayed.
3. Hematite, ferrite-Ca, ferrite-Mg, goethite, crystalline iron oxide, and magnetite were suppressed during model generation.

Iron Pourbaix Diagram, Ferrihydrite – Potential Migration Pathway

Baldwin Power Plant – Fly Ash Pond System

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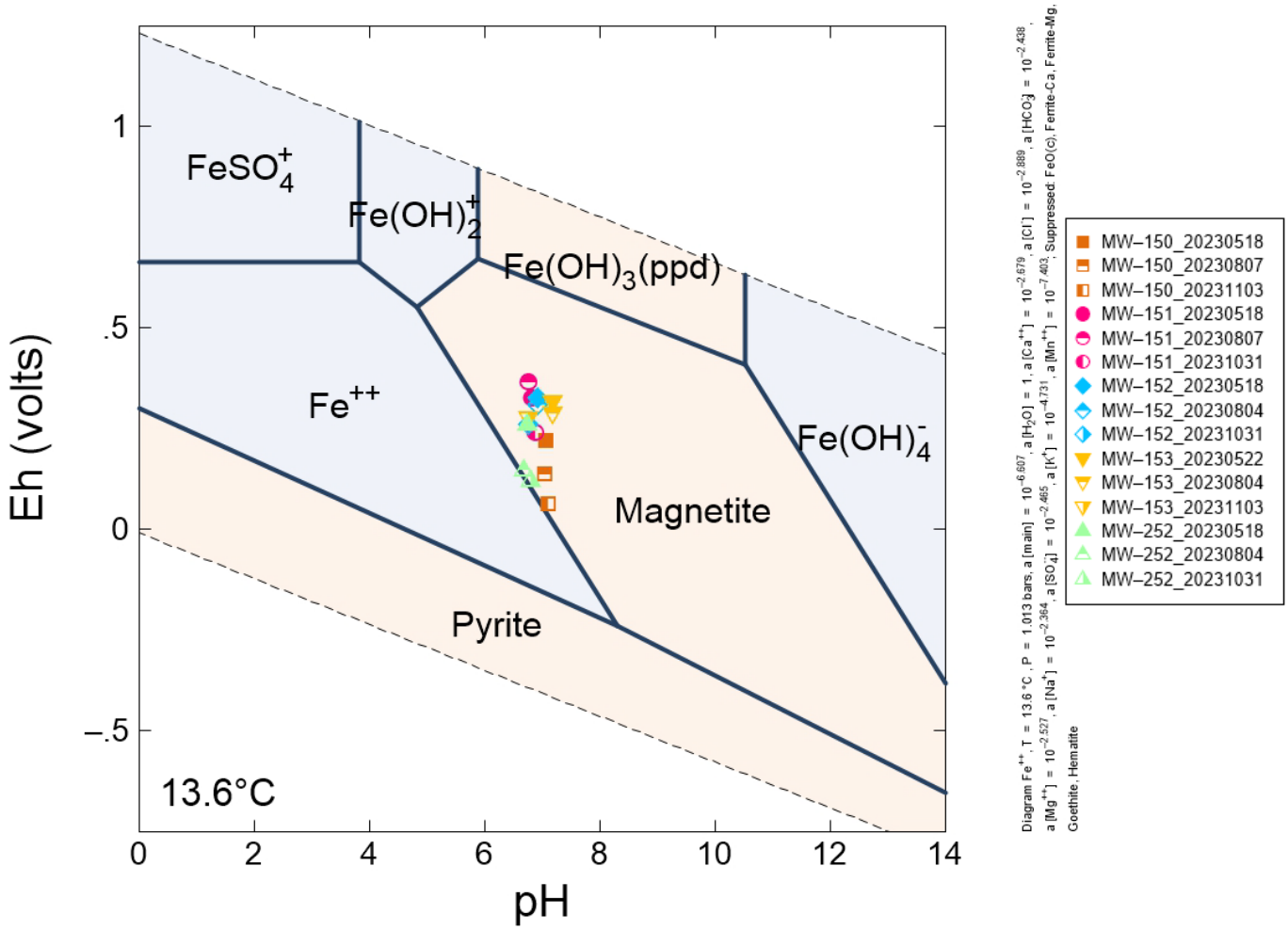
Figure **8d**



Notes:

1. Diagram was generated using conditions observed at well MW-150 on 5/18/23.
2. The three most recent available pH and ORP data points for each location are displayed.
3. Hematite, ferrite-Ca, ferrite-Mg, goethite, and crystalline iron oxide were suppressed during model generation.

Iron Pourbaix Diagram, Magnetite – Potential Migration Pathway

Baldwin Power Plant – Fly Ash Pond System

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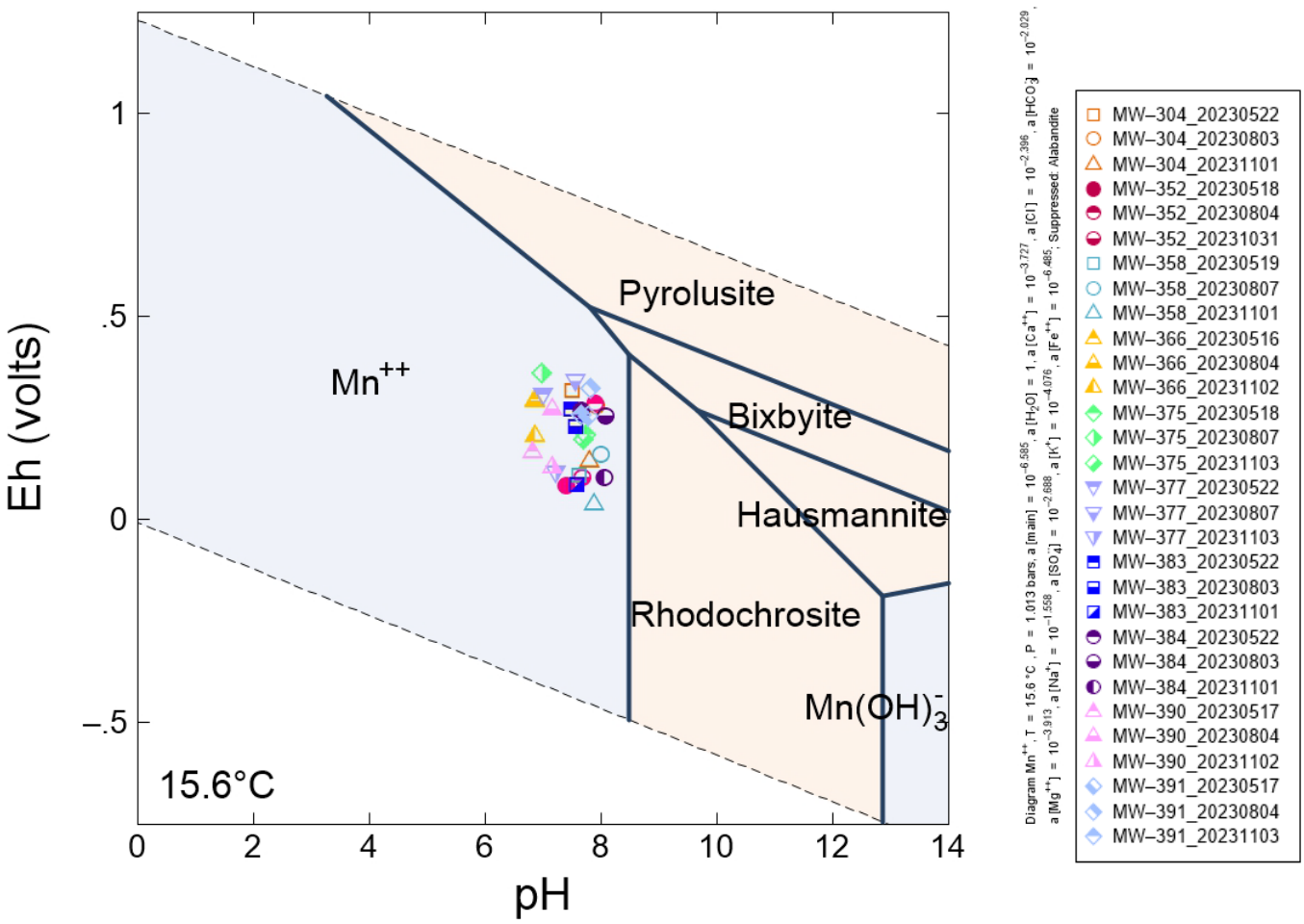
Figure **8e**



Notes:

1. Diagram was generated using conditions observed at well MW-391 on 5/17/23.
2. The three most recent available pH and ORP data points for each location are displayed.
3. Alabandite was suppressed during model generation.

Manganese Pourbaix Diagram – Uppermost Aquifer

Baldwin Power Plant – Fly Ash Pond System

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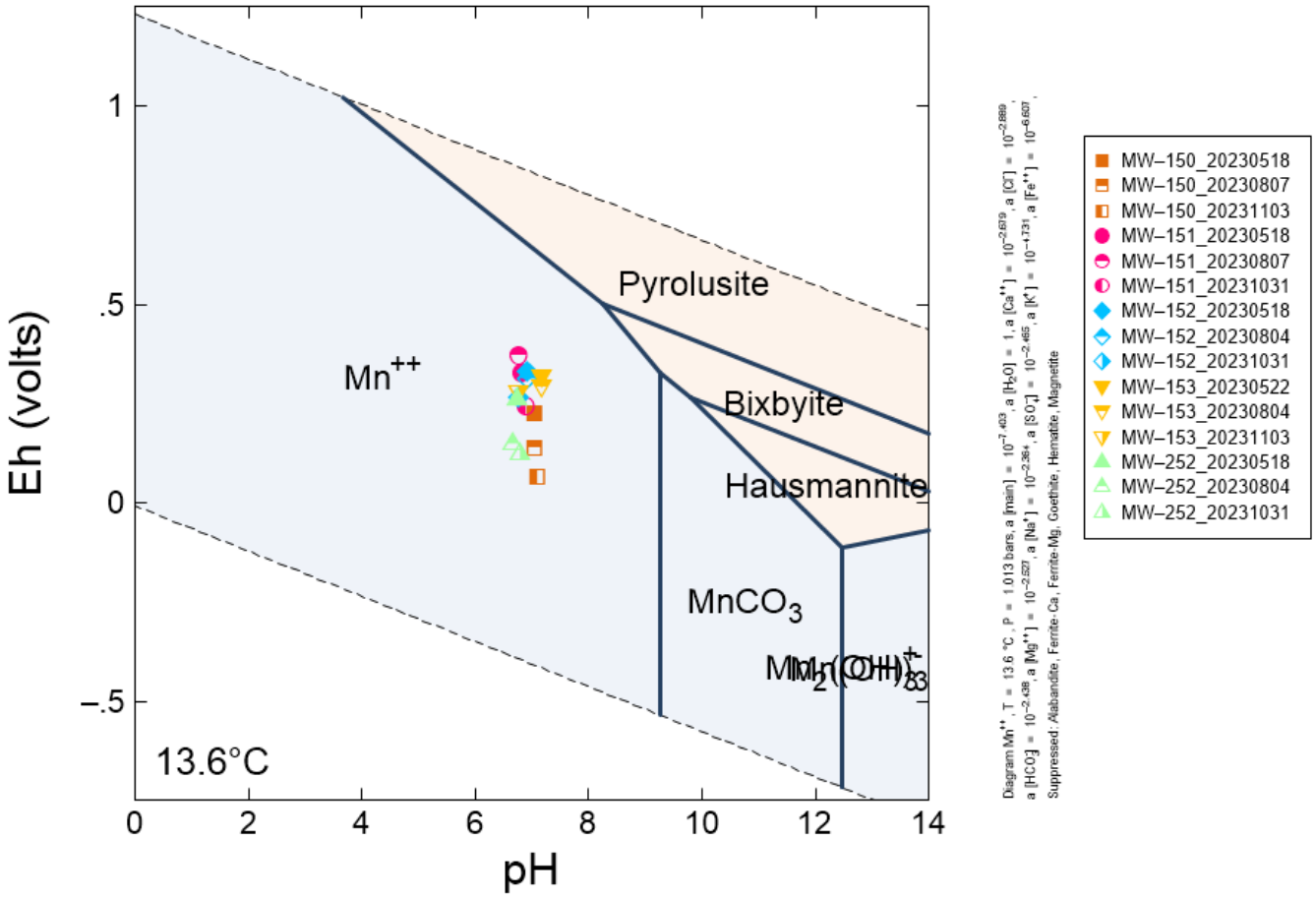
Figure **9a**



Notes:

1. Diagram was generated using conditions observed at well MW-150 on 5/18/23.
2. The three most recent available pH and ORP data points for each location are displayed.
3. Alabandite was suppressed during model generation.

Manganese Pourbaix Diagram– Potential Migration Pathway

Baldwin Power Plant – Fly Ash Pond System

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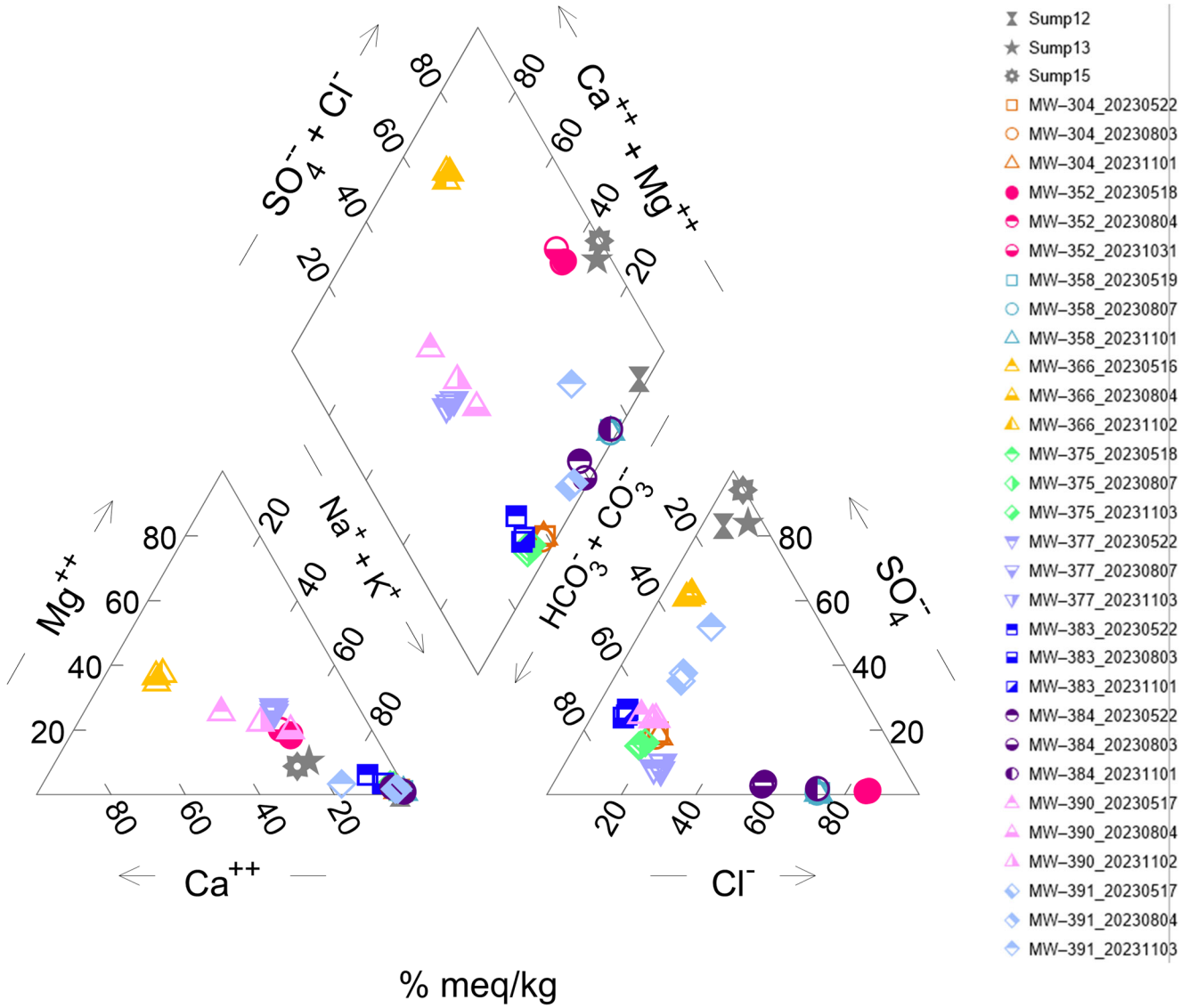
Figure **9b**



Notes:
1. The three most recent available data points for each location are displayed.
2. FAPS porewater locations Sump12, Sump13, and Sump 15 are shown with gray coloring and solid symbology

% meq/kg: percent milliequivalents per kilogram

Piper Diagram – UA Wells

Baldwin Power Plant – Fly Ash Pond System

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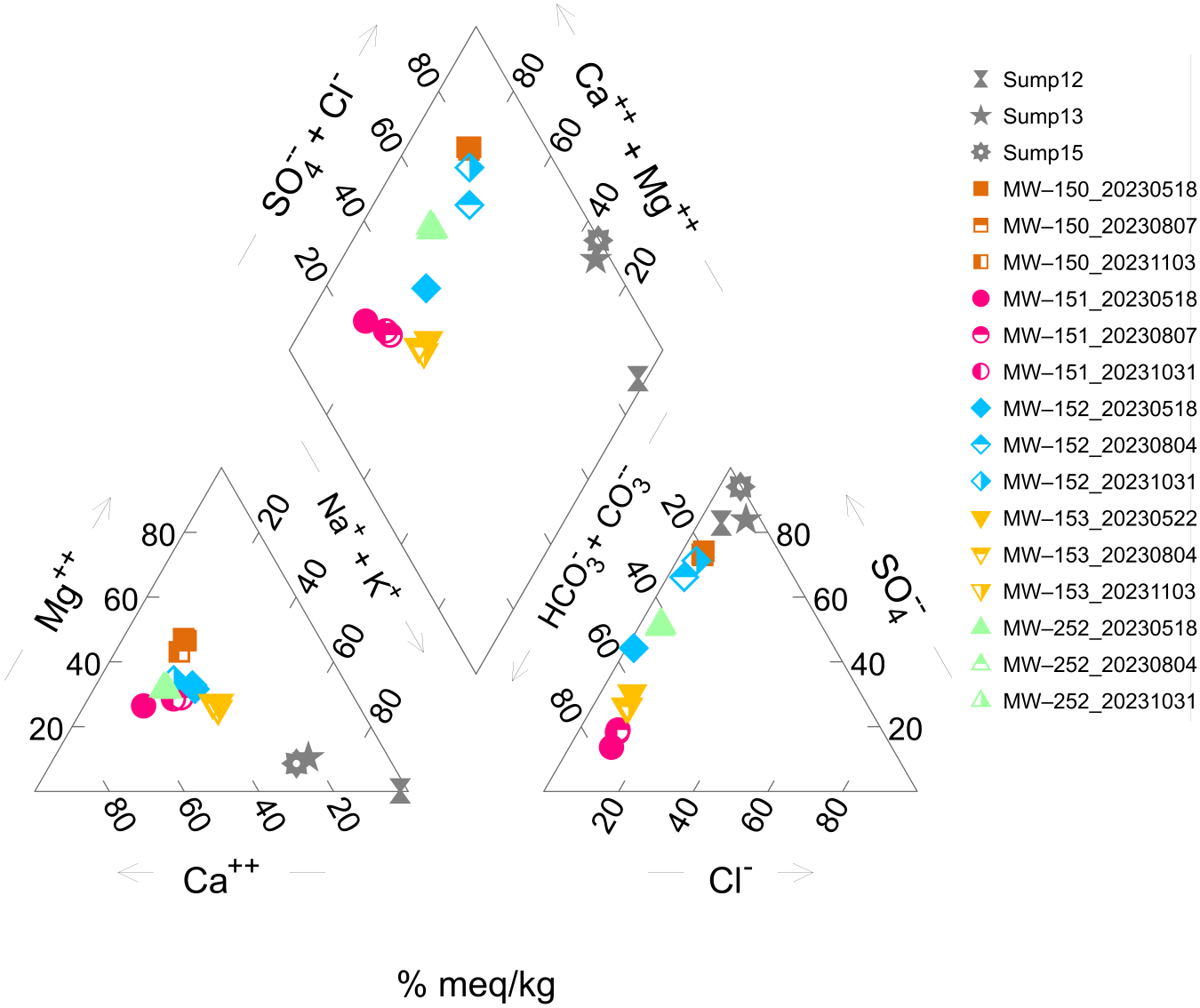
Figure **10a**



Notes:
1. The three most recent available data points for each location are displayed.
2. FAPS porewater locations Sump12, Sump13, and Sump 15 are shown with gray coloring and solid symbology.

% meq/kg: percent milliequivalents per kilogram

Piper Diagram – Potential Migration Pathway

Baldwin Power Plant – Fly Ash Pond System

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Figure **10b**

TABLES

Table 1. CEC and LOI of Site Solids
Geochemical Conceptual Site Model
Baldwin Power Plant - Fly Ash Pond System

Well ID	MW-150	MW-150	MW-350	MW-350	MW-350	MW-352	MW-352	MW-366	MW-391	REP MW-391
Depth (ft bgs)	(15-20)	(20-25)	(35-40)	(42-46)	(42-46)	(50-60)	(60-70)	(40-52)	(50-51)	(50-51)
Well Characterization	FAPS Compliance	FAPS Compliance	FAPS Compliance	FAPS Compliance	FAPS Compliance	FAPS Compliance	FAPS Compliance	FAPS Compliance	FAPS Compliance	FAPS Compliance
Sampled Aquifer Unit	PMP	PMP	UA	UA	UA	UA	UA	UA	UA	UA
Field Boring Log Description	Sandy clay	Sandy clay	Shale	Limestone	Limestone	Shale	Shale	Shale	Weathered shale	Weathered shale
CEC (meq/100 g solid)	12.94	18.94	67.49	173.79	173.68	134.55	146.45	71.09	53.7	-
LOI (%)	8.45	15.5	24.2	37.1	37.4	30.7	31.5	19.8	20.3	19.9
TOC (%)	-	-	-	-	-	-	-	-	-	-

Well ID	MW-391	MW-391	MW-358	MW-358	MW-358	MW-392	MW-392	MW-393	MW-394	MW-392
Depth (ft bgs)	(55-72)	(51-44)	(13-15)	(47-49)	(86-88)	(80-82)	(32-33.5)	(24-25.5)	(20.5-22)	(66-68)
Well Characterization	FAPS Compliance	FAPS Compliance	Background	Background	Background	BAP Compliance	BAP Compliance	BAP Compliance	BAP Compliance	BAP Compliance
Sampled Aquifer Unit	UA	UA	PMP	UA	UA	UA	PMP	PMP	PMP	UA
Field Boring Log Description	Limestone	Shale	Silty clay	Shallow shale	Deeper shale body	Shale transitioning to limestone	Clay with increasing sand content	Clayey sand	Silty sand	Shale
CEC (meq/100 g solid)	164.7	149.37	-	43.59	24.23	38.72	-	-	-	38.34
LOI (%)	40.5	33.2	5.47	9.79	9.74	21.6	6.15	3.82	5.09	13.8
TOC (%)	-	-	-	0.16	0.47	1.4	-	-	-	0.18

Notes
Sample depth is shown in feet below ground surface (ft bgs)
Dashes indicate sample was not analyzed for analyte
BAP: Bottom Ash Pond
CEC: cation exchange capacity
FAPS: Fly Ash Pond System
meq/100 g solid: milliequivalents per 100 grams solids
LOI: loss on ignition
PMP: potential migration pathway
TOC: total organic carbon
UA: uppermost aquifer

Table 2. Bulk Characterization of Site Solids
Geochemical Conceptual Site Model
Baldwin Power Plant - Fly Ash Pond System

Well ID	MW-150	MW-150	MW-350	MW-350	MW-350	MW-352	MW-352	MW-366	MW-391	MW-391	MW-391	MW-358	MW-358	MW-392	MW-392
Depth (ft bgs)	(15-20)	(20-25)	(35-40)	(42-46)	(42-46)	(50-60)	(60-70)	(40-52)	(50-51)	(51-55)	(55-72)	(47-49)	(86-88)	(80-82)	(66-68)
Well Characterization	FAPS Compliance	FAPS Compliance	FAPS Compliance	FAPS Compliance	FAPS Compliance	FAPS Compliance	FAPS Compliance	FAPS Compliance	FAPS Compliance	FAPS Compliance	FAPS Compliance	Background	Background	BAP Compliance	BAP Compliance
Sampled Aquifer Unit	PMP	PMP	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA
Field Boring Log Description	Sandy clay	Sandy clay	Shale	Limestone	Limestone	Shale	Shale	Shale	Weathered shale	Shale	Limestone	Shallow shale	Deeper shale body	Shale transitioning to limestone	Shale
Analyte	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Aluminum	42000	66000	56000	5900	5900	36000	16000	81000	61000	21000	4800	-	-	-	-
Antimony	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	-	-	-	-
Arsenic	4.3	11.0	6.1	1.9	1.6	5.3	7.5	4.9	8.8	4.0	3.2	2.1	11.0	17.0	1.0
Barium	500.0	560.0	150.0	59.0	46.0	73.0	45.0	180.0	160.0	64.0	19.0	140	45	40	21
Beryllium	1.1	1.9	1.6	0.2	0.3	1.0	0.5	2.3	2.1	0.6	0.2	0.9	0.7	0.9	0.7
Bismuth	0.1	0.2	0.2	< 0.09	< 0.09	0.1	< 0.09	0.3	0.2	< 0.09	< 0.09	-	-	-	-
Boron	-	-	-	-	-	-	-	-	-	-	-	11	16	16	13
Cadmium	0.2	0.3	0.3	0.3	0.4	0.1	0.9	0.6	0.1	0.2	0.7	< 0.02	< 0.02	0.4	0.1
Calcium	32000	57000	120000	320000	340000	190000	220000	95000	92000	260000	340000	-	-	-	-
Chromium	47.0	74.0	70.0	13.0	14.0	46.0	42.0	110.0	78.0	30.0	11.0	9.5	12	17	16.0
Cobalt	7.7	13.0	8.6	1.3	1.3	4.2	2.5	6.2	9.9	4.6	1.6	4.4	23	12	6.2
Copper	11.0	25.0	8.9	2.9	2.2	4.2	3.9	10.0	13.0	3.6	1.7	-	-	-	-
Iron	19000	38000	22000	5500	5300	16000	11000	23000	23000	12000	5600	-	-	-	-
Lead	13.0	17.0	10.0	3.0	3.0	6.0	5.0	17.0	20.0	7.0	4.0	5.7	9.6	17.0	4.9
Lithium	19.0	44.0	31.0	4.8	4.7	14.0	16.0	37.0	16.0	7.4	3.6	6.0	20.0	8.0	15.0
Magnesium	15000	21000	22000	4600	4600	16000	24000	12000	10000	5700	4500	-	-	-	-
Manganese	770	830	190	270	270	330	200	220	370	1200	590	-	-	-	-
Mercury	-	-	-	-	-	-	-	-	-	-	-	< 0.05	< 0.05	< 0.05	< 0.05
Molybdenum	1.2	1.7	0.8	0.6	0.5	0.5	2.2	0.7	0.5	0.3	1.0	0.3	0.3	0.3	0.3
Nickel	20.0	38.0	32.0	4.9	4.7	17.0	16.0	26.0	36.0	19.0	8.0	-	-	-	-
Potassium	17000	22000	13000	2100	1900	7900	3900	21000	18000	4700	1200	-	-	-	-
Selenium	0.2	0.6	0.9	0.2	0.2	0.4	0.8	2.7	1.6	0.3	0.5	< 0.7	< 0.7	1.4	< 0.7
Silver	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	-	-	-	-
Strontium	150	170	390	470	510	360	460	320	230	410	530	-	-	-	-
Sulfate	-	-	-	-	-	-	-	-	-	-	-	50	620	280	100
Thallium	0.4	0.6	0.4	0.1	0.1	0.2	0.2	0.5	0.4	0.1	0.0	0.1	0.1	0.0	0.0
Tin	< 6	6.5	6.9	< 6	< 6	6.2	< 6	7.5	6.8	< 6	< 6	-	-	-	-
Titanium	1900	3000	2300	310	310	1400	760	3500	2500	910	210	-	-	-	-
Uranium	1.7	2.5	3.2	1.1	1.0	1.9	2.4	3.7	2.9	1.2	2.1	-	-	-	-
Vanadium	57	110	70	14.0	14	45	29	150	68	28	9.4	-	-	-	-
Yttrium	13	20	14	8.8	8.7	8.9	9.3	19	32	11	7.6	-	-	-	-
Zinc	43	87	74	36	42	30	83	68	49	34	87	-	-	-	-

Notes:
Sample depth is shown in feet below ground surface (ft bgs)
Dashes indicate analyte was not reported by lab for sample
Non-detect values are shown as less than the reporting limit
BAP: Bottom Ash Pond
FAPS: Fly Ash Pond System
mg/kg: milligrams per kilogram
PMP: potential migration pathway
UA: uppermost aquifer

Table 3. XRF Analysis of Site Solids
Geochemical Conceptual Site Model
Baldwin Power Plant - Fly Ash Pond System

Well ID	MW-150	MW-150	MW-350	MW-350	MW-350	MW-352	MW-352	MW-366	MW-391	MW-391	MW-391	REP MW-391
Depth (ft bgs)	(15-20)	(20-25)	(35-40)	(42-46)	(42-46)	(50-60)	(60-70)	(40-52)	(50-51)	(44-51)	(55-72)	(50-51)
Well	FAPS	FAPS	FAPS	FAPS	FAPS	FAPS	FAPS	FAPS	FAPS	FAPS	FAPS	FAPS
Sampled Aquifer Unit	PMP	PMP	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA
Field Boring Log Description	Sandy clay	Sandy clay	Shale	Limestone	Limestone	Shale	Shale	Shale	Weathered shale	Shale	Limestone	Weathered shale
Analyte	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)
Al_2O_3	8.09	11.67	10.58	1.20	1.15	7.21	3.37	14.89	12.44	4.29	1.02	12.50
CaO	4.75	7.90	17.23	45.90	46.26	29.29	32.08	13.30	14.05	37.45	49.44	14.14
Cr_2O_3	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.01	<0.01	<0.01	<0.01
Fe_2O_3	2.75	5.03	3.18	0.77	0.70	2.30	1.57	3.17	3.44	1.70	0.83	3.46
K_2O	2.01	2.47	1.52	0.24	0.22	0.99	0.49	2.35	2.29	0.60	0.16	2.30
MgO	2.53	3.41	3.80	0.80	0.77	2.91	4.21	2.01	1.84	1.05	0.80	1.85
MnO/Mn_3O_4	0.12	0.11	0.02	0.03	0.03	0.05	0.03	0.03	0.06	0.18	0.09	0.05
Na_2O	1.09	0.73	0.19	0.12	0.09	0.15	0.20	0.68	0.19	0.07	0.04	0.19
P_2O_5	0.10	0.13	0.10	0.06	0.05	0.05	0.09	0.22	0.52	0.11	0.12	0.48
SiO_2	69.69	52.27	37.06	13.62	13.06	26.00	25.84	41.40	44.24	21.26	6.70	44.33
TiO_2	0.46	0.57	0.42	0.05	0.05	0.26	0.14	0.58	0.54	0.17	0.04	0.53
V_2O_5	0.01	0.02	0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.02	<0.01	<0.01	0.01

Well ID	MW-358	MW-358	MW-358	MW-392	MW-392	MW-393	MW-394	MW-392
Depth (ft bgs)	(13-15)	(47-49)	(86-88)	(80-82)	(32-33.5)	(24-25.5)	(20.5-22)	(66-68)
Well Characterization	Background	Background	Background	BAP Compliance	BAP Compliance	BAP Compliance	BAP Compliance	BAP Compliance
Sampled Aquifer	PMP	UA	UA	UA	PMP	PMP	PMP	UA
Field Boring Log Description	Silty clay	Shallow shale	Deeper shale body	Shale transitioning to limestone	Clay with increasing sand content	Clayey sand	Silty sand	Shale
Analyte	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)
Al_2O_3	10.60	17.20	19.20	8.17	10.70	8.70	11.00	15.30
CaO	0.73	0.57	0.50	25.40	1.35	0.55	0.92	6.38
Cr_2O_3	< 0.01	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fe_2O_3	3.72	7.01	4.34	2.76	4.54	3.27	4.46	7.66
K_2O	1.87	3.38	2.79	1.02	2.00	2.16	2.14	2.87
MgO	0.67	1.99	1.90	1.58	1.20	0.55	0.85	2.46
MnO/Mn_3O_4	0.07	< 0.01	< 0.01	0.04	0.11	0.09	0.09	0.03
Na_2O	1.04	0.83	0.77	0.40	0.87	0.94	1.27	0.29
P_2O_5	0.08	0.10	0.10	3.84	0.10	0.08	0.17	0.08
SiO_2	75.20	58.30	59.60	33.60	72.30	79.70	73.00	50.70
TiO_2	0.73	0.72	0.82	0.29	0.67	0.50	0.75	0.58
V_2O_5	0.02	0.02	0.02	0.02	0.01	< 0.01	0.01	0.02

Notes
Sample depth is shown in feet below ground surface (ft bgs).
Non-detect values are shown as less than the reporting limit.
Results are not normalized to 100%, with some portion of sample mass uncharacterized.
Analytes are presented as the respective oxide species of the element of interest, consistent with the sample processing prior to analysis.
Mn reported as MnO for Bottom Ash Pond (BAP) Compliance and Background samples and Mn_3O_4 for Fly Ash Pond System (FAPS) Compliance samples.
PMP: potential migration pathway
UA: uppermost aquifer
wt %: percentage by weight

Table 4. Boron and Iron Characterization of SEP Fraction of Site Solids
Geochemical Conceptual Site Model
Baldwin Power Plant - Fly Ash Pond System

Well ID			MW-358		MW-358		MW-358		MW-392		MW-392		MW-393		MW-394		MW-392	
Depth (ft bgs)			(13-15)		(47-49)		(86-88)		(80-82)		(32-33.5)		(24-25.5)		(20.5-22)		(66-68)	
Well Characterization			Background		Background		Background		BAP Compliance		BAP Compliance		BAP Compliance		BAP Compliance		BAP Compliance	
Sampled Aquifer Unit			PMP		UA		UA		UA		PMP		PMP		PMP		UA	
Field Boring Log Description			Silty clay		Shallow shale		Deeper shale body		Shale transitioning to limestone		Clay with increasing sand content		Clayey sand		Silty sand		Shale	
Fraction	**Reagent**	**Boron SEP**	µg/g	% of Total	µg/g	% of Total	µg/g	% of Total	µg/g	% of Total	µg/g	% of Total	µg/g	% of Total	µg/g	% of Total	µg/g	% of Total
1	Deionized Water	Water Soluble Fraction	< 1	-	8	10.4	10	11.9	3	7.3	< 1	-	< 1	-	< 1	-	5	7.2
2	$MgCl_2$	Exchangeable Metals Fraction	< 1	-	< 1	-	1	1.2	< 1	-	< 1	-	< 1	-	< 1	-	2	2.9
3	Sodium acetate, acetic acid	Metals Bound to Carbonates Fraction	< 1	-	2	2.6	3	3.6	4	9.8	< 1	-	< 1	-	< 1	-	3	4.3
4	Hydroxylamine HCl and acetic acid	Metals Bound to Fe and Mn Oxides Fraction	< 1	-	5	6.5	6	7.1	6	14.6	< 1	-	< 1	-	< 1	-	4	5.8
5	HNO_3, H_2O_2, and ammonium acetate	Bound to Organic Material Fraction	< 1	-	2	2.6	2	2.4	2	4.9	< 1	-	< 1	-	< 1	-	2	2.9
6	HNO_3, HCl, and HF	Residual Metals Fraction	13	100	60	77.9	62	73.8	26	63.4	21	100	15	100	16	100	53	76.8
SEP Total			13	-	77	-	84	-	41	-	21	-	15	-	16	-	69	-
Fraction	**Reagent**	**Iron SEP**	µg/g	% of Total	µg/g	% of Total	µg/g	% of Total	µg/g	% of Total	µg/g	% of Total	µg/g	% of Total	µg/g	% of Total	µg/g	% of Total
1	Deionized Water	Water Soluble Fraction	17	0.1	240	0.5	190	0.8	< 1	-	27	0.09	14	0.07	20	0.07	28	0.06
2	$MgCl_2$	Exchangeable Metals Fraction	2	0.01	21	0.05	< 1	-	12	0.1	8	0.03	9	0.04	8	0.03	10	0.02
3	Sodium acetate, acetic acid	Metals Bound to Carbonates Fraction	40	0.2	45	0.1	42	0.2	25	0.2	9	0.03	14	0.07	10	0.04	300	0.6
4	Hydroxylamine HCl and acetic acid	Metals Bound to Fe and Mn Oxides Fraction	1600	6.7	1600	3.6	1200	4.8	1800	11.2	1100	3.8	1500	7.3	1200	4.2	2700	5.8
5	HNO_3, H_2O_2, and ammonium acetate	Bound to Organic Material Fraction	150	0.6	610	1.4	1800	7.1	220	1.4	83	0.3	93	0.5	120	0.4	680	1.5
6	HNO_3, HCl, and HF	Residual Metals Fraction	22000	92.4	42000	94.3	22000	87.2	14000	87.2	28000	95.8	19000	92.1	27000	95.2	43000	92.0
SEP Total			23809	-	44516	-	25232	-	16057	-	29227	-	20630	-	28358	-	46718	-

Notes
Sample depth is shown in feet below ground surface (ft bgs).
Non-detect values are shown as less than the reporting limit.
µg/g: micrograms per gram
BAP: Bottom Ash Pond
PMP: potential migration pathway
UA: uppermost aquifer

Table 5a. XRD Analysis of PMP Solids
Geochemical Conceptual Site Model
Baldwin Power Plant - Fly Ash Pond System

Well ID			MW-150	MW-150	MW-358	MW-392	MW-393	MW-394
Depth (ft bgs)			(15-20)	(20-25)	(13-15)	(32-33.5)	(24-25.5)	(20.5-22)
Well Characterization			FAPS Compliance	FAPS Compliance	Background	BAP Compliance	BAP Compliance	BAP Compliance
Sampled Aquifer Unit			PMP	PMP	PMP	PMP	PMP	PMP
Field Boring Log Description			Sandy clay	Sandy clay	Silty clay	Clay with increasing sand content	Clayey sand	Silty sand
Mineral/Compound	**Formula**	**Mineral Type**	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)
Quartz	SiO_2	Silicate	53.5	32.4	52.7	52.1	64.1	55.4
Albite	$NaAlSi_3O_8$	Feldspar	11.3	9.0	12.3	9.1	6.4	12.8
Microcline	$KAlSi_3O_8$	Feldspar	8.0	9.7	7.3	6.5	10.1	7.3
Dolomite	$CaMg(CO_3)_2$	Carbonate	9.4	11.2	-	-	-	-
Calcite	$CaCO_3$	Carbonate	2.9	9.5	-	0.0	0.0	0.2
Ankerite	$CaFe(CO_3)_2$	Carbonate	-	-	-	1.4	0.9	0.5
Actinolite	Ca2(Mg,Fe)5Si8O22(OH)2	Amphibole	2.0	0.5	-	-	-	-
Magnetite	Fe_3O_4	Oxide	0.3	0.5	0.9	0.1	0.0	0.1
Hematite	Fe_2O_3	Oxide	-	-	-	-	-	-
Anatase	TiO_2	Oxide	-	-	0.2	0.6	0.3	0.3
Diaspore	aAlO.OH	Oxide	-	-	0.3	-	0.2	0.5
Fluorapatite	$Ca_5(PO_4)_3F$	Phosphate	-	-	-	0.3	-	0.2
Muscovite	$KAl_2(AlSi_3O_{10})(OH)_2$	Mica	2.0	9.1	7.7	9.0	5.5	7.6
Clay Minerals								
Chlorite	$(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$	Sheet silicate	-	0.7	-	-	-	-
Chlorite IIb	$(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$	Sheet silicate	-	-	2.6	5.8	1.2	3.1
Montmorillonite	$(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2 \cdot 10H_2O$	Clay	5.5	9.0	-	-	-	-
Montmorillonite-12A	$(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2 \cdot 10H_2O$	Clay	-	-	4.9	-	-	-
Montmorillonite-14A	$(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2 \cdot 10H_2O$	Clay	-	-	-	3.3	3.5	3.6
Illite	$(K,H_3O)(Al,Mg,Fe)_2(Si,Al)_4O_{10}[(OH)_2,(H_2O)]$	Clay	4.0	6.8	5.0	0.7	1.0	0.6
Illite-Montmorillonite - 11A	$KAl_4(Si,Al)_8O_{10}(OH)_4 \cdot 4H_2O$	Clay	-	-	-	2.7	2.1	3.0
Kaolinite	$Al_2Si_2O_5(OH)_4$	Clay	1.0	1.5	5.3	6.8	3.2	4.2
Nontronite	$Fe_2(Al,Si)_4O_{10}(OH)_2Na_{0.3}(H_2O)_4$	Clay	-	-	0.6	1.6	1.4	0.5
Clay Minerals Total			10.4	17.3	15.9	15.0	11.1	12.0
Clays + Muscovite Total			12.4	27.1	26.2	29.8	17.9	22.6

Notes
Dashes indicate mineral was not identified by lab
Sample depth is shown in feet below ground surface (ft bgs).
The weight percent quantities indicated have been normalized to a sum of 100% using only minerals included in the refinement.
BAP: Bottom Ash Pond
FAPS: Fly Ash Pond System
ft bgs: feet below ground surface
PMP: potential migration pathway
wt %: percentage by weight

Table 5b. XRD Analysis of UA Solids
Geochemical Conceptual Site Model
Baldwin Power Plant - Fly Ash Pond System

Well ID			MW-350	MW-350	MW-350	MW-352	MW-352	MW-366	MW-391	MW-391	MW-391	MW-358	MW-358	MW-392	MW-392
Depth (ft bgs)			(35-40)	(42-46)	(42-46)	(50-60)	(60-70)	(40-52)	(50-51)	(51-55)	(55-72)	(47-49)	(86-88)	(80-82)	(66-68)
Well Characterization			FAPS Compliance	FAPS Compliance	FAPS Compliance	FAPS Compliance	FAPS Compliance	FAPS Compliance	FAPS Compliance	FAPS Compliance	FAPS Compliance	Background	Background	BAP Compliance	BAP Compliance
Sampled Aquifer Unit			UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA
Field Boring Log Description			Shale	Limestone	Limestone	Shale	Shale	Shale	Weathered shale	Shale	Limestone	Shallow shale	Deeper shale body	Shale transitioning to limestone	Shale
Mineral/Compound	**Formula**	**Mineral Type**	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)
Quartz	SiO_2	Silicate	17.7	10.4	10.7	11.2	19.4	14.2	24.2	13.1	5.2	29.2	30.7	29.8	22.7
Dolomite	$CaMg(CO_3)_2$	Carbonate	4.4	0.8	0.4	3.5	6.2	0.3	-	-	-	-	-	-	-
Calcite	$CaCO_3$	Carbonate	27.2	80.5	84.6	57.2	49.5	33.9	35.5	74.9	90.2	0.5	1.0	28.1	14.9
Ankerite	$CaFe(CO_3)_2$	Carbonate	7.3	0.4	0.2	4.7	10.0	1.6	-	0.0	0.4	-	-	-	0.8
Rhodochrosite	$MnCO_3$	Carbonate	0.7	-	-	-	-	-	-	-	-	-	-	-	-
Albite	$NaAlSi_3O_8$	Feldspar	2.5	0.4	0.6	0.2	0.2	1.8	2.2	0.4	0.0	0.4	2.5	0.6	0.6
Microcline	$KAlSi_3O_8$	Feldspar	4.6	2.1	0.5	2.1	1.3	5.3	3.2	1.9	0.3	8.6	5.9	1.0	5.1
Gypsum	$CaSO_4{\cdot}2H_2O$	Sulfate	1.9	-	-	-	-	-	-	-	-	-	-	-	-
Pyrite	FeS_2	Sulfide	1.6	-	-	0.6	0.8	1.3	0.2	0.1	0.3	-	-	-	-
Actinolite	$Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$	Amphibole	1.3	-	-	-	-	-	-	-	-	-	-	-	-
Magnetite	Fe_3O_4	Oxide	0.8	-	-	0.2	-	-	0.7	0.4	-	0.5	0.3	1.4	0.1
Hematite	Fe_2O_3	Oxide	0.4	-	-	0.2	0.4	-	-	-	-	-	-	-	-
Anatase	TiO_2	Oxide	0.6	-	-	-	-	0.6	0.5	0.5	-	0.8	1.8	0.8	1.0
Diaspore	aAlO.OH	Oxide	-	-	-	-	-	-	-	-	-	-	-	-	2.8
Fluorapatite	$Ca_5(PO_4)_3F$	Phosphate	-	-	-	-	-	-	-	-	-	-	-	2.7	0.2
Muscovite	$KAl_2(AlSi_3O_{10})(OH)_2$	Mica	11.8	1.9	1.4	6.4	4.3	12.9	17.6	5.3	2.0	18.8	19.7	13.1	15.9
Clay Minerals															
Montmorillonite	$(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2{\cdot}10H_2O$	Clay	10.5	2.1	0.2	7.8	2.6	14.0	-	2.2	0.9	-	-	-	-
Montmorillonite-12A	$(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2{\cdot}10H_2O$	Clay	-	-	-	-	-	-	-	-	-	6.8	4.8	-	5.8
Montmorillonite-14A	$(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2{\cdot}10H_2O$	Clay	-	-	-	-	-	-	-	-	-	-	-	3.5	-
Illite	$(K,H_3O)(Al,Mg,Fe)_2(Si,Al)_4O_{10}[(OH)_2,(H_2O)]$	Clay	3.2	0.9	0.6	3.2	2.6	6.1	7.9	1.2	0.9	15.0	9.2	4.1	10.4
Illite-Montmorillonite - 11A	$KAl_4(Si,Al)_8O_{10}(OH)_4{\cdot}4H_2O$	Clay	-	-	-	-	-	-	-	-	-	8.8	2.7	3.6	7.1
Illite-Montmorillonite	$KAl_4(Si,Al)_8O_{20}(OH)_4{\cdot}8H_2O$	Clay	-	-	-	-	-	-	8.0	-	-	-	-	-	-
Kaolinite	$Al_2Si_2O_5(OH)_4$	Clay	3.2	0.5	0.6	2.4	0.8	4.2	-	-	-	4.8	15.0	5.5	3.6
Nontronite	$Fe_2(Al,Si)_4O_{10}(OH)_2Na_{0.3}(H_2O)_4$	Clay	-	-	-	-	-	-	-	-	-	4.6	4.3	4.2	3.3
Chlorite	$(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$	Sheet silicate	0.2	0.0	0.2	0.2	1.8	3.7	-	-	-	-	-	-	-
Chlorite IIb	$(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$	Sheet silicate	-	-	-	-	-	-	-	-	-	1.3	2.0	1.6	6.1
Clay Minerals Total			17.1	3.5	1.6	13.6	7.8	28.0	15.9	3.4	1.8	41.2	38.1	22.5	36.1
Clays + Muscovite Total			28.9	5.5	3.0	20.0	12.2	40.9	33.5	8.7	3.8	60.0	57.8	35.6	19.6

Notes
Dashes indicate mineral was not identified by lab
Sample depth is shown in feet below ground surface (ft bgs).
The weight percent quantities indicated have been normalized to a sum of 100% using only minerals included in the refinement.
BAP: Bottom Ash Pond
FAPS: Fly Ash Pond System
ft bgs: feet below ground surface
UA: uppermost aquifer
wt %: percentage by weight

Table 6. FAPS Porewater Chemistry
Geochemical Conceptual Site Model
Baldwin Power Plant - Fly Ash Pond System

Location Name	Sample Date	pH (SU)	Total Sulfate (mg/L)	Dissolved Sulfate (mg/L)	Total Boron (mg/L)	Dissolved Boron (mg/L)	Total Iron (mg/L)	Dissolved Iron (mg/L)	Total Manganese (mg/L)	Dissolved Manganese (mg/L)
TPZ-163	**2013/09/17**	9.7	750	-	39.7	-	7.86	-	0.13	-
	2013/11/20	8.8	-	626	-	37.2	-	< 0.02	-	< 0.005
	2014/02/18	7.6	-	610	-	37.8	-	< 0.02	-	< 0.005
	2014/06/12	9.5	-	495	-	36.3	-	< 0.02	-	< 0.005
TPZ-167	**2013/09/17**	9.9	1740	-	64.4	-	0.57	-	0.01	-
	2013/11/20	8.2	-	1850	-	53	-	< 0.02	-	< 0.005
	2014/02/18	7.7	-	1840	-	54.5	-	< 0.02	-	< 0.005
	2014/06/11	10	-	1650	-	60	-	< 0.02	-	< 0.005
TPZ-168	**2013/09/17**	10.8	2630	-	102	-	90.6	-	1.58	-
	2013/11/20	9.2	-	2760	-	87.2	-	< 0.02	-	< 0.005
	2014/02/18	8.1	-	2820	-	78.8	-	0.06	-	< 0.005
	2014/06/11	11.9	-	2240	-	94.7	-	0.055	-	< 0.005
Sump 12	**2020/05/15**	11.8	1840	-	60.3	-	0.96	< 0.025	0.0104	< 0.002
Sump 13	**2020/05/15**	9.0	84	-	0.663	-	10.9	< 0.025	0.054	< 0.002
Sump 15	**2020/05/15**	8.2	1080	-	10.6	-	0.5	< 0.025	1.82	1.7

Notes
SU: standard units
mg/L: milligrams per liter
- : Analyte not included in analyses for sampling date

Table 7. Eh-pH Diagram Inputs
Geochemical Conceptual Site Model
Baldwin Power Plant - Fly Ash Pond System

Well ID		MW-391	MW-150
Sample Date		5/17/2023	5/18/2023
Aquifer Unit		UA	PMP
Input Parameter	Unit		
Temperature	°C	15.6	13.6
pH	SU	7.78	7.06
Calcium	mg/L	18.7	223
Chloride	mg/L	170	56
Bicarbonate Alkalinity	mg/L	728	336
Magnesium	mg/L	6.6	173
Sodium	mg/L	767	121
Potassium	mg/L	3.96	0.893
Sulfate	mg/L	430	970
Total Manganese	mg/L	0.0348	0.0055
Total Iron	mg/L	1.88	0.038

Notes
°C - degrees Celsius
mg/L - milligrams per liter
PMP - potential migration pathway
SU - standard units
UA - uppermost aquifer

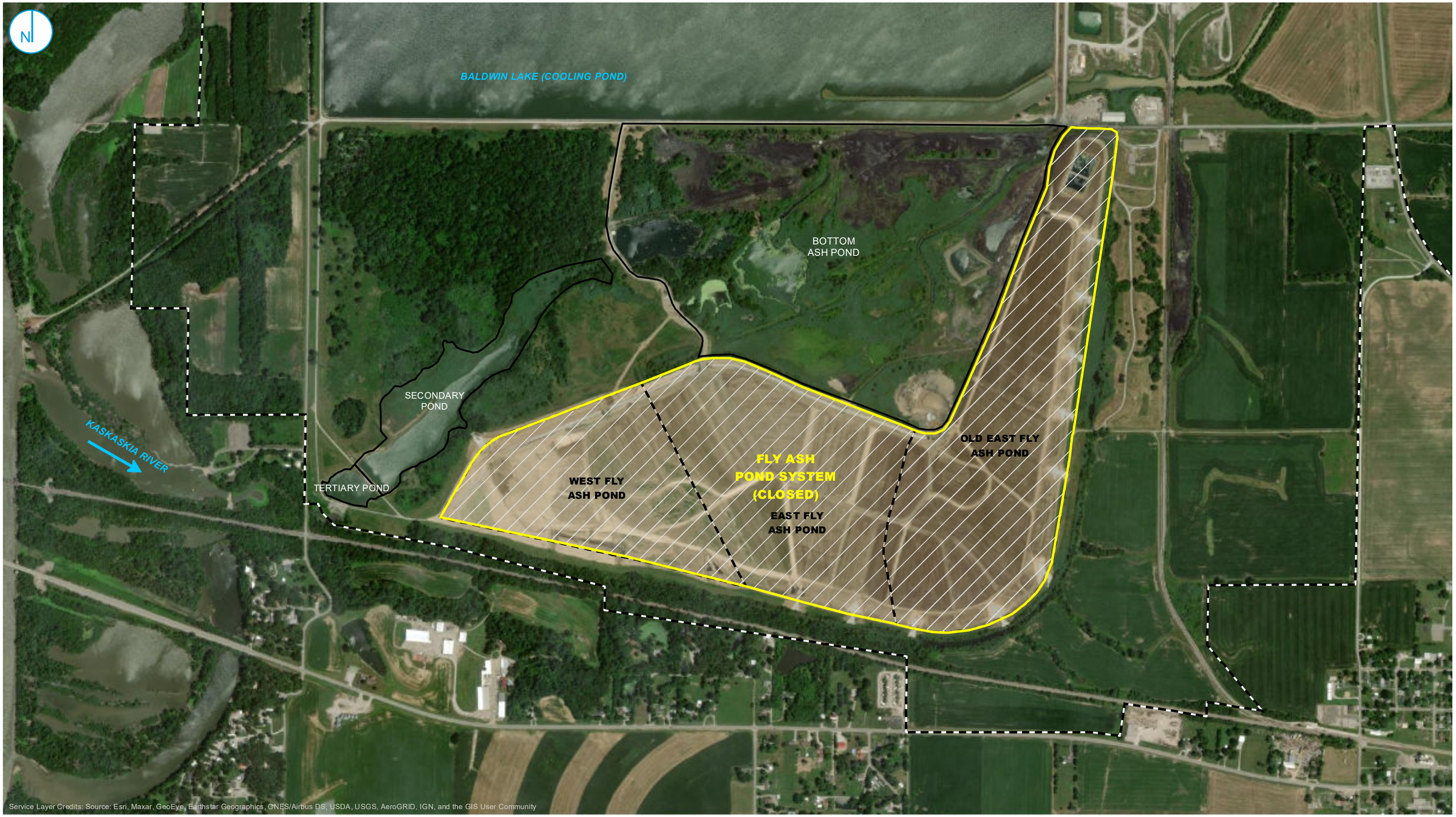
Table 8. Total and Dissolved Aqueous Iron and Manganese Results
Geochemical Conceptual Site Model
Baldwin Power Plant - Fly Ash Pond System *Geosyntec Consultants, Inc.*

Well ID	Sampled Aquifer Unit	Date	Dissolved Iron	Total Iron	Dissolved Manganese	Total Manganese
			(mg/L)	(mg/L)	(mg/L)	(mg/L)
MW-150	PMP	5/18/2023	<0.02	0.038	0.0038	0.0055
		8/7/2023	0.0666	0.166	0.0025	0.0028
		11/3/2023	0.0728	0.157	0.0025	0.0088
MW-151	PMP	5/18/2023	<0.02	25.2	0.0151	0.805
		8/7/2023	<0.0115	4.81	0.0177	0.118
		10/31/2023	0.013	5.55	0.0133	0.237
MW-152	PMP	5/18/2023	<0.02	1.35	0.0073	0.0506
		8/4/2023	<0.025	3.04	0.0176	0.114
		10/31/2023	<0.0115	7.75	0.0244	0.247
MW-153	PMP	5/22/2023	<0.02	10.6	<0.0025	0.089
		8/4/2023	<0.0115	0.089	0.0041	0.0068
		11/3/2023	<0.0115	0.243	0.0032	0.0114
MW-252	PMP	5/18/2023	0.0499	1.28	0.396	0.502
		8/4/2023	0.562	3.08	0.293	0.323
		10/31/2023	0.619	1.99	0.303	0.351
MW-304	UA	5/22/2023	<0.02	<0.02	<0.0025	<0.0025
		8/3/2023	<0.0115	0.014	0.0014	0.0032
		11/1/2023	<0.0115	<0.0115	0.002	0.0044
MW-352	UA	5/18/2023	0.164	0.356	0.0152	0.0179
		8/4/2023	0.482	0.307	0.0334	0.0112
		10/31/2023	0.392	0.459	0.0423	0.0162
MW-358	UA	5/19/2023	0.242	0.685	0.182	0.225
		8/7/2023	0.221	0.908	0.16	0.227
MW-366	UA	5/16/2023	<0.02	0.0649	0.0281	1.68
		8/4/2023	<0.025	0.023	0.0169	0.267
MW-375	UA	5/18/2023	<0.02	0.0854	<0.0025	0.0098
		8/7/2023	<0.0115	0.1	0.0013	0.0158
MW-377	UA	5/22/2023	0.024	0.07	0.011	0.016
		8/7/2023	<0.025	0.0371	0.0072	0.0125
MW-383	UA	5/22/2023	<0.02	0.0901	0.0269	0.0564
		8/3/2023	0.359	0.0471	0.0382	0.0333
MW-384	UA	5/22/2023	<0.02	0.824	0.0031	0.0088
		8/3/2023	0.0115	0.117	0.0066	0.018
MW-390	UA	5/17/2023	<0.02	0.126	0.364	0.709
		8/4/2023	<0.025	0.0631	0.681	0.088
MW-391	UA	5/17/2023	<0.02	1.88	0.007	0.0348
		8/4/2023	<0.023	0.219	0.0115	0.0102

Notes
Non-detect values are shown as less than the reporting limit.
mg/L: milligrams per liter
PMP: potential migration pathway
UA: uppermost aquifer

Attachment A
Site Layout Figure

Y:\Mapping\Projects\2212285Baldwin\MXD\GMP_Addendum\FAPS\Figure 1-2_Site Map.mxd



PROJECT: 169000XXXX | DATED: 10/15/2021 | DESIGNER: HOTCALD

REGULATED UNIT (SUBJECT UNIT) FLY ASH POND SYSTEM (CLOSED)

SITE FEATURE

LIMITS OF FINAL COVER

PROPERTY BOUNDARY

0 400 800 Feet

SITE MAP

35 I.A.C. § 845 GROUNDWATER MONITORING PLAN REVISION 1
FLY ASH POND SYSTEM

BALDWIN POWER PLANT
BALDWIN, ILLINOIS

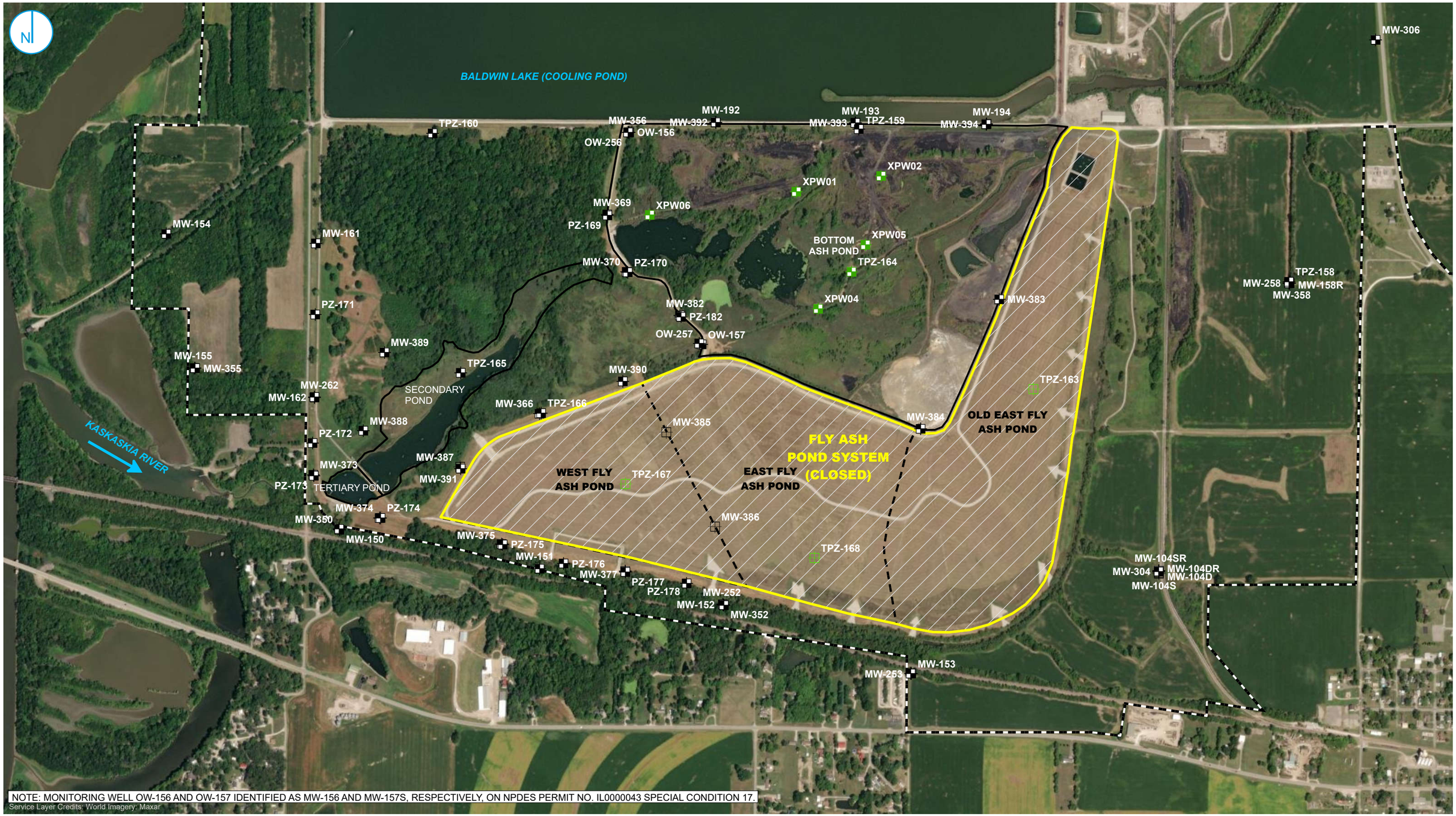
FIGURE 1-2

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL

Attachment B

Proposed Part 845 Groundwater Monitoring Network



NOTE: MONITORING WELL OW-156 AND OW-157 IDENTIFIED AS MW-156 AND MW-157S, RESPECTIVELY, ON NPDES PERMIT NO. IL0000043 SPECIAL CONDITION 17.

Service Layer Credits: World Imagery: Maxar

PROJECT: 169000XXXX | DATED: 7/18/2023 | DESIGNER: GALARNMC

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- MONITORING WELL AND PIEZOMETER LOCATION
- PORE WATER WELL
- CLOSED MONITORING WELL
- CLOSED PORE WATER WELL
- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- CAPPED AREA
- PROPERTY BOUNDARY

0 400 800 Feet

MONITORING WELL LOCATION MAP

35 I.A.C. § 845 GROUNDWATER MONITORING PLAN REVISION 1
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 2-1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

Attachment C
Monitoring Well Construction Information

Attachment C. Monitoring Well Construction Details
Geochemical Conceptual Site Model
Baldwin Fly Ash Pond System
Baldwin Power Plant
Baldwin, IL

Location	HSU	Date Constructed	Top of PVC Elevation (ft)	Measuring Point Elevation (ft)	Measuring Point Description	Ground Elevation (ft)	Screen Top Depth (ft bgs)	Screen Bottom Depth (ft bgs)	Screen Top Elevation (ft)	Screen Bottom Elevation (ft)	Well Depth (ft bgs)	Bottom of Boring Elevation (ft)	Screen Length (ft)	Screen Diameter (inches)	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
MW-150	PMP	2010-09-01	396.5	396.7	Top of PVC	393.8	15	24.7	378.8	369.2	25.2	368.7	9.6	2	38.189401	-89.878468
MW-151	PMP	2010-09-01	400.0	400.1	Top of PVC	397.2	6.1	15.8	391.1	381.4	16.3	380.9	9.6	2	38.188449	-89.872354
MW-152	PMP	2010-09-01	425.0	425.2	Top of PVC	422.2	7.5	16.7	414.7	405.5	17.2	405.0	9.3	2	38.187569	-89.866764
MW-153	PMP	2010-09-01	445.7	445.8	Top of PVC	442.8	10.4	20	432.4	422.8	20.5	422.3	9.6	2	38.185884	-89.86101
MW-252	PMP	2010-09-01	425.1	425.2	Top of PVC	422.3	44.4	49	377.9	373.2	49.5	372.7	4.6	2	38.187563	-89.866745
MW-253	PMP	2010-09-01	445.8	446.0	Top of PVC	442.7	29.9	34.5	412.8	408.2	35	407.7	4.6	2	38.185885	-89.861026
MW-304	UA	2015-10-20	455.5	455.4	Top of PVC	453.0	45	55	408.0	398.0	55	317.6	10	2	38.188332	-89.853441
MW-350	UA	2010-09-01	396.8	397.0	Top of PVC	394.1	41.6	46.2	352.5	347.9	46.6	347.4	4.6	2	38.189416	-89.878477
MW-352	UA	2010-09-01	425.0	425.2	Top of PVC	422.4	67.9	72.5	354.5	349.8	73	348.6	4.6	2	38.187554	-89.866729
MW-358	UA	2022-10-08	455.7	455.9	Top of PVC	453.6	80	90	373.7	363.7	90	363.6	10	2	38.195275	-89.849417
MW-366	UA	2015-12-04	425.1	425.2	Top of PVC	422.5	42	52	380.5	370.5	52	368.2	10	2	38.192191	-89.872345
MW-375	UA	2015-11-06	423.1	423.2	Top of PVC	420.5	57	67	363.5	353.5	67	335.8	10	2	38.189045	-89.873514
MW-377	UA	2015-11-02	421.4	421.5	Top of PVC	418.8	46	56	372.8	362.8	56	360.5	10	2	38.188386	-89.869742
MW-383	UA	2015-12-21	459.5	459.7	Top of PVC	457.2	58	68	399.2	389.2	68	384.2	10	2	38.194913	-89.858286
MW-384	UA	2015-12-18	458.9	459.1	Top of PVC	456.7	60.5	70.5	396.2	386.2	70.5	362.6	10	2	38.191789	-89.860699
MW-390	UA	2016-03-04	428.1	427.8	Top of PVC	426.0	50	65	376.0	361.0	65	358.0	15	2	38.192956	-89.869793
MW-391	UA	2016-03-10	426.6	426.8	Top of PVC	424.2	55	70	369.2	354.2	70	349.8	15	2	38.190869	-89.874759

Notes:
All elevation data are presented relative to the North American Vertical Datum 1988 (NAVD88), GEOID 12A
bgs = below ground surface
ft = foot or feet
HSU = Hydrostratigraphic Unit
UA = Uppermost Aquifer
PMP = Potential Migration Pathway
PVC = polyvinyl chloride

Attachment D
Boring Logs

KELRON ENVIRONMENTAL
INCORPORATED

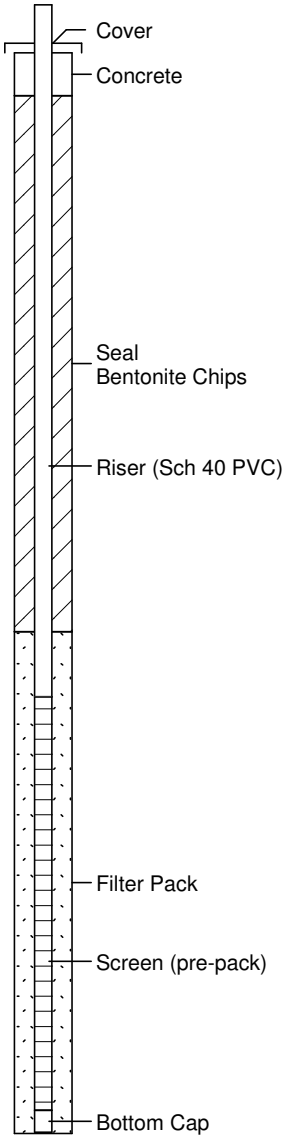
LOG OF BORING MW-150

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NW, NE

Date Completed	: 09/08/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD; 4 1/4" ID	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem (CME-550)	Land Surface Elevation	: 393.84
Sampling Method	: MacroCore (60")	Top of Casing Elevation	396.54
Drilling Company	: Terra Drill, Inc.	X,Y Coordinates	: 2379413, 554563

Depth in Feet	DESCRIPTION	Surf. Elev. 393.84	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	Continous boring - no soil sampling conducted.						
	Refer to boring log for adjacent nested well MW-350 for a description of subsurface materials	393					
5		388					
10		383					
15		378					
20		373					
25	END BOREHOLE AT 25.2 FEET BLS	368					
30							

Well: MW-150
Elev.: 396.54



KELRON ENVIRONMENTAL
INCORPORATED

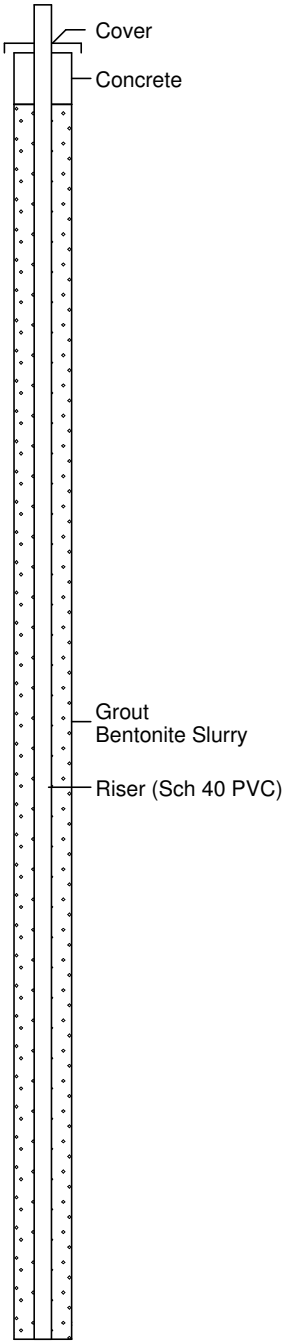
LOG OF BORING MW-350

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NW, NE

Date Completed	: 09/07/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID: 3 7/8" rock	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 394.11
Sampling Method	: MacroCore (60")/NX Core	Top of Casing Elevation	396.80
Drilling Company	: PSC	X,Y Coordinates	: 2379410, 554568

Depth in Feet	DESCRIPTION	Surf. Elev. 394.11	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	CLAY, very stiff to hard, brown, grayish-brown (10YR 5/2) mottled yellowish brown (10YR 5/8), dry	394	1	19/54	4.5	CH	
			2		2.25		
			3				
5	- grain size analysis @ 5 - 6 ft: 2.3% sand, 42.4% silt, 55.3% clay	389	4	47/60	4.5		
			5		3.5		
			6		3.25		
			7		4.0		
10		384	8	60/60	2.75		
	CLAY, brown to olive brown, moist		9		2.75	CL/CH	
	- grain size analysis @ 11 - 12 ft: 8.4% sand, 39.3% silt, 52.3% clay		10		2.75		
			11		1.75		
			12		2.0		
15		379					
	CLAY, soft, high plasticity, dark yellow brown, moist; 1-2" sand seams at 17' and 19'		13	45/60		CH	
	- grain size analysis @ 18 - 20 ft: 1.8% sand, 21.9% silt, 76.3% clay						
	- very stiff to hard, high plasticity						
20		374	14	60/60			
25			15	23/23			

Well: MW-350
Elev.: 396.80



KELRON ENVIRONMENTAL
INCORPORATED

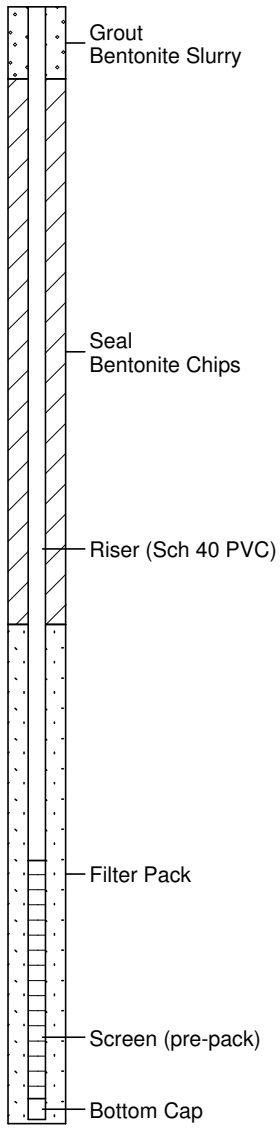
LOG OF BORING MW-350

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NW, NE

Date Completed	: 09/07/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID: 3 7/8" rock	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 394.11
Sampling Method	: MacroCore (60")/NX Core	Top of Casing Elevation	396.80
Drilling Company	: PSC	X,Y Coordinates	: 2379410, 554568

Well: MW-350
Elev.: 396.80

Depth in Feet	DESCRIPTION	Surf. Elev. 394.11	Samples	Recovery inches	Qp TSF	USCS
25	- Auger refusal at 26.4 feet bgs	369	15	23/23		CL
	LIMESTONE and SHALE, interbedded, banded, solid, very soft, light to dark gray; slightly weathered					LS/SH
	LIMESTONE, banded, medium bedded, solid, hard, medium gray; unweathered					LS
	LIMESTONE and SHALE, interbedded; limestone is banded, medium bedded, hard, medium gray; shale is very soft to medium soft, dark gray					
30	Borehole diameter from 26.4 to 46.7 feet bgs = 3 7/8"	364	16	116/120		LS/SH
	RQD for 26.4 - 36.4' = 72% (Fair) Recovery = 116/120"					
35	SHALE, banded, medium bedded, solid, soft to medium soft, dark gray	359				SH
40	LIMESTONE, banded, massive, solid, hard to very hard, light to medium gray	354	17	118/120		LS
45	RQD for 36.4 - 46.4' = 96% (Excellent) Recovery = 118/120"	349				
	END BOREHOLE AT 46.7 FEET BLS					
50						



KELRON ENVIRONMENTAL
INCORPORATED

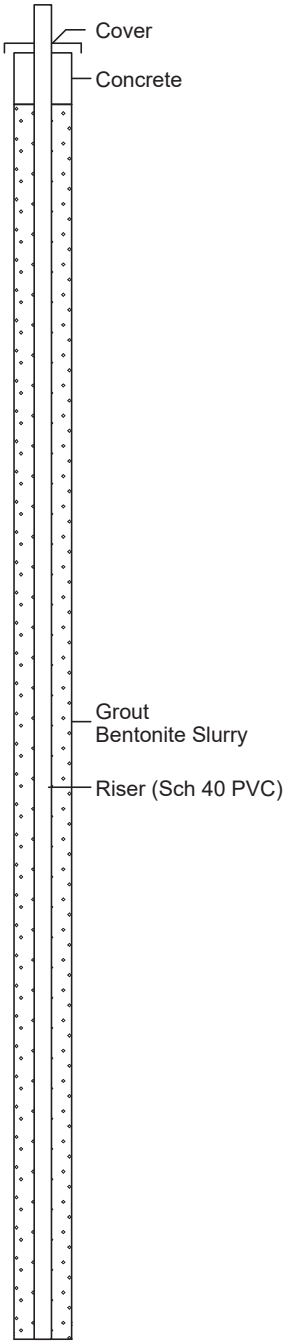
LOG OF BORING MW-350

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NW, NE

Date Completed	: 09/07/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID: 3 7/8" rock	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 394.11
Sampling Method	: MacroCore (60")/NX Core	Top of Casing Elevation	396.80
Drilling Company	: PSC	X,Y Coordinates	: 2379410, 554568

Depth in Feet	DESCRIPTION	Surf. Elev. 394.11	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	CLAY, very stiff to hard, brown, grayish-brown (10YR 5/2) mottled yellowish brown (10YR 5/8), dry	394	1	19/54	4.5	CH	
			2		2.25		
			3				
5	- grain size analysis @ 5 - 6 ft: 2.3% sand, 42.4% silt, 55.3% clay	389	4	47/60	4.5		
			5		3.5		
			6		3.25		
			7		4.0		
10		384	8	60/60	2.75		
	CLAY, brown to olive brown, moist		9		2.75	CL/CH	
	- grain size analysis @ 11 - 12 ft: 8.4% sand, 39.3% silt, 52.3% clay		10		2.75		
			11		1.75		
			12		2.0		
15		379					
	CLAY, soft, high plasticity, dark yellow brown, moist; 1-2" sand seams at 17' and 19'		13	45/60		CH	
	- grain size analysis @ 18 - 20 ft: 1.8% sand, 21.9% silt, 76.3% clay						
	- very stiff to hard, high plasticity						
20		374	14	60/60			
25			15	23/23			

Well: MW-350
Elev.: 396.80



KELRON ENVIRONMENTAL
INCORPORATED

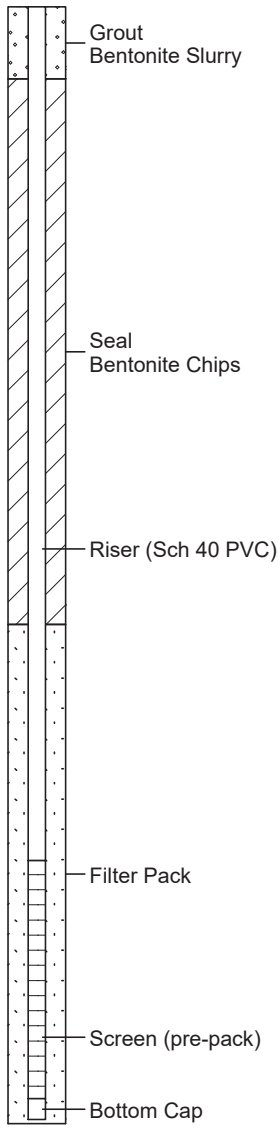
LOG OF BORING MW-350

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NW, NE

Date Completed	: 09/07/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID: 3 7/8" rock	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 394.11
Sampling Method	: MacroCore (60")/NX Core	Top of Casing Elevation	396.80
Drilling Company	: PSC	X,Y Coordinates	: 2379410, 554568

Well: MW-350
Elev.: 396.80

Depth in Feet	DESCRIPTION	Surf. Elev. 394.11	Samples	Recovery inches	Qp TSF	USCS
25	- Auger refusal at 26.4 feet bgs	369	15	23/23		CL
	LIMESTONE and SHALE, interbedded, banded, solid, very soft, light to dark gray; slightly weathered					LS/SH
	LIMESTONE, banded, medium bedded, solid, hard, medium gray; unweathered					LS
	LIMESTONE and SHALE, interbedded; limestone is banded, medium bedded, hard, medium gray; shale is very soft to medium soft, dark gray					
30	Borehole diameter from 26.4 to 46.7 feet bgs = 3 7/8"	364	16	116/120		LS/SH
	RQD for 26.4 - 36.4' = 72% (Fair) Recovery = 116/120"					
35	SHALE, banded, medium bedded, solid, soft to medium soft, dark gray	359				SH
40	LIMESTONE, banded, massive, solid, hard to very hard, light to medium gray	354	17	118/120		LS
45	RQD for 36.4 - 46.4' = 96% (Excellent) Recovery = 118/120"	349				
	END BOREHOLE AT 46.7 FEET BLS					
50						



KELRON ENVIRONMENTAL
INCORPORATED

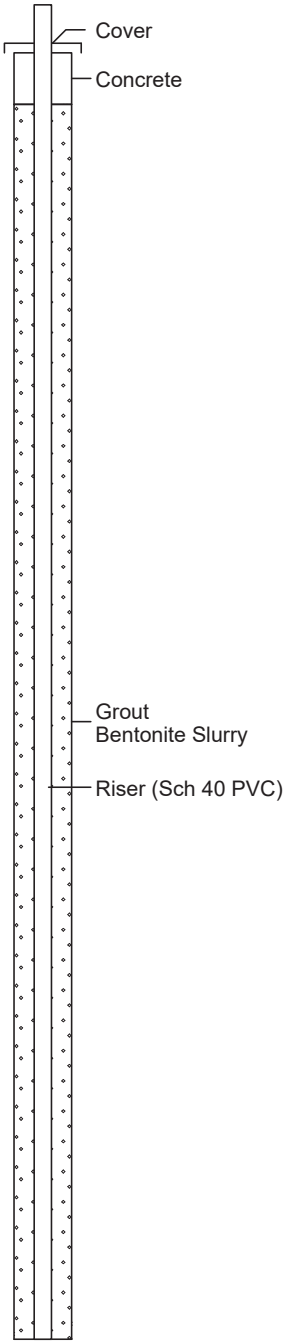
LOG OF BORING MW-352

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NE, NE

Date Completed	: 09/16/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID: 3 7/8" rock	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 422.36
Sampling Method	: MacroCore (60")/NX Core	Top of Casing Elevation	425.04
Drilling Company	: PSC	X,Y Coordinates	: 2382789, 553901

Depth in Feet	DESCRIPTION	Surf. Elev. 422.36	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	SILTY CLAY, very stiff to hard, yellow brown (10YR 5/6), dry	422	1	46/48	4.5+	CL	
			2	60/60	3.5		
5	CLAY, trace sand and fine gravel, very stiff, high plasticity, few black organic material	417	3		4.0	CL	
			4		2.75		
			5		3.0		
10	- medium hard	412	6	60/60	2.75		
	- soft		7		2.0		
			8		1.0		
			9		1.25		
15	- medium hard	407	10	60/60	1.5		
			11		2.5		
	SAND, poorly graded, loose, wet (4-inch thick)		12		2.75	SP	
	SANDY CLAY, trace fine gravel, yellow brown to olive brown (2.5Y 5/3)		13		3.5	CL	
20		402	14	60/60	4.5+		
			15		2.5		
			16		2.5		
			17		2.75		
25			18	48/60	2.5		

Well: MW-352
Elev.: 425.04



KELRON ENVIRONMENTAL
INCORPORATED

LOG OF BORING MW-352

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NE, NE

Date Completed	: 09/16/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID: 3 7/8" rock	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 422.36
Sampling Method	: MacroCore (60")/NX Core	Top of Casing Elevation	425.04
Drilling Company	: PSC	X,Y Coordinates	: 2382789, 553901

Well: MW-352
Elev.: 425.04

Depth in Feet	DESCRIPTION	Surf. Elev. 422.36	Samples	Recovery inches	Qp TSF	USCS
25		397				
	- grain size analysis @ 26.5 - 27.5 ft: 33.7% sand, 27.1% silt, 39.2% clay		18	48/60	2.5	CL
	SAND with few gravel, yellow brown					SP
	CLAY, some sand and fine gravel, hard to very hard, high plasticity, dark yellow brown (10YR 4/6)					CL
			19	60/60	3.0	
30	CLAY, lean to fat	392	20		3.0	CL/CH
	- grain size analysis @ 32 - 33 ft: 13.2% sand, 43.9% silt, 42.8% clay		21		3.5	
			22		3.0	
35		387	23	48/60	1.5	
	- medium hard, high plasticity, gray brown to light olive brown (2.5Y 5/2-5/3)		24		1.5	
	- trace silt, dark yellow brown (10YR 4/4)		25		1.75	
			26		1.5	
40		382	27	54/60	1.75	
			28		2.0	
			29		2.5	
			30		2.5	
			31	57/60	2.0	
45		377	32		1.75	
			33		1.75	
	CLAY, medium hard, low plasticity, olive brown (2.5Y 5/4)		34		2.5	CL
			35		1.75	
			36	3/3		
50						

KELRON ENVIRONMENTAL
INCORPORATED

LOG OF BORING MW-352

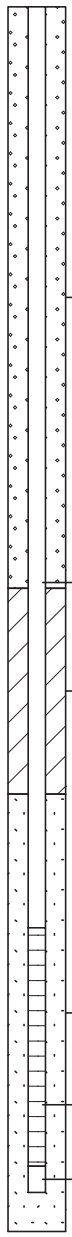
Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 16 SE, NE, NE

Date Completed	: 09/16/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID: 3 7/8" rock	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 422.36
Sampling Method	: MacroCore (60")/NX Core	Top of Casing Elevation	425.04
Drilling Company	: PSC	X,Y Coordinates	: 2382789, 553901

Well: MW-352
Elev.: 425.04

Depth in Feet	DESCRIPTION	Surf. Elev. 422.36	Samples	Recovery inches	Qp TSF	USCS
50		372				CL
	- Auger refusal at 53.7 feet bgs					
	LIMESTONE, weathered, thinly laminated, medium hard to hard, gray		37	5/5		LS
55		367	38	8/27		
	SHALE, clayey, gray					SH
	LIMESTONE, occasional shale partings		39	19/60		LS
60		362				
	- laminated, fossiliferous, medium gray		40	54/60		
	SHALE, soft, dark gray					SH
65		357				
	LIMESTONE, medium hard to hard, light gray		41	59/60		LS
70	Borehole diameter from 53.7 to 73.8 feet bgs = 3 7/8"	352				
	RQD for 53.8 - 73.8' = 57% (Fair) Recovery = 173/240"		42	33/34		
	END BOREHOLE AT 73.8 FEET BLS					
75						

GRAPHIC



KELRON ENVIRONMENTAL
INCORPORATED

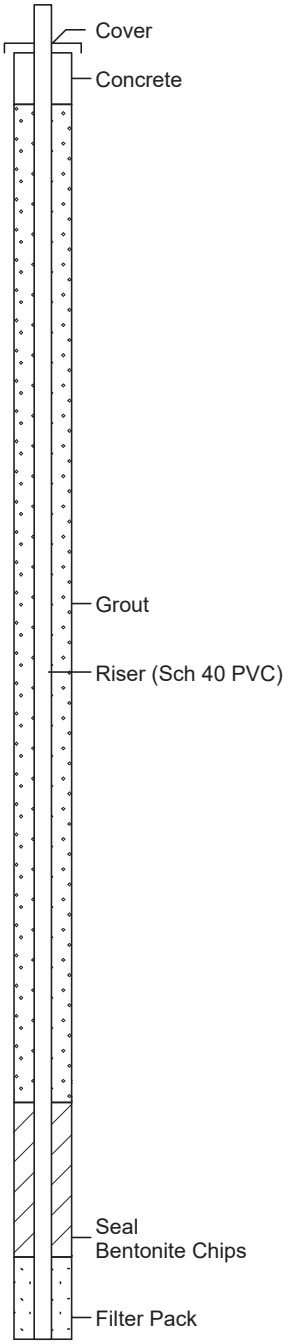
LOG OF BORING MW-355

Ash Pond System Monitoring Well Network
Baldwin Energy Complex
Dynegy Midwest Generation, Inc.
Location: Twp 04S, Rng 07W, 09 SW, SE, SW

Date Completed	: 09/14/2010	Driller	: Matt Cooper
Hole Diameter	: 8 1/2"OD / 4 1/4" ID; 3 7/8" rock	Geologist	: Brendon Wilder (PSC)
Drilling Method	: Hollow-Stem/Rotary (CME-550)	Land Surface Elevation	: 390.82
Sampling Method	: MacroCore (60")/NX Core	Top of Casing Elevation	393.69
Drilling Company	: Terra Drill, Inc.	X,Y Coordinates	: 2378145, 555980

Depth in Feet	DESCRIPTION	Surf. Elev. 390.82	Samples	Recovery inches	Qp TSF	USCS	GRAPHIC
0	Continuous boring to 20 feet below ground surface. Refer to boring log for adjacent well MW-155 for description of subsurface materials to 20 feet.	390					
5		385					
10		380					
15		375					
20	CLAYEY SAND, poorly graded, dark yellow brown, wet	370	1	23/23	3.5	SC	
	CLAY, lean, very stiff, gray with yellow-brown mottling - Auger refusal at 22.1 feet bgs					CL	
	LIMESTONE, lightly weathered, fine grained, slightly fossiliferous, medium soft, light gray banded with light red staining along horizontal fractures; three small shale lenses within 31 inch interval - coarse grained, medium soft to hard		2	108/124		LS	
25							

Well: MW-355
Elev.: 393.69



SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		MW-366

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Jim Dittmaier Bulldog Drilling	12/3/2015	12/4/2015	4 1/4 HSA and rotary

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-366	Feet (NAVD88)	422.54 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 555,581.80 N, 2,381,171.15 E E /Ⓦ
1/4 of 1/4 of Section , T N, R

Lat 38° 11' 31.8876"
Long -89° 52' 20.4414"

Local Grid Location
Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			0	0 - 5.6' **FILL, SILTY CLAY** CL/ML.	(FILL) CL/ML								0-33' Blind Drilled. See logs TPZ-166 and B-13-4 for soil description.
			5.6	5.6 - 33' **SILTY CLAY** CL/ML.	CL/ML								

Depth scale: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature [signature]

Firm Natural Resource Technology
234 W. Florida St., Fifth Floor, Milwaukee, WI 53204
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NATURAL RESOURCE TECHNOLOGY

Boring Number MW-366

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				5.6 - 33' **SILTY CLAY** CL/ML. *(continued)*									
			13										
			14										
			15										
			16										
			17										
			18										
			19										
			20										
			21										
			22		CL/ML								
			23										
			24										
			25										
			26										
			27										
			28										
			29										
			30										
			31										
			32										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-366

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				5.6 - 33' **SILTY CLAY** CL/ML. *(continued)*	CL/ML								
1 SS	23 18	17 21 20 50	33	33 - 35.6' **LEAN CLAY:** to **SHALE:** CL, gray, residual soil, hard (>4.5 tsf).	CL								
			34										
			35										
1 CORE	60 54		36	35.6 - 39.3' **SHALE:** BDX (SH), gray, highly decomposed, moderately fractured.	BDX (SH)								Core 1, RQD=54%
			37										
			38	38.4' limestone layer (approximately 2.5").									
			39										
2 CORE	60 47		40	39.3 - 42.3' **LIMESTONE:** BDX (LS), cherty, intensely fractured.	BDX (LS)								Core 2, RQD=32%
			41										
			42										
			43	42.3 - 42.9' **SHALE:** BDX (SH), dark gray, intensely fractured.	BDX (SH)								
				42.9 - 43.7' **SHALEY LIMESTONE:** BDX (LS/SH), intensely fractured.	BDX (LS/SH)								
			44	43.7 - 49.8' **SHALE:** BDX (SH), dark gray, moderately fractured.									
			45										
3 CORE	60 63		46										Core 3, RQD=73%
			47		BDX (SH)								
			48										
			49										
4 CORE	60 49		50	49.8 - 54.3' **SHALEY LIMESTONE:** BDX (LS/SH), fossiliferous, slightly fractured.									Core 4, RQD=96%
			51		BDX (LS/SH)								
			52										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-366

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				49.8 - 54.3' **SHALEY LIMESTONE**: BDX (LS/SH), fossiliferous, slightly fractured. *(continued)*									
			53	52.8' - 53.1 shale bed. 53.1' fossiliferous.	BDX (LS/SH)								
			54										Bedrock corehole reamed 6" in diameter to 54' for well installation.
				54.3' End of Boring.									

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Power Plant		MW358

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Blake Weller Cascade Drilling	10/5/2022	10/8/2022	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW358	Feet (NAVD88)	453.59 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 556,726.26 N, 2,387,756.63 E E/W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 42.9882"

Long -89° 50' 57.9018"

Local Grid Location ☐ N ☐ S Feet ☐ E ☐ W Feet

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	IL	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	180 97		1 2 3 4 5 6 7 8 9 10 11 12	0 - 3.8' **SILT:** ML, very dark grayish brown (10YR 3/2), organic material (0-10%), moist to wet. 2.1' dry.	ML									CS= Core Sample Measured Rock Quality Designation (RQD) was modified due to drilling methods, modified RQD equals the sum of recovered core sections greater than 4 inches in length divided by total core recovery.
				3.8 - 8.9' **CLAYEY SILT:** ML/CL, light gray (10YR 7/2), very dark grayish brown (10YR 3/2) and yellowish brown (10YR 5/8) mottling (20-30%), dry.	ML/CL									
				8.9 - 13' **SILTY CLAY WITH SAND:** (CL/ML)S, grayish brown (10YR 5/2), strong brown (7.5YR 5/6) and very dark brown (10YR 2/2) mottling (20-30%), organic material (0-10%), low toughness, low to medium plasticity, stiff.	(CL/ML)S									

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Ramboll
234 W Florida Street, 5th Floor, Milwaukee, WI 53204
Tel: (414)837-3607
Fax: (414)837-3608

Boring Number MW358

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
					(CL/ML)S									
			13	13 - 17.8' **SILTY CLAY:** CL/ML, grayish brown (10YR 5/2), strong brown (7.5YR 5/6) and very dark brown (10YR 2/2) mottling (20-30%), low toughness, medium to high plasticity, stiff to very stiff.										
			14											
2 CS	60 60		15		CL/ML									
			16	16.1' mottling discontinues.										
			17											
			18	17.8 - 21' **SILTY CLAY WITH SAND:** (CL/ML)S, brown (10YR 5/3), strong brown (7.5YR 5/6) and gray (10YR 6/1) mottling (20-30%), gravel (5-15%), no dilatancy, high toughness, low to medium plasticity, hard, moist.										
			19		(CL/ML)S									
3 CS	48 36		20											
			21	21 - 26.5' **SHALE:** BDX (SH), dark gray (GLEY 1 4/N), weathered, thin bedding, moderately fractured.										
			22											
			23											
4 CORE	36 32		24	24' -25.2' wet.	BDX (SH)									RUN #4: Modified RQD = (21/32) = 66%
			25											
			26											
5 CORE	36 29		27	26.5 - 27.5' **LIMESTONE:** BDX (LS), dark gray (5Y 4/1), shaley, fossiliferous, very strong.	BDX (LS)									RUN #5: Modified RQD = (0/29) = 0%
			28	27.5 - 31.3' **SHALE:** BDX (SH), grayish black (N2), weathered, highly decomposed to residual soil, wet to moist.										
			29	29.3' thinly bedded, moderately decomposed.	BDX (SH)									
6 CORE	72 60		30	30' slightly decomposed to competent, moderately fractured.										RUN #6: Modified RQD = (45/60) = 75%
			31											
				31.3 - 32' **COAL:** COAL, black (N1).	COAL									
			32											

Boring Number MW358

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				32 - 33' **SHALE:** BDX (SH), grayish black (N2), slightly decomposed to competent, moderately fractured, wet to moist.	BDX (SH)									
			33	33 - 36' **SHALEY LIMESTONE:** BDX (LS/SH), medium gray (N5), weathered, shaley, higly decomposed, slightly fractured.										
			34											
			35		BDX (LS/SH)									
7 CORE	72 71		36	36 - 40.8' **SHALEY LIMESTONE:** to **SHALE:** BDX (LS/SH), interbedded shale.										RUN #7: Modified RQD = (67/71) = 94%
			37											
			38		BDX (LS/SH)									
			39											
			40											
			41	40.8 - 42' **LIMESTONE:** BDX (LS), medium light gray (N6), strong to moderately fractured, slightly decomposed, narrow apertures.	BDX (LS)									
8 CORE	96 85		42	42 - 58.9' **SHALE:** BDX (SH), medium gray (N5) to medium dark gray (N4), weathered, weak, thinly bedded, moderately to highly fractured.										RUN #8: Modified RQD = (81/85) = 94%
			43											
			44											
			45											
			46											
			47		BDX (SH)									
			48	47.5' dark grayish brown (10YR 4/2), pale olive (5Y 6/4) discoloration, more competent.										
			49											
9 CORE	60 60		50	50.2' weak to moderate.										RUN #9: Modified RQD = (52/60) = 87%
			51	50.8' olive gray (5Y 5/2).										
			52											

Boring Number MW358

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				42 - 58.9' **SHALE:** BDX (SH), medium gray (N5) to medium dark gray (N4), weathered, weak, thinly bedded, moderately to highly fractured. *(continued)*										
			53	52.2' dark grayish green (5GY 4/2).										
			54	54.1' medium dark gray (N4) to medium gray (N5), weak, highly decomposed, no visible bedding, dry.										
10 CORE	60 58		55		BDX (SH)									RUN #10: Modified RQD = (42/58) = 72%
			56	55.7' dark grayish green (5GY 4/2).										
			57	57.2' light brownish gray (10YR 6/2), thinly bedded, laminated.										
			58	58.2' medium dark gray (N4), strong, intensely fractured, thinly bedded.										
			59	58.9 - 64' **LIMESTONE:** BDX (LS), medium gray (N5), very strong, moderately fractured, visible laminations.										
11 CORE	36 31		60											RUN #11: Modified RQD = (8/31) = 26%
			61		BDX (LS)									
			62											
12 CORE	36 36		63											RUN #12: Modified RQD = (31/36) = 86%
			64	64 - 75.3' **SHALE:** BDX (SH), medium dark gray (N4) to medium gray (N5), strong, thinly bedded to laminated, moderately fractured.										
			65	64.3' grayish green (5GY 5/2), weathered, weak, decomposed.										
13 CORE	48 48		66											RUN #13: Modified RQD = (43/48) = 90%
			67											
			68		BDX (SH)									
			69	69.3' medium dark gray (N4), weathered, moderate strength.										
14 CORE	60 58		70											RUN# 14: Modified RQD = (57/58) = 99%
			71											
			72											

Boring Number MW358

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			73	64 - 75.3' **SHALE:** BDX (SH), medium dark gray (N4) to medium gray (N5), strong, thinly bedded to laminated, moderately fractured. *(continued)*	BDX (SH)									
			74											
15 CORE	60 56		75	75.3 - 77.1' **LIMESTONE:** BDX (LS), gray (5Y 6/1), fossiliferous, very strong.	BDX (LS)									RUN #15: Modified RQD = Not Recorded
			76											
			77	77.1 - 78.2' **SHALE:** BDX (SH), medium dark gray (N4), weathered, weak to moderate strength, moderately decomposed.	BDX (SH)									
			78	78.2 - 84.8' **LIMESTONE:** BDX (LS), medium dark gray (N4) to medium gray (N5), shaley, fossiliferous, very strong, moderately fractured, laminations (0-5%).	BDX (LS)									
			79											
16 CORE	60 51		80											RUN #16: Modified RQD = (23/51) = 45%
			81											
			82											
			83											
			84											
17 CORE	60 60		85	84.8 - 90' **SHALE:** BDX (SH), dark gray (N3), weathered, weak to moderate strength, moderately decomposed, moderately fractured, thin bedding.	BDX (SH)									RUN #17: Modified RQD = (28/60) = 47%
			86											
			87											
			88											
			89											
			90	90' End of Boring.										

SOIL BORING LOG INFORMATION

NATURAL RESOURCE TECHNOLOGY

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Energy Complex		MW-391

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Jim Dittmaier Bulldog Drilling	3/7/2016	3/10/2016	4 1/4 HSA and rotary

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-391	Feet (NAVD88)	424.24 Feet (NAVD88)	8.3 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 555,100.63 N, 2,380,477.06 E E/W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 27.1285"

Long -89° 52' 29.1339"

Local Grid Location ☐N ☐S Feet ☐E ☐W Feet

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	Illinois	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				0 - 4' **SILTY CLAY** CL/ML.	CL/ML								0-35' Blind Drilled. See log MW-387 for soil description.
			1										
			2										
			3										
			4	4 - 10.8' **SILTY CLAY** CL/ML.	CL/ML								
			5										
			6										
			7										
			8										
			9										
			10										
			11	10.8 - 12' **CLAYEY SILT** ML/CL.	ML/CL								
			12										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Natural Resource Technology
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NATURAL RESOURCE TECHNOLOGY

Boring Number MW-391

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				12 - 24' **SILTY CLAY** CL/ML.									
			13										
			14										
			15										
			16										
			17										
			18		CL/ML								
			19										
			20										
			21										
			22										
			23										
			24	24 - 27.4' **LEAN CLAY:** CL.									
			25										
			26		CL								
			27										
				27.4 - 28.5' **SILTY SAND:** SM.									
			28		SM								
				28.5 - 32.5' **SILTY CLAY** CL/ML.									
			29										
			30		CL/ML								
			31										
			32										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-391

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				28.5 - 32.5' **SILTY CLAY** CL/ML. *(continued)*									
			33	32.5 - 34' **POORLY-GRADED SAND:** SP.	SP								
			34	34 - 34.5' **SILTY SAND:** SM.	SM								
				34.5 - 35' **SILTY CLAY** CL/ML.	CL/ML								
1 CS	60 52.5		35	35 - 35.8' **LEAN CLAY:** CL, brown, wet, possible wash out of clay.	CL								Core 1, RQD = 25%
			36	35.8 - 40.7' **LIMESTONE:** BDX (LS), brown and tan, moderately fractured (extremely narrow to narrow apertures), oxidation discoloration.									
			37										
			38	37.4' white, intensely fractured (extremely narrow to narrow apertures).	BDX (LS)								
			39										
2 CS	60 25.5		40										Core 2, RQD = 0%
			41	40.7 - 45.8' **SHALE:** BDX (SH), dark gray, highly decomposed, intensely fractured (tight to very narrow mud-filled fractures).									
			42										
			43		BDX (SH)								
			44										
3 CS	60 49.5		45										Core 3, RQD = 80%
			46	45.8 - 47.5' **SHALEY LIMESTONE:** BDX (LS/SH), light gray, moderately fractured (very narrow apertures).	BDX (LS/SH)								
			47										
			48	47.5 - 49.7' **LIMESTONE:** BDX (LS), white, massive, slightly fractured.	BDX (LS)								
			49										
4 CS	60 64		50	49.7 - 60' **SHALEY LIMESTONE:** BDX (LS/SH), light gray, medium to thinly bedded, moderately to highly decomposed, moderately fractured (tight to narrow apertures).									Core 4, RQD = 55%
			51		BDX (LS/SH)								
			52										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-391

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				49.7 - 60' **SHALEY LIMESTONE:** BDX (LS/SH), light gray, medium to thinly bedded, moderately to highly decomposed, moderately fractured (tight to narrow apertures). *(continued)*									
			53										
			54										
5 CS	60 58.5		55	54.7' light gray, moderately decomposed, moderately fractured, decomposition and fracture density decrease with depth.									Core 5, RQD = 96%
			56		BDX (LS/SH)								
			57										
			58										
			59										
			60	60 - 74.4' **LIMESTONE:** BDX (LS), white, massive, slightly fractured (extremely narrow to very narrow apertures).									
6 CS	60 52.5												Core 6, RQD =99%
			61										
			62										
			63										
			64										
7 CS	60 63.25			64.4' slightly fractured (very narrow aperture).									Core 7, RQD = 100%
			65										
			66		BDX (LS)								
			67										
			68										
			69										
8 CS	60 55		70	69.8' unfractured.									Core 8, RQD = 100%
			71										
			72										

NATURAL RESOURCE TECHNOLOGY

Boring Number MW-391

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram		Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			73 74	60 - 74.4' **LIMESTONE:** BDX (LS), white, massive, slightly fractured (extremely narrow to very narrow apertures). *(continued)*	BDX (LS)									
				74.4' End of Boring.										Bedrock corehole reamed to 6" in diameter to 72' bgs for well installation.

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SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Power Plant		MW392

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Blake Weller Cascade Drilling	9/9/2022	9/26/2022	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW392	Feet (NAVD88)	434.07 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 558,140.20 N, 2,382,717.92 E E/W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 57.132"

Long -89° 52' 0.9632"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	IL	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	120 46		1	0 - 1.2' **FILL, WELL-GRADED GRAVEL WITH CLAY:** GW-GC, pinkish gray (7.5YR 6/2), angular, moist.	(FILL) GW-GC									CS= Core Sample
			2	1.2 - 16' **FILL, LEAN CLAY:** CL, light brown (7.5YR 6/4), sand (0-5%), no dilatancy, low to medium plasticity, moist.										Measured Rock Quality Designation (RQD) was modified due to drilling methods, modified RQD equals the sum of recovered core sections greater than 4 inches in length divided by total core recovery.
			3											
			4											
			5											
			6		(FILL) CL									
			7											
			8											
			9											
2 CS	120 62		10											
			11											
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Ramboll
234 W Florida Street, 5th Floor, Milwaukee, WI 53204
Tel: (414)837-3607
Fax: (414)837-3608

Boring Number MW392

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				1.2 - 16' **FILL, LEAN CLAY:** CL, light brown (7.5YR 6/4), sand (0-5%), no dilatancy, low to medium plasticity, moist. *(continued)*										
			13											
			14		(FILL) CL									
			15											
			16	16 - 20' **LEAN CLAY:** CL, light brown (7.5YR 6/4), sand (0-5%), no dilatancy, low to medium plasticity, moist.										
			17											
			18		CL									
			19											
3 CS	120 33		20	20 - 33' **LEAN CLAY:** CL, pinkish gray (7.5YR 6/2), sand (0-5%), medium to high plasticity, stiff, moist.										
			21											
			22											
			23											
			24											
			25											
			26		CL									
			27											
			28											
			29											
4 CS	120 104		30	30' increasing sand and gravel content.										
			31											
			32											

Boring Number MW392

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				20 - 33' **LEAN CLAY:** CL, pinkish gray (7.5YR 6/2), sand (0-5%), medium to high plasticity, stiff, moist. *(continued)*	CL									
			33	33 - 35' **WELL-GRADED SAND WITH SILT AND GRAVEL:** (SW-SM)g, fine to medium sand, dry.	(SW-SM)g									
			34											
			35	35 - 36.5' **SANDY SILT WITH GRAVEL:** s(ML)g, light yellowish brown (10YR 6/4), dry.	s(ML)g									
			36											
			37	36.5 - 39' **CLAYEY SILT:** ML/CL, gray (7.5YR 5/1), sand (5-10%), coal (0-5%), gravel (0-5%), dry.	ML/CL									
			38											
			39	39 - 40' **SILTY CLAY:** CL/ML, sand (0-5%), low to medium plasticity, stiff.	CL/ML									
5 CS	120 108		40	40 - 48' **SILT WITH SAND:** (ML)s, light brownish gray (10YR 6/2), dry.										
			41											
			42											
			43											
			44	44' increasing clay content.	(ML)s									
			45	45' (2.5Y 6/2).										
			46											
			47											
			48	48 - 52' **SILT:** ML, gray (2.5Y 5/1), sand (0-5%), dry.										
			49											
6 CS	84 81		50		ML									
			51											
			52											

Boring Number MW392

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				52 - 57' **SHALE:** BDX (SH), dark gray (5Y 4/1), highly weathered, hard, dry.										
			53	53' very dark gray (7.5YR 3/1).										
			54											
					BDX (SH)									
			55											
			56											
			57											
7 CORE	60 4			57 - 57.5' **LIMESTONE:** BDX (LS), gray (5Y 6/1), slightly fractured.	BDX (LS)									RUN #7: Modified RQD = 0% (No Solid Recovery > 4")
			58	57.5 - 70' **SHALE:** BDX (SH), dark gray (5Y 4/1), weathered, soft, moderately fractured to highly fractured limestone beds (0-5%).										
			59											
			60											
			61											
8 CORE	96 78		62											RUN #8: Modified RQD = (28/78) = 36%
			63											
			64		BDX (SH)									
			65											
			66											
				66.3' - 67.2' highly fractured, very soft, wet.										
			67											
			68											
			69											
			70											
9 CORE	120 62			70 - 74.4' **LIMESTONE:** BDX (LS), gray (5Y 6/1), moderately to intensely fractured, moderately wide apertures.										RUN #9: Modified RQD = (28/78) = 36%
			71		BDX (LS)									
			72											

Boring Number MW392

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				70 - 74.4' **LIMESTONE:** BDX (LS), gray (5Y 6/1), moderately to intensely fractured, moderately wide apertures. *(continued)*	BDX (LS)									
			73											
			74											
				74.4 - 81.8' **SHALE:** BDX (SH), medium dark gray (N4) to dark gray (N3), slightly weathered, moderately fractured, thinly bedded.	BDX (SH)									
			75											
			76											
			77											
			78											
			79											
10 CORE	48 48		80											RUN #10: Modified RQD = (28/48) = 58%
			81											
			82	81.8 - 84' **LIMESTONE:** BDX (LS), medium light gray (N6), shaley, fossiliferous, moderately fractured, thinly bedded.	BDX (LS)									
			83	83.2' medium gray (N5).										
			84	84' End of Boring.										

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SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Power Plant		MW393

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Blake Weller Cascade Drilling	9/9/2022	10/4/2022	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW393	Feet (NAVD88)	434.59 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 558,133.57 N, 2,383,944.49 E E/W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 57.027"

Long -89° 51' 45.5976"

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	IL	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	120 86			0 - 1' **FILL, WELL-GRADED GRAVEL:** GW, pinkish gray (7.5YR 6/2), angular, moist.	(FILL) GW									CS= Core Sample
			1	1 - 20' **FILL, LEAN CLAY:** CL, brown (7.5YR 6/4), sand (0-5%), no dilatancy, low to medium plasticity, moist.	(FILL) CL									Measured Rock Quality Designation (RQD) was modified due to drilling methods, modified RQD equals the sum of recovered core sections greater than 4 inches in length divided by total core recovery.
			2											
			3											
			4											
			5											
			6											
			7											
			8											
			9											
2 CS	120 120		10	10' sand (0-5%), iron concretions (0-5%).										
			11											
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Ramboll
234 W Florida Street, 5th Floor, Milwaukee, WI 53204
Tel: (414)837-3607
Fax: (414)837-3608

Boring Number MW393

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			13	1 - 20' **FILL, LEAN CLAY:** CL, brown (7.5YR 6/4), sand (0-5%), no dilatancy, low to medium plasticity, moist. *(continued)*	(FILL) CL									
			14											
			15											
			16											
			17											
			18	18' medium to high plasticity.										
			19											
3 CS	120 120		20	20 - 24' **LEAN CLAY:** CL, light brown (7.5YR 6/4), mottling, sand (0-5%), medium to high plasticity, cohesive, moist.	CL									
			21											
			22											
			23											
			24	24 - 27' **CLAYEY SAND:** SC, gray (10YR 6/1), fine to medium sand, wet.	SC									
			25											
			26											
			27	27 - 31' **SILT WITH SAND:** (ML)s, dark gray (7.5YR 4/1), sand (0-5%), moist.	(ML)s									
			28											
			29											
4 CS	120 105		30	30' coal fragments (0-5%).										
			31	31 - 40' **SILTY CLAY:** CL/ML, dark gray (7.5Y 4/1), organic material (0-5%), gravel (0-5%), stiff to very stiff, moist.	CL/ML									
			32											

Boring Number MW393

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			33	31 - 40' **SILTY CLAY:** CL/ML, dark gray (7.5Y 4/1), organic material (0-5%), gravel (0-5%), stiff to very stiff, moist. *(continued)*										
			34											
			35											
			36		CL/ML									
			37											
			38											
			39											
5 CS	120 120		40	40 - 50' **SILT:** ML, grayish brown (2.5Y 5/2), very stiff to hard, platy, dry.										
			41											
			42											
			43											
			44											
			45		ML									
			46											
			47											
			48											
			49											
6 CS	120 92		50	50 - 55' **SILT:** ML, dark gray (7.5YR 4/1), sand (0-5%), very stiff to hard, dry.										
			51		ML									
			52											

Boring Number MW393

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				50 - 55' **SILT:** ML, dark gray (7.5YR 4/1), sand (0-5%), very stiff to hard, dry. *(continued)*	ML									
			53											
			54											
			55	55 - 57' **CLAYEY SILT:** ML/CL, gray (10YR 6/1), sand (0-5%), gravel (0-5%), medium plasticity, moist.	ML/CL									
			56											
			57	57 - 60' **LIMESTONE:** BDX (LS), gray (10YR 6/1), rock flour and angular chips (<2").	BDX (LS)									
			58											
			59											
7 CORE	120 60		60	60 - 70' **SHALE:** BDX (SH), medium gray (N5), weathered, very weak, residual soil, soft, slightly fractured.	BDX (SH)									RUN #7: Modified RQD = (31/60) = 52%
			61											
			62											
			63											
			64											
			65											
			66											
			67											
			68											
			69											
8 CORE	42 40		70	70 - 73.5' **LIMESTONE:** BDX (LS), medium dark gray (N4), weathered, shaley, thinly bedded, moderately fractured.	BDX (LS)									RUN #8: Modified RQD = (32/40) = 80%
			71											
			72											

Boring Number MW393

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			73	70 - 73.5' **LIMESTONE:** BDX (LS), medium dark gray (N4), weathered, shaley, thinly bedded, moderately fractured. *(continued)* 72' medium gray (N5).	BDX (LS)									
9 CORE	78 40		74	73.5 - 85' **SHALE:** BDX (SH), medium gray (N5), weathered, moderately to slightly fractured, thinly laminated.										RUN #9: Modified RQD = (30/40) = 75%
			75											
			76											
			77											
			78											
			79		BDX (SH)									
10 CORE	60 45		80											RUN #10: Modified RQD = (34/45) = 76%
			81											
			82											
			83											
			84	83.5' more competent.										
			85	85' End of Boring.										

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SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Power Plant		MW394

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Blake Weller Cascade Drilling	9/25/2022	10/5/2022	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW394	Feet (NAVD88)	435.51 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 558,123.63 N, 2,385,095.76 E E/W

1/4 of 1/4 of Section , T N, R

Lat 38° 11' 56.8911"

Long -89° 51' 31.1756"

Local Grid Location ☐ N ☐ S Feet ☐ E ☐ W Feet

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	IL	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	72 67		1, 2	0 - 2.6' **FILL, WELL-GRADED GRAVEL WITH CLAY:** GW-GC, brown (10YR 4/3), angular, moist.	(FILL) GW-GC									CS= Core Sample
			3, 4, 5, 6, 7, 8, 9, 10, 11, 12	2.6 - 20' **LEAN CLAY:** CL, brown (10YR 5/3), reddish brown bottling (20%), sand (0-5%), low to medium plasticity, very stiff to hard, moist.	CL				4					Measured Rock Quality Designation (RQD) was modified due to drilling methods, modified RQD equals the sum of recovered core sections greater than 4 inches in length divided by total core recovery.
									4					
2 CS	120 120								2.5					
									3.5					
									2					
				9.2' brown (7.5YR 5/3), medium to high plasticity.					2					
									3					
									2.25					

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Ramboll
234 W Florida Street, 5th Floor, Milwaukee, WI 53204
Tel: (414)837-3607
Fax: (414)837-3608

Boring Number MW394

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				2.6 - 20' **LEAN CLAY:** CL, brown (10YR 5/3), reddish brown bottling (20%), sand (0-5%), low to medium plasticity, very stiff to hard, moist. *(continued)*					2.25					
			13											
			14	14' low to medium plasticity.					2.5					
			15											
3 CS	120 120		16		CL									
			17	16.5' increasing sand and gravel content, gray (GLEY 1 5/1) iron concretions (50%).										
			18											
			19											
			20	20 - 22.1' **SILTY SAND:** SM, yellowish brown (10YR 5/6), fine sand, clay (0-5%), moist.	SM									
			21											
			22	22.1 - 36.8' **LEAN CLAY:** CL, dark yellowish brown (10YR 4/4), greenish gray (GLEY 1 5/10Y) and yellowish brown (10YR 5/6) mottling, sand (0-5%), medium to high plasticity, hard, moist.					4.5					
			23											
			24						4.5					
			25											
			26						4.5					
4 CS	120 112								4.5					
			27		CL									
			28						4.5					
			29						4.5					
			30						4.5					
			31						4.5					
			32						4.5					

Boring Number MW394

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			33	22.1 - 36.8' **LEAN CLAY:** CL, dark yellowish brown (10YR 4/4), greenish gray (GLEY 1 5/10Y) and yellowish brown (10YR 5/6) mottling, sand (0-5%), medium to high plasticity, hard, moist. *(continued)*					3.75					
			34						4.25					
				34.4' olive yellow (5Y 6/6), low to medium plasticity.	CL									
			35						4.5					
5 CS	120 113		36											
			37	36.8 - 48' **Weathered SHALE Bedrock:** BDX (SH), pale olive (5Y 6/3), weathered, argillaceous, fissile, moist.										
			38											
			39											
			40	40' olive gray (5Y 5/2).										
			41											
			42		BDX (SH)									
			43											
			44											
			45											
6 CS	96 96		46											
			47											
			48	48 - 58' **LIMESTONE:** to **SHALE:** BDX (LS), olive gray (5Y 4/2), interbedded limestone and shale, fissile.										
			49											
			50	50' - 50.2' limestone, very strong.	BDX (LS)									
			51											
			52											

Boring Number MW394

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				48 - 58' **LIMESTONE:** to **SHALE:** BDX (LS), olive gray (5Y 4/2), interbedded limestone and shale, fissile. *(continued)*										
			53											
			54	53.7' - 53.9' limestone, very strong.										
7 CS	48 48			54' - 55.6' dark gray (10YR 4/1) to gray (10YR 5/1), more competent.										
			55		BDX (LS)									
			56	55.6' gray (10YR 6/1) to dark gray (10YR 4/1), more competent.										
			57											
			58											
8 CORE	18 14			58 - 59.7' **LIMESTONE:** BDX (LS), medium gray (N5), shaley, laminated, moderately fractured.										RUN #8: Modified RQD = (4/14) = 29%
			59		BDX (LS)									
9 CORE	60 60			59.7 - 68' **SHALE:** BDX (SH), medium dark gray (N4), weathered, very weak to weak, thinly bedded, moderately fractured.										RUN #9: Modified RQD = (48/60) = 80%
			60											
			61											
			62											
			63											
			64		BDX (SH)									
10 CORE	57 56			64.5 - 67.2' highly decomposed, weathered, wet.										RUN #10: Modified RQD = Not Recorded
			65											
			66											
			67											
			68											
				68 - 68.4' **LIMESTONE:** BDX (LS), light olive gray (5Y 6/2) to olive gray (5/2).	BDX (LS)									
			69	68.4 - 70.8' **SHALE:** BDX (SH), medium dark gray (N4), weathered, very weak to weak, thinly bedded, moderately fractured.										
11 CORE	68 68				BDX (SH)									RUN #11: Modified RQD = (42/68) = 62%
			70											
			71	70.8 - 71' **LIMESTONE:** BDX (LS), dark gray (N3), shaley.	BDX (LS)									
				71 - 77.6' **SHALE:** BDX (SH), dark gray (N3),										
			72											

Boring Number MW394

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				strong, thinly bedded, moderately fractured. 71 - 77.6' **SHALE:** BDX (SH), dark gray (N3), strong, thinly bedded, moderately fractured. *(continued)*										
			73											
			74											
12 CORE	60 59		75		BDX (SH)									RUN #12: Modified RQD = (44/59) = 75%
			76											
			77											
			78	77.6 - 80' **LIMESTONE:** BDX (LS), medium gray (N5), shaley, weak, moderately fractured.	BDX (LS)									
			79											
13 CORE	60 48		80	80 - 85' **SHALE:** BDX (SH), medium dark gray (N4), weathered, weak, thinly bedded, moderately fractured, moist to wet.										RUN #13: Modified RQD = (40/48) = 83%
			81											
			82		BDX (SH)									
			83											
			84											
			85	85' End of Boring.										

Attachment E

Site Solids Bulk Characterization & Total Metals Analytical Data

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Trace Metals - Strong Acid Digest, ICP-MS

Project : PO# GLP8064

26-September-2023

Geosyntec Consultant
Attn : Allison Kreinberg/Brian Aces

2100 Commonwealth Boulevard, Suit 100
Ann Arbor, Michigan
48108, USA

Phone: 734-794-1545
Fax:

Date Rec. : 31 July 2023
LR Report: **CA19071-JUL23**
Reference: Baldwin - PO# GLP8064

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: BAL-1-15-20-20230620	6: BAL-1-20-25-20230620	7: BAL-1-35-40-20230620
Sample Date & Time					20-Jun-23 11:00	20-Jun-23 11:15	20-Jun-23 12:30
Ag [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	< 0.5	< 0.5	< 0.5
Al [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	42000	66000	56000
As [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	4.3	11	6.1
Ba [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	500	560	150
Be [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	1.1	1.9	1.6
Bi [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	0.13	0.23	0.15
Ca [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	32000	57000	120000
Cd [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	0.23	0.30	0.34
Co [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	7.7	13	8.6
Cr [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	47	74	70
Cu [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	11	25	8.9
Fe [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	19000	38000	22000
K [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	17000	22000	13000
Li [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	19	44	31
Mg [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	15000	21000	22000
Mn [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	770	830	190
Mo [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	1.2	1.7	0.8
Ni [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	20	38	32
Pb [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	13	17	10
Sb [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	< 0.8	< 0.8	< 0.8
Se [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	0.2	0.6	0.9
Sn [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	< 6	6.5	6.9
Sr [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	150	170	390
Ti [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	1900	3000	2300
Tl [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	0.42	0.61	0.39
U [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	1.7	2.5	3.2
V [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	57	110	70
Y [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	13	20	14
Zn [µg/g]	23-Sep-23	02:32	25-Sep-23	17:30	43	87	74

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Trace Metals - Strong Acid Digest, ICP-MS

Project : PO# GLP8064

LR Report : **CA19071-JUL23**

Analysis	8: BAL-1-42-46-20230620	9: BAL-1-42-46-2-20230620	10: BAL-2-50-60-20230621	11: BAL-2-60-70-20230621	12: BAL-3-40-52-20230621	13: BAL-4-50-51-20230622
Sample Date & Time	20-Jun-23 13:00	20-Jun-23 13:30	21-Jun-23 09:00	21-Jun-23 09:30	21-Jun-23 14:00	21-Jun-23 16:40
Ag [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Al [µg/g]	5900	5900	36000	16000	81000	61000
As [µg/g]	1.9	1.6	5.3	7.5	4.9	8.8
Ba [µg/g]	59	46	73	45	180	160
Be [µg/g]	0.24	0.25	1.0	0.48	2.3	2.1
Bi [µg/g]	< 0.09	< 0.09	0.10	< 0.09	0.26	0.20
Ca [µg/g]	320000	340000	190000	220000	95000	92000
Cd [µg/g]	0.32	0.38	0.13	0.88	0.60	0.14
Co [µg/g]	1.3	1.3	4.2	2.5	6.2	9.9
Cr [µg/g]	13	14	46	42	110	78
Cu [µg/g]	2.9	2.2	4.2	3.9	10	13
Fe [µg/g]	5500	5300	16000	11000	23000	23000
K [µg/g]	2100	1900	7900	3900	21000	18000
Li [µg/g]	4.8	4.7	14	16	37	16
Mg [µg/g]	4600	4600	16000	24000	12000	10000
Mn [µg/g]	270	270	330	200	220	370
Mo [µg/g]	0.6	0.5	0.5	2.2	0.7	0.5
Ni [µg/g]	4.9	4.7	17	16	26	36
Pb [µg/g]	3	3	6	5	17	20
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	0.2	0.2	0.4	0.8	2.7	1.6
Sn [µg/g]	< 6	< 6	6.2	< 6	7.5	6.8
Sr [µg/g]	470	510	360	460	320	230
Ti [µg/g]	310	310	1400	760	3500	2500
Tl [µg/g]	0.06	0.06	0.21	0.19	0.50	0.44
U [µg/g]	1.1	1.0	1.9	2.4	3.7	2.9
V [µg/g]	14	14	45	29	150	68
Y [µg/g]	8.8	8.7	8.9	9.3	19	32
Zn [µg/g]	36	42	30	83	68	49

Analysis	14: BAL-4-51-55-20230622	15: BAL-4-55-72-20230622
Sample Date & Time	22-Jun-23 08:40	22-Jun-23 10:10
Ag [µg/g]	< 0.5	< 0.5
Al [µg/g]	21000	4800
As [µg/g]	4.0	3.2
Ba [µg/g]	64	19
Be [µg/g]	0.63	0.24
Bi [µg/g]	< 0.09	< 0.09
Ca [µg/g]	260000	340000
Cd [µg/g]	0.21	0.68
Co [µg/g]	4.6	1.6

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Trace Metals - Strong Acid Digest, ICP-MS

Project : PO# GLP8064

LR Report : **CA19071-JUL23**

Analysis	14: BAL-4-51-55-20230622	15: BAL-4-55-72-20230622
Cr [µg/g]	30	11
Cu [µg/g]	3.6	1.7
Fe [µg/g]	12000	5600
K [µg/g]	4700	1200
Li [µg/g]	7.4	3.6
Mg [µg/g]	5700	4500
Mn [µg/g]	1200	590
Mo [µg/g]	0.3	1.0
Ni [µg/g]	19	8.0
Pb [µg/g]	7	4
Sb [µg/g]	< 0.8	< 0.8
Se [µg/g]	0.3	0.5
Sn [µg/g]	< 6	< 6
Sr [µg/g]	410	530
Ti [µg/g]	910	210
Tl [µg/g]	0.13	0.04
U [µg/g]	1.2	2.1
V [µg/g]	28	9.4
Y [µg/g]	11	7.6
Zn [µg/g]	34	87

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

28-February-2023

Ramboll Americas Engineering Solutions, Inc.
Attn : Evvan Plank

P.O# Box 4873
Syrascuse, New York
13221-7873, USA

Phone: 315-463-7554
Fax:

Date Rec. : 24 November 2022
LR Report: **CA19224-NOV22**
Reference: Baldwon Power Plant Drilling

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	6: MW-358 (47-49)	7: MW-358 (86-88)	8: MW-392 (80-82)	12: MW-392 (66-68)
Sample Date & Time					06-Oct-22 15:00	08-Oct-22 18:00	26-Sep-22 16:00	26-Sep-22 12:00
Hg MS [ug/g]	09-Dec-22	16:29	12-Dec-22	15:05	< 0.05	< 0.05	< 0.05	< 0.05
As [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	2.1	11	17	1.0
B [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	11	16	16	13
Ba [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	140	45	40	21
Be [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	0.85	0.67	0.85	0.70
Cd [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	< 0.02	< 0.02	0.36	0.09
Co [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	4.4	23	12	6.2
Cr [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	9.5	12	17	16
Li [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	6	20	8	15
Mo [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	0.3	0.3	0.3	0.3
Pb [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	5.7	9.6	17	4.9
Se [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	< 0.7	< 0.7	1.4	< 0.7
Tl [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	0.05	0.06	0.04	0.03

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0003246025

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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA19224-NOV22**

OnLine LIMS

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

28-February-2023

Ramboll Americas Engineering Solutions, Inc.
Attn : Evvan Plank

P.O# Box 4873
Syrascuse, New York
13221-7873, USA

Phone: 315-463-7554
Fax:

Date Rec. : 24 November 2022
LR Report: **CA19226-NOV22**
Reference: Baldwin Power Plant Drilling

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	6: MW-358 (47-49)	7: MW-358 (86-88)	8: MW-392 (80-82)	12: MW-392 (66-68)
Sample Date & Time					06-Oct-22 15:00	08-Oct-22 18:00	26-Sep-22 16:00	26-Sep-22 12:00
Cl [µg/g]	15-Dec-22	20:55	---	---	22	70	34	45
SO4 [µg/g]	15-Dec-22	20:55	29-Dec-22	13:45	50	620	280	100
F [%]	08-Dec-22	18:18	12-Dec-22	08:47	0.091	0.091	0.42	0.095
TKN [as N %]	30-Nov-22	09:28	02-Dec-22	11:00	0.06	0.05	< 0.01	0.05
Ra226 [Bq/g]	12-Dec-22	08:48	12-Dec-22	14:33	0.07	< 0.01	0.09	< 0.01

Catharine Arnold

ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO
CHARTERED
CATHARINE ARNOLD
CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0003246129

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SGS Canada Inc.
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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : CA19226-NOV22

OnLine LIMS

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Attachment F
X-Ray Fluorescence Analytical Data

ANALYSIS REPORT BBM23-31379

To F400101 SGS CANADA INC
LISA THOMPSON
185 Concession Street
Lakefield K0L 2H0
ON
CANADA

Order Number	PO#	Date Received	23-Aug-2023
Submission Number	CA19072-JUL23 / 11 Pulp	Date Analysed	30-Aug-2023 - 06-Sep-2023
Number of Samples	11	Date Completed	09-Sep-2023
		SGS Order Number	BBM23-31379

Methods Summary

Number of Sample	Method Code	Description
11	G_PHY01V	Loss on ignition (LOI), Furnace, variable wt, variable temp
11	GO_XRF72	Borate Fusion, XRF, Ore Grade

Comments

Preparation of samples was performed at the SGS Lakefield site.
Analysis of samples was performed at the SGS Burnaby site.

Authorised Signatory

John Chiang
Laboratory Operations Manager

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- not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

SGS Canada Inc. | NAM Minerals Geochemistry 3260 Production Way Burnaby BC. V5A 4W4 CANADA t +1 (604) 638 2349 f +1 (604) 444 5486 www.sgs.com

Member of the SGS Group (SGS SA)

Order Number PO#
Submission Number CA19072-JUL23 / 11 Pulp
Number of Samples 11

ANALYSIS REPORT BBM23-31379

Element	LOI	@Al2O3	@CaO	@Cr2O3	@Fe2O3	@K2O
Method	G_PHY01V	GO_XRF72	GO_XRF72	GO_XRF72	GO_XRF72	GO_XRF72
Lower Limit	-10	0.01	0.01	0.01	0.01	0.01
Upper Limit	100	100	60	5	100	70
Unit	%	%	%	%	%	%
BAL-1-15-20-20230620	8.44916	8.09	4.75	0.01	2.75	2.01
BAL-1-20-25-20230620	15.4785	11.67	7.90	0.01	5.03	2.47
BAL-1-35-40-20230620	24.1700	10.58	17.23	<0.01	3.18	1.52
BAL-1-42-46-20230620	37.0600	1.20	45.90	<0.01	0.77	0.24
BAL-1-42-46-2-20230620	37.3963	1.15	46.26	<0.01	0.70	0.22
BAL-2-50-60-20230621	30.7069	7.21	29.29	<0.01	2.30	0.99
BAL-2-60-70-20230621	31.5237	3.37	32.08	<0.01	1.57	0.49
BAL-3-40-52-20230621	19.8000	14.89	13.30	0.01	3.17	2.35
BAL-4-50-51-20230622	20.3420	12.44	14.05	0.01	3.44	2.29
BAL-4-51-44-20230622	33.2034	4.29	37.45	<0.01	1.70	0.60
BAL-4-55-72-20230622	40.5259	1.02	49.44	<0.01	0.83	0.16
*Std OREAS 70b	6.78796	-	-	-	-	-
*Rep BAL-4-50-51-20230622	19.8760	-	-	-	-	-
*Std OREAS 70b	-	7.12	4.28	0.18	7.95	0.71
*Rep BAL-4-50-51-20230622	-	12.50	14.14	<0.01	3.46	2.30
*Blk BLANK	-	<0.01	<0.01	<0.01	<0.01	<0.01
*Std OREAS 751	-	15.87	1.04	<0.01	2.40	2.89

Element	@MgO	Mn3O4	@Na2O	@P2O5	@SiO2	@TiO2
Method	GO_XRF72	GO_XRF72	GO_XRF72	GO_XRF72	GO_XRF72	GO_XRF72
Lower Limit	0.01	0.01	0.01	0.01	0.01	0.01
Upper Limit	100	100	60	55	100	100
Unit	%	%	%	%	%	%
BAL-1-15-20-20230620	2.53	0.12	1.09	0.10	69.69	0.46
BAL-1-20-25-20230620	3.41	0.11	0.73	0.13	52.27	0.57

- not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

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Member of the SGS Group (SGS SA)

Order Number PO#
Submission Number CA19072-JUL23 / 11 Pulp
Number of Samples 11

ANALYSIS REPORT BBM23-31379

Element	@MgO	Mn3O4	@Na2O	@P2O5	@SiO2	@TiO2
Method	GO_XRF72	GO_XRF72	GO_XRF72	GO_XRF72	GO_XRF72	GO_XRF72
Lower Limit	0.01	0.01	0.01	0.01	0.01	0.01
Upper Limit	100	100	60	55	100	100
Unit	%	%	%	%	%	%
BAL-1-35-40-20230620	3.80	0.02	0.19	0.10	37.06	0.42
BAL-1-42-46-20230620	0.80	0.03	0.12	0.06	13.62	0.05
BAL-1-42-46-2-20230620	0.77	0.03	0.09	0.05	13.06	0.05
BAL-2-50-60-20230621	2.91	0.05	0.15	0.05	26.00	0.26
BAL-2-60-70-20230621	4.21	0.03	0.20	0.09	25.84	0.14
BAL-3-40-52-20230621	2.01	0.03	0.68	0.22	41.40	0.58
BAL-4-50-51-20230622	1.84	0.06	0.19	0.52	44.24	0.54
BAL-4-51-44-20230622	1.05	0.18	0.07	0.11	21.26	0.17
BAL-4-55-72-20230622	0.80	0.09	0.04	0.12	6.70	0.04
*Std OREAS 70b	22.38	0.16	1.04	0.05	48.48	0.30
*Rep BAL-4-50-51-20230622	1.85	0.05	0.19	0.48	44.33	0.53
*Blk BLANK	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
*Std OREAS 751	0.50	0.10	3.40	0.27	71.34	0.24

Element	@V2O5	Sum
Method	GO_XRF72	GO_XRF72
Lower Limit	0.01	0.01
Upper Limit	10	100
Unit	%	%
BAL-1-15-20-20230620	0.01	91.71
BAL-1-20-25-20230620	0.02	84.43
BAL-1-35-40-20230620	0.01	75.12
BAL-1-42-46-20230620	<0.01	63.09
BAL-1-42-46-2-20230620	<0.01	62.68

- not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

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Order Number PO#
Submission Number CA19072-JUL23 / 11 Pulp
Number of Samples 11

ANALYSIS REPORT BBM23-31379

Element	@V2O5	Sum
Method	GO_XRF72	GO_XRF72
Lower Limit	0.01	0.01
Upper Limit	10	100
Unit	%	%
BAL-2-50-60-20230621	<0.01	69.93
BAL-2-60-70-20230621	<0.01	69.01
BAL-3-40-52-20230621	0.03	79.23
BAL-4-50-51-20230622	0.02	79.70
BAL-4-51-44-20230622	<0.01	67.05
BAL-4-55-72-20230622	<0.01	59.71
*Std OREAS 70b	0.01	93.40
*Rep BAL-4-50-51-20230622	0.01	79.95
*Blk BLANK	<0.01	0.03
*Std OREAS 751	<0.01	98.27

SGS Canada Minerals Burnaby conforms to the requirements of ISO/IEC17025 for specific tests as listed on their scope of accreditation found at https://www.scc.ca/en/search/laboratories/sgs
Tests and Elements marked with an "@" symbol in the report denote ISO/IEC17025 accreditation.

- not analysed | -- element not determined | I.S. insufficient sample | L.N.R. listed not received

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28-February-2023

Ramboll Americas Engineering Solutions, Inc.
Attn : Evvan Plank

P.O# Box 4873
Syrascuse, New York
13221-7873, USA

Phone: 315-463-7554
Fax:

Date Rec. : 24 November 2022
LR Report: **CA19227-NOV22**
Reference: Baldwin Power Plant Drilling

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MW-358 (13-15)	6: MW-358 (47-49)	7: MW-358 (86-88)
Sample Date & Time					05-Oct-22 14:05	06-Oct-22 15:00	08-Oct-22 18:00
SiO2 [%]	06-Dec-22	16:18	12-Dec-22	09:35	75.2	58.3	59.6
Al2O3 [%]	06-Dec-22	16:18	12-Dec-22	09:35	10.6	17.2	19.2
Fe2O3 [%]	06-Dec-22	16:18	12-Dec-22	09:35	3.72	7.01	4.34
MgO [%]	06-Dec-22	16:18	12-Dec-22	09:35	0.67	1.99	1.90
CaO [%]	06-Dec-22	16:18	12-Dec-22	09:35	0.73	0.57	0.50
Na2O [%]	06-Dec-22	16:18	12-Dec-22	09:35	1.04	0.83	0.77
K2O [%]	06-Dec-22	16:18	12-Dec-22	09:35	1.87	3.38	2.79
TiO2 [%]	06-Dec-22	16:18	12-Dec-22	09:35	0.73	0.72	0.82
P2O5 [%]	06-Dec-22	16:18	12-Dec-22	09:35	0.08	0.10	0.10
MnO [%]	06-Dec-22	16:18	12-Dec-22	09:35	0.07	< 0.01	< 0.01
Cr2O3 [%]	06-Dec-22	16:18	12-Dec-22	09:35	< 0.01	0.01	0.01
V2O5 [%]	06-Dec-22	16:18	12-Dec-22	09:35	0.02	0.02	0.02
LOI [%]	06-Dec-22	16:18	12-Dec-22	09:35	5.47	9.79	9.74
Sum [%]	06-Dec-22	16:18	12-Dec-22	09:35	100.3	99.9	99.8

Analysis	8: MW-392 (80-82)	9: MW-392 (32-33.5)	10: MW-393 (24-25.5)	11: MW-394 (20.5-22)	12: MW-392 (66-68)
Sample Date & Time	26-Sep-22 16:00	27-Sep-22 09:00	04-Oct-22 16:00	25-Sep-22 16:00	26-Sep-22 12:00
SiO2 [%]	33.6	72.3	79.7	73.0	50.7
Al2O3 [%]	8.17	10.7	8.70	11.0	15.3
Fe2O3 [%]	2.76	4.54	3.27	4.46	7.66
MgO [%]	1.58	1.20	0.55	0.85	2.46
CaO [%]	25.4	1.35	0.55	0.92	6.38
Na2O [%]	0.40	0.87	0.94	1.27	0.29
K2O [%]	1.02	2.00	2.16	2.14	2.87
TiO2 [%]	0.29	0.67	0.50	0.75	0.58
P2O5 [%]	3.84	0.10	0.08	0.17	0.08

OnLine LIMS

0003246149

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LR Report : **CA19227-NOV22**

Analysis	8: MW-392 (80-82)	9: MW-392 (32-33.5)	10: MW-393 (24-25.5)	11: MW-394 (20.5-22)	12: MW-392 (66-68)
MnO [%]	0.04	0.11	0.09	0.09	0.03
Cr2O3 [%]	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
V2O5 [%]	0.02	0.01	< 0.01	0.01	0.02
LOI [%]	21.6	6.15	3.82	5.09	13.8
Sum [%]	98.8	100.0	100.3	99.8	100.1

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

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Attachment G

Sequential Extraction Procedure Analytical Data

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28-February-2023

Ramboll Americas Engineering Solutions, Inc.
Attn : Evvan Plank

P.O# Box 4873
Syrascuse, New York
13221-7873, USA

Phone: 315-463-7554
Fax:

Date Rec. : 24 November 2022
LR Report: **CA19218-NOV22**
Reference: Baldwin Power Plant Drilling

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MW-358 (13-15)	6: MW-358 (47-49)	7: MW-358 (86-88)	8: MW-392 (80-82)
Sample Date & Time					05-Oct-22 14:05	06-Oct-22 15:00	08-Oct-22 18:00	26-Sep-22 16:00
Ag [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.05	< 0.05	< 0.05	< 0.05
Al [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	30	540	380	18
As [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.5	< 0.5	< 0.5	< 0.5
Ba [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	0.4	11	4.2	< 0.1
Be [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.02	0.06	0.05	< 0.02
B [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 1	8	10	3
Bi [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	21	300	140	75
Cd [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.05	< 0.05	< 0.05	< 0.05
Co [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.01	0.04	0.86	0.02
Cr [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.5	< 0.5	< 0.5	< 0.5
Cu [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.1	< 0.1	0.1	< 0.1
Fe [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	17	240	190	< 1
K [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	7	250	190	41
Li [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 2	< 2	< 2	< 2
Mg [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	9	210	150	19
Mn [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.5	0.6	0.9	< 0.5
Mo [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.1	< 0.1	< 0.1	< 0.1
Na [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	65	1800	1600	850
Ni [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.5	< 0.5	1.2	< 0.5
P [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 3	6	< 3	< 3
Pb [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.1	< 0.1	0.2	< 0.1
Si [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	100	950	750	59
Sb [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.7	< 0.7	< 0.7	< 0.7
Sr [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	0.1	13	5.9	1.4
Sn [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.5	< 0.5	< 0.5	< 0.5
Ti [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	1.1	0.6	0.5	0.6
Tl [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.002	0.006	0.029	< 0.002
V [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 3	< 3	< 3	< 3
Zn [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.7	< 0.7	< 0.7	< 0.7

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LR Report : **CA19218-NOV22**

Analysis	9: MW-392 (32-33.5)	10: MW-393 (24-25.5)	11: MW-394 (20.5-22)	12: MW-392 (66-68)
Sample Date & Time	27-Sep-22 09:00	04-Oct-22 16:00	25-Sep-22 16:00	26-Sep-22 12:00
Ag [µg/g]	< 0.05	< 0.05	< 0.05	< 0.05
Al [µg/g]	33	26	24	59
As [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
Ba [µg/g]	0.5	0.3	0.3	0.3
Be [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02
B [µg/g]	< 1	< 1	< 1	5
Bi [µg/g]	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	130	28	25	89
Cd [µg/g]	< 0.05	< 0.05	< 0.05	< 0.05
Co [µg/g]	0.02	< 0.01	0.01	0.02
Cr [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
Cu [µg/g]	< 0.1	< 0.1	< 0.1	< 0.1
Fe [µg/g]	27	14	20	28
K [µg/g]	16	9	12	92
Li [µg/g]	< 2	< 2	< 2	< 2
Mg [µg/g]	40	12	12	44
Mn [µg/g]	1.4	0.7	0.6	< 0.5
Mo [µg/g]	< 0.1	< 0.1	< 0.1	< 0.1
Na [µg/g]	44	49	43	720
Ni [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
P [µg/g]	< 3	< 3	< 3	< 3
Pb [µg/g]	< 0.1	< 0.1	< 0.1	< 0.1
Si [µg/g]	100	80	91	140
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7
Sr [µg/g]	0.3	< 0.1	< 0.1	1.8
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
Ti [µg/g]	0.6	0.6	0.9	0.5
Tl [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	< 0.002	< 0.002	< 0.002	< 0.002
V [µg/g]	< 3	< 3	< 3	< 3
Zn [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7

Water Soluble Fraction

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

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Tessier Leach Fraction 2 - Exchangeable Metals

28-February-2023

Ramboll Americas Engineering Solutions, Inc.
Attn : Evvan Plank

P.O# Box 4873
Syrascuse, New York
13221-7873, USA

Phone: 315-463-7554
Fax:

Date Rec. : 24 November 2022
LR Report: **CA19219-NOV22**
Reference: Baldwin Power Plant Drilling

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CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MW-358 (13-15)	6: MW-358 (47-49)	7: MW-358 (86-88)	8: MW-392 (80-82)
Sample Date & Time					05-Oct-22 14:05	06-Oct-22 15:00	08-Oct-22 18:00	26-Sep-22 16:00
Ag [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.05	< 0.05	< 0.05	< 0.05
Al [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	9	17	8	9
As [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.5	< 0.5	< 0.5	< 0.5
Ba [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	48	55	15	3.0
Be [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.02	< 0.02	< 0.02	< 0.02
B [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 1	< 1	1	< 1
Bi [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	2000	2500	1300	3500
Cd [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.05	< 0.05	< 0.05	< 0.05
Co [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.01	< 0.01	0.58	0.24
Cr [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.5	< 0.5	< 0.5	< 0.5
Cu [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 0.1	< 0.1	< 0.1	< 0.1
Fe [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	2	21	< 1	12
K [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	37	430	300	160
Li [µg/g]	19-Jan-23	23:42	31-Jan-23	09:43	< 2	< 2	< 2	< 2
Mn [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	6.5	0.7	1.8	3.6
Mo [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	< 0.1	< 0.1	< 0.1	< 0.1
Na [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	45	3200	2600	420
Ni [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	< 0.5	< 0.5	< 0.5	0.7
Pb [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	< 0.1	< 0.1	< 0.1	< 0.1
P [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	< 3	4	< 3	43
Sb [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	11	100	52	76
Ti [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	0.9	0.3	0.2	0.1
Tl [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	< 0.002	0.009	0.006	0.043
V [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	< 3	< 3	< 3	< 3
Zn [µg/g]	19-Jan-23	23:42	31-Jan-23	09:44	< 0.7	< 0.7	< 0.7	< 0.7

OnLine LIMS

0002345960

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LR Report : CA19219-NOV22

Analysis	9: MW-392 (32-33.5)	10: MW-393 (24-25.5)	11: MW-394 (20.5-22)	12: MW-392 (66-68)
Sample Date & Time	27-Sep-22 09:00	04-Oct-22 16:00	25-Sep-22 16:00	26-Sep-22 12:00
Ag [µg/g]	< 0.05	< 0.05	< 0.05	< 0.05
Al [µg/g]	10	12	12	10
As [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
Ba [µg/g]	16	16	10	4.3
Be [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02
B [µg/g]	< 1	< 1	< 1	2
Bi [µg/g]	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	2500	1400	2100	3700
Cd [µg/g]	< 0.05	< 0.05	< 0.05	< 0.05
Co [µg/g]	0.02	< 0.01	< 0.01	0.02
Cr [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
Cu [µg/g]	< 0.1	< 0.1	< 0.1	< 0.1
Fe [µg/g]	8	9	8	10
K [µg/g]	44	35	60	360
Li [µg/g]	< 2	< 2	< 2	< 2
Mn [µg/g]	3.5	1.7	3.2	2.5
Mo [µg/g]	< 0.1	< 0.1	< 0.1	< 0.1
Na [µg/g]	17	22	30	480
Ni [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
Pb [µg/g]	< 0.1	< 0.1	< 0.1	< 0.1
P [µg/g]	< 3	< 3	4	< 3
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	6.5	4.3	7.4	75
Ti [µg/g]	0.1	0.6	0.3	< 0.1
Tl [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	< 0.002	< 0.002	< 0.002	0.004
V [µg/g]	< 3	< 3	< 3	< 3
Zn [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7

Fraction 2 Exchangeable Metals

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0003245960

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Tessier Leach Fraction 3 - Metals Bound to Carbonates

28-February-2023

Ramboll Americas Engineering Solutions, Inc.
Attn : Evvan Plank

P.O# Box 4873
Syrascuse, New York
13221-7873, USA

Phone: 315-463-7554
Fax:

Date Rec. : 24 November 2022
LR Report: **CA19220-NOV22**
Reference: Ramboll Power Plant Drilling

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: MW-358 (13-15)	6: MW-358 (47-49)	7: MW-358 (86-88)	8: MW-392 (80-82)
Sample Date & Time					05-Oct-22 14:05	06-Oct-22 15:00	08-Oct-22 18:00	26-Sep-22 16:00
Ag [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	< 0.05	< 0.05	< 0.05	< 0.05
Al [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	30	55	56	25
As [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	< 0.5	< 0.5	< 0.5	< 0.5
Ba [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	25	23	6.9	2.8
Be [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	0.09	0.10	0.07	0.03
B [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	< 1	2	3	4
Bi [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	110	1300	770	52000
Cd [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	< 0.05	< 0.05	< 0.05	< 0.05
Co [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	0.04	0.02	2.3	1.0
Cr [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	< 0.5	< 0.5	< 0.5	< 0.5
Cu [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	0.6	0.2	0.6	0.2
Fe [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	40	45	42	25
K [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	15	180	120	90
Li [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	< 2	< 2	< 2	< 2
Mn [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	13	7.0	4.3	77
Mo [µg/g]	19-Jan-23	23:42	31-Jan-23	09:45	< 0.1	< 0.1	< 0.1	< 0.1
Ni [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	< 0.5	< 0.5	1.9	2.7
Pb [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	0.2	0.1	0.9	1.9
P [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	< 3	13	< 3	100
Sb [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	< 0.7	< 0.7	< 0.7	< 0.7
Si [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	96	160	150	33
Sn [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	0.5	10	7.3	99
Ti [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	0.8	0.6	0.5	1.0
Tl [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	0.19	0.094	0.13	0.31
V [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	< 3	< 3	< 3	< 3
Zn [µg/g]	19-Jan-23	23:42	31-Jan-23	09:46	< 0.7	< 0.7	< 0.7	3.7

OnLine LIMS

0003245975

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LR Report : CA19220-NOV22

Analysis	9: MW-392 (32-33.5)	10: MW-393 (24-25.5)	11: MW-394 (20.5-22)	12: MW-392 (66-68)
Sample Date & Time	27-Sep-22 09:00	04-Oct-22 16:00	25-Sep-22 16:00	26-Sep-22 12:00
Ag [µg/g]	< 0.05	< 0.05	< 0.05	< 0.05
Al [µg/g]	30	28	23	28
As [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
Ba [µg/g]	19	15	12	5.0
Be [µg/g]	0.06	0.04	0.04	0.07
B [µg/g]	< 1	< 1	< 1	3
Bi [µg/g]	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	1500	56	140	35000
Cd [µg/g]	< 0.05	< 0.05	< 0.05	< 0.05
Co [µg/g]	0.05	0.02	0.03	0.27
Cr [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
Cu [µg/g]	0.8	0.2	0.2	0.6
Fe [µg/g]	9	14	10	300
K [µg/g]	16	10	15	130
Li [µg/g]	< 2	< 2	< 2	< 2
Mn [µg/g]	20	4.4	7.0	144
Mo [µg/g]	< 0.1	< 0.1	< 0.1	< 0.1
Ni [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
Pb [µg/g]	0.2	0.1	0.1	0.4
P [µg/g]	< 3	< 3	4	< 3
Sb [µg/g]	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7	< 0.7
Si [µg/g]	130	90	99	96
Sn [µg/g]	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	1.5	0.3	0.8	59
Ti [µg/g]	0.1	1.9	0.6	< 0.1
Tl [µg/g]	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	0.12	0.14	0.17	0.100
V [µg/g]	< 3	< 3	< 3	< 3
Zn [µg/g]	< 0.7	< 0.7	< 0.7	1.0

Fraction 3 Metals Bound to Carbonates

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0003245975

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Tessier Leach Fraction 4 - Metals Bound to Fe and Mn Oxides

28-February-2023

Ramboll Americas Engineering Solutions, Inc.
Attn : Evvan Plank

P.O# Box 4873
Syrascuse, New York
13221-7873, USA

Phone: 315-463-7554
Fax:

Date Rec. : 24 November 2022
LR Report: **CA19221-NOV22**
Reference: Baldwin Power Plant Drilling

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Completed Date	4: Analysis Completed Time	5: MW-358 (13-15)	6: MW-358 (47-49)	7: MW-358 (86-88)	8: MW-392 (80-82)	9: MW-392 (32-33.5)
Sample Date & Time			05-Oct-22 14:05	06-Oct-22 15:00	08-Oct-22 18:00	26-Sep-22 16:00	27-Sep-22 09:00
Ag [µg/g]	31-Jan-23	09:47	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Al [µg/g]	31-Jan-23	09:47	290	310	340	220	220
As [µg/g]	31-Jan-23	09:47	< 0.5	< 0.5	< 0.5	1.3	< 0.5
Ba [µg/g]	31-Jan-23	09:47	16	6.4	1.6	4.1	56
Be [µg/g]	31-Jan-23	09:47	0.26	0.16	0.15	0.15	0.21
B [µg/g]	31-Jan-23	09:47	< 1	5	6	6	< 1
Bi [µg/g]	31-Jan-23	09:47	< 0.09	< 0.09	< 0.09	0.14	< 0.09
Ca [µg/g]	31-Jan-23	09:47	71	320	250	130000	2300
Cd [µg/g]	31-Jan-23	09:47	< 0.05	< 0.05	< 0.05	0.13	0.18
Co [µg/g]	31-Jan-23	09:47	3.8	0.33	3.0	2.3	5.1
Cr [µg/g]	31-Jan-23	09:47	2.3	1.2	1.3	1.0	0.9
Cu [µg/g]	31-Jan-23	09:47	1.6	0.4	0.7	0.1	2.9
Fe [µg/g]	31-Jan-23	09:47	1600	1600	1200	1800	1100
K [µg/g]	31-Jan-23	09:47	16	140	110	43	19
Li [µg/g]	31-Jan-23	09:47	< 2	3	5	< 2	< 2
Mn [µg/g]	31-Jan-23	09:47	240	3.1	2.9	190	500
Mo [µg/g]	31-Jan-23	09:47	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Ni [µg/g]	31-Jan-23	09:47	3.1	2.7	4.5	6.5	3.1
Pb [µg/g]	31-Jan-23	09:47	3.3	0.2	1.2	8.4	3.7
P [µg/g]	31-Jan-23	09:47	19	110	77	400	31
Sb [µg/g]	31-Jan-23	09:47	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	31-Jan-23	09:47	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Si [µg/g]	31-Jan-23	09:47	920	910	710	270	600
Sn [µg/g]	31-Jan-23	09:47	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	31-Jan-23	09:47	0.4	3.1	2.8	237	1.7
Ti [µg/g]	31-Jan-23	09:47	0.4	0.1	0.3	< 0.1	< 0.1
Tl [µg/g]	31-Jan-23	09:47	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
U [µg/g]	31-Jan-23	09:47	0.26	0.068	0.17	0.62	0.15
V [µg/g]	31-Jan-23	09:47	5	< 3	< 3	< 3	3
Zn [µg/g]	31-Jan-23	09:47	2.9	1.9	1.9	13	3.8

OnLine LIMS

0003245982

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SGS Canada Inc.
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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA19221-NOV22**

Analysis	10: MW-393 (24-25.5)	11: MW-394 (20.5-22)	12: MW-392 (66-68)
Sample Date & Time	04-Oct-22 16:00	25-Sep-22 16:00	26-Sep-22 12:00
Ag [µg/g]	< 0.01	0.02	< 0.01
Al [µg/g]	290	270	490
As [µg/g]	< 0.5	< 0.5	< 0.5
Ba [µg/g]	45	35	1.5
Be [µg/g]	0.16	0.18	0.18
B [µg/g]	< 1	< 1	4
Bi [µg/g]	< 0.09	< 0.09	0.14
Ca [µg/g]	100	350	7600
Cd [µg/g]	0.06	0.14	< 0.05
Co [µg/g]	4.3	3.5	0.62
Cr [µg/g]	1.2	1.2	2.0
Cu [µg/g]	1.5	2.0	0.9
Fe [µg/g]	1500	1200	2700
K [µg/g]	15	22	120
Li [µg/g]	< 2	< 2	2
Mn [µg/g]	380	260	63
Mo [µg/g]	< 0.1	< 0.1	< 0.1
Ni [µg/g]	3.2	3.7	2.5
Pb [µg/g]	3.5	2.1	0.9
P [µg/g]	17	91	110
Sb [µg/g]	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7
Si [µg/g]	660	850	650
Sn [µg/g]	< 0.5	< 0.5	< 0.5
Sr [µg/g]	0.5	1.3	26
Ti [µg/g]	0.3	0.2	0.2
Tl [µg/g]	< 0.02	< 0.02	< 0.02
U [µg/g]	0.12	0.18	0.082
V [µg/g]	< 3	5	< 3
Zn [µg/g]	4.3	7.8	2.8

Fraction 4 Metals Bound to Fe and Mn Oxides

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0003245982

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Tessier Leach Fraction 5 - Bound to Organic Material

28-February-2023

Ramboll Americas Engineering Solutions, Inc.
Attn : Evvan Plank

P.O# Box 4873
Syrascuse, New York
13221-7873, USA

Phone: 315-463-7554
Fax:

Date Rec. : 24 November 2022
LR Report: **CA19222-NOV22**
Reference: Baldwin Power plant Drilling

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Completed Date	4: Analysis Completed Time	5: MW-358 (13-15)	6: MW-358 (47-49)	7: MW-358 (86-88)	8: MW-392 (80-82)	9: MW-392 (32-33.5)
Sample Date & Time			05-Oct-22 14:05	06-Oct-22 15:00	08-Oct-22 18:00	26-Sep-22 16:00	27-Sep-22 09:00
Ag [µg/g]	31-Jan-23	09:48	0.14	0.15	0.08	0.07	0.06
Al [µg/g]	31-Jan-23	09:48	980	1300	1100	130	610
As [µg/g]	31-Jan-23	09:48	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ba [µg/g]	31-Jan-23	09:48	15	11	1.8	3.6	36
Be [µg/g]	31-Jan-23	09:48	0.13	0.32	0.16	0.07	0.12
B [µg/g]	31-Jan-23	09:48	< 1	2	2	2	< 1
Bi [µg/g]	31-Jan-23	09:48	< 0.09	< 0.09	< 0.09	< 0.09	< 0.09
Ca [µg/g]	31-Jan-23	09:48	160	490	220	8600	840
Cd [µg/g]	31-Jan-23	09:48	< 0.05	< 0.05	< 0.05	0.20	< 0.05
Co [µg/g]	31-Jan-23	09:48	1.4	0.45	9.7	3.3	1.3
Cr [µg/g]	31-Jan-23	09:48	2.1	1.0	1.2	< 0.5	1.6
Cu [µg/g]	31-Jan-23	09:48	0.5	1.0	1.8	1.9	0.4
Fe [µg/g]	31-Jan-23	09:48	150	610	1800	220	83
K [µg/g]	31-Jan-23	09:48	15	104	79	25	15
Li [µg/g]	31-Jan-23	09:48	< 2	< 2	3	< 2	< 2
Mg [µg/g]	31-Jan-23	09:48	170	1100	870	200	500
Mn [µg/g]	31-Jan-23	09:48	85	3.6	15	16	92
Mo [µg/g]	31-Jan-23	09:48	< 0.1	< 0.1	< 0.1	0.2	0.4
Na [µg/g]	31-Jan-23	09:48	110	180	150	90	75
Ni [µg/g]	31-Jan-23	09:48	1.9	4.3	13	15	2.1
Pb [µg/g]	31-Jan-23	09:48	1.6	0.1	1.6	3.8	1.3
P [µg/g]	31-Jan-23	09:48	< 3	< 3	< 3	290	5
Sb [µg/g]	31-Jan-23	09:48	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	31-Jan-23	09:48	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Si [µg/g]	31-Jan-23	09:48	590	480	420	130	530
Sn [µg/g]	31-Jan-23	09:48	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Sr [µg/g]	31-Jan-23	09:48	0.5	5.1	2.8	48	0.9
Ti [µg/g]	31-Jan-23	09:48	0.7	< 0.1	< 0.1	< 0.1	2.9
Tl [µg/g]	31-Jan-23	09:48	< 0.02	< 0.02	0.02	0.05	< 0.02
U [µg/g]	31-Jan-23	09:48	0.17	0.13	0.19	0.25	0.060
V [µg/g]	31-Jan-23	09:48	< 3	< 3	< 3	< 3	3
Zn [µg/g]	31-Jan-23	09:48	1.4	< 0.7	1.8	41	1.7

OnLine LIMS

0003245986

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Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA19222-NOV22**

Analysis	10: MW-393 (24-25.5)	11: MW-394 (20.5-22)	12: MW-392 (66-68)
Sample Date & Time	04-Oct-22 16:00	25-Sep-22 16:00	26-Sep-22 12:00
Ag [µg/g]	< 0.05	< 0.05	< 0.05
Al [µg/g]	660	870	820
As [µg/g]	< 0.5	< 0.5	< 0.5
Ba [µg/g]	33	45	1.5
Be [µg/g]	0.08	0.15	0.18
B [µg/g]	< 1	< 1	2
Bi [µg/g]	< 0.09	< 0.09	< 0.09
Ca [µg/g]	88	300	2400
Cd [µg/g]	< 0.05	< 0.05	< 0.05
Co [µg/g]	1.2	2.3	0.68
Cr [µg/g]	1.2	1.5	1.1
Cu [µg/g]	0.3	0.8	1.4
Fe [µg/g]	93	120	680
K [µg/g]	14	21	70
Li [µg/g]	< 2	< 2	< 2
Mg [µg/g]	150	280	730
Mn [µg/g]	100	164	15
Mo [µg/g]	0.1	0.3	< 0.1
Na [µg/g]	48	170	95
Ni [µg/g]	1.6	3.5	2.9
Pb [µg/g]	1.7	1.3	0.9
P [µg/g]	4	8	< 3
Sb [µg/g]	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7
Si [µg/g]	470	650	470
Sn [µg/g]	< 0.5	< 0.5	< 0.5
Sr [µg/g]	0.3	1.2	9.8
Ti [µg/g]	2.1	2.5	< 0.1
Tl [µg/g]	< 0.02	< 0.02	< 0.02
U [µg/g]	0.065	0.16	0.080
V [µg/g]	< 3	4	< 3
Zn [µg/g]	1.6	4.0	0.9

Fraction 5 Bound to Organic Material

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0003245986

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

28-February-2023

Ramboll Americas Engineering Solutions, Inc.
Attn : Evvan Plank

P.O# Box 4873
Syrascuse, New York
13221-7873, USA

Phone: 315-463-7554
Fax:

Date Rec. : 24 November 2022
LR Report: **CA19223-NOV22**
Reference: Baldwin Power Plant Drilling

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	3: Analysis Completed Date	4: Analysis Completed Time	5: MW-358 (13-15)	6: MW-358 (47-49)	7: MW-358 (86-88)	8: MW-392 (80-82)	9: MW-392 (32-33.5)
Sample Date & Time			05-Oct-22 14:05	06-Oct-22 15:00	08-Oct-22 18:00	26-Sep-22 16:00	27-Sep-22 09:00
Ag [µg/g]	31-Jan-23	09:48	0.09	< 0.05	< 0.05	< 0.05	0.07
Al [µg/g]	31-Jan-23	09:48	44000	63000	71000	27000	45000
As [µg/g]	31-Jan-23	09:48	5.8	2.3	9.8	10	8.6
Ba [µg/g]	31-Jan-23	09:48	390	150	140	56	320
Be [µg/g]	31-Jan-23	09:48	0.65	1.4	1.5	0.68	0.87
B [µg/g]	31-Jan-23	09:48	13	60	62	26	21
Bi [µg/g]	31-Jan-23	09:48	0.25	0.26	0.18	0.14	0.25
Ca [µg/g]	31-Jan-23	09:48	2500	150	120	20000	1400
Cd [µg/g]	31-Jan-23	09:48	0.06	< 0.05	< 0.05	0.11	0.08
Co [µg/g]	31-Jan-23	09:48	3.3	7.2	6.4	2.0	6.4
Cr [µg/g]	31-Jan-23	09:48	34	69	75	37	40
Cu [µg/g]	31-Jan-23	09:48	10	9.9	5.7	7.2	15
Fe [µg/g]	31-Jan-23	09:48	22000	42000	22000	14000	28000
K [µg/g]	31-Jan-23	09:48	11000	18000	16000	5100	13000
Li [µg/g]	31-Jan-23	09:48	18	9	65	7	20
Mg [µg/g]	31-Jan-23	09:48	2700	7800	7600	4100	3300
Mn [µg/g]	31-Jan-23	09:48	110	70	51	50	130
Mo [µg/g]	31-Jan-23	09:48	0.9	0.3	0.1	0.1	0.9
Na [µg/g]	31-Jan-23	09:48	6700	560	830	550	5200
Ni [µg/g]	31-Jan-23	09:48	14	32	29	13	21
Pb [µg/g]	31-Jan-23	09:48	10	8.0	7.0	17	12
P [µg/g]	31-Jan-23	09:48	260	240	160	7200	300
Sb [µg/g]	31-Jan-23	09:48	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Se [µg/g]	31-Jan-23	09:48	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
Si [µg/g]	31-Jan-23	09:48	160000	66000	51000	73000	65000
Sn [µg/g]	31-Jan-23	09:48	5.4	5.8	5.8	4.9	5.2
Sr [µg/g]	31-Jan-23	09:48	89	30	25	130	79
Ti [µg/g]	31-Jan-23	09:48	2400	670	570	520	980
Tl [µg/g]	31-Jan-23	09:48	0.47	0.42	0.42	0.17	0.51
U [µg/g]	31-Jan-23	09:48	1.3	0.30	0.99	2.7	1.1
V [µg/g]	31-Jan-23	09:48	54	73	86	95	57
Zn [µg/g]	31-Jan-23	09:48	37	47	32	43	53

OnLine LIMS

0003246014

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

LR Report : **CA19223-NOV22**

Analysis	10: MW-393 (24-25.5)	11: MW-394 (20.5-22)	12: MW-392 (66-68)
Sample Date & Time	04-Oct-22 16:00	25-Sep-22 16:00	26-Sep-22 12:00
Ag [µg/g]	< 0.05	< 0.05	< 0.05
Al [µg/g]	33000	45000	59000
As [µg/g]	10	9.8	0.9
Ba [µg/g]	300	410	93
Be [µg/g]	0.56	0.83	1.2
B [µg/g]	15	16	53
Bi [µg/g]	0.18	0.27	0.20
Ca [µg/g]	1700	3000	170
Cd [µg/g]	< 0.05	0.11	< 0.05
Co [µg/g]	3.2	5.0	6.4
Cr [µg/g]	24	35	71
Cu [µg/g]	9.9	13	12
Fe [µg/g]	19000	27000	43000
K [µg/g]	12000	14000	17000
Li [µg/g]	13	16	19
Mg [µg/g]	2200	3400	9500
Mn [µg/g]	80	140	47
Mo [µg/g]	0.7	2.7	0.2
Na [µg/g]	5100	7700	490
Ni [µg/g]	13	18	31
Pb [µg/g]	9.1	13	4.1
P [µg/g]	230	460	170
Sb [µg/g]	< 0.8	< 0.8	< 0.8
Se [µg/g]	< 0.7	< 0.7	< 0.7
Si [µg/g]	61000	43000	62000
Sn [µg/g]	4.6	5.2	5.6
Sr [µg/g]	70	110	22
Ti [µg/g]	780	1100	560
Tl [µg/g]	0.35	0.50	0.36
U [µg/g]	0.61	1.1	0.097
V [µg/g]	35	57	70
Zn [µg/g]	37	54	48

Fraction 6 Residual metals

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0003246014

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SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

28-February-2023

Ramboll Americas Engineering Solutions, Inc.
Attn : Evvan Plank

P.O# Box 4873
Syrascuse, New York
13221-7873, USA

Phone: 315-463-7554
Fax:

Date Rec. : 24 November 2022
LR Report: **CA19224-NOV22**
Reference: Baldwon Power Plant Drilling

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	6: MW-358 (47-49)	7: MW-358 (86-88)	8: MW-392 (80-82)	12: MW-392 (66-68)
Sample Date & Time					06-Oct-22 15:00	08-Oct-22 18:00	26-Sep-22 16:00	26-Sep-22 12:00
Hg MS [ug/g]	09-Dec-22	16:29	12-Dec-22	15:05	< 0.05	< 0.05	< 0.05	< 0.05
As [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	2.1	11	17	1.0
B [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	11	16	16	13
Ba [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	140	45	40	21
Be [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	0.85	0.67	0.85	0.70
Cd [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	< 0.02	< 0.02	0.36	0.09
Co [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	4.4	23	12	6.2
Cr [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	9.5	12	17	16
Li [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	6	20	8	15
Mo [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	0.3	0.3	0.3	0.3
Pb [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	5.7	9.6	17	4.9
Se [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	< 0.7	< 0.7	1.4	< 0.7
Tl [µg/g]	09-Dec-22	16:29	12-Dec-22	15:05	0.05	0.06	0.04	0.03

Catharine Arnold

Catharine Arnold, B.Sc., C.Chem
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0003246025

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LR Report : **CA19224-NOV22**

OnLine LIMS

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Attachment H
X-Ray Diffraction Analytical Data

Quantitative X-Ray Diffraction by Rietveld Refinement

Report Prepared for:	*Environmental Services*
Project Number/ LIMS No.	*Custom XRD/MI4527-AUG23*
Sample Receipt:	*August 10, 2023*
Sample Analysis:	*August 25, 2023*
Reporting Date:	*September 15, 2023*

Instrument:	BRUKER AXS D8 Advance Diffractometer
Test Conditions:	Co radiation, 35 kV, 40 mA; Detector: LYNXEYE Regular Scanning: Step: 0.02°, Step time: 0.75s, 2θ range: 6-80° Clay Section Scanning: Step: 0.01°, Step time:0.2s, 2θ range: 3-40°
Interpretations :	PDF2/PDF4 powder diffraction databases issued by the International Center for Diffraction Data (ICDD). DiffracPlus Eva and Topas software.
Detection Limit :	0.5-2%. Strongly dependent on crystallinity.

Contents:

1) Method Summary
2) Quantitative XRD Results
3) XRD Pattern(s)

Kim Gibbs, H.B.Sc., P.Geo.
Senior Mineralogist

Huyun Zhou, Ph.D., P.Geo.
Senior Mineralogist

ACCREDITATION: SGS Natural Resources Lakefield is accredited to the requirements of ISO/IEC 17025 for specific tests as listed on our scope of accreditation, including geochemical, mineralogical and trade mineral tests. To view a list of the accredited methods, please visit the following website and search SGS Canada Inc. - Minerals: https://www.scc.ca/en/search/palcan.

Method Summary

The Rietveld Method of Mineral Identification by XRD (ME-LR-MIN-MET-MN-D05) method used by SGS Natural Resources is accredited to the requirements of ISO/IEC 17025.

Mineral Identification and Interpretation:

Mineral identification and interpretation involves matching the diffraction pattern of an unknown material to patterns of single-phase reference materials. The reference patterns are compiled by the Joint Committee on Powder Diffraction Standards - International Center for Diffraction Data (JCPDS-ICDD) database and released on software as Powder Diffraction Files (PDF).

Interpretations do not reflect the presence of non-crystalline and/or amorphous compounds, except when internal standards have been added by request. Mineral proportions may be strongly influenced by crystallinity, crystal structure and preferred orientations. Mineral or compound identification and quantitative analysis results should be accompanied by supporting chemical assay data or other additional tests.

Clay Mineral Separation and Identification:

Clay minerals are typically fine-grained (<2 µm) phyllosilicates in sedimentary rock. Due to the poor crystallinity and fine size of clay minerals, separation of the clay fraction from bulk samples by centrifuge is required. A slide of the oriented clay fraction is prepared and scanned followed by a series of procedures (the addition of ethylene glycol and high temperature heating). Clay minerals are identified by their individual diffraction patterns and changes in their diffraction pattern after different treatments. Clay speciation and mineral identification of the bulk sample are performed using DIFFRACplus EVA (Bruker AXS).

Quantitative Rietveld Analysis:

Quantitative Rietveld Analysis is performed by using Topas 4.2 (Bruker AXS), a graphics based profile analysis program built around a non-linear least squares fitting system, to determine the amount of different phases present in a multicomponent sample. Whole pattern analyses are predicated by the fact that the X-ray diffraction pattern is a total sum of both instrumental and specimen factors. Unlike other peak intensity-based methods, the Rietveld method uses a least squares approach to refine a theoretical line profile until it matches the obtained experimental patterns.

Rietveld refinement is completed with a set of minerals specifically identified for the sample. Zero values indicate that the mineral was included in the refinement calculations, but the calculated concentration was less than 0.05wt%. Minerals not identified by the analyst are not included in refinement calculations for specific samples and are indicated with a dash.

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Summary of Rietveld Quantitative Analysis X-Ray Diffraction Results

Mineral/Compound	BAL-1-15-20-20230620 AUG4527-01 (wt %)	BAL-1-20-25-20230620 AUG4527-02 (wt %)	BAL-1-35-40-20230620 AUG4527-03 (wt %)	BAL-1-42-46-20230620 AUG4527-04 (wt %)	BAL-1-42-46-2-20230620 AUG4527-05 (wt %)	BAL-2-50-60-20230621 AUG4527-06 (wt %)
Quartz	53.5	32.4	17.7	10.4	10.7	11.2
Actinolite	2.0	0.5	1.3	-	-	-
Albite	11.3	9.0	2.5	0.4	0.6	0.2
Microcline	8.0	9.7	4.6	2.1	0.5	2.1
Dolomite	9.4	11.2	4.4	0.8	0.4	3.5
Calcite	2.9	9.5	27.2	80.5	84.6	57.2
Magnetite	0.3	0.5	0.8	-	-	0.2
Muscovite	2.0	9.1	11.8	1.9	1.4	6.4
Chlorite	-	0.7	0.2	0.0	0.2	0.2
Pyrite	-	-	1.6	-	-	0.6
Ankerite	-	-	7.3	0.4	0.2	4.7
Gypsum	-	-	1.9	-	-	-
Hematite	-	-	0.4	-	-	0.2
Anatase	-	-	0.6	-	-	-
Rhodochrosite	-	-	0.7	-	-	-
Clay						
Montmorillonite	5.5	9.0	10.5	2.1	0.2	7.8
Illite	4.0	6.8	3.2	0.9	0.6	3.2
Kaolinite	1.0	1.5	3.2	0.5	0.6	2.4
Illite-Montmorillonite	-	-	-	-	-	-
TOTAL	100	100	100	100	100	100

Zero values indicate that the mineral was included in the refinement, but the calculated concentration is below a measurable value.

Dashes indicate that the mineral was not identified by the analyst and not included in the refinement calculation for the sample.

The weight percent quantities indicated have been normalized to a sum of 100%. The quantity of amorphous material has not been determined.

Mineral/Compound	Formula
Quartz	SiO_2
Actinolite	$Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$
Albite	$NaAlSi_3O_8$
Microcline	$KAlSi_3O_8$
Dolomite	$CaMg(CO_3)_2$
Calcite	$CaCO_3$
Magnetite	Fe_3O_4
Muscovite	$KAl_2(AlSi_3O_{10})(OH)_2$
Chlorite	$(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$
Pyrite	FeS_2
Ankerite	$CaFe(CO_3)_2$
Gypsum	$CaSO_4 \cdot 2H_2O$
Hematite	Fe_2O_3
Anatase	TiO_2
Rhodochrosite	$MnCO_3$
Montmorillonite	$(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2 \cdot 10H_2O$
Illite	$(K,H_3O)(Al,Mg,Fe)_2(Si,Al)_4O_{10}[(OH)_2,(H_2O)]$
Kaolinite	$Al_2Si_2O_5(OH)_4$
Illite-Montmorillonite	$KAl_4(Si,Al)_8O_{20}(OH)_4 \cdot 8H_2O$

Summary of Rietveld Quantitative Analysis X-Ray Diffraction Results

Mineral/Compound	BAL-2-60-70-20230621 AUG4527-07 (wt %)	BAL-3-40-52-20230621 AUG4527-08 (wt %)	BAL-4-50-51-20230622 AUG4527-09 (wt %)	BAL-4-51-55-20230622 AUG4527-10 (wt %)	BAL-4-55-72-20230622 AUG4527-11 (wt %)
Quartz	19.4	14.2	24.2	13.1	5.2
Actinolite	-	-	-	-	-
Albite	0.2	1.8	2.2	0.4	0.0
Microcline	1.3	5.3	3.2	1.9	0.3
Dolomite	6.2	0.3	-	-	-
Calcite	49.5	33.9	35.5	74.9	90.2
Magnetite	-	-	0.7	0.4	-
Muscovite	4.3	12.9	17.6	5.3	2.0
Chlorite	1.8	3.7	-	-	-
Pyrite	0.8	1.3	0.2	0.1	0.3
Ankerite	10.0	1.6	-	0.0	0.4
Gypsum	-	-	-	-	-
Hematite	0.4	-	-	-	-
Anatase	-	0.6	0.5	0.5	-
Rhodochrosite	-	-	-	-	-
Clay					
Montmorillonite	2.6	14.0	-	2.2	0.9
Illite	2.6	6.1	7.9	1.2	0.9
Kaolinite	0.8	4.2	-	-	-
Illite-Montmorillonite	-	-	8.0	-	-
TOTAL	100	100	100	100	100

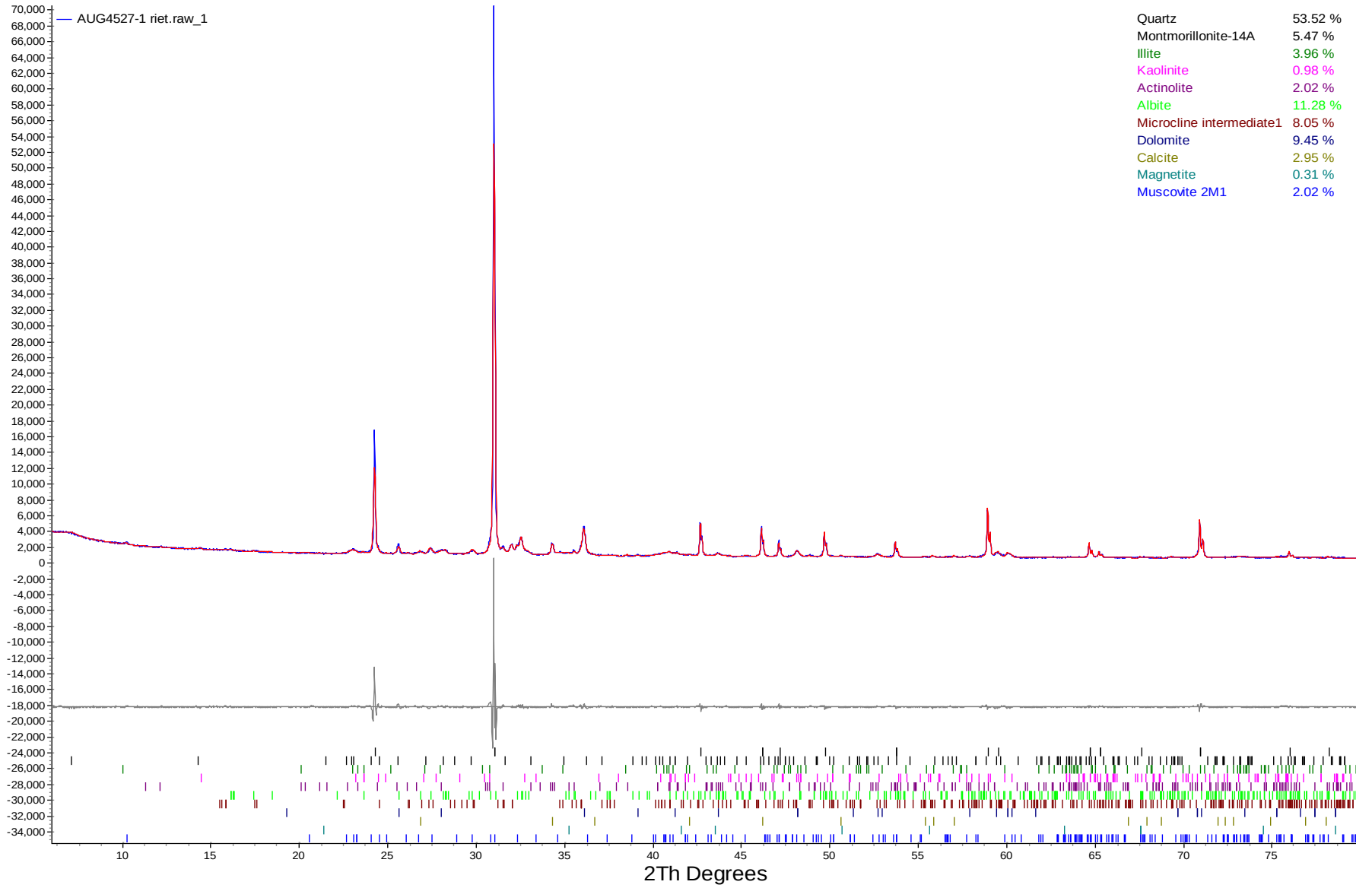
Zero values indicate that the mineral was included in the refinement, but the calculated concentration is below a measurable value.

Dashes indicate that the mineral was not identified by the analyst and not included in the refinement calculation for the sample.

The weight percent quantities indicated have been normalized to a sum of 100%. The quantity of amorphous material has not been determined.

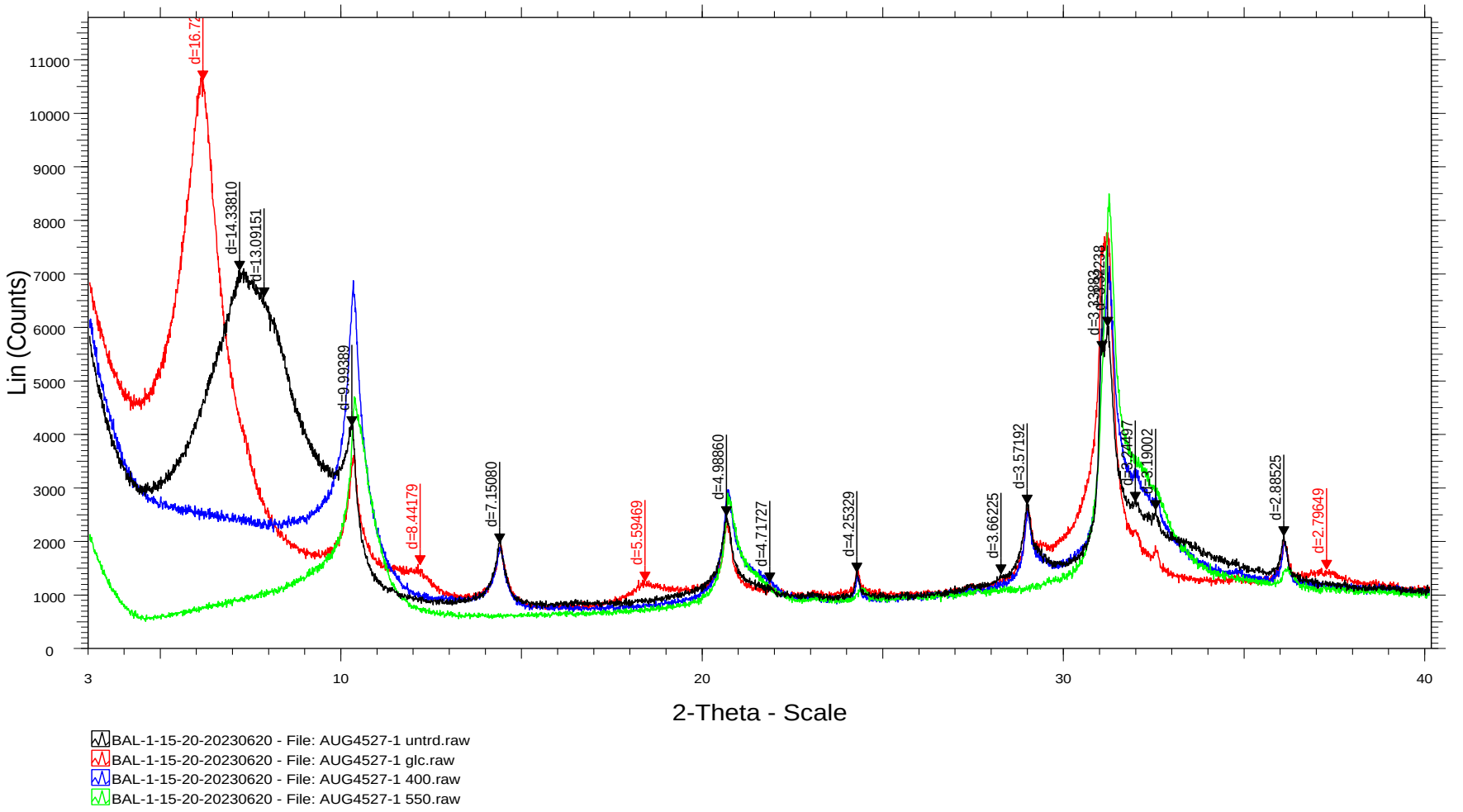
Mineral/Compound	Formula
Quartz	SiO_2
Actinolite	$Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$
Albite	$NaAlSi_3O_8$
Microcline	$KAlSi_3O_8$
Dolomite	$CaMg(CO_3)_2$
Calcite	$CaCO_3$
Magnetite	Fe_3O_4
Muscovite	$KAl_2(AlSi_3O_{10})(OH)_2$
Chlorite	$(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$
Pyrite	FeS_2
Ankerite	$CaFe(CO_3)_2$
Gypsum	$CaSO_4 \cdot 2H_2O$
Hematite	Fe_2O_3
Anatase	TiO_2
Rhodochrosite	$MnCO_3$
Montmorillonite	$(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2 \cdot 10H_2O$
Illite	$(K,H_3O)(Al,Mg,Fe)_2(Si,Al)_4O_{10}[(OH)_2,(H_2O)]$
Kaolinite	$Al_2Si_2O_5(OH)_4$
Illite-Montmorillonite	$KAl_4(Si,Al)_8O_{20}(OH)_4 \cdot 8H_2O$

BAL-1-15-20-20230620



Quartz	53.52 %
Montmorillonite-14A	5.47 %
Illite	3.96 %
Kaolinite	0.98 %
Actinolite	2.02 %
Albite	11.28 %
Microcline intermediate1	8.05 %
Dolomite	9.45 %
Calcite	2.95 %
Magnetite	0.31 %
Muscovite 2M1	2.02 %

BAL-1-15-20-20230620



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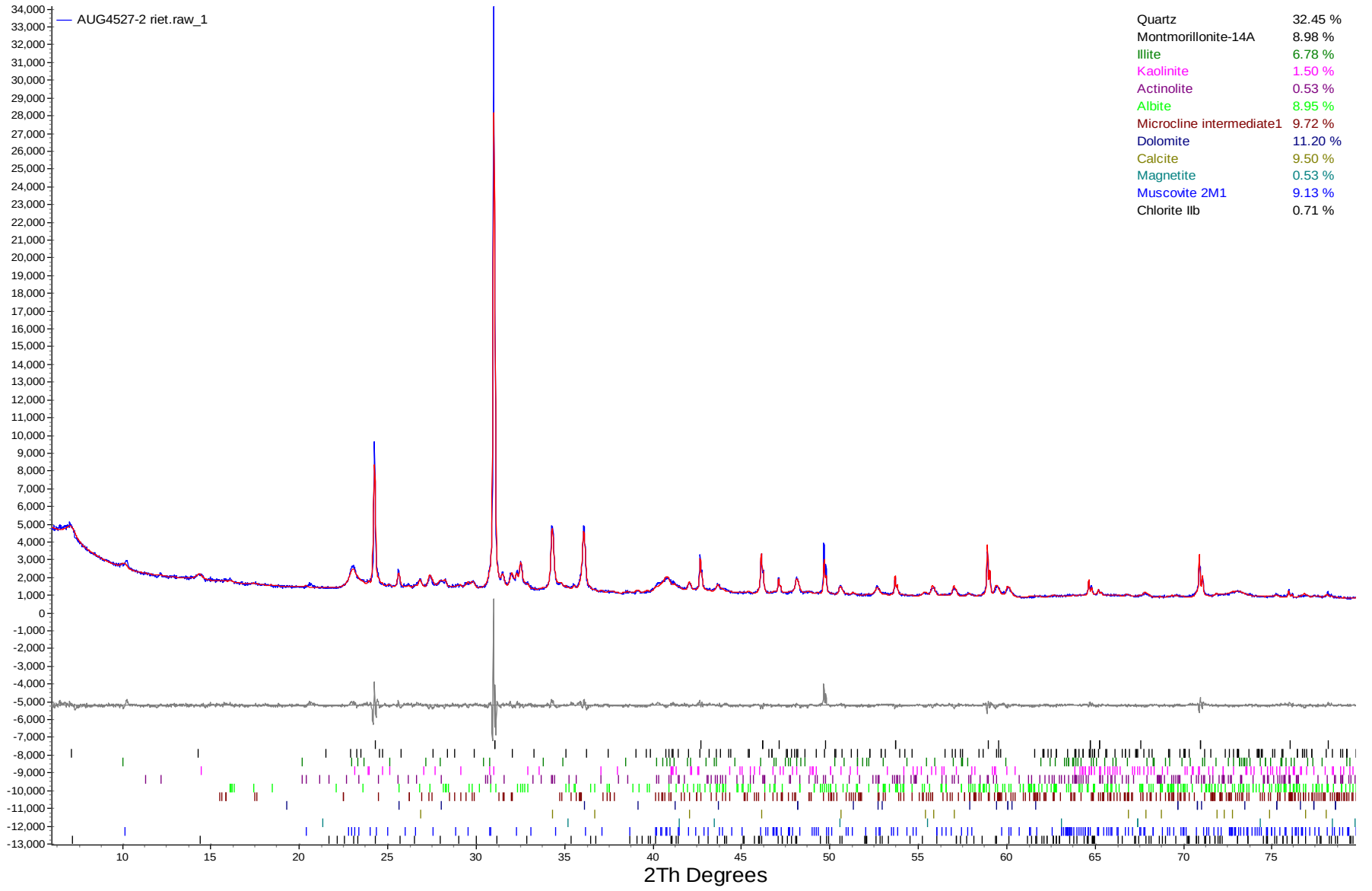
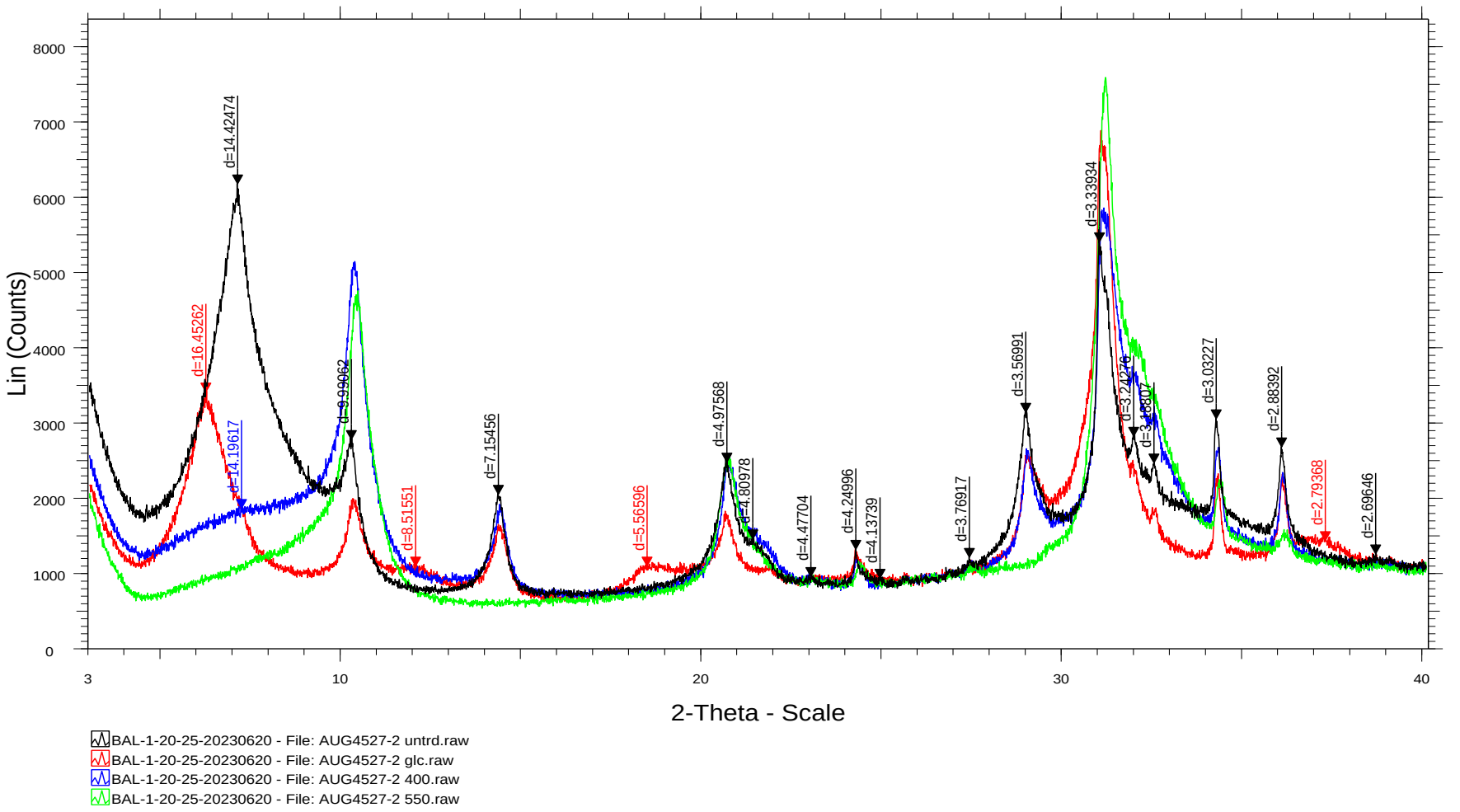
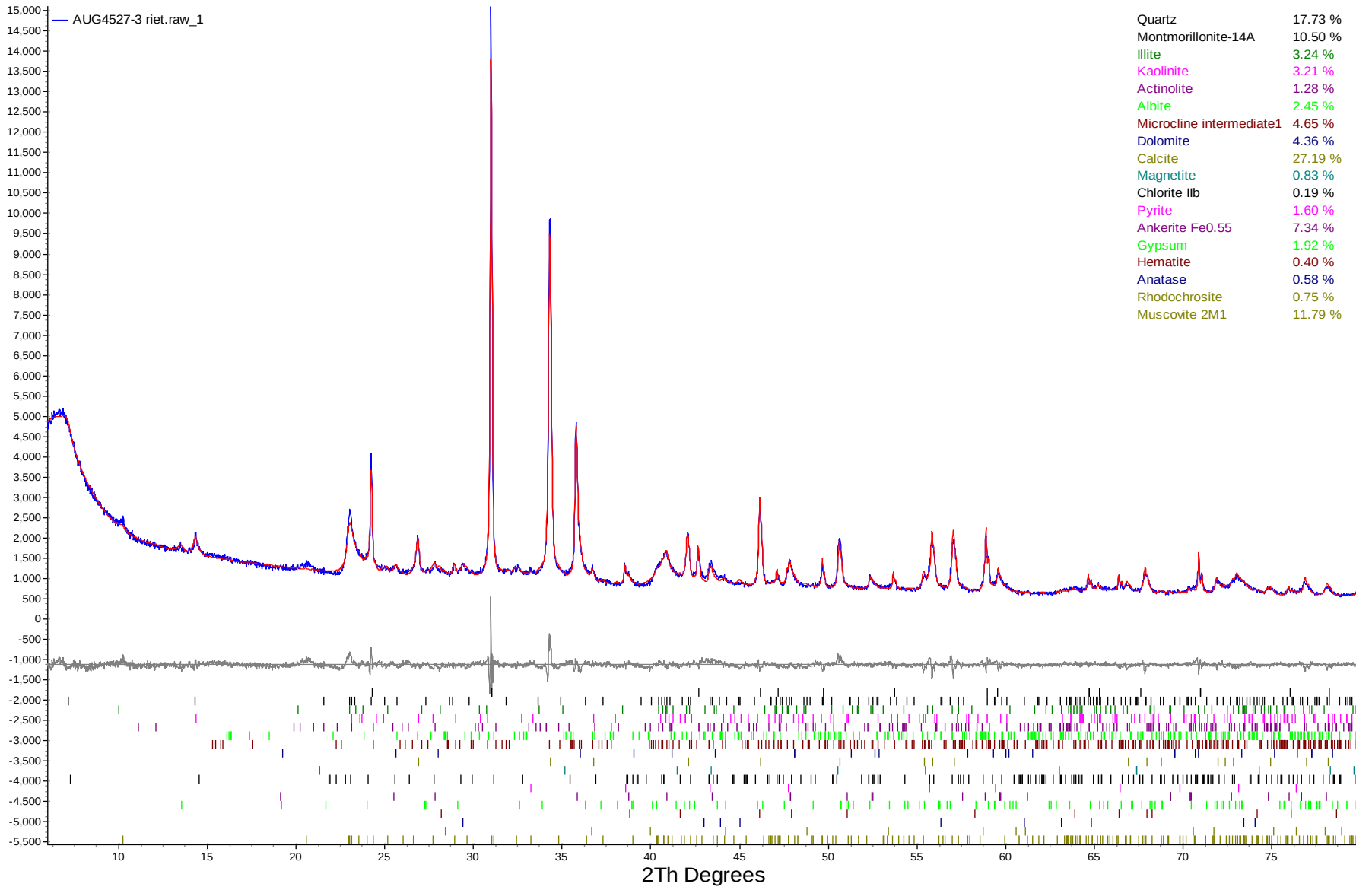


Quartz	32.45 %
Montmorillonite-14A	8.98 %
Illite	6.78 %
Kaolinite	1.50 %
Actinolite	0.53 %
Albite	8.95 %
Microcline intermediate1	9.72 %
Dolomite	11.20 %
Calcite	9.50 %
Magnetite	0.53 %
Muscovite 2M1	9.13 %
Chlorite IIb	0.71 %

BAL-1-20-25-20230620

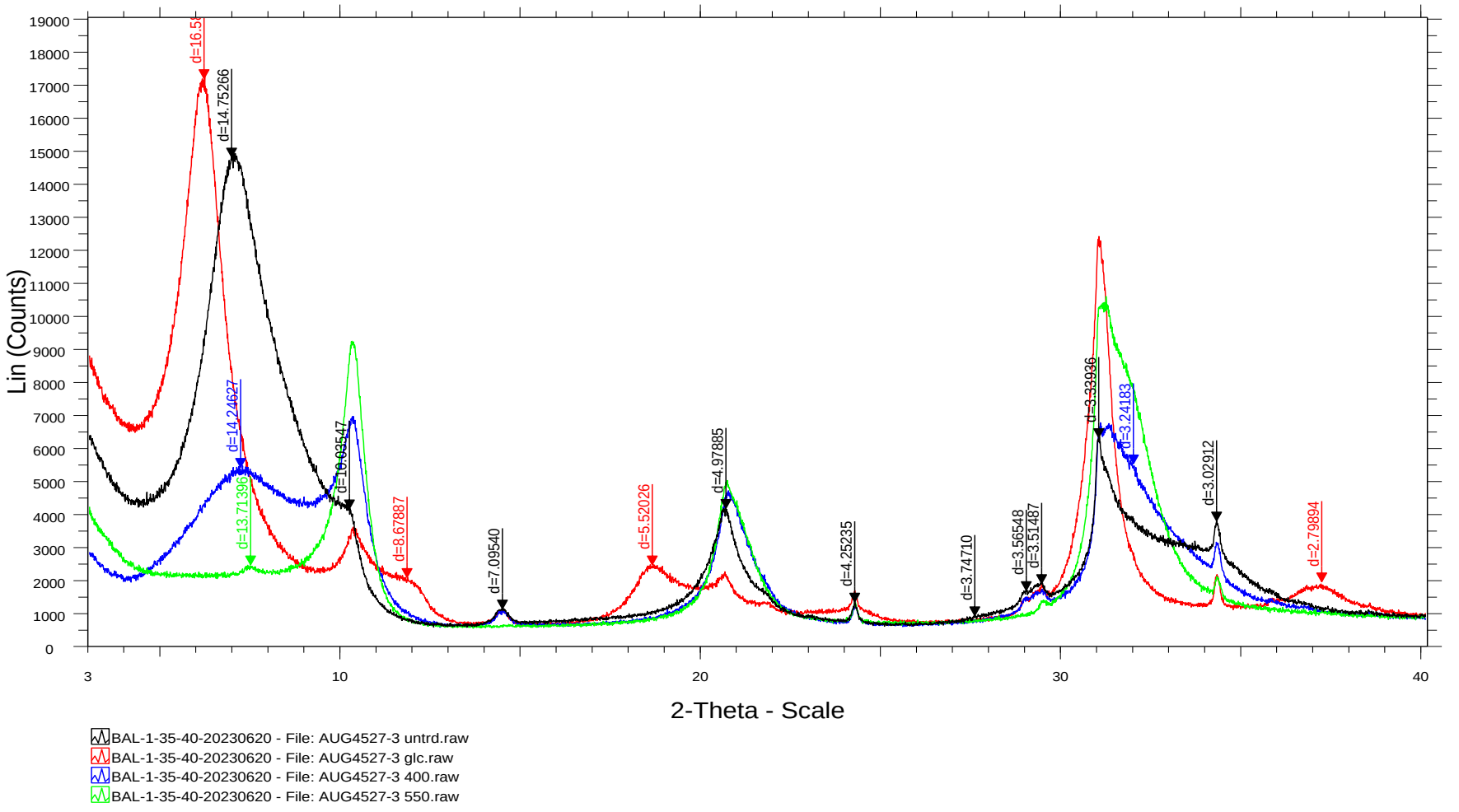


BAL-1-35-40-20230620

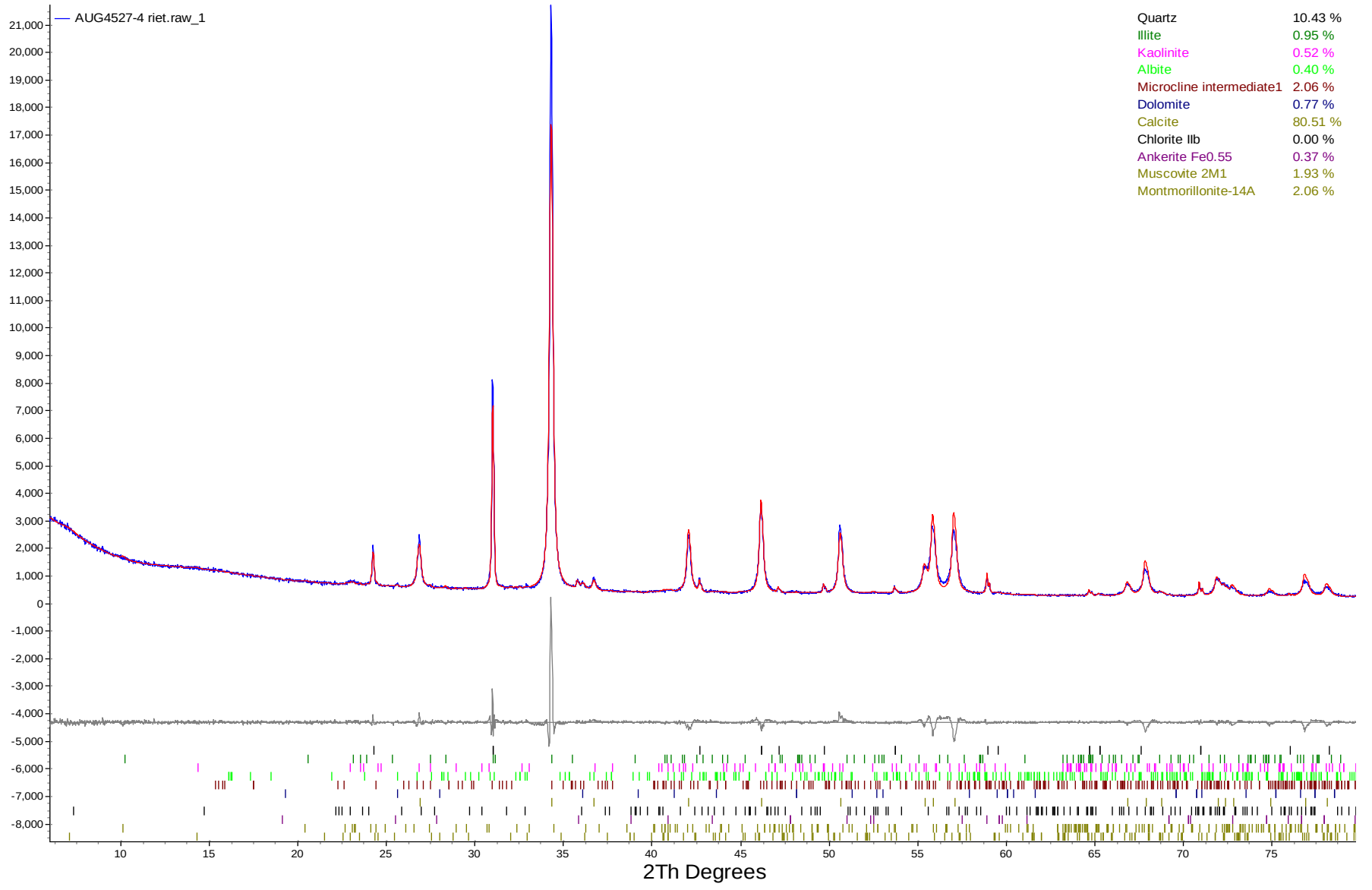


Quartz	17.73 %
Montmorillonite-14A	10.50 %
Illite	3.24 %
Kaolinite	3.21 %
Actinolite	1.28 %
Albite	2.45 %
Microcline intermediate1	4.65 %
Dolomite	4.36 %
Calcite	27.19 %
Magnetite	0.83 %
Chlorite IIb	0.19 %
Pyrite	1.60 %
Ankerite Fe0.55	7.34 %
Gypsum	1.92 %
Hematite	0.40 %
Anatase	0.58 %
Rhodochrosite	0.75 %
Muscovite 2M1	11.79 %

BAL-1-35-40-20230620

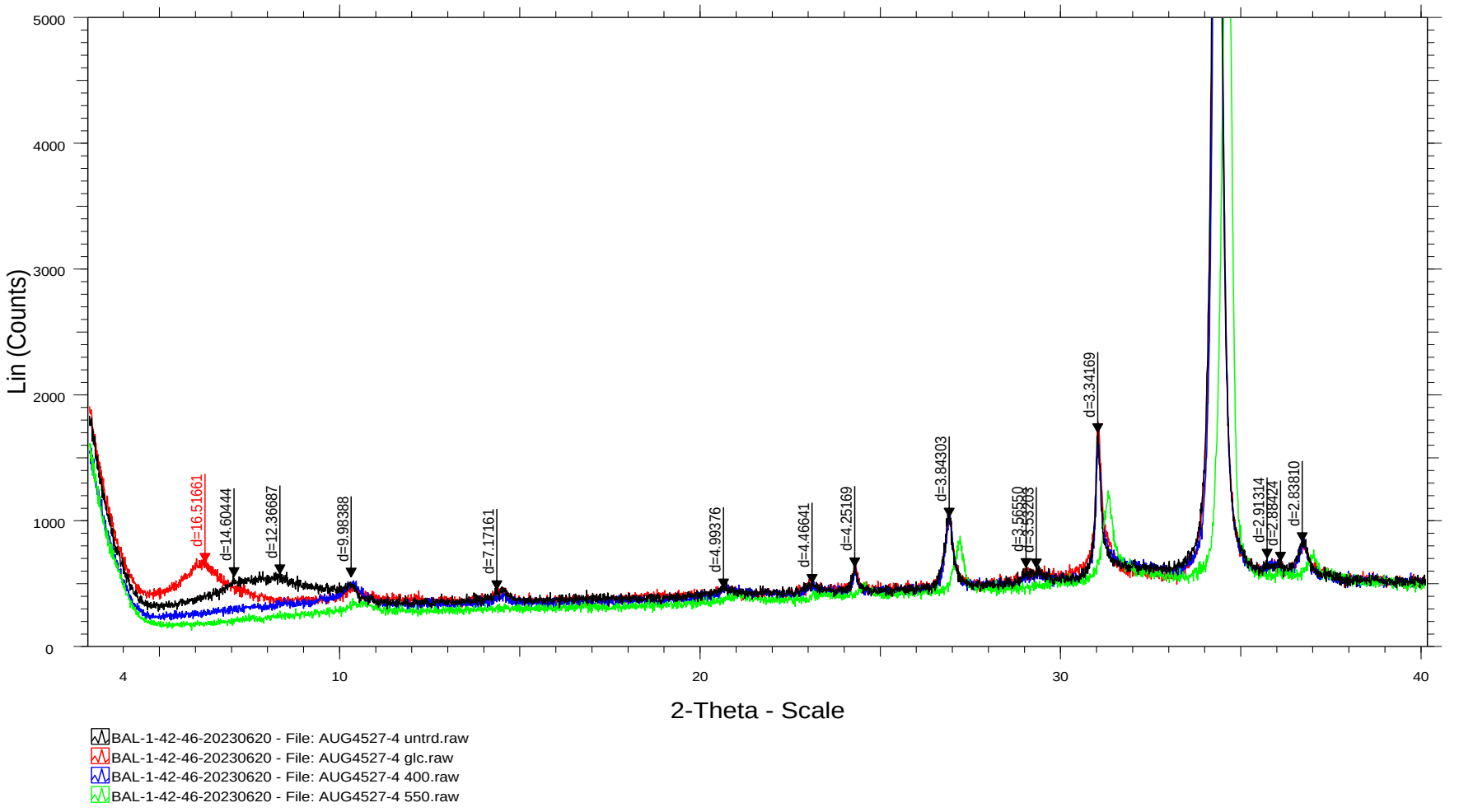


BAL-1-42-46-20230620

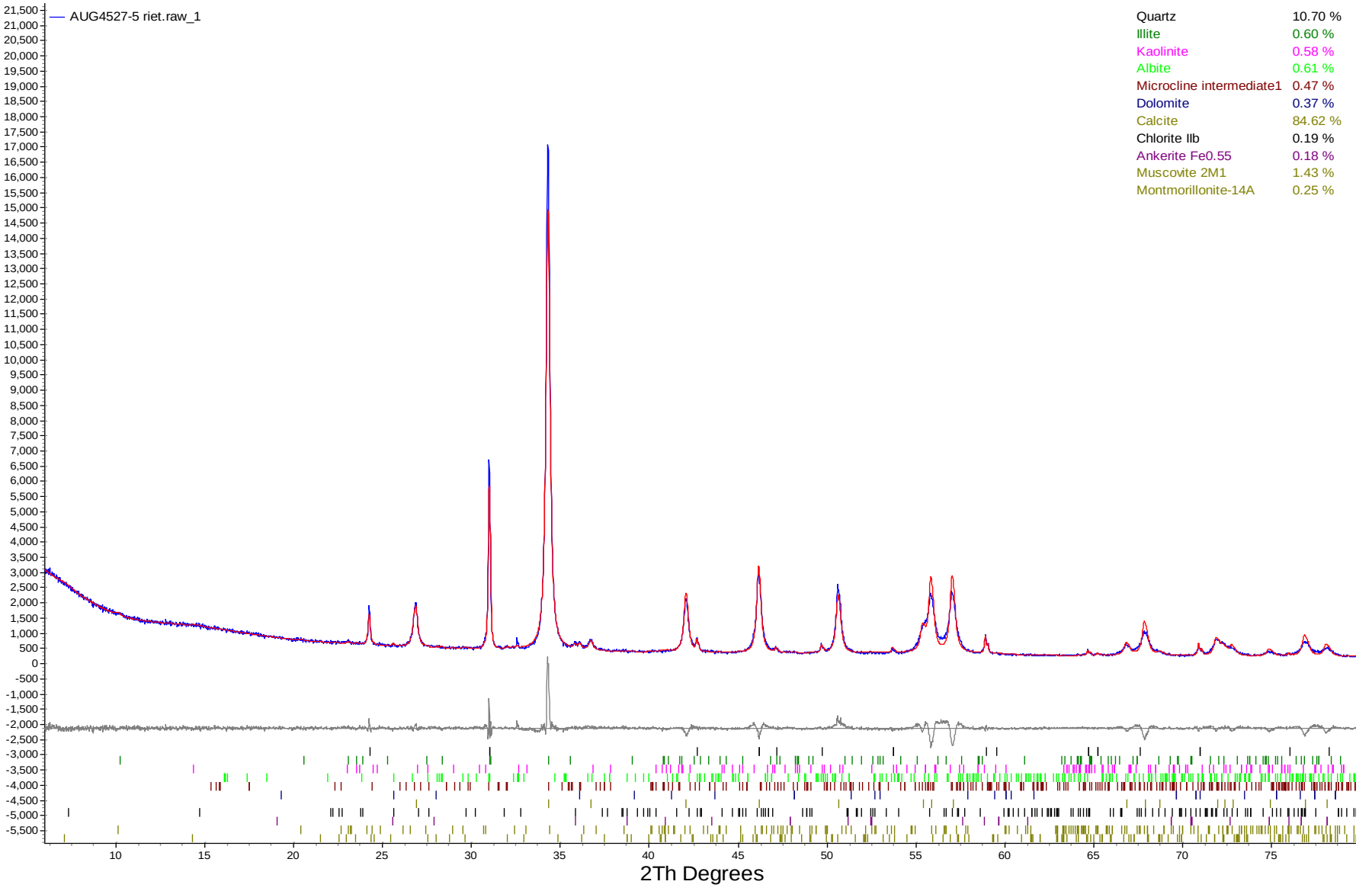


Quartz	10.43 %
Illite	0.95 %
Kaolinite	0.52 %
Albite	0.40 %
Microcline intermediate1	2.06 %
Dolomite	0.77 %
Calcite	80.51 %
Chlorite IIb	0.00 %
Ankerite Fe0.55	0.37 %
Muscovite 2M1	1.93 %
Montmorillonite-14A	2.06 %

BAL-1-42-46-20230620

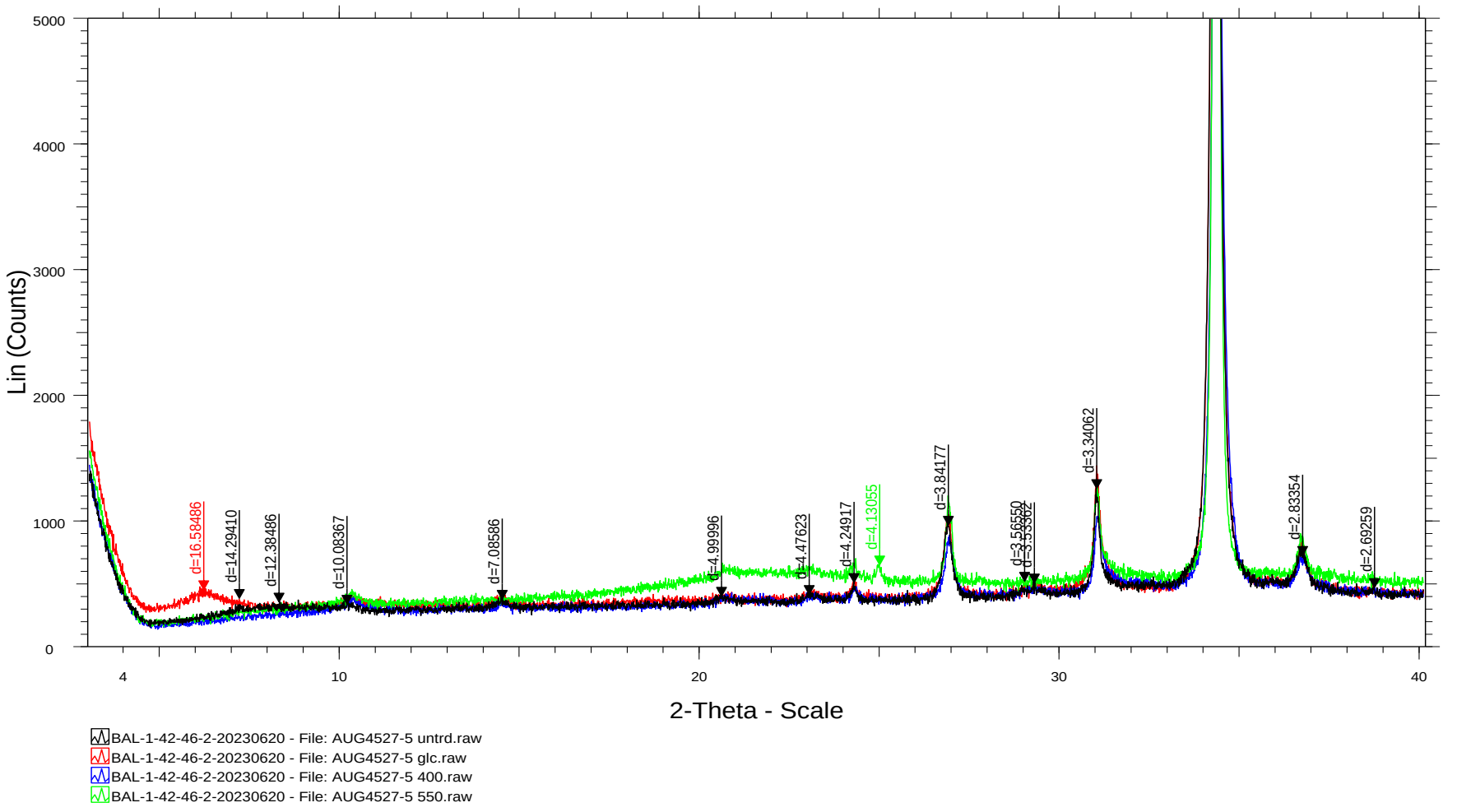


BAL-1-42-46-2-20230620

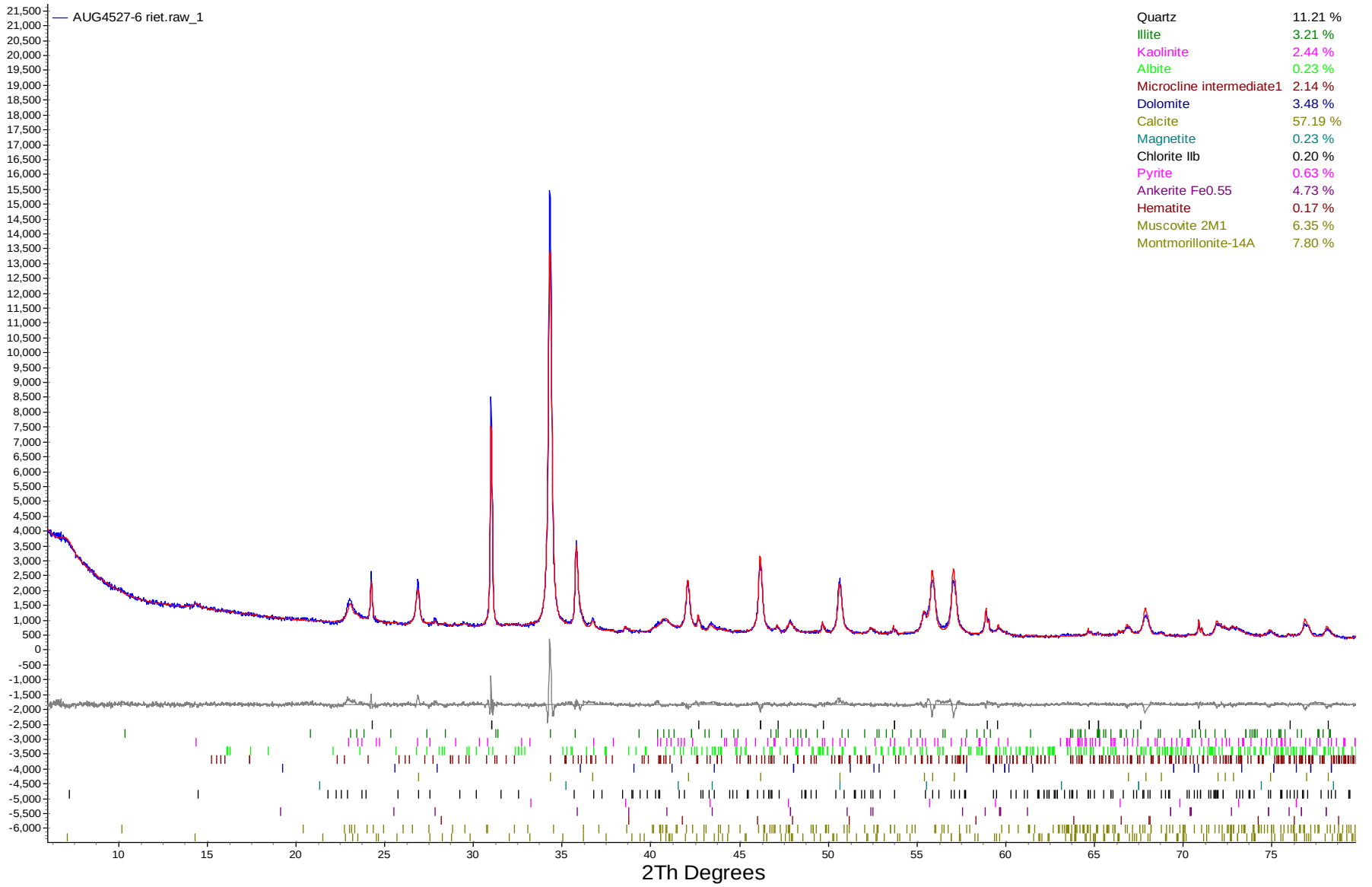


Quartz	10.70 %
Illite	0.60 %
Kaolinite	0.58 %
Albite	0.61 %
Microcline intermediate1	0.47 %
Dolomite	0.37 %
Calcite	84.62 %
Chlorite IIb	0.19 %
Ankerite Fe0.55	0.18 %
Muscovite 2M1	1.43 %
Montmorillonite-14A	0.25 %

BAL-1-42-46-2-20230620

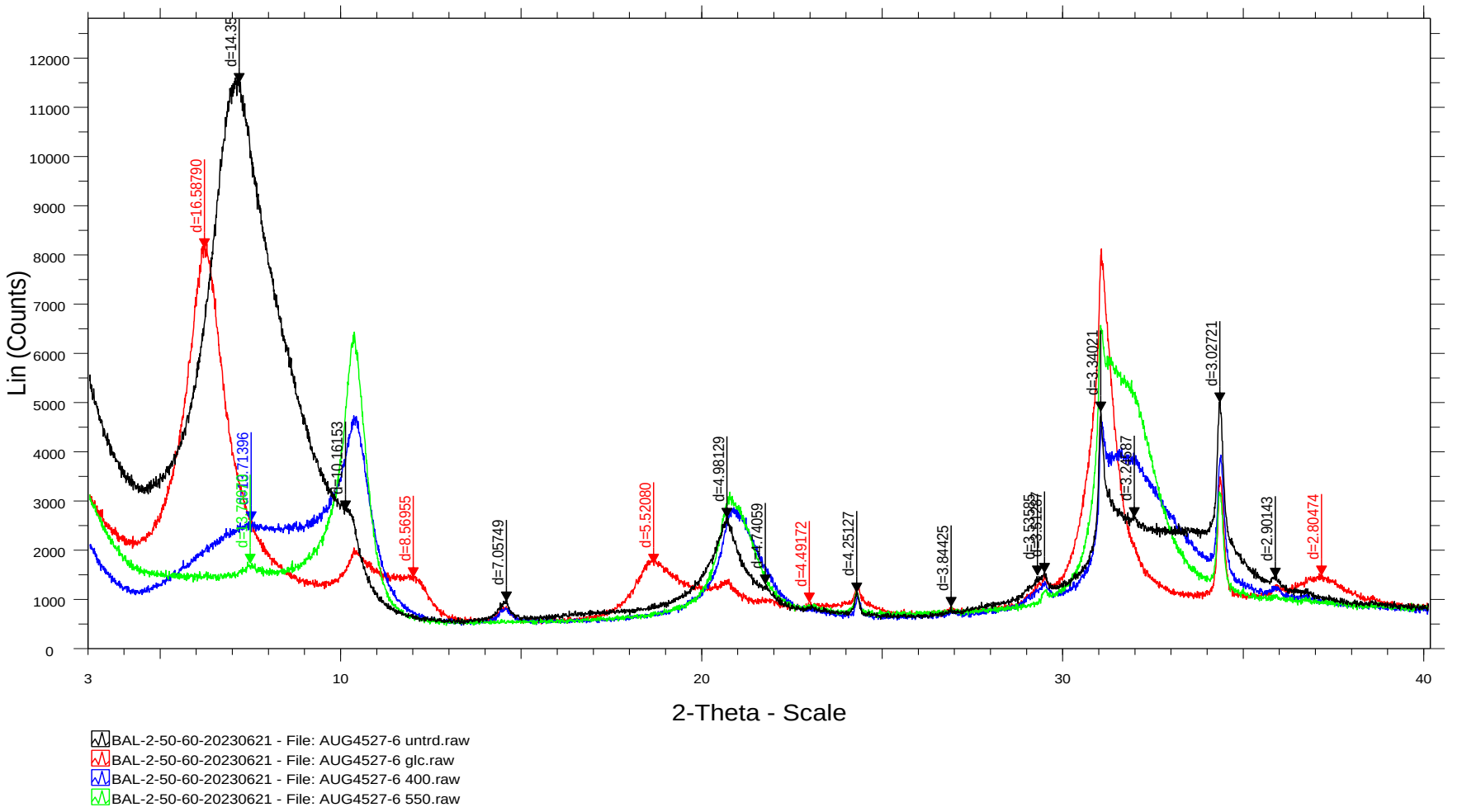


BAL-2-50-60-20230620

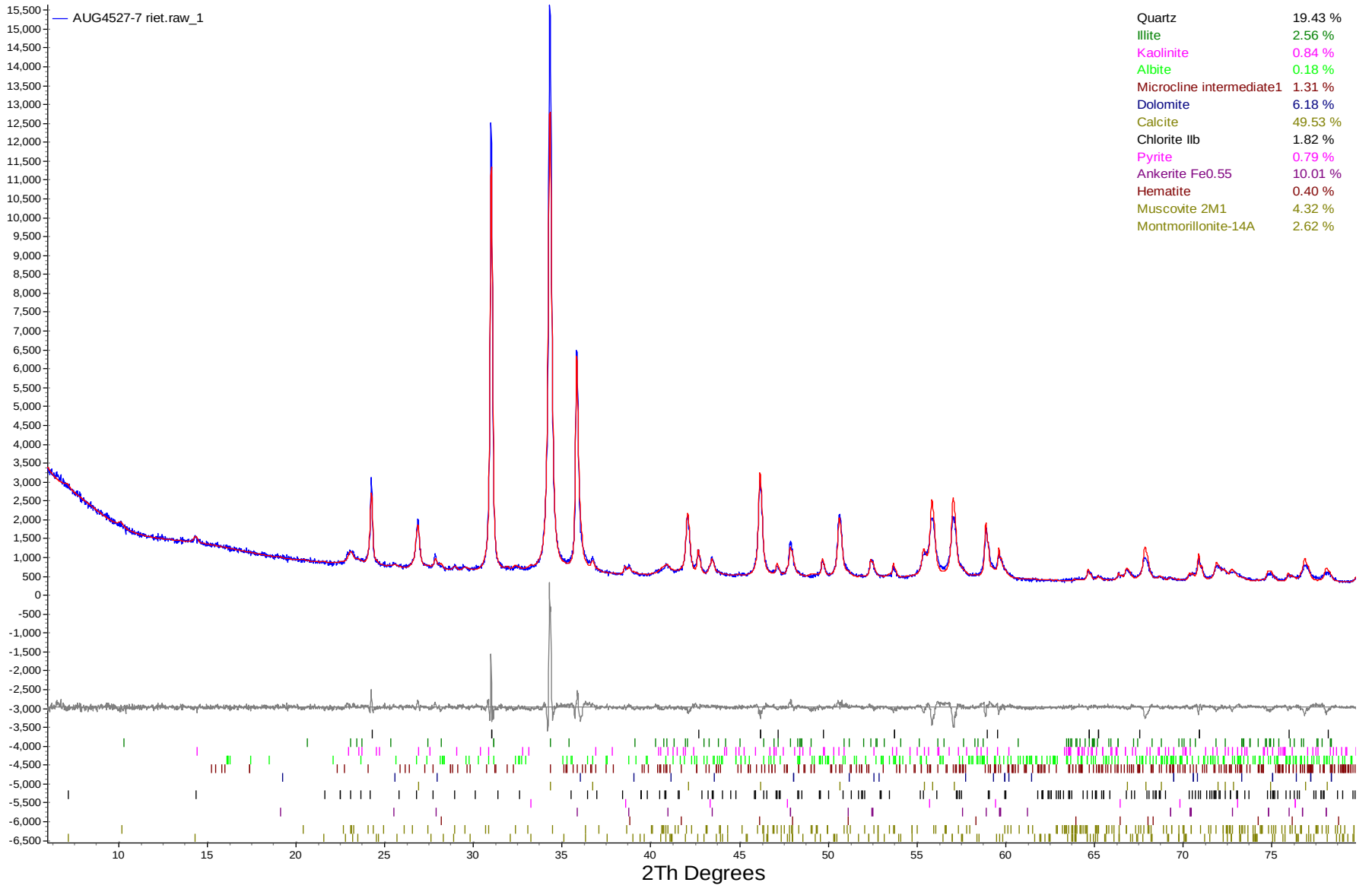


Quartz	11.21 %
Illite	3.21 %
Kaolinite	2.44 %
Albite	0.23 %
Microcline intermediate1	2.14 %
Dolomite	3.48 %
Calcite	57.19 %
Magnetite	0.23 %
Chlorite IIb	0.20 %
Pyrite	0.63 %
Ankerite Fe0.55	4.73 %
Hematite	0.17 %
Muscovite 2M1	6.35 %
Montmorillonite-14A	7.80 %

BAL-2-50-60-20230621

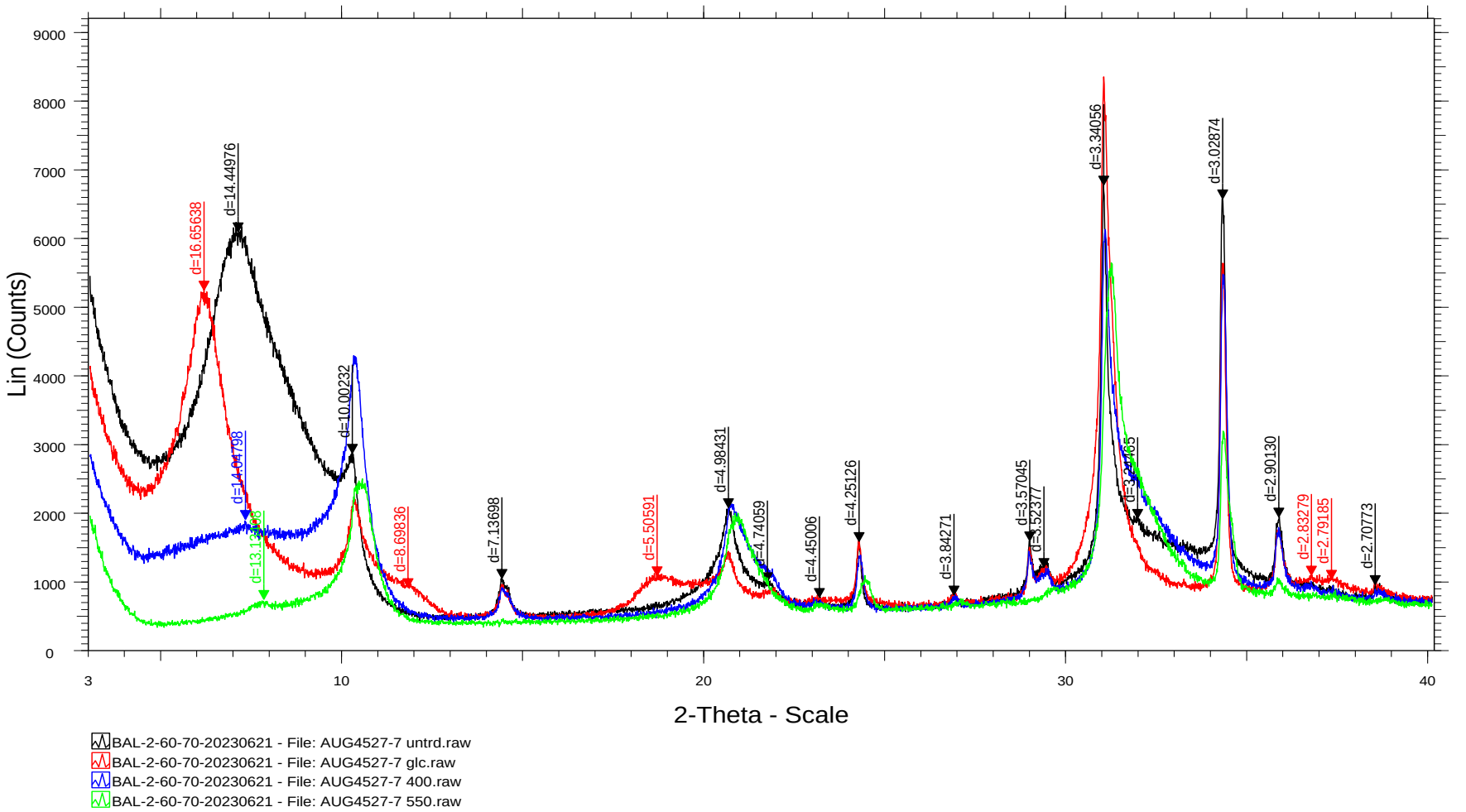


BAL-2-60-70-20230621

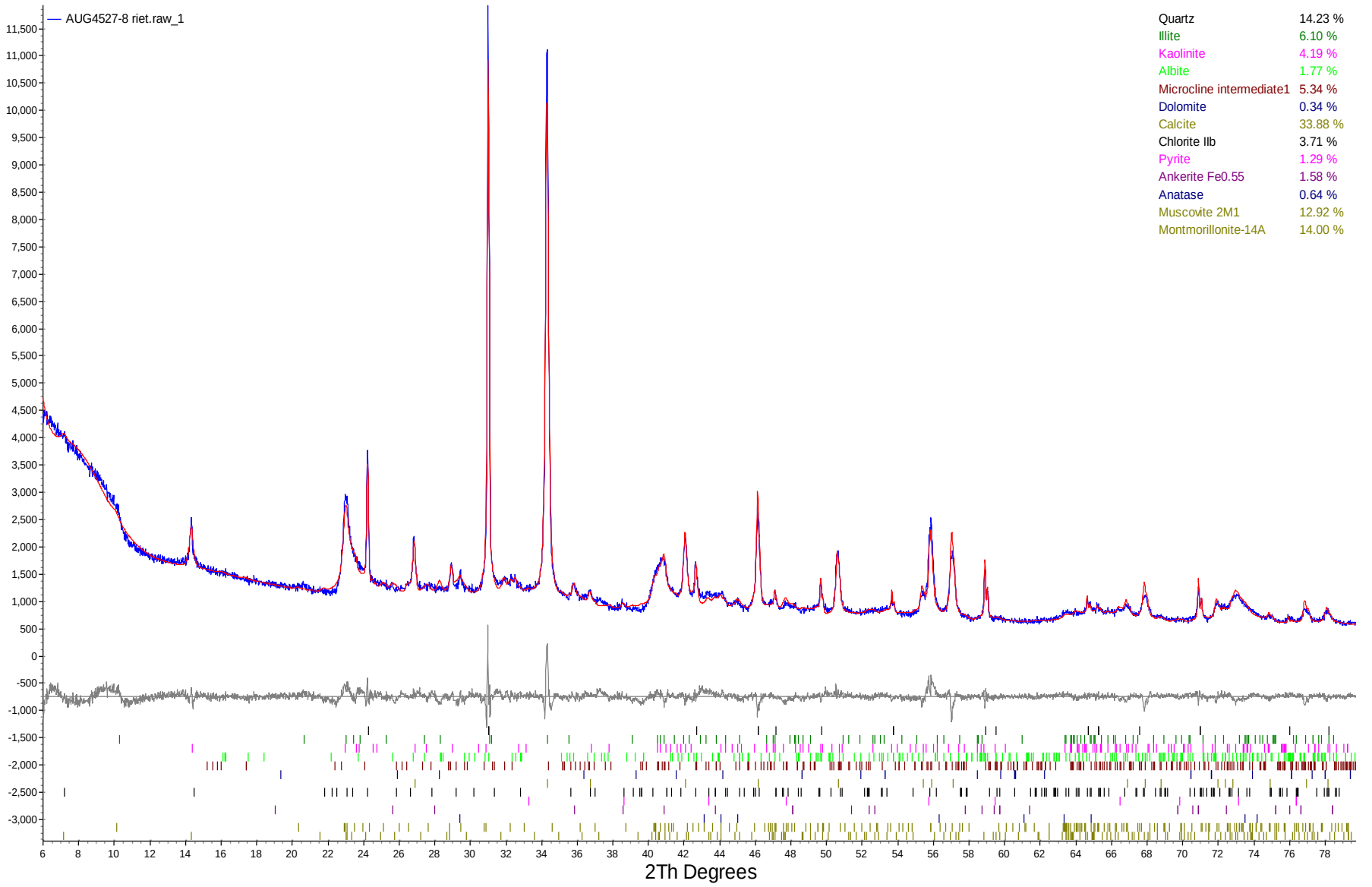


Quartz	19.43 %
Illite	2.56 %
Kaolinite	0.84 %
Albite	0.18 %
Microcline intermediate1	1.31 %
Dolomite	6.18 %
Calcite	49.53 %
Chlorite IIb	1.82 %
Pyrite	0.79 %
Ankerite Fe0.55	10.01 %
Hematite	0.40 %
Muscovite 2M1	4.32 %
Montmorillonite-14A	2.62 %

BAL-2-60-70-20230621

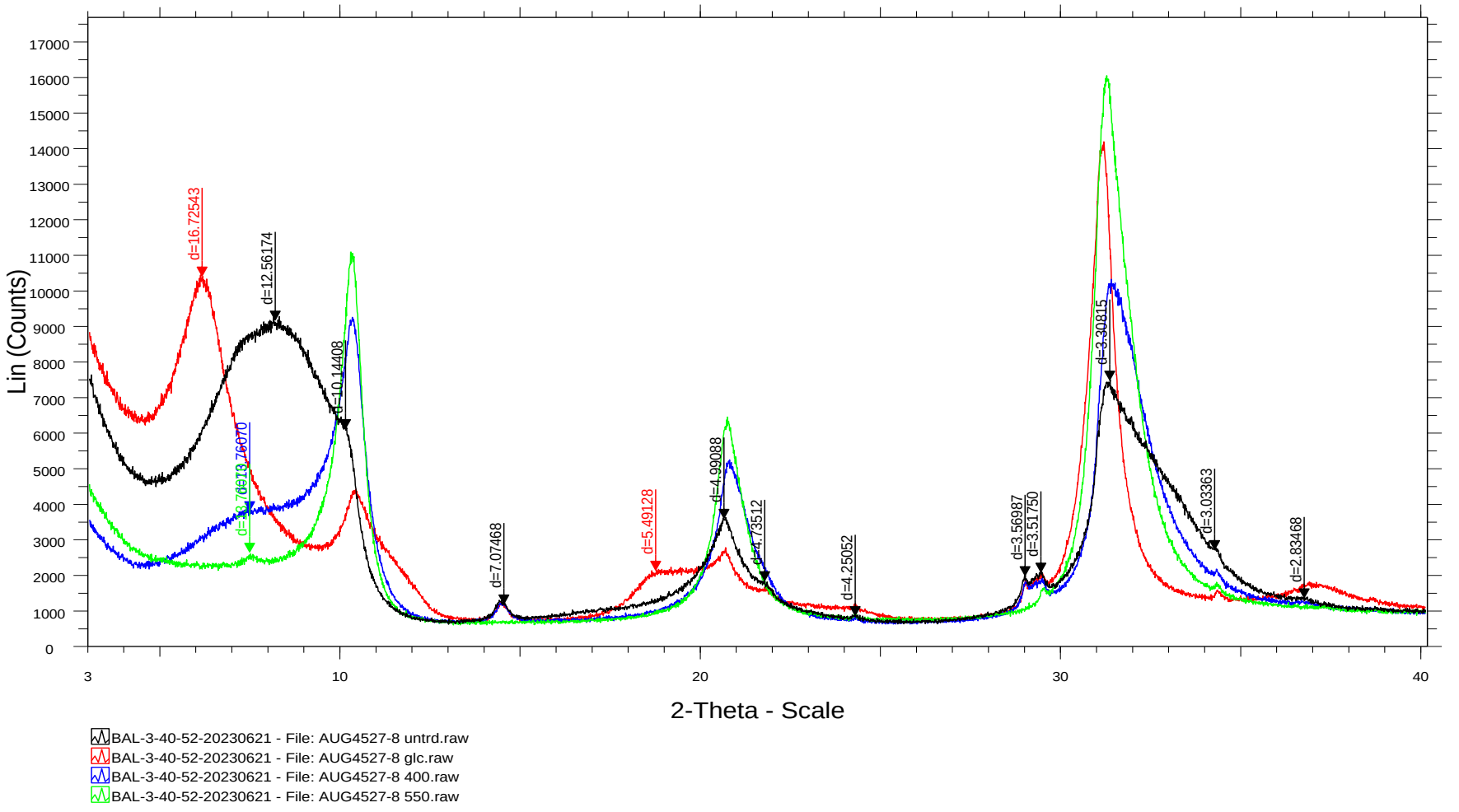


BAL-3-40-52-20230621

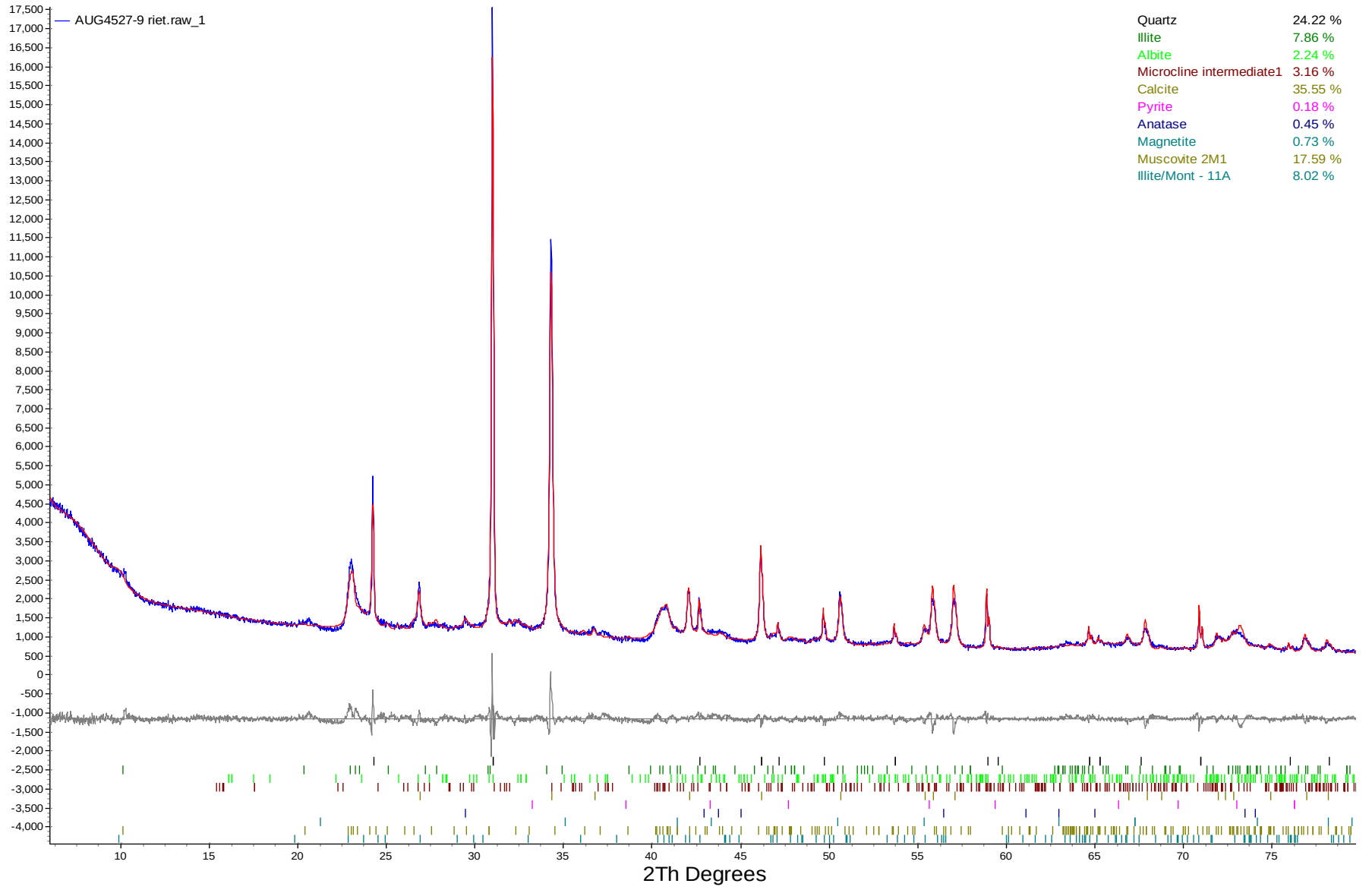


Quartz	14.23 %
Illite	6.10 %
Kaolinite	4.19 %
Albite	1.77 %
Microcline intermediate1	5.34 %
Dolomite	0.34 %
Calcite	33.88 %
Chlorite IIb	3.71 %
Pyrite	1.29 %
Ankerite Fe0.55	1.58 %
Anatase	0.64 %
Muscovite 2M1	12.92 %
Montmorillonite-14A	14.00 %

BAL-3-40-52-20230621

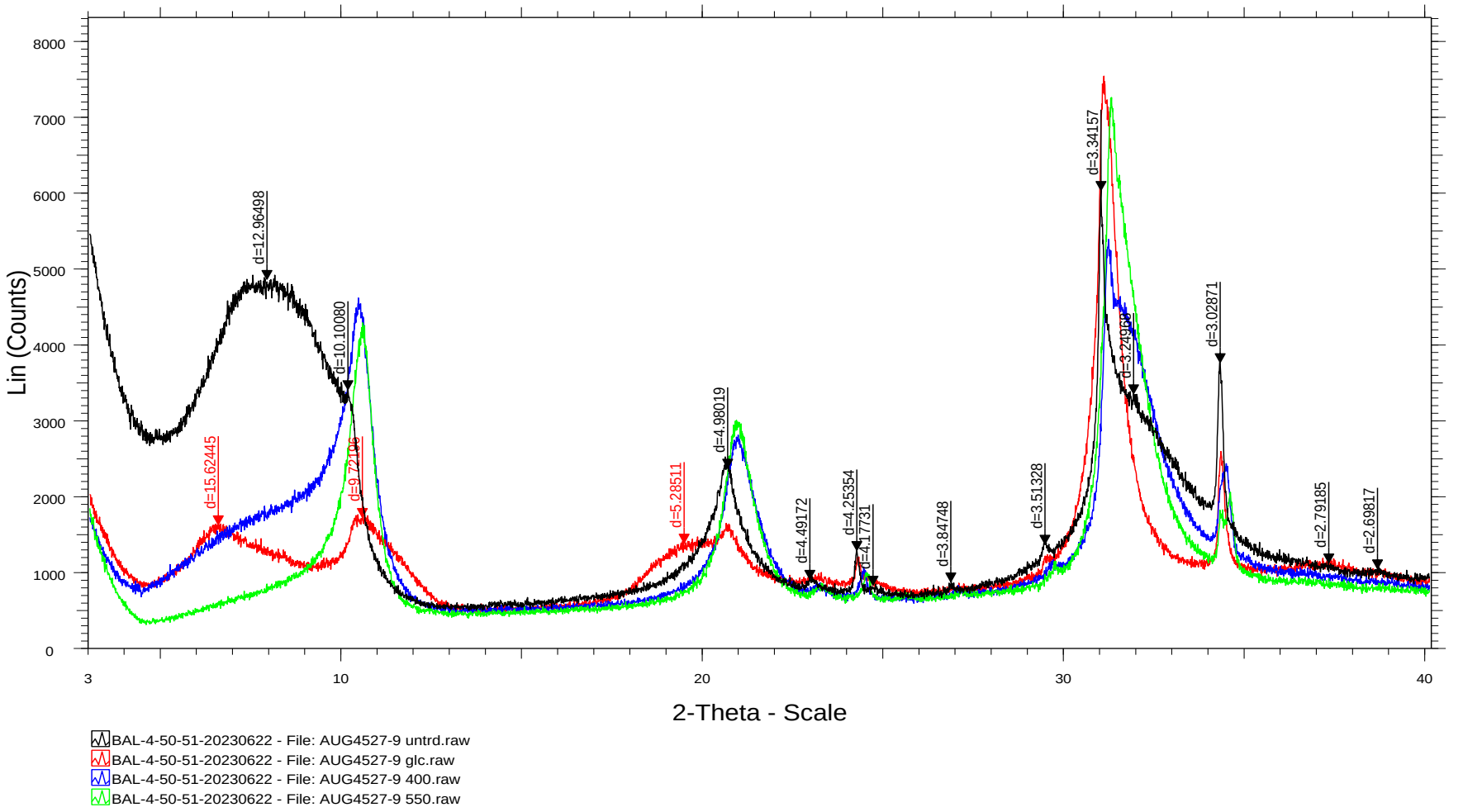


BAL-4-50-51-20230622

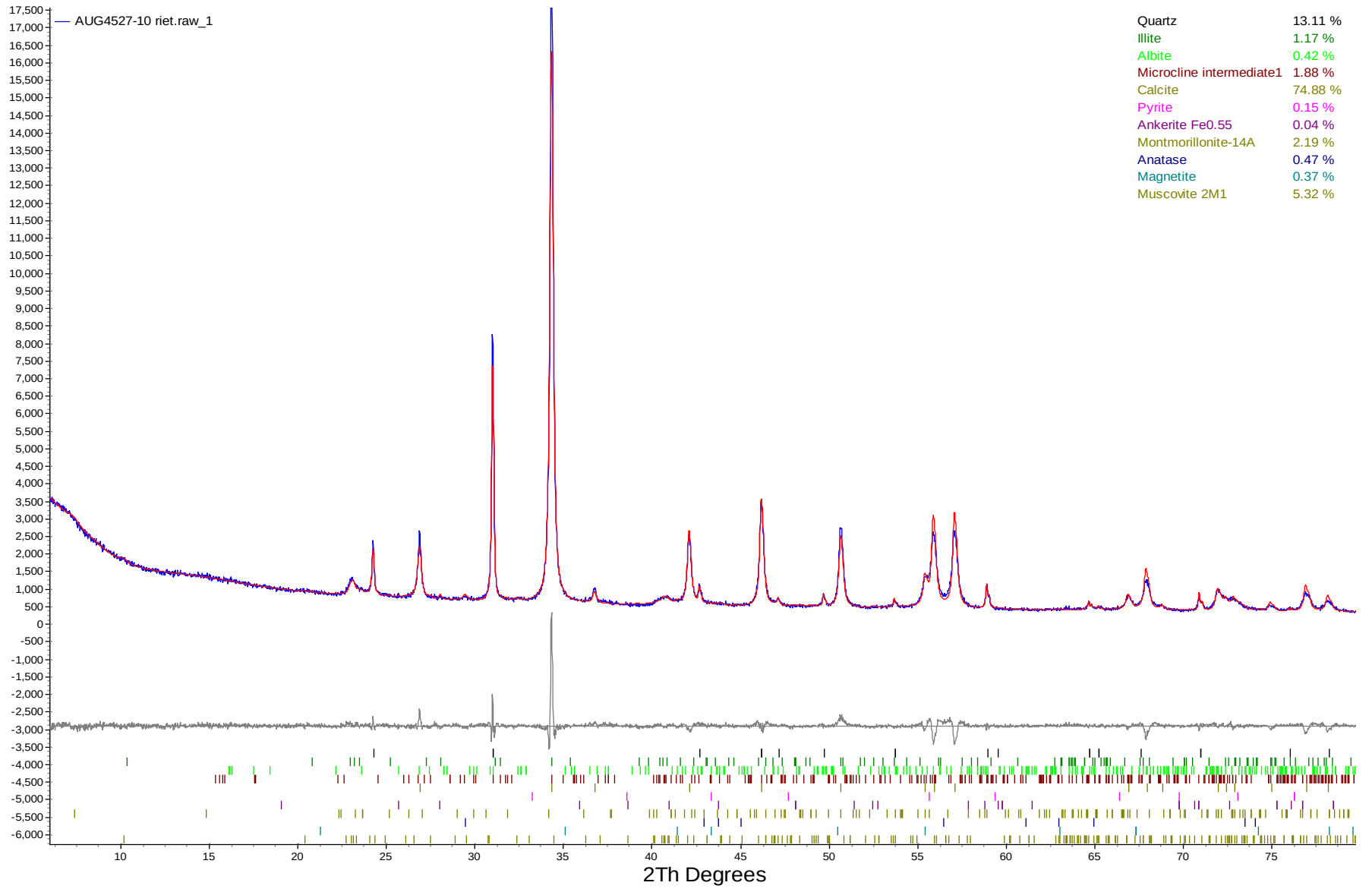


Quartz	24.22 %
Illite	7.86 %
Albite	2.24 %
Microcline intermediate1	3.16 %
Calcite	35.55 %
Pyrite	0.18 %
Anatase	0.45 %
Magnetite	0.73 %
Muscovite 2M1	17.59 %
Illite/Mont - 11A	8.02 %

BAL-4-50-51-20230622

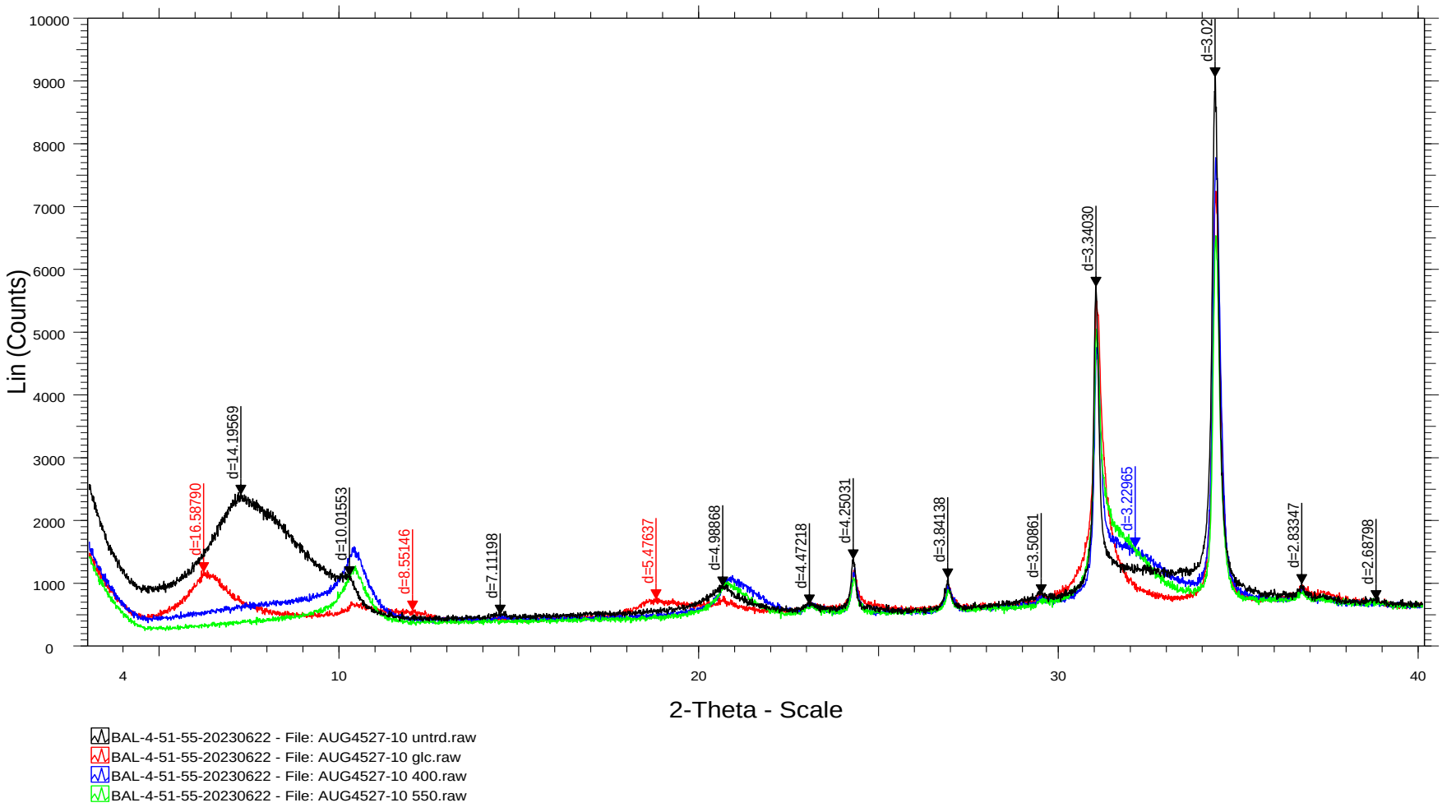


BAL-4-51-55-20230622

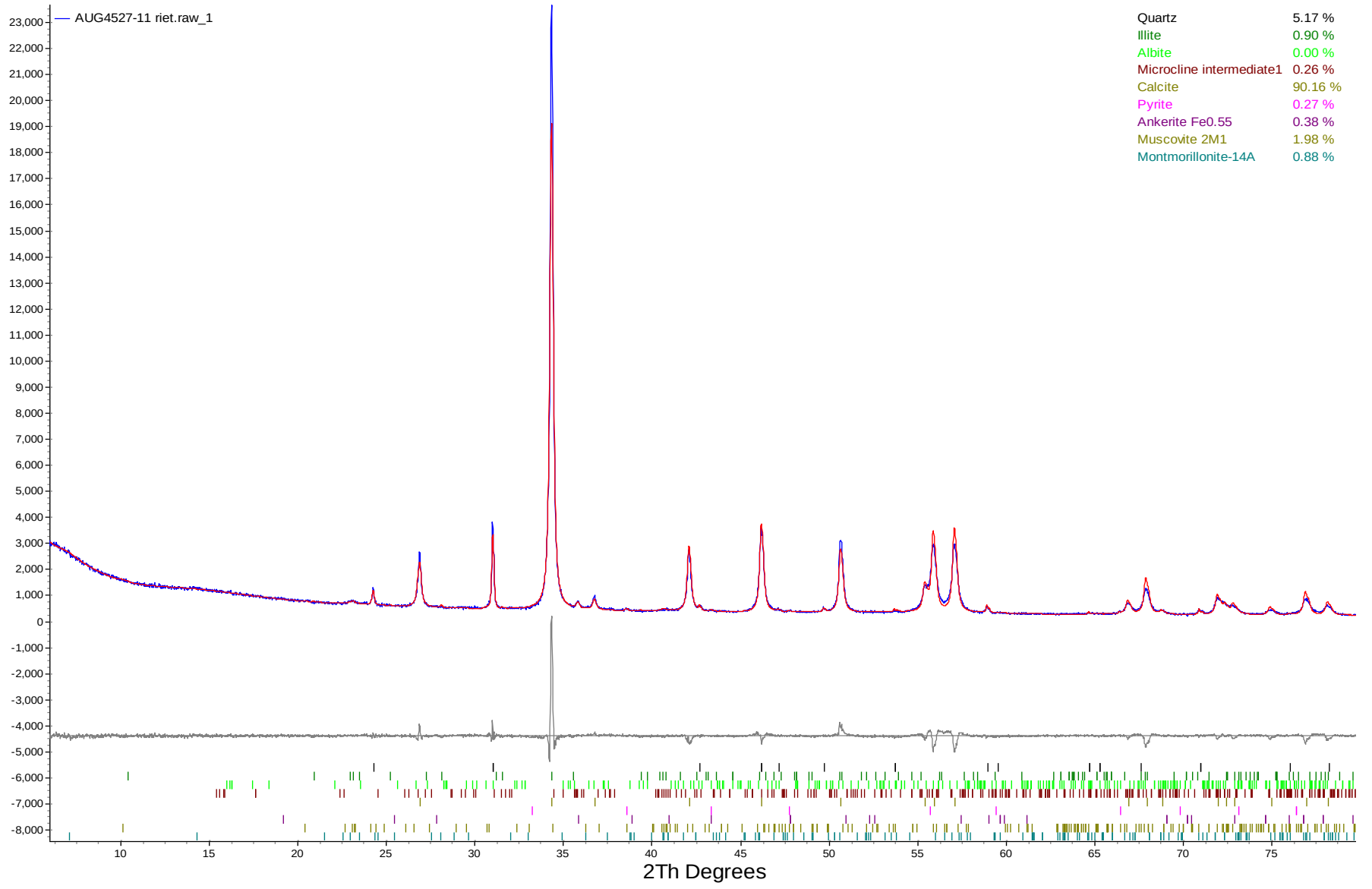


Quartz	13.11 %
Illite	1.17 %
Albite	0.42 %
Microcline intermediate1	1.88 %
Calcite	74.88 %
Pyrite	0.15 %
Ankerite Fe0.55	0.04 %
Montmorillonite-14A	2.19 %
Anatase	0.47 %
Magnetite	0.37 %
Muscovite 2M1	5.32 %

BAL-4-51-55-20230622

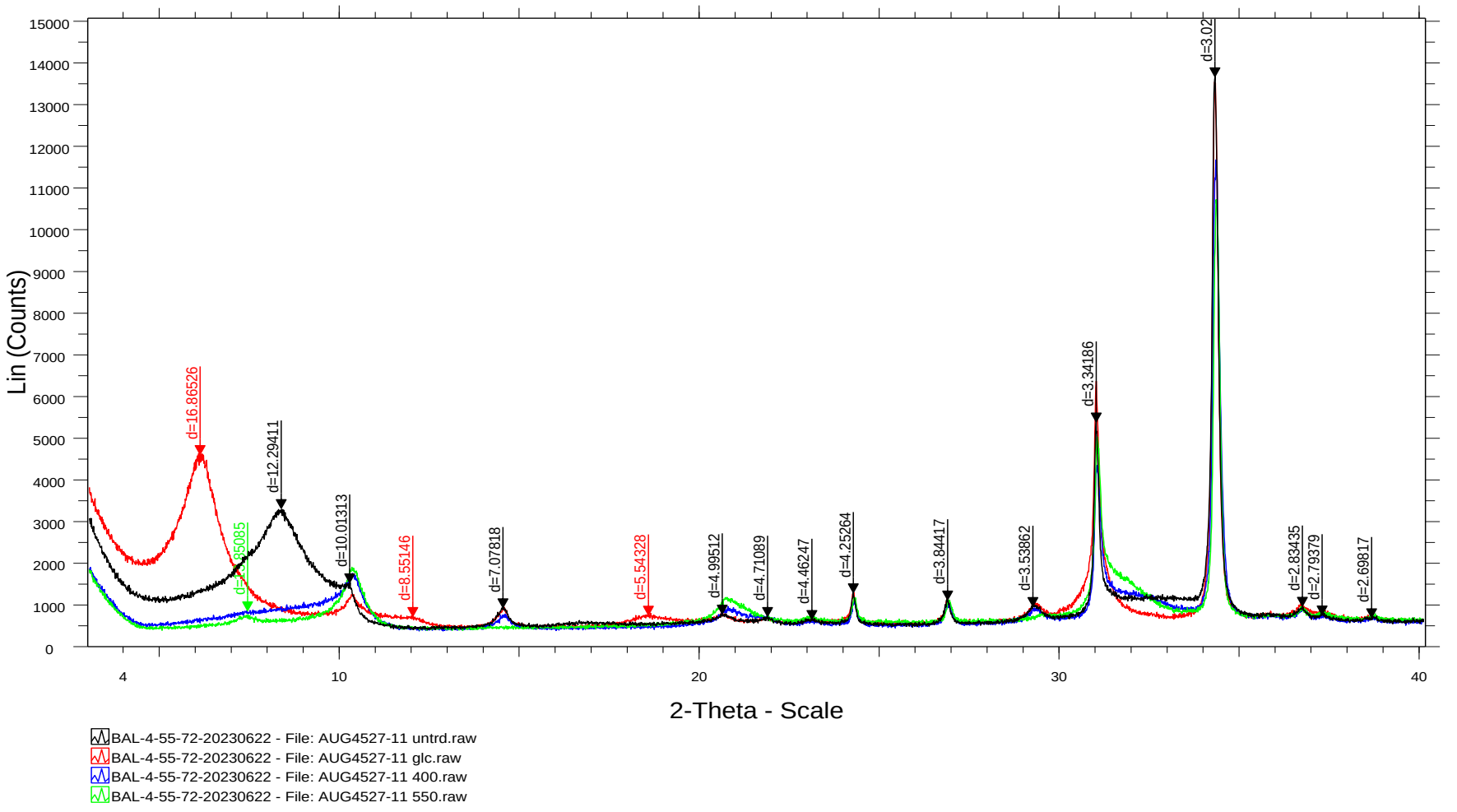


BAL-4-55-72-20230622



Quartz	5.17 %
Illite	0.90 %
Albite	0.00 %
Microcline intermediate1	0.26 %
Calcite	90.16 %
Pyrite	0.27 %
Ankerite Fe0.55	0.38 %
Muscovite 2M1	1.98 %
Montmorillonite-14A	0.88 %

BAL-4-55-72-20230622



Quantitative X-Ray Diffraction by Rietveld Refinement

Report Prepared for:	*Environmental Services*
Project Number/ LIMS No.	*Custom XRD/MI4508-DEC22*
Sample Receipt:	*December 7, 2022*
Sample Analysis:	*December 15, 2022*
Reporting Date:	*April 24, 2023*

Instrument:	BRUKER AXS D8 Advance Diffractometer
Test Conditions (Bulk):	Co radiation, 35 kV, 40 mA; Detector: LYNXEYE Regular Scanning: Step: 0.02°, Step time: 0.75s, 2θ range: 6-80°
Test Conditions (Clay):	Co radiation, 35 kV, 40 mA; Detector: LYNXEYE Regular Scanning: Step: 0.02°, Step time: 1s, 2θ range: 3-80° Clay Section Scanning: Step: 0.01°, Step time:0.2s, 2θ range: 3-40°
***Interpretations*:**	PDF2/PDF4 powder diffraction databases issued by the International Center for Diffraction Data (ICDD). DiffracPlus Eva and Topas software.
***Detection Limit*:**	0.5-2%. Strongly dependent on crystallinity.

Contents:

1) Method Summary
2) Quantitative XRD Results
3) XRD Pattern(s)

Kim Gibbs, H.B.Sc., P.Geo.
Senior Mineralogist

Huyun Zhou, Ph.D., P.Geo.
Senior Mineralogist

ACCREDITATION: SGS Natural Resources Lakefield is accredited to the requirements of ISO/IEC 17025 for specific tests as listed on our scope of accreditation, including geochemical, mineralogical and trade mineral tests. To view a list of the accredited methods, please visit the following website and search SGS Canada Inc. - Minerals: https://www.scc.ca/en/search/palcan.

Method Summary

The Rietveld Method of Mineral Identification by XRD (ME-LR-MIN-MET-MN-D05) method used by SGS Natural Resources is accredited to the requirements of ISO/IEC 17025.

***Mineral Identification and Interpretation*:**

Mineral identification and interpretation involves matching the diffraction pattern of an unknown material to patterns of single-phase reference materials. The reference patterns are compiled by the Joint Committee on Powder Diffraction Standards - International Center for Diffraction Data (JCPDS-ICDD) database and released on software as Powder Diffraction Files (PDF).

Interpretations do not reflect the presence of non-crystalline and/or amorphous compounds, except when internal standards have been added by request. Mineral proportions may be strongly influenced by crystallinity, crystal structure and preferred orientations. Mineral or compound identification and quantitative analysis results should be accompanied by supporting chemical assay data or other additional tests.

Clay Mineral Separation and Identification:

Clay minerals are typically fine-grained (<2 µm) phyllosilicates in sedimentary rock. Due to the poor crystallinity and fine size of clay minerals, separation of the clay fraction from bulk samples by centrifuge is required. A slide of the oriented clay fraction is prepared and scanned followed by a series of procedures (the addition of ethylene glycol and high temperature heating). Clay minerals are identified by their individual diffraction patterns and changes in their diffraction pattern after different treatments. Clay speciation and mineral identification of the bulk sample are performed using DIFFRACplus EVA (Bruker AXS).

Quantitative Rietveld Analysis:

Quantitative Rietveld Analysis is performed by using Topas 4.2 (Bruker AXS), a graphics based profile analysis program built around a non-linear least squares fitting system, to determine the amount of different phases present in a multicomponent sample. Whole pattern analyses are predicated by the fact that the X-ray diffraction pattern is a total sum of both instrumental and specimen factors. Unlike other peak intensity-based methods, the Rietveld method uses a least squares approach to refine a theoretical line profile until it matches the obtained experimental patterns.

Rietveld refinement is completed with a set of minerals specifically identified for the sample. Zero values indicate that the mineral was included in the refinement calculations, but the calculated concentration was less than 0.05wt%. Minerals not identified by the analyst are not included in refinement calculations for specific samples and are indicated with a dash.

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WARNING: The sample(s) to which the findings recorded herein (the "Findings") relate was(were) drawn and / or provided by the Client or by a third party acting at the Client's direction. The Findings constitute no warranty of the sample's representativeness of any goods and strictly relate to the sample(s). The Company accepts no liability with regard to the origin or source from which the sample(s) is/are said to be extracted.

Summary of Rietveld Quantitative Analysis X-Ray Diffraction Results

Mineral/Compound	MW-358 (13-15) DEC4508-1 (wt %)	MW-358 (47-49) DEC4508-2 (wt %)	MW-358 (86-88) DEC4508-3 (wt %)	MW-392 (80-82) DEC4508-4 (wt %)	MW-392 (32-33.5) DEC4508-5 (wt %)	MW-393 (24-25.5) DEC4508-6 (wt %)	MW-394 (20.5-22) DEC4508-7 (wt %)	MW-392 (66-68) DEC4508-8 (wt %)
Quartz	52.7	29.2	30.7	29.8	52.1	64.1	55.4	22.7
Muscovite	7.7	18.8	19.7	13.1	9.0	5.5	7.6	15.9
Albite	12.3	0.4	2.5	0.6	9.1	6.4	12.8	0.6
Microcline	7.3	8.6	5.9	1.0	6.5	10.1	7.3	5.1
Diaspore	0.3	-	-	-	-	0.2	0.5	2.8
Magnetite	0.9	0.5	0.3	1.4	0.1	0.0	0.1	0.1
Anatase	0.2	0.8	1.8	0.8	0.6	0.3	0.3	1.0
Calcite	-	0.5	1.0	28.1	0.0	0.0	0.2	14.9
Fluorapatite	-	-	-	2.7	0.3	-	0.2	0.2
Ankerite	-	-	-	-	1.4	0.9	0.5	0.8
Clay								
Kaolinite	5.3	4.8	15.0	5.5	6.8	3.2	4.2	3.6
Montmorillonite-12A	4.9	6.8	4.8	-	-	-	-	5.8
Montmorillonite-14A	-	-	-	3.5	3.3	3.5	3.6	-
Nontronite	0.6	4.6	4.3	4.2	1.6	1.4	0.5	3.3
Illite/Mont - 11A	-	8.8	2.7	3.6	2.7	2.1	3.0	7.1
Illite	5.0	15.0	9.2	4.1	0.7	1.0	0.6	10.4
Chlorite IIb	2.6	1.3	2.0	1.6	5.8	1.2	3.1	6.1
TOTAL	100	100	100	100	100	100	100	100

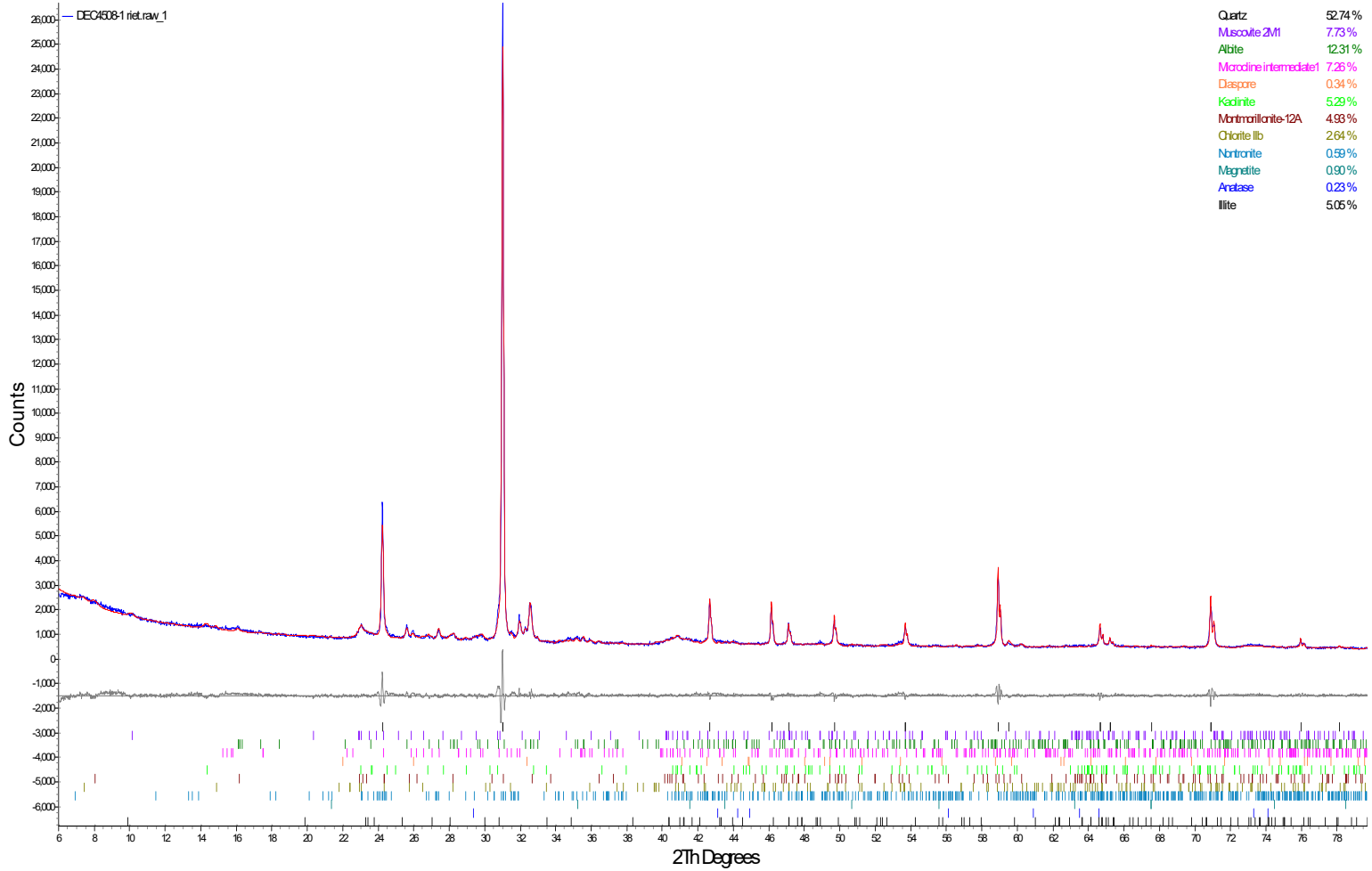
Zero values indicate that the mineral was included in the refinement, but the calculated concentration is below a measurable value.

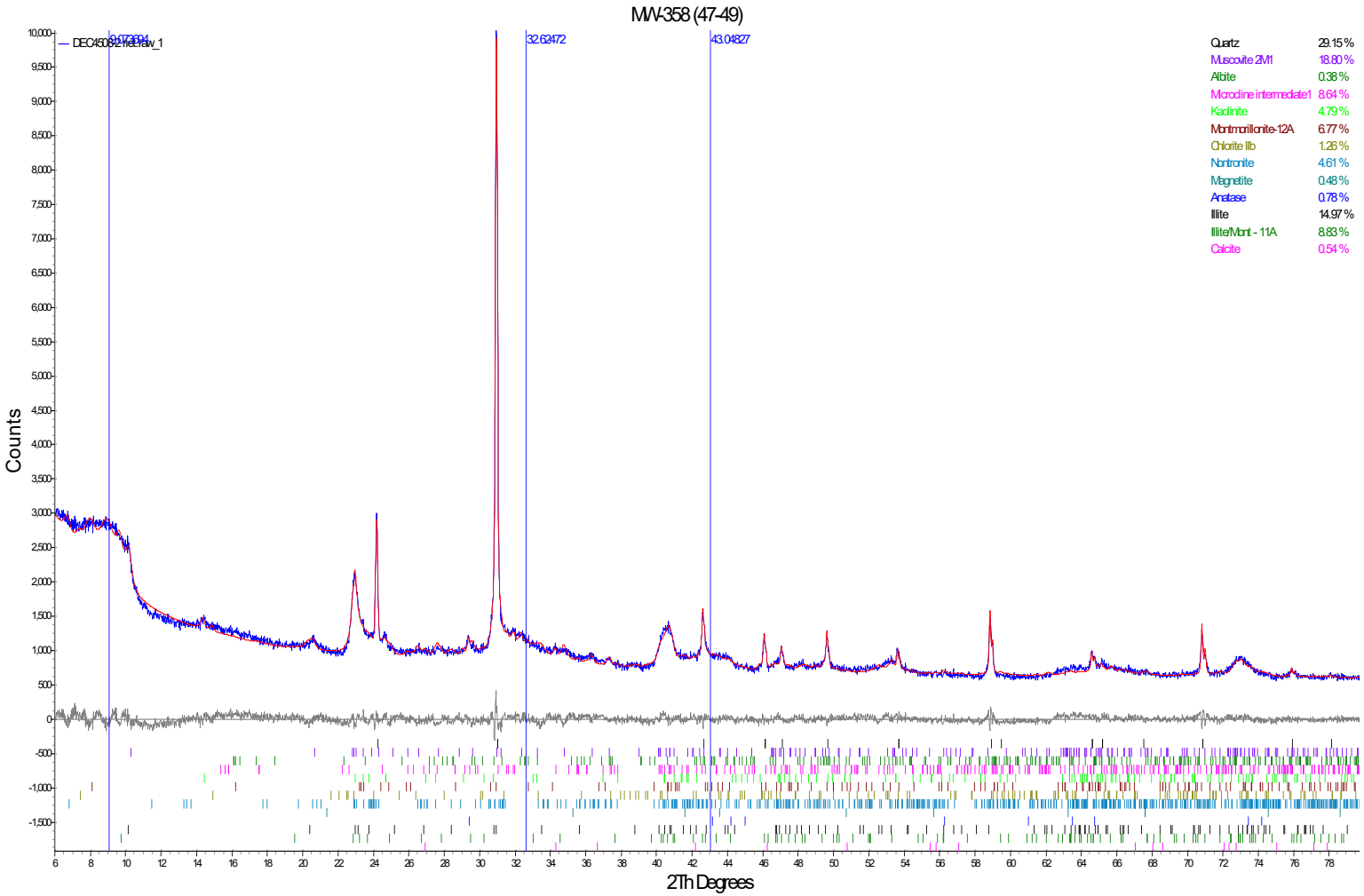
Dashes indicate that the mineral was not identified by the analyst and not included in the refinement calculation for the sample.

The weight percent quantities indicated have been normalized to a sum of 100%. The quantity of amorphous material has not been determined.

Mineral/Compound	Formula
Quartz	SiO_2
Muscovite	$KAl_2(AlSi_3O_{10})(OH)_2$
Albite	$NaAlSi_3O_8$
Microcline	$KAlSi_3O_8$
Diaspore	aAlO.OH
Magnetite	Fe_3O_4
Anatase	TiO_2
Calcite	$CaCO_3$
Fluorapatite	$Ca_5(PO_4)_3F$
Ankerite	$CaFe(CO_3)_2$
Kaolinite	$Al_2Si_2O_5(OH)_4$
Montmorillonite	$(Na,Ca)_{0.3}(Al,Mg)_2Si_4O_{10}(OH)_2 \cdot 10H_2O$
Nontronite	$Fe_2(Al,Si)_4O_{10}(OH)_2Na_{0.3}(H_2O)_4$
Illite/Mont	$KAl_4(Si,Al)_8O_{10}(OH)_4 \cdot 4H_2O$
Illite	$(K,H_3O)(Al,Mg,Fe)_2(Si,Al)_4O_{10}[(OH)_2,(H_2O)]$
Chlorite	$(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$

MW-358 (13-15)


DEC4508-1 riet.raw_1
Counts
2Th Degrees
Quartz 52.74 %
Muscovite 2M1 7.73 %
Albite 12.31 %
Microcline intermediate1 7.26 %
Diaspore 0.34 %
Kaolinite 5.29 %
Montmorillonite-12A 4.93 %
Chlorite IIb 2.64 %
Nontronite 0.59 %
Magnetite 0.90 %
Anatase 0.23 %
Illite 5.05 %


MW-358 (47-49)
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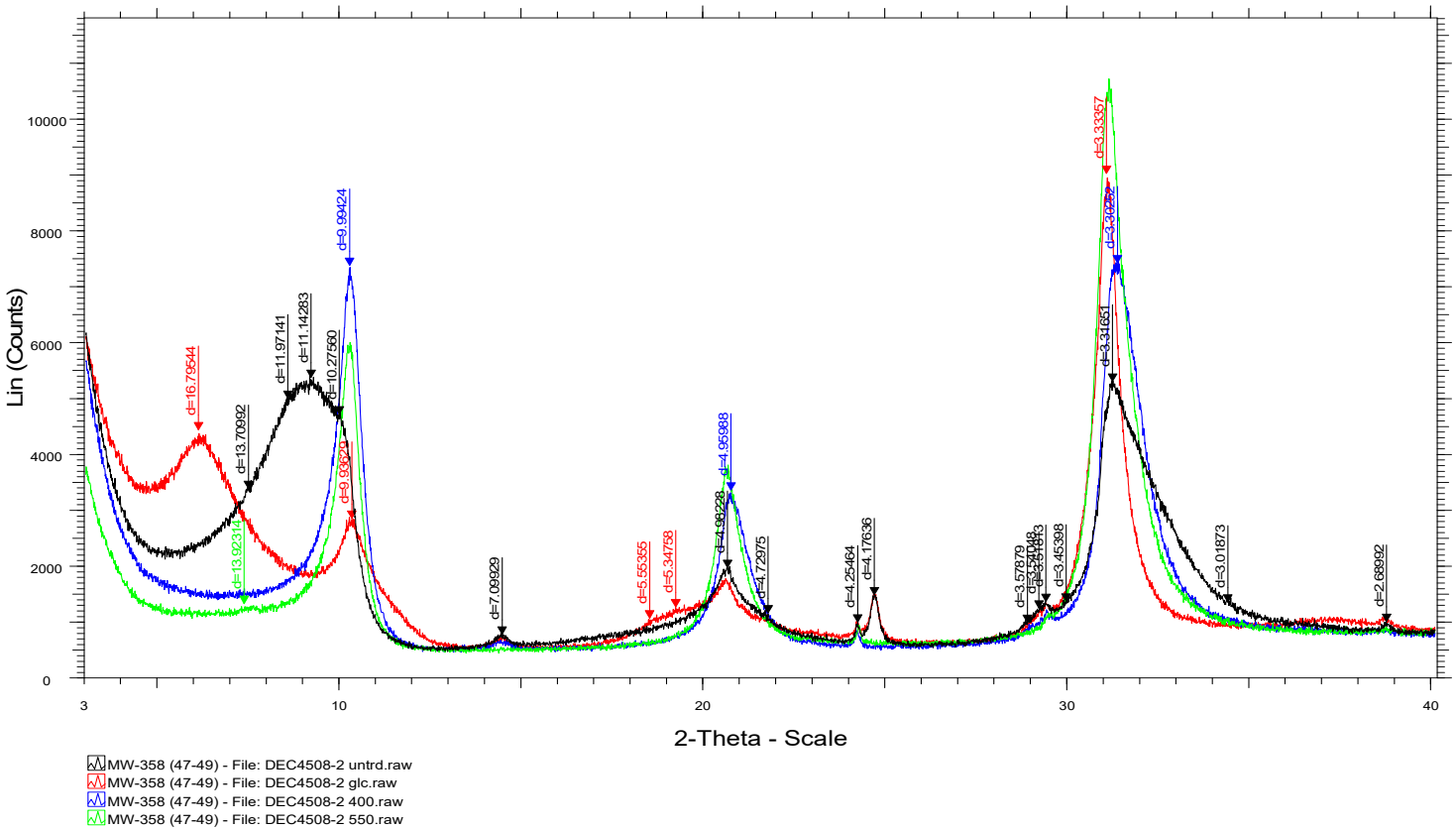
Muscovite 2M1 18.80 %
Albite 0.38 %
Microcline intermediate1 8.64 %
Kaolinite 4.79 %
Montmorillonite-12A 6.77 %
Chlorite IIb 1.26 %
Nontronite 4.61 %
Magnetite 0.48 %
Anatase 0.78 %
Illite 14.97 %
Illite/Mont - 11A 8.83 %
Calcite 0.54 %

MW-358 (47-49)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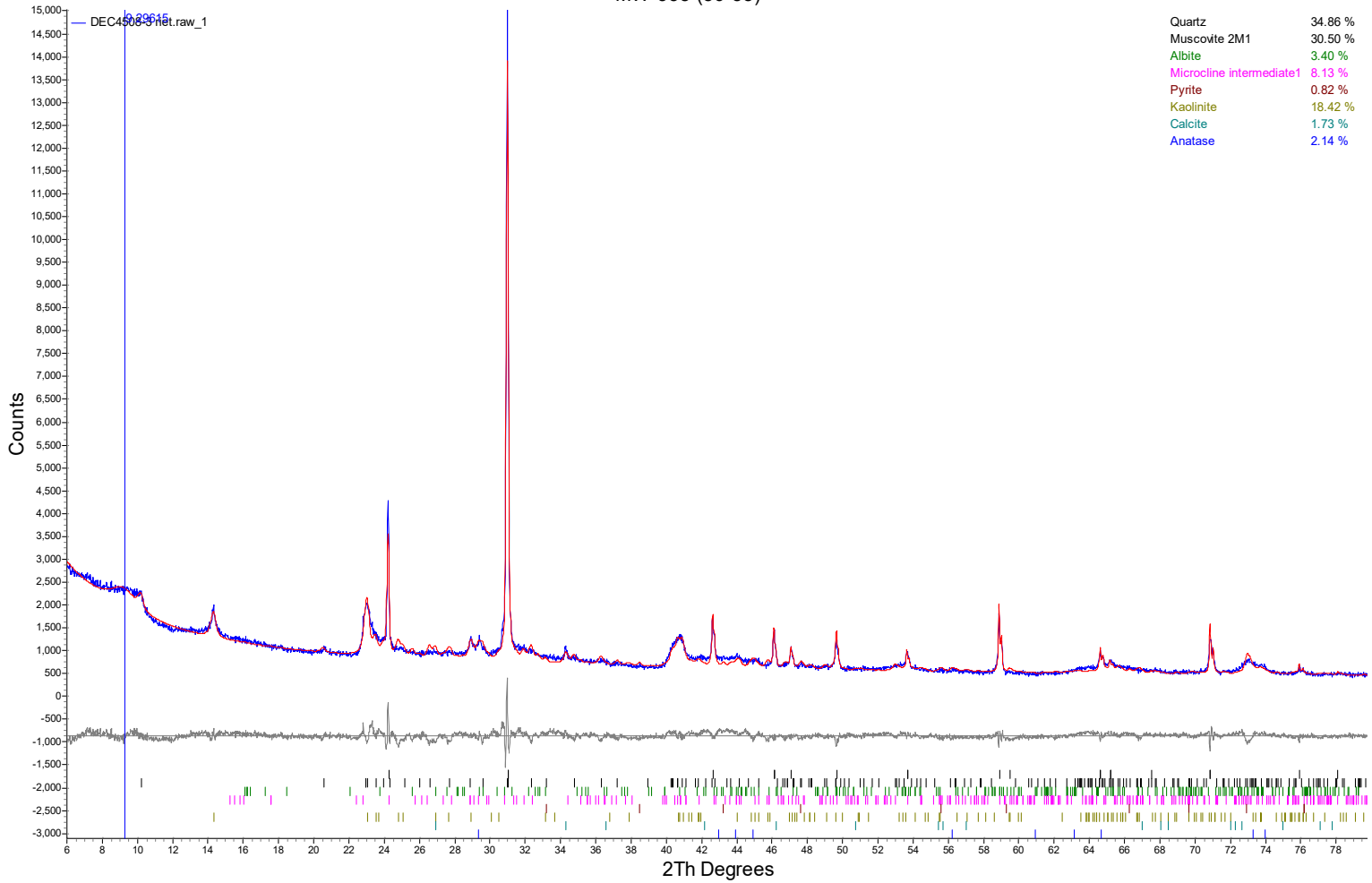
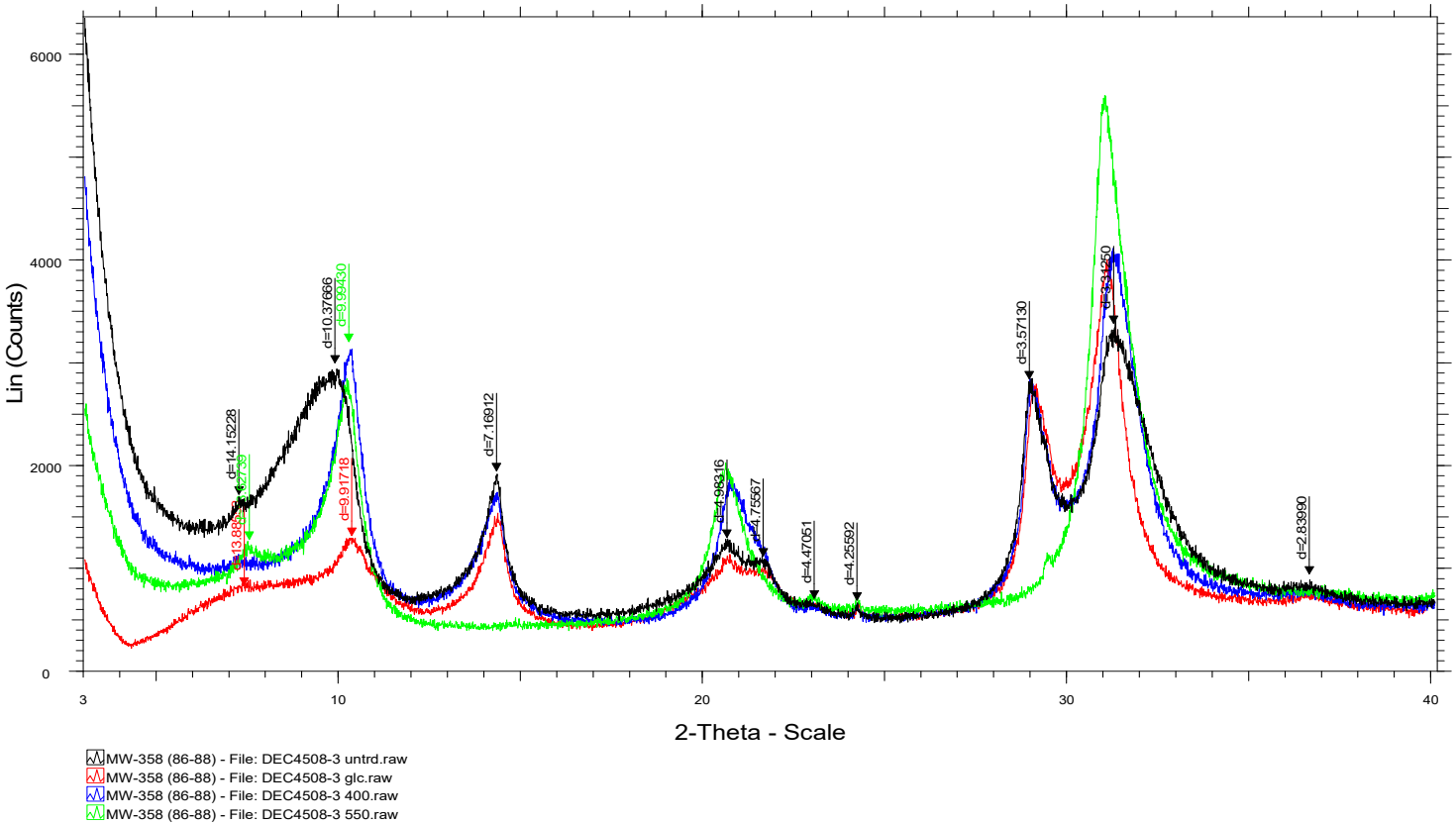
MW-358 (47-49) - File: DEC4508-2 550.raw

MW-358 (86-88)


DEC4508-3-net.raw_1
Quartz 34.86 %
Muscovite 2M1 30.50 %
Albite 3.40 %
Microcline intermediate1 8.13 %
Pyrite 0.82 %
Kaolinite 18.42 %
Calcite 1.73 %
Anatase 2.14 %
Counts
2Th Degrees

MW-358 (86-88)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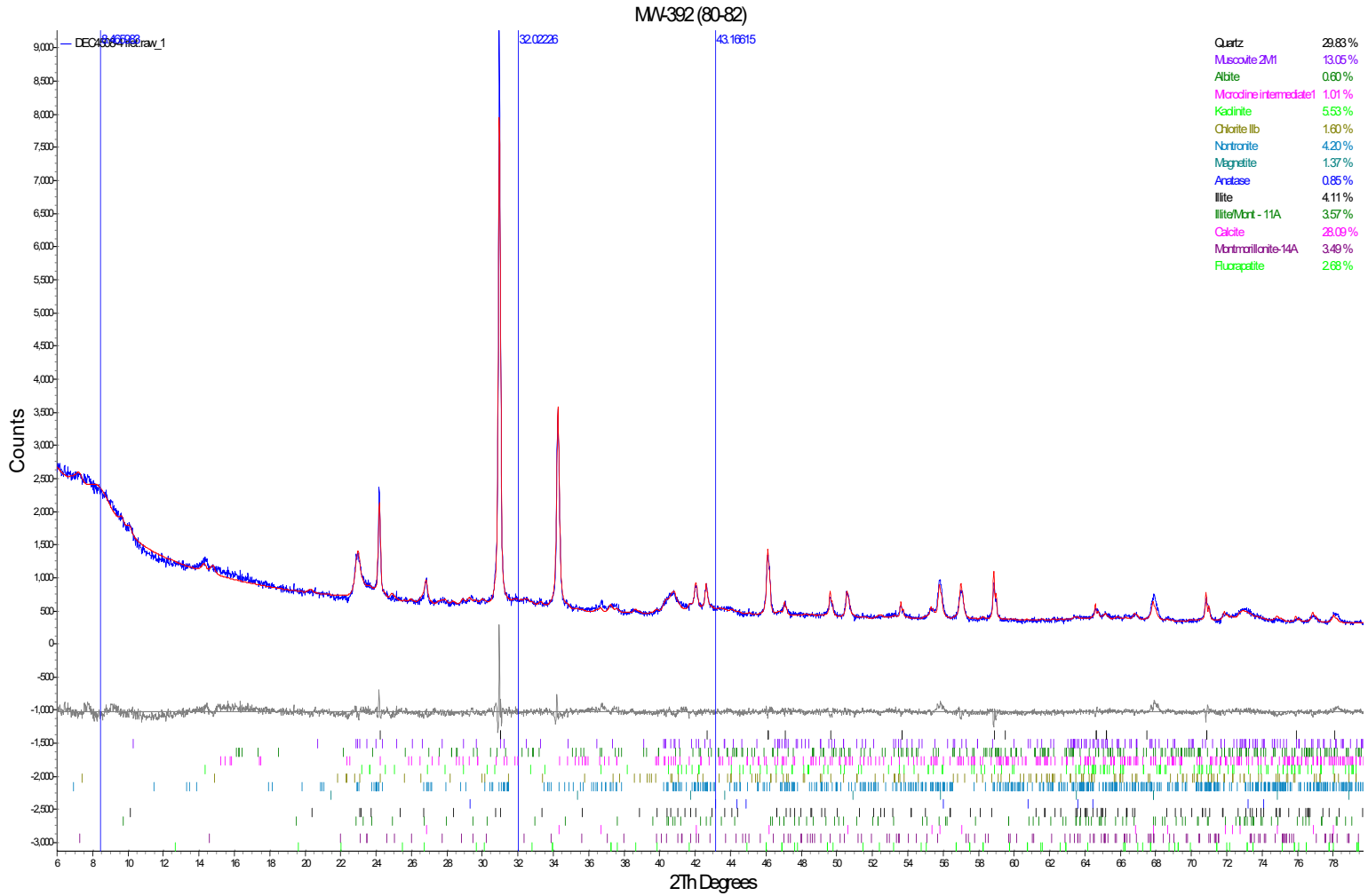
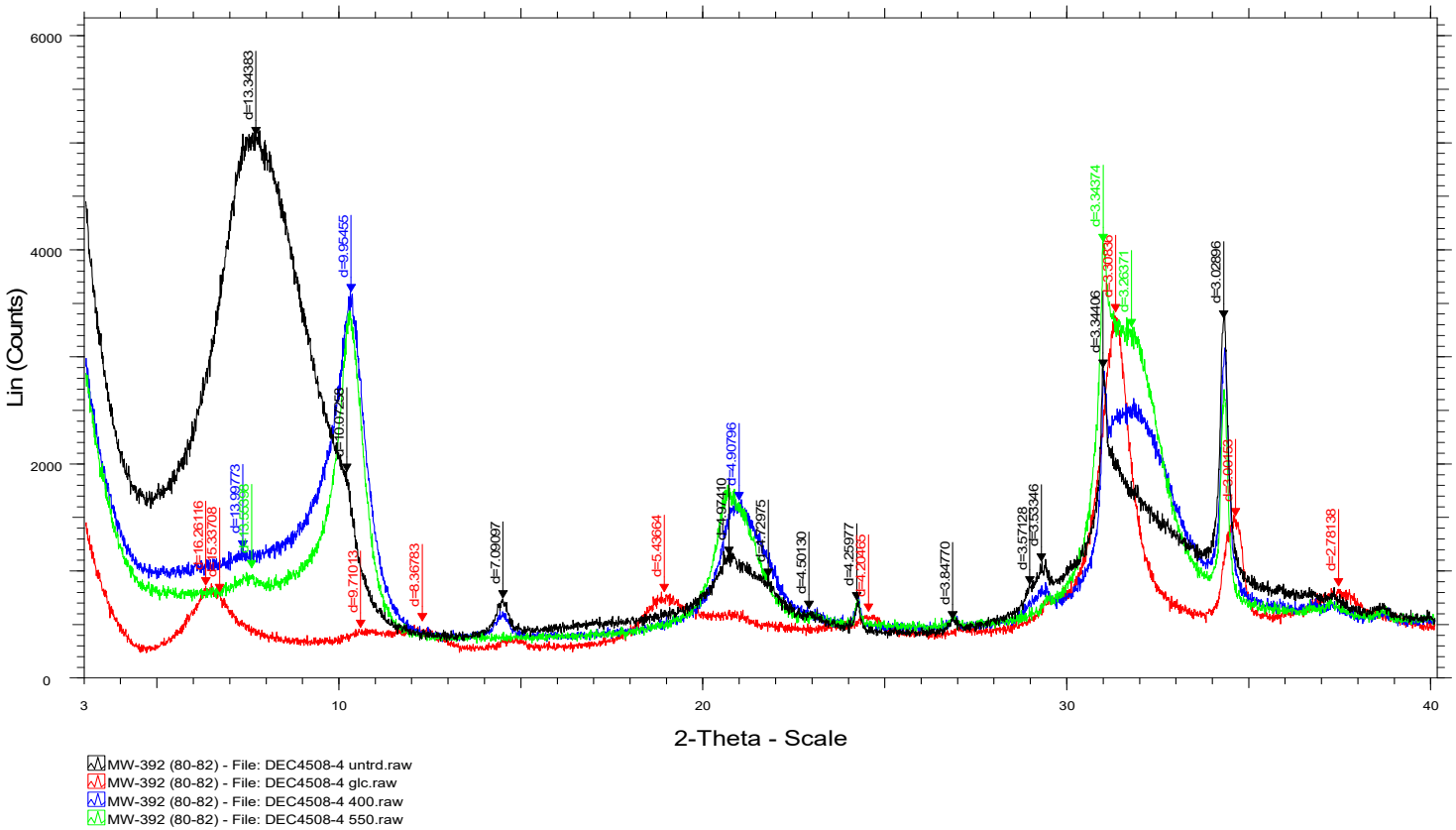
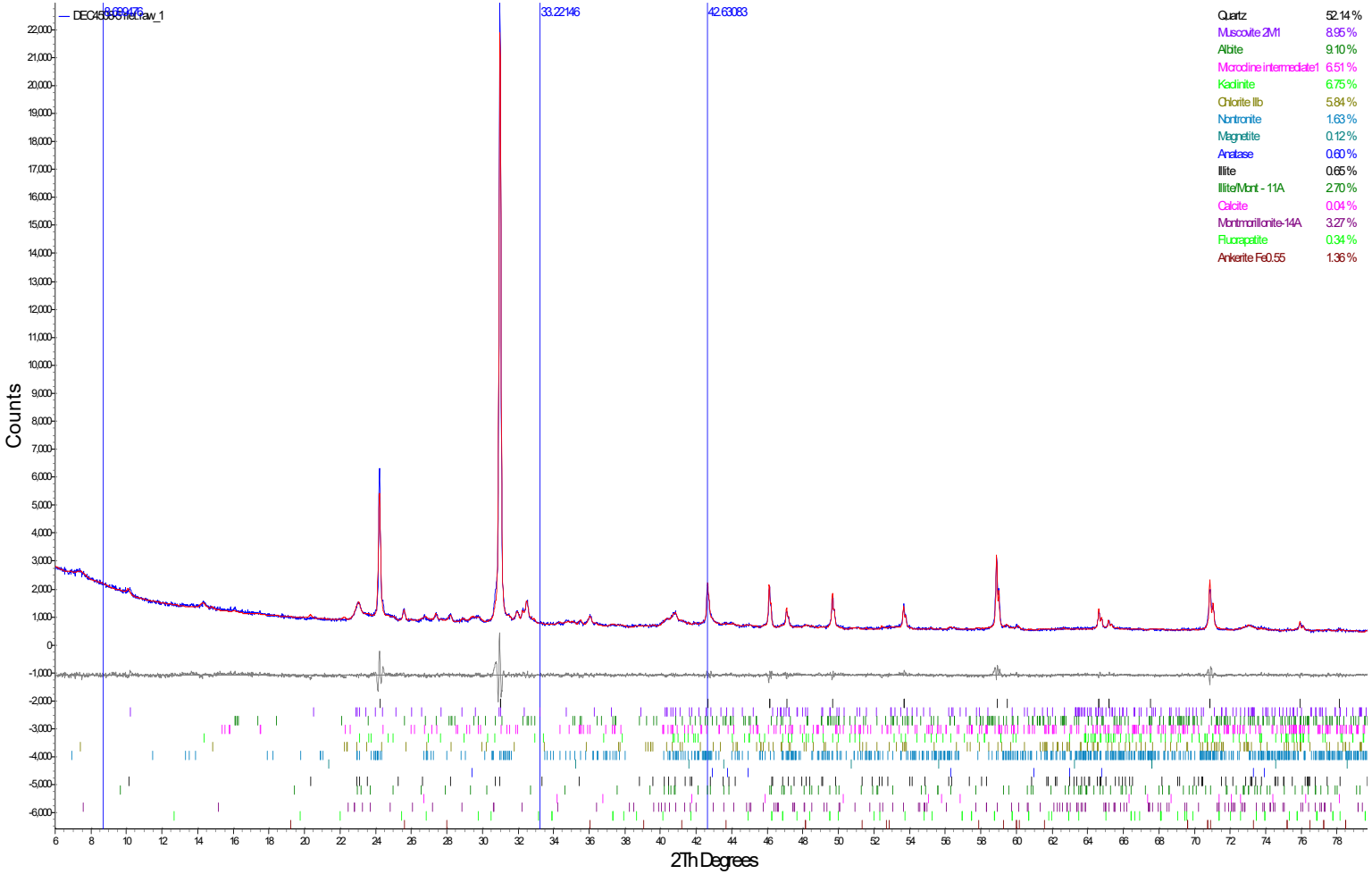
d=4.98316
d=4.75567
d=4.47051
d=4.25592
d=3.57130
d=3.31950
d=2.83990
MW-358 (86-88) - File: DEC4508-3 untrd.raw
MW-358 (86-88) - File: DEC4508-3 glc.raw
MW-358 (86-88) - File: DEC4508-3 400.raw
MW-358 (86-88) - File: DEC4508-3 550.raw

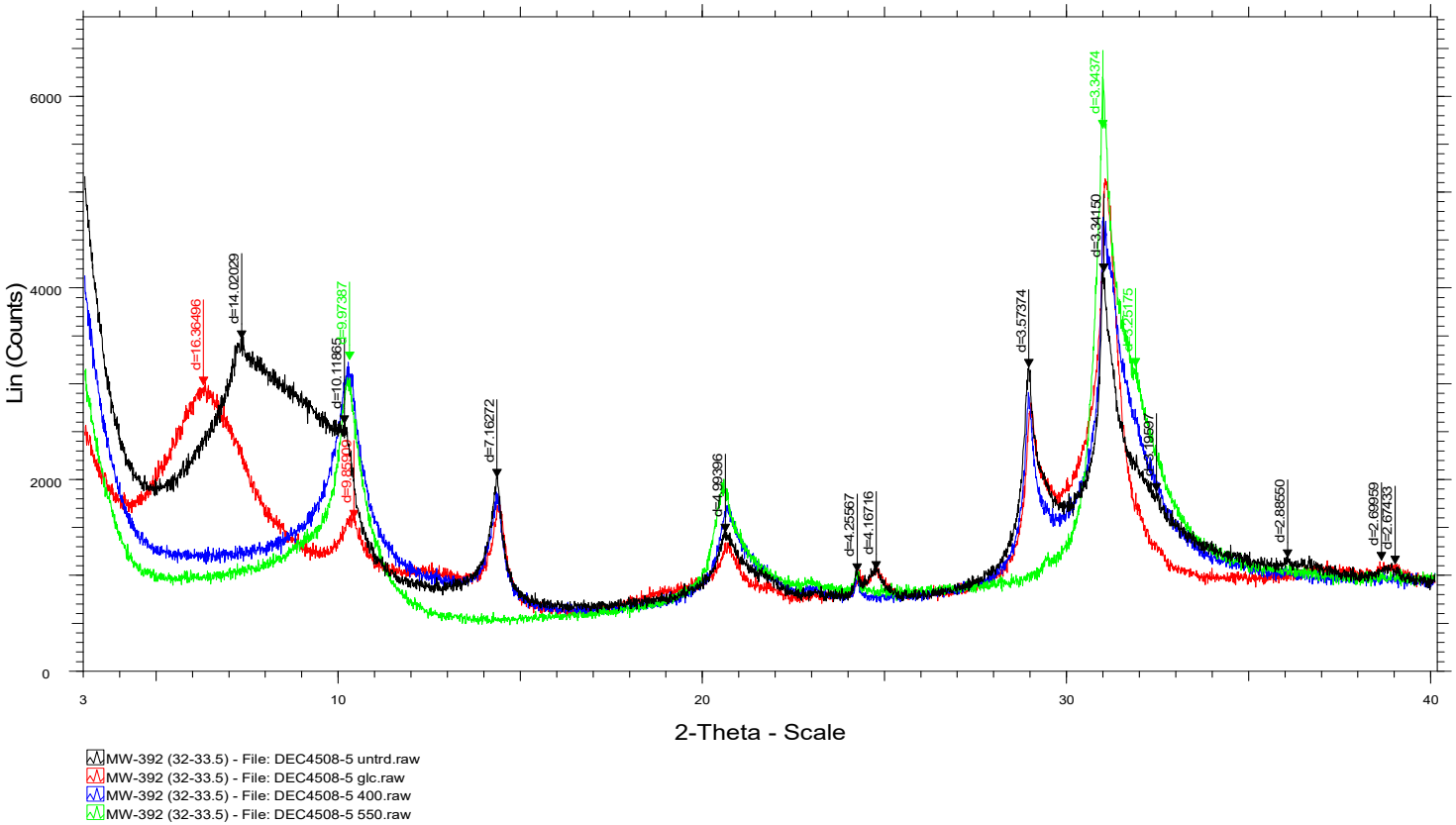

MW-392 (80-82)
DEC4508-4 rfet.raw_1
32.02226
43.16615
Quartz 29.83 %
Muscovite 2M1 13.05 %
Albite 0.60 %
Microcline intermediate1 1.01 %
Kaolinite 5.53 %
Chlorite IIb 1.60 %
Nontronite 4.20 %
Magnetite 1.37 %
Anatase 0.85 %
Illite 4.11 %
Illite/Mont - 11A 3.57 %
Calcite 28.09 %
Montmorillonite-14A 3.49 %
Fluorapatite 2.68 %
Counts
2Th Degrees

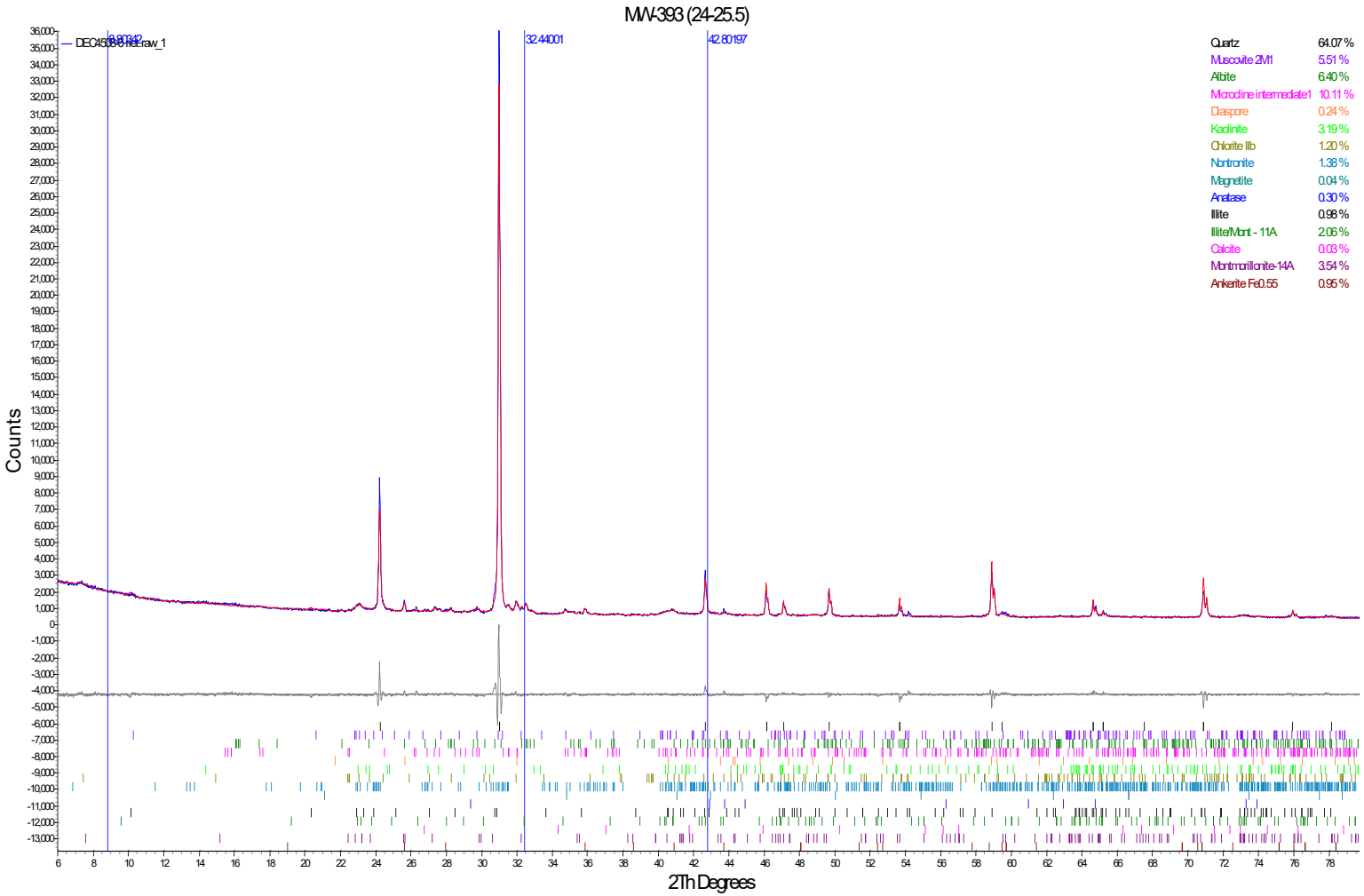
MW-392 (80-82)

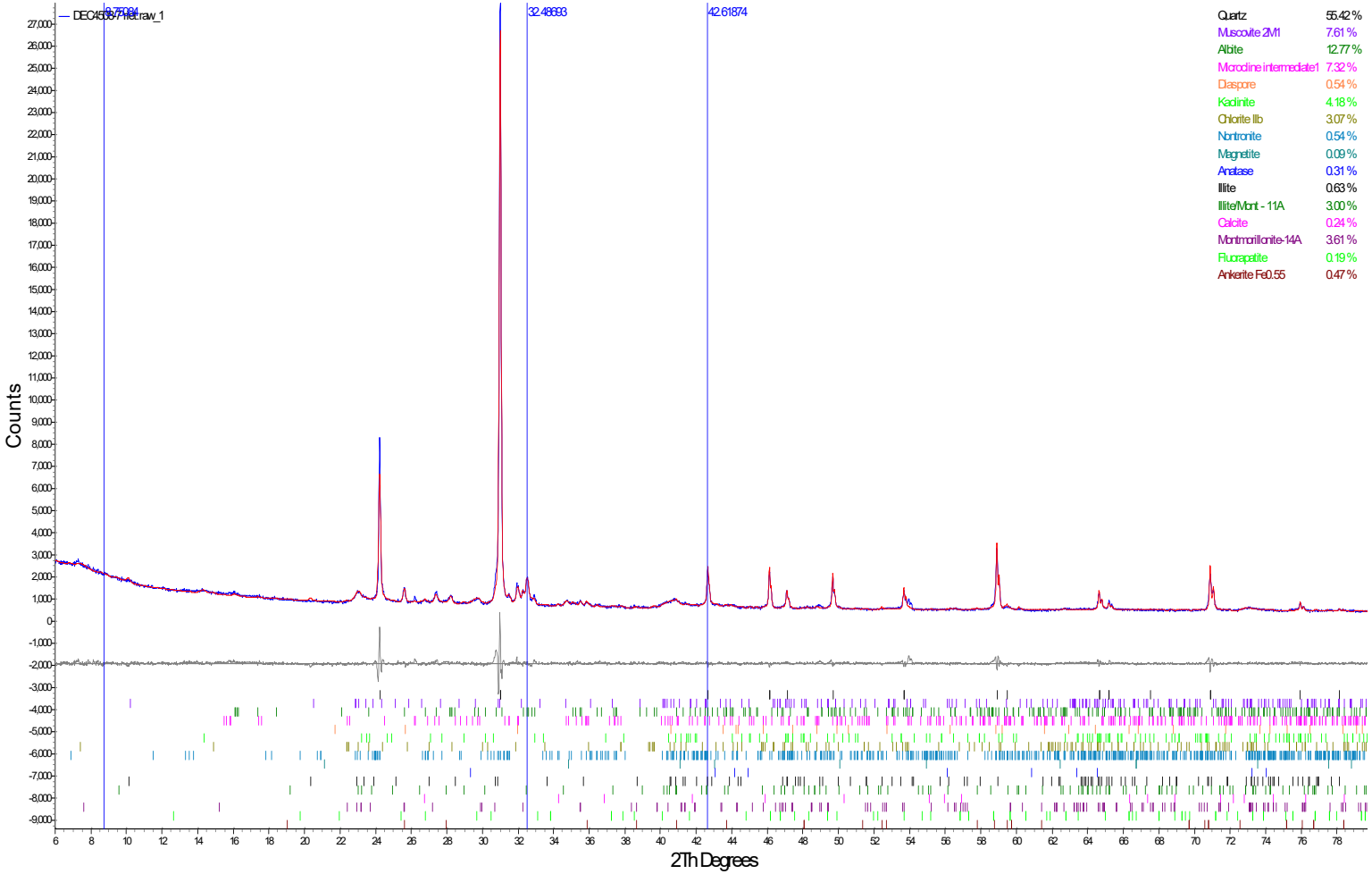

Lin (Counts)
6000
4000
2000
0
3
10
20
30
40
2-Theta - Scale
d=13.34383
d=9.95455
d=10.07258
d=16.26116
d=15.33708
d=13.99773
d=9.71013
d=8.36783
d=7.09097
d=5.43664
d=4.97410
d=4.90796
d=4.72975
d=4.50130
d=4.25977
d=4.02435
d=3.84770
d=3.57128
d=3.53346
d=3.34374
d=3.34406
d=3.30639
d=3.26371
d=3.02896
d=2.90162
d=2.78138
MW-392 (80-82) - File: DEC4508-4 untrd.raw
MW-392 (80-82) - File: DEC4508-4 glc.raw
MW-392 (80-82) - File: DEC4508-4 400.raw
MW-392 (80-82) - File: DEC4508-4 550.raw


MW-392 (32-33.5)
DEC4508-5 fret.raw_1
33.22146
42.63083
Quartz 52.14 %
Muscovite 2M1 8.95 %
Albite 9.10 %
Microcline intermediate1 6.51 %
Kaolinite 6.75 %
Chlorite IIb 5.84 %
Nontronite 1.63 %
Magnetite 0.12 %
Anatase 0.60 %
Illite 0.65 %
Illite/Mont - 11A 2.70 %
Calcite 0.04 %
Montmorillonite-14A 3.27 %
Fluorapatite 0.34 %
Ankerite Fe0.55 1.36 %
Counts
2Th Degrees

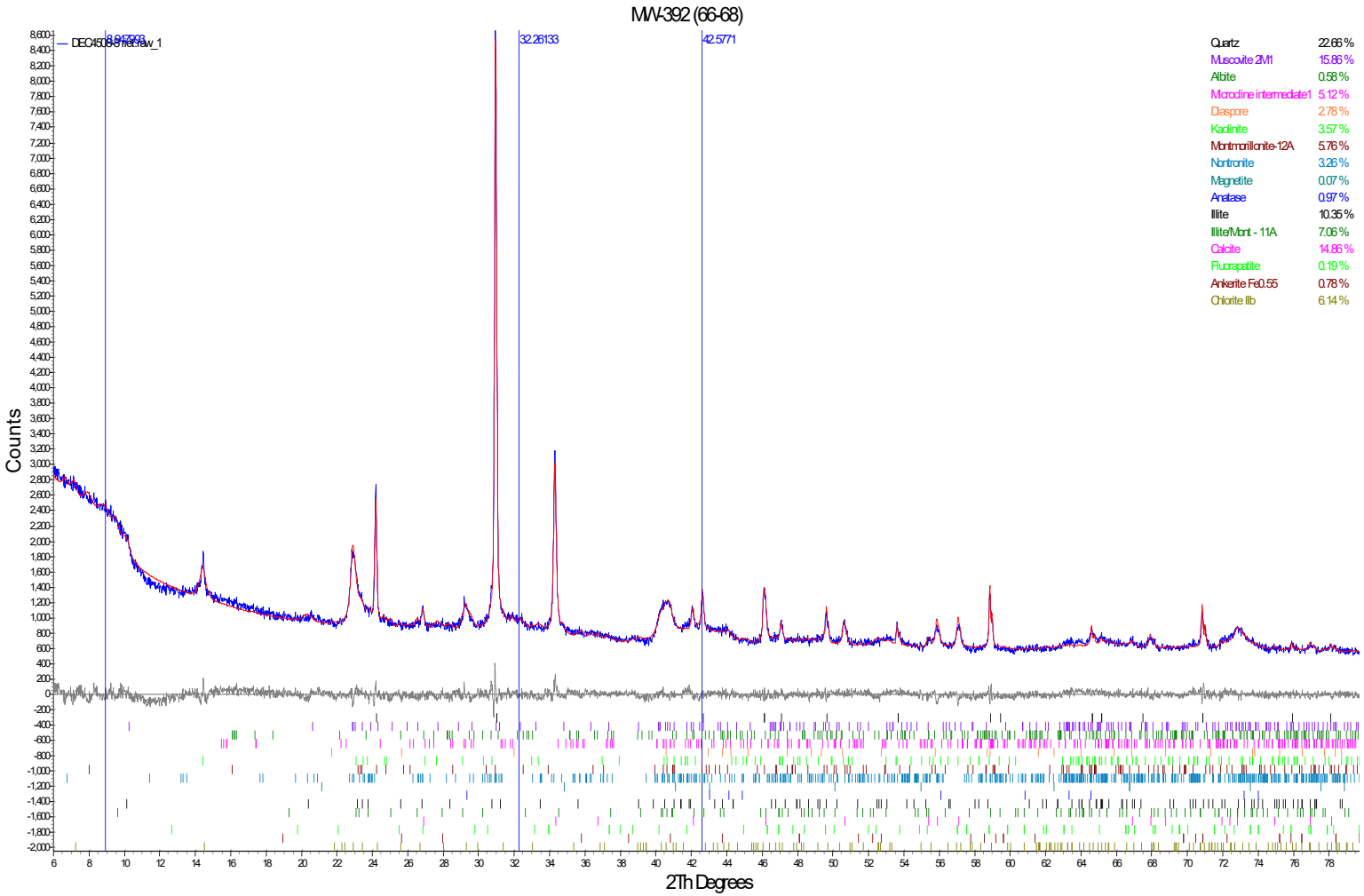
MW-392 (32-33.5)


Lin (Counts)
6000
4000
2000
0
3
10
20
30
40
2-Theta - Scale
d=16.36496
d=14.02029
d=10.11865
d=9.97387
d=9.85904
d=7.16272
d=4.99396
d=4.25567
d=4.16716
d=3.57374
d=3.34374
d=3.34150
d=3.25175
d=3.19597
d=2.88550
d=2.69959
d=2.67433
MW-392 (32-33.5) - File: DEC4508-5 untrd.raw
MW-392 (32-33.5) - File: DEC4508-5 glc.raw
MW-392 (32-33.5) - File: DEC4508-5 400.raw
MW-392 (32-33.5) - File: DEC4508-5 550.raw

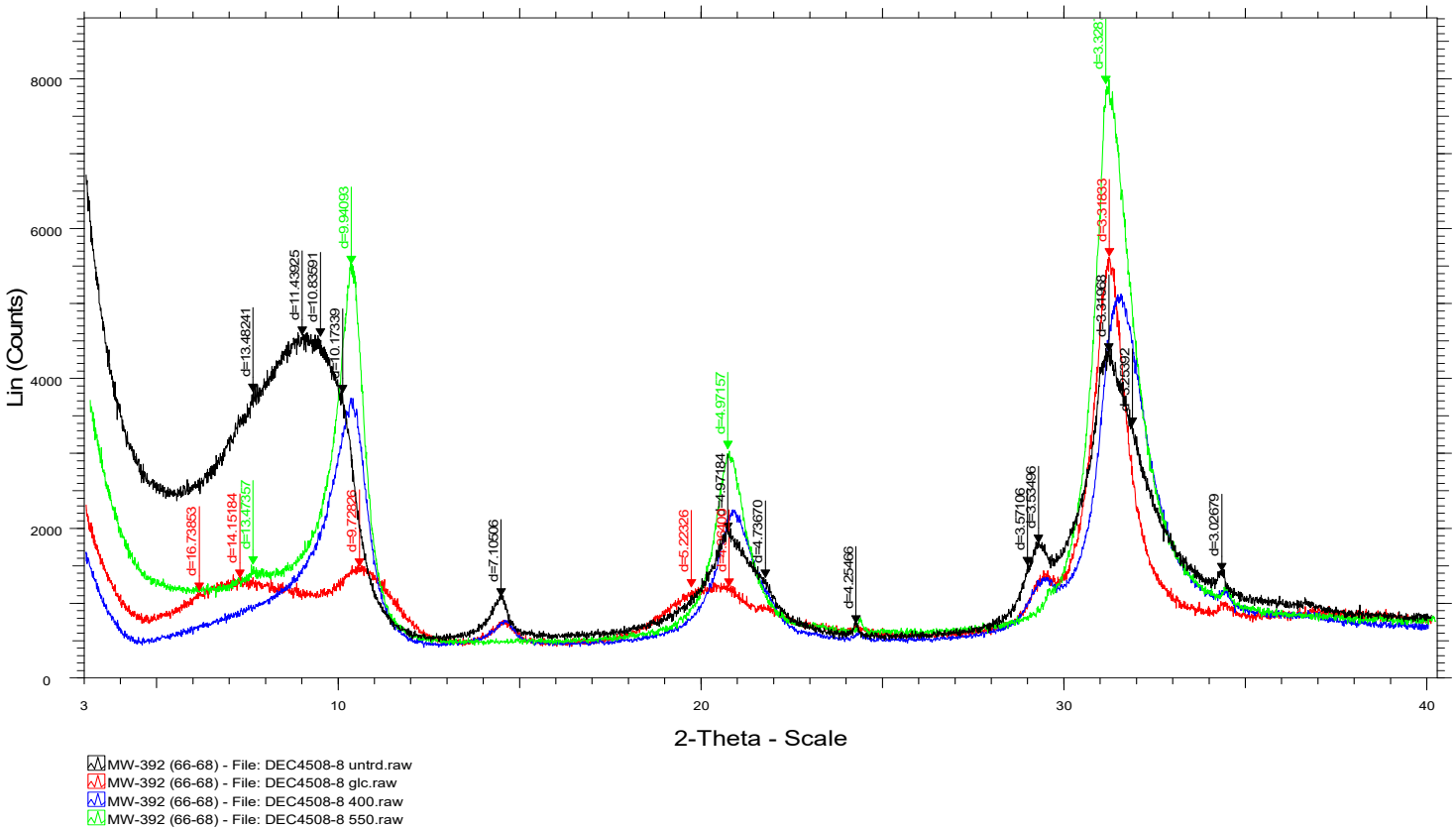

MW-393 (24-25.5)
DEC4508-6-net.raw_1
8.80342
32.44001
42.80197
Quartz 64.07 %
Muscovite 2M1 5.51 %
Albite 6.40 %
Microcline intermediate1 10.11 %
Diaspore 0.24 %
Kaolinite 3.19 %
Chlorite IIb 1.20 %
Nontronite 1.38 %
Magnetite 0.04 %
Anatase 0.30 %
Illite 0.98 %
Illite/Mont - 11A 2.06 %
Calcite 0.03 %
Montmorillonite-14A 3.54 %
Ankerite Fe0.55 0.95 %
Counts
2Th Degrees


MW-394 (20.5-22)
DEC4508-Pref.raw_1
32.48693
42.61874
Quartz 55.42 %
Muscovite 2M1 7.61 %
Albite 12.77 %
Microcline intermediate1 7.32 %
Diaspore 0.54 %
Kaolinite 4.18 %
Chlorite IIb 3.07 %
Nontronite 0.54 %
Magnetite 0.09 %
Anatase 0.31 %
Illite 0.63 %
Illite/Mont - 11A 3.00 %
Calcite 0.24 %
Montmorillonite-14A 3.61 %
Fluorapatite 0.19 %
Ankerite Fe0.55 0.47 %
Counts
2Th Degrees

Environmental Services
Custom XRD/MI4508-DEC22
24-Apr-23



MW-392 (66-68)



MW-392 (66-68) - File: DEC4508-8 untrd.raw
MW-392 (66-68) - File: DEC4508-8 glc.raw
MW-392 (66-68) - File: DEC4508-8 400.raw
MW-392 (66-68) - File: DEC4508-8 550.raw

Attachment I
Aqueous Phase Data Summary

Attachment I. Site Groundwater Data
Geochemical Conceptual Site Model
Baldwin Fly Ash Pond System
Baldwin Power Plant
Baldwin, IL

HSU	Location	Well Type	Date	Parameter	Unit	Result
PMP	MW-150	C	2013/09/16	pH (field)	SU	7.6
PMP	MW-150	C	2013/11/20	pH (field)	SU	7.1
PMP	MW-150	C	2014/02/19	pH (field)	SU	7.0
PMP	MW-150	C	2014/06/11	pH (field)	SU	7.3
PMP	MW-150	C	2015/03/25	pH (field)	SU	7.4
PMP	MW-150	C	2015/06/24	pH (field)	SU	7.2
PMP	MW-150	C	2015/09/25	pH (field)	SU	7.2
PMP	MW-150	C	2015/11/10	pH (field)	SU	7.0
PMP	MW-150	C	2016/03/22	pH (field)	SU	7.5
PMP	MW-150	C	2016/06/21	pH (field)	SU	7.3
PMP	MW-150	C	2016/09/29	pH (field)	SU	7.3
PMP	MW-150	C	2016/12/21	pH (field)	SU	7.2
PMP	MW-150	C	2017/03/16	pH (field)	SU	7.3
PMP	MW-150	C	2017/06/22	pH (field)	SU	7.1
PMP	MW-150	C	2017/09/21	pH (field)	SU	7.1
PMP	MW-150	C	2017/11/28	pH (field)	SU	7.3
PMP	MW-150	C	2018/03/19	pH (field)	SU	7.2
PMP	MW-150	C	2018/06/28	pH (field)	SU	7.1
PMP	MW-150	C	2018/09/26	pH (field)	SU	7.2
PMP	MW-150	C	2018/12/18	pH (field)	SU	7.2
PMP	MW-150	C	2019/03/20	pH (field)	SU	7.2
PMP	MW-150	C	2019/06/25	pH (field)	SU	7.2
PMP	MW-150	C	2019/09/26	pH (field)	SU	6.7
PMP	MW-150	C	2019/12/19	pH (field)	SU	7.2
PMP	MW-150	C	2020/03/26	pH (field)	SU	7.2
PMP	MW-150	C	2020/06/23	pH (field)	SU	7.3
PMP	MW-150	C	2020/09/17	pH (field)	SU	7.2
PMP	MW-150	C	2020/12/17	pH (field)	SU	6.9
PMP	MW-150	C	2021/03/10	pH (field)	SU	7.0
PMP	MW-150	C	2021/06/21	pH (field)	SU	7.1
PMP	MW-150	C	2021/09/14	pH (field)	SU	7.0
PMP	MW-150	C	2021/12/14	pH (field)	SU	7.1
PMP	MW-150	C	2022/03/28	pH (field)	SU	7.0
PMP	MW-150	C	2022/06/14	pH (field)	SU	7.1
PMP	MW-150	C	2022/09/29	pH (field)	SU	7.2
PMP	MW-150	C	2022/12/06	pH (field)	SU	7.1
PMP	MW-150	C	2023/03/15	pH (field)	SU	7.0
PMP	MW-150	C	2023/05/18	pH (field)	SU	7.1
PMP	MW-150	C	2023/08/07	pH (field)	SU	7.0
PMP	MW-150	C	2023/11/03	pH (field)	SU	7.1
PMP	MW-150	C	2021/03/10	Oxidation Reduction Potential	mV	105
PMP	MW-150	C	2021/06/21	Oxidation Reduction Potential	mV	-110
PMP	MW-150	C	2021/09/14	Oxidation Reduction Potential	mV	-42.0
PMP	MW-150	C	2021/12/14	Oxidation Reduction Potential	mV	16.0
PMP	MW-150	C	2022/03/28	Oxidation Reduction Potential	mV	-26.0
PMP	MW-150	C	2022/06/14	Oxidation Reduction Potential	mV	120
PMP	MW-150	C	2022/09/29	Oxidation Reduction Potential	mV	80.0
PMP	MW-150	C	2022/12/06	Oxidation Reduction Potential	mV	<-300
PMP	MW-150	C	2023/03/15	Oxidation Reduction Potential	mV	-93.5
PMP	MW-150	C	2023/05/18	Oxidation Reduction Potential	mV	20.0
PMP	MW-150	C	2023/08/07	Oxidation Reduction Potential	mV	-65.0
PMP	MW-150	C	2023/11/03	Oxidation Reduction Potential	mV	-139
PMP	MW-150	C	2021/03/10	Eh	V	0.30
PMP	MW-150	C	2021/06/21	Eh	V	0.087
PMP	MW-150	C	2021/09/14	Eh	V	0.15

PMP	MW-150	C	2021/12/14	Eh	V	0.21
PMP	MW-150	C	2022/03/28	Eh	V	0.17
PMP	MW-150	C	2022/06/14	Eh	V	0.32
PMP	MW-150	C	2022/09/29	Eh	V	0.28
PMP	MW-150	C	2022/12/06	Eh	V	-0.10
PMP	MW-150	C	2023/03/15	Eh	V	0.10
PMP	MW-150	C	2023/05/18	Eh	V	0.22
PMP	MW-150	C	2023/08/07	Eh	V	0.13
PMP	MW-150	C	2023/11/03	Eh	V	0.057
PMP	MW-150	C	2023/03/15	Alkalinity, bicarbonate	mg/L CaCO3	358
PMP	MW-150	C	2023/05/18	Alkalinity, bicarbonate	mg/L CaCO3	336
PMP	MW-150	C	2023/08/07	Alkalinity, bicarbonate	mg/L CaCO3	314
PMP	MW-150	C	2023/11/03	Alkalinity, bicarbonate	mg/L CaCO3	304
PMP	MW-150	C	2023/03/15	Barium, total	mg/L	0.0156
PMP	MW-150	C	2023/05/18	Barium, total	mg/L	0.0170
PMP	MW-150	C	2023/08/07	Barium, total	mg/L	0.0194
PMP	MW-150	C	2023/11/03	Barium, total	mg/L	0.0162
PMP	MW-150	C	2013/09/16	Boron, total	mg/L	0.680
PMP	MW-150	C	2023/03/15	Boron, total	mg/L	3.43
PMP	MW-150	C	2023/05/18	Boron, total	mg/L	4.12
PMP	MW-150	C	2023/08/07	Boron, total	mg/L	4.38
PMP	MW-150	C	2023/11/03	Boron, total	mg/L	3.59
PMP	MW-150	C	2023/03/15	Calcium, total	mg/L	188
PMP	MW-150	C	2023/05/18	Calcium, total	mg/L	223
PMP	MW-150	C	2023/08/07	Calcium, total	mg/L	186
PMP	MW-150	C	2023/11/03	Calcium, total	mg/L	206
PMP	MW-150	C	2013/09/16	Chloride, total	mg/L	54.0
PMP	MW-150	C	2023/03/15	Chloride, total	mg/L	56.0
PMP	MW-150	C	2023/05/18	Chloride, total	mg/L	56.0
PMP	MW-150	C	2023/08/07	Chloride, total	mg/L	53.0
PMP	MW-150	C	2023/11/03	Chloride, total	mg/L	49.0
PMP	MW-150	C	2013/11/20	Iron, dissolved	mg/L	0.0700
PMP	MW-150	C	2014/02/19	Iron, dissolved	mg/L	<0.007
PMP	MW-150	C	2014/06/11	Iron, dissolved	mg/L	<0.007
PMP	MW-150	C	2015/03/25	Iron, dissolved	mg/L	<0.007
PMP	MW-150	C	2015/06/24	Iron, dissolved	mg/L	0.0350
PMP	MW-150	C	2015/09/25	Iron, dissolved	mg/L	0.127
PMP	MW-150	C	2015/11/10	Iron, dissolved	mg/L	0.0388
PMP	MW-150	C	2016/03/22	Iron, dissolved	mg/L	0.0247
PMP	MW-150	C	2016/06/21	Iron, dissolved	mg/L	0.0276
PMP	MW-150	C	2016/09/29	Iron, dissolved	mg/L	<0.007
PMP	MW-150	C	2016/12/21	Iron, dissolved	mg/L	<0.007
PMP	MW-150	C	2017/03/16	Iron, dissolved	mg/L	<0.007
PMP	MW-150	C	2017/06/22	Iron, dissolved	mg/L	<0.007
PMP	MW-150	C	2017/09/21	Iron, dissolved	mg/L	<0.007
PMP	MW-150	C	2017/11/28	Iron, dissolved	mg/L	<0.007
PMP	MW-150	C	2018/03/19	Iron, dissolved	mg/L	<0.007
PMP	MW-150	C	2018/06/28	Iron, dissolved	mg/L	<0.02
PMP	MW-150	C	2018/09/26	Iron, dissolved	mg/L	<0.02
PMP	MW-150	C	2018/12/18	Iron, dissolved	mg/L	<0.02
PMP	MW-150	C	2019/03/20	Iron, dissolved	mg/L	<0.02
PMP	MW-150	C	2019/06/25	Iron, dissolved	mg/L	<0.02
PMP	MW-150	C	2019/09/26	Iron, dissolved	mg/L	<0.02
PMP	MW-150	C	2019/12/19	Iron, dissolved	mg/L	<0.02
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PMP	MW-150	C	2020/09/17	Iron, dissolved	mg/L	0.106

PMP	MW-150	C	2020/12/17	Iron, dissolved	mg/L	<0.02
PMP	MW-150	C	2021/03/10	Iron, dissolved	mg/L	<0.04
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PMP	MW-150	C	2021/09/14	Iron, dissolved	mg/L	<0.02
PMP	MW-150	C	2021/12/14	Iron, dissolved	mg/L	<0.02
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PMP	MW-150	C	2022/06/14	Iron, dissolved	mg/L	<0.02
PMP	MW-150	C	2022/09/29	Iron, dissolved	mg/L	<0.0115
PMP	MW-150	C	2022/12/06	Iron, dissolved	mg/L	<0.0115
PMP	MW-150	C	2023/03/15	Iron, dissolved	mg/L	0.0140
PMP	MW-150	C	2023/05/18	Iron, dissolved	mg/L	<0.02
PMP	MW-150	C	2023/08/07	Iron, dissolved	mg/L	0.0666
PMP	MW-150	C	2023/11/03	Iron, dissolved	mg/L	0.0728
PMP	MW-150	C	2023/03/15	Magnesium, total	mg/L	175
PMP	MW-150	C	2023/05/18	Magnesium, total	mg/L	173
PMP	MW-150	C	2023/08/07	Magnesium, total	mg/L	145
PMP	MW-150	C	2023/11/03	Magnesium, total	mg/L	135
PMP	MW-150	C	2013/11/20	Manganese, dissolved	mg/L	0.0300
PMP	MW-150	C	2014/02/19	Manganese, dissolved	mg/L	<0.0016
PMP	MW-150	C	2014/06/11	Manganese, dissolved	mg/L	0.00600
PMP	MW-150	C	2015/03/25	Manganese, dissolved	mg/L	0.0240
PMP	MW-150	C	2015/06/24	Manganese, dissolved	mg/L	0.00300
PMP	MW-150	C	2015/09/25	Manganese, dissolved	mg/L	0.0125
PMP	MW-150	C	2015/11/10	Manganese, dissolved	mg/L	0.00480
PMP	MW-150	C	2016/03/22	Manganese, dissolved	mg/L	<0.0005
PMP	MW-150	C	2016/06/21	Manganese, dissolved	mg/L	<0.0005
PMP	MW-150	C	2016/09/29	Manganese, dissolved	mg/L	<0.0005
PMP	MW-150	C	2016/12/21	Manganese, dissolved	mg/L	<0.0005
PMP	MW-150	C	2017/03/16	Manganese, dissolved	mg/L	<0.0005
PMP	MW-150	C	2017/06/22	Manganese, dissolved	mg/L	<0.0005
PMP	MW-150	C	2017/09/21	Manganese, dissolved	mg/L	<0.0005
PMP	MW-150	C	2017/11/28	Manganese, dissolved	mg/L	<0.0005
PMP	MW-150	C	2018/03/19	Manganese, dissolved	mg/L	<0.0005
PMP	MW-150	C	2018/06/28	Manganese, dissolved	mg/L	<0.0025
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PMP	MW-150	C	2018/12/18	Manganese, dissolved	mg/L	<0.0025
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PMP	MW-150	C	2019/06/25	Manganese, dissolved	mg/L	<0.0025
PMP	MW-150	C	2019/09/26	Manganese, dissolved	mg/L	<0.0025
PMP	MW-150	C	2019/12/19	Manganese, dissolved	mg/L	<0.0025
PMP	MW-150	C	2020/03/26	Manganese, dissolved	mg/L	<0.0025
PMP	MW-150	C	2020/06/23	Manganese, dissolved	mg/L	<0.0025
PMP	MW-150	C	2020/09/17	Manganese, dissolved	mg/L	<0.0025
PMP	MW-150	C	2020/12/17	Manganese, dissolved	mg/L	<0.0025
PMP	MW-150	C	2021/03/10	Manganese, dissolved	mg/L	<0.0025
PMP	MW-150	C	2021/06/21	Manganese, dissolved	mg/L	<0.0025
PMP	MW-150	C	2021/09/14	Manganese, dissolved	mg/L	<0.0025
PMP	MW-150	C	2021/12/14	Manganese, dissolved	mg/L	<0.0025
PMP	MW-150	C	2022/03/28	Manganese, dissolved	mg/L	<0.0008
PMP	MW-150	C	2022/06/14	Manganese, dissolved	mg/L	<0.0025
PMP	MW-150	C	2022/09/29	Manganese, dissolved	mg/L	0.00160
PMP	MW-150	C	2022/12/06	Manganese, dissolved	mg/L	0.00180
PMP	MW-150	C	2023/03/15	Manganese, dissolved	mg/L	<0.0008
PMP	MW-150	C	2023/05/18	Manganese, dissolved	mg/L	0.00380
PMP	MW-150	C	2023/08/07	Manganese, dissolved	mg/L	0.00250
PMP	MW-150	C	2023/11/03	Manganese, dissolved	mg/L	0.00250
PMP	MW-150	C	2023/05/18	Phosphate, dissolved	mg/L	0.0980

PMP	MW-150	C	2023/08/07	Phosphate, dissolved	mg/L	0.0710
PMP	MW-150	C	2023/03/15	Potassium, total	mg/L	0.731
PMP	MW-150	C	2023/05/18	Potassium, total	mg/L	0.893
PMP	MW-150	C	2023/08/07	Potassium, total	mg/L	0.864
PMP	MW-150	C	2023/11/03	Potassium, total	mg/L	0.806
PMP	MW-150	C	2023/05/18	Silicon, dissolved	mg/L	10.3
PMP	MW-150	C	2023/08/07	Silicon, dissolved	mg/L	9.45
PMP	MW-150	C	2023/03/15	Sodium, total	mg/L	125
PMP	MW-150	C	2023/05/18	Sodium, total	mg/L	121
PMP	MW-150	C	2023/08/07	Sodium, total	mg/L	94.8
PMP	MW-150	C	2023/11/03	Sodium, total	mg/L	102
PMP	MW-150	C	2013/09/16	Sulfate, total	mg/L	570
PMP	MW-150	C	2023/03/15	Sulfate, total	mg/L	927
PMP	MW-150	C	2023/05/18	Sulfate, total	mg/L	970
PMP	MW-150	C	2023/08/07	Sulfate, total	mg/L	852
PMP	MW-150	C	2023/11/03	Sulfate, total	mg/L	832
PMP	MW-150	C	2013/09/16	Temperature (Celsius)	degrees C	14.8
PMP	MW-150	C	2013/11/20	Temperature (Celsius)	degrees C	13.3
PMP	MW-150	C	2014/02/19	Temperature (Celsius)	degrees C	12.7
PMP	MW-150	C	2014/06/11	Temperature (Celsius)	degrees C	13.0
PMP	MW-150	C	2015/03/25	Temperature (Celsius)	degrees C	13.7
PMP	MW-150	C	2015/06/24	Temperature (Celsius)	degrees C	13.5
PMP	MW-150	C	2015/09/25	Temperature (Celsius)	degrees C	14.0
PMP	MW-150	C	2015/11/10	Temperature (Celsius)	degrees C	13.5
PMP	MW-150	C	2016/03/22	Temperature (Celsius)	degrees C	14.5
PMP	MW-150	C	2016/06/21	Temperature (Celsius)	degrees C	14.3
PMP	MW-150	C	2016/09/29	Temperature (Celsius)	degrees C	14.0
PMP	MW-150	C	2016/12/21	Temperature (Celsius)	degrees C	13.8
PMP	MW-150	C	2017/03/16	Temperature (Celsius)	degrees C	13.6
PMP	MW-150	C	2017/06/22	Temperature (Celsius)	degrees C	14.4
PMP	MW-150	C	2017/09/21	Temperature (Celsius)	degrees C	15.0
PMP	MW-150	C	2017/11/28	Temperature (Celsius)	degrees C	14.9
PMP	MW-150	C	2018/03/19	Temperature (Celsius)	degrees C	14.9
PMP	MW-150	C	2018/06/28	Temperature (Celsius)	degrees C	14.4
PMP	MW-150	C	2018/09/26	Temperature (Celsius)	degrees C	14.4
PMP	MW-150	C	2018/12/18	Temperature (Celsius)	degrees C	14.1
PMP	MW-150	C	2019/03/20	Temperature (Celsius)	degrees C	13.0
PMP	MW-150	C	2019/06/25	Temperature (Celsius)	degrees C	13.5
PMP	MW-150	C	2019/09/26	Temperature (Celsius)	degrees C	13.8
PMP	MW-150	C	2019/12/19	Temperature (Celsius)	degrees C	13.9
PMP	MW-150	C	2020/03/26	Temperature (Celsius)	degrees C	13.4
PMP	MW-150	C	2020/06/23	Temperature (Celsius)	degrees C	13.3
PMP	MW-150	C	2020/09/17	Temperature (Celsius)	degrees C	13.8
PMP	MW-150	C	2020/12/17	Temperature (Celsius)	degrees C	12.3
PMP	MW-150	C	2021/03/10	Temperature (Celsius)	degrees C	13.6
PMP	MW-150	C	2021/06/21	Temperature (Celsius)	degrees C	13.2
PMP	MW-150	C	2021/09/14	Temperature (Celsius)	degrees C	13.9
PMP	MW-150	C	2021/12/14	Temperature (Celsius)	degrees C	14.3
PMP	MW-150	C	2022/03/28	Temperature (Celsius)	degrees C	13.2
PMP	MW-150	C	2022/06/14	Temperature (Celsius)	degrees C	14.3
PMP	MW-150	C	2022/09/29	Temperature (Celsius)	degrees C	13.8
PMP	MW-150	C	2022/12/06	Temperature (Celsius)	degrees C	13.6
PMP	MW-150	C	2023/03/15	Temperature (Celsius)	degrees C	13.4
PMP	MW-150	C	2023/05/18	Temperature (Celsius)	degrees C	13.6
PMP	MW-150	C	2023/08/07	Temperature (Celsius)	degrees C	14.0
PMP	MW-150	C	2023/11/03	Temperature (Celsius)	degrees C	13.6
PMP	MW-150	C	2013/09/16	Total Dissolved Solids	mg/L	1,090

PMP	MW-150	C	2013/11/20	Total Dissolved Solids	mg/L	1,090
PMP	MW-150	C	2014/02/19	Total Dissolved Solids	mg/L	1,200
PMP	MW-150	C	2014/06/11	Total Dissolved Solids	mg/L	1,300
PMP	MW-150	C	2015/03/25	Total Dissolved Solids	mg/L	1,270
PMP	MW-150	C	2015/06/24	Total Dissolved Solids	mg/L	1,340
PMP	MW-150	C	2015/09/25	Total Dissolved Solids	mg/L	1,210
PMP	MW-150	C	2015/11/10	Total Dissolved Solids	mg/L	1,180
PMP	MW-150	C	2016/03/22	Total Dissolved Solids	mg/L	1,410
PMP	MW-150	C	2016/06/21	Total Dissolved Solids	mg/L	1,440
PMP	MW-150	C	2016/09/29	Total Dissolved Solids	mg/L	1,470
PMP	MW-150	C	2016/12/21	Total Dissolved Solids	mg/L	1,440
PMP	MW-150	C	2017/03/16	Total Dissolved Solids	mg/L	1,570
PMP	MW-150	C	2017/06/22	Total Dissolved Solids	mg/L	1,520
PMP	MW-150	C	2017/09/21	Total Dissolved Solids	mg/L	1,390
PMP	MW-150	C	2017/11/28	Total Dissolved Solids	mg/L	1,500
PMP	MW-150	C	2018/03/19	Total Dissolved Solids	mg/L	1,540
PMP	MW-150	C	2018/06/28	Total Dissolved Solids	mg/L	1,530
PMP	MW-150	C	2018/09/26	Total Dissolved Solids	mg/L	1,550
PMP	MW-150	C	2018/12/18	Total Dissolved Solids	mg/L	1,620
PMP	MW-150	C	2019/03/20	Total Dissolved Solids	mg/L	1,520
PMP	MW-150	C	2019/06/25	Total Dissolved Solids	mg/L	1,700
PMP	MW-150	C	2019/09/26	Total Dissolved Solids	mg/L	1,490
PMP	MW-150	C	2019/12/19	Total Dissolved Solids	mg/L	1,540
PMP	MW-150	C	2020/03/26	Total Dissolved Solids	mg/L	1,580
PMP	MW-150	C	2020/06/23	Total Dissolved Solids	mg/L	1,640
PMP	MW-150	C	2020/09/17	Total Dissolved Solids	mg/L	1,590
PMP	MW-150	C	2020/12/17	Total Dissolved Solids	mg/L	1,590
PMP	MW-150	C	2021/03/10	Total Dissolved Solids	mg/L	1,730
PMP	MW-150	C	2021/06/21	Total Dissolved Solids	mg/L	1,660
PMP	MW-150	C	2021/09/14	Total Dissolved Solids	mg/L	1,550
PMP	MW-150	C	2021/12/14	Total Dissolved Solids	mg/L	1,560
PMP	MW-150	C	2022/03/28	Total Dissolved Solids	mg/L	1,770
PMP	MW-150	C	2022/06/14	Total Dissolved Solids	mg/L	1,790
PMP	MW-150	C	2022/09/29	Total Dissolved Solids	mg/L	1,680
PMP	MW-150	C	2022/12/06	Total Dissolved Solids	mg/L	1,640
PMP	MW-150	C	2023/03/15	Total Dissolved Solids	mg/L	1,770
PMP	MW-150	C	2023/05/18	Total Dissolved Solids	mg/L	1,790
PMP	MW-150	C	2023/08/07	Total Dissolved Solids	mg/L	1,670
PMP	MW-150	C	2023/11/03	Total Dissolved Solids	mg/L	1,620
PMP	MW-151	C	2013/09/16	pH (field)	SU	7.2
PMP	MW-151	C	2013/11/20	pH (field)	SU	7.1
PMP	MW-151	C	2014/02/19	pH (field)	SU	7.1
PMP	MW-151	C	2014/06/12	pH (field)	SU	6.3
PMP	MW-151	C	2017/03/16	pH (field)	SU	7.2
PMP	MW-151	C	2017/06/21	pH (field)	SU	6.9
PMP	MW-151	C	2017/09/21	pH (field)	SU	6.9
PMP	MW-151	C	2017/11/28	pH (field)	SU	7.2
PMP	MW-151	C	2018/03/20	pH (field)	SU	7.1
PMP	MW-151	C	2018/06/27	pH (field)	SU	6.9
PMP	MW-151	C	2018/09/26	pH (field)	SU	6.9
PMP	MW-151	C	2018/12/18	pH (field)	SU	6.9
PMP	MW-151	C	2019/03/20	pH (field)	SU	7.0
PMP	MW-151	C	2019/06/25	pH (field)	SU	6.9
PMP	MW-151	C	2019/09/26	pH (field)	SU	6.7
PMP	MW-151	C	2019/12/19	pH (field)	SU	7.2
PMP	MW-151	C	2020/03/27	pH (field)	SU	6.9
PMP	MW-151	C	2020/06/23	pH (field)	SU	7.0

PMP	MW-151	C	2020/09/17	pH (field)	SU	7.0
PMP	MW-151	C	2020/12/16	pH (field)	SU	7.1
PMP	MW-151	C	2021/03/09	pH (field)	SU	6.9
PMP	MW-151	C	2021/06/21	pH (field)	SU	6.8
PMP	MW-151	C	2021/09/14	pH (field)	SU	6.9
PMP	MW-151	C	2021/12/14	pH (field)	SU	6.9
PMP	MW-151	C	2022/03/28	pH (field)	SU	6.9
PMP	MW-151	C	2022/06/14	pH (field)	SU	6.9
PMP	MW-151	C	2022/09/29	pH (field)	SU	6.7
PMP	MW-151	C	2022/12/06	pH (field)	SU	7.0
PMP	MW-151	C	2023/03/15	pH (field)	SU	6.9
PMP	MW-151	C	2023/05/18	pH (field)	SU	6.8
PMP	MW-151	C	2023/07/10	pH (field)	SU	7.0
PMP	MW-151	C	2023/08/07	pH (field)	SU	6.8
PMP	MW-151	C	2023/10/31	pH (field)	SU	6.9
PMP	MW-151	C	2021/03/09	Oxidation Reduction Potential	mV	79.0
PMP	MW-151	C	2021/06/21	Oxidation Reduction Potential	mV	32.0
PMP	MW-151	C	2021/09/14	Oxidation Reduction Potential	mV	90.0
PMP	MW-151	C	2021/12/14	Oxidation Reduction Potential	mV	78.0
PMP	MW-151	C	2022/03/28	Oxidation Reduction Potential	mV	50.0
PMP	MW-151	C	2022/06/14	Oxidation Reduction Potential	mV	104
PMP	MW-151	C	2022/09/29	Oxidation Reduction Potential	mV	155
PMP	MW-151	C	2022/12/06	Oxidation Reduction Potential	mV	97.0
PMP	MW-151	C	2023/03/15	Oxidation Reduction Potential	mV	96.8
PMP	MW-151	C	2023/05/18	Oxidation Reduction Potential	mV	125
PMP	MW-151	C	2023/07/10	Oxidation Reduction Potential	mV	125
PMP	MW-151	C	2023/08/07	Oxidation Reduction Potential	mV	166
PMP	MW-151	C	2023/10/31	Oxidation Reduction Potential	mV	40.0
PMP	MW-151	C	2021/03/09	Eh	V	0.28
PMP	MW-151	C	2021/06/21	Eh	V	0.23
PMP	MW-151	C	2021/09/14	Eh	V	0.28
PMP	MW-151	C	2021/12/14	Eh	V	0.27
PMP	MW-151	C	2022/03/28	Eh	V	0.25
PMP	MW-151	C	2022/06/14	Eh	V	0.30
PMP	MW-151	C	2022/09/29	Eh	V	0.35
PMP	MW-151	C	2022/12/06	Eh	V	0.29
PMP	MW-151	C	2023/03/15	Eh	V	0.29
PMP	MW-151	C	2023/05/18	Eh	V	0.32
PMP	MW-151	C	2023/07/10	Eh	V	0.32
PMP	MW-151	C	2023/08/07	Eh	V	0.36
PMP	MW-151	C	2023/10/31	Eh	V	0.23
PMP	MW-151	C	2023/03/15	Alkalinity, bicarbonate	mg/L CaCO3	436
PMP	MW-151	C	2023/05/18	Alkalinity, bicarbonate	mg/L CaCO3	523
PMP	MW-151	C	2023/08/07	Alkalinity, bicarbonate	mg/L CaCO3	443
PMP	MW-151	C	2023/10/31	Alkalinity, bicarbonate	mg/L CaCO3	474
PMP	MW-151	C	2023/03/15	Barium, total	mg/L	0.0599
PMP	MW-151	C	2023/05/18	Barium, total	mg/L	0.138
PMP	MW-151	C	2023/07/10	Barium, total	mg/L	0.0550
PMP	MW-151	C	2023/08/07	Barium, total	mg/L	0.0666
PMP	MW-151	C	2023/10/31	Barium, total	mg/L	0.0759
PMP	MW-151	C	2013/09/16	Boron, total	mg/L	0.240
PMP	MW-151	C	2023/03/15	Boron, total	mg/L	0.459
PMP	MW-151	C	2023/05/18	Boron, total	mg/L	0.345
PMP	MW-151	C	2023/07/10	Boron, total	mg/L	0.749
PMP	MW-151	C	2023/08/07	Boron, total	mg/L	0.887
PMP	MW-151	C	2023/10/31	Boron, total	mg/L	0.889
PMP	MW-151	C	2023/03/15	Calcium, total	mg/L	113

PMP	MW-151	C	2023/05/18	Calcium, total	mg/L	187
PMP	MW-151	C	2023/07/10	Calcium, total	mg/L	116
PMP	MW-151	C	2023/08/07	Calcium, total	mg/L	108
PMP	MW-151	C	2023/10/31	Calcium, total	mg/L	123
PMP	MW-151	C	2013/09/16	Chloride, total	mg/L	36.0
PMP	MW-151	C	2023/03/15	Chloride, total	mg/L	37.0
PMP	MW-151	C	2023/05/18	Chloride, total	mg/L	46.0
PMP	MW-151	C	2023/07/10	Chloride, total	mg/L	38.0
PMP	MW-151	C	2023/08/07	Chloride, total	mg/L	38.0
PMP	MW-151	C	2023/10/31	Chloride, total	mg/L	41.0
PMP	MW-151	C	2013/11/20	Iron, dissolved	mg/L	<0.007
PMP	MW-151	C	2014/02/19	Iron, dissolved	mg/L	<0.007
PMP	MW-151	C	2014/06/12	Iron, dissolved	mg/L	<0.007
PMP	MW-151	C	2017/03/16	Iron, dissolved	mg/L	<0.007
PMP	MW-151	C	2017/06/21	Iron, dissolved	mg/L	<0.007
PMP	MW-151	C	2017/09/21	Iron, dissolved	mg/L	<0.007
PMP	MW-151	C	2017/11/28	Iron, dissolved	mg/L	<0.007
PMP	MW-151	C	2018/03/20	Iron, dissolved	mg/L	<0.007
PMP	MW-151	C	2018/06/27	Iron, dissolved	mg/L	<0.02
PMP	MW-151	C	2018/09/26	Iron, dissolved	mg/L	<0.02
PMP	MW-151	C	2018/12/18	Iron, dissolved	mg/L	<0.02
PMP	MW-151	C	2019/03/20	Iron, dissolved	mg/L	<0.02
PMP	MW-151	C	2019/06/25	Iron, dissolved	mg/L	<0.02
PMP	MW-151	C	2019/09/26	Iron, dissolved	mg/L	<0.02
PMP	MW-151	C	2019/12/19	Iron, dissolved	mg/L	<0.02
PMP	MW-151	C	2020/03/27	Iron, dissolved	mg/L	<0.02
PMP	MW-151	C	2020/06/23	Iron, dissolved	mg/L	<0.02
PMP	MW-151	C	2020/09/17	Iron, dissolved	mg/L	<0.02
PMP	MW-151	C	2020/12/16	Iron, dissolved	mg/L	<0.02
PMP	MW-151	C	2021/03/09	Iron, dissolved	mg/L	<0.02
PMP	MW-151	C	2021/06/21	Iron, dissolved	mg/L	<0.02
PMP	MW-151	C	2021/09/14	Iron, dissolved	mg/L	<0.02
PMP	MW-151	C	2021/12/14	Iron, dissolved	mg/L	<0.02
PMP	MW-151	C	2022/03/28	Iron, dissolved	mg/L	<0.015
PMP	MW-151	C	2022/06/14	Iron, dissolved	mg/L	<0.02
PMP	MW-151	C	2022/09/29	Iron, dissolved	mg/L	<0.0115
PMP	MW-151	C	2022/12/06	Iron, dissolved	mg/L	<0.0115
PMP	MW-151	C	2023/03/15	Iron, dissolved	mg/L	<0.0115
PMP	MW-151	C	2023/05/18	Iron, dissolved	mg/L	<0.02
PMP	MW-151	C	2023/08/07	Iron, dissolved	mg/L	<0.0115
PMP	MW-151	C	2023/10/31	Iron, dissolved	mg/L	0.0130
PMP	MW-151	C	2023/03/15	Magnesium, total	mg/L	41.7
PMP	MW-151	C	2023/05/18	Magnesium, total	mg/L	51.7
PMP	MW-151	C	2023/08/07	Magnesium, total	mg/L	40.5
PMP	MW-151	C	2023/10/31	Magnesium, total	mg/L	43.6
PMP	MW-151	C	2013/11/20	Manganese, dissolved	mg/L	<0.0016
PMP	MW-151	C	2014/02/19	Manganese, dissolved	mg/L	<0.0016
PMP	MW-151	C	2014/06/12	Manganese, dissolved	mg/L	0.00500
PMP	MW-151	C	2017/03/16	Manganese, dissolved	mg/L	0.0100
PMP	MW-151	C	2017/06/21	Manganese, dissolved	mg/L	0.00320
PMP	MW-151	C	2017/09/21	Manganese, dissolved	mg/L	0.00300
PMP	MW-151	C	2017/11/28	Manganese, dissolved	mg/L	0.00630
PMP	MW-151	C	2018/03/20	Manganese, dissolved	mg/L	0.00320
PMP	MW-151	C	2018/06/27	Manganese, dissolved	mg/L	<0.0025
PMP	MW-151	C	2018/09/26	Manganese, dissolved	mg/L	0.0689
PMP	MW-151	C	2018/12/18	Manganese, dissolved	mg/L	<0.0025
PMP	MW-151	C	2019/03/20	Manganese, dissolved	mg/L	<0.0025

PMP	MW-151	C	2019/06/25	Manganese, dissolved	mg/L	<0.0025
PMP	MW-151	C	2019/09/26	Manganese, dissolved	mg/L	0.00900
PMP	MW-151	C	2019/12/19	Manganese, dissolved	mg/L	<0.0025
PMP	MW-151	C	2020/03/27	Manganese, dissolved	mg/L	<0.0025
PMP	MW-151	C	2020/06/23	Manganese, dissolved	mg/L	<0.0025
PMP	MW-151	C	2020/09/17	Manganese, dissolved	mg/L	0.00880
PMP	MW-151	C	2020/12/16	Manganese, dissolved	mg/L	<0.0025
PMP	MW-151	C	2021/03/09	Manganese, dissolved	mg/L	<0.0025
PMP	MW-151	C	2021/06/21	Manganese, dissolved	mg/L	<0.0025
PMP	MW-151	C	2021/09/14	Manganese, dissolved	mg/L	0.00810
PMP	MW-151	C	2021/12/14	Manganese, dissolved	mg/L	0.00910
PMP	MW-151	C	2022/03/28	Manganese, dissolved	mg/L	0.00320
PMP	MW-151	C	2022/06/14	Manganese, dissolved	mg/L	0.00470
PMP	MW-151	C	2022/09/29	Manganese, dissolved	mg/L	0.00320
PMP	MW-151	C	2022/12/06	Manganese, dissolved	mg/L	0.00370
PMP	MW-151	C	2023/03/15	Manganese, dissolved	mg/L	0.00350
PMP	MW-151	C	2023/05/18	Manganese, dissolved	mg/L	0.0151
PMP	MW-151	C	2023/08/07	Manganese, dissolved	mg/L	0.0177
PMP	MW-151	C	2023/10/31	Manganese, dissolved	mg/L	0.0133
PMP	MW-151	C	2023/05/18	Phosphate, dissolved	mg/L	<0.005
PMP	MW-151	C	2023/08/07	Phosphate, dissolved	mg/L	<0.005
PMP	MW-151	C	2023/03/15	Potassium, total	mg/L	1.68
PMP	MW-151	C	2023/05/18	Potassium, total	mg/L	5.43
PMP	MW-151	C	2023/08/07	Potassium, total	mg/L	2.37
PMP	MW-151	C	2023/10/31	Potassium, total	mg/L	2.64
PMP	MW-151	C	2023/05/18	Silicon, dissolved	mg/L	5.37
PMP	MW-151	C	2023/08/07	Silicon, dissolved	mg/L	5.38
PMP	MW-151	C	2023/03/15	Sodium, total	mg/L	48.2
PMP	MW-151	C	2023/05/18	Sodium, total	mg/L	56.3
PMP	MW-151	C	2023/08/07	Sodium, total	mg/L	64.6
PMP	MW-151	C	2023/10/31	Sodium, total	mg/L	64.9
PMP	MW-151	C	2013/09/16	Sulfate, total	mg/L	90.0
PMP	MW-151	C	2023/03/15	Sulfate, total	mg/L	81.0
PMP	MW-151	C	2023/05/18	Sulfate, total	mg/L	74.0
PMP	MW-151	C	2023/07/10	Sulfate, total	mg/L	82.0
PMP	MW-151	C	2023/08/07	Sulfate, total	mg/L	93.0
PMP	MW-151	C	2023/10/31	Sulfate, total	mg/L	95.0
PMP	MW-151	C	2013/09/16	Temperature (Celsius)	degrees C	17.3
PMP	MW-151	C	2013/11/20	Temperature (Celsius)	degrees C	14.2
PMP	MW-151	C	2014/02/19	Temperature (Celsius)	degrees C	8.50
PMP	MW-151	C	2014/06/12	Temperature (Celsius)	degrees C	13.8
PMP	MW-151	C	2017/03/16	Temperature (Celsius)	degrees C	10.8
PMP	MW-151	C	2017/06/21	Temperature (Celsius)	degrees C	15.1
PMP	MW-151	C	2017/09/21	Temperature (Celsius)	degrees C	18.1
PMP	MW-151	C	2017/11/28	Temperature (Celsius)	degrees C	16.3
PMP	MW-151	C	2018/03/20	Temperature (Celsius)	degrees C	10.8
PMP	MW-151	C	2018/06/27	Temperature (Celsius)	degrees C	14.6
PMP	MW-151	C	2018/09/26	Temperature (Celsius)	degrees C	18.3
PMP	MW-151	C	2018/12/18	Temperature (Celsius)	degrees C	13.1
PMP	MW-151	C	2019/03/20	Temperature (Celsius)	degrees C	9.30
PMP	MW-151	C	2019/06/25	Temperature (Celsius)	degrees C	14.2
PMP	MW-151	C	2019/09/26	Temperature (Celsius)	degrees C	17.0
PMP	MW-151	C	2019/12/19	Temperature (Celsius)	degrees C	12.8
PMP	MW-151	C	2020/06/23	Temperature (Celsius)	degrees C	14.0
PMP	MW-151	C	2020/09/17	Temperature (Celsius)	degrees C	17.3
PMP	MW-151	C	2020/12/16	Temperature (Celsius)	degrees C	13.1
PMP	MW-151	C	2021/03/09	Temperature (Celsius)	degrees C	10.9

PMP	MW-151	C	2021/06/21	Temperature (Celsius)	degrees C	14.3
PMP	MW-151	C	2021/09/14	Temperature (Celsius)	degrees C	18.7
PMP	MW-151	C	2021/12/14	Temperature (Celsius)	degrees C	15.2
PMP	MW-151	C	2022/03/28	Temperature (Celsius)	degrees C	10.4
PMP	MW-151	C	2022/06/14	Temperature (Celsius)	degrees C	19.9
PMP	MW-151	C	2022/09/29	Temperature (Celsius)	degrees C	16.9
PMP	MW-151	C	2022/12/06	Temperature (Celsius)	degrees C	13.9
PMP	MW-151	C	2023/03/15	Temperature (Celsius)	degrees C	11.6
PMP	MW-151	C	2023/05/18	Temperature (Celsius)	degrees C	12.6
PMP	MW-151	C	2023/07/10	Temperature (Celsius)	degrees C	15.2
PMP	MW-151	C	2023/08/07	Temperature (Celsius)	degrees C	16.3
PMP	MW-151	C	2023/10/31	Temperature (Celsius)	degrees C	16.4
PMP	MW-151	C	2013/09/16	Total Dissolved Solids	mg/L	526
PMP	MW-151	C	2013/11/20	Total Dissolved Solids	mg/L	542
PMP	MW-151	C	2014/02/19	Total Dissolved Solids	mg/L	538
PMP	MW-151	C	2014/06/12	Total Dissolved Solids	mg/L	562
PMP	MW-151	C	2017/03/16	Total Dissolved Solids	mg/L	514
PMP	MW-151	C	2017/06/21	Total Dissolved Solids	mg/L	536
PMP	MW-151	C	2017/09/21	Total Dissolved Solids	mg/L	514
PMP	MW-151	C	2017/11/28	Total Dissolved Solids	mg/L	590
PMP	MW-151	C	2018/03/20	Total Dissolved Solids	mg/L	542
PMP	MW-151	C	2018/06/27	Total Dissolved Solids	mg/L	568
PMP	MW-151	C	2018/09/26	Total Dissolved Solids	mg/L	588
PMP	MW-151	C	2018/12/18	Total Dissolved Solids	mg/L	550
PMP	MW-151	C	2019/03/20	Total Dissolved Solids	mg/L	550
PMP	MW-151	C	2019/06/25	Total Dissolved Solids	mg/L	525
PMP	MW-151	C	2019/09/26	Total Dissolved Solids	mg/L	584
PMP	MW-151	C	2019/12/19	Total Dissolved Solids	mg/L	604
PMP	MW-151	C	2020/03/27	Total Dissolved Solids	mg/L	556
PMP	MW-151	C	2020/06/23	Total Dissolved Solids	mg/L	496
PMP	MW-151	C	2020/09/17	Total Dissolved Solids	mg/L	556
PMP	MW-151	C	2020/12/16	Total Dissolved Solids	mg/L	552
PMP	MW-151	C	2021/03/09	Total Dissolved Solids	mg/L	542
PMP	MW-151	C	2021/06/21	Total Dissolved Solids	mg/L	566
PMP	MW-151	C	2021/09/14	Total Dissolved Solids	mg/L	518
PMP	MW-151	C	2021/12/14	Total Dissolved Solids	mg/L	520
PMP	MW-151	C	2022/03/28	Total Dissolved Solids	mg/L	558
PMP	MW-151	C	2022/06/14	Total Dissolved Solids	mg/L	544
PMP	MW-151	C	2022/09/29	Total Dissolved Solids	mg/L	586
PMP	MW-151	C	2022/12/06	Total Dissolved Solids	mg/L	560
PMP	MW-151	C	2023/03/15	Total Dissolved Solids	mg/L	586
PMP	MW-151	C	2023/05/18	Total Dissolved Solids	mg/L	545
PMP	MW-151	C	2023/07/10	Total Dissolved Solids	mg/L	602
PMP	MW-151	C	2023/08/07	Total Dissolved Solids	mg/L	595
PMP	MW-151	C	2023/10/31	Total Dissolved Solids	mg/L	600
PMP	MW-152	C	2013/09/16	pH (field)	SU	7.0
PMP	MW-152	C	2013/11/20	pH (field)	SU	7.2
PMP	MW-152	C	2014/02/19	pH (field)	SU	6.4
PMP	MW-152	C	2014/06/12	pH (field)	SU	6.5
PMP	MW-152	C	2015/03/25	pH (field)	SU	6.9
PMP	MW-152	C	2015/06/24	pH (field)	SU	6.8
PMP	MW-152	C	2015/09/25	pH (field)	SU	6.8
PMP	MW-152	C	2015/11/10	pH (field)	SU	6.7
PMP	MW-152	C	2016/03/22	pH (field)	SU	6.9
PMP	MW-152	C	2016/06/23	pH (field)	SU	7.5
PMP	MW-152	C	2016/09/29	pH (field)	SU	6.7
PMP	MW-152	C	2016/12/21	pH (field)	SU	6.8

PMP	MW-152	C	2017/03/16	pH (field)	SU	7.0
PMP	MW-152	C	2017/06/21	pH (field)	SU	6.6
PMP	MW-152	C	2017/09/21	pH (field)	SU	6.7
PMP	MW-152	C	2017/11/28	pH (field)	SU	7.2
PMP	MW-152	C	2018/03/20	pH (field)	SU	6.9
PMP	MW-152	C	2018/06/27	pH (field)	SU	6.8
PMP	MW-152	C	2018/09/26	pH (field)	SU	6.7
PMP	MW-152	C	2018/12/18	pH (field)	SU	6.9
PMP	MW-152	C	2019/03/20	pH (field)	SU	7.0
PMP	MW-152	C	2019/06/25	pH (field)	SU	7.0
PMP	MW-152	C	2019/09/26	pH (field)	SU	6.7
PMP	MW-152	C	2019/12/19	pH (field)	SU	6.9
PMP	MW-152	C	2020/03/27	pH (field)	SU	6.9
PMP	MW-152	C	2020/06/23	pH (field)	SU	7.2
PMP	MW-152	C	2020/09/17	pH (field)	SU	6.8
PMP	MW-152	C	2020/12/16	pH (field)	SU	6.9
PMP	MW-152	C	2021/03/09	pH (field)	SU	6.9
PMP	MW-152	C	2021/07/19	pH (field)	SU	6.6
PMP	MW-152	C	2021/09/14	pH (field)	SU	6.7
PMP	MW-152	C	2021/12/14	pH (field)	SU	6.8
PMP	MW-152	C	2022/03/28	pH (field)	SU	6.9
PMP	MW-152	C	2022/06/14	pH (field)	SU	6.9
PMP	MW-152	C	2022/09/29	pH (field)	SU	6.7
PMP	MW-152	C	2022/12/06	pH (field)	SU	6.7
PMP	MW-152	C	2023/03/15	pH (field)	SU	6.9
PMP	MW-152	C	2023/05/18	pH (field)	SU	6.9
PMP	MW-152	C	2023/08/04	pH (field)	SU	6.9
PMP	MW-152	C	2023/10/31	pH (field)	SU	6.8
PMP	MW-152	C	2021/03/09	Oxidation Reduction Potential	mV	53.0
PMP	MW-152	C	2021/07/19	Oxidation Reduction Potential	mV	141
PMP	MW-152	C	2021/09/14	Oxidation Reduction Potential	mV	19.0
PMP	MW-152	C	2021/12/14	Oxidation Reduction Potential	mV	75.0
PMP	MW-152	C	2022/03/28	Oxidation Reduction Potential	mV	58.0
PMP	MW-152	C	2022/06/14	Oxidation Reduction Potential	mV	116
PMP	MW-152	C	2022/09/29	Oxidation Reduction Potential	mV	155
PMP	MW-152	C	2022/12/06	Oxidation Reduction Potential	mV	76.0
PMP	MW-152	C	2023/03/15	Oxidation Reduction Potential	mV	118
PMP	MW-152	C	2023/05/18	Oxidation Reduction Potential	mV	126
PMP	MW-152	C	2023/08/04	Oxidation Reduction Potential	mV	108
PMP	MW-152	C	2023/10/31	Oxidation Reduction Potential	mV	60.0
PMP	MW-152	C	2021/03/09	Eh	V	0.25
PMP	MW-152	C	2021/07/19	Eh	V	0.34
PMP	MW-152	C	2021/09/14	Eh	V	0.21
PMP	MW-152	C	2021/12/14	Eh	V	0.27
PMP	MW-152	C	2022/03/28	Eh	V	0.26
PMP	MW-152	C	2022/06/14	Eh	V	0.31
PMP	MW-152	C	2022/09/29	Eh	V	0.35
PMP	MW-152	C	2022/12/06	Eh	V	0.27
PMP	MW-152	C	2023/03/15	Eh	V	0.32
PMP	MW-152	C	2023/05/18	Eh	V	0.32
PMP	MW-152	C	2023/08/04	Eh	V	0.30
PMP	MW-152	C	2023/10/31	Eh	V	0.26
PMP	MW-152	C	2023/03/15	Alkalinity, bicarbonate	mg/L CaCO3	408
PMP	MW-152	C	2023/05/18	Alkalinity, bicarbonate	mg/L CaCO3	375
PMP	MW-152	C	2023/08/04	Alkalinity, bicarbonate	mg/L CaCO3	414
PMP	MW-152	C	2023/10/31	Alkalinity, bicarbonate	mg/L CaCO3	417
PMP	MW-152	C	2023/03/15	Barium, total	mg/L	0.0112

PMP	MW-152	C	2023/05/18	Barium, total	mg/L	0.0167
PMP	MW-152	C	2023/08/04	Barium, total	mg/L	0.0330
PMP	MW-152	C	2023/10/31	Barium, total	mg/L	0.0454
PMP	MW-152	C	2013/09/16	Boron, total	mg/L	9.09
PMP	MW-152	C	2023/03/15	Boron, total	mg/L	0.477
PMP	MW-152	C	2023/05/18	Boron, total	mg/L	0.515
PMP	MW-152	C	2023/08/04	Boron, total	mg/L	9.09
PMP	MW-152	C	2023/10/31	Boron, total	mg/L	19.8
PMP	MW-152	C	2023/03/15	Calcium, total	mg/L	125
PMP	MW-152	C	2023/05/18	Calcium, total	mg/L	116
PMP	MW-152	C	2023/08/04	Calcium, total	mg/L	209
PMP	MW-152	C	2023/10/31	Calcium, total	mg/L	268
PMP	MW-152	C	2013/09/16	Chloride, total	mg/L	49.0
PMP	MW-152	C	2023/03/15	Chloride, total	mg/L	10.0
PMP	MW-152	C	2023/05/18	Chloride, total	mg/L	8.00
PMP	MW-152	C	2023/08/04	Chloride, total	mg/L	37.0
PMP	MW-152	C	2023/10/31	Chloride, total	mg/L	54.0
PMP	MW-152	C	2013/11/20	Iron, dissolved	mg/L	0.0700
PMP	MW-152	C	2014/02/19	Iron, dissolved	mg/L	0.0500
PMP	MW-152	C	2014/06/12	Iron, dissolved	mg/L	0.456
PMP	MW-152	C	2015/03/25	Iron, dissolved	mg/L	0.0440
PMP	MW-152	C	2015/06/24	Iron, dissolved	mg/L	0.118
PMP	MW-152	C	2015/09/25	Iron, dissolved	mg/L	0.0333
PMP	MW-152	C	2015/11/10	Iron, dissolved	mg/L	0.0759
PMP	MW-152	C	2016/03/22	Iron, dissolved	mg/L	<0.007
PMP	MW-152	C	2016/06/23	Iron, dissolved	mg/L	0.0346
PMP	MW-152	C	2016/09/29	Iron, dissolved	mg/L	<0.007
PMP	MW-152	C	2016/12/21	Iron, dissolved	mg/L	<0.007
PMP	MW-152	C	2017/03/16	Iron, dissolved	mg/L	<0.007
PMP	MW-152	C	2017/06/21	Iron, dissolved	mg/L	<0.007
PMP	MW-152	C	2017/09/21	Iron, dissolved	mg/L	0.190
PMP	MW-152	C	2017/11/28	Iron, dissolved	mg/L	0.280
PMP	MW-152	C	2018/03/20	Iron, dissolved	mg/L	<0.007
PMP	MW-152	C	2018/06/27	Iron, dissolved	mg/L	<0.02
PMP	MW-152	C	2018/09/26	Iron, dissolved	mg/L	<0.02
PMP	MW-152	C	2018/12/18	Iron, dissolved	mg/L	<0.02
PMP	MW-152	C	2019/03/20	Iron, dissolved	mg/L	<0.02
PMP	MW-152	C	2019/06/25	Iron, dissolved	mg/L	<0.02
PMP	MW-152	C	2019/09/26	Iron, dissolved	mg/L	0.0456
PMP	MW-152	C	2019/12/19	Iron, dissolved	mg/L	<0.02
PMP	MW-152	C	2020/03/27	Iron, dissolved	mg/L	<0.02
PMP	MW-152	C	2020/06/23	Iron, dissolved	mg/L	<0.02
PMP	MW-152	C	2020/09/17	Iron, dissolved	mg/L	<0.02
PMP	MW-152	C	2020/12/16	Iron, dissolved	mg/L	<0.02
PMP	MW-152	C	2021/03/09	Iron, dissolved	mg/L	<0.02
PMP	MW-152	C	2021/07/19	Iron, dissolved	mg/L	<0.02
PMP	MW-152	C	2021/09/14	Iron, dissolved	mg/L	<0.02
PMP	MW-152	C	2021/12/14	Iron, dissolved	mg/L	<0.02
PMP	MW-152	C	2022/03/28	Iron, dissolved	mg/L	<0.015
PMP	MW-152	C	2022/06/14	Iron, dissolved	mg/L	<0.02
PMP	MW-152	C	2022/09/29	Iron, dissolved	mg/L	<0.0115
PMP	MW-152	C	2022/12/06	Iron, dissolved	mg/L	0.253
PMP	MW-152	C	2023/03/15	Iron, dissolved	mg/L	<0.0115
PMP	MW-152	C	2023/05/18	Iron, dissolved	mg/L	<0.02
PMP	MW-152	C	2023/08/04	Iron, dissolved	mg/L	<0.012
PMP	MW-152	C	2023/10/31	Iron, dissolved	mg/L	<0.0115
PMP	MW-152	C	2023/03/15	Magnesium, total	mg/L	59.2

PMP	MW-152	C	2023/05/18	Magnesium, total	mg/L	53.5
PMP	MW-152	C	2023/08/04	Magnesium, total	mg/L	100
PMP	MW-152	C	2023/10/31	Magnesium, total	mg/L	122
PMP	MW-152	C	2013/11/20	Manganese, dissolved	mg/L	0.00500
PMP	MW-152	C	2014/02/19	Manganese, dissolved	mg/L	<0.0016
PMP	MW-152	C	2014/06/12	Manganese, dissolved	mg/L	0.102
PMP	MW-152	C	2015/03/25	Manganese, dissolved	mg/L	0.0100
PMP	MW-152	C	2015/06/24	Manganese, dissolved	mg/L	0.0910
PMP	MW-152	C	2015/09/25	Manganese, dissolved	mg/L	0.0192
PMP	MW-152	C	2015/11/10	Manganese, dissolved	mg/L	0.0398
PMP	MW-152	C	2016/03/22	Manganese, dissolved	mg/L	0.0180
PMP	MW-152	C	2016/06/23	Manganese, dissolved	mg/L	0.134
PMP	MW-152	C	2016/09/29	Manganese, dissolved	mg/L	0.0311
PMP	MW-152	C	2016/12/21	Manganese, dissolved	mg/L	0.0199
PMP	MW-152	C	2017/03/16	Manganese, dissolved	mg/L	0.00810
PMP	MW-152	C	2017/06/21	Manganese, dissolved	mg/L	0.0100
PMP	MW-152	C	2017/09/21	Manganese, dissolved	mg/L	0.0100
PMP	MW-152	C	2017/11/28	Manganese, dissolved	mg/L	0.0200
PMP	MW-152	C	2018/03/20	Manganese, dissolved	mg/L	0.00670
PMP	MW-152	C	2018/06/27	Manganese, dissolved	mg/L	<0.0025
PMP	MW-152	C	2018/09/26	Manganese, dissolved	mg/L	0.0173
PMP	MW-152	C	2018/12/18	Manganese, dissolved	mg/L	0.0105
PMP	MW-152	C	2019/03/20	Manganese, dissolved	mg/L	<0.0025
PMP	MW-152	C	2019/06/25	Manganese, dissolved	mg/L	<0.0025
PMP	MW-152	C	2019/09/26	Manganese, dissolved	mg/L	0.0374
PMP	MW-152	C	2019/12/19	Manganese, dissolved	mg/L	<0.005
PMP	MW-152	C	2020/03/27	Manganese, dissolved	mg/L	0.00730
PMP	MW-152	C	2020/06/23	Manganese, dissolved	mg/L	<0.0025
PMP	MW-152	C	2020/09/17	Manganese, dissolved	mg/L	0.0163
PMP	MW-152	C	2020/12/16	Manganese, dissolved	mg/L	0.0123
PMP	MW-152	C	2021/03/09	Manganese, dissolved	mg/L	<0.0025
PMP	MW-152	C	2021/07/19	Manganese, dissolved	mg/L	<0.0025
PMP	MW-152	C	2021/09/14	Manganese, dissolved	mg/L	0.0183
PMP	MW-152	C	2021/12/14	Manganese, dissolved	mg/L	0.00850
PMP	MW-152	C	2022/03/28	Manganese, dissolved	mg/L	0.00620
PMP	MW-152	C	2022/06/14	Manganese, dissolved	mg/L	0.00610
PMP	MW-152	C	2022/09/29	Manganese, dissolved	mg/L	0.0153
PMP	MW-152	C	2022/12/06	Manganese, dissolved	mg/L	0.0209
PMP	MW-152	C	2023/03/15	Manganese, dissolved	mg/L	0.00310
PMP	MW-152	C	2023/05/18	Manganese, dissolved	mg/L	0.00730
PMP	MW-152	C	2023/08/04	Manganese, dissolved	mg/L	0.0176
PMP	MW-152	C	2023/10/31	Manganese, dissolved	mg/L	0.0244
PMP	MW-152	C	2023/05/18	Phosphate, dissolved	mg/L	0.0150
PMP	MW-152	C	2023/08/04	Phosphate, dissolved	mg/L	0.0400
PMP	MW-152	C	2023/03/15	Potassium, total	mg/L	0.515
PMP	MW-152	C	2023/05/18	Potassium, total	mg/L	0.717
PMP	MW-152	C	2023/08/04	Potassium, total	mg/L	1.34
PMP	MW-152	C	2023/10/31	Potassium, total	mg/L	1.86
PMP	MW-152	C	2023/05/18	Silicon, dissolved	mg/L	8.72
PMP	MW-152	C	2023/08/04	Silicon, dissolved	mg/L	9.62
PMP	MW-152	C	2023/03/15	Sodium, total	mg/L	107
PMP	MW-152	C	2023/05/18	Sodium, total	mg/L	86.9
PMP	MW-152	C	2023/08/04	Sodium, total	mg/L	149
PMP	MW-152	C	2023/10/31	Sodium, total	mg/L	134
PMP	MW-152	C	2013/09/16	Sulfate, total	mg/L	873
PMP	MW-152	C	2023/03/15	Sulfate, total	mg/L	369
PMP	MW-152	C	2023/05/18	Sulfate, total	mg/L	242

PMP	MW-152	C	2023/08/04	Sulfate, total	mg/L	732
PMP	MW-152	C	2023/10/31	Sulfate, total	mg/L	988
PMP	MW-152	C	2013/09/16	Temperature (Celsius)	degrees C	16.2
PMP	MW-152	C	2013/11/20	Temperature (Celsius)	degrees C	13.7
PMP	MW-152	C	2014/02/19	Temperature (Celsius)	degrees C	9.50
PMP	MW-152	C	2014/06/12	Temperature (Celsius)	degrees C	12.9
PMP	MW-152	C	2015/03/25	Temperature (Celsius)	degrees C	10.0
PMP	MW-152	C	2015/06/24	Temperature (Celsius)	degrees C	14.0
PMP	MW-152	C	2015/09/25	Temperature (Celsius)	degrees C	16.3
PMP	MW-152	C	2015/11/10	Temperature (Celsius)	degrees C	15.2
PMP	MW-152	C	2016/03/22	Temperature (Celsius)	degrees C	12.2
PMP	MW-152	C	2016/06/23	Temperature (Celsius)	degrees C	15.1
PMP	MW-152	C	2016/09/29	Temperature (Celsius)	degrees C	16.4
PMP	MW-152	C	2016/12/21	Temperature (Celsius)	degrees C	13.9
PMP	MW-152	C	2017/03/16	Temperature (Celsius)	degrees C	11.5
PMP	MW-152	C	2017/06/21	Temperature (Celsius)	degrees C	14.3
PMP	MW-152	C	2017/09/21	Temperature (Celsius)	degrees C	16.8
PMP	MW-152	C	2017/11/28	Temperature (Celsius)	degrees C	16
PMP	MW-152	C	2018/03/20	Temperature (Celsius)	degrees C	12.1
PMP	MW-152	C	2018/06/27	Temperature (Celsius)	degrees C	14.6
PMP	MW-152	C	2018/09/26	Temperature (Celsius)	degrees C	16.4
PMP	MW-152	C	2018/12/18	Temperature (Celsius)	degrees C	13.7
PMP	MW-152	C	2019/03/20	Temperature (Celsius)	degrees C	10.7
PMP	MW-152	C	2019/06/25	Temperature (Celsius)	degrees C	13.7
PMP	MW-152	C	2019/09/26	Temperature (Celsius)	degrees C	15.7
PMP	MW-152	C	2019/12/19	Temperature (Celsius)	degrees C	13.6
PMP	MW-152	C	2020/03/27	Temperature (Celsius)	degrees C	12.0
PMP	MW-152	C	2020/06/23	Temperature (Celsius)	degrees C	13.3
PMP	MW-152	C	2020/09/17	Temperature (Celsius)	degrees C	15.6
PMP	MW-152	C	2020/12/16	Temperature (Celsius)	degrees C	13.6
PMP	MW-152	C	2021/03/09	Temperature (Celsius)	degrees C	11.5
PMP	MW-152	C	2021/07/19	Temperature (Celsius)	degrees C	13.8
PMP	MW-152	C	2021/09/14	Temperature (Celsius)	degrees C	15.8
PMP	MW-152	C	2021/12/14	Temperature (Celsius)	degrees C	14.6
PMP	MW-152	C	2022/03/28	Temperature (Celsius)	degrees C	11.4
PMP	MW-152	C	2022/06/14	Temperature (Celsius)	degrees C	14.2
PMP	MW-152	C	2022/09/29	Temperature (Celsius)	degrees C	16.9
PMP	MW-152	C	2022/12/06	Temperature (Celsius)	degrees C	14.1
PMP	MW-152	C	2023/03/15	Temperature (Celsius)	degrees C	11.8
PMP	MW-152	C	2023/05/18	Temperature (Celsius)	degrees C	12.7
PMP	MW-152	C	2023/08/04	Temperature (Celsius)	degrees C	15.1
PMP	MW-152	C	2023/10/31	Temperature (Celsius)	degrees C	14.3
PMP	MW-152	C	2013/09/16	Total Dissolved Solids	mg/L	1,620
PMP	MW-152	C	2013/11/20	Total Dissolved Solids	mg/L	1,720
PMP	MW-152	C	2014/02/19	Total Dissolved Solids	mg/L	1,770
PMP	MW-152	C	2014/06/12	Total Dissolved Solids	mg/L	1,530
PMP	MW-152	C	2015/03/25	Total Dissolved Solids	mg/L	2,150
PMP	MW-152	C	2015/06/24	Total Dissolved Solids	mg/L	2,150
PMP	MW-152	C	2015/09/25	Total Dissolved Solids	mg/L	1,920
PMP	MW-152	C	2015/11/10	Total Dissolved Solids	mg/L	1,920
PMP	MW-152	C	2016/03/22	Total Dissolved Solids	mg/L	2,150
PMP	MW-152	C	2016/06/23	Total Dissolved Solids	mg/L	2,260
PMP	MW-152	C	2016/09/29	Total Dissolved Solids	mg/L	2,240
PMP	MW-152	C	2016/12/21	Total Dissolved Solids	mg/L	1,870
PMP	MW-152	C	2017/03/16	Total Dissolved Solids	mg/L	1,480
PMP	MW-152	C	2017/06/21	Total Dissolved Solids	mg/L	1,610
PMP	MW-152	C	2017/09/21	Total Dissolved Solids	mg/L	1,940

PMP	MW-152	C	2017/11/28	Total Dissolved Solids	mg/L	2,010
PMP	MW-152	C	2018/03/20	Total Dissolved Solids	mg/L	1,770
PMP	MW-152	C	2018/06/27	Total Dissolved Solids	mg/L	1,760
PMP	MW-152	C	2018/09/26	Total Dissolved Solids	mg/L	2,170
PMP	MW-152	C	2018/12/18	Total Dissolved Solids	mg/L	1,550
PMP	MW-152	C	2019/03/20	Total Dissolved Solids	mg/L	1,340
PMP	MW-152	C	2019/06/25	Total Dissolved Solids	mg/L	894
PMP	MW-152	C	2019/09/26	Total Dissolved Solids	mg/L	1,790
PMP	MW-152	C	2019/12/19	Total Dissolved Solids	mg/L	1,880
PMP	MW-152	C	2020/03/27	Total Dissolved Solids	mg/L	1,250
PMP	MW-152	C	2020/06/23	Total Dissolved Solids	mg/L	900
PMP	MW-152	C	2020/09/17	Total Dissolved Solids	mg/L	1,850
PMP	MW-152	C	2020/12/16	Total Dissolved Solids	mg/L	1,340
PMP	MW-152	C	2021/03/09	Total Dissolved Solids	mg/L	948
PMP	MW-152	C	2021/07/19	Total Dissolved Solids	mg/L	868
PMP	MW-152	C	2021/09/14	Total Dissolved Solids	mg/L	1,300
PMP	MW-152	C	2021/12/14	Total Dissolved Solids	mg/L	1,100
PMP	MW-152	C	2022/03/28	Total Dissolved Solids	mg/L	786
PMP	MW-152	C	2022/06/14	Total Dissolved Solids	mg/L	880
PMP	MW-152	C	2022/09/29	Total Dissolved Solids	mg/L	1,780
PMP	MW-152	C	2022/12/06	Total Dissolved Solids	mg/L	368
PMP	MW-152	C	2023/03/15	Total Dissolved Solids	mg/L	904
PMP	MW-152	C	2023/05/18	Total Dissolved Solids	mg/L	706
PMP	MW-152	C	2023/08/04	Total Dissolved Solids	mg/L	1,510
PMP	MW-152	C	2023/10/31	Total Dissolved Solids	mg/L	1,790
PMP	MW-153	C	2013/09/17	pH (field)	SU	7.3
PMP	MW-153	C	2013/11/21	pH (field)	SU	6.6
PMP	MW-153	C	2014/02/19	pH (field)	SU	7.2
PMP	MW-153	C	2014/06/11	pH (field)	SU	7.1
PMP	MW-153	C	2015/03/25	pH (field)	SU	7.3
PMP	MW-153	C	2015/06/24	pH (field)	SU	7.2
PMP	MW-153	C	2015/09/25	pH (field)	SU	6.8
PMP	MW-153	C	2015/11/10	pH (field)	SU	7.1
PMP	MW-153	C	2016/03/22	pH (field)	SU	7.0
PMP	MW-153	C	2016/06/21	pH (field)	SU	7.4
PMP	MW-153	C	2016/09/29	pH (field)	SU	7.3
PMP	MW-153	C	2016/12/21	pH (field)	SU	7.2
PMP	MW-153	C	2017/03/17	pH (field)	SU	7.3
PMP	MW-153	C	2017/06/22	pH (field)	SU	7.0
PMP	MW-153	C	2017/09/21	pH (field)	SU	7.1
PMP	MW-153	C	2017/11/28	pH (field)	SU	7.3
PMP	MW-153	C	2018/03/20	pH (field)	SU	7.2
PMP	MW-153	C	2018/06/28	pH (field)	SU	7.1
PMP	MW-153	C	2018/09/26	pH (field)	SU	7.0
PMP	MW-153	C	2018/12/19	pH (field)	SU	7.2
PMP	MW-153	C	2019/03/21	pH (field)	SU	6.1
PMP	MW-153	C	2019/06/26	pH (field)	SU	6.9
PMP	MW-153	C	2019/09/26	pH (field)	SU	7.1
PMP	MW-153	C	2019/12/19	pH (field)	SU	7.1
PMP	MW-153	C	2020/03/27	pH (field)	SU	7.1
PMP	MW-153	C	2020/06/23	pH (field)	SU	7.3
PMP	MW-153	C	2020/09/17	pH (field)	SU	7.2
PMP	MW-153	C	2020/12/17	pH (field)	SU	7.1
PMP	MW-153	C	2021/03/10	pH (field)	SU	7.1
PMP	MW-153	C	2021/06/22	pH (field)	SU	6.6
PMP	MW-153	C	2021/09/16	pH (field)	SU	7.0
PMP	MW-153	C	2021/12/15	pH (field)	SU	7.0

PMP	MW-153	C	2022/03/29	pH (field)	SU	6.9
PMP	MW-153	C	2022/06/15	pH (field)	SU	7.1
PMP	MW-153	C	2022/09/29	pH (field)	SU	7.3
PMP	MW-153	C	2022/12/06	pH (field)	SU	7.2
PMP	MW-153	C	2023/03/15	pH (field)	SU	7.2
PMP	MW-153	C	2023/05/22	pH (field)	SU	7.2
PMP	MW-153	C	2023/07/10	pH (field)	SU	6.8
PMP	MW-153	C	2023/08/04	pH (field)	SU	7.2
PMP	MW-153	C	2023/11/03	pH (field)	SU	6.8
PMP	MW-153	C	2021/03/10	Oxidation Reduction Potential	mV	38.0
PMP	MW-153	C	2021/06/22	Oxidation Reduction Potential	mV	4.00
PMP	MW-153	C	2021/09/16	Oxidation Reduction Potential	mV	56.0
PMP	MW-153	C	2021/12/15	Oxidation Reduction Potential	mV	98.0
PMP	MW-153	C	2022/03/29	Oxidation Reduction Potential	mV	55.0
PMP	MW-153	C	2022/06/15	Oxidation Reduction Potential	mV	119
PMP	MW-153	C	2022/09/29	Oxidation Reduction Potential	mV	120
PMP	MW-153	C	2022/12/06	Oxidation Reduction Potential	mV	39.0
PMP	MW-153	C	2023/03/15	Oxidation Reduction Potential	mV	59.5
PMP	MW-153	C	2023/05/22	Oxidation Reduction Potential	mV	117
PMP	MW-153	C	2023/07/10	Oxidation Reduction Potential	mV	150
PMP	MW-153	C	2023/08/04	Oxidation Reduction Potential	mV	89.0
PMP	MW-153	C	2023/11/03	Oxidation Reduction Potential	mV	77.0
PMP	MW-153	C	2021/03/10	Eh	V	0.23
PMP	MW-153	C	2021/06/22	Eh	V	0.20
PMP	MW-153	C	2021/09/16	Eh	V	0.25
PMP	MW-153	C	2021/12/15	Eh	V	0.29
PMP	MW-153	C	2022/03/29	Eh	V	0.25
PMP	MW-153	C	2022/06/15	Eh	V	0.31
PMP	MW-153	C	2022/09/29	Eh	V	0.32
PMP	MW-153	C	2022/12/06	Eh	V	0.23
PMP	MW-153	C	2023/03/15	Eh	V	0.26
PMP	MW-153	C	2023/05/22	Eh	V	0.31
PMP	MW-153	C	2023/07/10	Eh	V	0.35
PMP	MW-153	C	2023/08/04	Eh	V	0.28
PMP	MW-153	C	2023/11/03	Eh	V	0.27
PMP	MW-153	C	2023/03/15	Alkalinity, bicarbonate	mg/L CaCO3	197
PMP	MW-153	C	2023/05/22	Alkalinity, bicarbonate	mg/L CaCO3	195
PMP	MW-153	C	2023/08/04	Alkalinity, bicarbonate	mg/L CaCO3	198
PMP	MW-153	C	2023/11/03	Alkalinity, bicarbonate	mg/L CaCO3	196
PMP	MW-153	C	2023/03/15	Barium, total	mg/L	0.0366
PMP	MW-153	C	2023/05/22	Barium, total	mg/L	0.0867
PMP	MW-153	C	2023/07/10	Barium, total	mg/L	0.0365
PMP	MW-153	C	2023/08/04	Barium, total	mg/L	0.0357
PMP	MW-153	C	2023/11/03	Barium, total	mg/L	0.0335
PMP	MW-153	C	2013/09/17	Boron, total	mg/L	0.0200
PMP	MW-153	C	2023/03/15	Boron, total	mg/L	<0.02
PMP	MW-153	C	2023/05/22	Boron, total	mg/L	<0.013
PMP	MW-153	C	2023/07/10	Boron, total	mg/L	<0.009
PMP	MW-153	C	2023/08/04	Boron, total	mg/L	0.0357
PMP	MW-153	C	2023/11/03	Boron, total	mg/L	<0.0092
PMP	MW-153	C	2023/03/15	Calcium, total	mg/L	50.9
PMP	MW-153	C	2023/05/22	Calcium, total	mg/L	50.6
PMP	MW-153	C	2023/07/10	Calcium, total	mg/L	48.8
PMP	MW-153	C	2023/08/04	Calcium, total	mg/L	52.8
PMP	MW-153	C	2023/11/03	Calcium, total	mg/L	52.3
PMP	MW-153	C	2013/09/17	Chloride, total	mg/L	23.0
PMP	MW-153	C	2023/03/15	Chloride, total	mg/L	17.0

PMP	MW-153	C	2023/05/22	Chloride, total	mg/L	16.0
PMP	MW-153	C	2023/07/10	Chloride, total	mg/L	15.0
PMP	MW-153	C	2023/08/04	Chloride, total	mg/L	16.0
PMP	MW-153	C	2023/11/03	Chloride, total	mg/L	17.0
PMP	MW-153	C	2013/11/21	Iron, dissolved	mg/L	<0.007
PMP	MW-153	C	2014/02/19	Iron, dissolved	mg/L	<0.007
PMP	MW-153	C	2014/06/11	Iron, dissolved	mg/L	<0.007
PMP	MW-153	C	2015/03/25	Iron, dissolved	mg/L	<0.007
PMP	MW-153	C	2015/06/24	Iron, dissolved	mg/L	<0.007
PMP	MW-153	C	2015/09/25	Iron, dissolved	mg/L	<0.007
PMP	MW-153	C	2015/11/10	Iron, dissolved	mg/L	<0.007
PMP	MW-153	C	2016/03/22	Iron, dissolved	mg/L	<0.007
PMP	MW-153	C	2016/06/21	Iron, dissolved	mg/L	<0.007
PMP	MW-153	C	2016/09/29	Iron, dissolved	mg/L	<0.007
PMP	MW-153	C	2016/12/21	Iron, dissolved	mg/L	<0.007
PMP	MW-153	C	2017/03/17	Iron, dissolved	mg/L	0.0200
PMP	MW-153	C	2017/06/22	Iron, dissolved	mg/L	<0.007
PMP	MW-153	C	2017/09/21	Iron, dissolved	mg/L	<0.007
PMP	MW-153	C	2017/11/28	Iron, dissolved	mg/L	<0.007
PMP	MW-153	C	2018/03/20	Iron, dissolved	mg/L	<0.007
PMP	MW-153	C	2018/06/28	Iron, dissolved	mg/L	<0.02
PMP	MW-153	C	2018/09/26	Iron, dissolved	mg/L	<0.02
PMP	MW-153	C	2018/12/19	Iron, dissolved	mg/L	<0.02
PMP	MW-153	C	2019/03/21	Iron, dissolved	mg/L	<0.02
PMP	MW-153	C	2019/06/26	Iron, dissolved	mg/L	<0.02
PMP	MW-153	C	2019/09/26	Iron, dissolved	mg/L	<0.02
PMP	MW-153	C	2019/12/19	Iron, dissolved	mg/L	<0.02
PMP	MW-153	C	2020/03/27	Iron, dissolved	mg/L	<0.02
PMP	MW-153	C	2020/06/23	Iron, dissolved	mg/L	<0.02
PMP	MW-153	C	2020/09/17	Iron, dissolved	mg/L	<0.02
PMP	MW-153	C	2020/12/17	Iron, dissolved	mg/L	<0.02
PMP	MW-153	C	2021/03/10	Iron, dissolved	mg/L	<0.02
PMP	MW-153	C	2021/06/22	Iron, dissolved	mg/L	<0.02
PMP	MW-153	C	2021/09/16	Iron, dissolved	mg/L	<0.02
PMP	MW-153	C	2021/12/15	Iron, dissolved	mg/L	0.0739
PMP	MW-153	C	2022/03/29	Iron, dissolved	mg/L	0.0489
PMP	MW-153	C	2022/06/15	Iron, dissolved	mg/L	<0.02
PMP	MW-153	C	2022/09/29	Iron, dissolved	mg/L	0.0274
PMP	MW-153	C	2022/12/06	Iron, dissolved	mg/L	<0.0115
PMP	MW-153	C	2023/03/15	Iron, dissolved	mg/L	<0.0115
PMP	MW-153	C	2023/05/22	Iron, dissolved	mg/L	<0.02
PMP	MW-153	C	2023/08/04	Iron, dissolved	mg/L	<0.0115
PMP	MW-153	C	2023/11/03	Iron, dissolved	mg/L	<0.0115
PMP	MW-153	C	2023/03/15	Magnesium, total	mg/L	21.4
PMP	MW-153	C	2023/05/22	Magnesium, total	mg/L	22.4
PMP	MW-153	C	2023/08/04	Magnesium, total	mg/L	22.3
PMP	MW-153	C	2023/11/03	Magnesium, total	mg/L	20.8
PMP	MW-153	C	2013/11/21	Manganese, dissolved	mg/L	0.0300
PMP	MW-153	C	2014/02/19	Manganese, dissolved	mg/L	<0.0016
PMP	MW-153	C	2014/06/11	Manganese, dissolved	mg/L	0.00900
PMP	MW-153	C	2015/03/25	Manganese, dissolved	mg/L	0.0160
PMP	MW-153	C	2015/06/24	Manganese, dissolved	mg/L	0.00900
PMP	MW-153	C	2015/09/25	Manganese, dissolved	mg/L	0.00840
PMP	MW-153	C	2015/11/10	Manganese, dissolved	mg/L	0.00870
PMP	MW-153	C	2016/03/22	Manganese, dissolved	mg/L	0.00690
PMP	MW-153	C	2016/06/21	Manganese, dissolved	mg/L	0.00800
PMP	MW-153	C	2016/09/29	Manganese, dissolved	mg/L	0.0193

PMP	MW-153	C	2016/12/21	Manganese, dissolved	mg/L	0.0257
PMP	MW-153	C	2017/03/17	Manganese, dissolved	mg/L	0.0100
PMP	MW-153	C	2017/06/22	Manganese, dissolved	mg/L	0.0100
PMP	MW-153	C	2017/09/21	Manganese, dissolved	mg/L	0.00730
PMP	MW-153	C	2017/11/28	Manganese, dissolved	mg/L	0.00890
PMP	MW-153	C	2018/03/20	Manganese, dissolved	mg/L	0.0147
PMP	MW-153	C	2018/06/28	Manganese, dissolved	mg/L	0.0116
PMP	MW-153	C	2018/09/26	Manganese, dissolved	mg/L	0.0114
PMP	MW-153	C	2018/12/19	Manganese, dissolved	mg/L	0.0120
PMP	MW-153	C	2019/03/21	Manganese, dissolved	mg/L	0.00890
PMP	MW-153	C	2019/06/26	Manganese, dissolved	mg/L	0.00830
PMP	MW-153	C	2019/09/26	Manganese, dissolved	mg/L	0.00800
PMP	MW-153	C	2019/12/19	Manganese, dissolved	mg/L	<0.0025
PMP	MW-153	C	2020/03/27	Manganese, dissolved	mg/L	0.00820
PMP	MW-153	C	2020/06/23	Manganese, dissolved	mg/L	<0.0025
PMP	MW-153	C	2020/09/17	Manganese, dissolved	mg/L	<0.0025
PMP	MW-153	C	2020/12/17	Manganese, dissolved	mg/L	0.00920
PMP	MW-153	C	2021/03/10	Manganese, dissolved	mg/L	<0.0025
PMP	MW-153	C	2021/06/22	Manganese, dissolved	mg/L	<0.0025
PMP	MW-153	C	2021/09/16	Manganese, dissolved	mg/L	0.00700
PMP	MW-153	C	2021/12/15	Manganese, dissolved	mg/L	0.0193
PMP	MW-153	C	2022/03/29	Manganese, dissolved	mg/L	0.0106
PMP	MW-153	C	2022/06/15	Manganese, dissolved	mg/L	0.00500
PMP	MW-153	C	2022/09/29	Manganese, dissolved	mg/L	0.00550
PMP	MW-153	C	2022/12/06	Manganese, dissolved	mg/L	0.00620
PMP	MW-153	C	2023/03/15	Manganese, dissolved	mg/L	0.00400
PMP	MW-153	C	2023/05/22	Manganese, dissolved	mg/L	<0.0025
PMP	MW-153	C	2023/08/04	Manganese, dissolved	mg/L	0.00410
PMP	MW-153	C	2023/11/03	Manganese, dissolved	mg/L	0.00320
PMP	MW-153	C	2023/05/22	Phosphate, dissolved	mg/L	<0.005
PMP	MW-153	C	2023/08/04	Phosphate, dissolved	mg/L	0.0370
PMP	MW-153	C	2023/03/15	Potassium, total	mg/L	0.200
PMP	MW-153	C	2023/05/22	Potassium, total	mg/L	1.11
PMP	MW-153	C	2023/08/04	Potassium, total	mg/L	0.230
PMP	MW-153	C	2023/11/03	Potassium, total	mg/L	0.0990
PMP	MW-153	C	2023/05/22	Silicon, dissolved	mg/L	10.2
PMP	MW-153	C	2023/08/04	Silicon, dissolved	mg/L	9.47
PMP	MW-153	C	2023/03/15	Sodium, total	mg/L	48.4
PMP	MW-153	C	2023/05/22	Sodium, total	mg/L	55.4
PMP	MW-153	C	2023/08/04	Sodium, total	mg/L	53.3
PMP	MW-153	C	2023/11/03	Sodium, total	mg/L	57.0
PMP	MW-153	C	2013/09/17	Sulfate, total	mg/L	75.0
PMP	MW-153	C	2023/03/15	Sulfate, total	mg/L	68.0
PMP	MW-153	C	2023/05/22	Sulfate, total	mg/L	75.0
PMP	MW-153	C	2023/07/10	Sulfate, total	mg/L	62.0
PMP	MW-153	C	2023/08/04	Sulfate, total	mg/L	62.0
PMP	MW-153	C	2023/11/03	Sulfate, total	mg/L	62.0
PMP	MW-153	C	2013/09/17	Temperature (Celsius)	degrees C	15.5
PMP	MW-153	C	2013/11/21	Temperature (Celsius)	degrees C	14.1
PMP	MW-153	C	2014/02/19	Temperature (Celsius)	degrees C	13.7
PMP	MW-153	C	2014/06/11	Temperature (Celsius)	degrees C	13.2
PMP	MW-153	C	2015/03/25	Temperature (Celsius)	degrees C	12.9
PMP	MW-153	C	2015/06/24	Temperature (Celsius)	degrees C	14.3
PMP	MW-153	C	2015/09/25	Temperature (Celsius)	degrees C	15.2
PMP	MW-153	C	2015/11/10	Temperature (Celsius)	degrees C	15.5
PMP	MW-153	C	2016/03/22	Temperature (Celsius)	degrees C	12.6
PMP	MW-153	C	2016/06/21	Temperature (Celsius)	degrees C	14.5

PMP	MW-153	C	2016/09/29	Temperature (Celsius)	degrees C	15.4
PMP	MW-153	C	2016/12/21	Temperature (Celsius)	degrees C	15.1
PMP	MW-153	C	2017/03/17	Temperature (Celsius)	degrees C	13.6
PMP	MW-153	C	2017/06/22	Temperature (Celsius)	degrees C	15.0
PMP	MW-153	C	2017/09/21	Temperature (Celsius)	degrees C	16.5
PMP	MW-153	C	2017/11/28	Temperature (Celsius)	degrees C	16.2
PMP	MW-153	C	2018/03/20	Temperature (Celsius)	degrees C	14.1
PMP	MW-153	C	2018/06/28	Temperature (Celsius)	degrees C	14.1
PMP	MW-153	C	2018/09/26	Temperature (Celsius)	degrees C	16.4
PMP	MW-153	C	2018/12/19	Temperature (Celsius)	degrees C	14.8
PMP	MW-153	C	2019/03/21	Temperature (Celsius)	degrees C	12.1
PMP	MW-153	C	2019/06/26	Temperature (Celsius)	degrees C	13.9
PMP	MW-153	C	2019/09/26	Temperature (Celsius)	degrees C	15.3
PMP	MW-153	C	2019/12/19	Temperature (Celsius)	degrees C	13.9
PMP	MW-153	C	2020/03/27	Temperature (Celsius)	degrees C	13.3
PMP	MW-153	C	2020/06/23	Temperature (Celsius)	degrees C	13.9
PMP	MW-153	C	2020/09/17	Temperature (Celsius)	degrees C	15.6
PMP	MW-153	C	2020/12/17	Temperature (Celsius)	degrees C	14.8
PMP	MW-153	C	2021/03/10	Temperature (Celsius)	degrees C	13.4
PMP	MW-153	C	2021/06/22	Temperature (Celsius)	degrees C	13.7
PMP	MW-153	C	2021/09/16	Temperature (Celsius)	degrees C	15.4
PMP	MW-153	C	2021/12/15	Temperature (Celsius)	degrees C	15.4
PMP	MW-153	C	2022/03/29	Temperature (Celsius)	degrees C	13.3
PMP	MW-153	C	2022/06/15	Temperature (Celsius)	degrees C	14.6
PMP	MW-153	C	2022/09/29	Temperature (Celsius)	degrees C	15.6
PMP	MW-153	C	2022/12/06	Temperature (Celsius)	degrees C	14.7
PMP	MW-153	C	2023/03/15	Temperature (Celsius)	degrees C	13.3
PMP	MW-153	C	2023/05/22	Temperature (Celsius)	degrees C	13.5
PMP	MW-153	C	2023/07/10	Temperature (Celsius)	degrees C	15.6
PMP	MW-153	C	2023/08/04	Temperature (Celsius)	degrees C	14.9
PMP	MW-153	C	2023/11/03	Temperature (Celsius)	degrees C	15.5
PMP	MW-153	C	2013/09/17	Total Dissolved Solids	mg/L	448
PMP	MW-153	C	2013/11/21	Total Dissolved Solids	mg/L	384
PMP	MW-153	C	2014/02/19	Total Dissolved Solids	mg/L	402
PMP	MW-153	C	2014/06/11	Total Dissolved Solids	mg/L	426
PMP	MW-153	C	2015/03/25	Total Dissolved Solids	mg/L	354
PMP	MW-153	C	2015/06/24	Total Dissolved Solids	mg/L	442
PMP	MW-153	C	2015/09/25	Total Dissolved Solids	mg/L	354
PMP	MW-153	C	2015/11/10	Total Dissolved Solids	mg/L	360
PMP	MW-153	C	2016/03/22	Total Dissolved Solids	mg/L	364
PMP	MW-153	C	2016/06/21	Total Dissolved Solids	mg/L	398
PMP	MW-153	C	2016/09/29	Total Dissolved Solids	mg/L	408
PMP	MW-153	C	2016/12/21	Total Dissolved Solids	mg/L	390
PMP	MW-153	C	2017/03/17	Total Dissolved Solids	mg/L	342
PMP	MW-153	C	2017/06/22	Total Dissolved Solids	mg/L	404
PMP	MW-153	C	2017/09/21	Total Dissolved Solids	mg/L	336
PMP	MW-153	C	2017/11/28	Total Dissolved Solids	mg/L	428
PMP	MW-153	C	2018/03/20	Total Dissolved Solids	mg/L	394
PMP	MW-153	C	2018/06/28	Total Dissolved Solids	mg/L	414
PMP	MW-153	C	2018/09/26	Total Dissolved Solids	mg/L	406
PMP	MW-153	C	2018/12/19	Total Dissolved Solids	mg/L	408
PMP	MW-153	C	2019/03/21	Total Dissolved Solids	mg/L	392
PMP	MW-153	C	2019/06/26	Total Dissolved Solids	mg/L	404
PMP	MW-153	C	2019/09/26	Total Dissolved Solids	mg/L	370
PMP	MW-153	C	2019/12/19	Total Dissolved Solids	mg/L	402
PMP	MW-153	C	2020/03/27	Total Dissolved Solids	mg/L	364
PMP	MW-153	C	2020/06/23	Total Dissolved Solids	mg/L	362

PMP	MW-153	C	2020/09/17	Total Dissolved Solids	mg/L	334
PMP	MW-153	C	2020/12/17	Total Dissolved Solids	mg/L	368
PMP	MW-153	C	2021/03/10	Total Dissolved Solids	mg/L	390
PMP	MW-153	C	2021/06/22	Total Dissolved Solids	mg/L	362
PMP	MW-153	C	2021/09/16	Total Dissolved Solids	mg/L	370
PMP	MW-153	C	2021/12/15	Total Dissolved Solids	mg/L	396
PMP	MW-153	C	2022/03/29	Total Dissolved Solids	mg/L	378
PMP	MW-153	C	2022/06/15	Total Dissolved Solids	mg/L	338
PMP	MW-153	C	2022/09/29	Total Dissolved Solids	mg/L	374
PMP	MW-153	C	2022/12/06	Total Dissolved Solids	mg/L	1,940
PMP	MW-153	C	2023/03/15	Total Dissolved Solids	mg/L	358
PMP	MW-153	C	2023/05/22	Total Dissolved Solids	mg/L	350
PMP	MW-153	C	2023/07/10	Total Dissolved Solids	mg/L	378
PMP	MW-153	C	2023/08/04	Total Dissolved Solids	mg/L	396
PMP	MW-153	C	2023/11/03	Total Dissolved Solids	mg/L	384
PMP	MW-252	C	2013/09/16	pH (field)	SU	7.0
PMP	MW-252	C	2013/11/20	pH (field)	SU	7.1
PMP	MW-252	C	2014/02/19	pH (field)	SU	8.1
PMP	MW-252	C	2014/06/12	pH (field)	SU	6.4
PMP	MW-252	C	2015/03/25	pH (field)	SU	7.0
PMP	MW-252	C	2015/06/24	pH (field)	SU	6.7
PMP	MW-252	C	2015/09/25	pH (field)	SU	6.8
PMP	MW-252	C	2015/11/10	pH (field)	SU	6.6
PMP	MW-252	C	2016/03/22	pH (field)	SU	7.0
PMP	MW-252	C	2016/06/23	pH (field)	SU	7.4
PMP	MW-252	C	2016/09/29	pH (field)	SU	6.8
PMP	MW-252	C	2016/12/21	pH (field)	SU	6.8
PMP	MW-252	C	2017/03/16	pH (field)	SU	6.9
PMP	MW-252	C	2017/06/21	pH (field)	SU	6.7
PMP	MW-252	C	2017/09/21	pH (field)	SU	7.6
PMP	MW-252	C	2017/11/28	pH (field)	SU	7.0
PMP	MW-252	C	2018/03/20	pH (field)	SU	7.0
PMP	MW-252	C	2018/06/27	pH (field)	SU	6.8
PMP	MW-252	C	2018/09/26	pH (field)	SU	6.8
PMP	MW-252	C	2018/12/18	pH (field)	SU	6.8
PMP	MW-252	C	2019/03/20	pH (field)	SU	6.8
PMP	MW-252	C	2019/06/25	pH (field)	SU	6.7
PMP	MW-252	C	2019/09/26	pH (field)	SU	6.7
PMP	MW-252	C	2019/12/19	pH (field)	SU	6.9
PMP	MW-252	C	2020/03/27	pH (field)	SU	7.0
PMP	MW-252	C	2020/06/23	pH (field)	SU	7.0
PMP	MW-252	C	2020/09/17	pH (field)	SU	7.0
PMP	MW-252	C	2020/12/16	pH (field)	SU	6.8
PMP	MW-252	C	2021/03/09	pH (field)	SU	6.8
PMP	MW-252	C	2021/07/19	pH (field)	SU	7.1
PMP	MW-252	C	2021/09/14	pH (field)	SU	6.7
PMP	MW-252	C	2021/12/14	pH (field)	SU	7.1
PMP	MW-252	C	2022/03/28	pH (field)	SU	6.8
PMP	MW-252	C	2022/06/14	pH (field)	SU	6.8
PMP	MW-252	C	2022/09/29	pH (field)	SU	6.6
PMP	MW-252	C	2022/12/06	pH (field)	SU	6.9
PMP	MW-252	C	2023/03/15	pH (field)	SU	6.9
PMP	MW-252	C	2023/05/18	pH (field)	SU	6.8
PMP	MW-252	C	2023/08/04	pH (field)	SU	6.7
PMP	MW-252	C	2023/10/31	pH (field)	SU	6.8
PMP	MW-252	C	2021/03/09	Oxidation Reduction Potential	mV	22.0
PMP	MW-252	C	2021/07/19	Oxidation Reduction Potential	mV	147

PMP	MW-252	C	2021/09/14	Oxidation Reduction Potential	mV	93.0
PMP	MW-252	C	2021/12/14	Oxidation Reduction Potential	mV	136
PMP	MW-252	C	2022/03/28	Oxidation Reduction Potential	mV	11.0
PMP	MW-252	C	2022/06/14	Oxidation Reduction Potential	mV	121
PMP	MW-252	C	2022/09/29	Oxidation Reduction Potential	mV	170
PMP	MW-252	C	2022/12/06	Oxidation Reduction Potential	mV	65.0
PMP	MW-252	C	2023/03/15	Oxidation Reduction Potential	mV	11.5
PMP	MW-252	C	2023/05/18	Oxidation Reduction Potential	mV	62.0
PMP	MW-252	C	2023/08/04	Oxidation Reduction Potential	mV	-51.0
PMP	MW-252	C	2023/10/31	Oxidation Reduction Potential	mV	-77.0
PMP	MW-252	C	2021/03/09	Eh	V	0.22
PMP	MW-252	C	2021/07/19	Eh	V	0.34
PMP	MW-252	C	2021/09/14	Eh	V	0.29
PMP	MW-252	C	2021/12/14	Eh	V	0.33
PMP	MW-252	C	2022/03/28	Eh	V	0.21
PMP	MW-252	C	2022/06/14	Eh	V	0.31
PMP	MW-252	C	2022/09/29	Eh	V	0.37
PMP	MW-252	C	2022/12/06	Eh	V	0.26
PMP	MW-252	C	2023/03/15	Eh	V	0.21
PMP	MW-252	C	2023/05/18	Eh	V	0.26
PMP	MW-252	C	2023/08/04	Eh	V	0.14
PMP	MW-252	C	2023/10/31	Eh	V	0.12
PMP	MW-252	C	2023/03/15	Alkalinity, bicarbonate	mg/L CaCO3	486
PMP	MW-252	C	2023/05/18	Alkalinity, bicarbonate	mg/L CaCO3	479
PMP	MW-252	C	2023/08/04	Alkalinity, bicarbonate	mg/L CaCO3	486
PMP	MW-252	C	2023/10/31	Alkalinity, bicarbonate	mg/L CaCO3	503
PMP	MW-252	C	2023/03/15	Barium, total	mg/L	0.0290
PMP	MW-252	C	2023/05/18	Barium, total	mg/L	0.0377
PMP	MW-252	C	2023/08/04	Barium, total	mg/L	0.0359
PMP	MW-252	C	2023/10/31	Barium, total	mg/L	0.0315
PMP	MW-252	C	2013/09/16	Boron, total	mg/L	0.240
PMP	MW-252	C	2023/03/15	Boron, total	mg/L	0.166
PMP	MW-252	C	2023/05/18	Boron, total	mg/L	0.174
PMP	MW-252	C	2023/08/04	Boron, total	mg/L	0.143
PMP	MW-252	C	2023/10/31	Boron, total	mg/L	0.155
PMP	MW-252	C	2023/03/15	Calcium, total	mg/L	191
PMP	MW-252	C	2023/05/18	Calcium, total	mg/L	224
PMP	MW-252	C	2023/08/04	Calcium, total	mg/L	210
PMP	MW-252	C	2023/10/31	Calcium, total	mg/L	209
PMP	MW-252	C	2013/09/16	Chloride, total	mg/L	39.0
PMP	MW-252	C	2023/03/15	Chloride, total	mg/L	37.0
PMP	MW-252	C	2023/05/18	Chloride, total	mg/L	38.0
PMP	MW-252	C	2023/08/04	Chloride, total	mg/L	37.0
PMP	MW-252	C	2023/10/31	Chloride, total	mg/L	37.0
PMP	MW-252	C	2013/11/20	Iron, dissolved	mg/L	0.0700
PMP	MW-252	C	2014/02/19	Iron, dissolved	mg/L	<0.007
PMP	MW-252	C	2014/06/12	Iron, dissolved	mg/L	<0.007
PMP	MW-252	C	2015/03/25	Iron, dissolved	mg/L	<0.007
PMP	MW-252	C	2015/06/24	Iron, dissolved	mg/L	0.100
PMP	MW-252	C	2015/09/25	Iron, dissolved	mg/L	<0.007
PMP	MW-252	C	2015/11/10	Iron, dissolved	mg/L	0.0221
PMP	MW-252	C	2016/03/22	Iron, dissolved	mg/L	0.130
PMP	MW-252	C	2016/06/23	Iron, dissolved	mg/L	0.245
PMP	MW-252	C	2016/09/29	Iron, dissolved	mg/L	0.0243
PMP	MW-252	C	2016/12/21	Iron, dissolved	mg/L	<0.007
PMP	MW-252	C	2017/03/16	Iron, dissolved	mg/L	<0.007
PMP	MW-252	C	2017/06/21	Iron, dissolved	mg/L	<0.007

PMP	MW-252	C	2017/09/21	Iron, dissolved	mg/L	0.0800
PMP	MW-252	C	2017/11/28	Iron, dissolved	mg/L	0.110
PMP	MW-252	C	2018/03/20	Iron, dissolved	mg/L	0.108
PMP	MW-252	C	2018/06/27	Iron, dissolved	mg/L	<0.02
PMP	MW-252	C	2018/09/26	Iron, dissolved	mg/L	<0.02
PMP	MW-252	C	2018/12/18	Iron, dissolved	mg/L	0.186
PMP	MW-252	C	2019/03/20	Iron, dissolved	mg/L	<0.02
PMP	MW-252	C	2019/06/25	Iron, dissolved	mg/L	<0.02
PMP	MW-252	C	2019/09/26	Iron, dissolved	mg/L	<0.02
PMP	MW-252	C	2019/12/19	Iron, dissolved	mg/L	<0.02
PMP	MW-252	C	2020/03/27	Iron, dissolved	mg/L	<0.02
PMP	MW-252	C	2020/06/23	Iron, dissolved	mg/L	<0.02
PMP	MW-252	C	2020/09/17	Iron, dissolved	mg/L	0.0641
PMP	MW-252	C	2020/12/16	Iron, dissolved	mg/L	<0.02
PMP	MW-252	C	2021/03/09	Iron, dissolved	mg/L	0.127
PMP	MW-252	C	2021/07/19	Iron, dissolved	mg/L	<0.02
PMP	MW-252	C	2021/09/14	Iron, dissolved	mg/L	<0.02
PMP	MW-252	C	2021/12/14	Iron, dissolved	mg/L	<0.02
PMP	MW-252	C	2022/03/28	Iron, dissolved	mg/L	<0.015
PMP	MW-252	C	2022/06/14	Iron, dissolved	mg/L	<0.02
PMP	MW-252	C	2022/09/29	Iron, dissolved	mg/L	0.177
PMP	MW-252	C	2022/12/06	Iron, dissolved	mg/L	0.0794
PMP	MW-252	C	2023/03/15	Iron, dissolved	mg/L	1.37
PMP	MW-252	C	2023/05/18	Iron, dissolved	mg/L	0.0499
PMP	MW-252	C	2023/08/04	Iron, dissolved	mg/L	0.562
PMP	MW-252	C	2023/10/31	Iron, dissolved	mg/L	0.619
PMP	MW-252	C	2023/03/15	Magnesium, total	mg/L	77.4
PMP	MW-252	C	2023/05/18	Magnesium, total	mg/L	87.6
PMP	MW-252	C	2023/08/04	Magnesium, total	mg/L	82.5
PMP	MW-252	C	2023/10/31	Magnesium, total	mg/L	81.5
PMP	MW-252	C	2013/11/20	Manganese, dissolved	mg/L	0.110
PMP	MW-252	C	2014/02/19	Manganese, dissolved	mg/L	0.0100
PMP	MW-252	C	2014/06/12	Manganese, dissolved	mg/L	0.0570
PMP	MW-252	C	2015/03/25	Manganese, dissolved	mg/L	0.0530
PMP	MW-252	C	2015/06/24	Manganese, dissolved	mg/L	0.198
PMP	MW-252	C	2015/09/25	Manganese, dissolved	mg/L	0.582
PMP	MW-252	C	2015/11/10	Manganese, dissolved	mg/L	0.152
PMP	MW-252	C	2016/03/22	Manganese, dissolved	mg/L	0.249
PMP	MW-252	C	2016/06/23	Manganese, dissolved	mg/L	0.248
PMP	MW-252	C	2016/09/29	Manganese, dissolved	mg/L	0.126
PMP	MW-252	C	2016/12/21	Manganese, dissolved	mg/L	0.0827
PMP	MW-252	C	2017/03/16	Manganese, dissolved	mg/L	0.0800
PMP	MW-252	C	2017/06/21	Manganese, dissolved	mg/L	0.140
PMP	MW-252	C	2017/09/21	Manganese, dissolved	mg/L	0.160
PMP	MW-252	C	2017/11/28	Manganese, dissolved	mg/L	0.180
PMP	MW-252	C	2018/03/20	Manganese, dissolved	mg/L	0.179
PMP	MW-252	C	2018/06/27	Manganese, dissolved	mg/L	0.171
PMP	MW-252	C	2018/09/26	Manganese, dissolved	mg/L	0.300
PMP	MW-252	C	2018/12/18	Manganese, dissolved	mg/L	0.128
PMP	MW-252	C	2019/03/20	Manganese, dissolved	mg/L	0.00730
PMP	MW-252	C	2019/06/25	Manganese, dissolved	mg/L	0.0851
PMP	MW-252	C	2019/09/26	Manganese, dissolved	mg/L	0.0696
PMP	MW-252	C	2019/12/19	Manganese, dissolved	mg/L	0.0938
PMP	MW-252	C	2020/03/27	Manganese, dissolved	mg/L	0.0258
PMP	MW-252	C	2020/06/23	Manganese, dissolved	mg/L	<0.0025
PMP	MW-252	C	2020/09/17	Manganese, dissolved	mg/L	0.0975
PMP	MW-252	C	2020/12/16	Manganese, dissolved	mg/L	0.0785

PMP	MW-252	C	2021/03/09	Manganese, dissolved	mg/L	0.129
PMP	MW-252	C	2021/07/19	Manganese, dissolved	mg/L	0.0459
PMP	MW-252	C	2021/09/14	Manganese, dissolved	mg/L	0.0708
PMP	MW-252	C	2021/12/14	Manganese, dissolved	mg/L	0.135
PMP	MW-252	C	2022/03/28	Manganese, dissolved	mg/L	0.0929
PMP	MW-252	C	2022/06/14	Manganese, dissolved	mg/L	0.00460
PMP	MW-252	C	2022/09/29	Manganese, dissolved	mg/L	0.172
PMP	MW-252	C	2022/12/06	Manganese, dissolved	mg/L	0.121
PMP	MW-252	C	2023/03/15	Manganese, dissolved	mg/L	0.221
PMP	MW-252	C	2023/05/18	Manganese, dissolved	mg/L	0.396
PMP	MW-252	C	2023/08/04	Manganese, dissolved	mg/L	0.293
PMP	MW-252	C	2023/10/31	Manganese, dissolved	mg/L	0.303
PMP	MW-252	C	2023/05/18	Phosphate, dissolved	mg/L	0.212
PMP	MW-252	C	2023/08/04	Phosphate, dissolved	mg/L	0.0740
PMP	MW-252	C	2023/03/15	Potassium, total	mg/L	1.38
PMP	MW-252	C	2023/05/18	Potassium, total	mg/L	1.68
PMP	MW-252	C	2023/08/04	Potassium, total	mg/L	1.89
PMP	MW-252	C	2023/10/31	Potassium, total	mg/L	1.48
PMP	MW-252	C	2023/05/18	Silicon, dissolved	mg/L	7.03
PMP	MW-252	C	2023/08/04	Silicon, dissolved	mg/L	6.74
PMP	MW-252	C	2023/03/15	Sodium, total	mg/L	81.7
PMP	MW-252	C	2023/05/18	Sodium, total	mg/L	104
PMP	MW-252	C	2023/08/04	Sodium, total	mg/L	94.9
PMP	MW-252	C	2023/10/31	Sodium, total	mg/L	89.2
PMP	MW-252	C	2013/09/16	Sulfate, total	mg/L	500
PMP	MW-252	C	2023/03/15	Sulfate, total	mg/L	437
PMP	MW-252	C	2023/05/18	Sulfate, total	mg/L	454
PMP	MW-252	C	2023/08/04	Sulfate, total	mg/L	448
PMP	MW-252	C	2023/10/31	Sulfate, total	mg/L	474
PMP	MW-252	C	2013/09/16	Temperature (Celsius)	degrees C	14.1
PMP	MW-252	C	2013/11/20	Temperature (Celsius)	degrees C	13.8
PMP	MW-252	C	2014/02/19	Temperature (Celsius)	degrees C	10.9
PMP	MW-252	C	2014/06/12	Temperature (Celsius)	degrees C	14.3
PMP	MW-252	C	2015/03/25	Temperature (Celsius)	degrees C	12.8
PMP	MW-252	C	2015/06/24	Temperature (Celsius)	degrees C	13.7
PMP	MW-252	C	2015/09/25	Temperature (Celsius)	degrees C	14.5
PMP	MW-252	C	2015/11/10	Temperature (Celsius)	degrees C	13.7
PMP	MW-252	C	2016/03/22	Temperature (Celsius)	degrees C	15
PMP	MW-252	C	2016/06/23	Temperature (Celsius)	degrees C	14.4
PMP	MW-252	C	2016/09/29	Temperature (Celsius)	degrees C	14.8
PMP	MW-252	C	2016/12/21	Temperature (Celsius)	degrees C	13.5
PMP	MW-252	C	2017/03/16	Temperature (Celsius)	degrees C	12.0
PMP	MW-252	C	2017/06/21	Temperature (Celsius)	degrees C	14.0
PMP	MW-252	C	2017/09/21	Temperature (Celsius)	degrees C	15.4
PMP	MW-252	C	2017/11/28	Temperature (Celsius)	degrees C	14.2
PMP	MW-252	C	2018/03/20	Temperature (Celsius)	degrees C	13.8
PMP	MW-252	C	2018/06/27	Temperature (Celsius)	degrees C	14.9
PMP	MW-252	C	2018/09/26	Temperature (Celsius)	degrees C	14.2
PMP	MW-252	C	2018/12/18	Temperature (Celsius)	degrees C	13.6
PMP	MW-252	C	2019/03/20	Temperature (Celsius)	degrees C	13.3
PMP	MW-252	C	2019/06/25	Temperature (Celsius)	degrees C	14.8
PMP	MW-252	C	2019/09/26	Temperature (Celsius)	degrees C	14.0
PMP	MW-252	C	2019/12/19	Temperature (Celsius)	degrees C	13.5
PMP	MW-252	C	2020/03/27	Temperature (Celsius)	degrees C	14.1
PMP	MW-252	C	2020/06/23	Temperature (Celsius)	degrees C	13.6
PMP	MW-252	C	2020/09/17	Temperature (Celsius)	degrees C	14.1
PMP	MW-252	C	2020/12/16	Temperature (Celsius)	degrees C	13.5

PMP	MW-252	C	2021/03/09	Temperature (Celsius)	degrees C	13.0
PMP	MW-252	C	2021/07/19	Temperature (Celsius)	degrees C	17.3
PMP	MW-252	C	2021/09/14	Temperature (Celsius)	degrees C	16.8
PMP	MW-252	C	2021/12/14	Temperature (Celsius)	degrees C	12.8
PMP	MW-252	C	2022/03/28	Temperature (Celsius)	degrees C	13.7
PMP	MW-252	C	2022/06/14	Temperature (Celsius)	degrees C	17.2
PMP	MW-252	C	2022/09/29	Temperature (Celsius)	degrees C	15.4
PMP	MW-252	C	2022/12/06	Temperature (Celsius)	degrees C	13.7
PMP	MW-252	C	2023/03/15	Temperature (Celsius)	degrees C	13.3
PMP	MW-252	C	2023/05/18	Temperature (Celsius)	degrees C	14.3
PMP	MW-252	C	2023/08/04	Temperature (Celsius)	degrees C	18.9
PMP	MW-252	C	2023/10/31	Temperature (Celsius)	degrees C	13.5
PMP	MW-252	C	2013/09/16	Total Dissolved Solids	mg/L	1,260
PMP	MW-252	C	2013/11/20	Total Dissolved Solids	mg/L	1,250
PMP	MW-252	C	2014/02/19	Total Dissolved Solids	mg/L	1,310
PMP	MW-252	C	2014/06/12	Total Dissolved Solids	mg/L	1,390
PMP	MW-252	C	2015/03/25	Total Dissolved Solids	mg/L	1,270
PMP	MW-252	C	2015/06/24	Total Dissolved Solids	mg/L	1,320
PMP	MW-252	C	2015/09/25	Total Dissolved Solids	mg/L	1,250
PMP	MW-252	C	2015/11/10	Total Dissolved Solids	mg/L	1,250
PMP	MW-252	C	2016/03/22	Total Dissolved Solids	mg/L	1,300
PMP	MW-252	C	2016/06/23	Total Dissolved Solids	mg/L	1,270
PMP	MW-252	C	2016/09/29	Total Dissolved Solids	mg/L	1,280
PMP	MW-252	C	2016/12/21	Total Dissolved Solids	mg/L	1,310
PMP	MW-252	C	2017/03/16	Total Dissolved Solids	mg/L	1,270
PMP	MW-252	C	2017/06/21	Total Dissolved Solids	mg/L	1,320
PMP	MW-252	C	2017/09/21	Total Dissolved Solids	mg/L	1,230
PMP	MW-252	C	2017/11/28	Total Dissolved Solids	mg/L	1,290
PMP	MW-252	C	2018/03/20	Total Dissolved Solids	mg/L	1,260
PMP	MW-252	C	2018/06/27	Total Dissolved Solids	mg/L	1,290
PMP	MW-252	C	2018/09/26	Total Dissolved Solids	mg/L	1,280
PMP	MW-252	C	2018/12/18	Total Dissolved Solids	mg/L	1,270
PMP	MW-252	C	2019/03/20	Total Dissolved Solids	mg/L	1,300
PMP	MW-252	C	2019/06/25	Total Dissolved Solids	mg/L	1,330
PMP	MW-252	C	2019/09/26	Total Dissolved Solids	mg/L	1,250
PMP	MW-252	C	2019/12/19	Total Dissolved Solids	mg/L	1,230
PMP	MW-252	C	2020/03/27	Total Dissolved Solids	mg/L	1,240
PMP	MW-252	C	2020/06/23	Total Dissolved Solids	mg/L	1,200
PMP	MW-252	C	2020/09/17	Total Dissolved Solids	mg/L	1,200
PMP	MW-252	C	2020/12/16	Total Dissolved Solids	mg/L	1,200
PMP	MW-252	C	2021/03/09	Total Dissolved Solids	mg/L	1,190
PMP	MW-252	C	2021/07/19	Total Dissolved Solids	mg/L	1,140
PMP	MW-252	C	2021/09/14	Total Dissolved Solids	mg/L	1,160
PMP	MW-252	C	2021/12/14	Total Dissolved Solids	mg/L	1,130
PMP	MW-252	C	2022/03/28	Total Dissolved Solids	mg/L	1,180
PMP	MW-252	C	2022/06/14	Total Dissolved Solids	mg/L	1,200
PMP	MW-252	C	2022/09/29	Total Dissolved Solids	mg/L	1,080
PMP	MW-252	C	2022/12/06	Total Dissolved Solids	mg/L	1,230
PMP	MW-252	C	2023/03/15	Total Dissolved Solids	mg/L	1,130
PMP	MW-252	C	2023/05/18	Total Dissolved Solids	mg/L	1,200
PMP	MW-252	C	2023/08/04	Total Dissolved Solids	mg/L	1,260
PMP	MW-252	C	2023/10/31	Total Dissolved Solids	mg/L	1,220
PMP	MW-253	C	2013/09/17	pH (field)	SU	10.6
PMP	MW-253	C	2013/11/21	pH (field)	SU	8.6
PMP	MW-253	C	2014/02/19	pH (field)	SU	7.9
PMP	MW-253	C	2014/06/11	pH (field)	SU	11.4
PMP	MW-253	C	2015/03/25	pH (field)	SU	12.4

PMP	MW-253	C	2015/06/24	pH (field)	SU	12.4
PMP	MW-253	C	2015/09/25	pH (field)	SU	11.1
PMP	MW-253	C	2015/11/10	pH (field)	SU	10.1
PMP	MW-253	C	2016/03/22	pH (field)	SU	11.8
PMP	MW-253	C	2016/06/21	pH (field)	SU	11.9
PMP	MW-253	C	2016/09/29	pH (field)	SU	11.7
PMP	MW-253	C	2016/12/21	pH (field)	SU	11.0
PMP	MW-253	C	2017/03/17	pH (field)	SU	10.6
PMP	MW-253	C	2017/06/22	pH (field)	SU	11.7
PMP	MW-253	C	2017/09/21	pH (field)	SU	9.8
PMP	MW-253	C	2017/11/28	pH (field)	SU	10.3
PMP	MW-253	C	2018/03/20	pH (field)	SU	11.9
PMP	MW-253	C	2018/06/28	pH (field)	SU	11.8
PMP	MW-253	C	2018/09/26	pH (field)	SU	11.8
PMP	MW-253	C	2018/12/19	pH (field)	SU	11.8
PMP	MW-253	C	2019/03/21	pH (field)	SU	12.2
PMP	MW-253	C	2019/06/26	pH (field)	SU	12.0
PMP	MW-253	C	2019/09/26	pH (field)	SU	11.3
PMP	MW-253	C	2019/12/19	pH (field)	SU	11.0
PMP	MW-253	C	2020/03/27	pH (field)	SU	12.1
PMP	MW-253	C	2020/06/23	pH (field)	SU	12.4
PMP	MW-253	C	2020/09/17	pH (field)	SU	11.6
PMP	MW-253	C	2020/12/17	pH (field)	SU	12.0
PMP	MW-253	C	2021/03/10	pH (field)	SU	11.8
PMP	MW-253	C	2021/06/22	pH (field)	SU	11.7
PMP	MW-253	C	2021/09/16	pH (field)	SU	11.3
PMP	MW-253	C	2021/12/15	pH (field)	SU	11.2
PMP	MW-253	C	2022/03/29	pH (field)	SU	11.6
PMP	MW-253	C	2022/06/15	pH (field)	SU	11.6
PMP	MW-253	C	2022/09/29	pH (field)	SU	11.4
PMP	MW-253	C	2022/12/06	pH (field)	SU	10.7
PMP	MW-253	C	2023/03/15	pH (field)	SU	11.8
PMP	MW-253	C	2023/08/04	pH (field)	SU	11.3
PMP	MW-253	C	2023/11/03	pH (field)	SU	10.8
PMP	MW-253	C	2021/03/10	Oxidation Reduction Potential	mV	-179
PMP	MW-253	C	2021/06/22	Oxidation Reduction Potential	mV	<-300
PMP	MW-253	C	2021/09/16	Oxidation Reduction Potential	mV	-72.0
PMP	MW-253	C	2021/12/15	Oxidation Reduction Potential	mV	-8.00
PMP	MW-253	C	2022/03/29	Oxidation Reduction Potential	mV	-180
PMP	MW-253	C	2022/06/15	Oxidation Reduction Potential	mV	-35.0
PMP	MW-253	C	2022/09/29	Oxidation Reduction Potential	mV	-2.00
PMP	MW-253	C	2022/12/06	Oxidation Reduction Potential	mV	<-300
PMP	MW-253	C	2023/03/15	Oxidation Reduction Potential	mV	-114
PMP	MW-253	C	2023/08/04	Oxidation Reduction Potential	mV	68.0
PMP	MW-253	C	2023/11/03	Oxidation Reduction Potential	mV	-35.0
PMP	MW-253	C	2021/03/10	Eh	V	0.017
PMP	MW-253	C	2021/06/22	Eh	V	-0.11
PMP	MW-253	C	2021/09/16	Eh	V	0.12
PMP	MW-253	C	2021/12/15	Eh	V	0.19
PMP	MW-253	C	2022/03/29	Eh	V	0.016
PMP	MW-253	C	2022/06/15	Eh	V	0.16
PMP	MW-253	C	2022/09/29	Eh	V	0.19
PMP	MW-253	C	2022/12/06	Eh	V	-0.10
PMP	MW-253	C	2023/03/15	Eh	V	0.082
PMP	MW-253	C	2023/08/04	Eh	V	0.26
PMP	MW-253	C	2023/11/03	Eh	V	0.16
PMP	MW-253	C	2023/03/15	Alkalinity, carbonate	mg/L CaCO3	57.0

PMP	MW-253	C	2023/08/04	Alkalinity, carbonate	mg/L CaCO3	29.0
PMP	MW-253	C	2023/11/03	Alkalinity, carbonate	mg/L CaCO3	14.0
PMP	MW-253	C	2023/03/15	Barium, total	mg/L	0.112
PMP	MW-253	C	2023/08/04	Barium, total	mg/L	0.0562
PMP	MW-253	C	2023/11/03	Barium, total	mg/L	0.157
PMP	MW-253	C	2013/09/17	Boron, total	mg/L	0.0600
PMP	MW-253	C	2023/03/15	Boron, total	mg/L	<0.02
PMP	MW-253	C	2023/08/04	Boron, total	mg/L	0.0698
PMP	MW-253	C	2023/11/03	Boron, total	mg/L	0.0853
PMP	MW-253	C	2023/03/15	Calcium, total	mg/L	202
PMP	MW-253	C	2023/08/04	Calcium, total	mg/L	75.0
PMP	MW-253	C	2023/11/03	Calcium, total	mg/L	70.8
PMP	MW-253	C	2013/09/17	Chloride, total	mg/L	15.0
PMP	MW-253	C	2023/03/15	Chloride, total	mg/L	21.0
PMP	MW-253	C	2023/08/04	Chloride, total	mg/L	21.0
PMP	MW-253	C	2023/11/03	Chloride, total	mg/L	22.0
PMP	MW-253	C	2013/11/21	Iron, dissolved	mg/L	<0.007
PMP	MW-253	C	2014/02/19	Iron, dissolved	mg/L	<0.007
PMP	MW-253	C	2014/06/11	Iron, dissolved	mg/L	<0.007
PMP	MW-253	C	2015/03/25	Iron, dissolved	mg/L	<0.007
PMP	MW-253	C	2015/06/24	Iron, dissolved	mg/L	<0.007
PMP	MW-253	C	2015/09/25	Iron, dissolved	mg/L	<0.007
PMP	MW-253	C	2015/11/10	Iron, dissolved	mg/L	<0.007
PMP	MW-253	C	2016/03/22	Iron, dissolved	mg/L	<0.007
PMP	MW-253	C	2016/06/21	Iron, dissolved	mg/L	<0.007
PMP	MW-253	C	2016/09/29	Iron, dissolved	mg/L	<0.007
PMP	MW-253	C	2016/12/21	Iron, dissolved	mg/L	<0.007
PMP	MW-253	C	2017/03/17	Iron, dissolved	mg/L	<0.007
PMP	MW-253	C	2017/06/22	Iron, dissolved	mg/L	<0.007
PMP	MW-253	C	2017/09/21	Iron, dissolved	mg/L	<0.007
PMP	MW-253	C	2017/11/28	Iron, dissolved	mg/L	<0.007
PMP	MW-253	C	2018/03/20	Iron, dissolved	mg/L	<0.007
PMP	MW-253	C	2018/06/28	Iron, dissolved	mg/L	<0.02
PMP	MW-253	C	2018/09/26	Iron, dissolved	mg/L	<0.02
PMP	MW-253	C	2018/12/19	Iron, dissolved	mg/L	<0.02
PMP	MW-253	C	2019/03/21	Iron, dissolved	mg/L	<0.02
PMP	MW-253	C	2019/06/26	Iron, dissolved	mg/L	<0.02
PMP	MW-253	C	2019/09/26	Iron, dissolved	mg/L	<0.02
PMP	MW-253	C	2019/12/19	Iron, dissolved	mg/L	<0.02
PMP	MW-253	C	2020/03/27	Iron, dissolved	mg/L	<0.02
PMP	MW-253	C	2020/06/23	Iron, dissolved	mg/L	<0.02
PMP	MW-253	C	2020/09/17	Iron, dissolved	mg/L	<0.02
PMP	MW-253	C	2020/12/17	Iron, dissolved	mg/L	<0.02
PMP	MW-253	C	2021/03/10	Iron, dissolved	mg/L	<0.02
PMP	MW-253	C	2021/06/22	Iron, dissolved	mg/L	<0.02
PMP	MW-253	C	2021/09/16	Iron, dissolved	mg/L	<0.02
PMP	MW-253	C	2021/12/15	Iron, dissolved	mg/L	<0.02
PMP	MW-253	C	2022/03/29	Iron, dissolved	mg/L	<0.015
PMP	MW-253	C	2022/06/15	Iron, dissolved	mg/L	<0.02
PMP	MW-253	C	2022/09/29	Iron, dissolved	mg/L	<0.0115
PMP	MW-253	C	2022/12/06	Iron, dissolved	mg/L	<0.0115
PMP	MW-253	C	2023/03/15	Iron, dissolved	mg/L	<0.0115
PMP	MW-253	C	2023/08/04	Iron, dissolved	mg/L	<0.0115
PMP	MW-253	C	2023/11/03	Iron, dissolved	mg/L	<0.0115
PMP	MW-253	C	2023/03/15	Magnesium, total	mg/L	0.301
PMP	MW-253	C	2023/08/04	Magnesium, total	mg/L	2.29
PMP	MW-253	C	2023/11/03	Magnesium, total	mg/L	2.82

PMP	MW-253	C	2013/11/21	Manganese, dissolved	mg/L	<0.0016
PMP	MW-253	C	2014/02/19	Manganese, dissolved	mg/L	<0.0016
PMP	MW-253	C	2014/06/11	Manganese, dissolved	mg/L	<0.0016
PMP	MW-253	C	2015/03/25	Manganese, dissolved	mg/L	<0.0005
PMP	MW-253	C	2015/06/24	Manganese, dissolved	mg/L	<0.0005
PMP	MW-253	C	2015/09/25	Manganese, dissolved	mg/L	<0.0005
PMP	MW-253	C	2015/11/10	Manganese, dissolved	mg/L	<0.0005
PMP	MW-253	C	2016/03/22	Manganese, dissolved	mg/L	<0.0005
PMP	MW-253	C	2016/06/21	Manganese, dissolved	mg/L	<0.0005
PMP	MW-253	C	2016/09/29	Manganese, dissolved	mg/L	<0.0005
PMP	MW-253	C	2016/12/21	Manganese, dissolved	mg/L	<0.0005
PMP	MW-253	C	2017/03/17	Manganese, dissolved	mg/L	<0.0005
PMP	MW-253	C	2017/06/22	Manganese, dissolved	mg/L	<0.0005
PMP	MW-253	C	2017/09/21	Manganese, dissolved	mg/L	<0.0005
PMP	MW-253	C	2017/11/28	Manganese, dissolved	mg/L	<0.0005
PMP	MW-253	C	2018/03/20	Manganese, dissolved	mg/L	<0.0005
PMP	MW-253	C	2018/06/28	Manganese, dissolved	mg/L	<0.0025
PMP	MW-253	C	2018/09/26	Manganese, dissolved	mg/L	<0.0025
PMP	MW-253	C	2018/12/19	Manganese, dissolved	mg/L	<0.0025
PMP	MW-253	C	2019/03/21	Manganese, dissolved	mg/L	<0.0025
PMP	MW-253	C	2019/06/26	Manganese, dissolved	mg/L	<0.0025
PMP	MW-253	C	2019/09/26	Manganese, dissolved	mg/L	<0.0025
PMP	MW-253	C	2019/12/19	Manganese, dissolved	mg/L	<0.0025
PMP	MW-253	C	2020/03/27	Manganese, dissolved	mg/L	<0.0025
PMP	MW-253	C	2020/06/23	Manganese, dissolved	mg/L	<0.0025
PMP	MW-253	C	2020/09/17	Manganese, dissolved	mg/L	<0.0025
PMP	MW-253	C	2020/12/17	Manganese, dissolved	mg/L	<0.0025
PMP	MW-253	C	2021/03/10	Manganese, dissolved	mg/L	<0.0025
PMP	MW-253	C	2021/06/22	Manganese, dissolved	mg/L	<0.0025
PMP	MW-253	C	2021/09/16	Manganese, dissolved	mg/L	<0.0025
PMP	MW-253	C	2021/12/15	Manganese, dissolved	mg/L	<0.0025
PMP	MW-253	C	2022/03/29	Manganese, dissolved	mg/L	<0.0008
PMP	MW-253	C	2022/06/15	Manganese, dissolved	mg/L	<0.0025
PMP	MW-253	C	2022/09/29	Manganese, dissolved	mg/L	<0.0008
PMP	MW-253	C	2022/12/06	Manganese, dissolved	mg/L	0.000900
PMP	MW-253	C	2023/03/15	Manganese, dissolved	mg/L	<0.0008
PMP	MW-253	C	2023/08/04	Manganese, dissolved	mg/L	<0.0008
PMP	MW-253	C	2023/11/03	Manganese, dissolved	mg/L	<0.0008
PMP	MW-253	C	2023/08/04	Phosphate, dissolved	mg/L	0.0250
PMP	MW-253	C	2023/03/15	Potassium, total	mg/L	1.89
PMP	MW-253	C	2023/08/04	Potassium, total	mg/L	1.46
PMP	MW-253	C	2023/11/03	Potassium, total	mg/L	1.31
PMP	MW-253	C	2023/08/04	Silicon, dissolved	mg/L	1.21
PMP	MW-253	C	2023/03/15	Sodium, total	mg/L	38.3
PMP	MW-253	C	2023/08/04	Sodium, total	mg/L	40.7
PMP	MW-253	C	2023/11/03	Sodium, total	mg/L	39.2
PMP	MW-253	C	2013/09/17	Sulfate, total	mg/L	349
PMP	MW-253	C	2023/03/15	Sulfate, total	mg/L	140
PMP	MW-253	C	2023/08/04	Sulfate, total	mg/L	154
PMP	MW-253	C	2023/11/03	Sulfate, total	mg/L	174
PMP	MW-253	C	2013/09/17	Temperature (Celsius)	degrees C	15.6
PMP	MW-253	C	2013/11/21	Temperature (Celsius)	degrees C	13.9
PMP	MW-253	C	2014/02/19	Temperature (Celsius)	degrees C	14.4
PMP	MW-253	C	2014/06/11	Temperature (Celsius)	degrees C	14.1
PMP	MW-253	C	2015/03/25	Temperature (Celsius)	degrees C	14.1
PMP	MW-253	C	2015/06/24	Temperature (Celsius)	degrees C	14.8
PMP	MW-253	C	2015/09/25	Temperature (Celsius)	degrees C	14.6

PMP	MW-253	C	2015/11/10	Temperature (Celsius)	degrees C	14.8
PMP	MW-253	C	2016/03/22	Temperature (Celsius)	degrees C	13.3
PMP	MW-253	C	2016/06/21	Temperature (Celsius)	degrees C	14.8
PMP	MW-253	C	2016/09/29	Temperature (Celsius)	degrees C	14.9
PMP	MW-253	C	2016/12/21	Temperature (Celsius)	degrees C	14.0
PMP	MW-253	C	2017/03/17	Temperature (Celsius)	degrees C	14.3
PMP	MW-253	C	2017/06/22	Temperature (Celsius)	degrees C	15.5
PMP	MW-253	C	2017/09/21	Temperature (Celsius)	degrees C	15.5
PMP	MW-253	C	2017/11/28	Temperature (Celsius)	degrees C	15.4
PMP	MW-253	C	2018/03/20	Temperature (Celsius)	degrees C	14.9
PMP	MW-253	C	2018/06/28	Temperature (Celsius)	degrees C	15.1
PMP	MW-253	C	2018/09/26	Temperature (Celsius)	degrees C	15.5
PMP	MW-253	C	2018/12/19	Temperature (Celsius)	degrees C	14.3
PMP	MW-253	C	2019/03/21	Temperature (Celsius)	degrees C	12.4
PMP	MW-253	C	2019/06/26	Temperature (Celsius)	degrees C	15.9
PMP	MW-253	C	2019/09/26	Temperature (Celsius)	degrees C	14.8
PMP	MW-253	C	2019/12/19	Temperature (Celsius)	degrees C	13.4
PMP	MW-253	C	2020/03/27	Temperature (Celsius)	degrees C	14.3
PMP	MW-253	C	2020/06/23	Temperature (Celsius)	degrees C	14.4
PMP	MW-253	C	2020/09/17	Temperature (Celsius)	degrees C	14.9
PMP	MW-253	C	2020/12/17	Temperature (Celsius)	degrees C	14.1
PMP	MW-253	C	2021/03/10	Temperature (Celsius)	degrees C	13.8
PMP	MW-253	C	2021/06/22	Temperature (Celsius)	degrees C	17.6
PMP	MW-253	C	2021/09/16	Temperature (Celsius)	degrees C	15.7
PMP	MW-253	C	2021/12/15	Temperature (Celsius)	degrees C	14.9
PMP	MW-253	C	2022/03/29	Temperature (Celsius)	degrees C	14.3
PMP	MW-253	C	2022/06/15	Temperature (Celsius)	degrees C	16.8
PMP	MW-253	C	2022/09/29	Temperature (Celsius)	degrees C	14.5
PMP	MW-253	C	2022/12/06	Temperature (Celsius)	degrees C	13.7
PMP	MW-253	C	2023/03/15	Temperature (Celsius)	degrees C	14.1
PMP	MW-253	C	2023/08/04	Temperature (Celsius)	degrees C	15.0
PMP	MW-253	C	2023/11/03	Temperature (Celsius)	degrees C	15.9
PMP	MW-253	C	2013/09/17	Total Dissolved Solids	mg/L	546
PMP	MW-253	C	2013/11/21	Total Dissolved Solids	mg/L	602
PMP	MW-253	C	2014/02/19	Total Dissolved Solids	mg/L	564
PMP	MW-253	C	2014/06/11	Total Dissolved Solids	mg/L	668
PMP	MW-253	C	2015/03/25	Total Dissolved Solids	mg/L	820
PMP	MW-253	C	2015/06/24	Total Dissolved Solids	mg/L	928
PMP	MW-253	C	2015/09/25	Total Dissolved Solids	mg/L	346
PMP	MW-253	C	2015/11/10	Total Dissolved Solids	mg/L	300
PMP	MW-253	C	2016/03/22	Total Dissolved Solids	mg/L	546
PMP	MW-253	C	2016/06/21	Total Dissolved Solids	mg/L	568
PMP	MW-253	C	2016/09/29	Total Dissolved Solids	mg/L	446
PMP	MW-253	C	2016/12/21	Total Dissolved Solids	mg/L	414
PMP	MW-253	C	2017/03/17	Total Dissolved Solids	mg/L	352
PMP	MW-253	C	2017/06/22	Total Dissolved Solids	mg/L	555
PMP	MW-253	C	2017/09/21	Total Dissolved Solids	mg/L	436
PMP	MW-253	C	2017/11/28	Total Dissolved Solids	mg/L	496
PMP	MW-253	C	2018/03/20	Total Dissolved Solids	mg/L	668
PMP	MW-253	C	2018/06/28	Total Dissolved Solids	mg/L	570
PMP	MW-253	C	2018/09/26	Total Dissolved Solids	mg/L	560
PMP	MW-253	C	2018/12/19	Total Dissolved Solids	mg/L	645
PMP	MW-253	C	2019/03/21	Total Dissolved Solids	mg/L	910
PMP	MW-253	C	2019/06/26	Total Dissolved Solids	mg/L	685
PMP	MW-253	C	2019/09/26	Total Dissolved Solids	mg/L	320
PMP	MW-253	C	2019/12/19	Total Dissolved Solids	mg/L	370
PMP	MW-253	C	2020/03/27	Total Dissolved Solids	mg/L	894

PMP	MW-253	C	2020/06/23	Total Dissolved Solids	mg/L	518
PMP	MW-253	C	2020/09/17	Total Dissolved Solids	mg/L	376
PMP	MW-253	C	2020/12/17	Total Dissolved Solids	mg/L	530
PMP	MW-253	C	2021/03/10	Total Dissolved Solids	mg/L	758
PMP	MW-253	C	2021/06/22	Total Dissolved Solids	mg/L	500
PMP	MW-253	C	2021/09/16	Total Dissolved Solids	mg/L	360
PMP	MW-253	C	2021/12/15	Total Dissolved Solids	mg/L	378
PMP	MW-253	C	2022/03/29	Total Dissolved Solids	mg/L	720
PMP	MW-253	C	2022/06/15	Total Dissolved Solids	mg/L	530
PMP	MW-253	C	2022/09/29	Total Dissolved Solids	mg/L	332
PMP	MW-253	C	2022/12/06	Total Dissolved Solids	mg/L	320
PMP	MW-253	C	2023/03/15	Total Dissolved Solids	mg/L	540
PMP	MW-253	C	2023/08/04	Total Dissolved Solids	mg/L	328
PMP	MW-253	C	2023/11/03	Total Dissolved Solids	mg/L	316
UA	MW-304	B	2015/12/29	pH (field)	SU	8.0
UA	MW-304	B	2016/03/21	pH (field)	SU	8.2
UA	MW-304	B	2016/06/21	pH (field)	SU	8.1
UA	MW-304	B	2016/09/19	pH (field)	SU	7.9
UA	MW-304	B	2016/12/27	pH (field)	SU	7.9
UA	MW-304	B	2017/03/16	pH (field)	SU	7.9
UA	MW-304	B	2017/06/21	pH (field)	SU	7.9
UA	MW-304	B	2017/07/28	pH (field)	SU	7.8
UA	MW-304	B	2017/09/21	pH (field)	SU	7.9
UA	MW-304	B	2017/11/28	pH (field)	SU	8.0
UA	MW-304	B	2018/03/19	pH (field)	SU	7.9
UA	MW-304	B	2018/06/27	pH (field)	SU	7.4
UA	MW-304	B	2018/09/26	pH (field)	SU	7.9
UA	MW-304	B	2018/12/19	pH (field)	SU	7.9
UA	MW-304	B	2019/03/20	pH (field)	SU	7.7
UA	MW-304	B	2019/06/25	pH (field)	SU	7.9
UA	MW-304	B	2019/09/25	pH (field)	SU	7.9
UA	MW-304	B	2019/12/19	pH (field)	SU	7.9
UA	MW-304	B	2020/03/26	pH (field)	SU	7.9
UA	MW-304	B	2020/06/23	pH (field)	SU	8.0
UA	MW-304	B	2020/09/17	pH (field)	SU	8.0
UA	MW-304	B	2020/12/16	pH (field)	SU	7.9
UA	MW-304	B	2021/03/09	pH (field)	SU	7.9
UA	MW-304	B	2021/06/21	pH (field)	SU	7.8
UA	MW-304	B	2021/09/14	pH (field)	SU	7.7
UA	MW-304	B	2021/12/14	pH (field)	SU	7.8
UA	MW-304	B	2022/03/28	pH (field)	SU	7.8
UA	MW-304	B	2022/06/14	pH (field)	SU	7.8
UA	MW-304	B	2022/09/29	pH (field)	SU	7.7
UA	MW-304	B	2022/10/26	pH (field)	SU	7.9
UA	MW-304	B	2022/11/17	pH (field)	SU	7.9
UA	MW-304	B	2022/12/05	pH (field)	SU	7.8
UA	MW-304	B	2022/12/14	pH (field)	SU	7.8
UA	MW-304	B	2023/01/11	pH (field)	SU	7.8
UA	MW-304	B	2023/02/20	pH (field)	SU	7.8
UA	MW-304	B	2023/03/15	pH (field)	SU	7.8
UA	MW-304	B	2023/04/04	pH (field)	SU	7.8
UA	MW-304	B	2023/05/22	pH (field)	SU	7.5
UA	MW-304	B	2023/08/03	pH (field)	SU	7.9
UA	MW-304	B	2023/11/01	pH (field)	SU	7.8
UA	MW-304	B	2015/12/29	Oxidation Reduction Potential	mV	214
UA	MW-304	B	2016/03/21	Oxidation Reduction Potential	mV	47.0
UA	MW-304	B	2016/06/21	Oxidation Reduction Potential	mV	-15.0

UA	MW-304	B	2016/09/19	Oxidation Reduction Potential	mV	-64.0
UA	MW-304	B	2016/12/27	Oxidation Reduction Potential	mV	-51.0
UA	MW-304	B	2017/03/16	Oxidation Reduction Potential	mV	-39.0
UA	MW-304	B	2017/06/21	Oxidation Reduction Potential	mV	-65.0
UA	MW-304	B	2017/07/28	Oxidation Reduction Potential	mV	-67.0
UA	MW-304	B	2017/11/28	Oxidation Reduction Potential	mV	47.0
UA	MW-304	B	2018/06/27	Oxidation Reduction Potential	mV	57.0
UA	MW-304	B	2018/09/26	Oxidation Reduction Potential	mV	-165
UA	MW-304	B	2019/03/20	Oxidation Reduction Potential	mV	<-300
UA	MW-304	B	2019/09/25	Oxidation Reduction Potential	mV	-15.0
UA	MW-304	B	2020/03/26	Oxidation Reduction Potential	mV	-14.0
UA	MW-304	B	2020/09/17	Oxidation Reduction Potential	mV	-48.0
UA	MW-304	B	2021/03/09	Oxidation Reduction Potential	mV	-6.00
UA	MW-304	B	2021/06/21	Oxidation Reduction Potential	mV	-78.0
UA	MW-304	B	2021/09/14	Oxidation Reduction Potential	mV	-24.0
UA	MW-304	B	2021/12/14	Oxidation Reduction Potential	mV	56.0
UA	MW-304	B	2022/03/28	Oxidation Reduction Potential	mV	-21.0
UA	MW-304	B	2022/06/14	Oxidation Reduction Potential	mV	105
UA	MW-304	B	2022/09/29	Oxidation Reduction Potential	mV	86.0
UA	MW-304	B	2022/10/26	Oxidation Reduction Potential	mV	30.9
UA	MW-304	B	2022/11/17	Oxidation Reduction Potential	mV	160
UA	MW-304	B	2022/12/05	Oxidation Reduction Potential	mV	48.0
UA	MW-304	B	2022/12/14	Oxidation Reduction Potential	mV	191
UA	MW-304	B	2023/01/11	Oxidation Reduction Potential	mV	52.0
UA	MW-304	B	2023/02/20	Oxidation Reduction Potential	mV	53.2
UA	MW-304	B	2023/03/15	Oxidation Reduction Potential	mV	31.9
UA	MW-304	B	2023/04/04	Oxidation Reduction Potential	mV	-95.0
UA	MW-304	B	2023/05/22	Oxidation Reduction Potential	mV	116
UA	MW-304	B	2023/08/03	Oxidation Reduction Potential	mV	78.0
UA	MW-304	B	2023/11/01	Oxidation Reduction Potential	mV	-56.0
UA	MW-304	B	2015/12/29	Eh	V	0.41
UA	MW-304	B	2016/03/21	Eh	V	0.24
UA	MW-304	B	2016/06/21	Eh	V	0.18
UA	MW-304	B	2016/09/19	Eh	V	0.12
UA	MW-304	B	2016/12/27	Eh	V	0.15
UA	MW-304	B	2017/03/16	Eh	V	0.16
UA	MW-304	B	2017/06/21	Eh	V	0.12
UA	MW-304	B	2017/07/28	Eh	V	0.13
UA	MW-304	B	2017/11/28	Eh	V	0.24
UA	MW-304	B	2018/06/27	Eh	V	0.25
UA	MW-304	B	2018/09/26	Eh	V	0.027
UA	MW-304	B	2019/03/20	Eh	V	-0.10
UA	MW-304	B	2019/09/25	Eh	V	0.18
UA	MW-304	B	2020/03/26	Eh	V	0.18
UA	MW-304	B	2020/09/17	Eh	V	0.15
UA	MW-304	B	2021/03/09	Eh	V	0.19
UA	MW-304	B	2021/06/21	Eh	V	0.12
UA	MW-304	B	2021/09/14	Eh	V	0.17
UA	MW-304	B	2021/12/14	Eh	V	0.25
UA	MW-304	B	2022/03/28	Eh	V	0.18
UA	MW-304	B	2022/06/14	Eh	V	0.30
UA	MW-304	B	2022/09/29	Eh	V	0.28
UA	MW-304	B	2022/10/26	Eh	V	0.23
UA	MW-304	B	2022/11/17	Eh	V	0.36
UA	MW-304	B	2022/12/05	Eh	V	0.24
UA	MW-304	B	2022/12/14	Eh	V	0.39
UA	MW-304	B	2023/01/11	Eh	V	0.25

UA	MW-304	B	2023/02/20	Eh	V	0.25
UA	MW-304	B	2023/03/15	Eh	V	0.23
UA	MW-304	B	2023/04/04	Eh	V	0.100
UA	MW-304	B	2023/05/22	Eh	V	0.31
UA	MW-304	B	2023/08/03	Eh	V	0.27
UA	MW-304	B	2023/11/01	Eh	V	0.14
UA	MW-304	B	2017/07/28	Alkalinity, bicarbonate	mg/L CaCO3	800
UA	MW-304	B	2020/03/26	Alkalinity, bicarbonate	mg/L CaCO3	802
UA	MW-304	B	2020/09/17	Alkalinity, bicarbonate	mg/L CaCO3	836
UA	MW-304	B	2021/03/09	Alkalinity, bicarbonate	mg/L CaCO3	784
UA	MW-304	B	2021/09/14	Alkalinity, bicarbonate	mg/L CaCO3	784
UA	MW-304	B	2022/03/28	Alkalinity, bicarbonate	mg/L CaCO3	843
UA	MW-304	B	2022/09/29	Alkalinity, bicarbonate	mg/L CaCO3	826
UA	MW-304	B	2022/10/26	Alkalinity, bicarbonate	mg/L CaCO3	801
UA	MW-304	B	2022/11/17	Alkalinity, bicarbonate	mg/L CaCO3	818
UA	MW-304	B	2022/12/14	Alkalinity, bicarbonate	mg/L CaCO3	833
UA	MW-304	B	2023/01/11	Alkalinity, bicarbonate	mg/L CaCO3	844
UA	MW-304	B	2023/02/20	Alkalinity, bicarbonate	mg/L CaCO3	854
UA	MW-304	B	2023/03/15	Alkalinity, bicarbonate	mg/L CaCO3	814
UA	MW-304	B	2023/04/04	Alkalinity, bicarbonate	mg/L CaCO3	853
UA	MW-304	B	2023/05/22	Alkalinity, bicarbonate	mg/L CaCO3	836
UA	MW-304	B	2023/08/03	Alkalinity, bicarbonate	mg/L CaCO3	838
UA	MW-304	B	2023/11/01	Alkalinity, bicarbonate	mg/L CaCO3	823
UA	MW-304	B	2022/09/29	Alkalinity, carbonate	mg/L CaCO3	10.0
UA	MW-304	B	2022/10/26	Alkalinity, carbonate	mg/L CaCO3	24.0
UA	MW-304	B	2023/11/01	Alkalinity, carbonate	mg/L CaCO3	32.0
UA	MW-304	B	2015/12/29	Barium, total	mg/L	0.0191
UA	MW-304	B	2016/03/21	Barium, total	mg/L	0.0195
UA	MW-304	B	2016/06/21	Barium, total	mg/L	0.0199
UA	MW-304	B	2016/09/19	Barium, total	mg/L	0.0238
UA	MW-304	B	2016/12/27	Barium, total	mg/L	0.0199
UA	MW-304	B	2017/03/16	Barium, total	mg/L	0.0171
UA	MW-304	B	2017/06/21	Barium, total	mg/L	0.0206
UA	MW-304	B	2017/07/28	Barium, total	mg/L	0.0193
UA	MW-304	B	2018/06/27	Barium, total	mg/L	0.0210
UA	MW-304	B	2018/09/26	Barium, total	mg/L	0.0229
UA	MW-304	B	2019/03/20	Barium, total	mg/L	0.0214
UA	MW-304	B	2019/09/25	Barium, total	mg/L	0.0211
UA	MW-304	B	2020/03/26	Barium, total	mg/L	0.0212
UA	MW-304	B	2020/09/17	Barium, total	mg/L	0.0192
UA	MW-304	B	2021/03/09	Barium, total	mg/L	0.0200
UA	MW-304	B	2021/09/14	Barium, total	mg/L	0.0189
UA	MW-304	B	2022/03/28	Barium, total	mg/L	0.0194
UA	MW-304	B	2022/09/29	Barium, total	mg/L	0.0183
UA	MW-304	B	2022/10/26	Barium, total	mg/L	0.0186
UA	MW-304	B	2022/11/17	Barium, total	mg/L	0.0209
UA	MW-304	B	2022/12/14	Barium, total	mg/L	0.0191
UA	MW-304	B	2023/01/11	Barium, total	mg/L	0.0173
UA	MW-304	B	2023/02/20	Barium, total	mg/L	0.0216
UA	MW-304	B	2023/03/15	Barium, total	mg/L	0.0206
UA	MW-304	B	2023/04/04	Barium, total	mg/L	0.0324
UA	MW-304	B	2023/05/22	Barium, total	mg/L	0.0199
UA	MW-304	B	2023/08/03	Barium, total	mg/L	0.0201
UA	MW-304	B	2023/11/01	Barium, total	mg/L	0.0199
UA	MW-304	B	2015/12/29	Boron, total	mg/L	1.28
UA	MW-304	B	2016/03/21	Boron, total	mg/L	1.27
UA	MW-304	B	2016/06/21	Boron, total	mg/L	1.33

UA	MW-304	B	2016/09/19	Boron, total	mg/L	1.95
UA	MW-304	B	2016/12/27	Boron, total	mg/L	1.51
UA	MW-304	B	2017/03/16	Boron, total	mg/L	1.49
UA	MW-304	B	2017/06/21	Boron, total	mg/L	1.55
UA	MW-304	B	2017/07/28	Boron, total	mg/L	1.42
UA	MW-304	B	2017/11/28	Boron, total	mg/L	1.45
UA	MW-304	B	2018/06/27	Boron, total	mg/L	1.75
UA	MW-304	B	2018/09/26	Boron, total	mg/L	1.74
UA	MW-304	B	2019/03/20	Boron, total	mg/L	1.82
UA	MW-304	B	2019/09/25	Boron, total	mg/L	1.84
UA	MW-304	B	2020/03/26	Boron, total	mg/L	1.66
UA	MW-304	B	2020/09/17	Boron, total	mg/L	1.89
UA	MW-304	B	2021/03/09	Boron, total	mg/L	1.57
UA	MW-304	B	2021/09/14	Boron, total	mg/L	1.61
UA	MW-304	B	2022/03/28	Boron, total	mg/L	1.71
UA	MW-304	B	2022/09/29	Boron, total	mg/L	1.75
UA	MW-304	B	2022/10/26	Boron, total	mg/L	1.76
UA	MW-304	B	2022/11/17	Boron, total	mg/L	1.91
UA	MW-304	B	2022/12/14	Boron, total	mg/L	2.16
UA	MW-304	B	2023/01/11	Boron, total	mg/L	1.68
UA	MW-304	B	2023/02/20	Boron, total	mg/L	1.75
UA	MW-304	B	2023/03/15	Boron, total	mg/L	1.89
UA	MW-304	B	2023/04/04	Boron, total	mg/L	1.69
UA	MW-304	B	2023/05/22	Boron, total	mg/L	1.68
UA	MW-304	B	2023/08/03	Boron, total	mg/L	1.61
UA	MW-304	B	2023/11/01	Boron, total	mg/L	1.67
UA	MW-304	B	2015/12/29	Calcium, total	mg/L	9.64
UA	MW-304	B	2016/03/21	Calcium, total	mg/L	9.86
UA	MW-304	B	2016/06/21	Calcium, total	mg/L	14.3
UA	MW-304	B	2016/09/19	Calcium, total	mg/L	16.5
UA	MW-304	B	2016/12/27	Calcium, total	mg/L	15.4
UA	MW-304	B	2017/03/16	Calcium, total	mg/L	6.91
UA	MW-304	B	2017/06/21	Calcium, total	mg/L	17.8
UA	MW-304	B	2017/07/28	Calcium, total	mg/L	13.2
UA	MW-304	B	2017/11/28	Calcium, total	mg/L	11.4
UA	MW-304	B	2018/06/27	Calcium, total	mg/L	12.9
UA	MW-304	B	2018/09/26	Calcium, total	mg/L	13.1
UA	MW-304	B	2019/03/20	Calcium, total	mg/L	13.7
UA	MW-304	B	2019/09/25	Calcium, total	mg/L	18.4
UA	MW-304	B	2020/03/26	Calcium, total	mg/L	17.2
UA	MW-304	B	2020/09/17	Calcium, total	mg/L	15.3
UA	MW-304	B	2021/03/09	Calcium, total	mg/L	12.7
UA	MW-304	B	2021/09/14	Calcium, total	mg/L	13.3
UA	MW-304	B	2022/03/28	Calcium, total	mg/L	14.5
UA	MW-304	B	2022/09/29	Calcium, total	mg/L	10.2
UA	MW-304	B	2022/10/26	Calcium, total	mg/L	10.8
UA	MW-304	B	2022/11/17	Calcium, total	mg/L	9.48
UA	MW-304	B	2022/12/14	Calcium, total	mg/L	10.0
UA	MW-304	B	2023/01/11	Calcium, total	mg/L	8.50
UA	MW-304	B	2023/02/20	Calcium, total	mg/L	10.7
UA	MW-304	B	2023/03/15	Calcium, total	mg/L	10.6
UA	MW-304	B	2023/04/04	Calcium, total	mg/L	8.91
UA	MW-304	B	2023/05/22	Calcium, total	mg/L	9.63
UA	MW-304	B	2023/08/03	Calcium, total	mg/L	11.4
UA	MW-304	B	2023/11/01	Calcium, total	mg/L	12.0
UA	MW-304	B	2015/12/29	Chloride, total	mg/L	124
UA	MW-304	B	2016/03/21	Chloride, total	mg/L	131

UA	MW-304	B	2016/06/21	Chloride, total	mg/L	140
UA	MW-304	B	2016/09/19	Chloride, total	mg/L	138
UA	MW-304	B	2016/12/27	Chloride, total	mg/L	141
UA	MW-304	B	2017/03/16	Chloride, total	mg/L	144
UA	MW-304	B	2017/06/21	Chloride, total	mg/L	152
UA	MW-304	B	2017/07/28	Chloride, total	mg/L	155
UA	MW-304	B	2017/11/28	Chloride, total	mg/L	138
UA	MW-304	B	2018/06/27	Chloride, total	mg/L	151
UA	MW-304	B	2018/09/26	Chloride, total	mg/L	151
UA	MW-304	B	2019/03/20	Chloride, total	mg/L	148
UA	MW-304	B	2019/09/25	Chloride, total	mg/L	152
UA	MW-304	B	2020/03/26	Chloride, total	mg/L	153
UA	MW-304	B	2020/09/17	Chloride, total	mg/L	161
UA	MW-304	B	2021/03/09	Chloride, total	mg/L	159
UA	MW-304	B	2021/09/14	Chloride, total	mg/L	168
UA	MW-304	B	2022/03/28	Chloride, total	mg/L	161
UA	MW-304	B	2022/09/29	Chloride, total	mg/L	174
UA	MW-304	B	2022/10/26	Chloride, total	mg/L	175
UA	MW-304	B	2022/11/17	Chloride, total	mg/L	175
UA	MW-304	B	2022/12/14	Chloride, total	mg/L	181
UA	MW-304	B	2023/01/11	Chloride, total	mg/L	185
UA	MW-304	B	2023/02/20	Chloride, total	mg/L	186
UA	MW-304	B	2023/03/15	Chloride, total	mg/L	173
UA	MW-304	B	2023/04/04	Chloride, total	mg/L	168
UA	MW-304	B	2023/05/22	Chloride, total	mg/L	162
UA	MW-304	B	2023/08/03	Chloride, total	mg/L	160
UA	MW-304	B	2023/11/01	Chloride, total	mg/L	166
UA	MW-304	B	2017/03/16	Iron, dissolved	mg/L	<0.007
UA	MW-304	B	2017/06/21	Iron, dissolved	mg/L	<0.007
UA	MW-304	B	2017/09/21	Iron, dissolved	mg/L	<0.007
UA	MW-304	B	2017/11/28	Iron, dissolved	mg/L	<0.007
UA	MW-304	B	2018/03/19	Iron, dissolved	mg/L	<0.007
UA	MW-304	B	2018/06/27	Iron, dissolved	mg/L	<0.02
UA	MW-304	B	2018/09/26	Iron, dissolved	mg/L	<0.02
UA	MW-304	B	2018/12/19	Iron, dissolved	mg/L	<0.02
UA	MW-304	B	2019/03/20	Iron, dissolved	mg/L	<0.02
UA	MW-304	B	2019/06/25	Iron, dissolved	mg/L	<0.02
UA	MW-304	B	2019/09/25	Iron, dissolved	mg/L	<0.02
UA	MW-304	B	2019/12/19	Iron, dissolved	mg/L	<0.02
UA	MW-304	B	2020/03/26	Iron, dissolved	mg/L	<0.02
UA	MW-304	B	2020/06/23	Iron, dissolved	mg/L	<0.02
UA	MW-304	B	2020/09/17	Iron, dissolved	mg/L	<0.02
UA	MW-304	B	2020/12/16	Iron, dissolved	mg/L	<0.02
UA	MW-304	B	2021/03/09	Iron, dissolved	mg/L	<0.02
UA	MW-304	B	2021/06/21	Iron, dissolved	mg/L	<0.02
UA	MW-304	B	2021/09/14	Iron, dissolved	mg/L	<0.02
UA	MW-304	B	2021/12/14	Iron, dissolved	mg/L	<0.02
UA	MW-304	B	2022/03/28	Iron, dissolved	mg/L	<0.0115
UA	MW-304	B	2022/06/14	Iron, dissolved	mg/L	<0.02
UA	MW-304	B	2022/09/29	Iron, dissolved	mg/L	<0.0115
UA	MW-304	B	2022/12/05	Iron, dissolved	mg/L	<0.0115
UA	MW-304	B	2023/03/15	Iron, dissolved	mg/L	<0.0115
UA	MW-304	B	2023/05/22	Iron, dissolved	mg/L	<0.02
UA	MW-304	B	2023/08/03	Iron, dissolved	mg/L	<0.0115
UA	MW-304	B	2023/11/01	Iron, dissolved	mg/L	<0.0115
UA	MW-304	B	2017/07/28	Magnesium, total	mg/L	5.33
UA	MW-304	B	2020/03/26	Magnesium, total	mg/L	7.14

UA	MW-304	B	2020/09/17	Magnesium, total	mg/L	6.18
UA	MW-304	B	2021/03/09	Magnesium, total	mg/L	5.62
UA	MW-304	B	2021/09/14	Magnesium, total	mg/L	5.79
UA	MW-304	B	2022/03/28	Magnesium, total	mg/L	6.11
UA	MW-304	B	2022/09/29	Magnesium, total	mg/L	4.42
UA	MW-304	B	2022/10/26	Magnesium, total	mg/L	4.74
UA	MW-304	B	2022/11/17	Magnesium, total	mg/L	4.29
UA	MW-304	B	2022/12/14	Magnesium, total	mg/L	4.23
UA	MW-304	B	2023/01/11	Magnesium, total	mg/L	3.84
UA	MW-304	B	2023/02/20	Magnesium, total	mg/L	4.39
UA	MW-304	B	2023/03/15	Magnesium, total	mg/L	4.47
UA	MW-304	B	2023/04/04	Magnesium, total	mg/L	3.90
UA	MW-304	B	2023/05/22	Magnesium, total	mg/L	4.36
UA	MW-304	B	2023/08/03	Magnesium, total	mg/L	4.76
UA	MW-304	B	2023/11/01	Magnesium, total	mg/L	5.02
UA	MW-304	B	2017/03/16	Manganese, dissolved	mg/L	<0.0005
UA	MW-304	B	2017/06/21	Manganese, dissolved	mg/L	<0.0005
UA	MW-304	B	2017/09/21	Manganese, dissolved	mg/L	<0.0005
UA	MW-304	B	2017/11/28	Manganese, dissolved	mg/L	<0.0005
UA	MW-304	B	2018/03/19	Manganese, dissolved	mg/L	<0.0005
UA	MW-304	B	2018/06/27	Manganese, dissolved	mg/L	<0.0025
UA	MW-304	B	2018/09/26	Manganese, dissolved	mg/L	<0.0025
UA	MW-304	B	2018/12/19	Manganese, dissolved	mg/L	<0.0025
UA	MW-304	B	2019/03/20	Manganese, dissolved	mg/L	<0.0025
UA	MW-304	B	2019/06/25	Manganese, dissolved	mg/L	<0.0025
UA	MW-304	B	2019/09/25	Manganese, dissolved	mg/L	<0.0025
UA	MW-304	B	2019/12/19	Manganese, dissolved	mg/L	<0.0025
UA	MW-304	B	2020/03/26	Manganese, dissolved	mg/L	<0.0025
UA	MW-304	B	2020/06/23	Manganese, dissolved	mg/L	<0.0025
UA	MW-304	B	2020/09/17	Manganese, dissolved	mg/L	<0.0025
UA	MW-304	B	2020/12/16	Manganese, dissolved	mg/L	<0.0025
UA	MW-304	B	2021/03/09	Manganese, dissolved	mg/L	<0.0025
UA	MW-304	B	2021/06/21	Manganese, dissolved	mg/L	<0.0025
UA	MW-304	B	2021/09/14	Manganese, dissolved	mg/L	<0.0025
UA	MW-304	B	2021/12/14	Manganese, dissolved	mg/L	<0.0025
UA	MW-304	B	2022/03/28	Manganese, dissolved	mg/L	0.00290
UA	MW-304	B	2022/06/14	Manganese, dissolved	mg/L	<0.0025
UA	MW-304	B	2022/09/29	Manganese, dissolved	mg/L	0.00130
UA	MW-304	B	2022/12/05	Manganese, dissolved	mg/L	0.00230
UA	MW-304	B	2023/03/15	Manganese, dissolved	mg/L	0.00140
UA	MW-304	B	2023/05/22	Manganese, dissolved	mg/L	<0.0025
UA	MW-304	B	2023/08/03	Manganese, dissolved	mg/L	0.00140
UA	MW-304	B	2023/11/01	Manganese, dissolved	mg/L	0.00200
UA	MW-304	B	2023/05/22	Phosphate, dissolved	mg/L	0.0520
UA	MW-304	B	2023/08/03	Phosphate, dissolved	mg/L	0.0310
UA	MW-304	B	2017/07/28	Potassium, total	mg/L	2.18
UA	MW-304	B	2020/03/26	Potassium, total	mg/L	2.36
UA	MW-304	B	2020/09/17	Potassium, total	mg/L	2.48
UA	MW-304	B	2021/03/09	Potassium, total	mg/L	2.12
UA	MW-304	B	2021/09/14	Potassium, total	mg/L	2.36
UA	MW-304	B	2022/03/28	Potassium, total	mg/L	2.34
UA	MW-304	B	2022/09/29	Potassium, total	mg/L	2.20
UA	MW-304	B	2022/10/26	Potassium, total	mg/L	2.15
UA	MW-304	B	2022/11/17	Potassium, total	mg/L	1.98
UA	MW-304	B	2022/12/14	Potassium, total	mg/L	2.05
UA	MW-304	B	2023/01/11	Potassium, total	mg/L	2.08
UA	MW-304	B	2023/02/20	Potassium, total	mg/L	2.33

UA	MW-304	B	2023/03/15	Potassium, total	mg/L	2.10
UA	MW-304	B	2023/04/04	Potassium, total	mg/L	2.40
UA	MW-304	B	2023/05/22	Potassium, total	mg/L	2.41
UA	MW-304	B	2023/08/03	Potassium, total	mg/L	2.31
UA	MW-304	B	2023/11/01	Potassium, total	mg/L	2.26
UA	MW-304	B	2023/05/22	Silicon, dissolved	mg/L	3.85
UA	MW-304	B	2023/08/03	Silicon, dissolved	mg/L	3.55
UA	MW-304	B	2017/07/28	Sodium, total	mg/L	516
UA	MW-304	B	2020/03/26	Sodium, total	mg/L	556
UA	MW-304	B	2020/09/17	Sodium, total	mg/L	631
UA	MW-304	B	2021/03/09	Sodium, total	mg/L	570
UA	MW-304	B	2021/09/14	Sodium, total	mg/L	565
UA	MW-304	B	2022/03/28	Sodium, total	mg/L	555
UA	MW-304	B	2022/09/29	Sodium, total	mg/L	570
UA	MW-304	B	2022/10/26	Sodium, total	mg/L	587
UA	MW-304	B	2022/11/17	Sodium, total	mg/L	564
UA	MW-304	B	2022/12/14	Sodium, total	mg/L	604
UA	MW-304	B	2023/01/11	Sodium, total	mg/L	626
UA	MW-304	B	2023/02/20	Sodium, total	mg/L	617
UA	MW-304	B	2023/03/15	Sodium, total	mg/L	569
UA	MW-304	B	2023/04/04	Sodium, total	mg/L	642
UA	MW-304	B	2023/05/22	Sodium, total	mg/L	582
UA	MW-304	B	2023/08/03	Sodium, total	mg/L	617
UA	MW-304	B	2023/11/01	Sodium, total	mg/L	629
UA	MW-304	B	2015/12/29	Sulfate, total	mg/L	157
UA	MW-304	B	2016/03/21	Sulfate, total	mg/L	163
UA	MW-304	B	2016/06/21	Sulfate, total	mg/L	200
UA	MW-304	B	2016/09/19	Sulfate, total	mg/L	176
UA	MW-304	B	2016/12/27	Sulfate, total	mg/L	177
UA	MW-304	B	2017/03/16	Sulfate, total	mg/L	166
UA	MW-304	B	2017/06/21	Sulfate, total	mg/L	177
UA	MW-304	B	2017/07/28	Sulfate, total	mg/L	187
UA	MW-304	B	2017/11/28	Sulfate, total	mg/L	178
UA	MW-304	B	2018/06/27	Sulfate, total	mg/L	208
UA	MW-304	B	2018/09/26	Sulfate, total	mg/L	201
UA	MW-304	B	2019/03/20	Sulfate, total	mg/L	177
UA	MW-304	B	2019/09/25	Sulfate, total	mg/L	169
UA	MW-304	B	2020/03/26	Sulfate, total	mg/L	177
UA	MW-304	B	2020/09/17	Sulfate, total	mg/L	196
UA	MW-304	B	2021/03/09	Sulfate, total	mg/L	194
UA	MW-304	B	2021/09/14	Sulfate, total	mg/L	231
UA	MW-304	B	2022/03/28	Sulfate, total	mg/L	198
UA	MW-304	B	2022/09/29	Sulfate, total	mg/L	199
UA	MW-304	B	2022/10/26	Sulfate, total	mg/L	193
UA	MW-304	B	2022/11/17	Sulfate, total	mg/L	218
UA	MW-304	B	2022/12/14	Sulfate, total	mg/L	216
UA	MW-304	B	2023/01/11	Sulfate, total	mg/L	209
UA	MW-304	B	2023/02/20	Sulfate, total	mg/L	228
UA	MW-304	B	2023/03/15	Sulfate, total	mg/L	208
UA	MW-304	B	2023/04/04	Sulfate, total	mg/L	210
UA	MW-304	B	2023/05/22	Sulfate, total	mg/L	208
UA	MW-304	B	2023/08/03	Sulfate, total	mg/L	188
UA	MW-304	B	2023/11/01	Sulfate, total	mg/L	191
UA	MW-304	B	2015/12/29	Temperature (Celsius)	degrees C	14.8
UA	MW-304	B	2016/03/21	Temperature (Celsius)	degrees C	15.6
UA	MW-304	B	2016/06/21	Temperature (Celsius)	degrees C	17.9
UA	MW-304	B	2016/09/19	Temperature (Celsius)	degrees C	25.2

UA	MW-304	B	2016/12/27	Temperature (Celsius)	degrees C	13.4
UA	MW-304	B	2017/03/16	Temperature (Celsius)	degrees C	12.5
UA	MW-304	B	2017/06/21	Temperature (Celsius)	degrees C	23.9
UA	MW-304	B	2017/07/28	Temperature (Celsius)	degrees C	19.7
UA	MW-304	B	2017/09/21	Temperature (Celsius)	degrees C	16.8
UA	MW-304	B	2017/11/28	Temperature (Celsius)	degrees C	15.9
UA	MW-304	B	2018/03/19	Temperature (Celsius)	degrees C	14.6
UA	MW-304	B	2018/06/27	Temperature (Celsius)	degrees C	20.5
UA	MW-304	B	2018/09/26	Temperature (Celsius)	degrees C	20.3
UA	MW-304	B	2018/12/19	Temperature (Celsius)	degrees C	14.4
UA	MW-304	B	2019/03/20	Temperature (Celsius)	degrees C	13.4
UA	MW-304	B	2019/06/25	Temperature (Celsius)	degrees C	16.5
UA	MW-304	B	2019/09/25	Temperature (Celsius)	degrees C	17.6
UA	MW-304	B	2019/12/19	Temperature (Celsius)	degrees C	13.6
UA	MW-304	B	2020/03/26	Temperature (Celsius)	degrees C	14.0
UA	MW-304	B	2020/06/23	Temperature (Celsius)	degrees C	15.5
UA	MW-304	B	2020/09/17	Temperature (Celsius)	degrees C	16.5
UA	MW-304	B	2020/12/16	Temperature (Celsius)	degrees C	13.9
UA	MW-304	B	2021/03/09	Temperature (Celsius)	degrees C	15.2
UA	MW-304	B	2021/06/21	Temperature (Celsius)	degrees C	16.2
UA	MW-304	B	2021/09/14	Temperature (Celsius)	degrees C	17.2
UA	MW-304	B	2021/12/14	Temperature (Celsius)	degrees C	15.0
UA	MW-304	B	2022/03/28	Temperature (Celsius)	degrees C	13.4
UA	MW-304	B	2022/06/14	Temperature (Celsius)	degrees C	18.3
UA	MW-304	B	2022/09/29	Temperature (Celsius)	degrees C	16.5
UA	MW-304	B	2022/10/26	Temperature (Celsius)	degrees C	16.8
UA	MW-304	B	2022/11/17	Temperature (Celsius)	degrees C	15.4
UA	MW-304	B	2022/12/05	Temperature (Celsius)	degrees C	14.5
UA	MW-304	B	2022/12/14	Temperature (Celsius)	degrees C	15.4
UA	MW-304	B	2023/01/11	Temperature (Celsius)	degrees C	15.5
UA	MW-304	B	2023/02/20	Temperature (Celsius)	degrees C	14.4
UA	MW-304	B	2023/03/15	Temperature (Celsius)	degrees C	13.2
UA	MW-304	B	2023/04/04	Temperature (Celsius)	degrees C	15.8
UA	MW-304	B	2023/05/22	Temperature (Celsius)	degrees C	15.2
UA	MW-304	B	2023/08/03	Temperature (Celsius)	degrees C	16.2
UA	MW-304	B	2023/11/01	Temperature (Celsius)	degrees C	15.3
UA	MW-304	B	2015/12/29	Total Dissolved Solids	mg/L	1,090
UA	MW-304	B	2016/03/21	Total Dissolved Solids	mg/L	1,200
UA	MW-304	B	2016/06/21	Total Dissolved Solids	mg/L	1,220
UA	MW-304	B	2016/09/19	Total Dissolved Solids	mg/L	1,220
UA	MW-304	B	2016/12/27	Total Dissolved Solids	mg/L	1,230
UA	MW-304	B	2017/03/16	Total Dissolved Solids	mg/L	1,280
UA	MW-304	B	2017/06/21	Total Dissolved Solids	mg/L	1,360
UA	MW-304	B	2017/07/28	Total Dissolved Solids	mg/L	1,330
UA	MW-304	B	2017/09/21	Total Dissolved Solids	mg/L	1,350
UA	MW-304	B	2017/11/28	Total Dissolved Solids	mg/L	1,330
UA	MW-304	B	2018/03/19	Total Dissolved Solids	mg/L	1,360
UA	MW-304	B	2018/06/27	Total Dissolved Solids	mg/L	1,360
UA	MW-304	B	2018/09/26	Total Dissolved Solids	mg/L	1,420
UA	MW-304	B	2018/12/19	Total Dissolved Solids	mg/L	1,440
UA	MW-304	B	2019/03/20	Total Dissolved Solids	mg/L	1,390
UA	MW-304	B	2019/06/25	Total Dissolved Solids	mg/L	1,420
UA	MW-304	B	2019/09/25	Total Dissolved Solids	mg/L	1,350
UA	MW-304	B	2019/12/19	Total Dissolved Solids	mg/L	1,450
UA	MW-304	B	2020/03/26	Total Dissolved Solids	mg/L	1,320
UA	MW-304	B	2020/06/23	Total Dissolved Solids	mg/L	1,410
UA	MW-304	B	2020/09/17	Total Dissolved Solids	mg/L	1,320

UA	MW-304	B	2020/12/16	Total Dissolved Solids	mg/L	1,440
UA	MW-304	B	2021/03/09	Total Dissolved Solids	mg/L	1,350
UA	MW-304	B	2021/06/21	Total Dissolved Solids	mg/L	1,440
UA	MW-304	B	2021/09/14	Total Dissolved Solids	mg/L	1,290
UA	MW-304	B	2021/12/14	Total Dissolved Solids	mg/L	1,400
UA	MW-304	B	2022/03/28	Total Dissolved Solids	mg/L	1,410
UA	MW-304	B	2022/06/14	Total Dissolved Solids	mg/L	1,430
UA	MW-304	B	2022/09/29	Total Dissolved Solids	mg/L	1,470
UA	MW-304	B	2022/10/26	Total Dissolved Solids	mg/L	1,450
UA	MW-304	B	2022/11/17	Total Dissolved Solids	mg/L	1,490
UA	MW-304	B	2022/12/05	Total Dissolved Solids	mg/L	1,480
UA	MW-304	B	2022/12/14	Total Dissolved Solids	mg/L	1,300
UA	MW-304	B	2023/01/11	Total Dissolved Solids	mg/L	1,450
UA	MW-304	B	2023/02/20	Total Dissolved Solids	mg/L	1,470
UA	MW-304	B	2023/03/15	Total Dissolved Solids	mg/L	1,230
UA	MW-304	B	2023/04/04	Total Dissolved Solids	mg/L	1,460
UA	MW-304	B	2023/05/22	Total Dissolved Solids	mg/L	1,420
UA	MW-304	B	2023/08/03	Total Dissolved Solids	mg/L	1,380
UA	MW-304	B	2023/11/01	Total Dissolved Solids	mg/L	1,470
UA	MW-358	B	2022/10/27	pH (field)	SU	7.9
UA	MW-358	B	2022/11/17	pH (field)	SU	7.8
UA	MW-358	B	2022/12/13	pH (field)	SU	8.4
UA	MW-358	B	2023/01/11	pH (field)	SU	7.6
UA	MW-358	B	2023/02/20	pH (field)	SU	8.4
UA	MW-358	B	2023/03/13	pH (field)	SU	7.7
UA	MW-358	B	2023/04/04	pH (field)	SU	7.7
UA	MW-358	B	2023/05/19	pH (field)	SU	7.6
UA	MW-358	B	2023/08/07	pH (field)	SU	8.0
UA	MW-358	B	2023/11/01	pH (field)	SU	7.9
UA	MW-358	B	2022/10/27	Oxidation Reduction Potential	mV	-167
UA	MW-358	B	2022/11/17	Oxidation Reduction Potential	mV	200
UA	MW-358	B	2022/12/13	Oxidation Reduction Potential	mV	-266
UA	MW-358	B	2023/01/11	Oxidation Reduction Potential	mV	180
UA	MW-358	B	2023/02/20	Oxidation Reduction Potential	mV	-132
UA	MW-358	B	2023/03/13	Oxidation Reduction Potential	mV	-188
UA	MW-358	B	2023/04/04	Oxidation Reduction Potential	mV	-207
UA	MW-358	B	2023/05/19	Oxidation Reduction Potential	mV	-91.0
UA	MW-358	B	2023/08/07	Oxidation Reduction Potential	mV	-42.0
UA	MW-358	B	2023/11/01	Oxidation Reduction Potential	mV	-162
UA	MW-358	B	2022/10/27	Eh	V	0.029
UA	MW-358	B	2022/11/17	Eh	V	0.40
UA	MW-358	B	2022/12/13	Eh	V	-0.068
UA	MW-358	B	2023/01/11	Eh	V	0.38
UA	MW-358	B	2023/02/20	Eh	V	0.064
UA	MW-358	B	2023/03/13	Eh	V	0.0094
UA	MW-358	B	2023/04/04	Eh	V	-0.013
UA	MW-358	B	2023/05/19	Eh	V	0.10
UA	MW-358	B	2023/08/07	Eh	V	0.15
UA	MW-358	B	2023/11/01	Eh	V	0.034
UA	MW-358	B	2022/10/27	Alkalinity, bicarbonate	mg/L CaCO3	601
UA	MW-358	B	2022/11/17	Alkalinity, bicarbonate	mg/L CaCO3	758
UA	MW-358	B	2022/12/13	Alkalinity, bicarbonate	mg/L CaCO3	859
UA	MW-358	B	2023/01/11	Alkalinity, bicarbonate	mg/L CaCO3	841
UA	MW-358	B	2023/02/20	Alkalinity, bicarbonate	mg/L CaCO3	847
UA	MW-358	B	2023/03/13	Alkalinity, bicarbonate	mg/L CaCO3	856
UA	MW-358	B	2023/04/04	Alkalinity, bicarbonate	mg/L CaCO3	851
UA	MW-358	B	2023/05/19	Alkalinity, bicarbonate	mg/L CaCO3	817

UA	MW-358	B	2023/08/07	Alkalinity, bicarbonate	mg/L CaCO3	833
UA	MW-358	B	2023/11/01	Alkalinity, bicarbonate	mg/L CaCO3	829
UA	MW-358	B	2022/10/27	Alkalinity, carbonate	mg/L CaCO3	32.0
UA	MW-358	B	2023/05/19	Alkalinity, carbonate	mg/L CaCO3	18.0
UA	MW-358	B	2023/08/07	Alkalinity, carbonate	mg/L CaCO3	10.0
UA	MW-358	B	2023/11/01	Alkalinity, carbonate	mg/L CaCO3	11.0
UA	MW-358	B	2022/10/27	Barium, total	mg/L	0.0933
UA	MW-358	B	2022/11/17	Barium, total	mg/L	0.172
UA	MW-358	B	2022/12/13	Barium, total	mg/L	0.168
UA	MW-358	B	2023/01/11	Barium, total	mg/L	0.165
UA	MW-358	B	2023/02/20	Barium, total	mg/L	0.201
UA	MW-358	B	2023/03/13	Barium, total	mg/L	0.166
UA	MW-358	B	2023/04/04	Barium, total	mg/L	0.261
UA	MW-358	B	2023/05/19	Barium, total	mg/L	0.192
UA	MW-358	B	2023/08/07	Barium, total	mg/L	0.235
UA	MW-358	B	2023/11/01	Barium, total	mg/L	0.162
UA	MW-358	B	2022/10/27	Boron, total	mg/L	1.10
UA	MW-358	B	2022/11/17	Boron, total	mg/L	1.25
UA	MW-358	B	2022/12/13	Boron, total	mg/L	1.67
UA	MW-358	B	2023/01/11	Boron, total	mg/L	1.38
UA	MW-358	B	2023/02/20	Boron, total	mg/L	1.42
UA	MW-358	B	2023/03/13	Boron, total	mg/L	1.51
UA	MW-358	B	2023/04/04	Boron, total	mg/L	1.45
UA	MW-358	B	2023/05/19	Boron, total	mg/L	1.60
UA	MW-358	B	2023/08/07	Boron, total	mg/L	1.60
UA	MW-358	B	2023/11/01	Boron, total	mg/L	1.38
UA	MW-358	B	2022/10/27	Calcium, total	mg/L	12.8
UA	MW-358	B	2022/11/17	Calcium, total	mg/L	15.8
UA	MW-358	B	2022/12/13	Calcium, total	mg/L	18.6
UA	MW-358	B	2023/01/11	Calcium, total	mg/L	14.0
UA	MW-358	B	2023/02/20	Calcium, total	mg/L	13.2
UA	MW-358	B	2023/03/13	Calcium, total	mg/L	10.9
UA	MW-358	B	2023/04/04	Calcium, total	mg/L	11.4
UA	MW-358	B	2023/05/19	Calcium, total	mg/L	12.5
UA	MW-358	B	2023/08/07	Calcium, total	mg/L	9.87
UA	MW-358	B	2023/11/01	Calcium, total	mg/L	11.3
UA	MW-358	B	2022/10/27	Chloride, total	mg/L	688
UA	MW-358	B	2022/11/17	Chloride, total	mg/L	992
UA	MW-358	B	2022/12/13	Chloride, total	mg/L	1,120
UA	MW-358	B	2023/01/11	Chloride, total	mg/L	1,200
UA	MW-358	B	2023/02/20	Chloride, total	mg/L	1,330
UA	MW-358	B	2023/03/13	Chloride, total	mg/L	1,340
UA	MW-358	B	2023/04/04	Chloride, total	mg/L	1,370
UA	MW-358	B	2023/05/19	Chloride, total	mg/L	1,300
UA	MW-358	B	2023/08/07	Chloride, total	mg/L	1,290
UA	MW-358	B	2023/11/01	Chloride, total	mg/L	1,310
UA	MW-358	B	2023/05/19	Iron, dissolved	mg/L	0.242
UA	MW-358	B	2023/08/07	Iron, dissolved	mg/L	0.221
UA	MW-358	B	2022/10/27	Magnesium, total	mg/L	5.66
UA	MW-358	B	2022/11/17	Magnesium, total	mg/L	7.53
UA	MW-358	B	2022/12/13	Magnesium, total	mg/L	8.62
UA	MW-358	B	2023/01/11	Magnesium, total	mg/L	6.96
UA	MW-358	B	2023/02/20	Magnesium, total	mg/L	6.40
UA	MW-358	B	2023/03/13	Magnesium, total	mg/L	5.64
UA	MW-358	B	2023/04/04	Magnesium, total	mg/L	5.89
UA	MW-358	B	2023/05/19	Magnesium, total	mg/L	6.07
UA	MW-358	B	2023/08/07	Magnesium, total	mg/L	5.06

UA	MW-358	B	2023/11/01	Magnesium, total	mg/L	5.80
UA	MW-358	B	2023/05/19	Manganese, dissolved	mg/L	0.182
UA	MW-358	B	2023/08/07	Manganese, dissolved	mg/L	0.160
UA	MW-358	B	2023/05/19	Phosphate, dissolved	mg/L	0.390
UA	MW-358	B	2023/08/07	Phosphate, dissolved	mg/L	0.252
UA	MW-358	B	2022/10/27	Potassium, total	mg/L	8.56
UA	MW-358	B	2022/11/17	Potassium, total	mg/L	7.33
UA	MW-358	B	2022/12/13	Potassium, total	mg/L	6.51
UA	MW-358	B	2023/01/11	Potassium, total	mg/L	5.58
UA	MW-358	B	2023/02/20	Potassium, total	mg/L	5.25
UA	MW-358	B	2023/03/13	Potassium, total	mg/L	4.05
UA	MW-358	B	2023/04/04	Potassium, total	mg/L	5.19
UA	MW-358	B	2023/05/19	Potassium, total	mg/L	4.48
UA	MW-358	B	2023/08/07	Potassium, total	mg/L	4.20
UA	MW-358	B	2023/11/01	Potassium, total	mg/L	3.90
UA	MW-358	B	2023/05/19	Silicon, dissolved	mg/L	3.54
UA	MW-358	B	2023/08/07	Silicon, dissolved	mg/L	3.56
UA	MW-358	B	2022/10/27	Sodium, total	mg/L	802
UA	MW-358	B	2022/11/17	Sodium, total	mg/L	991
UA	MW-358	B	2022/12/13	Sodium, total	mg/L	1,100
UA	MW-358	B	2023/01/11	Sodium, total	mg/L	1,250
UA	MW-358	B	2023/02/20	Sodium, total	mg/L	1,390
UA	MW-358	B	2023/03/13	Sodium, total	mg/L	1,190
UA	MW-358	B	2023/04/04	Sodium, total	mg/L	1,330
UA	MW-358	B	2023/05/19	Sodium, total	mg/L	1,260
UA	MW-358	B	2023/08/07	Sodium, total	mg/L	1,260
UA	MW-358	B	2023/11/01	Sodium, total	mg/L	1,320
UA	MW-358	B	2022/10/27	Sulfate, total	mg/L	108
UA	MW-358	B	2022/11/17	Sulfate, total	mg/L	101
UA	MW-358	B	2022/12/13	Sulfate, total	mg/L	71.0
UA	MW-358	B	2023/01/11	Sulfate, total	mg/L	34.0
UA	MW-358	B	2023/02/20	Sulfate, total	mg/L	16.0
UA	MW-358	B	2023/03/13	Sulfate, total	mg/L	8.00
UA	MW-358	B	2023/04/04	Sulfate, total	mg/L	<31
UA	MW-358	B	2023/05/19	Sulfate, total	mg/L	<12
UA	MW-358	B	2023/08/07	Sulfate, total	mg/L	9.00
UA	MW-358	B	2023/11/01	Sulfate, total	mg/L	11.0
UA	MW-358	B	2022/10/27	Temperature (Celsius)	degrees C	14.5
UA	MW-358	B	2022/11/17	Temperature (Celsius)	degrees C	13.3
UA	MW-358	B	2022/12/13	Temperature (Celsius)	degrees C	11.6
UA	MW-358	B	2023/01/11	Temperature (Celsius)	degrees C	14.9
UA	MW-358	B	2023/02/20	Temperature (Celsius)	degrees C	14.0
UA	MW-358	B	2023/03/13	Temperature (Celsius)	degrees C	12.2
UA	MW-358	B	2023/04/04	Temperature (Celsius)	degrees C	16.7
UA	MW-358	B	2023/05/19	Temperature (Celsius)	degrees C	18.2
UA	MW-358	B	2023/08/07	Temperature (Celsius)	degrees C	16.1
UA	MW-358	B	2023/11/01	Temperature (Celsius)	degrees C	14.6
UA	MW-358	B	2022/10/27	Total Dissolved Solids	mg/L	1,990
UA	MW-358	B	2022/11/17	Total Dissolved Solids	mg/L	2,620
UA	MW-358	B	2022/12/13	Total Dissolved Solids	mg/L	3,260
UA	MW-358	B	2023/01/11	Total Dissolved Solids	mg/L	2,690
UA	MW-358	B	2023/02/20	Total Dissolved Solids	mg/L	3,080
UA	MW-358	B	2023/03/13	Total Dissolved Solids	mg/L	2,880
UA	MW-358	B	2023/04/04	Total Dissolved Solids	mg/L	2,990
UA	MW-358	B	2023/05/19	Total Dissolved Solids	mg/L	3,040
UA	MW-358	B	2023/08/07	Total Dissolved Solids	mg/L	3,160
UA	MW-358	B	2023/11/01	Total Dissolved Solids	mg/L	3,140

UA	MW-350	C	2013/09/16	pH (field)	SU	12.3
UA	MW-350	C	2013/11/20	pH (field)	SU	11.8
UA	MW-350	C	2014/02/19	pH (field)	SU	8.1
UA	MW-350	C	2014/06/11	pH (field)	SU	12.4
UA	MW-350	C	2015/03/25	pH (field)	SU	12.8
UA	MW-350	C	2015/06/24	pH (field)	SU	12.5
UA	MW-350	C	2015/09/25	pH (field)	SU	12.6
UA	MW-350	C	2015/11/10	pH (field)	SU	12.2
UA	MW-350	C	2016/03/22	pH (field)	SU	12.6
UA	MW-350	C	2016/06/21	pH (field)	SU	12.2
UA	MW-350	C	2016/09/29	pH (field)	SU	12.1
UA	MW-350	C	2016/12/21	pH (field)	SU	11.9
UA	MW-350	C	2017/03/16	pH (field)	SU	12.2
UA	MW-350	C	2017/06/22	pH (field)	SU	11.7
UA	MW-350	C	2017/09/21	pH (field)	SU	11.4
UA	MW-350	C	2017/11/28	pH (field)	SU	11.7
UA	MW-350	C	2018/03/19	pH (field)	SU	11.4
UA	MW-350	C	2018/06/28	pH (field)	SU	11.2
UA	MW-350	C	2018/09/26	pH (field)	SU	11.6
UA	MW-350	C	2018/12/18	pH (field)	SU	11.7
UA	MW-350	C	2019/03/20	pH (field)	SU	11.9
UA	MW-350	C	2019/06/25	pH (field)	SU	11.9
UA	MW-350	C	2019/09/26	pH (field)	SU	11.0
UA	MW-350	C	2019/12/19	pH (field)	SU	10.9
UA	MW-350	C	2020/03/26	pH (field)	SU	11.7
UA	MW-350	C	2020/06/23	pH (field)	SU	11.4
UA	MW-350	C	2020/09/16	pH (field)	SU	11.0
UA	MW-350	C	2020/09/17	pH (field)	SU	10.7
UA	MW-350	C	2020/12/17	pH (field)	SU	11.1
UA	MW-350	C	2021/03/10	pH (field)	SU	11.0
UA	MW-350	C	2021/07/19	pH (field)	SU	8.4
UA	MW-350	C	2021/09/14	pH (field)	SU	8.0
UA	MW-350	C	2021/12/14	pH (field)	SU	10.1
UA	MW-350	C	2022/03/28	pH (field)	SU	11.6
UA	MW-350	C	2022/06/14	pH (field)	SU	11.4
UA	MW-350	C	2022/09/29	pH (field)	SU	11.6
UA	MW-350	C	2022/12/06	pH (field)	SU	11.3
UA	MW-350	C	2023/03/15	pH (field)	SU	11.5
UA	MW-350	C	2023/05/18	pH (field)	SU	11.4
UA	MW-350	C	2023/08/07	pH (field)	SU	11.5
UA	MW-350	C	2023/11/03	pH (field)	SU	8.4
UA	MW-350	C	2020/03/26	Oxidation Reduction Potential	mV	-299
UA	MW-350	C	2020/09/16	Oxidation Reduction Potential	mV	-270
UA	MW-350	C	2021/03/10	Oxidation Reduction Potential	mV	<-300
UA	MW-350	C	2021/07/19	Oxidation Reduction Potential	mV	-250
UA	MW-350	C	2021/09/14	Oxidation Reduction Potential	mV	-253
UA	MW-350	C	2021/12/14	Oxidation Reduction Potential	mV	-204
UA	MW-350	C	2022/03/28	Oxidation Reduction Potential	mV	-254
UA	MW-350	C	2022/06/14	Oxidation Reduction Potential	mV	-7.00
UA	MW-350	C	2022/09/29	Oxidation Reduction Potential	mV	-21.0
UA	MW-350	C	2022/12/06	Oxidation Reduction Potential	mV	<-300
UA	MW-350	C	2023/03/15	Oxidation Reduction Potential	mV	-147
UA	MW-350	C	2023/05/18	Oxidation Reduction Potential	mV	-123
UA	MW-350	C	2023/08/07	Oxidation Reduction Potential	mV	-7.00
UA	MW-350	C	2023/11/03	Oxidation Reduction Potential	mV	-242
UA	MW-350	C	2020/03/26	Eh	V	-0.10
UA	MW-350	C	2020/09/16	Eh	V	-0.074

UA	MW-350	C	2021/03/10	Eh	V	-0.10
UA	MW-350	C	2021/07/19	Eh	V	-0.056
UA	MW-350	C	2021/09/14	Eh	V	-0.059
UA	MW-350	C	2021/12/14	Eh	V	-0.0086
UA	MW-350	C	2022/03/28	Eh	V	-0.057
UA	MW-350	C	2022/06/14	Eh	V	0.19
UA	MW-350	C	2022/09/29	Eh	V	0.18
UA	MW-350	C	2022/12/06	Eh	V	-0.10
UA	MW-350	C	2023/03/15	Eh	V	0.050
UA	MW-350	C	2023/05/18	Eh	V	0.073
UA	MW-350	C	2023/08/07	Eh	V	0.19
UA	MW-350	C	2023/11/03	Eh	V	-0.046
UA	MW-350	C	2021/09/14	Alkalinity, bicarbonate	mg/L CaCO3	231
UA	MW-350	C	2020/03/26	Alkalinity, carbonate	mg/L CaCO3	62.0
UA	MW-350	C	2020/09/16	Alkalinity, carbonate	mg/L CaCO3	68.0
UA	MW-350	C	2021/03/10	Alkalinity, carbonate	mg/L CaCO3	78.0
UA	MW-350	C	2022/03/28	Alkalinity, carbonate	mg/L CaCO3	54.0
UA	MW-350	C	2022/09/29	Alkalinity, carbonate	mg/L CaCO3	56.0
UA	MW-350	C	2023/03/15	Alkalinity, carbonate	mg/L CaCO3	26.0
UA	MW-350	C	2023/05/18	Alkalinity, carbonate	mg/L CaCO3	55.0
UA	MW-350	C	2023/08/07	Alkalinity, carbonate	mg/L CaCO3	49.0
UA	MW-350	C	2023/11/03	Alkalinity, carbonate	mg/L CaCO3	92.0
UA	MW-350	C	2020/03/26	Barium, total	mg/L	0.244
UA	MW-350	C	2020/09/16	Barium, total	mg/L	0.165
UA	MW-350	C	2021/03/10	Barium, total	mg/L	0.169
UA	MW-350	C	2021/09/14	Barium, total	mg/L	0.179
UA	MW-350	C	2022/03/28	Barium, total	mg/L	0.329
UA	MW-350	C	2022/09/29	Barium, total	mg/L	0.296
UA	MW-350	C	2023/03/15	Barium, total	mg/L	0.304
UA	MW-350	C	2023/05/18	Barium, total	mg/L	0.327
UA	MW-350	C	2023/08/07	Barium, total	mg/L	0.267
UA	MW-350	C	2023/11/03	Barium, total	mg/L	0.201
UA	MW-350	C	2013/09/16	Boron, total	mg/L	0.0200
UA	MW-350	C	2020/03/26	Boron, total	mg/L	0.635
UA	MW-350	C	2020/09/16	Boron, total	mg/L	0.541
UA	MW-350	C	2021/03/10	Boron, total	mg/L	0.682
UA	MW-350	C	2021/09/14	Boron, total	mg/L	0.622
UA	MW-350	C	2022/03/28	Boron, total	mg/L	0.900
UA	MW-350	C	2022/09/29	Boron, total	mg/L	0.669
UA	MW-350	C	2023/03/15	Boron, total	mg/L	0.613
UA	MW-350	C	2023/05/18	Boron, total	mg/L	0.560
UA	MW-350	C	2023/08/07	Boron, total	mg/L	0.585
UA	MW-350	C	2023/11/03	Boron, total	mg/L	0.538
UA	MW-350	C	2020/03/26	Calcium, total	mg/L	52.9
UA	MW-350	C	2020/09/16	Calcium, total	mg/L	16.6
UA	MW-350	C	2021/03/10	Calcium, total	mg/L	20.9
UA	MW-350	C	2021/09/14	Calcium, total	mg/L	25.1
UA	MW-350	C	2022/03/28	Calcium, total	mg/L	124
UA	MW-350	C	2022/09/29	Calcium, total	mg/L	72.0
UA	MW-350	C	2023/03/15	Calcium, total	mg/L	81.0
UA	MW-350	C	2023/05/18	Calcium, total	mg/L	84.0
UA	MW-350	C	2023/08/07	Calcium, total	mg/L	39.6
UA	MW-350	C	2023/11/03	Calcium, total	mg/L	49.0
UA	MW-350	C	2013/09/16	Chloride, total	mg/L	33.0
UA	MW-350	C	2020/03/26	Chloride, total	mg/L	52.0
UA	MW-350	C	2020/09/16	Chloride, total	mg/L	48.0
UA	MW-350	C	2021/03/10	Chloride, total	mg/L	43.0

UA	MW-350	C	2021/09/14	Chloride, total	mg/L	29.0
UA	MW-350	C	2022/03/28	Chloride, total	mg/L	58.0
UA	MW-350	C	2022/09/29	Chloride, total	mg/L	65.0
UA	MW-350	C	2023/03/15	Chloride, total	mg/L	58.0
UA	MW-350	C	2023/05/18	Chloride, total	mg/L	50.0
UA	MW-350	C	2023/08/07	Chloride, total	mg/L	54.0
UA	MW-350	C	2023/11/03	Chloride, total	mg/L	47.0
UA	MW-350	C	2013/11/20	Iron, dissolved	mg/L	<0.007
UA	MW-350	C	2014/02/19	Iron, dissolved	mg/L	<0.007
UA	MW-350	C	2014/06/11	Iron, dissolved	mg/L	<0.007
UA	MW-350	C	2015/03/25	Iron, dissolved	mg/L	<0.007
UA	MW-350	C	2015/06/24	Iron, dissolved	mg/L	<0.007
UA	MW-350	C	2015/09/25	Iron, dissolved	mg/L	<0.007
UA	MW-350	C	2015/11/10	Iron, dissolved	mg/L	<0.007
UA	MW-350	C	2016/03/22	Iron, dissolved	mg/L	<0.007
UA	MW-350	C	2016/06/21	Iron, dissolved	mg/L	<0.007
UA	MW-350	C	2016/09/29	Iron, dissolved	mg/L	<0.007
UA	MW-350	C	2016/12/21	Iron, dissolved	mg/L	<0.007
UA	MW-350	C	2017/03/16	Iron, dissolved	mg/L	<0.007
UA	MW-350	C	2017/06/22	Iron, dissolved	mg/L	<0.007
UA	MW-350	C	2017/09/21	Iron, dissolved	mg/L	<0.007
UA	MW-350	C	2017/11/28	Iron, dissolved	mg/L	<0.007
UA	MW-350	C	2018/03/19	Iron, dissolved	mg/L	<0.007
UA	MW-350	C	2018/06/28	Iron, dissolved	mg/L	<0.02
UA	MW-350	C	2018/09/26	Iron, dissolved	mg/L	<0.02
UA	MW-350	C	2018/12/18	Iron, dissolved	mg/L	<0.02
UA	MW-350	C	2019/03/20	Iron, dissolved	mg/L	<0.02
UA	MW-350	C	2019/06/25	Iron, dissolved	mg/L	<0.02
UA	MW-350	C	2019/09/26	Iron, dissolved	mg/L	<0.02
UA	MW-350	C	2019/12/19	Iron, dissolved	mg/L	<0.02
UA	MW-350	C	2020/03/26	Iron, dissolved	mg/L	<0.02
UA	MW-350	C	2020/06/23	Iron, dissolved	mg/L	<0.02
UA	MW-350	C	2020/09/17	Iron, dissolved	mg/L	<0.02
UA	MW-350	C	2020/12/17	Iron, dissolved	mg/L	<0.02
UA	MW-350	C	2021/03/10	Iron, dissolved	mg/L	<0.02
UA	MW-350	C	2021/07/19	Iron, dissolved	mg/L	<0.02
UA	MW-350	C	2021/09/14	Iron, dissolved	mg/L	<0.02
UA	MW-350	C	2021/12/14	Iron, dissolved	mg/L	<0.02
UA	MW-350	C	2022/03/28	Iron, dissolved	mg/L	<0.015
UA	MW-350	C	2022/06/14	Iron, dissolved	mg/L	<0.02
UA	MW-350	C	2022/09/29	Iron, dissolved	mg/L	<0.0115
UA	MW-350	C	2022/12/06	Iron, dissolved	mg/L	<0.0115
UA	MW-350	C	2023/03/15	Iron, dissolved	mg/L	<0.0115
UA	MW-350	C	2023/05/18	Iron, dissolved	mg/L	<0.02
UA	MW-350	C	2023/08/07	Iron, dissolved	mg/L	<0.0115
UA	MW-350	C	2023/11/03	Iron, dissolved	mg/L	<0.0115
UA	MW-350	C	2020/03/26	Magnesium, total	mg/L	0.113
UA	MW-350	C	2020/09/16	Magnesium, total	mg/L	0.262
UA	MW-350	C	2021/03/10	Magnesium, total	mg/L	1.43
UA	MW-350	C	2021/09/14	Magnesium, total	mg/L	4.38
UA	MW-350	C	2022/03/28	Magnesium, total	mg/L	0.0837
UA	MW-350	C	2022/09/29	Magnesium, total	mg/L	0.350
UA	MW-350	C	2023/03/15	Magnesium, total	mg/L	0.172
UA	MW-350	C	2023/05/18	Magnesium, total	mg/L	0.646
UA	MW-350	C	2023/08/07	Magnesium, total	mg/L	0.784
UA	MW-350	C	2023/11/03	Magnesium, total	mg/L	5.33
UA	MW-350	C	2013/11/20	Manganese, dissolved	mg/L	<0.0016

UA	MW-350	C	2014/02/19	Manganese, dissolved	mg/L	<0.0016
UA	MW-350	C	2014/06/11	Manganese, dissolved	mg/L	<0.0016
UA	MW-350	C	2015/03/25	Manganese, dissolved	mg/L	<0.0005
UA	MW-350	C	2015/06/24	Manganese, dissolved	mg/L	<0.0005
UA	MW-350	C	2015/09/25	Manganese, dissolved	mg/L	<0.0005
UA	MW-350	C	2015/11/10	Manganese, dissolved	mg/L	<0.0005
UA	MW-350	C	2016/03/22	Manganese, dissolved	mg/L	<0.0005
UA	MW-350	C	2016/06/21	Manganese, dissolved	mg/L	<0.0005
UA	MW-350	C	2016/09/29	Manganese, dissolved	mg/L	<0.0005
UA	MW-350	C	2016/12/21	Manganese, dissolved	mg/L	<0.0005
UA	MW-350	C	2017/03/16	Manganese, dissolved	mg/L	<0.0005
UA	MW-350	C	2017/06/22	Manganese, dissolved	mg/L	<0.0005
UA	MW-350	C	2017/09/21	Manganese, dissolved	mg/L	<0.0005
UA	MW-350	C	2017/11/28	Manganese, dissolved	mg/L	<0.0005
UA	MW-350	C	2018/03/19	Manganese, dissolved	mg/L	<0.0005
UA	MW-350	C	2018/06/28	Manganese, dissolved	mg/L	<0.0025
UA	MW-350	C	2018/09/26	Manganese, dissolved	mg/L	<0.0025
UA	MW-350	C	2018/12/18	Manganese, dissolved	mg/L	<0.0025
UA	MW-350	C	2019/03/20	Manganese, dissolved	mg/L	<0.0025
UA	MW-350	C	2019/06/25	Manganese, dissolved	mg/L	<0.0025
UA	MW-350	C	2019/09/26	Manganese, dissolved	mg/L	<0.0025
UA	MW-350	C	2019/12/19	Manganese, dissolved	mg/L	<0.0025
UA	MW-350	C	2020/03/26	Manganese, dissolved	mg/L	<0.0025
UA	MW-350	C	2020/06/23	Manganese, dissolved	mg/L	<0.0025
UA	MW-350	C	2020/09/17	Manganese, dissolved	mg/L	<0.0025
UA	MW-350	C	2020/12/17	Manganese, dissolved	mg/L	<0.0025
UA	MW-350	C	2021/03/10	Manganese, dissolved	mg/L	<0.0025
UA	MW-350	C	2021/07/19	Manganese, dissolved	mg/L	<0.0025
UA	MW-350	C	2021/09/14	Manganese, dissolved	mg/L	<0.0025
UA	MW-350	C	2021/12/14	Manganese, dissolved	mg/L	<0.0025
UA	MW-350	C	2022/03/28	Manganese, dissolved	mg/L	<0.0008
UA	MW-350	C	2022/06/14	Manganese, dissolved	mg/L	<0.0025
UA	MW-350	C	2022/09/29	Manganese, dissolved	mg/L	<0.0008
UA	MW-350	C	2022/12/06	Manganese, dissolved	mg/L	<0.0008
UA	MW-350	C	2023/03/15	Manganese, dissolved	mg/L	<0.0008
UA	MW-350	C	2023/05/18	Manganese, dissolved	mg/L	<0.0025
UA	MW-350	C	2023/08/07	Manganese, dissolved	mg/L	<0.0008
UA	MW-350	C	2023/11/03	Manganese, dissolved	mg/L	<0.0008
UA	MW-350	C	2023/05/18	Phosphate, dissolved	mg/L	<0.005
UA	MW-350	C	2023/08/07	Phosphate, dissolved	mg/L	<0.005
UA	MW-350	C	2020/03/26	Potassium, total	mg/L	4.27
UA	MW-350	C	2020/09/16	Potassium, total	mg/L	5.66
UA	MW-350	C	2021/03/10	Potassium, total	mg/L	4.69
UA	MW-350	C	2021/09/14	Potassium, total	mg/L	5.52
UA	MW-350	C	2022/03/28	Potassium, total	mg/L	5.10
UA	MW-350	C	2022/09/29	Potassium, total	mg/L	5.00
UA	MW-350	C	2023/03/15	Potassium, total	mg/L	4.12
UA	MW-350	C	2023/05/18	Potassium, total	mg/L	5.01
UA	MW-350	C	2023/08/07	Potassium, total	mg/L	4.46
UA	MW-350	C	2023/11/03	Potassium, total	mg/L	4.81
UA	MW-350	C	2023/05/18	Silicon, dissolved	mg/L	5.18
UA	MW-350	C	2023/08/07	Silicon, dissolved	mg/L	2.25
UA	MW-350	C	2020/03/26	Sodium, total	mg/L	73.0
UA	MW-350	C	2020/09/16	Sodium, total	mg/L	76.4
UA	MW-350	C	2021/03/10	Sodium, total	mg/L	77.6
UA	MW-350	C	2021/09/14	Sodium, total	mg/L	74.3
UA	MW-350	C	2022/03/28	Sodium, total	mg/L	67.9

UA	MW-350	C	2022/09/29	Sodium, total	mg/L	70.2
UA	MW-350	C	2023/03/15	Sodium, total	mg/L	68.6
UA	MW-350	C	2023/05/18	Sodium, total	mg/L	91.2
UA	MW-350	C	2023/08/07	Sodium, total	mg/L	71.7
UA	MW-350	C	2023/11/03	Sodium, total	mg/L	85.1
UA	MW-350	C	2013/09/16	Sulfate, total	mg/L	<5
UA	MW-350	C	2020/03/26	Sulfate, total	mg/L	71.0
UA	MW-350	C	2020/09/16	Sulfate, total	mg/L	74.0
UA	MW-350	C	2021/03/10	Sulfate, total	mg/L	52.0
UA	MW-350	C	2021/09/14	Sulfate, total	mg/L	99.0
UA	MW-350	C	2022/03/28	Sulfate, total	mg/L	74.0
UA	MW-350	C	2022/09/29	Sulfate, total	mg/L	113
UA	MW-350	C	2023/03/15	Sulfate, total	mg/L	88.0
UA	MW-350	C	2023/05/18	Sulfate, total	mg/L	97.0
UA	MW-350	C	2023/08/07	Sulfate, total	mg/L	102
UA	MW-350	C	2023/11/03	Sulfate, total	mg/L	100
UA	MW-350	C	2013/09/16	Temperature (Celsius)	degrees C	14.6
UA	MW-350	C	2013/11/20	Temperature (Celsius)	degrees C	13.5
UA	MW-350	C	2014/02/19	Temperature (Celsius)	degrees C	13.3
UA	MW-350	C	2014/06/11	Temperature (Celsius)	degrees C	14.3
UA	MW-350	C	2015/03/25	Temperature (Celsius)	degrees C	14.4
UA	MW-350	C	2015/06/24	Temperature (Celsius)	degrees C	14.4
UA	MW-350	C	2015/09/25	Temperature (Celsius)	degrees C	13.8
UA	MW-350	C	2015/11/10	Temperature (Celsius)	degrees C	13.5
UA	MW-350	C	2016/03/22	Temperature (Celsius)	degrees C	14.4
UA	MW-350	C	2016/06/21	Temperature (Celsius)	degrees C	14.3
UA	MW-350	C	2016/09/29	Temperature (Celsius)	degrees C	13.8
UA	MW-350	C	2016/12/21	Temperature (Celsius)	degrees C	13.3
UA	MW-350	C	2017/03/16	Temperature (Celsius)	degrees C	13.8
UA	MW-350	C	2017/06/22	Temperature (Celsius)	degrees C	14.5
UA	MW-350	C	2017/09/21	Temperature (Celsius)	degrees C	14.6
UA	MW-350	C	2017/11/28	Temperature (Celsius)	degrees C	14.6
UA	MW-350	C	2018/03/19	Temperature (Celsius)	degrees C	14.7
UA	MW-350	C	2018/06/28	Temperature (Celsius)	degrees C	15.2
UA	MW-350	C	2018/09/26	Temperature (Celsius)	degrees C	14.2
UA	MW-350	C	2018/12/18	Temperature (Celsius)	degrees C	13.7
UA	MW-350	C	2019/03/20	Temperature (Celsius)	degrees C	13.5
UA	MW-350	C	2019/06/25	Temperature (Celsius)	degrees C	14.4
UA	MW-350	C	2019/09/26	Temperature (Celsius)	degrees C	13.9
UA	MW-350	C	2019/12/19	Temperature (Celsius)	degrees C	13.4
UA	MW-350	C	2020/03/26	Temperature (Celsius)	degrees C	14.2
UA	MW-350	C	2020/06/23	Temperature (Celsius)	degrees C	14.6
UA	MW-350	C	2020/09/16	Temperature (Celsius)	degrees C	14.7
UA	MW-350	C	2020/09/17	Temperature (Celsius)	degrees C	15.1
UA	MW-350	C	2020/12/17	Temperature (Celsius)	degrees C	13.1
UA	MW-350	C	2021/03/10	Temperature (Celsius)	degrees C	13.9
UA	MW-350	C	2021/07/19	Temperature (Celsius)	degrees C	16.8
UA	MW-350	C	2021/09/14	Temperature (Celsius)	degrees C	16.8
UA	MW-350	C	2021/12/14	Temperature (Celsius)	degrees C	15.2
UA	MW-350	C	2022/03/28	Temperature (Celsius)	degrees C	13.5
UA	MW-350	C	2022/06/14	Temperature (Celsius)	degrees C	17.3
UA	MW-350	C	2022/09/29	Temperature (Celsius)	degrees C	13.8
UA	MW-350	C	2022/12/06	Temperature (Celsius)	degrees C	13.2
UA	MW-350	C	2023/03/15	Temperature (Celsius)	degrees C	13.7
UA	MW-350	C	2023/05/18	Temperature (Celsius)	degrees C	14.1
UA	MW-350	C	2023/08/07	Temperature (Celsius)	degrees C	13.9
UA	MW-350	C	2023/11/03	Temperature (Celsius)	degrees C	13.7

UA	MW-350	C	2013/09/16	Total Dissolved Solids	mg/L	1,640
UA	MW-350	C	2013/11/20	Total Dissolved Solids	mg/L	1,370
UA	MW-350	C	2014/02/19	Total Dissolved Solids	mg/L	1,420
UA	MW-350	C	2014/06/11	Total Dissolved Solids	mg/L	1,580
UA	MW-350	C	2015/03/25	Total Dissolved Solids	mg/L	1,430
UA	MW-350	C	2015/06/24	Total Dissolved Solids	mg/L	1,430
UA	MW-350	C	2015/09/25	Total Dissolved Solids	mg/L	1,140
UA	MW-350	C	2015/11/10	Total Dissolved Solids	mg/L	690
UA	MW-350	C	2016/03/22	Total Dissolved Solids	mg/L	712
UA	MW-350	C	2016/06/21	Total Dissolved Solids	mg/L	906
UA	MW-350	C	2016/09/29	Total Dissolved Solids	mg/L	600
UA	MW-350	C	2016/12/21	Total Dissolved Solids	mg/L	536
UA	MW-350	C	2017/03/16	Total Dissolved Solids	mg/L	624
UA	MW-350	C	2017/06/22	Total Dissolved Solids	mg/L	475
UA	MW-350	C	2017/09/21	Total Dissolved Solids	mg/L	246
UA	MW-350	C	2017/11/28	Total Dissolved Solids	mg/L	454
UA	MW-350	C	2018/03/19	Total Dissolved Solids	mg/L	376
UA	MW-350	C	2018/06/28	Total Dissolved Solids	mg/L	346
UA	MW-350	C	2018/09/26	Total Dissolved Solids	mg/L	385
UA	MW-350	C	2018/12/18	Total Dissolved Solids	mg/L	425
UA	MW-350	C	2019/03/20	Total Dissolved Solids	mg/L	578
UA	MW-350	C	2019/06/25	Total Dissolved Solids	mg/L	485
UA	MW-350	C	2019/09/26	Total Dissolved Solids	mg/L	368
UA	MW-350	C	2019/12/19	Total Dissolved Solids	mg/L	324
UA	MW-350	C	2020/03/26	Total Dissolved Solids	mg/L	344
UA	MW-350	C	2020/06/23	Total Dissolved Solids	mg/L	258
UA	MW-350	C	2020/09/16	Total Dissolved Solids	mg/L	230
UA	MW-350	C	2020/09/17	Total Dissolved Solids	mg/L	226
UA	MW-350	C	2020/12/17	Total Dissolved Solids	mg/L	260
UA	MW-350	C	2021/03/10	Total Dissolved Solids	mg/L	272
UA	MW-350	C	2021/07/19	Total Dissolved Solids	mg/L	362
UA	MW-350	C	2021/09/14	Total Dissolved Solids	mg/L	402
UA	MW-350	C	2021/12/14	Total Dissolved Solids	mg/L	248
UA	MW-350	C	2022/03/28	Total Dissolved Solids	mg/L	494
UA	MW-350	C	2022/06/14	Total Dissolved Solids	mg/L	350
UA	MW-350	C	2022/09/29	Total Dissolved Solids	mg/L	382
UA	MW-350	C	2022/12/06	Total Dissolved Solids	mg/L	372
UA	MW-350	C	2023/03/15	Total Dissolved Solids	mg/L	414
UA	MW-350	C	2023/05/18	Total Dissolved Solids	mg/L	420
UA	MW-350	C	2023/08/07	Total Dissolved Solids	mg/L	328
UA	MW-350	C	2023/11/03	Total Dissolved Solids	mg/L	306
UA	MW-352	C	2013/09/16	pH (field)	SU	9.4
UA	MW-352	C	2013/11/20	pH (field)	SU	7.3
UA	MW-352	C	2014/02/19	pH (field)	SU	6.5
UA	MW-352	C	2014/06/12	pH (field)	SU	8.9
UA	MW-352	C	2015/03/25	pH (field)	SU	9.0
UA	MW-352	C	2015/06/24	pH (field)	SU	8.6
UA	MW-352	C	2015/09/25	pH (field)	SU	8.0
UA	MW-352	C	2015/11/10	pH (field)	SU	7.6
UA	MW-352	C	2016/03/22	pH (field)	SU	7.9
UA	MW-352	C	2016/06/23	pH (field)	SU	7.7
UA	MW-352	C	2016/09/29	pH (field)	SU	7.9
UA	MW-352	C	2016/12/21	pH (field)	SU	7.9
UA	MW-352	C	2017/03/16	pH (field)	SU	7.8
UA	MW-352	C	2017/06/21	pH (field)	SU	7.6
UA	MW-352	C	2017/09/21	pH (field)	SU	6.7
UA	MW-352	C	2017/11/28	pH (field)	SU	7.6

UA	MW-352	C	2018/03/20	pH (field)	SU	7.6
UA	MW-352	C	2018/06/27	pH (field)	SU	7.7
UA	MW-352	C	2018/09/26	pH (field)	SU	7.8
UA	MW-352	C	2018/12/18	pH (field)	SU	7.6
UA	MW-352	C	2019/03/20	pH (field)	SU	7.7
UA	MW-352	C	2019/06/25	pH (field)	SU	7.7
UA	MW-352	C	2019/09/26	pH (field)	SU	7.4
UA	MW-352	C	2019/12/19	pH (field)	SU	7.7
UA	MW-352	C	2020/03/27	pH (field)	SU	7.5
UA	MW-352	C	2020/06/23	pH (field)	SU	7.8
UA	MW-352	C	2020/09/17	pH (field)	SU	7.7
UA	MW-352	C	2020/12/16	pH (field)	SU	7.7
UA	MW-352	C	2021/03/09	pH (field)	SU	7.6
UA	MW-352	C	2021/07/19	pH (field)	SU	7.3
UA	MW-352	C	2021/09/14	pH (field)	SU	7.4
UA	MW-352	C	2021/12/14	pH (field)	SU	7.3
UA	MW-352	C	2022/03/28	pH (field)	SU	7.5
UA	MW-352	C	2022/06/14	pH (field)	SU	7.5
UA	MW-352	C	2022/09/29	pH (field)	SU	8.0
UA	MW-352	C	2022/12/06	pH (field)	SU	7.4
UA	MW-352	C	2023/03/15	pH (field)	SU	7.5
UA	MW-352	C	2023/05/18	pH (field)	SU	7.4
UA	MW-352	C	2023/07/10	pH (field)	SU	7.3
UA	MW-352	C	2023/08/04	pH (field)	SU	7.9
UA	MW-352	C	2023/10/31	pH (field)	SU	7.7
UA	MW-352	C	2021/03/09	Oxidation Reduction Potential	mV	-140
UA	MW-352	C	2021/07/19	Oxidation Reduction Potential	mV	34.0
UA	MW-352	C	2021/09/14	Oxidation Reduction Potential	mV	-123
UA	MW-352	C	2021/12/14	Oxidation Reduction Potential	mV	-28.0
UA	MW-352	C	2022/03/28	Oxidation Reduction Potential	mV	-144
UA	MW-352	C	2022/06/14	Oxidation Reduction Potential	mV	90.0
UA	MW-352	C	2022/09/29	Oxidation Reduction Potential	mV	133
UA	MW-352	C	2022/12/06	Oxidation Reduction Potential	mV	<-300
UA	MW-352	C	2023/03/15	Oxidation Reduction Potential	mV	-162
UA	MW-352	C	2023/05/18	Oxidation Reduction Potential	mV	-119
UA	MW-352	C	2023/07/10	Oxidation Reduction Potential	mV	65.0
UA	MW-352	C	2023/08/04	Oxidation Reduction Potential	mV	85.0
UA	MW-352	C	2023/10/31	Oxidation Reduction Potential	mV	-98.0
UA	MW-352	C	2021/03/09	Eh	V	0.057
UA	MW-352	C	2021/07/19	Eh	V	0.23
UA	MW-352	C	2021/09/14	Eh	V	0.069
UA	MW-352	C	2021/12/14	Eh	V	0.17
UA	MW-352	C	2022/03/28	Eh	V	0.054
UA	MW-352	C	2022/06/14	Eh	V	0.28
UA	MW-352	C	2022/09/29	Eh	V	0.33
UA	MW-352	C	2022/12/06	Eh	V	-0.10
UA	MW-352	C	2023/03/15	Eh	V	0.035
UA	MW-352	C	2023/05/18	Eh	V	0.077
UA	MW-352	C	2023/07/10	Eh	V	0.26
UA	MW-352	C	2023/08/04	Eh	V	0.28
UA	MW-352	C	2023/10/31	Eh	V	0.098
UA	MW-352	C	2023/03/15	Alkalinity, bicarbonate	mg/L CaCO3	143
UA	MW-352	C	2023/05/18	Alkalinity, bicarbonate	mg/L CaCO3	147
UA	MW-352	C	2023/08/04	Alkalinity, bicarbonate	mg/L CaCO3	147
UA	MW-352	C	2023/10/31	Alkalinity, bicarbonate	mg/L CaCO3	149
UA	MW-352	C	2023/03/15	Barium, total	mg/L	0.0867
UA	MW-352	C	2023/05/18	Barium, total	mg/L	0.0891

UA	MW-352	C	2023/07/10	Barium, total	mg/L	0.0898
UA	MW-352	C	2023/08/04	Barium, total	mg/L	0.0856
UA	MW-352	C	2023/10/31	Barium, total	mg/L	0.122
UA	MW-352	C	2013/09/16	Boron, total	mg/L	1.42
UA	MW-352	C	2023/03/15	Boron, total	mg/L	2.29
UA	MW-352	C	2023/05/18	Boron, total	mg/L	2.04
UA	MW-352	C	2023/07/10	Boron, total	mg/L	2.10
UA	MW-352	C	2023/08/04	Boron, total	mg/L	1.88
UA	MW-352	C	2023/10/31	Boron, total	mg/L	2.77
UA	MW-352	C	2023/03/15	Calcium, total	mg/L	97.8
UA	MW-352	C	2023/05/18	Calcium, total	mg/L	88.3
UA	MW-352	C	2023/07/10	Calcium, total	mg/L	105
UA	MW-352	C	2023/08/04	Calcium, total	mg/L	87.0
UA	MW-352	C	2023/10/31	Calcium, total	mg/L	93.3
UA	MW-352	C	2013/09/16	Chloride, total	mg/L	580
UA	MW-352	C	2023/03/15	Chloride, total	mg/L	576
UA	MW-352	C	2023/05/18	Chloride, total	mg/L	569
UA	MW-352	C	2023/07/10	Chloride, total	mg/L	582
UA	MW-352	C	2023/08/04	Chloride, total	mg/L	529
UA	MW-352	C	2023/10/31	Chloride, total	mg/L	567
UA	MW-352	C	2013/11/20	Iron, dissolved	mg/L	<0.007
UA	MW-352	C	2014/02/19	Iron, dissolved	mg/L	<0.007
UA	MW-352	C	2014/06/12	Iron, dissolved	mg/L	<0.007
UA	MW-352	C	2015/03/25	Iron, dissolved	mg/L	<0.007
UA	MW-352	C	2015/06/24	Iron, dissolved	mg/L	<0.007
UA	MW-352	C	2015/09/25	Iron, dissolved	mg/L	<0.007
UA	MW-352	C	2015/11/10	Iron, dissolved	mg/L	<0.007
UA	MW-352	C	2016/03/22	Iron, dissolved	mg/L	0.0220
UA	MW-352	C	2016/06/23	Iron, dissolved	mg/L	0.0285
UA	MW-352	C	2016/09/29	Iron, dissolved	mg/L	0.0224
UA	MW-352	C	2016/12/21	Iron, dissolved	mg/L	<0.007
UA	MW-352	C	2017/03/16	Iron, dissolved	mg/L	0.0500
UA	MW-352	C	2017/06/21	Iron, dissolved	mg/L	0.120
UA	MW-352	C	2017/09/21	Iron, dissolved	mg/L	0.140
UA	MW-352	C	2017/11/28	Iron, dissolved	mg/L	0.120
UA	MW-352	C	2018/03/20	Iron, dissolved	mg/L	0.109
UA	MW-352	C	2018/06/27	Iron, dissolved	mg/L	0.125
UA	MW-352	C	2018/09/26	Iron, dissolved	mg/L	0.151
UA	MW-352	C	2018/12/18	Iron, dissolved	mg/L	0.159
UA	MW-352	C	2019/03/20	Iron, dissolved	mg/L	0.0824
UA	MW-352	C	2019/06/25	Iron, dissolved	mg/L	0.125
UA	MW-352	C	2019/09/26	Iron, dissolved	mg/L	0.145
UA	MW-352	C	2019/12/19	Iron, dissolved	mg/L	0.190
UA	MW-352	C	2020/03/27	Iron, dissolved	mg/L	0.144
UA	MW-352	C	2020/06/23	Iron, dissolved	mg/L	0.323
UA	MW-352	C	2020/09/17	Iron, dissolved	mg/L	0.472
UA	MW-352	C	2020/12/16	Iron, dissolved	mg/L	0.374
UA	MW-352	C	2021/03/09	Iron, dissolved	mg/L	0.184
UA	MW-352	C	2021/07/19	Iron, dissolved	mg/L	0.262
UA	MW-352	C	2021/09/14	Iron, dissolved	mg/L	0.220
UA	MW-352	C	2021/12/14	Iron, dissolved	mg/L	0.263
UA	MW-352	C	2022/03/28	Iron, dissolved	mg/L	0.222
UA	MW-352	C	2022/06/14	Iron, dissolved	mg/L	0.224
UA	MW-352	C	2022/09/29	Iron, dissolved	mg/L	0.0318
UA	MW-352	C	2022/12/06	Iron, dissolved	mg/L	0.373
UA	MW-352	C	2023/03/15	Iron, dissolved	mg/L	0.194
UA	MW-352	C	2023/05/18	Iron, dissolved	mg/L	0.164

UA	MW-352	C	2023/08/04	Iron, dissolved	mg/L	0.482
UA	MW-352	C	2023/10/31	Iron, dissolved	mg/L	0.392
UA	MW-352	C	2023/03/15	Magnesium, total	mg/L	47.7
UA	MW-352	C	2023/05/18	Magnesium, total	mg/L	41.7
UA	MW-352	C	2023/08/04	Magnesium, total	mg/L	43.9
UA	MW-352	C	2023/10/31	Magnesium, total	mg/L	46.4
UA	MW-352	C	2013/11/20	Manganese, dissolved	mg/L	<0.0016
UA	MW-352	C	2014/02/19	Manganese, dissolved	mg/L	<0.0016
UA	MW-352	C	2014/06/12	Manganese, dissolved	mg/L	<0.0016
UA	MW-352	C	2015/03/25	Manganese, dissolved	mg/L	<0.0005
UA	MW-352	C	2015/06/24	Manganese, dissolved	mg/L	<0.0005
UA	MW-352	C	2015/09/25	Manganese, dissolved	mg/L	0.00660
UA	MW-352	C	2015/11/10	Manganese, dissolved	mg/L	0.00530
UA	MW-352	C	2016/03/22	Manganese, dissolved	mg/L	0.00560
UA	MW-352	C	2016/06/23	Manganese, dissolved	mg/L	0.00560
UA	MW-352	C	2016/09/29	Manganese, dissolved	mg/L	0.00540
UA	MW-352	C	2016/12/21	Manganese, dissolved	mg/L	0.00390
UA	MW-352	C	2017/03/16	Manganese, dissolved	mg/L	0.00560
UA	MW-352	C	2017/06/21	Manganese, dissolved	mg/L	0.00770
UA	MW-352	C	2017/09/21	Manganese, dissolved	mg/L	0.00580
UA	MW-352	C	2017/11/28	Manganese, dissolved	mg/L	0.00600
UA	MW-352	C	2018/03/20	Manganese, dissolved	mg/L	0.00590
UA	MW-352	C	2018/06/27	Manganese, dissolved	mg/L	<0.0025
UA	MW-352	C	2018/09/26	Manganese, dissolved	mg/L	<0.0025
UA	MW-352	C	2018/12/18	Manganese, dissolved	mg/L	<0.0025
UA	MW-352	C	2019/03/20	Manganese, dissolved	mg/L	<0.0025
UA	MW-352	C	2019/06/25	Manganese, dissolved	mg/L	<0.0025
UA	MW-352	C	2019/09/26	Manganese, dissolved	mg/L	<0.0025
UA	MW-352	C	2019/12/19	Manganese, dissolved	mg/L	<0.0025
UA	MW-352	C	2020/03/27	Manganese, dissolved	mg/L	<0.0025
UA	MW-352	C	2020/06/23	Manganese, dissolved	mg/L	0.0312
UA	MW-352	C	2020/09/17	Manganese, dissolved	mg/L	0.0210
UA	MW-352	C	2020/12/16	Manganese, dissolved	mg/L	0.0107
UA	MW-352	C	2021/03/09	Manganese, dissolved	mg/L	0.0113
UA	MW-352	C	2021/07/19	Manganese, dissolved	mg/L	0.00860
UA	MW-352	C	2021/09/14	Manganese, dissolved	mg/L	0.0161
UA	MW-352	C	2021/12/14	Manganese, dissolved	mg/L	0.0109
UA	MW-352	C	2022/03/28	Manganese, dissolved	mg/L	0.00870
UA	MW-352	C	2022/06/14	Manganese, dissolved	mg/L	0.0103
UA	MW-352	C	2022/09/29	Manganese, dissolved	mg/L	0.00400
UA	MW-352	C	2022/12/06	Manganese, dissolved	mg/L	0.00870
UA	MW-352	C	2023/03/15	Manganese, dissolved	mg/L	0.0111
UA	MW-352	C	2023/05/18	Manganese, dissolved	mg/L	0.0152
UA	MW-352	C	2023/08/04	Manganese, dissolved	mg/L	0.0334
UA	MW-352	C	2023/10/31	Manganese, dissolved	mg/L	0.0423
UA	MW-352	C	2023/05/18	Phosphate, dissolved	mg/L	0.221
UA	MW-352	C	2023/08/04	Phosphate, dissolved	mg/L	0.0740
UA	MW-352	C	2023/03/15	Potassium, total	mg/L	3.61
UA	MW-352	C	2023/05/18	Potassium, total	mg/L	3.77
UA	MW-352	C	2023/08/04	Potassium, total	mg/L	3.83
UA	MW-352	C	2023/10/31	Potassium, total	mg/L	3.78
UA	MW-352	C	2023/05/18	Silicon, dissolved	mg/L	7.14
UA	MW-352	C	2023/08/04	Silicon, dissolved	mg/L	6.33
UA	MW-352	C	2023/03/15	Sodium, total	mg/L	234
UA	MW-352	C	2023/05/18	Sodium, total	mg/L	263
UA	MW-352	C	2023/08/04	Sodium, total	mg/L	262
UA	MW-352	C	2023/10/31	Sodium, total	mg/L	241

UA	MW-352	C	2013/09/16	Sulfate, total	mg/L	<5
UA	MW-352	C	2023/03/15	Sulfate, total	mg/L	6.00
UA	MW-352	C	2023/05/18	Sulfate, total	mg/L	<6
UA	MW-352	C	2023/07/10	Sulfate, total	mg/L	7.00
UA	MW-352	C	2023/08/04	Sulfate, total	mg/L	7.00
UA	MW-352	C	2023/10/31	Sulfate, total	mg/L	8.00
UA	MW-352	C	2013/09/16	Temperature (Celsius)	degrees C	14.6
UA	MW-352	C	2013/11/20	Temperature (Celsius)	degrees C	13.3
UA	MW-352	C	2014/02/19	Temperature (Celsius)	degrees C	11.5
UA	MW-352	C	2014/06/12	Temperature (Celsius)	degrees C	14.3
UA	MW-352	C	2015/03/25	Temperature (Celsius)	degrees C	13.3
UA	MW-352	C	2015/06/24	Temperature (Celsius)	degrees C	14.6
UA	MW-352	C	2015/09/25	Temperature (Celsius)	degrees C	15.3
UA	MW-352	C	2015/11/10	Temperature (Celsius)	degrees C	13.8
UA	MW-352	C	2016/03/22	Temperature (Celsius)	degrees C	14.4
UA	MW-352	C	2016/06/23	Temperature (Celsius)	degrees C	16.6
UA	MW-352	C	2016/09/29	Temperature (Celsius)	degrees C	14.5
UA	MW-352	C	2016/12/21	Temperature (Celsius)	degrees C	13.2
UA	MW-352	C	2017/03/16	Temperature (Celsius)	degrees C	13.2
UA	MW-352	C	2017/06/21	Temperature (Celsius)	degrees C	15.6
UA	MW-352	C	2017/09/21	Temperature (Celsius)	degrees C	14.3
UA	MW-352	C	2017/11/28	Temperature (Celsius)	degrees C	14.8
UA	MW-352	C	2018/03/20	Temperature (Celsius)	degrees C	12.9
UA	MW-352	C	2018/06/27	Temperature (Celsius)	degrees C	14.9
UA	MW-352	C	2018/09/26	Temperature (Celsius)	degrees C	15.4
UA	MW-352	C	2018/12/18	Temperature (Celsius)	degrees C	13.0
UA	MW-352	C	2019/03/20	Temperature (Celsius)	degrees C	12.5
UA	MW-352	C	2019/06/25	Temperature (Celsius)	degrees C	14.6
UA	MW-352	C	2019/09/26	Temperature (Celsius)	degrees C	15.1
UA	MW-352	C	2019/12/19	Temperature (Celsius)	degrees C	13.1
UA	MW-352	C	2020/03/27	Temperature (Celsius)	degrees C	13.8
UA	MW-352	C	2020/06/23	Temperature (Celsius)	degrees C	14.6
UA	MW-352	C	2020/09/17	Temperature (Celsius)	degrees C	15.4
UA	MW-352	C	2020/12/16	Temperature (Celsius)	degrees C	12.2
UA	MW-352	C	2021/03/09	Temperature (Celsius)	degrees C	13.4
UA	MW-352	C	2021/07/19	Temperature (Celsius)	degrees C	16.8
UA	MW-352	C	2021/09/14	Temperature (Celsius)	degrees C	19.9
UA	MW-352	C	2021/12/14	Temperature (Celsius)	degrees C	13.4
UA	MW-352	C	2022/03/28	Temperature (Celsius)	degrees C	11.9
UA	MW-352	C	2022/06/14	Temperature (Celsius)	degrees C	19.0
UA	MW-352	C	2022/09/29	Temperature (Celsius)	degrees C	16.8
UA	MW-352	C	2022/12/06	Temperature (Celsius)	degrees C	12.8
UA	MW-352	C	2023/03/15	Temperature (Celsius)	degrees C	13.1
UA	MW-352	C	2023/05/18	Temperature (Celsius)	degrees C	14.8
UA	MW-352	C	2023/07/10	Temperature (Celsius)	degrees C	19.5
UA	MW-352	C	2023/08/04	Temperature (Celsius)	degrees C	16.4
UA	MW-352	C	2023/10/31	Temperature (Celsius)	degrees C	14.1
UA	MW-352	C	2013/09/16	Total Dissolved Solids	mg/L	1,130
UA	MW-352	C	2013/11/20	Total Dissolved Solids	mg/L	996
UA	MW-352	C	2014/02/19	Total Dissolved Solids	mg/L	768
UA	MW-352	C	2014/06/12	Total Dissolved Solids	mg/L	1,090
UA	MW-352	C	2015/03/25	Total Dissolved Solids	mg/L	874
UA	MW-352	C	2015/06/24	Total Dissolved Solids	mg/L	1,100
UA	MW-352	C	2015/09/25	Total Dissolved Solids	mg/L	1,210
UA	MW-352	C	2015/11/10	Total Dissolved Solids	mg/L	1,100
UA	MW-352	C	2016/03/22	Total Dissolved Solids	mg/L	1,130
UA	MW-352	C	2016/06/23	Total Dissolved Solids	mg/L	1,200

UA	MW-352	C	2016/09/29	Total Dissolved Solids	mg/L	744
UA	MW-352	C	2016/12/21	Total Dissolved Solids	mg/L	850
UA	MW-352	C	2017/03/16	Total Dissolved Solids	mg/L	1,120
UA	MW-352	C	2017/06/21	Total Dissolved Solids	mg/L	1,210
UA	MW-352	C	2017/09/21	Total Dissolved Solids	mg/L	1,090
UA	MW-352	C	2017/11/28	Total Dissolved Solids	mg/L	1,220
UA	MW-352	C	2018/03/20	Total Dissolved Solids	mg/L	1,100
UA	MW-352	C	2018/06/27	Total Dissolved Solids	mg/L	1,210
UA	MW-352	C	2018/09/26	Total Dissolved Solids	mg/L	1,360
UA	MW-352	C	2018/12/18	Total Dissolved Solids	mg/L	1,120
UA	MW-352	C	2019/03/20	Total Dissolved Solids	mg/L	1,150
UA	MW-352	C	2019/06/25	Total Dissolved Solids	mg/L	1,240
UA	MW-352	C	2019/09/26	Total Dissolved Solids	mg/L	1,320
UA	MW-352	C	2019/12/19	Total Dissolved Solids	mg/L	1,180
UA	MW-352	C	2020/03/27	Total Dissolved Solids	mg/L	1,130
UA	MW-352	C	2020/06/23	Total Dissolved Solids	mg/L	1,290
UA	MW-352	C	2020/09/17	Total Dissolved Solids	mg/L	1,230
UA	MW-352	C	2020/12/16	Total Dissolved Solids	mg/L	1,160
UA	MW-352	C	2021/03/09	Total Dissolved Solids	mg/L	1,210
UA	MW-352	C	2021/07/19	Total Dissolved Solids	mg/L	1,280
UA	MW-352	C	2021/09/14	Total Dissolved Solids	mg/L	1,140
UA	MW-352	C	2021/12/14	Total Dissolved Solids	mg/L	1,100
UA	MW-352	C	2022/03/28	Total Dissolved Solids	mg/L	1,090
UA	MW-352	C	2022/06/14	Total Dissolved Solids	mg/L	1,220
UA	MW-352	C	2022/09/29	Total Dissolved Solids	mg/L	978
UA	MW-352	C	2022/12/06	Total Dissolved Solids	mg/L	1,160
UA	MW-352	C	2023/03/15	Total Dissolved Solids	mg/L	1,080
UA	MW-352	C	2023/05/18	Total Dissolved Solids	mg/L	1,270
UA	MW-352	C	2023/07/10	Total Dissolved Solids	mg/L	1,330
UA	MW-352	C	2023/08/04	Total Dissolved Solids	mg/L	1,280
UA	MW-352	C	2023/10/31	Total Dissolved Solids	mg/L	1,170
UA	MW-366	C	2016/01/20	pH (field)	SU	6.7
UA	MW-366	C	2016/03/23	pH (field)	SU	7.1
UA	MW-366	C	2016/06/22	pH (field)	SU	7.2
UA	MW-366	C	2016/09/20	pH (field)	SU	7.1
UA	MW-366	C	2016/12/22	pH (field)	SU	7.0
UA	MW-366	C	2017/03/15	pH (field)	SU	7.5
UA	MW-366	C	2017/06/20	pH (field)	SU	7.0
UA	MW-366	C	2017/07/26	pH (field)	SU	7.2
UA	MW-366	C	2017/11/27	pH (field)	SU	7.3
UA	MW-366	C	2018/06/26	pH (field)	SU	6.9
UA	MW-366	C	2018/09/25	pH (field)	SU	7.0
UA	MW-366	C	2019/03/19	pH (field)	SU	7.0
UA	MW-366	C	2019/09/25	pH (field)	SU	6.7
UA	MW-366	C	2020/03/26	pH (field)	SU	6.9
UA	MW-366	C	2020/09/16	pH (field)	SU	7.0
UA	MW-366	C	2021/03/12	pH (field)	SU	7.0
UA	MW-366	C	2021/09/15	pH (field)	SU	6.8
UA	MW-366	C	2022/03/29	pH (field)	SU	6.8
UA	MW-366	C	2022/09/30	pH (field)	SU	6.8
UA	MW-366	C	2023/03/14	pH (field)	SU	6.7
UA	MW-366	C	2023/05/16	pH (field)	SU	6.9
UA	MW-366	C	2023/08/04	pH (field)	SU	6.9
UA	MW-366	C	2023/11/02	pH (field)	SU	6.9
UA	MW-366	C	2016/01/20	Oxidation Reduction Potential	mV	81.0
UA	MW-366	C	2016/03/23	Oxidation Reduction Potential	mV	63.0
UA	MW-366	C	2016/06/22	Oxidation Reduction Potential	mV	-17.0

UA	MW-366	C	2016/09/20	Oxidation Reduction Potential	mV	-46.0
UA	MW-366	C	2016/12/22	Oxidation Reduction Potential	mV	-2.00
UA	MW-366	C	2017/03/15	Oxidation Reduction Potential	mV	3.00
UA	MW-366	C	2017/06/20	Oxidation Reduction Potential	mV	48.0
UA	MW-366	C	2017/07/26	Oxidation Reduction Potential	mV	111
UA	MW-366	C	2017/11/27	Oxidation Reduction Potential	mV	139
UA	MW-366	C	2018/06/26	Oxidation Reduction Potential	mV	25.0
UA	MW-366	C	2018/09/25	Oxidation Reduction Potential	mV	45.0
UA	MW-366	C	2019/03/19	Oxidation Reduction Potential	mV	-60.0
UA	MW-366	C	2019/09/25	Oxidation Reduction Potential	mV	-106
UA	MW-366	C	2020/03/26	Oxidation Reduction Potential	mV	60.0
UA	MW-366	C	2020/09/16	Oxidation Reduction Potential	mV	-66.0
UA	MW-366	C	2021/03/12	Oxidation Reduction Potential	mV	-18.0
UA	MW-366	C	2021/09/15	Oxidation Reduction Potential	mV	-17.0
UA	MW-366	C	2022/03/29	Oxidation Reduction Potential	mV	-17.0
UA	MW-366	C	2022/09/30	Oxidation Reduction Potential	mV	138
UA	MW-366	C	2023/03/14	Oxidation Reduction Potential	mV	5.90
UA	MW-366	C	2023/05/16	Oxidation Reduction Potential	mV	95.0
UA	MW-366	C	2023/08/04	Oxidation Reduction Potential	mV	92.0
UA	MW-366	C	2023/11/02	Oxidation Reduction Potential	mV	9.00
UA	MW-366	C	2016/01/20	Eh	V	0.28
UA	MW-366	C	2016/03/23	Eh	V	0.26
UA	MW-366	C	2016/06/22	Eh	V	0.17
UA	MW-366	C	2016/09/20	Eh	V	0.15
UA	MW-366	C	2016/12/22	Eh	V	0.19
UA	MW-366	C	2017/03/15	Eh	V	0.20
UA	MW-366	C	2017/06/20	Eh	V	0.24
UA	MW-366	C	2017/07/26	Eh	V	0.30
UA	MW-366	C	2017/11/27	Eh	V	0.33
UA	MW-366	C	2018/06/26	Eh	V	0.22
UA	MW-366	C	2018/09/25	Eh	V	0.24
UA	MW-366	C	2019/03/19	Eh	V	0.14
UA	MW-366	C	2019/09/25	Eh	V	0.088
UA	MW-366	C	2020/03/26	Eh	V	0.26
UA	MW-366	C	2020/09/16	Eh	V	0.13
UA	MW-366	C	2021/03/12	Eh	V	0.18
UA	MW-366	C	2021/09/15	Eh	V	0.18
UA	MW-366	C	2022/03/29	Eh	V	0.18
UA	MW-366	C	2022/09/30	Eh	V	0.33
UA	MW-366	C	2023/03/14	Eh	V	0.20
UA	MW-366	C	2023/05/16	Eh	V	0.29
UA	MW-366	C	2023/08/04	Eh	V	0.29
UA	MW-366	C	2023/11/02	Eh	V	0.20
UA	MW-366	C	2017/07/26	Alkalinity, bicarbonate	mg/L CaCO3	412
UA	MW-366	C	2020/03/26	Alkalinity, bicarbonate	mg/L CaCO3	314
UA	MW-366	C	2020/09/16	Alkalinity, bicarbonate	mg/L CaCO3	324
UA	MW-366	C	2021/03/12	Alkalinity, bicarbonate	mg/L CaCO3	280
UA	MW-366	C	2021/09/15	Alkalinity, bicarbonate	mg/L CaCO3	313
UA	MW-366	C	2022/03/29	Alkalinity, bicarbonate	mg/L CaCO3	340
UA	MW-366	C	2022/09/30	Alkalinity, bicarbonate	mg/L CaCO3	321
UA	MW-366	C	2023/03/14	Alkalinity, bicarbonate	mg/L CaCO3	350
UA	MW-366	C	2023/05/16	Alkalinity, bicarbonate	mg/L CaCO3	308
UA	MW-366	C	2023/08/04	Alkalinity, bicarbonate	mg/L CaCO3	315
UA	MW-366	C	2023/11/02	Alkalinity, bicarbonate	mg/L CaCO3	326
UA	MW-366	C	2016/01/20	Barium, total	mg/L	0.0793
UA	MW-366	C	2016/03/23	Barium, total	mg/L	0.0827
UA	MW-366	C	2016/06/22	Barium, total	mg/L	0.0817

UA	MW-366	C	2016/09/20	Barium, total	mg/L	0.110
UA	MW-366	C	2016/12/22	Barium, total	mg/L	0.0762
UA	MW-366	C	2017/03/15	Barium, total	mg/L	0.0764
UA	MW-366	C	2017/06/20	Barium, total	mg/L	0.0770
UA	MW-366	C	2017/07/26	Barium, total	mg/L	0.0696
UA	MW-366	C	2018/06/26	Barium, total	mg/L	0.0441
UA	MW-366	C	2018/09/25	Barium, total	mg/L	0.0623
UA	MW-366	C	2019/03/19	Barium, total	mg/L	0.0348
UA	MW-366	C	2019/09/25	Barium, total	mg/L	0.0617
UA	MW-366	C	2020/03/26	Barium, total	mg/L	0.0322
UA	MW-366	C	2020/09/16	Barium, total	mg/L	0.0391
UA	MW-366	C	2021/03/12	Barium, total	mg/L	0.0424
UA	MW-366	C	2021/09/15	Barium, total	mg/L	0.0507
UA	MW-366	C	2022/03/29	Barium, total	mg/L	0.0753
UA	MW-366	C	2022/09/30	Barium, total	mg/L	0.0607
UA	MW-366	C	2023/03/14	Barium, total	mg/L	0.0565
UA	MW-366	C	2023/05/16	Barium, total	mg/L	0.0305
UA	MW-366	C	2023/08/04	Barium, total	mg/L	0.0348
UA	MW-366	C	2023/11/02	Barium, total	mg/L	0.0547
UA	MW-366	C	2016/01/20	Boron, total	mg/L	1.42
UA	MW-366	C	2016/03/23	Boron, total	mg/L	1.51
UA	MW-366	C	2016/06/22	Boron, total	mg/L	1.30
UA	MW-366	C	2016/09/20	Boron, total	mg/L	2.31
UA	MW-366	C	2016/12/22	Boron, total	mg/L	1.69
UA	MW-366	C	2017/03/15	Boron, total	mg/L	1.67
UA	MW-366	C	2017/06/20	Boron, total	mg/L	1.66
UA	MW-366	C	2017/07/26	Boron, total	mg/L	1.66
UA	MW-366	C	2017/11/27	Boron, total	mg/L	1.79
UA	MW-366	C	2018/06/26	Boron, total	mg/L	1.53
UA	MW-366	C	2018/09/25	Boron, total	mg/L	1.38
UA	MW-366	C	2019/03/19	Boron, total	mg/L	1.37
UA	MW-366	C	2019/09/25	Boron, total	mg/L	1.50
UA	MW-366	C	2020/03/26	Boron, total	mg/L	1.68
UA	MW-366	C	2020/09/16	Boron, total	mg/L	1.64
UA	MW-366	C	2021/03/12	Boron, total	mg/L	1.19
UA	MW-366	C	2021/09/15	Boron, total	mg/L	1.67
UA	MW-366	C	2022/03/29	Boron, total	mg/L	1.87
UA	MW-366	C	2022/09/30	Boron, total	mg/L	2.70
UA	MW-366	C	2023/03/14	Boron, total	mg/L	2.56
UA	MW-366	C	2023/05/16	Boron, total	mg/L	1.74
UA	MW-366	C	2023/08/04	Boron, total	mg/L	1.63
UA	MW-366	C	2023/11/02	Boron, total	mg/L	1.81
UA	MW-366	C	2016/01/20	Calcium, total	mg/L	74.5
UA	MW-366	C	2016/03/23	Calcium, total	mg/L	72.9
UA	MW-366	C	2016/06/22	Calcium, total	mg/L	70.4
UA	MW-366	C	2016/09/20	Calcium, total	mg/L	103
UA	MW-366	C	2016/12/22	Calcium, total	mg/L	67.7
UA	MW-366	C	2017/03/15	Calcium, total	mg/L	74.4
UA	MW-366	C	2017/06/20	Calcium, total	mg/L	70.1
UA	MW-366	C	2017/07/26	Calcium, total	mg/L	73.0
UA	MW-366	C	2017/11/27	Calcium, total	mg/L	108
UA	MW-366	C	2018/06/26	Calcium, total	mg/L	141
UA	MW-366	C	2018/09/25	Calcium, total	mg/L	127
UA	MW-366	C	2019/03/19	Calcium, total	mg/L	146
UA	MW-366	C	2019/09/25	Calcium, total	mg/L	166
UA	MW-366	C	2020/03/26	Calcium, total	mg/L	168
UA	MW-366	C	2020/09/16	Calcium, total	mg/L	175

UA	MW-366	C	2021/03/12	Calcium, total	mg/L	163
UA	MW-366	C	2021/09/15	Calcium, total	mg/L	181
UA	MW-366	C	2022/03/29	Calcium, total	mg/L	186
UA	MW-366	C	2022/09/30	Calcium, total	mg/L	227
UA	MW-366	C	2023/03/14	Calcium, total	mg/L	244
UA	MW-366	C	2023/05/16	Calcium, total	mg/L	187
UA	MW-366	C	2023/08/04	Calcium, total	mg/L	184
UA	MW-366	C	2023/11/02	Calcium, total	mg/L	177
UA	MW-366	C	2016/01/20	Chloride, total	mg/L	9.00
UA	MW-366	C	2016/03/23	Chloride, total	mg/L	8.00
UA	MW-366	C	2016/06/22	Chloride, total	mg/L	12.0
UA	MW-366	C	2016/09/20	Chloride, total	mg/L	17.0
UA	MW-366	C	2016/12/22	Chloride, total	mg/L	14.0
UA	MW-366	C	2017/03/15	Chloride, total	mg/L	14.0
UA	MW-366	C	2017/06/20	Chloride, total	mg/L	16.0
UA	MW-366	C	2017/07/26	Chloride, total	mg/L	18.0
UA	MW-366	C	2017/11/27	Chloride, total	mg/L	31.0
UA	MW-366	C	2018/06/26	Chloride, total	mg/L	50.0
UA	MW-366	C	2018/09/25	Chloride, total	mg/L	47.0
UA	MW-366	C	2019/03/19	Chloride, total	mg/L	43.0
UA	MW-366	C	2019/09/25	Chloride, total	mg/L	47.0
UA	MW-366	C	2020/03/26	Chloride, total	mg/L	47.0
UA	MW-366	C	2020/09/16	Chloride, total	mg/L	53.0
UA	MW-366	C	2021/03/12	Chloride, total	mg/L	39.0
UA	MW-366	C	2021/09/15	Chloride, total	mg/L	47.0
UA	MW-366	C	2022/03/29	Chloride, total	mg/L	46.0
UA	MW-366	C	2022/09/30	Chloride, total	mg/L	56.0
UA	MW-366	C	2023/03/14	Chloride, total	mg/L	55.0
UA	MW-366	C	2023/05/16	Chloride, total	mg/L	48.0
UA	MW-366	C	2023/08/04	Chloride, total	mg/L	47.0
UA	MW-366	C	2023/11/02	Chloride, total	mg/L	42.0
UA	MW-366	C	2023/05/16	Iron, dissolved	mg/L	<0.02
UA	MW-366	C	2023/08/04	Iron, dissolved	mg/L	<0.012
UA	MW-366	C	2017/07/26	Magnesium, total	mg/L	44.6
UA	MW-366	C	2020/03/26	Magnesium, total	mg/L	73.2
UA	MW-366	C	2020/09/16	Magnesium, total	mg/L	87.7
UA	MW-366	C	2021/03/12	Magnesium, total	mg/L	66.8
UA	MW-366	C	2021/09/15	Magnesium, total	mg/L	81.6
UA	MW-366	C	2022/03/29	Magnesium, total	mg/L	105
UA	MW-366	C	2022/09/30	Magnesium, total	mg/L	98.4
UA	MW-366	C	2023/03/14	Magnesium, total	mg/L	110
UA	MW-366	C	2023/05/16	Magnesium, total	mg/L	78.2
UA	MW-366	C	2023/08/04	Magnesium, total	mg/L	82.3
UA	MW-366	C	2023/11/02	Magnesium, total	mg/L	84.3
UA	MW-366	C	2023/05/16	Manganese, dissolved	mg/L	0.0281
UA	MW-366	C	2023/08/04	Manganese, dissolved	mg/L	0.0169
UA	MW-366	C	2023/05/16	Phosphate, dissolved	mg/L	0.0150
UA	MW-366	C	2023/08/04	Phosphate, dissolved	mg/L	0.0340
UA	MW-366	C	2017/07/26	Potassium, total	mg/L	3.85
UA	MW-366	C	2020/03/26	Potassium, total	mg/L	5.15
UA	MW-366	C	2020/09/16	Potassium, total	mg/L	5.45
UA	MW-366	C	2021/03/12	Potassium, total	mg/L	3.91
UA	MW-366	C	2021/09/15	Potassium, total	mg/L	4.39
UA	MW-366	C	2022/03/29	Potassium, total	mg/L	5.35
UA	MW-366	C	2022/09/30	Potassium, total	mg/L	4.65
UA	MW-366	C	2023/03/14	Potassium, total	mg/L	4.44
UA	MW-366	C	2023/05/16	Potassium, total	mg/L	4.05

UA	MW-366	C	2023/08/04	Potassium, total	mg/L	4.05
UA	MW-366	C	2023/11/02	Potassium, total	mg/L	4.39
UA	MW-366	C	2023/05/16	Silicon, dissolved	mg/L	8.80
UA	MW-366	C	2023/08/04	Silicon, dissolved	mg/L	7.81
UA	MW-366	C	2017/07/26	Sodium, total	mg/L	57.5
UA	MW-366	C	2020/03/26	Sodium, total	mg/L	74.3
UA	MW-366	C	2020/09/16	Sodium, total	mg/L	81.8
UA	MW-366	C	2021/03/12	Sodium, total	mg/L	59.5
UA	MW-366	C	2021/09/15	Sodium, total	mg/L	63.3
UA	MW-366	C	2022/03/29	Sodium, total	mg/L	76.8
UA	MW-366	C	2022/09/30	Sodium, total	mg/L	68.2
UA	MW-366	C	2023/03/14	Sodium, total	mg/L	70.0
UA	MW-366	C	2023/05/16	Sodium, total	mg/L	61.6
UA	MW-366	C	2023/08/04	Sodium, total	mg/L	56.9
UA	MW-366	C	2023/11/02	Sodium, total	mg/L	63.4
UA	MW-366	C	2016/01/20	Sulfate, total	mg/L	38.0
UA	MW-366	C	2016/03/23	Sulfate, total	mg/L	33.0
UA	MW-366	C	2016/06/22	Sulfate, total	mg/L	40.0
UA	MW-366	C	2016/09/20	Sulfate, total	mg/L	49.0
UA	MW-366	C	2016/12/22	Sulfate, total	mg/L	46.0
UA	MW-366	C	2017/03/15	Sulfate, total	mg/L	46.0
UA	MW-366	C	2017/06/20	Sulfate, total	mg/L	64.0
UA	MW-366	C	2017/07/26	Sulfate, total	mg/L	77.0
UA	MW-366	C	2017/11/27	Sulfate, total	mg/L	195
UA	MW-366	C	2018/06/26	Sulfate, total	mg/L	526
UA	MW-366	C	2018/09/25	Sulfate, total	mg/L	432
UA	MW-366	C	2019/03/19	Sulfate, total	mg/L	397
UA	MW-366	C	2019/09/25	Sulfate, total	mg/L	464
UA	MW-366	C	2020/03/26	Sulfate, total	mg/L	488
UA	MW-366	C	2020/09/16	Sulfate, total	mg/L	521
UA	MW-366	C	2021/03/12	Sulfate, total	mg/L	360
UA	MW-366	C	2021/09/15	Sulfate, total	mg/L	597
UA	MW-366	C	2022/03/29	Sulfate, total	mg/L	583
UA	MW-366	C	2022/09/30	Sulfate, total	mg/L	700
UA	MW-366	C	2023/03/14	Sulfate, total	mg/L	699
UA	MW-366	C	2023/05/16	Sulfate, total	mg/L	502
UA	MW-366	C	2023/08/04	Sulfate, total	mg/L	496
UA	MW-366	C	2023/11/02	Sulfate, total	mg/L	487
UA	MW-366	C	2016/01/20	Temperature (Celsius)	degrees C	10.2
UA	MW-366	C	2016/03/23	Temperature (Celsius)	degrees C	14.7
UA	MW-366	C	2016/06/22	Temperature (Celsius)	degrees C	22.9
UA	MW-366	C	2016/09/20	Temperature (Celsius)	degrees C	21.1
UA	MW-366	C	2016/12/22	Temperature (Celsius)	degrees C	14.0
UA	MW-366	C	2017/03/15	Temperature (Celsius)	degrees C	12.6
UA	MW-366	C	2017/06/20	Temperature (Celsius)	degrees C	19.4
UA	MW-366	C	2017/07/26	Temperature (Celsius)	degrees C	23.6
UA	MW-366	C	2017/11/27	Temperature (Celsius)	degrees C	17.6
UA	MW-366	C	2018/06/26	Temperature (Celsius)	degrees C	20.6
UA	MW-366	C	2018/09/25	Temperature (Celsius)	degrees C	16.4
UA	MW-366	C	2019/03/19	Temperature (Celsius)	degrees C	14.8
UA	MW-366	C	2019/09/25	Temperature (Celsius)	degrees C	16.5
UA	MW-366	C	2020/03/26	Temperature (Celsius)	degrees C	14.1
UA	MW-366	C	2020/09/16	Temperature (Celsius)	degrees C	15.4
UA	MW-366	C	2021/03/12	Temperature (Celsius)	degrees C	13.4
UA	MW-366	C	2021/09/15	Temperature (Celsius)	degrees C	16.6
UA	MW-366	C	2022/03/29	Temperature (Celsius)	degrees C	13.0
UA	MW-366	C	2022/09/30	Temperature (Celsius)	degrees C	16.6

UA	MW-366	C	2023/03/14	Temperature (Celsius)	degrees C	13.5
UA	MW-366	C	2023/05/16	Temperature (Celsius)	degrees C	14.5
UA	MW-366	C	2023/08/04	Temperature (Celsius)	degrees C	15.4
UA	MW-366	C	2023/11/02	Temperature (Celsius)	degrees C	15.7
UA	MW-366	C	2016/01/20	Total Dissolved Solids	mg/L	416
UA	MW-366	C	2016/03/23	Total Dissolved Solids	mg/L	450
UA	MW-366	C	2016/06/22	Total Dissolved Solids	mg/L	434
UA	MW-366	C	2016/09/20	Total Dissolved Solids	mg/L	398
UA	MW-366	C	2016/12/22	Total Dissolved Solids	mg/L	430
UA	MW-366	C	2017/03/15	Total Dissolved Solids	mg/L	478
UA	MW-366	C	2017/06/20	Total Dissolved Solids	mg/L	474
UA	MW-366	C	2017/07/26	Total Dissolved Solids	mg/L	474
UA	MW-366	C	2017/11/27	Total Dissolved Solids	mg/L	740
UA	MW-366	C	2018/06/26	Total Dissolved Solids	mg/L	1,060
UA	MW-366	C	2018/09/25	Total Dissolved Solids	mg/L	1,050
UA	MW-366	C	2019/03/19	Total Dissolved Solids	mg/L	1,030
UA	MW-366	C	2019/09/25	Total Dissolved Solids	mg/L	1,130
UA	MW-366	C	2020/03/26	Total Dissolved Solids	mg/L	1,090
UA	MW-366	C	2020/09/16	Total Dissolved Solids	mg/L	1,100
UA	MW-366	C	2021/03/12	Total Dissolved Solids	mg/L	876
UA	MW-366	C	2021/09/15	Total Dissolved Solids	mg/L	1,140
UA	MW-366	C	2022/03/29	Total Dissolved Solids	mg/L	1,230
UA	MW-366	C	2022/09/30	Total Dissolved Solids	mg/L	1,350
UA	MW-366	C	2023/03/14	Total Dissolved Solids	mg/L	1,490
UA	MW-366	C	2023/05/16	Total Dissolved Solids	mg/L	1,160
UA	MW-366	C	2023/08/04	Total Dissolved Solids	mg/L	1,190
UA	MW-366	C	2023/11/02	Total Dissolved Solids	mg/L	1,370
UA	MW-375	C	2016/01/20	pH (field)	SU	7.7
UA	MW-375	C	2016/03/23	pH (field)	SU	7.8
UA	MW-375	C	2016/06/22	pH (field)	SU	7.9
UA	MW-375	C	2016/09/20	pH (field)	SU	7.8
UA	MW-375	C	2016/12/22	pH (field)	SU	7.8
UA	MW-375	C	2017/03/16	pH (field)	SU	7.8
UA	MW-375	C	2017/06/21	pH (field)	SU	7.7
UA	MW-375	C	2017/07/28	pH (field)	SU	7.8
UA	MW-375	C	2017/11/27	pH (field)	SU	7.9
UA	MW-375	C	2018/06/27	pH (field)	SU	7.6
UA	MW-375	C	2018/09/25	pH (field)	SU	7.8
UA	MW-375	C	2019/03/20	pH (field)	SU	7.8
UA	MW-375	C	2019/09/25	pH (field)	SU	7.8
UA	MW-375	C	2020/03/24	pH (field)	SU	7.8
UA	MW-375	C	2020/09/16	pH (field)	SU	7.8
UA	MW-375	C	2021/03/12	pH (field)	SU	7.8
UA	MW-375	C	2021/09/14	pH (field)	SU	7.8
UA	MW-375	C	2022/03/28	pH (field)	SU	7.8
UA	MW-375	C	2022/09/30	pH (field)	SU	7.8
UA	MW-375	C	2023/03/14	pH (field)	SU	7.7
UA	MW-375	C	2023/05/18	pH (field)	SU	7.7
UA	MW-375	C	2023/08/07	pH (field)	SU	7.0
UA	MW-375	C	2023/11/03	pH (field)	SU	7.7
UA	MW-375	C	2016/01/20	Oxidation Reduction Potential	mV	24.0
UA	MW-375	C	2016/03/23	Oxidation Reduction Potential	mV	32.0
UA	MW-375	C	2016/06/22	Oxidation Reduction Potential	mV	17.0
UA	MW-375	C	2016/09/20	Oxidation Reduction Potential	mV	-15.0
UA	MW-375	C	2016/12/22	Oxidation Reduction Potential	mV	-27.0
UA	MW-375	C	2017/03/16	Oxidation Reduction Potential	mV	71.0
UA	MW-375	C	2017/06/21	Oxidation Reduction Potential	mV	18.0

UA	MW-375	C	2017/07/28	Oxidation Reduction Potential	mV	47.0
UA	MW-375	C	2017/11/27	Oxidation Reduction Potential	mV	79.0
UA	MW-375	C	2018/06/27	Oxidation Reduction Potential	mV	149
UA	MW-375	C	2018/09/25	Oxidation Reduction Potential	mV	131
UA	MW-375	C	2019/03/20	Oxidation Reduction Potential	mV	-12.0
UA	MW-375	C	2019/09/25	Oxidation Reduction Potential	mV	24.0
UA	MW-375	C	2020/03/24	Oxidation Reduction Potential	mV	13.0
UA	MW-375	C	2020/09/16	Oxidation Reduction Potential	mV	-97.0
UA	MW-375	C	2021/03/12	Oxidation Reduction Potential	mV	-2.00
UA	MW-375	C	2021/09/14	Oxidation Reduction Potential	mV	-106
UA	MW-375	C	2022/03/28	Oxidation Reduction Potential	mV	-63.0
UA	MW-375	C	2022/09/30	Oxidation Reduction Potential	mV	61.0
UA	MW-375	C	2023/03/14	Oxidation Reduction Potential	mV	-68.3
UA	MW-375	C	2023/05/18	Oxidation Reduction Potential	mV	7.00
UA	MW-375	C	2023/08/07	Oxidation Reduction Potential	mV	160
UA	MW-375	C	2023/11/03	Oxidation Reduction Potential	mV	-3.00
UA	MW-375	C	2016/01/20	Eh	V	0.22
UA	MW-375	C	2016/03/23	Eh	V	0.23
UA	MW-375	C	2016/06/22	Eh	V	0.21
UA	MW-375	C	2016/09/20	Eh	V	0.17
UA	MW-375	C	2016/12/22	Eh	V	0.17
UA	MW-375	C	2017/03/16	Eh	V	0.27
UA	MW-375	C	2017/06/21	Eh	V	0.21
UA	MW-375	C	2017/07/28	Eh	V	0.24
UA	MW-375	C	2017/11/27	Eh	V	0.27
UA	MW-375	C	2018/06/27	Eh	V	0.34
UA	MW-375	C	2018/09/25	Eh	V	0.32
UA	MW-375	C	2019/03/20	Eh	V	0.18
UA	MW-375	C	2019/09/25	Eh	V	0.22
UA	MW-375	C	2020/03/24	Eh	V	0.21
UA	MW-375	C	2020/09/16	Eh	V	0.098
UA	MW-375	C	2021/03/12	Eh	V	0.19
UA	MW-375	C	2021/09/14	Eh	V	0.089
UA	MW-375	C	2022/03/28	Eh	V	0.13
UA	MW-375	C	2022/09/30	Eh	V	0.26
UA	MW-375	C	2023/03/14	Eh	V	0.13
UA	MW-375	C	2023/05/18	Eh	V	0.20
UA	MW-375	C	2023/08/07	Eh	V	0.35
UA	MW-375	C	2023/11/03	Eh	V	0.19
UA	MW-375	C	2017/07/28	Alkalinity, bicarbonate	mg/L CaCO3	620
UA	MW-375	C	2020/03/24	Alkalinity, bicarbonate	mg/L CaCO3	572
UA	MW-375	C	2020/09/16	Alkalinity, bicarbonate	mg/L CaCO3	586
UA	MW-375	C	2021/03/12	Alkalinity, bicarbonate	mg/L CaCO3	580
UA	MW-375	C	2021/09/14	Alkalinity, bicarbonate	mg/L CaCO3	585
UA	MW-375	C	2022/03/28	Alkalinity, bicarbonate	mg/L CaCO3	591
UA	MW-375	C	2022/09/30	Alkalinity, bicarbonate	mg/L CaCO3	593
UA	MW-375	C	2023/03/14	Alkalinity, bicarbonate	mg/L CaCO3	594
UA	MW-375	C	2023/05/18	Alkalinity, bicarbonate	mg/L CaCO3	585
UA	MW-375	C	2023/08/07	Alkalinity, bicarbonate	mg/L CaCO3	605
UA	MW-375	C	2023/11/03	Alkalinity, bicarbonate	mg/L CaCO3	598
UA	MW-375	C	2022/09/30	Alkalinity, carbonate	mg/L CaCO3	6.00
UA	MW-375	C	2023/11/03	Alkalinity, carbonate	mg/L CaCO3	12.0
UA	MW-375	C	2016/01/20	Barium, total	mg/L	0.0303
UA	MW-375	C	2016/03/23	Barium, total	mg/L	0.0264
UA	MW-375	C	2016/06/22	Barium, total	mg/L	0.0247
UA	MW-375	C	2016/09/20	Barium, total	mg/L	0.0375
UA	MW-375	C	2016/12/22	Barium, total	mg/L	0.0239

UA	MW-375	C	2017/03/16	Barium, total	mg/L	0.0237
UA	MW-375	C	2017/06/21	Barium, total	mg/L	0.0250
UA	MW-375	C	2017/07/28	Barium, total	mg/L	0.0243
UA	MW-375	C	2018/06/27	Barium, total	mg/L	0.0297
UA	MW-375	C	2018/09/25	Barium, total	mg/L	0.0263
UA	MW-375	C	2019/03/20	Barium, total	mg/L	0.0271
UA	MW-375	C	2019/09/25	Barium, total	mg/L	0.0263
UA	MW-375	C	2020/03/24	Barium, total	mg/L	0.0259
UA	MW-375	C	2020/09/16	Barium, total	mg/L	0.0238
UA	MW-375	C	2021/03/12	Barium, total	mg/L	0.0245
UA	MW-375	C	2021/09/14	Barium, total	mg/L	0.0230
UA	MW-375	C	2022/03/28	Barium, total	mg/L	0.0226
UA	MW-375	C	2022/09/30	Barium, total	mg/L	0.0312
UA	MW-375	C	2023/03/14	Barium, total	mg/L	0.0244
UA	MW-375	C	2023/05/18	Barium, total	mg/L	0.0290
UA	MW-375	C	2023/08/07	Barium, total	mg/L	0.0338
UA	MW-375	C	2023/11/03	Barium, total	mg/L	0.0211
UA	MW-375	C	2016/01/20	Boron, total	mg/L	0.979
UA	MW-375	C	2016/03/23	Boron, total	mg/L	1.13
UA	MW-375	C	2016/06/22	Boron, total	mg/L	1.27
UA	MW-375	C	2016/09/20	Boron, total	mg/L	2.06
UA	MW-375	C	2016/12/22	Boron, total	mg/L	1.32
UA	MW-375	C	2017/03/16	Boron, total	mg/L	1.24
UA	MW-375	C	2017/06/21	Boron, total	mg/L	1.37
UA	MW-375	C	2017/07/28	Boron, total	mg/L	1.23
UA	MW-375	C	2017/11/27	Boron, total	mg/L	1.26
UA	MW-375	C	2018/06/27	Boron, total	mg/L	1.46
UA	MW-375	C	2018/09/25	Boron, total	mg/L	1.34
UA	MW-375	C	2019/03/20	Boron, total	mg/L	1.38
UA	MW-375	C	2019/09/25	Boron, total	mg/L	1.39
UA	MW-375	C	2020/03/24	Boron, total	mg/L	1.50
UA	MW-375	C	2020/09/16	Boron, total	mg/L	1.44
UA	MW-375	C	2021/03/12	Boron, total	mg/L	1.51
UA	MW-375	C	2021/09/14	Boron, total	mg/L	1.33
UA	MW-375	C	2022/03/28	Boron, total	mg/L	1.54
UA	MW-375	C	2022/09/30	Boron, total	mg/L	1.75
UA	MW-375	C	2023/03/14	Boron, total	mg/L	1.40
UA	MW-375	C	2023/05/18	Boron, total	mg/L	1.45
UA	MW-375	C	2023/08/07	Boron, total	mg/L	1.78
UA	MW-375	C	2023/11/03	Boron, total	mg/L	1.35
UA	MW-375	C	2016/01/20	Calcium, total	mg/L	14.9
UA	MW-375	C	2016/03/23	Calcium, total	mg/L	12.1
UA	MW-375	C	2016/06/22	Calcium, total	mg/L	11.2
UA	MW-375	C	2016/09/20	Calcium, total	mg/L	18.1
UA	MW-375	C	2016/12/22	Calcium, total	mg/L	9.63
UA	MW-375	C	2017/03/16	Calcium, total	mg/L	9.96
UA	MW-375	C	2017/06/21	Calcium, total	mg/L	8.82
UA	MW-375	C	2017/07/28	Calcium, total	mg/L	8.97
UA	MW-375	C	2017/11/27	Calcium, total	mg/L	10.6
UA	MW-375	C	2018/06/27	Calcium, total	mg/L	24.0
UA	MW-375	C	2018/09/25	Calcium, total	mg/L	19.7
UA	MW-375	C	2019/03/20	Calcium, total	mg/L	21.0
UA	MW-375	C	2019/09/25	Calcium, total	mg/L	20.7
UA	MW-375	C	2020/03/24	Calcium, total	mg/L	24.7
UA	MW-375	C	2020/09/16	Calcium, total	mg/L	13.8
UA	MW-375	C	2021/03/12	Calcium, total	mg/L	14.6
UA	MW-375	C	2021/09/14	Calcium, total	mg/L	11.8

UA	MW-375	C	2022/03/28	Calcium, total	mg/L	11.0
UA	MW-375	C	2022/09/30	Calcium, total	mg/L	12.7
UA	MW-375	C	2023/03/14	Calcium, total	mg/L	11.2
UA	MW-375	C	2023/05/18	Calcium, total	mg/L	13.7
UA	MW-375	C	2023/08/07	Calcium, total	mg/L	9.80
UA	MW-375	C	2023/11/03	Calcium, total	mg/L	10.7
UA	MW-375	C	2016/01/20	Chloride, total	mg/L	77.0
UA	MW-375	C	2016/03/23	Chloride, total	mg/L	77.0
UA	MW-375	C	2016/06/22	Chloride, total	mg/L	90.0
UA	MW-375	C	2016/09/20	Chloride, total	mg/L	96.0
UA	MW-375	C	2016/12/22	Chloride, total	mg/L	98.0
UA	MW-375	C	2017/03/16	Chloride, total	mg/L	93.0
UA	MW-375	C	2017/06/21	Chloride, total	mg/L	91.0
UA	MW-375	C	2017/07/28	Chloride, total	mg/L	96.0
UA	MW-375	C	2017/11/27	Chloride, total	mg/L	90.0
UA	MW-375	C	2018/06/27	Chloride, total	mg/L	103
UA	MW-375	C	2018/09/25	Chloride, total	mg/L	107
UA	MW-375	C	2019/03/20	Chloride, total	mg/L	95.0
UA	MW-375	C	2019/09/25	Chloride, total	mg/L	97.0
UA	MW-375	C	2020/03/24	Chloride, total	mg/L	105
UA	MW-375	C	2020/09/16	Chloride, total	mg/L	111
UA	MW-375	C	2021/03/12	Chloride, total	mg/L	104
UA	MW-375	C	2021/09/14	Chloride, total	mg/L	114
UA	MW-375	C	2022/03/28	Chloride, total	mg/L	106
UA	MW-375	C	2022/09/30	Chloride, total	mg/L	118
UA	MW-375	C	2023/03/14	Chloride, total	mg/L	92.0
UA	MW-375	C	2023/05/18	Chloride, total	mg/L	90.0
UA	MW-375	C	2023/08/07	Chloride, total	mg/L	90.0
UA	MW-375	C	2023/11/03	Chloride, total	mg/L	98.0
UA	MW-375	C	2023/05/18	Iron, dissolved	mg/L	<0.02
UA	MW-375	C	2023/08/07	Iron, dissolved	mg/L	<0.0115
UA	MW-375	C	2017/07/28	Magnesium, total	mg/L	5.14
UA	MW-375	C	2020/03/24	Magnesium, total	mg/L	11.8
UA	MW-375	C	2020/09/16	Magnesium, total	mg/L	7.97
UA	MW-375	C	2021/03/12	Magnesium, total	mg/L	5.98
UA	MW-375	C	2021/09/14	Magnesium, total	mg/L	6.09
UA	MW-375	C	2022/03/28	Magnesium, total	mg/L	6.41
UA	MW-375	C	2022/09/30	Magnesium, total	mg/L	6.49
UA	MW-375	C	2023/03/14	Magnesium, total	mg/L	6.09
UA	MW-375	C	2023/05/18	Magnesium, total	mg/L	6.92
UA	MW-375	C	2023/08/07	Magnesium, total	mg/L	5.52
UA	MW-375	C	2023/11/03	Magnesium, total	mg/L	5.96
UA	MW-375	C	2023/05/18	Manganese, dissolved	mg/L	<0.0025
UA	MW-375	C	2023/08/07	Manganese, dissolved	mg/L	0.00130
UA	MW-375	C	2023/05/18	Phosphate, dissolved	mg/L	0.0310
UA	MW-375	C	2023/08/07	Phosphate, dissolved	mg/L	0.0400
UA	MW-375	C	2017/07/28	Potassium, total	mg/L	2.36
UA	MW-375	C	2020/03/24	Potassium, total	mg/L	3.26
UA	MW-375	C	2020/09/16	Potassium, total	mg/L	3.08
UA	MW-375	C	2021/03/12	Potassium, total	mg/L	2.42
UA	MW-375	C	2021/09/14	Potassium, total	mg/L	2.57
UA	MW-375	C	2022/03/28	Potassium, total	mg/L	2.78
UA	MW-375	C	2022/09/30	Potassium, total	mg/L	2.84
UA	MW-375	C	2023/03/14	Potassium, total	mg/L	2.43
UA	MW-375	C	2023/05/18	Potassium, total	mg/L	2.95
UA	MW-375	C	2023/08/07	Potassium, total	mg/L	2.74
UA	MW-375	C	2023/11/03	Potassium, total	mg/L	2.73

UA	MW-375	C	2023/05/18	Silicon, dissolved	mg/L	3.56
UA	MW-375	C	2023/08/07	Silicon, dissolved	mg/L	3.46
UA	MW-375	C	2017/07/28	Sodium, total	mg/L	352
UA	MW-375	C	2020/03/24	Sodium, total	mg/L	388
UA	MW-375	C	2020/09/16	Sodium, total	mg/L	440
UA	MW-375	C	2021/03/12	Sodium, total	mg/L	333
UA	MW-375	C	2021/09/14	Sodium, total	mg/L	330
UA	MW-375	C	2022/03/28	Sodium, total	mg/L	388
UA	MW-375	C	2022/09/30	Sodium, total	mg/L	354
UA	MW-375	C	2023/03/14	Sodium, total	mg/L	369
UA	MW-375	C	2023/05/18	Sodium, total	mg/L	419
UA	MW-375	C	2023/08/07	Sodium, total	mg/L	383
UA	MW-375	C	2023/11/03	Sodium, total	mg/L	415
UA	MW-375	C	2016/01/20	Sulfate, total	mg/L	104
UA	MW-375	C	2016/03/23	Sulfate, total	mg/L	128
UA	MW-375	C	2016/06/22	Sulfate, total	mg/L	122
UA	MW-375	C	2016/09/20	Sulfate, total	mg/L	123
UA	MW-375	C	2016/12/22	Sulfate, total	mg/L	103
UA	MW-375	C	2017/03/16	Sulfate, total	mg/L	93.0
UA	MW-375	C	2017/06/21	Sulfate, total	mg/L	83.0
UA	MW-375	C	2017/07/28	Sulfate, total	mg/L	85.0
UA	MW-375	C	2017/11/27	Sulfate, total	mg/L	88.0
UA	MW-375	C	2018/06/27	Sulfate, total	mg/L	243
UA	MW-375	C	2018/09/25	Sulfate, total	mg/L	214
UA	MW-375	C	2019/03/20	Sulfate, total	mg/L	184
UA	MW-375	C	2019/09/25	Sulfate, total	mg/L	163
UA	MW-375	C	2020/03/24	Sulfate, total	mg/L	209
UA	MW-375	C	2020/09/16	Sulfate, total	mg/L	202
UA	MW-375	C	2021/03/12	Sulfate, total	mg/L	168
UA	MW-375	C	2021/09/14	Sulfate, total	mg/L	176
UA	MW-375	C	2022/03/28	Sulfate, total	mg/L	160
UA	MW-375	C	2022/09/30	Sulfate, total	mg/L	160
UA	MW-375	C	2023/03/14	Sulfate, total	mg/L	109
UA	MW-375	C	2023/05/18	Sulfate, total	mg/L	104
UA	MW-375	C	2023/08/07	Sulfate, total	mg/L	104
UA	MW-375	C	2023/11/03	Sulfate, total	mg/L	114
UA	MW-375	C	2016/01/20	Temperature (Celsius)	degrees C	10.4
UA	MW-375	C	2016/03/23	Temperature (Celsius)	degrees C	14.3
UA	MW-375	C	2016/06/22	Temperature (Celsius)	degrees C	24.7
UA	MW-375	C	2016/09/20	Temperature (Celsius)	degrees C	26.9
UA	MW-375	C	2016/12/22	Temperature (Celsius)	degrees C	11.6
UA	MW-375	C	2017/03/16	Temperature (Celsius)	degrees C	12.5
UA	MW-375	C	2017/06/21	Temperature (Celsius)	degrees C	18.1
UA	MW-375	C	2017/07/28	Temperature (Celsius)	degrees C	19.8
UA	MW-375	C	2017/11/27	Temperature (Celsius)	degrees C	14.9
UA	MW-375	C	2018/06/27	Temperature (Celsius)	degrees C	19.0
UA	MW-375	C	2018/09/25	Temperature (Celsius)	degrees C	20.7
UA	MW-375	C	2019/03/20	Temperature (Celsius)	degrees C	13.3
UA	MW-375	C	2019/09/25	Temperature (Celsius)	degrees C	15.6
UA	MW-375	C	2020/03/24	Temperature (Celsius)	degrees C	13.0
UA	MW-375	C	2020/09/16	Temperature (Celsius)	degrees C	15.0
UA	MW-375	C	2021/03/12	Temperature (Celsius)	degrees C	13.2
UA	MW-375	C	2021/09/14	Temperature (Celsius)	degrees C	16.2
UA	MW-375	C	2022/03/28	Temperature (Celsius)	degrees C	13.5
UA	MW-375	C	2022/09/30	Temperature (Celsius)	degrees C	14.8
UA	MW-375	C	2023/03/14	Temperature (Celsius)	degrees C	12.6
UA	MW-375	C	2023/05/18	Temperature (Celsius)	degrees C	15.0

UA	MW-375	C	2023/08/07	Temperature (Celsius)	degrees C	15.8
UA	MW-375	C	2023/11/03	Temperature (Celsius)	degrees C	14.2
UA	MW-375	C	2016/01/20	Total Dissolved Solids	mg/L	472
UA	MW-375	C	2016/03/23	Total Dissolved Solids	mg/L	904
UA	MW-375	C	2016/06/22	Total Dissolved Solids	mg/L	934
UA	MW-375	C	2016/09/20	Total Dissolved Solids	mg/L	902
UA	MW-375	C	2016/12/22	Total Dissolved Solids	mg/L	876
UA	MW-375	C	2017/03/16	Total Dissolved Solids	mg/L	904
UA	MW-375	C	2017/06/21	Total Dissolved Solids	mg/L	916
UA	MW-375	C	2017/07/28	Total Dissolved Solids	mg/L	882
UA	MW-375	C	2017/11/27	Total Dissolved Solids	mg/L	928
UA	MW-375	C	2018/06/27	Total Dissolved Solids	mg/L	1,110
UA	MW-375	C	2018/09/25	Total Dissolved Solids	mg/L	1,100
UA	MW-375	C	2019/03/20	Total Dissolved Solids	mg/L	1,040
UA	MW-375	C	2019/09/25	Total Dissolved Solids	mg/L	1,010
UA	MW-375	C	2020/03/24	Total Dissolved Solids	mg/L	1,000
UA	MW-375	C	2020/09/16	Total Dissolved Solids	mg/L	1,010
UA	MW-375	C	2021/03/12	Total Dissolved Solids	mg/L	1,010
UA	MW-375	C	2021/09/14	Total Dissolved Solids	mg/L	976
UA	MW-375	C	2022/03/28	Total Dissolved Solids	mg/L	1,020
UA	MW-375	C	2022/09/30	Total Dissolved Solids	mg/L	1,030
UA	MW-375	C	2023/03/14	Total Dissolved Solids	mg/L	940
UA	MW-375	C	2023/05/18	Total Dissolved Solids	mg/L	950
UA	MW-375	C	2023/08/07	Total Dissolved Solids	mg/L	926
UA	MW-375	C	2023/11/03	Total Dissolved Solids	mg/L	968
UA	MW-377	C	2016/01/19	pH (field)	SU	7.5
UA	MW-377	C	2016/03/23	pH (field)	SU	7.2
UA	MW-377	C	2016/06/22	pH (field)	SU	7.2
UA	MW-377	C	2016/09/21	pH (field)	SU	7.2
UA	MW-377	C	2016/12/22	pH (field)	SU	6.9
UA	MW-377	C	2017/03/15	pH (field)	SU	7.7
UA	MW-377	C	2017/06/21	pH (field)	SU	7.1
UA	MW-377	C	2017/07/28	pH (field)	SU	7.2
UA	MW-377	C	2017/11/28	pH (field)	SU	7.0
UA	MW-377	C	2018/06/27	pH (field)	SU	7.0
UA	MW-377	C	2018/09/25	pH (field)	SU	7.2
UA	MW-377	C	2019/03/20	pH (field)	SU	7.2
UA	MW-377	C	2019/09/25	pH (field)	SU	7.0
UA	MW-377	C	2020/03/24	pH (field)	SU	7.2
UA	MW-377	C	2020/09/16	pH (field)	SU	7.2
UA	MW-377	C	2021/03/12	pH (field)	SU	7.1
UA	MW-377	C	2021/09/14	pH (field)	SU	7.1
UA	MW-377	C	2022/03/28	pH (field)	SU	7.2
UA	MW-377	C	2022/09/30	pH (field)	SU	7.1
UA	MW-377	C	2023/03/14	pH (field)	SU	7.1
UA	MW-377	C	2023/05/22	pH (field)	SU	7.0
UA	MW-377	C	2023/08/07	pH (field)	SU	7.6
UA	MW-377	C	2023/11/03	pH (field)	SU	7.2
UA	MW-377	C	2016/01/19	Oxidation Reduction Potential	mV	47.0
UA	MW-377	C	2016/03/23	Oxidation Reduction Potential	mV	-17.0
UA	MW-377	C	2016/06/22	Oxidation Reduction Potential	mV	-54.0
UA	MW-377	C	2016/09/21	Oxidation Reduction Potential	mV	-59.0
UA	MW-377	C	2016/12/22	Oxidation Reduction Potential	mV	-14.0
UA	MW-377	C	2017/03/15	Oxidation Reduction Potential	mV	-22.0
UA	MW-377	C	2017/06/21	Oxidation Reduction Potential	mV	-24.0
UA	MW-377	C	2017/07/28	Oxidation Reduction Potential	mV	-19.0
UA	MW-377	C	2017/11/28	Oxidation Reduction Potential	mV	157

UA	MW-377	C	2018/06/27	Oxidation Reduction Potential	mV	89.0
UA	MW-377	C	2018/09/25	Oxidation Reduction Potential	mV	-20.0
UA	MW-377	C	2019/03/20	Oxidation Reduction Potential	mV	-37.0
UA	MW-377	C	2019/09/25	Oxidation Reduction Potential	mV	-2.00
UA	MW-377	C	2020/03/24	Oxidation Reduction Potential	mV	35.0
UA	MW-377	C	2020/09/16	Oxidation Reduction Potential	mV	-21.0
UA	MW-377	C	2021/03/12	Oxidation Reduction Potential	mV	44.0
UA	MW-377	C	2021/09/14	Oxidation Reduction Potential	mV	-2.00
UA	MW-377	C	2022/03/28	Oxidation Reduction Potential	mV	-17.0
UA	MW-377	C	2022/09/30	Oxidation Reduction Potential	mV	106
UA	MW-377	C	2023/03/14	Oxidation Reduction Potential	mV	-27.7
UA	MW-377	C	2023/05/22	Oxidation Reduction Potential	mV	108
UA	MW-377	C	2023/08/07	Oxidation Reduction Potential	mV	142
UA	MW-377	C	2023/11/03	Oxidation Reduction Potential	mV	-84.0
UA	MW-377	C	2016/01/19	Eh	V	0.25
UA	MW-377	C	2016/03/23	Eh	V	0.18
UA	MW-377	C	2016/06/22	Eh	V	0.14
UA	MW-377	C	2016/09/21	Eh	V	0.13
UA	MW-377	C	2016/12/22	Eh	V	0.18
UA	MW-377	C	2017/03/15	Eh	V	0.17
UA	MW-377	C	2017/06/21	Eh	V	0.16
UA	MW-377	C	2017/07/28	Eh	V	0.17
UA	MW-377	C	2017/11/28	Eh	V	0.35
UA	MW-377	C	2018/06/27	Eh	V	0.28
UA	MW-377	C	2018/09/25	Eh	V	0.17
UA	MW-377	C	2019/03/20	Eh	V	0.16
UA	MW-377	C	2019/09/25	Eh	V	0.19
UA	MW-377	C	2020/03/24	Eh	V	0.23
UA	MW-377	C	2020/09/16	Eh	V	0.17
UA	MW-377	C	2021/03/12	Eh	V	0.24
UA	MW-377	C	2021/09/14	Eh	V	0.19
UA	MW-377	C	2022/03/28	Eh	V	0.18
UA	MW-377	C	2022/09/30	Eh	V	0.30
UA	MW-377	C	2023/03/14	Eh	V	0.17
UA	MW-377	C	2023/05/22	Eh	V	0.30
UA	MW-377	C	2023/08/07	Eh	V	0.34
UA	MW-377	C	2023/11/03	Eh	V	0.11
UA	MW-377	C	2017/07/28	Alkalinity, bicarbonate	mg/L CaCO3	440
UA	MW-377	C	2020/03/24	Alkalinity, bicarbonate	mg/L CaCO3	442
UA	MW-377	C	2020/09/16	Alkalinity, bicarbonate	mg/L CaCO3	436
UA	MW-377	C	2021/03/12	Alkalinity, bicarbonate	mg/L CaCO3	436
UA	MW-377	C	2021/09/14	Alkalinity, bicarbonate	mg/L CaCO3	437
UA	MW-377	C	2022/03/28	Alkalinity, bicarbonate	mg/L CaCO3	420
UA	MW-377	C	2022/09/30	Alkalinity, bicarbonate	mg/L CaCO3	416
UA	MW-377	C	2023/03/14	Alkalinity, bicarbonate	mg/L CaCO3	422
UA	MW-377	C	2023/05/22	Alkalinity, bicarbonate	mg/L CaCO3	434
UA	MW-377	C	2023/08/07	Alkalinity, bicarbonate	mg/L CaCO3	427
UA	MW-377	C	2023/11/03	Alkalinity, bicarbonate	mg/L CaCO3	432
UA	MW-377	C	2016/01/19	Barium, total	mg/L	0.0580
UA	MW-377	C	2016/03/23	Barium, total	mg/L	0.0637
UA	MW-377	C	2016/06/22	Barium, total	mg/L	0.0663
UA	MW-377	C	2016/09/21	Barium, total	mg/L	0.0755
UA	MW-377	C	2016/12/22	Barium, total	mg/L	0.0625
UA	MW-377	C	2017/03/15	Barium, total	mg/L	0.0646
UA	MW-377	C	2017/06/21	Barium, total	mg/L	0.0602
UA	MW-377	C	2017/07/28	Barium, total	mg/L	0.0631
UA	MW-377	C	2018/06/27	Barium, total	mg/L	0.0643

UA	MW-377	C	2018/09/25	Barium, total	mg/L	0.0608
UA	MW-377	C	2019/03/20	Barium, total	mg/L	0.0672
UA	MW-377	C	2019/09/25	Barium, total	mg/L	0.0630
UA	MW-377	C	2020/03/24	Barium, total	mg/L	0.0625
UA	MW-377	C	2020/09/16	Barium, total	mg/L	0.0599
UA	MW-377	C	2021/03/12	Barium, total	mg/L	0.0609
UA	MW-377	C	2021/09/14	Barium, total	mg/L	0.0630
UA	MW-377	C	2022/03/28	Barium, total	mg/L	0.0554
UA	MW-377	C	2022/09/30	Barium, total	mg/L	0.0589
UA	MW-377	C	2023/03/14	Barium, total	mg/L	0.0631
UA	MW-377	C	2023/05/22	Barium, total	mg/L	0.0603
UA	MW-377	C	2023/08/07	Barium, total	mg/L	0.0636
UA	MW-377	C	2023/11/03	Barium, total	mg/L	0.0555
UA	MW-377	C	2016/01/19	Boron, total	mg/L	1.54
UA	MW-377	C	2016/03/23	Boron, total	mg/L	1.59
UA	MW-377	C	2016/06/22	Boron, total	mg/L	1.79
UA	MW-377	C	2016/09/21	Boron, total	mg/L	2.01
UA	MW-377	C	2016/12/22	Boron, total	mg/L	1.72
UA	MW-377	C	2017/03/15	Boron, total	mg/L	1.67
UA	MW-377	C	2017/06/21	Boron, total	mg/L	1.74
UA	MW-377	C	2017/07/28	Boron, total	mg/L	1.63
UA	MW-377	C	2017/11/28	Boron, total	mg/L	1.91
UA	MW-377	C	2018/06/27	Boron, total	mg/L	1.74
UA	MW-377	C	2018/09/25	Boron, total	mg/L	1.78
UA	MW-377	C	2019/03/20	Boron, total	mg/L	1.73
UA	MW-377	C	2019/09/25	Boron, total	mg/L	1.77
UA	MW-377	C	2020/03/24	Boron, total	mg/L	1.79
UA	MW-377	C	2020/09/16	Boron, total	mg/L	1.75
UA	MW-377	C	2021/03/12	Boron, total	mg/L	1.58
UA	MW-377	C	2021/09/14	Boron, total	mg/L	1.77
UA	MW-377	C	2022/03/28	Boron, total	mg/L	1.69
UA	MW-377	C	2022/09/30	Boron, total	mg/L	1.71
UA	MW-377	C	2023/03/14	Boron, total	mg/L	1.74
UA	MW-377	C	2023/05/22	Boron, total	mg/L	1.71
UA	MW-377	C	2023/08/07	Boron, total	mg/L	1.65
UA	MW-377	C	2023/11/03	Boron, total	mg/L	1.58
UA	MW-377	C	2016/01/19	Calcium, total	mg/L	54.3
UA	MW-377	C	2016/03/23	Calcium, total	mg/L	55.1
UA	MW-377	C	2016/06/22	Calcium, total	mg/L	61.0
UA	MW-377	C	2016/09/21	Calcium, total	mg/L	69.5
UA	MW-377	C	2016/12/22	Calcium, total	mg/L	55.4
UA	MW-377	C	2017/03/15	Calcium, total	mg/L	60.9
UA	MW-377	C	2017/06/21	Calcium, total	mg/L	53.4
UA	MW-377	C	2017/07/28	Calcium, total	mg/L	57.4
UA	MW-377	C	2017/11/28	Calcium, total	mg/L	63.2
UA	MW-377	C	2018/06/27	Calcium, total	mg/L	54.1
UA	MW-377	C	2018/09/25	Calcium, total	mg/L	55.9
UA	MW-377	C	2019/03/20	Calcium, total	mg/L	68.1
UA	MW-377	C	2019/09/25	Calcium, total	mg/L	57.8
UA	MW-377	C	2020/03/24	Calcium, total	mg/L	54.0
UA	MW-377	C	2020/09/16	Calcium, total	mg/L	56.2
UA	MW-377	C	2021/03/12	Calcium, total	mg/L	54.7
UA	MW-377	C	2021/09/14	Calcium, total	mg/L	55.2
UA	MW-377	C	2022/03/28	Calcium, total	mg/L	56.0
UA	MW-377	C	2022/09/30	Calcium, total	mg/L	57.3
UA	MW-377	C	2023/03/14	Calcium, total	mg/L	55.1
UA	MW-377	C	2023/05/22	Calcium, total	mg/L	53.2

UA	MW-377	C	2023/08/07	Calcium, total	mg/L	52.8
UA	MW-377	C	2023/11/03	Calcium, total	mg/L	60.2
UA	MW-377	C	2016/01/19	Chloride, total	mg/L	82.0
UA	MW-377	C	2016/03/23	Chloride, total	mg/L	79.0
UA	MW-377	C	2016/06/22	Chloride, total	mg/L	86.0
UA	MW-377	C	2016/09/21	Chloride, total	mg/L	98.0
UA	MW-377	C	2016/12/22	Chloride, total	mg/L	95.0
UA	MW-377	C	2017/03/15	Chloride, total	mg/L	90.0
UA	MW-377	C	2017/06/21	Chloride, total	mg/L	94.0
UA	MW-377	C	2017/07/28	Chloride, total	mg/L	93.0
UA	MW-377	C	2017/11/28	Chloride, total	mg/L	90.0
UA	MW-377	C	2018/06/27	Chloride, total	mg/L	93.0
UA	MW-377	C	2018/09/25	Chloride, total	mg/L	96.0
UA	MW-377	C	2019/03/20	Chloride, total	mg/L	90.0
UA	MW-377	C	2019/09/25	Chloride, total	mg/L	93.0
UA	MW-377	C	2020/03/24	Chloride, total	mg/L	99.0
UA	MW-377	C	2020/09/16	Chloride, total	mg/L	97.0
UA	MW-377	C	2021/03/12	Chloride, total	mg/L	94.0
UA	MW-377	C	2021/09/14	Chloride, total	mg/L	100
UA	MW-377	C	2022/03/28	Chloride, total	mg/L	92.0
UA	MW-377	C	2022/09/30	Chloride, total	mg/L	99.0
UA	MW-377	C	2023/03/14	Chloride, total	mg/L	90.0
UA	MW-377	C	2023/05/22	Chloride, total	mg/L	93.0
UA	MW-377	C	2023/08/07	Chloride, total	mg/L	102
UA	MW-377	C	2023/11/03	Chloride, total	mg/L	103
UA	MW-377	C	2023/05/22	Iron, dissolved	mg/L	0.0240
UA	MW-377	C	2023/08/07	Iron, dissolved	mg/L	<0.012
UA	MW-377	C	2017/07/28	Magnesium, total	mg/L	38.9
UA	MW-377	C	2020/03/24	Magnesium, total	mg/L	39.2
UA	MW-377	C	2020/09/16	Magnesium, total	mg/L	43.6
UA	MW-377	C	2021/03/12	Magnesium, total	mg/L	39.8
UA	MW-377	C	2021/09/14	Magnesium, total	mg/L	37.2
UA	MW-377	C	2022/03/28	Magnesium, total	mg/L	38.9
UA	MW-377	C	2022/09/30	Magnesium, total	mg/L	37.9
UA	MW-377	C	2023/03/14	Magnesium, total	mg/L	36.9
UA	MW-377	C	2023/05/22	Magnesium, total	mg/L	37.8
UA	MW-377	C	2023/08/07	Magnesium, total	mg/L	35.9
UA	MW-377	C	2023/11/03	Magnesium, total	mg/L	38.4
UA	MW-377	C	2023/05/22	Manganese, dissolved	mg/L	0.0110
UA	MW-377	C	2023/08/07	Manganese, dissolved	mg/L	0.00720
UA	MW-377	C	2023/05/22	Phosphate, dissolved	mg/L	<0.005
UA	MW-377	C	2023/08/07	Phosphate, dissolved	mg/L	<0.005
UA	MW-377	C	2017/07/28	Potassium, total	mg/L	3.48
UA	MW-377	C	2020/03/24	Potassium, total	mg/L	3.44
UA	MW-377	C	2020/09/16	Potassium, total	mg/L	3.94
UA	MW-377	C	2021/03/12	Potassium, total	mg/L	3.29
UA	MW-377	C	2021/09/14	Potassium, total	mg/L	3.28
UA	MW-377	C	2022/03/28	Potassium, total	mg/L	3.77
UA	MW-377	C	2022/09/30	Potassium, total	mg/L	3.47
UA	MW-377	C	2023/03/14	Potassium, total	mg/L	3.07
UA	MW-377	C	2023/05/22	Potassium, total	mg/L	3.56
UA	MW-377	C	2023/08/07	Potassium, total	mg/L	3.44
UA	MW-377	C	2023/11/03	Potassium, total	mg/L	3.49
UA	MW-377	C	2023/05/22	Silicon, dissolved	mg/L	4.43
UA	MW-377	C	2023/08/07	Silicon, dissolved	mg/L	4.11
UA	MW-377	C	2017/07/28	Sodium, total	mg/L	129
UA	MW-377	C	2020/03/24	Sodium, total	mg/L	135

UA	MW-377	C	2020/09/16	Sodium, total	mg/L	155
UA	MW-377	C	2021/03/12	Sodium, total	mg/L	137
UA	MW-377	C	2021/09/14	Sodium, total	mg/L	123
UA	MW-377	C	2022/03/28	Sodium, total	mg/L	144
UA	MW-377	C	2022/09/30	Sodium, total	mg/L	130
UA	MW-377	C	2023/03/14	Sodium, total	mg/L	135
UA	MW-377	C	2023/05/22	Sodium, total	mg/L	133
UA	MW-377	C	2023/08/07	Sodium, total	mg/L	131
UA	MW-377	C	2023/11/03	Sodium, total	mg/L	148
UA	MW-377	C	2016/01/19	Sulfate, total	mg/L	43.0
UA	MW-377	C	2016/03/23	Sulfate, total	mg/L	44.0
UA	MW-377	C	2016/06/22	Sulfate, total	mg/L	41.0
UA	MW-377	C	2016/09/21	Sulfate, total	mg/L	40.0
UA	MW-377	C	2016/12/22	Sulfate, total	mg/L	39.0
UA	MW-377	C	2017/03/15	Sulfate, total	mg/L	42.0
UA	MW-377	C	2017/06/21	Sulfate, total	mg/L	39.0
UA	MW-377	C	2017/07/28	Sulfate, total	mg/L	39.0
UA	MW-377	C	2017/11/28	Sulfate, total	mg/L	41.0
UA	MW-377	C	2018/06/27	Sulfate, total	mg/L	46.0
UA	MW-377	C	2018/09/25	Sulfate, total	mg/L	41.0
UA	MW-377	C	2019/03/20	Sulfate, total	mg/L	38.0
UA	MW-377	C	2019/09/25	Sulfate, total	mg/L	39.0
UA	MW-377	C	2020/03/24	Sulfate, total	mg/L	37.0
UA	MW-377	C	2020/09/16	Sulfate, total	mg/L	39.0
UA	MW-377	C	2021/03/12	Sulfate, total	mg/L	37.0
UA	MW-377	C	2021/09/14	Sulfate, total	mg/L	38.0
UA	MW-377	C	2022/03/28	Sulfate, total	mg/L	39.0
UA	MW-377	C	2022/09/30	Sulfate, total	mg/L	39.0
UA	MW-377	C	2023/03/14	Sulfate, total	mg/L	37.0
UA	MW-377	C	2023/05/22	Sulfate, total	mg/L	40.0
UA	MW-377	C	2023/08/07	Sulfate, total	mg/L	37.0
UA	MW-377	C	2023/11/03	Sulfate, total	mg/L	51.0
UA	MW-377	C	2016/01/19	Temperature (Celsius)	degrees C	10.9
UA	MW-377	C	2016/03/23	Temperature (Celsius)	degrees C	13.8
UA	MW-377	C	2016/06/22	Temperature (Celsius)	degrees C	24.0
UA	MW-377	C	2016/09/21	Temperature (Celsius)	degrees C	21.7
UA	MW-377	C	2016/12/22	Temperature (Celsius)	degrees C	13.6
UA	MW-377	C	2017/03/15	Temperature (Celsius)	degrees C	14.0
UA	MW-377	C	2017/06/21	Temperature (Celsius)	degrees C	25.9
UA	MW-377	C	2017/07/28	Temperature (Celsius)	degrees C	19.1
UA	MW-377	C	2017/11/28	Temperature (Celsius)	degrees C	15.0
UA	MW-377	C	2018/06/27	Temperature (Celsius)	degrees C	22.2
UA	MW-377	C	2018/09/25	Temperature (Celsius)	degrees C	24.7
UA	MW-377	C	2019/03/20	Temperature (Celsius)	degrees C	12.7
UA	MW-377	C	2019/09/25	Temperature (Celsius)	degrees C	18.4
UA	MW-377	C	2020/03/24	Temperature (Celsius)	degrees C	12.8
UA	MW-377	C	2020/09/16	Temperature (Celsius)	degrees C	16.1
UA	MW-377	C	2021/03/12	Temperature (Celsius)	degrees C	12.6
UA	MW-377	C	2021/09/14	Temperature (Celsius)	degrees C	21.3
UA	MW-377	C	2022/03/28	Temperature (Celsius)	degrees C	13.3
UA	MW-377	C	2022/09/30	Temperature (Celsius)	degrees C	17.3
UA	MW-377	C	2023/03/14	Temperature (Celsius)	degrees C	13.8
UA	MW-377	C	2023/05/22	Temperature (Celsius)	degrees C	15.2
UA	MW-377	C	2023/08/07	Temperature (Celsius)	degrees C	15.4
UA	MW-377	C	2023/11/03	Temperature (Celsius)	degrees C	16.6
UA	MW-377	C	2016/01/19	Total Dissolved Solids	mg/L	552
UA	MW-377	C	2016/03/23	Total Dissolved Solids	mg/L	606

UA	MW-377	C	2016/06/22	Total Dissolved Solids	mg/L	628
UA	MW-377	C	2016/09/21	Total Dissolved Solids	mg/L	592
UA	MW-377	C	2016/12/22	Total Dissolved Solids	mg/L	606
UA	MW-377	C	2017/03/15	Total Dissolved Solids	mg/L	628
UA	MW-377	C	2017/06/21	Total Dissolved Solids	mg/L	614
UA	MW-377	C	2017/07/28	Total Dissolved Solids	mg/L	590
UA	MW-377	C	2017/11/28	Total Dissolved Solids	mg/L	652
UA	MW-377	C	2018/06/27	Total Dissolved Solids	mg/L	614
UA	MW-377	C	2018/09/25	Total Dissolved Solids	mg/L	646
UA	MW-377	C	2019/03/20	Total Dissolved Solids	mg/L	614
UA	MW-377	C	2019/09/25	Total Dissolved Solids	mg/L	626
UA	MW-377	C	2020/03/24	Total Dissolved Solids	mg/L	580
UA	MW-377	C	2020/09/16	Total Dissolved Solids	mg/L	580
UA	MW-377	C	2021/03/12	Total Dissolved Solids	mg/L	606
UA	MW-377	C	2021/09/14	Total Dissolved Solids	mg/L	580
UA	MW-377	C	2022/03/28	Total Dissolved Solids	mg/L	642
UA	MW-377	C	2022/09/30	Total Dissolved Solids	mg/L	622
UA	MW-377	C	2023/03/14	Total Dissolved Solids	mg/L	612
UA	MW-377	C	2023/05/22	Total Dissolved Solids	mg/L	608
UA	MW-377	C	2023/08/07	Total Dissolved Solids	mg/L	646
UA	MW-377	C	2023/11/03	Total Dissolved Solids	mg/L	628
UA	MW-383	C	2016/01/21	pH (field)	SU	7.8
UA	MW-383	C	2016/03/24	pH (field)	SU	7.7
UA	MW-383	C	2016/06/23	pH (field)	SU	7.8
UA	MW-383	C	2016/09/21	pH (field)	SU	7.6
UA	MW-383	C	2016/12/27	pH (field)	SU	7.6
UA	MW-383	C	2017/03/16	pH (field)	SU	7.7
UA	MW-383	C	2017/06/19	pH (field)	SU	7.7
UA	MW-383	C	2017/07/26	pH (field)	SU	7.6
UA	MW-383	C	2017/11/28	pH (field)	SU	7.6
UA	MW-383	C	2018/06/27	pH (field)	SU	7.3
UA	MW-383	C	2018/09/25	pH (field)	SU	7.6
UA	MW-383	C	2019/03/20	pH (field)	SU	7.5
UA	MW-383	C	2019/09/24	pH (field)	SU	7.5
UA	MW-383	C	2020/03/25	pH (field)	SU	7.6
UA	MW-383	C	2020/09/15	pH (field)	SU	7.7
UA	MW-383	C	2021/03/12	pH (field)	SU	7.6
UA	MW-383	C	2021/09/13	pH (field)	SU	7.6
UA	MW-383	C	2022/03/29	pH (field)	SU	7.5
UA	MW-383	C	2022/09/30	pH (field)	SU	7.6
UA	MW-383	C	2023/03/14	pH (field)	SU	7.5
UA	MW-383	C	2023/05/22	pH (field)	SU	7.5
UA	MW-383	C	2023/08/03	pH (field)	SU	7.6
UA	MW-383	C	2023/11/01	pH (field)	SU	7.6
UA	MW-383	C	2016/01/21	Oxidation Reduction Potential	mV	89.0
UA	MW-383	C	2016/03/24	Oxidation Reduction Potential	mV	46.0
UA	MW-383	C	2016/06/23	Oxidation Reduction Potential	mV	-52.0
UA	MW-383	C	2016/09/21	Oxidation Reduction Potential	mV	-46.0
UA	MW-383	C	2016/12/27	Oxidation Reduction Potential	mV	-27.0
UA	MW-383	C	2017/03/16	Oxidation Reduction Potential	mV	-2.00
UA	MW-383	C	2017/06/19	Oxidation Reduction Potential	mV	-35.0
UA	MW-383	C	2017/07/26	Oxidation Reduction Potential	mV	56.0
UA	MW-383	C	2017/11/28	Oxidation Reduction Potential	mV	25.0
UA	MW-383	C	2018/06/27	Oxidation Reduction Potential	mV	12.0
UA	MW-383	C	2018/09/25	Oxidation Reduction Potential	mV	-10.0
UA	MW-383	C	2019/03/20	Oxidation Reduction Potential	mV	-84.0
UA	MW-383	C	2019/09/24	Oxidation Reduction Potential	mV	-51.0

UA	MW-383	C	2020/03/25	Oxidation Reduction Potential	mV	-10.0
UA	MW-383	C	2020/09/15	Oxidation Reduction Potential	mV	-32.0
UA	MW-383	C	2021/03/12	Oxidation Reduction Potential	mV	-73.0
UA	MW-383	C	2021/09/13	Oxidation Reduction Potential	mV	-5.00
UA	MW-383	C	2022/03/29	Oxidation Reduction Potential	mV	-70.0
UA	MW-383	C	2022/09/30	Oxidation Reduction Potential	mV	100
UA	MW-383	C	2023/03/14	Oxidation Reduction Potential	mV	-44.0
UA	MW-383	C	2023/05/22	Oxidation Reduction Potential	mV	70.0
UA	MW-383	C	2023/08/03	Oxidation Reduction Potential	mV	29.0
UA	MW-383	C	2023/11/01	Oxidation Reduction Potential	mV	-114
UA	MW-383	C	2016/01/21	Eh	V	0.28
UA	MW-383	C	2016/03/24	Eh	V	0.24
UA	MW-383	C	2016/06/23	Eh	V	0.13
UA	MW-383	C	2016/09/21	Eh	V	0.14
UA	MW-383	C	2016/12/27	Eh	V	0.17
UA	MW-383	C	2017/03/16	Eh	V	0.19
UA	MW-383	C	2017/06/19	Eh	V	0.15
UA	MW-383	C	2017/07/26	Eh	V	0.25
UA	MW-383	C	2017/11/28	Eh	V	0.22
UA	MW-383	C	2018/06/27	Eh	V	0.20
UA	MW-383	C	2018/09/25	Eh	V	0.18
UA	MW-383	C	2019/03/20	Eh	V	0.11
UA	MW-383	C	2019/09/24	Eh	V	0.14
UA	MW-383	C	2020/03/25	Eh	V	0.18
UA	MW-383	C	2020/09/15	Eh	V	0.16
UA	MW-383	C	2021/03/12	Eh	V	0.12
UA	MW-383	C	2021/09/13	Eh	V	0.19
UA	MW-383	C	2022/03/29	Eh	V	0.12
UA	MW-383	C	2022/09/30	Eh	V	0.29
UA	MW-383	C	2023/03/14	Eh	V	0.15
UA	MW-383	C	2023/05/22	Eh	V	0.26
UA	MW-383	C	2023/08/03	Eh	V	0.22
UA	MW-383	C	2023/11/01	Eh	V	0.080
UA	MW-383	C	2017/07/26	Alkalinity, bicarbonate	mg/L CaCO3	556
UA	MW-383	C	2020/03/25	Alkalinity, bicarbonate	mg/L CaCO3	592
UA	MW-383	C	2020/09/15	Alkalinity, bicarbonate	mg/L CaCO3	590
UA	MW-383	C	2021/03/12	Alkalinity, bicarbonate	mg/L CaCO3	553
UA	MW-383	C	2021/09/13	Alkalinity, bicarbonate	mg/L CaCO3	581
UA	MW-383	C	2022/03/29	Alkalinity, bicarbonate	mg/L CaCO3	575
UA	MW-383	C	2022/09/30	Alkalinity, bicarbonate	mg/L CaCO3	585
UA	MW-383	C	2023/03/14	Alkalinity, bicarbonate	mg/L CaCO3	569
UA	MW-383	C	2023/05/22	Alkalinity, bicarbonate	mg/L CaCO3	561
UA	MW-383	C	2023/08/03	Alkalinity, bicarbonate	mg/L CaCO3	571
UA	MW-383	C	2023/11/01	Alkalinity, bicarbonate	mg/L CaCO3	569
UA	MW-383	C	2023/11/01	Alkalinity, carbonate	mg/L CaCO3	9.00
UA	MW-383	C	2016/01/21	Barium, total	mg/L	0.0339
UA	MW-383	C	2016/03/24	Barium, total	mg/L	0.0320
UA	MW-383	C	2016/06/23	Barium, total	mg/L	0.0307
UA	MW-383	C	2016/09/21	Barium, total	mg/L	0.0360
UA	MW-383	C	2016/12/27	Barium, total	mg/L	0.0310
UA	MW-383	C	2017/03/16	Barium, total	mg/L	0.0324
UA	MW-383	C	2017/06/19	Barium, total	mg/L	0.0361
UA	MW-383	C	2017/07/26	Barium, total	mg/L	0.0346
UA	MW-383	C	2018/06/27	Barium, total	mg/L	0.0398
UA	MW-383	C	2018/09/25	Barium, total	mg/L	0.0363
UA	MW-383	C	2019/03/20	Barium, total	mg/L	0.0414
UA	MW-383	C	2019/09/24	Barium, total	mg/L	0.0410

UA	MW-383	C	2020/03/25	Barium, total	mg/L	0.0421
UA	MW-383	C	2020/09/15	Barium, total	mg/L	0.0449
UA	MW-383	C	2021/03/12	Barium, total	mg/L	0.0406
UA	MW-383	C	2021/09/13	Barium, total	mg/L	0.0443
UA	MW-383	C	2022/03/29	Barium, total	mg/L	0.0617
UA	MW-383	C	2022/09/30	Barium, total	mg/L	0.0481
UA	MW-383	C	2023/03/14	Barium, total	mg/L	0.0446
UA	MW-383	C	2023/05/22	Barium, total	mg/L	0.0442
UA	MW-383	C	2023/08/03	Barium, total	mg/L	0.0427
UA	MW-383	C	2023/11/01	Barium, total	mg/L	0.0479
UA	MW-383	C	2016/01/21	Boron, total	mg/L	1.27
UA	MW-383	C	2016/03/24	Boron, total	mg/L	1.33
UA	MW-383	C	2016/06/23	Boron, total	mg/L	1.45
UA	MW-383	C	2016/09/21	Boron, total	mg/L	2.05
UA	MW-383	C	2016/12/27	Boron, total	mg/L	1.49
UA	MW-383	C	2017/03/16	Boron, total	mg/L	1.42
UA	MW-383	C	2017/06/19	Boron, total	mg/L	1.53
UA	MW-383	C	2017/07/26	Boron, total	mg/L	1.26
UA	MW-383	C	2017/11/28	Boron, total	mg/L	1.49
UA	MW-383	C	2018/06/27	Boron, total	mg/L	1.50
UA	MW-383	C	2018/09/25	Boron, total	mg/L	1.40
UA	MW-383	C	2019/03/20	Boron, total	mg/L	1.43
UA	MW-383	C	2019/09/24	Boron, total	mg/L	1.39
UA	MW-383	C	2020/03/25	Boron, total	mg/L	1.33
UA	MW-383	C	2020/09/15	Boron, total	mg/L	1.39
UA	MW-383	C	2021/03/12	Boron, total	mg/L	1.40
UA	MW-383	C	2021/09/13	Boron, total	mg/L	1.34
UA	MW-383	C	2022/03/29	Boron, total	mg/L	1.56
UA	MW-383	C	2022/09/30	Boron, total	mg/L	1.52
UA	MW-383	C	2023/03/14	Boron, total	mg/L	1.35
UA	MW-383	C	2023/05/22	Boron, total	mg/L	1.16
UA	MW-383	C	2023/08/03	Boron, total	mg/L	1.33
UA	MW-383	C	2023/11/01	Boron, total	mg/L	1.40
UA	MW-383	C	2016/01/21	Calcium, total	mg/L	16.2
UA	MW-383	C	2016/03/24	Calcium, total	mg/L	15.7
UA	MW-383	C	2016/06/23	Calcium, total	mg/L	14.9
UA	MW-383	C	2016/09/21	Calcium, total	mg/L	20.2
UA	MW-383	C	2016/12/27	Calcium, total	mg/L	14.9
UA	MW-383	C	2017/03/16	Calcium, total	mg/L	16.2
UA	MW-383	C	2017/06/19	Calcium, total	mg/L	16.1
UA	MW-383	C	2017/07/26	Calcium, total	mg/L	16.1
UA	MW-383	C	2017/11/28	Calcium, total	mg/L	18.4
UA	MW-383	C	2018/06/27	Calcium, total	mg/L	17.0
UA	MW-383	C	2018/09/25	Calcium, total	mg/L	16.8
UA	MW-383	C	2019/03/20	Calcium, total	mg/L	18.4
UA	MW-383	C	2019/09/24	Calcium, total	mg/L	19.2
UA	MW-383	C	2020/03/25	Calcium, total	mg/L	18.2
UA	MW-383	C	2020/09/15	Calcium, total	mg/L	18.3
UA	MW-383	C	2021/03/12	Calcium, total	mg/L	17.2
UA	MW-383	C	2021/09/13	Calcium, total	mg/L	17.1
UA	MW-383	C	2022/03/29	Calcium, total	mg/L	17.9
UA	MW-383	C	2022/09/30	Calcium, total	mg/L	19.4
UA	MW-383	C	2023/03/14	Calcium, total	mg/L	18.2
UA	MW-383	C	2023/05/22	Calcium, total	mg/L	23.8
UA	MW-383	C	2023/08/03	Calcium, total	mg/L	17.3
UA	MW-383	C	2023/11/01	Calcium, total	mg/L	18.8
UA	MW-383	C	2016/01/21	Chloride, total	mg/L	41.0

UA	MW-383	C	2016/03/24	Chloride, total	mg/L	39.0
UA	MW-383	C	2016/06/23	Chloride, total	mg/L	39.0
UA	MW-383	C	2016/09/21	Chloride, total	mg/L	40.0
UA	MW-383	C	2016/12/27	Chloride, total	mg/L	41.0
UA	MW-383	C	2017/03/16	Chloride, total	mg/L	40.0
UA	MW-383	C	2017/06/19	Chloride, total	mg/L	40.0
UA	MW-383	C	2017/07/26	Chloride, total	mg/L	40.0
UA	MW-383	C	2017/11/28	Chloride, total	mg/L	39.0
UA	MW-383	C	2018/06/27	Chloride, total	mg/L	39.0
UA	MW-383	C	2018/09/25	Chloride, total	mg/L	40.0
UA	MW-383	C	2019/03/20	Chloride, total	mg/L	39.0
UA	MW-383	C	2019/09/24	Chloride, total	mg/L	41.0
UA	MW-383	C	2020/03/25	Chloride, total	mg/L	40.0
UA	MW-383	C	2020/09/15	Chloride, total	mg/L	45.0
UA	MW-383	C	2021/03/12	Chloride, total	mg/L	42.0
UA	MW-383	C	2021/09/13	Chloride, total	mg/L	45.0
UA	MW-383	C	2022/03/29	Chloride, total	mg/L	50.0
UA	MW-383	C	2022/09/30	Chloride, total	mg/L	42.0
UA	MW-383	C	2023/03/14	Chloride, total	mg/L	40.0
UA	MW-383	C	2023/05/22	Chloride, total	mg/L	43.0
UA	MW-383	C	2023/08/03	Chloride, total	mg/L	43.0
UA	MW-383	C	2023/11/01	Chloride, total	mg/L	46.0
UA	MW-383	C	2023/05/22	Iron, dissolved	mg/L	<0.02
UA	MW-383	C	2023/08/03	Iron, dissolved	mg/L	0.359
UA	MW-383	C	2017/07/26	Magnesium, total	mg/L	6.23
UA	MW-383	C	2020/03/25	Magnesium, total	mg/L	7.38
UA	MW-383	C	2020/09/15	Magnesium, total	mg/L	7.96
UA	MW-383	C	2021/03/12	Magnesium, total	mg/L	7.36
UA	MW-383	C	2021/09/13	Magnesium, total	mg/L	6.52
UA	MW-383	C	2022/03/29	Magnesium, total	mg/L	6.68
UA	MW-383	C	2022/09/30	Magnesium, total	mg/L	7.71
UA	MW-383	C	2023/03/14	Magnesium, total	mg/L	7.12
UA	MW-383	C	2023/05/22	Magnesium, total	mg/L	10.5
UA	MW-383	C	2023/08/03	Magnesium, total	mg/L	6.72
UA	MW-383	C	2023/11/01	Magnesium, total	mg/L	7.00
UA	MW-383	C	2023/05/22	Manganese, dissolved	mg/L	0.0269
UA	MW-383	C	2023/08/03	Manganese, dissolved	mg/L	0.0382
UA	MW-383	C	2023/05/22	Phosphate, dissolved	mg/L	<0.005
UA	MW-383	C	2023/08/03	Phosphate, dissolved	mg/L	0.0150
UA	MW-383	C	2017/07/26	Potassium, total	mg/L	1.92
UA	MW-383	C	2020/03/25	Potassium, total	mg/L	2.10
UA	MW-383	C	2020/09/15	Potassium, total	mg/L	2.40
UA	MW-383	C	2021/03/12	Potassium, total	mg/L	2.03
UA	MW-383	C	2021/09/13	Potassium, total	mg/L	1.95
UA	MW-383	C	2022/03/29	Potassium, total	mg/L	2.15
UA	MW-383	C	2022/09/30	Potassium, total	mg/L	2.14
UA	MW-383	C	2023/03/14	Potassium, total	mg/L	1.96
UA	MW-383	C	2023/05/22	Potassium, total	mg/L	2.17
UA	MW-383	C	2023/08/03	Potassium, total	mg/L	2.18
UA	MW-383	C	2023/11/01	Potassium, total	mg/L	2.14
UA	MW-383	C	2023/05/22	Silicon, dissolved	mg/L	5.64
UA	MW-383	C	2023/08/03	Silicon, dissolved	mg/L	5.11
UA	MW-383	C	2017/07/26	Sodium, total	mg/L	320
UA	MW-383	C	2020/03/25	Sodium, total	mg/L	346
UA	MW-383	C	2020/09/15	Sodium, total	mg/L	386
UA	MW-383	C	2021/03/12	Sodium, total	mg/L	349
UA	MW-383	C	2021/09/13	Sodium, total	mg/L	302

UA	MW-383	C	2022/03/29	Sodium, total	mg/L	350
UA	MW-383	C	2022/09/30	Sodium, total	mg/L	314
UA	MW-383	C	2023/03/14	Sodium, total	mg/L	315
UA	MW-383	C	2023/05/22	Sodium, total	mg/L	290
UA	MW-383	C	2023/08/03	Sodium, total	mg/L	349
UA	MW-383	C	2023/11/01	Sodium, total	mg/L	374
UA	MW-383	C	2016/01/21	Sulfate, total	mg/L	212
UA	MW-383	C	2016/03/24	Sulfate, total	mg/L	205
UA	MW-383	C	2016/06/23	Sulfate, total	mg/L	176
UA	MW-383	C	2016/09/21	Sulfate, total	mg/L	192
UA	MW-383	C	2016/12/27	Sulfate, total	mg/L	174
UA	MW-383	C	2017/03/16	Sulfate, total	mg/L	180
UA	MW-383	C	2017/06/19	Sulfate, total	mg/L	177
UA	MW-383	C	2017/07/26	Sulfate, total	mg/L	182
UA	MW-383	C	2017/11/28	Sulfate, total	mg/L	171
UA	MW-383	C	2018/06/27	Sulfate, total	mg/L	200
UA	MW-383	C	2018/09/25	Sulfate, total	mg/L	184
UA	MW-383	C	2019/03/20	Sulfate, total	mg/L	166
UA	MW-383	C	2019/09/24	Sulfate, total	mg/L	169
UA	MW-383	C	2020/03/25	Sulfate, total	mg/L	175
UA	MW-383	C	2020/09/15	Sulfate, total	mg/L	190
UA	MW-383	C	2021/03/12	Sulfate, total	mg/L	179
UA	MW-383	C	2021/09/13	Sulfate, total	mg/L	168
UA	MW-383	C	2022/03/29	Sulfate, total	mg/L	159
UA	MW-383	C	2022/09/30	Sulfate, total	mg/L	169
UA	MW-383	C	2023/03/14	Sulfate, total	mg/L	150
UA	MW-383	C	2023/05/22	Sulfate, total	mg/L	177
UA	MW-383	C	2023/08/03	Sulfate, total	mg/L	157
UA	MW-383	C	2023/11/01	Sulfate, total	mg/L	165
UA	MW-383	C	2016/01/21	Temperature (Celsius)	degrees C	15.2
UA	MW-383	C	2016/03/24	Temperature (Celsius)	degrees C	16.1
UA	MW-383	C	2016/06/23	Temperature (Celsius)	degrees C	27.4
UA	MW-383	C	2016/09/21	Temperature (Celsius)	degrees C	22.7
UA	MW-383	C	2016/12/27	Temperature (Celsius)	degrees C	14.7
UA	MW-383	C	2017/03/16	Temperature (Celsius)	degrees C	16.9
UA	MW-383	C	2017/06/19	Temperature (Celsius)	degrees C	24.0
UA	MW-383	C	2017/07/26	Temperature (Celsius)	degrees C	21.7
UA	MW-383	C	2017/11/28	Temperature (Celsius)	degrees C	18.6
UA	MW-383	C	2018/06/27	Temperature (Celsius)	degrees C	23.2
UA	MW-383	C	2018/09/25	Temperature (Celsius)	degrees C	20.4
UA	MW-383	C	2019/03/20	Temperature (Celsius)	degrees C	16.6
UA	MW-383	C	2019/09/24	Temperature (Celsius)	degrees C	19.7
UA	MW-383	C	2020/03/25	Temperature (Celsius)	degrees C	17.8
UA	MW-383	C	2020/09/15	Temperature (Celsius)	degrees C	18.7
UA	MW-383	C	2021/03/12	Temperature (Celsius)	degrees C	17.3
UA	MW-383	C	2021/09/13	Temperature (Celsius)	degrees C	22.3
UA	MW-383	C	2022/03/29	Temperature (Celsius)	degrees C	17.9
UA	MW-383	C	2022/09/30	Temperature (Celsius)	degrees C	18.2
UA	MW-383	C	2023/03/14	Temperature (Celsius)	degrees C	17.2
UA	MW-383	C	2023/05/22	Temperature (Celsius)	degrees C	18.4
UA	MW-383	C	2023/08/03	Temperature (Celsius)	degrees C	19.1
UA	MW-383	C	2023/11/01	Temperature (Celsius)	degrees C	17.5
UA	MW-383	C	2016/01/21	Total Dissolved Solids	mg/L	800
UA	MW-383	C	2016/03/24	Total Dissolved Solids	mg/L	828
UA	MW-383	C	2016/06/23	Total Dissolved Solids	mg/L	916
UA	MW-383	C	2016/09/21	Total Dissolved Solids	mg/L	840
UA	MW-383	C	2016/12/27	Total Dissolved Solids	mg/L	910

UA	MW-383	C	2017/03/16	Total Dissolved Solids	mg/L	890
UA	MW-383	C	2017/06/19	Total Dissolved Solids	mg/L	912
UA	MW-383	C	2017/07/26	Total Dissolved Solids	mg/L	890
UA	MW-383	C	2017/11/28	Total Dissolved Solids	mg/L	962
UA	MW-383	C	2018/06/27	Total Dissolved Solids	mg/L	926
UA	MW-383	C	2018/09/25	Total Dissolved Solids	mg/L	940
UA	MW-383	C	2019/03/20	Total Dissolved Solids	mg/L	920
UA	MW-383	C	2019/09/24	Total Dissolved Solids	mg/L	922
UA	MW-383	C	2020/03/25	Total Dissolved Solids	mg/L	874
UA	MW-383	C	2020/09/15	Total Dissolved Solids	mg/L	884
UA	MW-383	C	2021/03/12	Total Dissolved Solids	mg/L	960
UA	MW-383	C	2021/09/13	Total Dissolved Solids	mg/L	864
UA	MW-383	C	2022/03/29	Total Dissolved Solids	mg/L	896
UA	MW-383	C	2022/09/30	Total Dissolved Solids	mg/L	906
UA	MW-383	C	2023/03/14	Total Dissolved Solids	mg/L	890
UA	MW-383	C	2023/05/22	Total Dissolved Solids	mg/L	872
UA	MW-383	C	2023/08/03	Total Dissolved Solids	mg/L	882
UA	MW-383	C	2023/11/01	Total Dissolved Solids	mg/L	934
UA	MW-384	C	2016/01/21	pH (field)	SU	7.5
UA	MW-384	C	2016/03/24	pH (field)	SU	7.8
UA	MW-384	C	2016/06/23	pH (field)	SU	7.8
UA	MW-384	C	2016/09/21	pH (field)	SU	8.0
UA	MW-384	C	2016/12/27	pH (field)	SU	7.9
UA	MW-384	C	2017/03/16	pH (field)	SU	8.0
UA	MW-384	C	2017/06/19	pH (field)	SU	8.0
UA	MW-384	C	2017/07/25	pH (field)	SU	7.6
UA	MW-384	C	2017/11/28	pH (field)	SU	7.9
UA	MW-384	C	2018/06/27	pH (field)	SU	7.2
UA	MW-384	C	2018/09/25	pH (field)	SU	8.0
UA	MW-384	C	2019/03/20	pH (field)	SU	7.5
UA	MW-384	C	2019/09/24	pH (field)	SU	8.0
UA	MW-384	C	2020/03/25	pH (field)	SU	8.1
UA	MW-384	C	2020/09/15	pH (field)	SU	8.1
UA	MW-384	C	2021/03/11	pH (field)	SU	7.8
UA	MW-384	C	2021/09/13	pH (field)	SU	8.0
UA	MW-384	C	2022/03/29	pH (field)	SU	8.0
UA	MW-384	C	2022/09/30	pH (field)	SU	8.1
UA	MW-384	C	2023/03/14	pH (field)	SU	8.0
UA	MW-384	C	2023/05/22	pH (field)	SU	7.7
UA	MW-384	C	2023/08/03	pH (field)	SU	8.1
UA	MW-384	C	2023/11/01	pH (field)	SU	8.1
UA	MW-384	C	2016/01/21	Oxidation Reduction Potential	mV	68.0
UA	MW-384	C	2016/03/24	Oxidation Reduction Potential	mV	102
UA	MW-384	C	2016/06/23	Oxidation Reduction Potential	mV	-23.0
UA	MW-384	C	2016/09/21	Oxidation Reduction Potential	mV	-78.0
UA	MW-384	C	2016/12/27	Oxidation Reduction Potential	mV	-61.0
UA	MW-384	C	2017/03/16	Oxidation Reduction Potential	mV	-33.0
UA	MW-384	C	2017/06/19	Oxidation Reduction Potential	mV	-191
UA	MW-384	C	2017/07/25	Oxidation Reduction Potential	mV	-91.0
UA	MW-384	C	2017/11/28	Oxidation Reduction Potential	mV	-25.0
UA	MW-384	C	2018/06/27	Oxidation Reduction Potential	mV	-40.0
UA	MW-384	C	2018/09/25	Oxidation Reduction Potential	mV	-250
UA	MW-384	C	2019/03/20	Oxidation Reduction Potential	mV	-123
UA	MW-384	C	2019/09/24	Oxidation Reduction Potential	mV	-157
UA	MW-384	C	2020/03/25	Oxidation Reduction Potential	mV	-104
UA	MW-384	C	2020/09/15	Oxidation Reduction Potential	mV	-95.0
UA	MW-384	C	2021/03/11	Oxidation Reduction Potential	mV	2.00

UA	MW-384	C	2021/09/13	Oxidation Reduction Potential	mV	-93.0
UA	MW-384	C	2022/03/29	Oxidation Reduction Potential	mV	-136
UA	MW-384	C	2022/09/30	Oxidation Reduction Potential	mV	65.0
UA	MW-384	C	2023/03/14	Oxidation Reduction Potential	mV	-112
UA	MW-384	C	2023/05/22	Oxidation Reduction Potential	mV	69.0
UA	MW-384	C	2023/08/03	Oxidation Reduction Potential	mV	54.0
UA	MW-384	C	2023/11/01	Oxidation Reduction Potential	mV	-99.0
UA	MW-384	C	2016/01/21	Eh	V	0.27
UA	MW-384	C	2016/03/24	Eh	V	0.30
UA	MW-384	C	2016/06/23	Eh	V	0.17
UA	MW-384	C	2016/09/21	Eh	V	0.11
UA	MW-384	C	2016/12/27	Eh	V	0.14
UA	MW-384	C	2017/03/16	Eh	V	0.16
UA	MW-384	C	2017/06/19	Eh	V	-0.0013
UA	MW-384	C	2017/07/25	Eh	V	0.096
UA	MW-384	C	2017/11/28	Eh	V	0.17
UA	MW-384	C	2018/06/27	Eh	V	0.15
UA	MW-384	C	2018/09/25	Eh	V	-0.057
UA	MW-384	C	2019/03/20	Eh	V	0.073
UA	MW-384	C	2019/09/24	Eh	V	0.036
UA	MW-384	C	2020/03/25	Eh	V	0.091
UA	MW-384	C	2020/09/15	Eh	V	0.099
UA	MW-384	C	2021/03/11	Eh	V	0.20
UA	MW-384	C	2021/09/13	Eh	V	0.099
UA	MW-384	C	2022/03/29	Eh	V	0.058
UA	MW-384	C	2022/09/30	Eh	V	0.26
UA	MW-384	C	2023/03/14	Eh	V	0.083
UA	MW-384	C	2023/05/22	Eh	V	0.26
UA	MW-384	C	2023/08/03	Eh	V	0.25
UA	MW-384	C	2023/11/01	Eh	V	0.096
UA	MW-384	C	2017/07/25	Alkalinity, bicarbonate	mg/L CaCO3	632
UA	MW-384	C	2020/03/25	Alkalinity, bicarbonate	mg/L CaCO3	638
UA	MW-384	C	2020/09/15	Alkalinity, bicarbonate	mg/L CaCO3	674
UA	MW-384	C	2021/03/11	Alkalinity, bicarbonate	mg/L CaCO3	608
UA	MW-384	C	2021/09/13	Alkalinity, bicarbonate	mg/L CaCO3	632
UA	MW-384	C	2022/03/29	Alkalinity, bicarbonate	mg/L CaCO3	605
UA	MW-384	C	2022/09/30	Alkalinity, bicarbonate	mg/L CaCO3	617
UA	MW-384	C	2023/03/14	Alkalinity, bicarbonate	mg/L CaCO3	586
UA	MW-384	C	2023/05/22	Alkalinity, bicarbonate	mg/L CaCO3	594
UA	MW-384	C	2023/08/03	Alkalinity, bicarbonate	mg/L CaCO3	634
UA	MW-384	C	2023/11/01	Alkalinity, bicarbonate	mg/L CaCO3	619
UA	MW-384	C	2021/03/11	Alkalinity, carbonate	mg/L CaCO3	26.0
UA	MW-384	C	2022/03/29	Alkalinity, carbonate	mg/L CaCO3	23.0
UA	MW-384	C	2022/09/30	Alkalinity, carbonate	mg/L CaCO3	14.0
UA	MW-384	C	2023/05/22	Alkalinity, carbonate	mg/L CaCO3	11.0
UA	MW-384	C	2023/08/03	Alkalinity, carbonate	mg/L CaCO3	16.0
UA	MW-384	C	2023/11/01	Alkalinity, carbonate	mg/L CaCO3	30.0
UA	MW-384	C	2016/01/21	Barium, total	mg/L	0.0221
UA	MW-384	C	2016/03/24	Barium, total	mg/L	0.0245
UA	MW-384	C	2016/06/23	Barium, total	mg/L	0.0282
UA	MW-384	C	2016/09/21	Barium, total	mg/L	0.0258
UA	MW-384	C	2016/12/27	Barium, total	mg/L	0.0275
UA	MW-384	C	2017/03/16	Barium, total	mg/L	0.0283
UA	MW-384	C	2017/06/19	Barium, total	mg/L	0.0277
UA	MW-384	C	2017/07/25	Barium, total	mg/L	0.0264
UA	MW-384	C	2018/06/27	Barium, total	mg/L	0.0332
UA	MW-384	C	2018/09/25	Barium, total	mg/L	0.0285

UA	MW-384	C	2019/03/20	Barium, total	mg/L	0.0336
UA	MW-384	C	2019/09/24	Barium, total	mg/L	0.0305
UA	MW-384	C	2020/03/25	Barium, total	mg/L	0.0322
UA	MW-384	C	2020/09/15	Barium, total	mg/L	0.0394
UA	MW-384	C	2021/03/11	Barium, total	mg/L	0.0430
UA	MW-384	C	2021/09/13	Barium, total	mg/L	0.0521
UA	MW-384	C	2022/03/29	Barium, total	mg/L	0.0285
UA	MW-384	C	2022/09/30	Barium, total	mg/L	0.0666
UA	MW-384	C	2023/03/14	Barium, total	mg/L	0.0530
UA	MW-384	C	2023/05/22	Barium, total	mg/L	0.0513
UA	MW-384	C	2023/08/03	Barium, total	mg/L	0.0287
UA	MW-384	C	2023/11/01	Barium, total	mg/L	0.0324
UA	MW-384	C	2016/01/21	Boron, total	mg/L	1.45
UA	MW-384	C	2016/03/24	Boron, total	mg/L	1.29
UA	MW-384	C	2016/06/23	Boron, total	mg/L	1.48
UA	MW-384	C	2016/09/21	Boron, total	mg/L	1.52
UA	MW-384	C	2016/12/27	Boron, total	mg/L	1.41
UA	MW-384	C	2017/03/16	Boron, total	mg/L	1.33
UA	MW-384	C	2017/06/19	Boron, total	mg/L	1.50
UA	MW-384	C	2017/07/25	Boron, total	mg/L	1.26
UA	MW-384	C	2017/11/28	Boron, total	mg/L	1.92
UA	MW-384	C	2018/06/27	Boron, total	mg/L	1.51
UA	MW-384	C	2018/09/25	Boron, total	mg/L	1.39
UA	MW-384	C	2019/03/20	Boron, total	mg/L	1.44
UA	MW-384	C	2019/09/24	Boron, total	mg/L	1.36
UA	MW-384	C	2020/03/25	Boron, total	mg/L	1.43
UA	MW-384	C	2020/09/15	Boron, total	mg/L	1.51
UA	MW-384	C	2021/03/11	Boron, total	mg/L	1.66
UA	MW-384	C	2021/09/13	Boron, total	mg/L	1.54
UA	MW-384	C	2022/03/29	Boron, total	mg/L	2.26
UA	MW-384	C	2022/09/30	Boron, total	mg/L	1.91
UA	MW-384	C	2023/03/14	Boron, total	mg/L	1.58
UA	MW-384	C	2023/05/22	Boron, total	mg/L	1.48
UA	MW-384	C	2023/08/03	Boron, total	mg/L	1.47
UA	MW-384	C	2023/11/01	Boron, total	mg/L	1.55
UA	MW-384	C	2016/01/21	Calcium, total	mg/L	22.6
UA	MW-384	C	2016/03/24	Calcium, total	mg/L	22.5
UA	MW-384	C	2016/06/23	Calcium, total	mg/L	23.2
UA	MW-384	C	2016/09/21	Calcium, total	mg/L	22.3
UA	MW-384	C	2016/12/27	Calcium, total	mg/L	19.8
UA	MW-384	C	2017/03/16	Calcium, total	mg/L	20.5
UA	MW-384	C	2017/06/19	Calcium, total	mg/L	19.5
UA	MW-384	C	2017/07/25	Calcium, total	mg/L	19.3
UA	MW-384	C	2017/11/28	Calcium, total	mg/L	20.7
UA	MW-384	C	2018/06/27	Calcium, total	mg/L	21.4
UA	MW-384	C	2018/09/25	Calcium, total	mg/L	19.8
UA	MW-384	C	2019/03/20	Calcium, total	mg/L	21.5
UA	MW-384	C	2019/09/24	Calcium, total	mg/L	19.8
UA	MW-384	C	2020/03/25	Calcium, total	mg/L	19.4
UA	MW-384	C	2020/09/15	Calcium, total	mg/L	18.4
UA	MW-384	C	2021/03/11	Calcium, total	mg/L	17.6
UA	MW-384	C	2021/09/13	Calcium, total	mg/L	20.0
UA	MW-384	C	2022/03/29	Calcium, total	mg/L	6.83
UA	MW-384	C	2022/09/30	Calcium, total	mg/L	19.4
UA	MW-384	C	2023/03/14	Calcium, total	mg/L	18.2
UA	MW-384	C	2023/05/22	Calcium, total	mg/L	17.4
UA	MW-384	C	2023/08/03	Calcium, total	mg/L	5.32

UA	MW-384	C	2023/11/01	Calcium, total	mg/L	8.11
UA	MW-384	C	2016/01/21	Chloride, total	mg/L	138
UA	MW-384	C	2016/03/24	Chloride, total	mg/L	109
UA	MW-384	C	2016/06/23	Chloride, total	mg/L	141
UA	MW-384	C	2016/09/21	Chloride, total	mg/L	158
UA	MW-384	C	2016/12/27	Chloride, total	mg/L	187
UA	MW-384	C	2017/03/16	Chloride, total	mg/L	206
UA	MW-384	C	2017/06/19	Chloride, total	mg/L	170
UA	MW-384	C	2017/07/25	Chloride, total	mg/L	179
UA	MW-384	C	2017/11/28	Chloride, total	mg/L	234
UA	MW-384	C	2018/06/27	Chloride, total	mg/L	248
UA	MW-384	C	2018/09/25	Chloride, total	mg/L	396
UA	MW-384	C	2019/03/20	Chloride, total	mg/L	216
UA	MW-384	C	2019/09/24	Chloride, total	mg/L	197
UA	MW-384	C	2020/03/25	Chloride, total	mg/L	229
UA	MW-384	C	2020/09/15	Chloride, total	mg/L	493
UA	MW-384	C	2021/03/11	Chloride, total	mg/L	488
UA	MW-384	C	2021/09/13	Chloride, total	mg/L	501
UA	MW-384	C	2022/03/29	Chloride, total	mg/L	466
UA	MW-384	C	2022/09/30	Chloride, total	mg/L	531
UA	MW-384	C	2023/03/14	Chloride, total	mg/L	474
UA	MW-384	C	2023/05/22	Chloride, total	mg/L	492
UA	MW-384	C	2023/08/03	Chloride, total	mg/L	508
UA	MW-384	C	2023/11/01	Chloride, total	mg/L	978
UA	MW-384	C	2023/05/22	Iron, dissolved	mg/L	<0.02
UA	MW-384	C	2023/08/03	Iron, dissolved	mg/L	<0.0115
UA	MW-384	C	2017/07/25	Magnesium, total	mg/L	7.24
UA	MW-384	C	2020/03/25	Magnesium, total	mg/L	7.96
UA	MW-384	C	2020/09/15	Magnesium, total	mg/L	7.91
UA	MW-384	C	2021/03/11	Magnesium, total	mg/L	7.25
UA	MW-384	C	2021/09/13	Magnesium, total	mg/L	7.86
UA	MW-384	C	2022/03/29	Magnesium, total	mg/L	2.79
UA	MW-384	C	2022/09/30	Magnesium, total	mg/L	7.59
UA	MW-384	C	2023/03/14	Magnesium, total	mg/L	7.23
UA	MW-384	C	2023/05/22	Magnesium, total	mg/L	7.00
UA	MW-384	C	2023/08/03	Magnesium, total	mg/L	2.37
UA	MW-384	C	2023/11/01	Magnesium, total	mg/L	3.41
UA	MW-384	C	2023/05/22	Manganese, dissolved	mg/L	0.00310
UA	MW-384	C	2023/08/03	Manganese, dissolved	mg/L	0.00660
UA	MW-384	C	2023/05/22	Phosphate, dissolved	mg/L	0.0280
UA	MW-384	C	2023/08/03	Phosphate, dissolved	mg/L	0.0460
UA	MW-384	C	2017/07/25	Potassium, total	mg/L	1.92
UA	MW-384	C	2020/03/25	Potassium, total	mg/L	2.11
UA	MW-384	C	2020/09/15	Potassium, total	mg/L	2.66
UA	MW-384	C	2021/03/11	Potassium, total	mg/L	2.10
UA	MW-384	C	2021/09/13	Potassium, total	mg/L	2.47
UA	MW-384	C	2022/03/29	Potassium, total	mg/L	2.03
UA	MW-384	C	2022/09/30	Potassium, total	mg/L	2.64
UA	MW-384	C	2023/03/14	Potassium, total	mg/L	2.15
UA	MW-384	C	2023/05/22	Potassium, total	mg/L	2.65
UA	MW-384	C	2023/08/03	Potassium, total	mg/L	1.90
UA	MW-384	C	2023/11/01	Potassium, total	mg/L	2.04
UA	MW-384	C	2023/05/22	Silicon, dissolved	mg/L	4.23
UA	MW-384	C	2023/08/03	Silicon, dissolved	mg/L	3.85
UA	MW-384	C	2017/07/25	Sodium, total	mg/L	396
UA	MW-384	C	2020/03/25	Sodium, total	mg/L	474
UA	MW-384	C	2020/09/15	Sodium, total	mg/L	668

UA	MW-384	C	2021/03/11	Sodium, total	mg/L	610
UA	MW-384	C	2021/09/13	Sodium, total	mg/L	553
UA	MW-384	C	2022/03/29	Sodium, total	mg/L	677
UA	MW-384	C	2022/09/30	Sodium, total	mg/L	577
UA	MW-384	C	2023/03/14	Sodium, total	mg/L	577
UA	MW-384	C	2023/05/22	Sodium, total	mg/L	575
UA	MW-384	C	2023/08/03	Sodium, total	mg/L	695
UA	MW-384	C	2023/11/01	Sodium, total	mg/L	709
UA	MW-384	C	2016/01/21	Sulfate, total	mg/L	178
UA	MW-384	C	2016/03/24	Sulfate, total	mg/L	178
UA	MW-384	C	2016/06/23	Sulfate, total	mg/L	135
UA	MW-384	C	2016/09/21	Sulfate, total	mg/L	142
UA	MW-384	C	2016/12/27	Sulfate, total	mg/L	160
UA	MW-384	C	2017/03/16	Sulfate, total	mg/L	156
UA	MW-384	C	2017/06/19	Sulfate, total	mg/L	130
UA	MW-384	C	2017/07/25	Sulfate, total	mg/L	127
UA	MW-384	C	2017/11/28	Sulfate, total	mg/L	114
UA	MW-384	C	2018/06/27	Sulfate, total	mg/L	124
UA	MW-384	C	2018/09/25	Sulfate, total	mg/L	82.0
UA	MW-384	C	2019/03/20	Sulfate, total	mg/L	94.0
UA	MW-384	C	2019/09/24	Sulfate, total	mg/L	102
UA	MW-384	C	2020/03/25	Sulfate, total	mg/L	110
UA	MW-384	C	2020/09/15	Sulfate, total	mg/L	53.0
UA	MW-384	C	2021/03/11	Sulfate, total	mg/L	38.0
UA	MW-384	C	2021/09/13	Sulfate, total	mg/L	40.0
UA	MW-384	C	2022/03/29	Sulfate, total	mg/L	34.0
UA	MW-384	C	2022/09/30	Sulfate, total	mg/L	35.0
UA	MW-384	C	2023/03/14	Sulfate, total	mg/L	36.0
UA	MW-384	C	2023/05/22	Sulfate, total	mg/L	43.0
UA	MW-384	C	2023/08/03	Sulfate, total	mg/L	32.0
UA	MW-384	C	2023/11/01	Sulfate, total	mg/L	30.0
UA	MW-384	C	2016/01/21	Temperature (Celsius)	degrees C	12.6
UA	MW-384	C	2016/03/24	Temperature (Celsius)	degrees C	14.6
UA	MW-384	C	2016/06/23	Temperature (Celsius)	degrees C	22.4
UA	MW-384	C	2016/09/21	Temperature (Celsius)	degrees C	24.4
UA	MW-384	C	2016/12/27	Temperature (Celsius)	degrees C	13.7
UA	MW-384	C	2017/03/16	Temperature (Celsius)	degrees C	13.6
UA	MW-384	C	2017/06/19	Temperature (Celsius)	degrees C	23.4
UA	MW-384	C	2017/07/25	Temperature (Celsius)	degrees C	26.6
UA	MW-384	C	2017/11/28	Temperature (Celsius)	degrees C	16.4
UA	MW-384	C	2018/06/27	Temperature (Celsius)	degrees C	19.8
UA	MW-384	C	2018/09/25	Temperature (Celsius)	degrees C	19.1
UA	MW-384	C	2019/03/20	Temperature (Celsius)	degrees C	14.9
UA	MW-384	C	2019/09/24	Temperature (Celsius)	degrees C	18.5
UA	MW-384	C	2020/03/25	Temperature (Celsius)	degrees C	16.4
UA	MW-384	C	2020/09/15	Temperature (Celsius)	degrees C	17.6
UA	MW-384	C	2021/03/11	Temperature (Celsius)	degrees C	15.4
UA	MW-384	C	2021/09/13	Temperature (Celsius)	degrees C	20.7
UA	MW-384	C	2022/03/29	Temperature (Celsius)	degrees C	16.7
UA	MW-384	C	2022/09/30	Temperature (Celsius)	degrees C	17.0
UA	MW-384	C	2023/03/14	Temperature (Celsius)	degrees C	15.7
UA	MW-384	C	2023/05/22	Temperature (Celsius)	degrees C	17.0
UA	MW-384	C	2023/08/03	Temperature (Celsius)	degrees C	17.5
UA	MW-384	C	2023/11/01	Temperature (Celsius)	degrees C	16.3
UA	MW-384	C	2016/01/21	Total Dissolved Solids	mg/L	992
UA	MW-384	C	2016/03/24	Total Dissolved Solids	mg/L	1,080
UA	MW-384	C	2016/06/23	Total Dissolved Solids	mg/L	1,110

UA	MW-384	C	2016/09/21	Total Dissolved Solids	mg/L	1,080
UA	MW-384	C	2016/12/27	Total Dissolved Solids	mg/L	1,220
UA	MW-384	C	2017/03/16	Total Dissolved Solids	mg/L	1,230
UA	MW-384	C	2017/06/19	Total Dissolved Solids	mg/L	1,120
UA	MW-384	C	2017/07/25	Total Dissolved Solids	mg/L	1,090
UA	MW-384	C	2017/11/28	Total Dissolved Solids	mg/L	1,230
UA	MW-384	C	2018/06/27	Total Dissolved Solids	mg/L	1,200
UA	MW-384	C	2018/09/25	Total Dissolved Solids	mg/L	1,510
UA	MW-384	C	2019/03/20	Total Dissolved Solids	mg/L	1,180
UA	MW-384	C	2019/09/24	Total Dissolved Solids	mg/L	1,120
UA	MW-384	C	2020/03/25	Total Dissolved Solids	mg/L	1,150
UA	MW-384	C	2020/09/15	Total Dissolved Solids	mg/L	1,520
UA	MW-384	C	2021/03/11	Total Dissolved Solids	mg/L	1,540
UA	MW-384	C	2021/09/13	Total Dissolved Solids	mg/L	1,440
UA	MW-384	C	2022/03/29	Total Dissolved Solids	mg/L	1,520
UA	MW-384	C	2022/09/30	Total Dissolved Solids	mg/L	1,600
UA	MW-384	C	2023/03/14	Total Dissolved Solids	mg/L	1,500
UA	MW-384	C	2023/05/22	Total Dissolved Solids	mg/L	1,480
UA	MW-384	C	2023/08/03	Total Dissolved Solids	mg/L	1,570
UA	MW-384	C	2023/11/01	Total Dissolved Solids	mg/L	1,540
UA	MW-390	C	2016/03/22	pH (field)	SU	7.4
UA	MW-390	C	2016/06/23	pH (field)	SU	7.6
UA	MW-390	C	2016/08/18	pH (field)	SU	7.2
UA	MW-390	C	2016/09/20	pH (field)	SU	7.5
UA	MW-390	C	2016/12/22	pH (field)	SU	7.5
UA	MW-390	C	2017/03/15	pH (field)	SU	7.8
UA	MW-390	C	2017/06/20	pH (field)	SU	7.2
UA	MW-390	C	2017/07/28	pH (field)	SU	7.4
UA	MW-390	C	2017/11/27	pH (field)	SU	7.5
UA	MW-390	C	2018/06/26	pH (field)	SU	6.9
UA	MW-390	C	2018/09/25	pH (field)	SU	7.0
UA	MW-390	C	2019/03/19	pH (field)	SU	7.2
UA	MW-390	C	2019/09/24	pH (field)	SU	7.1
UA	MW-390	C	2020/03/26	pH (field)	SU	6.9
UA	MW-390	C	2020/09/16	pH (field)	SU	7.2
UA	MW-390	C	2021/03/12	pH (field)	SU	7.2
UA	MW-390	C	2021/09/15	pH (field)	SU	7.1
UA	MW-390	C	2022/03/29	pH (field)	SU	7.1
UA	MW-390	C	2022/09/30	pH (field)	SU	7.2
UA	MW-390	C	2023/03/14	pH (field)	SU	7.0
UA	MW-390	C	2023/05/17	pH (field)	SU	6.8
UA	MW-390	C	2023/08/04	pH (field)	SU	7.2
UA	MW-390	C	2023/11/02	pH (field)	SU	7.2
UA	MW-390	C	2016/03/22	Oxidation Reduction Potential	mV	132
UA	MW-390	C	2016/06/23	Oxidation Reduction Potential	mV	7.00
UA	MW-390	C	2016/08/18	Oxidation Reduction Potential	mV	-19.0
UA	MW-390	C	2016/09/20	Oxidation Reduction Potential	mV	-28.0
UA	MW-390	C	2016/12/22	Oxidation Reduction Potential	mV	-16.0
UA	MW-390	C	2017/03/15	Oxidation Reduction Potential	mV	-66.0
UA	MW-390	C	2017/06/20	Oxidation Reduction Potential	mV	-124
UA	MW-390	C	2017/07/28	Oxidation Reduction Potential	mV	-92.0
UA	MW-390	C	2017/11/27	Oxidation Reduction Potential	mV	204
UA	MW-390	C	2018/06/26	Oxidation Reduction Potential	mV	-18.0
UA	MW-390	C	2018/09/25	Oxidation Reduction Potential	mV	-162
UA	MW-390	C	2019/03/19	Oxidation Reduction Potential	mV	-128
UA	MW-390	C	2019/09/24	Oxidation Reduction Potential	mV	-133
UA	MW-390	C	2020/03/26	Oxidation Reduction Potential	mV	-14.0

UA	MW-390	C	2020/09/16	Oxidation Reduction Potential	mV	-105
UA	MW-390	C	2021/03/12	Oxidation Reduction Potential	mV	-65.0
UA	MW-390	C	2021/09/15	Oxidation Reduction Potential	mV	-98.0
UA	MW-390	C	2022/03/29	Oxidation Reduction Potential	mV	-106
UA	MW-390	C	2022/09/30	Oxidation Reduction Potential	mV	55.0
UA	MW-390	C	2023/03/14	Oxidation Reduction Potential	mV	-70.2
UA	MW-390	C	2023/05/17	Oxidation Reduction Potential	mV	-32.0
UA	MW-390	C	2023/08/04	Oxidation Reduction Potential	mV	73.0
UA	MW-390	C	2023/11/02	Oxidation Reduction Potential	mV	-70.0
UA	MW-390	C	2016/03/22	Eh	V	0.33
UA	MW-390	C	2016/06/23	Eh	V	0.20
UA	MW-390	C	2016/08/18	Eh	V	0.17
UA	MW-390	C	2016/09/20	Eh	V	0.16
UA	MW-390	C	2016/12/22	Eh	V	0.18
UA	MW-390	C	2017/03/15	Eh	V	0.13
UA	MW-390	C	2017/06/20	Eh	V	0.065
UA	MW-390	C	2017/07/28	Eh	V	0.10
UA	MW-390	C	2017/11/27	Eh	V	0.40
UA	MW-390	C	2018/06/26	Eh	V	0.17
UA	MW-390	C	2018/09/25	Eh	V	0.030
UA	MW-390	C	2019/03/19	Eh	V	0.068
UA	MW-390	C	2019/09/24	Eh	V	0.061
UA	MW-390	C	2020/03/26	Eh	V	0.18
UA	MW-390	C	2020/09/16	Eh	V	0.090
UA	MW-390	C	2021/03/12	Eh	V	0.13
UA	MW-390	C	2021/09/15	Eh	V	0.095
UA	MW-390	C	2022/03/29	Eh	V	0.091
UA	MW-390	C	2022/09/30	Eh	V	0.25
UA	MW-390	C	2023/03/14	Eh	V	0.13
UA	MW-390	C	2023/05/17	Eh	V	0.16
UA	MW-390	C	2023/08/04	Eh	V	0.27
UA	MW-390	C	2023/11/02	Eh	V	0.12
UA	MW-390	C	2017/07/28	Alkalinity, bicarbonate	mg/L CaCO3	392
UA	MW-390	C	2020/03/26	Alkalinity, bicarbonate	mg/L CaCO3	376
UA	MW-390	C	2020/09/16	Alkalinity, bicarbonate	mg/L CaCO3	408
UA	MW-390	C	2021/03/12	Alkalinity, bicarbonate	mg/L CaCO3	422
UA	MW-390	C	2021/09/15	Alkalinity, bicarbonate	mg/L CaCO3	416
UA	MW-390	C	2022/03/29	Alkalinity, bicarbonate	mg/L CaCO3	413
UA	MW-390	C	2022/09/30	Alkalinity, bicarbonate	mg/L CaCO3	435
UA	MW-390	C	2023/03/14	Alkalinity, bicarbonate	mg/L CaCO3	374
UA	MW-390	C	2023/05/17	Alkalinity, bicarbonate	mg/L CaCO3	382
UA	MW-390	C	2023/08/04	Alkalinity, bicarbonate	mg/L CaCO3	426
UA	MW-390	C	2023/11/02	Alkalinity, bicarbonate	mg/L CaCO3	440
UA	MW-390	C	2016/03/22	Barium, total	mg/L	0.0330
UA	MW-390	C	2016/06/23	Barium, total	mg/L	0.0299
UA	MW-390	C	2016/08/18	Barium, total	mg/L	0.0289
UA	MW-390	C	2016/09/20	Barium, total	mg/L	0.0258
UA	MW-390	C	2016/12/22	Barium, total	mg/L	0.0228
UA	MW-390	C	2017/03/15	Barium, total	mg/L	0.0520
UA	MW-390	C	2017/06/20	Barium, total	mg/L	0.0400
UA	MW-390	C	2017/07/28	Barium, total	mg/L	0.0385
UA	MW-390	C	2018/06/26	Barium, total	mg/L	0.0806
UA	MW-390	C	2018/09/25	Barium, total	mg/L	0.101
UA	MW-390	C	2019/03/19	Barium, total	mg/L	0.0962
UA	MW-390	C	2019/09/24	Barium, total	mg/L	0.0830
UA	MW-390	C	2020/03/26	Barium, total	mg/L	0.0895
UA	MW-390	C	2020/09/16	Barium, total	mg/L	0.0785

UA	MW-390	C	2021/03/12	Barium, total	mg/L	0.0838
UA	MW-390	C	2021/09/15	Barium, total	mg/L	0.0695
UA	MW-390	C	2022/03/29	Barium, total	mg/L	0.0552
UA	MW-390	C	2022/09/30	Barium, total	mg/L	0.105
UA	MW-390	C	2023/03/14	Barium, total	mg/L	0.0674
UA	MW-390	C	2023/05/17	Barium, total	mg/L	0.0886
UA	MW-390	C	2023/08/04	Barium, total	mg/L	0.0225
UA	MW-390	C	2023/11/02	Barium, total	mg/L	0.0442
UA	MW-390	C	2016/03/22	Boron, total	mg/L	1.74
UA	MW-390	C	2016/06/23	Boron, total	mg/L	2.30
UA	MW-390	C	2016/08/18	Boron, total	mg/L	1.88
UA	MW-390	C	2016/09/20	Boron, total	mg/L	2.18
UA	MW-390	C	2016/12/22	Boron, total	mg/L	2.12
UA	MW-390	C	2017/03/15	Boron, total	mg/L	0.668
UA	MW-390	C	2017/06/20	Boron, total	mg/L	1.30
UA	MW-390	C	2017/07/28	Boron, total	mg/L	1.12
UA	MW-390	C	2017/11/27	Boron, total	mg/L	0.854
UA	MW-390	C	2018/06/26	Boron, total	mg/L	0.207
UA	MW-390	C	2018/09/25	Boron, total	mg/L	0.175
UA	MW-390	C	2019/03/19	Boron, total	mg/L	0.178
UA	MW-390	C	2019/09/24	Boron, total	mg/L	0.288
UA	MW-390	C	2020/03/26	Boron, total	mg/L	0.182
UA	MW-390	C	2020/09/16	Boron, total	mg/L	0.247
UA	MW-390	C	2021/03/12	Boron, total	mg/L	0.274
UA	MW-390	C	2021/09/15	Boron, total	mg/L	0.308
UA	MW-390	C	2022/03/29	Boron, total	mg/L	0.546
UA	MW-390	C	2022/09/30	Boron, total	mg/L	0.384
UA	MW-390	C	2023/03/14	Boron, total	mg/L	0.268
UA	MW-390	C	2023/05/17	Boron, total	mg/L	0.234
UA	MW-390	C	2023/08/04	Boron, total	mg/L	1.42
UA	MW-390	C	2023/11/02	Boron, total	mg/L	0.962
UA	MW-390	C	2016/03/22	Calcium, total	mg/L	55.0
UA	MW-390	C	2016/06/23	Calcium, total	mg/L	53.6
UA	MW-390	C	2016/08/18	Calcium, total	mg/L	53.1
UA	MW-390	C	2016/09/20	Calcium, total	mg/L	52.8
UA	MW-390	C	2016/12/22	Calcium, total	mg/L	49.6
UA	MW-390	C	2017/03/15	Calcium, total	mg/L	53.0
UA	MW-390	C	2017/06/20	Calcium, total	mg/L	57.4
UA	MW-390	C	2017/07/28	Calcium, total	mg/L	58.6
UA	MW-390	C	2017/11/27	Calcium, total	mg/L	69.7
UA	MW-390	C	2018/06/26	Calcium, total	mg/L	68.4
UA	MW-390	C	2018/09/25	Calcium, total	mg/L	90.4
UA	MW-390	C	2019/03/19	Calcium, total	mg/L	89.2
UA	MW-390	C	2019/09/24	Calcium, total	mg/L	90.9
UA	MW-390	C	2020/03/26	Calcium, total	mg/L	96.7
UA	MW-390	C	2020/09/16	Calcium, total	mg/L	91.8
UA	MW-390	C	2021/03/12	Calcium, total	mg/L	92.2
UA	MW-390	C	2021/09/15	Calcium, total	mg/L	90.2
UA	MW-390	C	2022/03/29	Calcium, total	mg/L	88.1
UA	MW-390	C	2022/09/30	Calcium, total	mg/L	100
UA	MW-390	C	2023/03/14	Calcium, total	mg/L	82.6
UA	MW-390	C	2023/05/17	Calcium, total	mg/L	96.0
UA	MW-390	C	2023/08/04	Calcium, total	mg/L	58.4
UA	MW-390	C	2023/11/02	Calcium, total	mg/L	74.0
UA	MW-390	C	2016/03/22	Chloride, total	mg/L	24.0
UA	MW-390	C	2016/06/23	Chloride, total	mg/L	36.0
UA	MW-390	C	2016/08/18	Chloride, total	mg/L	77.0

UA	MW-390	C	2016/09/20	Chloride, total	mg/L	61.0
UA	MW-390	C	2016/12/22	Chloride, total	mg/L	74.0
UA	MW-390	C	2017/03/15	Chloride, total	mg/L	125
UA	MW-390	C	2017/06/20	Chloride, total	mg/L	127
UA	MW-390	C	2017/07/28	Chloride, total	mg/L	123
UA	MW-390	C	2017/11/27	Chloride, total	mg/L	112
UA	MW-390	C	2018/06/26	Chloride, total	mg/L	64.0
UA	MW-390	C	2018/09/25	Chloride, total	mg/L	69.0
UA	MW-390	C	2019/03/19	Chloride, total	mg/L	67.0
UA	MW-390	C	2019/09/24	Chloride, total	mg/L	116
UA	MW-390	C	2020/03/26	Chloride, total	mg/L	87.0
UA	MW-390	C	2020/09/16	Chloride, total	mg/L	71.0
UA	MW-390	C	2021/03/12	Chloride, total	mg/L	106
UA	MW-390	C	2021/09/15	Chloride, total	mg/L	62.0
UA	MW-390	C	2022/03/29	Chloride, total	mg/L	80.0
UA	MW-390	C	2022/09/30	Chloride, total	mg/L	115
UA	MW-390	C	2023/03/14	Chloride, total	mg/L	54.0
UA	MW-390	C	2023/05/17	Chloride, total	mg/L	47.0
UA	MW-390	C	2023/08/04	Chloride, total	mg/L	74.0
UA	MW-390	C	2023/11/02	Chloride, total	mg/L	72.0
UA	MW-390	C	2023/05/17	Iron, dissolved	mg/L	<0.02
UA	MW-390	C	2023/08/04	Iron, dissolved	mg/L	<0.012
UA	MW-390	C	2017/07/28	Magnesium, total	mg/L	29.8
UA	MW-390	C	2020/03/26	Magnesium, total	mg/L	42.2
UA	MW-390	C	2020/09/16	Magnesium, total	mg/L	42.6
UA	MW-390	C	2021/03/12	Magnesium, total	mg/L	40.4
UA	MW-390	C	2021/09/15	Magnesium, total	mg/L	38.6
UA	MW-390	C	2022/03/29	Magnesium, total	mg/L	39.9
UA	MW-390	C	2022/09/30	Magnesium, total	mg/L	42.4
UA	MW-390	C	2023/03/14	Magnesium, total	mg/L	34.6
UA	MW-390	C	2023/05/17	Magnesium, total	mg/L	39.4
UA	MW-390	C	2023/08/04	Magnesium, total	mg/L	32.2
UA	MW-390	C	2023/11/02	Magnesium, total	mg/L	34.8
UA	MW-390	C	2023/05/17	Manganese, dissolved	mg/L	0.364
UA	MW-390	C	2023/08/04	Manganese, dissolved	mg/L	0.681
UA	MW-390	C	2023/05/17	Phosphate, dissolved	mg/L	0.0860
UA	MW-390	C	2023/08/04	Phosphate, dissolved	mg/L	0.0180
UA	MW-390	C	2017/07/28	Potassium, total	mg/L	5.62
UA	MW-390	C	2020/03/26	Potassium, total	mg/L	4.17
UA	MW-390	C	2020/09/16	Potassium, total	mg/L	3.88
UA	MW-390	C	2021/03/12	Potassium, total	mg/L	3.42
UA	MW-390	C	2021/09/15	Potassium, total	mg/L	3.26
UA	MW-390	C	2022/03/29	Potassium, total	mg/L	4.05
UA	MW-390	C	2022/09/30	Potassium, total	mg/L	4.14
UA	MW-390	C	2023/03/14	Potassium, total	mg/L	3.08
UA	MW-390	C	2023/05/17	Potassium, total	mg/L	3.78
UA	MW-390	C	2023/08/04	Potassium, total	mg/L	3.70
UA	MW-390	C	2023/11/02	Potassium, total	mg/L	3.99
UA	MW-390	C	2023/05/17	Silicon, dissolved	mg/L	7.77
UA	MW-390	C	2023/08/04	Silicon, dissolved	mg/L	7.23
UA	MW-390	C	2017/07/28	Sodium, total	mg/L	225
UA	MW-390	C	2020/03/26	Sodium, total	mg/L	98.7
UA	MW-390	C	2020/09/16	Sodium, total	mg/L	84.2
UA	MW-390	C	2021/03/12	Sodium, total	mg/L	107
UA	MW-390	C	2021/09/15	Sodium, total	mg/L	68.4
UA	MW-390	C	2022/03/29	Sodium, total	mg/L	122
UA	MW-390	C	2022/09/30	Sodium, total	mg/L	113

UA	MW-390	C	2023/03/14	Sodium, total	mg/L	75.5
UA	MW-390	C	2023/05/17	Sodium, total	mg/L	106
UA	MW-390	C	2023/08/04	Sodium, total	mg/L	178
UA	MW-390	C	2023/11/02	Sodium, total	mg/L	143
UA	MW-390	C	2016/03/22	Sulfate, total	mg/L	102
UA	MW-390	C	2016/06/23	Sulfate, total	mg/L	154
UA	MW-390	C	2016/08/18	Sulfate, total	mg/L	169
UA	MW-390	C	2016/09/20	Sulfate, total	mg/L	154
UA	MW-390	C	2016/12/22	Sulfate, total	mg/L	171
UA	MW-390	C	2017/03/15	Sulfate, total	mg/L	234
UA	MW-390	C	2017/06/20	Sulfate, total	mg/L	233
UA	MW-390	C	2017/07/28	Sulfate, total	mg/L	222
UA	MW-390	C	2017/11/27	Sulfate, total	mg/L	228
UA	MW-390	C	2018/06/26	Sulfate, total	mg/L	141
UA	MW-390	C	2018/09/25	Sulfate, total	mg/L	117
UA	MW-390	C	2019/03/19	Sulfate, total	mg/L	114
UA	MW-390	C	2019/09/24	Sulfate, total	mg/L	171
UA	MW-390	C	2020/03/26	Sulfate, total	mg/L	139
UA	MW-390	C	2020/09/16	Sulfate, total	mg/L	132
UA	MW-390	C	2021/03/12	Sulfate, total	mg/L	174
UA	MW-390	C	2021/09/15	Sulfate, total	mg/L	152
UA	MW-390	C	2022/03/29	Sulfate, total	mg/L	142
UA	MW-390	C	2022/09/30	Sulfate, total	mg/L	180
UA	MW-390	C	2023/03/14	Sulfate, total	mg/L	107
UA	MW-390	C	2023/05/17	Sulfate, total	mg/L	118
UA	MW-390	C	2023/08/04	Sulfate, total	mg/L	133
UA	MW-390	C	2023/11/02	Sulfate, total	mg/L	134
UA	MW-390	C	2016/03/22	Temperature (Celsius)	degrees C	15.2
UA	MW-390	C	2016/06/23	Temperature (Celsius)	degrees C	22.3
UA	MW-390	C	2016/08/18	Temperature (Celsius)	degrees C	20.5
UA	MW-390	C	2016/09/20	Temperature (Celsius)	degrees C	22.0
UA	MW-390	C	2016/12/22	Temperature (Celsius)	degrees C	13.2
UA	MW-390	C	2017/03/15	Temperature (Celsius)	degrees C	12.4
UA	MW-390	C	2017/06/20	Temperature (Celsius)	degrees C	23.8
UA	MW-390	C	2017/07/28	Temperature (Celsius)	degrees C	18.5
UA	MW-390	C	2017/11/27	Temperature (Celsius)	degrees C	16.4
UA	MW-390	C	2018/06/26	Temperature (Celsius)	degrees C	20.7
UA	MW-390	C	2018/09/25	Temperature (Celsius)	degrees C	19.5
UA	MW-390	C	2019/03/19	Temperature (Celsius)	degrees C	14.4
UA	MW-390	C	2019/09/24	Temperature (Celsius)	degrees C	17.2
UA	MW-390	C	2020/03/26	Temperature (Celsius)	degrees C	13.8
UA	MW-390	C	2020/09/16	Temperature (Celsius)	degrees C	16.4
UA	MW-390	C	2021/03/12	Temperature (Celsius)	degrees C	13.0
UA	MW-390	C	2021/09/15	Temperature (Celsius)	degrees C	18.4
UA	MW-390	C	2022/03/29	Temperature (Celsius)	degrees C	12.8
UA	MW-390	C	2022/09/30	Temperature (Celsius)	degrees C	17.0
UA	MW-390	C	2023/03/14	Temperature (Celsius)	degrees C	13.4
UA	MW-390	C	2023/05/17	Temperature (Celsius)	degrees C	15.4
UA	MW-390	C	2023/08/04	Temperature (Celsius)	degrees C	17.3
UA	MW-390	C	2023/11/02	Temperature (Celsius)	degrees C	16.6
UA	MW-390	C	2016/03/22	Total Dissolved Solids	mg/L	590
UA	MW-390	C	2016/06/23	Total Dissolved Solids	mg/L	722
UA	MW-390	C	2016/08/18	Total Dissolved Solids	mg/L	778
UA	MW-390	C	2016/09/20	Total Dissolved Solids	mg/L	704
UA	MW-390	C	2016/12/22	Total Dissolved Solids	mg/L	780
UA	MW-390	C	2017/03/15	Total Dissolved Solids	mg/L	898
UA	MW-390	C	2017/06/20	Total Dissolved Solids	mg/L	894

UA	MW-390	C	2017/07/28	Total Dissolved Solids	mg/L	842
UA	MW-390	C	2017/11/27	Total Dissolved Solids	mg/L	898
UA	MW-390	C	2018/06/26	Total Dissolved Solids	mg/L	636
UA	MW-390	C	2018/09/25	Total Dissolved Solids	mg/L	660
UA	MW-390	C	2019/03/19	Total Dissolved Solids	mg/L	646
UA	MW-390	C	2019/09/24	Total Dissolved Solids	mg/L	800
UA	MW-390	C	2020/03/26	Total Dissolved Solids	mg/L	654
UA	MW-390	C	2020/09/16	Total Dissolved Solids	mg/L	644
UA	MW-390	C	2021/03/12	Total Dissolved Solids	mg/L	852
UA	MW-390	C	2021/09/15	Total Dissolved Solids	mg/L	682
UA	MW-390	C	2022/03/29	Total Dissolved Solids	mg/L	742
UA	MW-390	C	2022/09/30	Total Dissolved Solids	mg/L	826
UA	MW-390	C	2023/03/14	Total Dissolved Solids	mg/L	544
UA	MW-390	C	2023/05/17	Total Dissolved Solids	mg/L	642
UA	MW-390	C	2023/08/04	Total Dissolved Solids	mg/L	740
UA	MW-390	C	2023/11/02	Total Dissolved Solids	mg/L	750
UA	MW-391	C	2016/12/22	pH (field)	SU	7.6
UA	MW-391	C	2017/03/15	pH (field)	SU	8.0
UA	MW-391	C	2017/06/20	pH (field)	SU	7.5
UA	MW-391	C	2018/06/26	pH (field)	SU	7.3
UA	MW-391	C	2018/09/25	pH (field)	SU	7.5
UA	MW-391	C	2019/03/19	pH (field)	SU	7.6
UA	MW-391	C	2019/09/25	pH (field)	SU	7.6
UA	MW-391	C	2020/03/24	pH (field)	SU	7.7
UA	MW-391	C	2020/09/16	pH (field)	SU	7.8
UA	MW-391	C	2021/03/12	pH (field)	SU	7.7
UA	MW-391	C	2021/06/22	pH (field)	SU	7.7
UA	MW-391	C	2021/09/14	pH (field)	SU	7.7
UA	MW-391	C	2022/03/29	pH (field)	SU	7.9
UA	MW-391	C	2022/09/30	pH (field)	SU	8.2
UA	MW-391	C	2023/03/14	pH (field)	SU	7.8
UA	MW-391	C	2023/05/17	pH (field)	SU	7.8
UA	MW-391	C	2023/08/04	pH (field)	SU	7.8
UA	MW-391	C	2023/11/03	pH (field)	SU	7.7
UA	MW-391	C	2016/12/22	Oxidation Reduction Potential	mV	1.00
UA	MW-391	C	2017/03/15	Oxidation Reduction Potential	mV	14.0
UA	MW-391	C	2017/06/20	Oxidation Reduction Potential	mV	116
UA	MW-391	C	2018/06/26	Oxidation Reduction Potential	mV	101
UA	MW-391	C	2018/09/25	Oxidation Reduction Potential	mV	140
UA	MW-391	C	2019/03/19	Oxidation Reduction Potential	mV	63.0
UA	MW-391	C	2019/09/25	Oxidation Reduction Potential	mV	56.0
UA	MW-391	C	2020/03/24	Oxidation Reduction Potential	mV	73.0
UA	MW-391	C	2020/09/16	Oxidation Reduction Potential	mV	22.0
UA	MW-391	C	2021/03/12	Oxidation Reduction Potential	mV	7.00
UA	MW-391	C	2021/06/22	Oxidation Reduction Potential	mV	31.0
UA	MW-391	C	2021/09/14	Oxidation Reduction Potential	mV	-4.00
UA	MW-391	C	2022/03/29	Oxidation Reduction Potential	mV	-6.00
UA	MW-391	C	2022/09/30	Oxidation Reduction Potential	mV	110
UA	MW-391	C	2023/03/14	Oxidation Reduction Potential	mV	-6.10
UA	MW-391	C	2023/05/17	Oxidation Reduction Potential	mV	53.0
UA	MW-391	C	2023/08/04	Oxidation Reduction Potential	mV	122
UA	MW-391	C	2023/11/03	Oxidation Reduction Potential	mV	55.0
UA	MW-391	C	2016/12/22	Eh	V	0.20
UA	MW-391	C	2017/03/15	Eh	V	0.21
UA	MW-391	C	2017/06/20	Eh	V	0.31
UA	MW-391	C	2018/06/26	Eh	V	0.29
UA	MW-391	C	2018/09/25	Eh	V	0.33

UA	MW-391	C	2019/03/19	Eh	V	0.26
UA	MW-391	C	2019/09/25	Eh	V	0.25
UA	MW-391	C	2020/03/24	Eh	V	0.27
UA	MW-391	C	2020/09/16	Eh	V	0.22
UA	MW-391	C	2021/03/12	Eh	V	0.20
UA	MW-391	C	2021/06/22	Eh	V	0.23
UA	MW-391	C	2021/09/14	Eh	V	0.19
UA	MW-391	C	2022/03/29	Eh	V	0.19
UA	MW-391	C	2022/09/30	Eh	V	0.31
UA	MW-391	C	2023/03/14	Eh	V	0.19
UA	MW-391	C	2023/05/17	Eh	V	0.25
UA	MW-391	C	2023/08/04	Eh	V	0.32
UA	MW-391	C	2023/11/03	Eh	V	0.25
UA	MW-391	C	2020/03/24	Alkalinity, bicarbonate	mg/L CaCO3	590
UA	MW-391	C	2020/09/16	Alkalinity, bicarbonate	mg/L CaCO3	588
UA	MW-391	C	2021/03/12	Alkalinity, bicarbonate	mg/L CaCO3	566
UA	MW-391	C	2021/09/14	Alkalinity, bicarbonate	mg/L CaCO3	560
UA	MW-391	C	2022/03/29	Alkalinity, bicarbonate	mg/L CaCO3	540
UA	MW-391	C	2022/09/30	Alkalinity, bicarbonate	mg/L CaCO3	632
UA	MW-391	C	2023/03/14	Alkalinity, bicarbonate	mg/L CaCO3	734
UA	MW-391	C	2023/05/17	Alkalinity, bicarbonate	mg/L CaCO3	728
UA	MW-391	C	2023/08/04	Alkalinity, bicarbonate	mg/L CaCO3	743
UA	MW-391	C	2023/11/03	Alkalinity, bicarbonate	mg/L CaCO3	643
UA	MW-391	C	2022/03/29	Alkalinity, carbonate	mg/L CaCO3	22.0
UA	MW-391	C	2022/09/30	Alkalinity, carbonate	mg/L CaCO3	24.0
UA	MW-391	C	2023/05/17	Alkalinity, carbonate	mg/L CaCO3	6.00
UA	MW-391	C	2023/11/03	Alkalinity, carbonate	mg/L CaCO3	17.0
UA	MW-391	C	2016/12/22	Barium, total	mg/L	0.0293
UA	MW-391	C	2017/03/15	Barium, total	mg/L	0.0332
UA	MW-391	C	2017/06/20	Barium, total	mg/L	0.0350
UA	MW-391	C	2018/06/26	Barium, total	mg/L	0.0475
UA	MW-391	C	2018/09/25	Barium, total	mg/L	0.0450
UA	MW-391	C	2019/03/19	Barium, total	mg/L	0.0366
UA	MW-391	C	2019/09/25	Barium, total	mg/L	0.0330
UA	MW-391	C	2020/03/24	Barium, total	mg/L	0.0297
UA	MW-391	C	2020/09/16	Barium, total	mg/L	0.0256
UA	MW-391	C	2021/03/12	Barium, total	mg/L	0.0161
UA	MW-391	C	2021/09/14	Barium, total	mg/L	0.0165
UA	MW-391	C	2022/03/29	Barium, total	mg/L	0.0135
UA	MW-391	C	2022/09/30	Barium, total	mg/L	0.0222
UA	MW-391	C	2023/03/14	Barium, total	mg/L	0.0209
UA	MW-391	C	2023/05/17	Barium, total	mg/L	0.0287
UA	MW-391	C	2023/08/04	Barium, total	mg/L	0.0234
UA	MW-391	C	2023/11/03	Barium, total	mg/L	0.124
UA	MW-391	C	2016/12/22	Boron, total	mg/L	1.30
UA	MW-391	C	2017/03/15	Boron, total	mg/L	1.43
UA	MW-391	C	2017/06/20	Boron, total	mg/L	1.88
UA	MW-391	C	2018/06/26	Boron, total	mg/L	8.91
UA	MW-391	C	2018/09/25	Boron, total	mg/L	8.60
UA	MW-391	C	2019/03/19	Boron, total	mg/L	6.77
UA	MW-391	C	2019/09/25	Boron, total	mg/L	6.16
UA	MW-391	C	2020/03/24	Boron, total	mg/L	5.29
UA	MW-391	C	2020/09/16	Boron, total	mg/L	4.35
UA	MW-391	C	2021/03/12	Boron, total	mg/L	2.60
UA	MW-391	C	2021/09/14	Boron, total	mg/L	2.84
UA	MW-391	C	2022/03/29	Boron, total	mg/L	3.24
UA	MW-391	C	2022/09/30	Boron, total	mg/L	3.25

UA	MW-391	C	2023/03/14	Boron, total	mg/L	2.45
UA	MW-391	C	2023/05/17	Boron, total	mg/L	2.49
UA	MW-391	C	2023/08/04	Boron, total	mg/L	2.38
UA	MW-391	C	2023/11/03	Boron, total	mg/L	3.75
UA	MW-391	C	2016/12/22	Calcium, total	mg/L	22.4
UA	MW-391	C	2017/03/15	Calcium, total	mg/L	24.5
UA	MW-391	C	2017/06/20	Calcium, total	mg/L	23.6
UA	MW-391	C	2018/06/26	Calcium, total	mg/L	78.9
UA	MW-391	C	2018/09/25	Calcium, total	mg/L	64.6
UA	MW-391	C	2019/03/19	Calcium, total	mg/L	44.7
UA	MW-391	C	2019/09/25	Calcium, total	mg/L	35.5
UA	MW-391	C	2020/03/24	Calcium, total	mg/L	21.4
UA	MW-391	C	2020/09/16	Calcium, total	mg/L	24.7
UA	MW-391	C	2021/03/12	Calcium, total	mg/L	7.06
UA	MW-391	C	2021/09/14	Calcium, total	mg/L	8.95
UA	MW-391	C	2022/03/29	Calcium, total	mg/L	6.63
UA	MW-391	C	2022/09/30	Calcium, total	mg/L	8.06
UA	MW-391	C	2023/03/14	Calcium, total	mg/L	11.3
UA	MW-391	C	2023/05/17	Calcium, total	mg/L	18.7
UA	MW-391	C	2023/08/04	Calcium, total	mg/L	15.0
UA	MW-391	C	2023/11/03	Calcium, total	mg/L	183
UA	MW-391	C	2016/12/22	Chloride, total	mg/L	258
UA	MW-391	C	2017/03/15	Chloride, total	mg/L	274
UA	MW-391	C	2017/06/20	Chloride, total	mg/L	300
UA	MW-391	C	2018/06/26	Chloride, total	mg/L	168
UA	MW-391	C	2018/09/25	Chloride, total	mg/L	181
UA	MW-391	C	2019/03/19	Chloride, total	mg/L	182
UA	MW-391	C	2019/09/25	Chloride, total	mg/L	194
UA	MW-391	C	2020/03/24	Chloride, total	mg/L	206
UA	MW-391	C	2020/09/16	Chloride, total	mg/L	186
UA	MW-391	C	2021/03/12	Chloride, total	mg/L	147
UA	MW-391	C	2021/09/14	Chloride, total	mg/L	116
UA	MW-391	C	2022/03/29	Chloride, total	mg/L	110
UA	MW-391	C	2022/09/30	Chloride, total	mg/L	147
UA	MW-391	C	2023/03/14	Chloride, total	mg/L	161
UA	MW-391	C	2023/05/17	Chloride, total	mg/L	170
UA	MW-391	C	2023/08/04	Chloride, total	mg/L	174
UA	MW-391	C	2023/11/03	Chloride, total	mg/L	228
UA	MW-391	C	2023/05/17	Iron, dissolved	mg/L	<0.02
UA	MW-391	C	2023/08/04	Iron, dissolved	mg/L	<0.023
UA	MW-391	C	2020/03/24	Magnesium, total	mg/L	13.6
UA	MW-391	C	2020/09/16	Magnesium, total	mg/L	14.0
UA	MW-391	C	2021/03/12	Magnesium, total	mg/L	3.92
UA	MW-391	C	2021/09/14	Magnesium, total	mg/L	4.55
UA	MW-391	C	2022/03/29	Magnesium, total	mg/L	3.58
UA	MW-391	C	2022/09/30	Magnesium, total	mg/L	3.88
UA	MW-391	C	2023/03/14	Magnesium, total	mg/L	5.01
UA	MW-391	C	2023/05/17	Magnesium, total	mg/L	6.60
UA	MW-391	C	2023/08/04	Magnesium, total	mg/L	6.64
UA	MW-391	C	2023/11/03	Magnesium, total	mg/L	21.9
UA	MW-391	C	2023/05/17	Manganese, dissolved	mg/L	0.00700
UA	MW-391	C	2023/08/04	Manganese, dissolved	mg/L	0.0115
UA	MW-391	C	2023/05/17	Phosphate, dissolved	mg/L	0.0250
UA	MW-391	C	2023/08/04	Phosphate, dissolved	mg/L	0.0520
UA	MW-391	C	2020/03/24	Potassium, total	mg/L	4.75
UA	MW-391	C	2020/09/16	Potassium, total	mg/L	5.50
UA	MW-391	C	2021/03/12	Potassium, total	mg/L	2.39

UA	MW-391	C	2021/09/14	Potassium, total	mg/L	2.70
UA	MW-391	C	2022/03/29	Potassium, total	mg/L	2.60
UA	MW-391	C	2022/09/30	Potassium, total	mg/L	2.99
UA	MW-391	C	2023/03/14	Potassium, total	mg/L	3.06
UA	MW-391	C	2023/05/17	Potassium, total	mg/L	3.96
UA	MW-391	C	2023/08/04	Potassium, total	mg/L	3.66
UA	MW-391	C	2023/11/03	Potassium, total	mg/L	6.70
UA	MW-391	C	2023/05/17	Silicon, dissolved	mg/L	3.27
UA	MW-391	C	2023/08/04	Silicon, dissolved	mg/L	3.28
UA	MW-391	C	2020/03/24	Sodium, total	mg/L	1,040
UA	MW-391	C	2020/09/16	Sodium, total	mg/L	972
UA	MW-391	C	2021/03/12	Sodium, total	mg/L	541
UA	MW-391	C	2021/09/14	Sodium, total	mg/L	527
UA	MW-391	C	2022/03/29	Sodium, total	mg/L	554
UA	MW-391	C	2022/09/30	Sodium, total	mg/L	607
UA	MW-391	C	2023/03/14	Sodium, total	mg/L	663
UA	MW-391	C	2023/05/17	Sodium, total	mg/L	767
UA	MW-391	C	2023/08/04	Sodium, total	mg/L	791
UA	MW-391	C	2023/11/03	Sodium, total	mg/L	1,030
UA	MW-391	C	2016/12/22	Sulfate, total	mg/L	679
UA	MW-391	C	2017/03/15	Sulfate, total	mg/L	726
UA	MW-391	C	2017/06/20	Sulfate, total	mg/L	758
UA	MW-391	C	2018/06/26	Sulfate, total	mg/L	1,760
UA	MW-391	C	2018/09/25	Sulfate, total	mg/L	1,420
UA	MW-391	C	2019/03/19	Sulfate, total	mg/L	1,340
UA	MW-391	C	2019/09/25	Sulfate, total	mg/L	1,450
UA	MW-391	C	2020/03/24	Sulfate, total	mg/L	1,320
UA	MW-391	C	2020/09/16	Sulfate, total	mg/L	1,230
UA	MW-391	C	2021/03/12	Sulfate, total	mg/L	907
UA	MW-391	C	2021/09/14	Sulfate, total	mg/L	668
UA	MW-391	C	2022/03/29	Sulfate, total	mg/L	499
UA	MW-391	C	2022/09/30	Sulfate, total	mg/L	426
UA	MW-391	C	2023/03/14	Sulfate, total	mg/L	439
UA	MW-391	C	2023/05/17	Sulfate, total	mg/L	430
UA	MW-391	C	2023/08/04	Sulfate, total	mg/L	489
UA	MW-391	C	2023/11/03	Sulfate, total	mg/L	870
UA	MW-391	C	2016/12/22	Temperature (Celsius)	degrees C	14.5
UA	MW-391	C	2017/03/15	Temperature (Celsius)	degrees C	13.9
UA	MW-391	C	2017/06/20	Temperature (Celsius)	degrees C	23.2
UA	MW-391	C	2018/06/26	Temperature (Celsius)	degrees C	18.2
UA	MW-391	C	2018/09/25	Temperature (Celsius)	degrees C	17.9
UA	MW-391	C	2019/03/19	Temperature (Celsius)	degrees C	14.8
UA	MW-391	C	2019/09/25	Temperature (Celsius)	degrees C	17.8
UA	MW-391	C	2020/03/24	Temperature (Celsius)	degrees C	12.9
UA	MW-391	C	2020/09/16	Temperature (Celsius)	degrees C	15.6
UA	MW-391	C	2021/03/12	Temperature (Celsius)	degrees C	14.3
UA	MW-391	C	2021/06/22	Temperature (Celsius)	degrees C	15.8
UA	MW-391	C	2021/09/14	Temperature (Celsius)	degrees C	20.4
UA	MW-391	C	2022/03/29	Temperature (Celsius)	degrees C	14.0
UA	MW-391	C	2022/09/30	Temperature (Celsius)	degrees C	15.6
UA	MW-391	C	2023/03/14	Temperature (Celsius)	degrees C	14.4
UA	MW-391	C	2023/05/17	Temperature (Celsius)	degrees C	15.6
UA	MW-391	C	2023/08/04	Temperature (Celsius)	degrees C	16.4
UA	MW-391	C	2023/11/03	Temperature (Celsius)	degrees C	15.1
UA	MW-391	C	2016/12/22	Total Dissolved Solids	mg/L	1,980
UA	MW-391	C	2017/03/15	Total Dissolved Solids	mg/L	2,260
UA	MW-391	C	2017/06/20	Total Dissolved Solids	mg/L	2,460

Attachment I. Site Groundwater Data
Geochemical Conceptual Site Model
Baldwin Fly Ash Pond System
Baldwin Power Plant
Baldwin, IL

UA	MW-391	C	2018/06/26	Total Dissolved Solids	mg/L	3,030
UA	MW-391	C	2018/09/25	Total Dissolved Solids	mg/L	3,090
UA	MW-391	C	2019/03/19	Total Dissolved Solids	mg/L	3,110
UA	MW-391	C	2019/09/25	Total Dissolved Solids	mg/L	2,980
UA	MW-391	C	2020/03/24	Total Dissolved Solids	mg/L	2,870
UA	MW-391	C	2020/09/16	Total Dissolved Solids	mg/L	2,630
UA	MW-391	C	2021/03/12	Total Dissolved Solids	mg/L	2,180
UA	MW-391	C	2021/09/14	Total Dissolved Solids	mg/L	1,620
UA	MW-391	C	2022/03/29	Total Dissolved Solids	mg/L	1,510
UA	MW-391	C	2022/09/30	Total Dissolved Solids	mg/L	1,660
UA	MW-391	C	2023/03/14	Total Dissolved Solids	mg/L	1,860
UA	MW-391	C	2023/05/17	Total Dissolved Solids	mg/L	1,970
UA	MW-391	C	2023/08/04	Total Dissolved Solids	mg/L	2,090
UA	MW-391	C	2023/11/03	Total Dissolved Solids	mg/L	2,590

Notes:
< = results is less than detection limit
B = Background
C = Compliance
HSU = Hydrostratigraphic Unit
PMP = Potential Migration Pathway
UA = Uppermost Aquifer
mg/L = milligrams per liter
SU = standard units
V = volts

Intended for
Dynegy Midwest Generation, LLC
10901 Baldwin Road
Baldwin, IL 62217

Date
April 22, 2025

Project No.
1940110241-005

NATURE AND EXTENT REPORT ADDENDUM

BALDWIN POWER PLANT, FLY ASH POND SYSTEM, IEPA ID NO. W1578510001-01, W1578510001-02, AND W1578510001-03

RAMBOLL Bright ideas. Sustainable change.

NATURE AND EXTENT REPORT ADDENDUM
BALDWIN POWER PLANT, FLY ASH POND SYSTEM, IEPA ID NO. W1578510001-01, W1578510001-02, AND W1578510001-03

Project name	**Baldwin Power Plant Fly Ash Pond System**
Project no.	**1940110241-005**
Recipient	**Dynegy Midwest Generation, LLC**
Document type	**Nature and Extent Report**
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ACRONYMS AND ABBREVIATIONS

35 I.A.C.	Title 35 of the Illinois Administrative Code
ASD	Alternative Source Demonstration
BAP	Bottom Ash Pond
bgs	below ground surface
BPP	Baldwin Power Plant
CCR	coal combustion residuals
CEC	Cation Exchange Capacity
cm/s	centimeters per second
CSM	conceptual site model
GCSM	geochemical conceptual site model
GWPS	groundwater protection standard
IEPA	Illinois Environmental Protection Agency
ISGS	Illinois State Geological Survey
ISWS	Illinois State Water Survey
FAPS	Fly Ash Pond System
LOI	loss-on-ignition
mg/L	milligrams per liter
NAVD88	North American Vertical Datum 1988
PMP	Potential Migration Pathway
SEP	sequential extraction procedure
SI	surface impoundment
UA	Uppermost Aquifer
UU	Upper Unit
XRD	x-ray diffraction

1. INTRODUCTION

Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845.650(d)(1) requires the owner or operator of a coal combustion residuals (CCR) surface impoundment (SI) to characterize the nature and extent of a release and relevant site conditions that may affect the remedy ultimately selected for a CCR SI if any constituent regulated under 35 I.A.C. § 845 is found to exceed the groundwater protection standard (GWPS). A report documenting the nature and extent of constituents detected above the GWPS that are attributable to the Baldwin Power Plant (BPP) Fly Ash Pond System (FAPS) was prepared and submitted to the Illinois Environmental Protection Agency (IEPA) dated April 24, 2024 [1]. Additional investigation to further characterize the nature and extent as described in the Nature and Extent Report was performed in 2024 following the submittal of the Report.

The additional investigation to evaluate the nature and extent included the following (**Figure 1-1**):

- Installation and development of four monitoring wells (MW-195, MW-196, MW-197, and MW-198) within the Upper Unit (UU)/ Potential Migration Pathway (PMP) downgradient of MW-150 and the FAPS to define the nature and extent of boron exceedances.[1]
- Redevelopment and sampling of piezometers (PZ-174, PZ-176, and PZ-178) that were previously unsampled along the southern boundary of the FAPS.
- Completion of slug tests at new monitoring wells (MW-195, MW-196, MW-197, and MW-198) and at existing piezometers (PZ-174, PZ-176, and PZ-178) to further characterize the hydraulic conductivity in the UU/PMP unit.
- Completion of an updated private well survey to identify potential receptors downgradient of the FAPS.

In addition to the investigation activities summarized above, modifications to the monitoring well network were completed as follows:

- Abandonment of monitoring well MW-307 because it is no longer used for monitoring and background well MW-306 due to grout contamination.
- Abandonment and replacement of compliance wells MW-253 and MW-350 due to grout contamination as approved by the IEPA in a letter dated March 7, 2024.
- Abandonment and replacement of MW-358 and MW-391 after collection of downhole videos indicated joints were compromised and likely resulted in the observed relatively rapid changes in groundwater elevation and/or water quality.
- Performance of a clean water slug test to evaluate connectivity between MW-391 and the aquifer and updates to the BPP groundwater model incorporating new data.

[1] Throughout this document, "exceedance" or "exceedances" is intended to refer only to potential exceedances of proposed applicable background statistics or GWPSs as described in the proposed groundwater monitoring plan, which was submitted to the IEPA on October 25, 2021 as part of Dynegy Midwest Generation, LLC's operating permit application for the BPP FAPS. That operating permit application, including the proposed groundwater monitoring plan, remains under review by the IEPA and, therefore, Dynegy Midwest Generation, LLC has not identified any actual exceedances.

Documentation of site investigation activities described above and other well maintenance activities performed during the April and May 2024 field work and the updated private well survey is included in **Appendix A**. Groundwater elevations were measured and samples were collected following installation or replacement of the wells and continued through October 2024. This report supplements the existing Nature and Extent Report with the results from the additional investigation and initial groundwater monitoring completed in 2024.

2. ADDITIONAL INVESTIGATION RESULTS

2.1 Geology

As previously described in the Nature and Extent Report [1], materials at the site have been categorized into two hydrostratigraphic units (in addition to the CCR) at the FAPS based on stratigraphic relationships, geologic composition, and common hydrogeologic properties. The units, listed from surface downward, are summarized as follows:

- **UU:** Predominantly clay with some silt and minor sand, silt layers, and occasional sand lenses. Includes the lithologic layers identified as the Cahokia Alluvium, Peoria Loess, Equality Formation, and Vandalia Till Member. This unit is composed of unlithified natural geologic materials present above the top of bedrock, ranging in thickness at the Site between 17 and 56 feet. Thin sand seams within the unit and the interface (contact) between the UU and bedrock have been identified as potential migration pathways. No continuous sand seams were observed within or immediately adjacent to the FAPS; however, the sand seams on Site may act as a PMP due to relatively higher hydraulic conductivities. The acronym UU and the materials it contains is synonymous with Upper Groundwater Unit used in previous documents.
- **Bedrock Unit:** This unit is considered the uppermost aquifer (UA). Pennsylvanian and Mississippian-aged bedrock is composed of interbedded shale and limestone bedrock, which underlies and is continuous across the entire Site. Review of regional literature [2] indicates that three formations are present at the bedrock surface onsite including (from youngest [eastern portions of site] to oldest [western portion of the site]): Menard Formation; Waltersburg, Vienna, and Tar Springs Formation; and Glen Dean and Hardinsburg Formation. In many of the boring logs from the Site [3], the bedrock is described as highly weathered.

CCR consists of fly ash within the FAPS (and bottom ash and boiler slab on the BPP property more broadly, see Bottom Ash Pond [BAP]) and may be present from the surface (approximately 418 to 466 feet[2]) to a minimum elevation of approximately 401 feet. CCR material is lowest in elevation along a historic drainage feature that runs approximately through the center of the FAPS.

Borings and monitoring wells installed to further define and understand the nature and extent of exceedances (**Figure 1-1**, MW-195, MW-196, MW-197, MW-198, MW-253R, and MW-350R; nature and extent wells) indicate consistent geologic materials and stratigraphic relationships. The Nature and Extent wells encountered the following units:

- **UU/ PMP:** The UU was encountered in all borings advanced in 2024. Sand lenses (PMP) within the UU were identified in MW-195, and consistent with previous borings the PMP in contact with underlying lithified bedrock was identified in MW-253R and MW-350R.
- **Bedrock Unit and UA:** Bedrock was encountered in MW-253R at a depth of 28.3 feet below ground surface (bgs) and in MW-350R at a depth of 24.6 feet bgs, which is consistent with the Nature and Extent Report [1].

[2] All elevations in this report are referenced to North American Vertical Datum of 1988 (NAVD88) unless otherwise noted.

2.2 Hydrogeology

2.2.1 Groundwater Elevations and Flow Directions

Groundwater elevations and flow directions within the UU/PMP are consistent with historical measurements occurring at elevations between approximately 376 and 440 feet. Based on the October 2024 measurements, groundwater within the UU/PMP flows generally from east to west with a southwestern component near the southern boundary toward monitoring wells MW-150 and MW-196 (Figure 2-1); and an intermittent drainage channel which connects with an unnamed tributary (Figure 2-2; note: these features combined are referred to as the south stream to the Kaskaskia River in the Groundwater Modeling Technical Memorandum [4]). Measurements of groundwater elevations in MW-195 south of the unnamed tributary indicate that groundwater flows to the north toward the unnamed tributary (**Figure 2-1**), which is consistent with the topography in the area (**Figure 2-2**). There are no wells south of MW-253R, but it is expected that the shallow water table is generally consistent with the topography (**Figure 2-2**) as observed in other portions of the site and groundwater flow is likely west toward an existing drainage feature that connects with the drainage channel.

Consistent with previous reporting [1], groundwater flow in the UA is generally similar to groundwater flow in the shallow unlithified materials. Groundwater in bedrock flows to the west and southwest across the Site in 2024 as illustrated in the October UA potentiometric surface map (**Figures 2-3**). Groundwater flow in bedrock is northwest in the east and central areas of the BAP, and southwest to northwest on the east area of the FAPS (Old East Fly Ash Pond) until groundwater reaches the bedrock valley feature underlying the Secondary and Tertiary Ponds west of the BAP and FAPS, at which point the flow direction veers toward this bedrock surface low and flows southwest.

Vertical gradients measured between wells MW-150 and MW-350R measured after April 2024 are downward which is consistent with those reported in the Nature and Extent Report [1].

2.2.2 Field Hydraulic Conductivity

Hydraulic conductivity was measured using slug tests in UU/PMP wells PZ-174, PZ-177, MW-195, MW-196, MW-197, and MW-198. Results indicate the hydraulic conductivity of the UU/PMP ranged from 9.0×10^{-8} centimeters per second (cm/s) to 1.6×10^{-3} cm/s which is similar in magnitude to the results included in the Hydrogeologic Site Characterization Report [3].

2.2.3 Private Well Survey

The private well survey completed in 2021 [3] was updated to evaluate and confirm whether additional wells were located south of the FAPS. The survey included the following components:

- Review of the Illinois State Geological Survey (ISGS) and Illinois State Water Survey (ISWS) databases to identify existing well records.
- Documentation of well locations identified during access discussions with adjacent property owners.
- A windshield survey to identify potential wells based on surface features.
- A discussion with the village of Baldwin about village connections and well locations (Gary Schoenbeck).

- A second windshield survey to review and discuss potential well features, identified in the original survey, with property owners onsite.

The details of the survey updates are included in **Appendix A** and identified wells are shown on **Figure 2-4**. Five wells were confirmed to exist south of the FAPs and their location and use is summarized below:

- One bored well (API#121572681800), approximately 37 feet deep and located at 7517 State Route 154 is used for potable purposes and is included in the ISGS database.
- One bored well (labeled "A"), approximately 40 feet deep and located at 7509 State Route 154 is used for non-potable purposes including truck washing.
- One hand dug well (labeled "B") located at 7525 State Route 154 has an unknown depth and is used for non-potable purposes including livestock watering.
- One bored well (API#121570240900) located at 7601 State Route 154 and approximately 32 feet deep is used for potable purposes and is included in the ISGS database.
- One bored well (labeled "C") located at 7615 Ruby Lane has an unknown depth and historically provided water to a house that in no longer present onsite. The property owner has indicated that they plan to abandon the well in 2025.

3. UPDATES TO THE OCCURRENCE AND DISTRIBUTION OF GROUNDWATER EXCEEDANCES (EXTENT)

Field sampling forms and laboratory reports for additional sampling containing groundwater data from supplemental sampling locations are presented in **Appendix B**[3]. A summary of all exceedance parameters (boron, fluoride, and sulfate) at wells with exceedances (MW-150, MW-152, MW-196, MW-197, MW-252, MW-253R, MW-366, MW-384, PZ-174, PZ176, and PZ-178) is provided in **Table 3-1** and groundwater data at exceedance locations is summarized in **Table 3-2**.

As discussed in the Nature and Extent Report, an Alternative Source Demonstration (ASD) identifying grout contamination as the alternative source was completed for the pH exceedance at UU monitoring well MW-253 and UA monitoring well MW-350 and received concurrence from IEPA. The nature and extent of pH in both the UU and UA are not included in this report. Compliance wells MW-253 and MW-350 were replaced (MW-253R and MW-350R, respectively). Background well MW-306 was also identified as being influenced by grout contamination and was abandoned. Background was therefore updated between the 2023 Q4 and 2024 Q1 sampling event and exceedances discussed in this Addendum are based on comparisons to this updated background.

3.1 Extent in the Uppermost Aquifer

The Nature and Extent Report [1] identified only boron concentrations at well MW-391 as an exceedance in the UA. Subsequent investigation found the MW-391 well casing to be compromised such that sample results no longer were representative of groundwater in the UA. The replacement well, MW-391R, has been dry following installation in 2024. The lack of groundwater at this location is consistent with previously installed wells at this location (MW-387, and MW-391 prior to its failure). Based on the lack of boron exceedances in this unit, the nature and extent of boron concentrations in the UA has not been included in this report.

Following submittal of the Nature and Extent Report, exceedances of the GWPS for sulfate (MW-366) and fluoride (MW-384) concentrations have been identified and reported in the UA [5,6]. The exceedances are shown on **Figure 3-1** and summarized in **Table 3-1**. The groundwater data is included in **Table 3-2.**

3.1.1 Sulfate

Sulfate exceedances in the UA are limited to a single monitoring well, MW-366. This exceedance was first reported when the site-specific background was updated in the first quarter of 2024 and the resulting sulfate GWPS decreased following the update to background. The lateral and downgradient extent of sulfate GWPS exceedances in proximity to MW-366 is limited by the Secondary Pond located to the west and adjacent to the monitoring well. No results have been reported for MW-391R (downgradient to the southwest) because it has been dry since it was installed, but the lack of groundwater at this location suggests that sulfate concentrations are unlikely to migrate in this direction. Further groundwater monitoring at MW-391R will be used to

[3] Laboratory reports from sampling the existing monitoring network are posted quarterly to https://www.luminant.com/ccr/illinois-ccr/?dir=il-ccr%2FBaldwin

continue to evaluate the potential downgradient extent of sulfate exceedances in the UA. There are no sulfate exceedances to the northeast of MW-366 based on monitoring at MW-390.

Vertically, the extent of the sulfate impacts is limited by the low permeability of the shale bedrock, which decreases with depth as the secondary porosities of the shale do not yield a sufficient volume of groundwater to produce a useable water supply. In addition, water quality decreases with increasing depth as water becomes increasingly mineralized [5].

3.1.2 Fluoride

Fluoride exceedances in the UA are limited to a single monitoring well, MW-384, located at the boundary between the FAPS and BAP (**Figure 3-1**). Fluoride concentrations have generally increased beginning in the second quarter of 2023 and exceeded the GWPS in the second quarter of 2024. The lateral and downgradient extent of fluoride concentrations near MW-384 are bounded to the west and southwest by the downgradient wells MW-352, MW-377, and MW-390. These wells reported maximum fluoride concentrations below 2 milligrams per liter (mg/L) while fluoride concentrations in MW-384 ranged between 4.05 and 4.58 mg/L in 2024, above the GWPS of 4.0 mg/L.

Vertically, the extent of the fluoride impacts is limited by the low permeability of the shale bedrock, which decreases with depth as the secondary porosities do not yield a sufficient volume of groundwater to produce a useable water supply. In addition, water quality decreases with increasing depth as water becomes increasingly mineralized [5].

3.2 Extents in Upper Unit (Potential Migration Pathways)

Exceedances reported for the UU (PMP) in the Nature and Extent Report included the following constituents and locations:

- Boron at MW-150, and MW-152
- Sulfate at MW-150

Subsequent to the submission of the Nature and Extent report and the update to background, the following exceedances were observed in compliance wells:

- Sulfate at MW-252 and MW-253R

Direct comparison of concentrations to the GWPS for additional wells sampled in 2024 to further define the nature and extent of boron in the UU resulted in the following potential exceedances:

- Boron at PZ-174 and MW-196
- Sulfate at PZ-174 and MW-196

The potential exceedances are shown in **Figure 3-2** and summarized in **Table 3-1**. The groundwater data is included in **Table 3-2.**

3.2.1 Boron

Concentrations of boron measured in the UU (PMP) exceed the GWPS in MW-150 and MW-152 as discussed in the Nature and Extent Report. During investigations completed in 2024, two of six additional wells sampled to further delineate the extent of boron also reported exceedances. Results from two wells (PZ-174 and MW-196) located near the southwest corner of the FAPS both

indicate potential exceedances based on direct comparison to the GWPS during the initial (two at PZ-174, three at MW-196) sampling events completed at these locations.

- **MW-150, PZ-174, and MW-196**: The lateral extent of boron concentrations near MW-150, PZ-174, and MW-196 is limited by the Tertiary Pond to the north and northwest and to the south by monitoring well MW-197 and the unnamed tributary to the south and west. The maximum concentration of boron detected in MW-197 to the south was 0.02 mg/L, which provided delineation to the south. The shallow groundwater elevation measured in MW-195, located on the other side of the unnamed tributary, was higher than that measured in MW-197 indicating that the water table south of the tributary likely reflects the generally north-sloping topography (**Figure 2-2**). This further limits the migration of boron concentrations to the south. The extent of boron concentrations to the east and southeast of MW-196 is defined by MW-151, where concentrations in 2024 are less than 1.64 mg/L [6], and MW-198, where concentrations are less than 0.025 mg/L (**Table 3-2**). The downgradient extent to the west, based on the both the most recent groundwater quality data and groundwater modeling, is most likely defined by the unnamed tributary to the west/southwest. Surface water samples collected from the Kaskaskia River [7], the ultimate groundwater receptor to the west, indicate boron concentrations are less than 0.05 mg/L.
  - Vertically, the extent of boron concentrations is limited by low hydraulic conductivity of the UU, with a range 6.3×10^{-9} to 4.2×10^{-4} cm/s [1] and low hydraulic conductivity bedrock. Concentrations of boron in MW-150 are also defined vertically by MW-350R, a deeper well immediately adjacent to MW-150 and screened in the UA. The maximum concentration of boron detected in MW-350R was 1.29 mg/L.

3.2.2 Sulfate

Concentrations of sulfate measured in the UU (PMP) exceed the GWPS intermittently along the southern border of the FAPS. The exceedance at MW-150, located at the southwest corner of the FAPS, was included in the Nature and Extent Report. The exceedance at MW-252, centrally located along the southern border of the FAPS, was first reported when the site-specific background was updated in the first quarter of 2024 and the resulting sulfate GWPS was lower. The exceedance at MW-253R, located near the southeast corner of the FAPS, was first reported when the initial sample was collected. In addition to these compliance wells, potential sulfate exceedances were also observed at delineation wells PZ-174 and MW-196, both located near MW-150 and the southwest corner of the FAPS, based on the initial samples taken at these locations.

- **MW-150, PZ-174, and MW196**: The lateral extent of sulfate concentrations near MW-150, PZ-174, and MW-196 is consistent with the extent of boron. Sulfate exceedances are defined by the Secondary and Tertiary Ponds to the north and northwest, and by monitoring well MW-197 and the unnamed tributary to the south and west. The maximum concentration of sulfate detected in MW-197 was 174 mg/L. The shallow groundwater elevation measured in MW-195, located on the other side of the unnamed tributary, was higher than that measured in MW-197, indicating that the water table south of the tributary likely reflects the generally north-sloping topography (**Figure 2-2**). This further limits the migration of sulfate concentrations to the south. Concentrations to the east and southeast of MW-196, based on the most recent samples collected in 2024, are less than 141 mg/L at MW-151 and the initial sample concentration of 43.1 mg/L at MW-198. Based on both the recent groundwater

quality data and groundwater modeling, the downgradient extent of sulfate is most likely limited by the unnamed tributary to the west/southwest.

  - Vertically, the extent of sulfate concentrations is limited by low hydraulic conductivity of the UU, with a range 6.3 x 10^{-9} to 4.2 x 10^{-4} cm/s [1] and low hydraulic conductivity bedrock. Concentrations of sulfate in MW-150 are also defined vertically by MW-350R, a deeper well immediately adjacent to MW-150 and screened in the UA. The maximum concentration of sulfate detected in MW-350R was 70 mg/L.

- **MW-252 and MW-253R**: The lateral and downgradient extent of sulfate concentrations in proximity to MW-252 is limited by piezometer PZ-178 to the west. The maximum sulfate concentrations detected at this location is less than 200 mg/L. The downgradient extent of sulfate concentrations is also limited to the south by the drainage channel and the regional shallow groundwater table which, based on the topography, is expected to flow generally to the west. A 2012 investigation completed south of the site and attached to the Nature and Extent Report [1] indicates that groundwater generally flows west in the area near MW-252 and only one of six locations (BPZ4, located on the southern property line) had elevated sulfate concentrations (817 mg/L), while the remaining locations to the south did not exceed the 35 I.A.C. Part 620 Section 410 Class I Groundwater Standards.

  - As discussed previously, the groundwater flow direction near MW-253R is expected to be to the west toward the temporary piezometers installed in 2012, and generally consistent with the topography (**Figure 2-2**). The extent of sulfate is limited to the south due to these expected flow directions. The downgradient extent of sulfate in the UU to the west and southwest is limited by the unnamed tributary, and ultimately by the Kaskaskia River and connected oxbows located west and southwest of the property boundary.

  - Vertically, the extent of sulfate concentrations is limited by low hydraulic conductivity of the UU, with a range 6.3 x 10^{-9} to 4.2 x 10^{-4} cm/s [1].Concentrations of sulfate in MW-252 are also defined vertically by MW-152, a shallow well nested with MW-252 and screened in the UU and MW-352 which is screened in the UA. The sulfate concentration detected in MW-152 is highly variable ranging from 242 to 988 mg/L, while concentration in bedrock well MW-352 are less than 10 mg/L.

4. UPDATES TO THE GEOCHEMICAL CONCEPTUAL SITE MODEL (NATURE)

A geochemical conceptual site model (GCSM) was developed to describe the conditions of the groundwater in the vicinity of the BPP FAPS and is summarized here (full analysis presented in Appendix E of the Nature and Extent Report to which this addendum is attached). The GCSM describes the geochemical processes that contribute to the mobilization, distribution, and attenuation of chemicals in the environment. Only parameters that have exceeded the GWPS in FAPS groundwater and will be addressed in the corrective action plan are included in the GCSM. As discussed in previous sections, the exceedances observed at the FAPS include boron, sulfate, and fluoride. The effects of additional observed exceedances (*i.e.*, fluoride at MW-384 and sulfate at MW-252, MW-253R, and MW-366) and additional and ongoing data collection on the GCSM are summarized below and described in detail in **Appendix C**.

As in **Section 3**, additional data collection (and therefore the update to the GCSM) is focused on the south/southwest side of the unit; the single-location fluoride exceedance is briefly discussed here. Fluoride ranged from 3 to 4 mg/L in water measurements available from the FAPS prior to unit closure[4], indicating that the FAPS may be a source of fluoride to downgradient water. Fluoride is also naturally enriched in the shale bedrock observed at the Site [8] and contributes to elevated fluoride in the north of the Site [9]. Geologic sources and the FAPS may both contribute to the fluoride exceedance observed at MW-384.

Solid samples collected from MW-195, MW-196, MW-197, and MW-350R (per **Appendix A**) were analyzed for cation exchange capacity (CEC), loss on ignition (LOI), total metals, seven-step sequential extraction procedure (SEP), and X-ray diffraction (XRD). All laboratory reports for additional solid phase characterization are included in **Appendix C**. The additional investigation samples had somewhat higher CEC and LOI compared to previous samples, suggesting higher sorption capacity of the solids. analysis of the additional investigation samples did not identify crystalline iron hydroxides (which were observed in previous samples), although the sequential extraction analysis identified iron in both the amorphous/non-crystalline and crystalline phases. These results indicate that there is likely a combination of iron oxide/hydroxide mineral phases throughout the site.

Groundwater geochemical data collected from wells MW-195, MW-196, MW-197, MW-198, PZ-17, PZ-176, and PZ-178 were consistent with previous results for the site. Additional investigation PMP wells with sulfate exceedances (*i.e.*, PZ-174 and MW-196) have similar groundwater composition as PMP compliance wells with exceedances (MW-150, MW-152, and MW-253R). Results from the aquifer solids and groundwater investigation wells at BAL FAPS are consistent with the earlier GCSM as summarized below.

The primary source of boron and sulfate to groundwaters of the UA and UU PMP within the monitoring network is the FAPS porewater (*i.e.,* CCR source water), based on concentrations within the source and relationships to hydrogeological patterns at the site. Boron was identified within UA solids at concentrations that suggest that aquifer solids could provide an additional

[4] Data representing the CCR source water are presented in Appendix D ('Types of CCR and Chemical Constituents') of the Construction Permit Application for the BPP FAPS (to which this document is attached).

potential natural geogenic source of boron to groundwater, and groundwater from background wells consistently exhibited boron concentrations consistent with a natural geogenic source.

Boron and sulfate in the groundwater system may be attenuated via surface complexation reactions within portions of the UU PMP and the UA. Conditions within groundwater from both the UA and UU PMP are typically predicted to favor amorphous iron oxide stability at most locations, and the presence of iron oxides is corroborated by XRD and SEP data. Limited variability in pH or redox conditions is observed between upgradient background and downgradient locations. Boron may be further attenuated via interactions with clay minerals, which are observed in solids across both the UU and UA. The observation of gypsum, although limited to the shale bedrock portions of the UA, indicates that precipitation of gypsum may be another potential attenuation mechanism for sulfate at locations near the FAPS.

5. COMBINED GEOCHEMICAL AND HYDROGEOLOGIC CONCEPTUAL SITE MODELS

5.1 Boron Conceptual Site Model

The conceptual site model (CSM) describing current conditions at the FAPS combining the hydrogeologic and geochemical CSMs for boron is as follows. Water that may come into contact with CCR in the FAPS becomes porewater within the unlined CCR unit. Porewater (*i.e.,* CCR source water) containing elevated concentrations of boron mixes with groundwater underlying and adjacent to the UU. Groundwater within the UU/PMP in the vicinity of the FAPS travels horizontally outward from the FAPS, migrating toward the Secondary Pond, Tertiary Pond, drainage channel to the south, or unnamed tributary to the south and west, but ultimately toward the Kaskaskia River and hydraulically connected oxbows. Groundwater may also migrate vertically through the clay of the UU into the UA. If groundwater reaches the UA, it migrates slowly in the formation due to the low permeability of the shale bedrock.

The distribution of boron exceedances in the UU is laterally defined by the Tertiary Pond to the north/northwest; to the south by well MW-197 and the unnamed tributary to the south and west; to the east by monitoring wells MW-151 and MW-198; and ultimately defined in the downgradient flow direction by an oxbow of the Kaskaskia River to the west. The distribution of boron exceedances in the UU is vertically defined by MW-350R. The presence or absence of exceedances can be attributed to variability in the geology and porewater concentrations, changes in groundwater elevations and flow directions, and attenuation processes. Boron concentrations are attenuated physically through dilution and dispersion and may be chemically attenuated via surface complexation to iron oxides and clay minerals, which are observed in solids within both the UU and UA.

5.2 Sulfate Conceptual Site Model

The CSM describing current conditions at the FAPS combining the hydrogeologic and geochemical CSMs for sulfate is as follows. Water that may come into contact with CCR in the FAPS becomes porewater within the unlined CCR unit. Porewater containing elevated concentrations of sulfate mixes with groundwater underlying and adjacent to the UU. Groundwater within the UU/PMP in the vicinity of the FAPS migrates toward the Secondary Pond, Tertiary Pond, drainage channel to the south, or unnamed tributary to the south and west, but ultimately toward the Kaskaskia River and hydraulically connected oxbows. Groundwater may also migrate vertically into the clay of the UU that separates the UU from the UA. If it reaches the UA, it migrates slowly in the formation due to the low permeability of the shale bedrock.

South of the FAPS, the limit of sulfate exceedances in the UU near MW-150, PZ-174, and MW-196 is laterally defined by the unnamed tributary to the south and west and by MW-197 and MW-198 to the south and southeast, and vertically by MW-350R. Near monitoring wells MW-252 and 253R, sulfate concentrations are limited by the flow direction which is expected to reflect the surficial topography and indicates a westerly flow direction. Vertically, concentrations are defined by MW-352, which is screened within the UA below MW-252. West of the FAPS, the limit of sulfate exceedances in the UA near MW-366 is defined by the Secondary Pond to the west, by MW-391R to the southwest, and by MW-390 to the northeast. The presence or absence of exceedances can be attributed to variability in the geology and CCR source water (porewater) concentrations, changes in groundwater elevations and flow directions, the extent of water

migration between the UU and UA, and attenuation processes. Sulfate concentrations are attenuated physically through dilution and dispersion and may be geochemically attenuated via surface complexation to iron oxides within portions of the UU PMP and the UA. The observation of gypsum, although limited to the shale bedrock portions of the UA, indicates that precipitation of gypsum may be another potential attenuation mechanism for sulfate at locations near the FAPS.

5.3 Fluoride Conceptual Site Model

The CSM describing current conditions at the FAPS combining the hydrogeologic and geochemical CSMs for fluoride is as follows. Water that may come into contact with CCR in the FAPS becomes porewater within the unlined CCR unit. Porewater containing elevated concentrations of fluoride mixes with groundwater underlying and adjacent to the UU and may migrate vertically through the clay of the UU into the UA. Interaction of groundwater with the shale bedrock may also drive elevated groundwater fluoride concentrations. Groundwater within the UA migrates slowly in the formation due to the low permeability of the shale bedrock.

Concentrations of fluoride in MW-384 exceed the GWPS, and the lateral and downgradient extents are defined to the west and southwest by the downgradient wells MW-352, MW-377, and MW-390. Vertically the migration of fluoride is limited by the low permeability shale underlying the UA.

6. CONCLUSIONS AND FUTURE ACTIVITIES

In accordance with 35 I.A.C. § 845.650(d)(1), the nature and extent of GWPS exceedances of boron, fluoride, and sulfate have been described in sufficient detail to support a complete and accurate assessment of the corrective measures necessary to effectively clean up all releases from the FAPS.

The lateral extents of exceedances are illustrated in **Figures 3-1 and 3-2**. Boron was selected for modeling source control presented in the Final Closure Plan and was identified as a surrogate for the exceedances of other constituents, as described in the Groundwater Modeling Report.[5] For modeling purposes, it was assumed that boron would not significantly sorb or chemically react with aquifer solids (soil adsorption coefficient was set to 0 milliliters per gram), which is a conservative estimate for predicting contaminant transport times in the model. Additional geochemical modeling was completed to evaluate how sorption to solid phases may affect boron and sulfate mobility and therefore the time to reach the GWPS for these parameters.[6]

[5] The Groundwater Modeling Technical Memorandum is provided as Appendix B to the Corrective Action Alternatives Analysis Supporting Information Report. The Corrective Action Alternatives Analysis Supporting Information Report is provided as Appendix B to the Corrective Action Alternatives Analysis to which this report is also attached.

[6] Presented in the Groundwater Polishing Report provided as Appendix E to the Corrective Action Alternatives Analysis to which this report is also attached.

7. REFERENCES

[1] Ramboll Americas Engineering Solutions, Nature and Extent Report, Fly Ash Pond System, Baldwin Power Plant, Baldwin Illinois, April 2024.

[2] I. S. G. Survey, "Bedrock Geology of Baldwin Quadrangle, Randolp and St. Clair Counties, Illinois," 2018.

[3] Ramboll Americas Engineering Solutions, Inc., "Hydrogeologic Site Characterization Report, Revision 1. Bottom Ash Pond, Baldwin Power Plant, Baldwin, Illinois. Dynegy Midwest Generation, LLC.," August 1, 2023.

[4] Ramboll Americas Engineering Solutions, Groundwater Modeling Technical Memorandum, Fly Ash Pond System, Baldwin Power Plant, Baldwin Illinois, February 2025.

[5] W. A. Pryor, "Groundwater Geology in Southern Illinois: A Preliminary Geologic Report. Illinois State Geological Survey, Circular 212.," Urbana, Illinois, 1956.

[6] Ramboll Americas Engineering Solutions, "Baldwin Power Plant Fly Ash Pond System (IEPA ID W1578510001-01,02,03) 2024 Annual Consolidated Report," January 30, 2025.

[7] Hanson Professional Services Inc, "Antidegradation Assessment for Management of Coal Combustion Residuals Impoundment Waters Baldwin Energy Complex, Dynegy Midwest Generation, LLC," 2017.

[8] W. F. a. R. T. Cable L.W., "Hydrogeology of the principal aquifers in Vigo and Clay Counties, Indiana," Indiana Department of Natural Resources Bulletin 34, 1971.

[9] Geosyntec, "Alternative Source Demonstration Baldwin Power Plant Bottom Ash Pond," 2023.

TABLES

Table 3-1. Exeedance Parameter Statistical Results
Nature and Extent Report
Baldwin Fly Ash Pond System
Baldwin Power Plant
Baldwin, IL

Location	Well Type	HSU	Event	Parameter	Unit	Date Range	Sample Count	Percent ND	Statistical Calculation	Statistical Result	GWPS	GWPS Source	Exceedance
MW-150	C	PMP	2023 Q2	Boron, total	mg/L	03/15/23 - 05/18/23	2	0	Most recent sample	4.12	2.23	Background	YES
MW-150	C	PMP	2023 Q3	Boron, total	mg/L	03/15/23 - 08/07/23	3	0	Most recent sample	4.38	2.23	Background	YES
MW-150	C	PMP	2023 Q4	Boron, total	mg/L	03/15/23 - 11/03/23	4	0	CI around mean	2.87	2.23	Background	YES
MW-150	C	PMP	2024 Q1	Boron, total	mg/L	03/15/23 - 02/07/24	5	0	CI around mean	3.22	2.23	Background	YES
MW-150	C	PMP	2024 Q2	Boron, total	mg/L	03/15/23 - 04/17/24	6	0	CI around mean	3.28	2.23	Background	YES
MW-150	C	PMP	2024 Q3	Boron, total	mg/L	03/15/23 - 07/18/24	7	0	CI around mean	3.32	2.23	Background	YES
MW-150	C	PMP	2024 Q4	Boron, total	mg/L	03/15/23 - 10/15/24	8	0	CI around mean	3.40	2.23	Background	YES
MW-150	C	PMP	2025 Q1	Boron, total	mg/L	03/15/23 - 01/22/25	9	0	CI around mean	3.45	2.23	Background	YES
MW-150	C	PMP	2023 Q2	Fluoride, total	mg/L	03/15/23 - 05/18/23	2	0	Most recent sample	0.700	4.0	MCL/HBL	NO
MW-150	C	PMP	2023 Q3	Fluoride, total	mg/L	03/15/23 - 08/07/23	3	0	Most recent sample	0.750	4.0	MCL/HBL	NO
MW-150	C	PMP	2023 Q4	Fluoride, total	mg/L	03/15/23 - 11/03/23	4	0	CI around mean	0.610	4.0	MCL/HBL	NO
MW-150	C	PMP	2024 Q1	Fluoride, total	mg/L	03/15/23 - 02/07/24	5	0	CI around mean	0.647	4.0	MCL/HBL	NO
MW-150	C	PMP	2024 Q2	Fluoride, total	mg/L	03/15/23 - 04/17/24	6	0	CI around mean	0.653	4.0	MCL/HBL	NO
MW-150	C	PMP	2024 Q3	Fluoride, total	mg/L	03/15/23 - 07/18/24	7	0	CI around mean	0.658	4.0	MCL/HBL	NO
MW-150	C	PMP	2024 Q4	Fluoride, total	mg/L	03/15/23 - 10/15/24	8	0	CI around mean	0.669	4.0	MCL/HBL	NO
MW-150	C	PMP	2025 Q1	Fluoride, total	mg/L	03/15/23 - 01/22/25	9	0	CI around mean	0.661	4.0	MCL/HBL	NO
MW-150	C	PMP	2023 Q2	Sulfate, total	mg/L	03/15/23 - 05/18/23	2	0	Most recent sample	970	400	MCL/HBL	YES
MW-150	C	PMP	2023 Q3	Sulfate, total	mg/L	03/15/23 - 08/07/23	3	0	Most recent sample	852	400	MCL/HBL	YES
MW-150	C	PMP	2023 Q4	Sulfate, total	mg/L	03/15/23 - 11/03/23	4	0	CI around mean	749	400	MCL/HBL	NO
MW-150	C	PMP	2024 Q1	Sulfate, total	mg/L	03/15/23 - 02/07/24	5	0	CI around mean	797	400	MCL/HBL	YES
MW-150	C	PMP	2024 Q2	Sulfate, total	mg/L	03/15/23 - 04/17/24	6	0	CI around mean	823	400	MCL/HBL	YES
MW-150	C	PMP	2024 Q3	Sulfate, total	mg/L	03/15/23 - 07/18/24	7	0	CI around mean	840	400	MCL/HBL	YES
MW-150	C	PMP	2024 Q4	Sulfate, total	mg/L	03/15/23 - 10/15/24	8	0	CI around mean	847	400	MCL/HBL	YES
MW-150	C	PMP	2025 Q1	Sulfate, total	mg/L	03/15/23 - 01/22/25	9	0	CI around mean	854	400	MCL/HBL	YES
MW-152	C	PMP	2023 Q2	Boron, total	mg/L	03/15/23 - 05/18/23	2	0	Most recent sample	0.515	2.23	Background	NO
MW-152	C	PMP	2023 Q3	Boron, total	mg/L	03/15/23 - 08/04/23	3	0	Most recent sample	9.09	2.23	Background	YES
MW-152	C	PMP	2023 Q4	Boron, total	mg/L	03/15/23 - 10/31/23	4	0	CI around mean	-13.3	2.23	Background	NO
MW-152	C	PMP	2024 Q1	Boron, total	mg/L	03/15/23 - 02/07/24	5	0	CI around mean	-5.36	2.23	Background	NO
MW-152	C	PMP	2024 Q2	Boron, total	mg/L	03/15/23 - 04/18/24	6	0	CI around mean	-3.71	2.23	Background	NO
MW-152	C	PMP	2024 Q3	Boron, total	mg/L	03/15/23 - 07/18/24	7	0	CI around mean	-2.85	2.23	Background	NO
MW-152	C	PMP	2024 Q4	Boron, total	mg/L	03/15/23 - 10/16/24	8	0	CI around mean	-1.38	2.23	Background	NO
MW-152	C	PMP	2025 Q1	Boron, total	mg/L	03/15/23 - 01/27/25	9	0	CI around mean	-1.19	2.23	Background	NO
MW-152	C	PMP	2023 Q2	Fluoride, total	mg/L	03/15/23 - 05/18/23	2	0	Most recent sample	0.310	4.0	MCL/HBL	NO
MW-152	C	PMP	2023 Q3	Fluoride, total	mg/L	03/15/23 - 08/04/23	3	0	Most recent sample	0.390	4.0	MCL/HBL	NO
MW-152	C	PMP	2023 Q4	Fluoride, total	mg/L	03/15/23 - 10/31/23	4	0	CI around mean	0.219	4.0	MCL/HBL	NO
MW-152	C	PMP	2024 Q1	Fluoride, total	mg/L	03/15/23 - 02/07/24	5	0	CI around mean	0.229	4.0	MCL/HBL	NO
MW-152	C	PMP	2024 Q2	Fluoride, total	mg/L	03/15/23 - 04/18/24	6	0	CI around mean	0.227	4.0	MCL/HBL	NO
MW-152	C	PMP	2024 Q3	Fluoride, total	mg/L	03/15/23 - 07/18/24	7	0	CI around mean	0.243	4.0	MCL/HBL	NO
MW-152	C	PMP	2024 Q4	Fluoride, total	mg/L	03/15/23 - 10/16/24	8	12	CI around mean	0.243	4.0	MCL/HBL	NO
MW-152	C	PMP	2025 Q1	Fluoride, total	mg/L	03/15/23 - 01/27/25	9	22	CI around mean	0.251	4.0	MCL/HBL	NO
MW-152	C	PMP	2023 Q2	Sulfate, total	mg/L	03/15/23 - 05/18/23	2	0	Most recent sample	242	400	MCL/HBL	NO
MW-152	C	PMP	2023 Q3	Sulfate, total	mg/L	03/15/23 - 08/04/23	3	0	Most recent sample	732	400	MCL/HBL	NO
MW-152	C	PMP	2023 Q4	Sulfate, total	mg/L	03/15/23 - 10/31/23	4	0	CI around mean	-191	400	MCL/HBL	NO
MW-152	C	PMP	2024 Q1	Sulfate, total	mg/L	03/15/23 - 02/07/24	5	0	CI around mean	105	400	MCL/HBL	NO
MW-152	C	PMP	2024 Q2	Sulfate, total	mg/L	03/15/23 - 04/18/24	6	0	CI around mean	249	400	MCL/HBL	NO
MW-152	C	PMP	2024 Q3	Sulfate, total	mg/L	03/15/23 - 07/18/24	7	0	CI around mean	259	400	MCL/HBL	NO
MW-152	C	PMP	2024 Q4	Sulfate, total	mg/L	03/15/23 - 10/16/24	8	0	CI around mean	338	400	MCL/HBL	NO

Table 3-1. Exeedance Parameter Statistical Results

Nature and Extent Report

Baldwin Fly Ash Pond System

Baldwin Power Plant

Baldwin, IL

Location	Well Type	HSU	Event	Parameter	Unit	Date Range	Sample Count	Percent ND	Statistical Calculation	Statistical Result	GWPS	GWPS Source	Exceedance
MW-152	C	PMP	2025 Q1	Sulfate, total	mg/L	03/15/23 - 01/27/25	9	0	CI around mean	326	400	MCL/HBL	NO
MW-196	NE	PMP	2024 Q3	Boron, total	mg/L	06/13/24 - 07/23/24	2	0	Most recent sample	4.85	2.23	Background	YES
MW-196	NE	PMP	2024 Q4	Boron, total	mg/L	06/13/24 - 10/17/24	3	0	Most recent sample	4.23	2.23	Background	YES
MW-196	NE	PMP	2025 Q1	Boron, total	mg/L	06/13/24 - 01/27/25	4	0	CI around mean	1.78	2.23	Background	NO
MW-196	NE	PMP	2024 Q3	Fluoride, total	mg/L	06/13/24 - 07/23/24	2	0	Most recent sample	0.420	4.0	MCL/HBL	NO
MW-196	NE	PMP	2024 Q4	Fluoride, total	mg/L	06/13/24 - 10/17/24	3	33	Most recent sample	0.500	4.0	MCL/HBL	NO
MW-196	NE	PMP	2025 Q1	Fluoride, total	mg/L	06/13/24 - 01/27/25	4	50	CI around mean	0.404	4.0	MCL/HBL	NO
MW-196	NE	PMP	2024 Q3	Sulfate, total	mg/L	06/13/24 - 07/23/24	2	0	Most recent sample	428	400	MCL/HBL	YES
MW-196	NE	PMP	2024 Q4	Sulfate, total	mg/L	06/13/24 - 10/17/24	3	0	Most recent sample	451	400	MCL/HBL	YES
MW-196	NE	PMP	2025 Q1	Sulfate, total	mg/L	06/13/24 - 01/27/25	4	0	CI around mean	345	400	MCL/HBL	NO
MW-197	NE	PMP	2024 Q3	Boron, total	mg/L	06/13/24 - 07/19/24	2	0	Most recent sample	0.0254	2.23	Background	NO
MW-197	NE	PMP	2024 Q4	Boron, total	mg/L	06/13/24 - 10/17/24	3	33	Most recent sample	0.0250	2.23	Background	NO
MW-197	NE	PMP	2025 Q1	Boron, total	mg/L	06/13/24 - 01/27/25	4	50	ound median (Last Sample,	0.0250	2.23	Background	NO
MW-197	NE	PMP	2024 Q3	Fluoride, total	mg/L	06/13/24 - 07/19/24	2	0	Most recent sample	0.320	4.0	MCL/HBL	NO
MW-197	NE	PMP	2024 Q4	Fluoride, total	mg/L	06/13/24 - 10/17/24	3	33	Most recent sample	0.500	4.0	MCL/HBL	NO
MW-197	NE	PMP	2025 Q1	Fluoride, total	mg/L	06/13/24 - 01/27/25	4	50	CI around mean	0.255	4.0	MCL/HBL	NO
MW-197	NE	PMP	2024 Q3	Sulfate, total	mg/L	06/13/24 - 07/19/24	2	0	Most recent sample	155	400	MCL/HBL	NO
MW-197	NE	PMP	2024 Q4	Sulfate, total	mg/L	06/13/24 - 10/17/24	3	0	Most recent sample	148	400	MCL/HBL	NO
MW-197	NE	PMP	2025 Q1	Sulfate, total	mg/L	06/13/24 - 01/27/25	4	0	CI around mean	112	400	MCL/HBL	NO
MW-198	NE	PMP	2024 Q4	Boron, total	mg/L	11/01/24 - 11/01/24	1	100	All ND - Last	0.025	2.23	Background	NO
MW-198	NE	PMP	2025 Q1	Boron, total	mg/L	11/01/24 - 01/27/25	2	50	Most recent sample	0.0452	2.23	Background	NO
MW-198	NE	PMP	2024 Q4	Fluoride, total	mg/L	11/01/24 - 11/01/24	1	100	All ND - Last	0.5	4.0	MCL/HBL	NO
MW-198	NE	PMP	2025 Q1	Fluoride, total	mg/L	11/01/24 - 01/27/25	2	100	All ND - Last	0.5	4.0	MCL/HBL	NO
MW-198	NE	PMP	2024 Q4	Sulfate, total	mg/L	11/01/24 - 11/01/24	1	0	Most recent sample	43.1	400	MCL/HBL	NO
MW-198	NE	PMP	2025 Q1	Sulfate, total	mg/L	11/01/24 - 01/27/25	2	0	Most recent sample	46.0	400	MCL/HBL	NO
MW-252	C	PMP	2023 Q2	Boron, total	mg/L	03/15/23 - 05/18/23	2	0	Most recent sample	0.174	2.23	Background	NO
MW-252	C	PMP	2023 Q3	Boron, total	mg/L	03/15/23 - 08/04/23	3	0	Most recent sample	0.143	2.23	Background	NO
MW-252	C	PMP	2023 Q4	Boron, total	mg/L	03/15/23 - 10/31/23	4	0	CI around mean	0.129	2.23	Background	NO
MW-252	C	PMP	2024 Q1	Boron, total	mg/L	03/15/23 - 02/07/24	5	0	CI around mean	0.115	2.23	Background	NO
MW-252	C	PMP	2024 Q2	Boron, total	mg/L	03/15/23 - 04/18/24	6	0	CI around mean	0.132	2.23	Background	NO
MW-252	C	PMP	2024 Q3	Boron, total	mg/L	03/15/23 - 07/18/24	7	0	CI around mean	0.131	2.23	Background	NO
MW-252	C	PMP	2024 Q4	Boron, total	mg/L	03/15/23 - 10/16/24	8	0	CI around mean	0.140	2.23	Background	NO
MW-252	C	PMP	2025 Q1	Boron, total	mg/L	03/15/23 - 01/27/25	9	0	CI around mean	0.145	2.23	Background	NO
MW-252	C	PMP	2023 Q2	Fluoride, total	mg/L	03/15/23 - 05/18/23	2	0	Most recent sample	0.220	4.0	MCL/HBL	NO
MW-252	C	PMP	2023 Q3	Fluoride, total	mg/L	03/15/23 - 08/04/23	3	0	Most recent sample	0.240	4.0	MCL/HBL	NO
MW-252	C	PMP	2023 Q4	Fluoride, total	mg/L	03/15/23 - 10/31/23	4	0	CI around mean	0.171	4.0	MCL/HBL	NO
MW-252	C	PMP	2024 Q1	Fluoride, total	mg/L	03/15/23 - 02/07/24	5	0	CI around mean	0.186	4.0	MCL/HBL	NO
MW-252	C	PMP	2024 Q2	Fluoride, total	mg/L	03/15/23 - 04/18/24	6	0	CI around mean	0.195	4.0	MCL/HBL	NO
MW-252	C	PMP	2024 Q3	Fluoride, total	mg/L	03/15/23 - 07/18/24	7	0	CI around mean	0.202	4.0	MCL/HBL	NO
MW-252	C	PMP	2024 Q4	Fluoride, total	mg/L	03/15/23 - 10/16/24	8	12	CI around mean	0.207	4.0	MCL/HBL	NO
MW-252	C	PMP	2025 Q1	Fluoride, total	mg/L	03/15/23 - 01/27/25	9	22	CI around median	0.210	4.0	MCL/HBL	NO
MW-252	C	PMP	2023 Q2	Sulfate, total	mg/L	03/15/23 - 05/18/23	2	0	Most recent sample	454	400	MCL/HBL	NO
MW-252	C	PMP	2023 Q3	Sulfate, total	mg/L	03/15/23 - 08/04/23	3	0	Most recent sample	448	400	MCL/HBL	NO
MW-252	C	PMP	2023 Q4	Sulfate, total	mg/L	03/15/23 - 10/31/23	4	0	CI around mean	418	400	MCL/HBL	NO
MW-252	C	PMP	2024 Q1	Sulfate, total	mg/L	03/15/23 - 02/07/24	5	0	CI around mean	421	400	MCL/HBL	YES
MW-252	C	PMP	2024 Q2	Sulfate, total	mg/L	03/15/23 - 04/18/24	6	0	CI around mean	433	400	MCL/HBL	YES
MW-252	C	PMP	2024 Q3	Sulfate, total	mg/L	03/15/23 - 07/18/24	7	0	CI around mean	440	400	MCL/HBL	YES

Table 3-1. Exeedance Parameter Statistical Results
Nature and Extent Report
Baldwin Fly Ash Pond System
Baldwin Power Plant
Baldwin, IL

Location	Well Type	HSU	Event	Parameter	Unit	Date Range	Sample Count	Percent ND	Statistical Calculation	Statistical Result	GWPS	GWPS Source	Exceedance
MW-252	C	PMP	2024 Q4	Sulfate, total	mg/L	03/15/23 - 10/16/24	8	0	CI around mean	446	400	MCL/HBL	YES
MW-252	C	PMP	2025 Q1	Sulfate, total	mg/L	03/15/23 - 01/27/25	9	0	CI around mean	449	400	MCL/HBL	YES
MW-253R	C	PMP	2024 Q3	Boron, total	mg/L	07/18/24 - 07/18/24	1	0	Most recent sample	0.182	2.23	Background	NO
MW-253R	C	PMP	2024 Q4	Boron, total	mg/L	07/18/24 - 10/16/24	3	0	Most recent sample	0.254	2.23	Background	NO
MW-253R	C	PMP	2025 Q1	Boron, total	mg/L	07/18/24 - 01/23/25	4	0	CI around mean	0.154	2.23	Background	NO
MW-253R	C	PMP	2024 Q3	Fluoride, total	mg/L	07/18/24 - 07/18/24	1	50	Most recent sample	0.460	4.0	MCL/HBL	NO
MW-253R	C	PMP	2024 Q4	Fluoride, total	mg/L	07/18/24 - 10/16/24	3	66	Most recent sample	0.500	4.0	MCL/HBL	NO
MW-253R	C	PMP	2025 Q1	Fluoride, total	mg/L	07/18/24 - 01/23/25	4	75	ound median (Last Sample,	0.500	4.0	MCL/HBL	NO
MW-253R	C	PMP	2024 Q3	Sulfate, total	mg/L	07/18/24 - 07/18/24	1	0	Most recent sample	549	400	MCL/HBL	YES
MW-253R	C	PMP	2024 Q4	Sulfate, total	mg/L	07/18/24 - 10/16/24	3	0	Most recent sample	500	400	MCL/HBL	YES
MW-253R	C	PMP	2025 Q1	Sulfate, total	mg/L	07/18/24 - 01/23/25	4	0	CI around mean	387	400	MCL/HBL	NO
MW-366	C	UA	2023 Q2	Boron, total	mg/L	01/20/16 - 05/16/23	21	0	CI around geomean	1.49	2.23	Background	NO
MW-366	C	UA	2023 Q3	Boron, total	mg/L	01/20/16 - 08/04/23	22	0	CI around geomean	1.50	2.23	Background	NO
MW-366	C	UA	2023 Q4	Boron, total	mg/L	01/20/16 - 11/02/23	23	0	CI around geomean	1.51	2.23	Background	NO
MW-366	C	UA	2024 Q1	Boron, total	mg/L	01/20/16 - 02/07/24	24	0	CI around geomean	1.53	2.23	Background	NO
MW-366	C	UA	2024 Q2	Boron, total	mg/L	01/20/16 - 04/16/24	25	0	CB around linear reg	1.80	2.23	Background	NO
MW-366	C	UA	2024 Q3	Boron, total	mg/L	01/20/16 - 07/18/24	26	0	CB around linear reg	1.90	2.23	Background	NO
MW-366	C	UA	2024 Q4	Boron, total	mg/L	01/20/16 - 10/15/24	27	0	CB around linear reg	2.03	2.23	Background	NO
MW-366	C	UA	2025 Q1	Boron, total	mg/L	01/20/16 - 01/23/25	28	0	CB around linear reg	2.19	2.23	Background	NO
MW-366	C	UA	2023 Q2	Fluoride, total	mg/L	01/20/16 - 05/16/23	21	0	CB around linear reg	0.0856	4.0	MCL/HBL	NO
MW-366	C	UA	2023 Q3	Fluoride, total	mg/L	01/20/16 - 08/04/23	22	0	CB around linear reg	0.103	4.0	MCL/HBL	NO
MW-366	C	UA	2023 Q4	Fluoride, total	mg/L	01/20/16 - 11/02/23	23	0	CB around linear reg	0.129	4.0	MCL/HBL	NO
MW-366	C	UA	2024 Q1	Fluoride, total	mg/L	01/20/16 - 02/07/24	24	0	CB around linear reg	0.125	4.0	MCL/HBL	NO
MW-366	C	UA	2024 Q2	Fluoride, total	mg/L	01/20/16 - 04/16/24	25	0	CB around linear reg	0.141	4.0	MCL/HBL	NO
MW-366	C	UA	2024 Q3	Fluoride, total	mg/L	01/20/16 - 07/18/24	26	0	CB around linear reg	0.135	4.0	MCL/HBL	NO
MW-366	C	UA	2024 Q4	Fluoride, total	mg/L	01/20/16 - 10/15/24	27	3	CB around linear reg	0.120	4.0	MCL/HBL	NO
MW-366	C	UA	2025 Q1	Fluoride, total	mg/L	01/20/16 - 01/23/25	28	7	CB around linear reg	0.105	4.0	MCL/HBL	NO
MW-366	C	UA	2023 Q2	Sulfate, total	mg/L	01/20/16 - 05/16/23	21	0	CB around linear reg	570	400	MCL/HBL	NO
MW-366	C	UA	2023 Q3	Sulfate, total	mg/L	01/20/16 - 08/04/23	22	0	CB around linear reg	550	400	MCL/HBL	NO
MW-366	C	UA	2023 Q4	Sulfate, total	mg/L	01/20/16 - 11/02/23	23	0	CB around linear reg	537	400	MCL/HBL	NO
MW-366	C	UA	2024 Q1	Sulfate, total	mg/L	01/20/16 - 02/07/24	24	0	CB around linear reg	579	400	MCL/HBL	YES
MW-366	C	UA	2024 Q2	Sulfate, total	mg/L	01/20/16 - 04/16/24	25	0	CB around linear reg	600	400	MCL/HBL	YES
MW-366	C	UA	2024 Q3	Sulfate, total	mg/L	01/20/16 - 07/18/24	26	0	CB around linear reg	633	400	MCL/HBL	YES
MW-366	C	UA	2024 Q4	Sulfate, total	mg/L	01/20/16 - 10/15/24	27	0	CB around linear reg	666	400	MCL/HBL	YES
MW-366	C	UA	2025 Q1	Sulfate, total	mg/L	01/20/16 - 01/23/25	28	0	CB around linear reg	694	400	MCL/HBL	YES
MW-384	C	UA	2023 Q2	Boron, total	mg/L	01/21/16 - 05/22/23	21	0	CI around median	1.41	2.23	Background	NO
MW-384	C	UA	2023 Q3	Boron, total	mg/L	01/21/16 - 08/03/23	22	0	CI around median	1.41	2.23	Background	NO
MW-384	C	UA	2023 Q4	Boron, total	mg/L	01/21/16 - 11/01/23	23	0	CI around median	1.41	2.23	Background	NO
MW-384	C	UA	2024 Q1	Boron, total	mg/L	01/21/16 - 02/06/24	24	0	CI around median	1.43	2.23	Background	NO
MW-384	C	UA	2024 Q2	Boron, total	mg/L	01/21/16 - 04/17/24	25	0	CI around median	1.43	2.23	Background	NO
MW-384	C	UA	2024 Q3	Boron, total	mg/L	01/21/16 - 07/17/24	26	0	CI around median	1.44	2.23	Background	NO
MW-384	C	UA	2024 Q4	Boron, total	mg/L	01/21/16 - 10/14/24	27	0	CI around median	1.44	2.23	Background	NO
MW-384	C	UA	2025 Q1	Boron, total	mg/L	01/21/16 - 01/23/25	28	0	CI around median	1.44	2.23	Background	NO
MW-384	C	UA	2023 Q2	Fluoride, total	mg/L	01/21/16 - 05/22/23	21	0	CB around linear reg	3.41	4.0	MCL/HBL	NO
MW-384	C	UA	2023 Q3	Fluoride, total	mg/L	01/21/16 - 08/03/23	22	0	CB around linear reg	3.60	4.0	MCL/HBL	NO
MW-384	C	UA	2023 Q4	Fluoride, total	mg/L	01/21/16 - 11/01/23	23	0	CB around linear reg	3.83	4.0	MCL/HBL	NO
MW-384	C	UA	2024 Q1	Fluoride, total	mg/L	01/21/16 - 02/06/24	24	0	CB around linear reg	3.97	4.0	MCL/HBL	NO

Table 3-1. Exeedance Parameter Statistical Results

Nature and Extent Report

Baldwin Fly Ash Pond System

Baldwin Power Plant

Baldwin, IL

Location	Well Type	HSU	Event	Parameter	Unit	Date Range	Sample Count	Percent ND	Statistical Calculation	Statistical Result	GWPS	GWPS Source	Exceedance
MW-384	C	UA	2024 Q2	Fluoride, total	mg/L	01/21/16 - 04/17/24	25	0	CB around linear reg	4.08	4.0	MCL/HBL	YES
MW-384	C	UA	2024 Q3	Fluoride, total	mg/L	01/21/16 - 07/17/24	26	0	CB around linear reg	4.19	4.0	MCL/HBL	YES
MW-384	C	UA	2024 Q4	Fluoride, total	mg/L	01/21/16 - 10/14/24	27	0	CB around linear reg	4.21	4.0	MCL/HBL	YES
MW-384	C	UA	2025 Q1	Fluoride, total	mg/L	01/21/16 - 01/23/25	28	0	CB around linear reg	4.14	4.0	MCL/HBL	YES
MW-384	C	UA	2023 Q2	Sulfate, total	mg/L	01/21/16 - 05/22/23	21	0	CB around linear reg	-1.43	400	MCL/HBL	NO
MW-384	C	UA	2023 Q3	Sulfate, total	mg/L	01/21/16 - 08/03/23	22	0	CB around linear reg	-1.13	400	MCL/HBL	NO
MW-384	C	UA	2023 Q4	Sulfate, total	mg/L	01/21/16 - 11/01/23	23	0	CB around linear reg	-2.27	400	MCL/HBL	NO
MW-384	C	UA	2024 Q1	Sulfate, total	mg/L	01/21/16 - 02/06/24	24	0	CB around linear reg	-3.40	400	MCL/HBL	NO
MW-384	C	UA	2024 Q2	Sulfate, total	mg/L	01/21/16 - 04/17/24	25	4	CB around linear reg	-6.64	400	MCL/HBL	NO
MW-384	C	UA	2024 Q3	Sulfate, total	mg/L	01/21/16 - 07/17/24	26	3	CB around linear reg	-7.68	400	MCL/HBL	NO
MW-384	C	UA	2024 Q4	Sulfate, total	mg/L	01/21/16 - 10/14/24	27	3	CB around linear reg	-8.70	400	MCL/HBL	NO
MW-384	C	UA	2025 Q1	Sulfate, total	mg/L	01/21/16 - 01/23/25	28	3	CB around linear reg	-10.3	400	MCL/HBL	NO
PZ-174	NE	PMP	2024 Q3	Boron, total	mg/L	07/18/24 - 07/18/24	1	0	Most recent sample	4.03	2.23	Background	YES
PZ-174	NE	PMP	2024 Q4	Boron, total	mg/L	07/18/24 - 10/15/24	2	0	Most recent sample	4.44	2.23	Background	YES
PZ-174	NE	PMP	2024 Q3	Fluoride, total	mg/L	07/18/24 - 07/18/24	1	0	Most recent sample	0.530	4.0	MCL/HBL	NO
PZ-174	NE	PMP	2024 Q4	Fluoride, total	mg/L	07/18/24 - 10/15/24	2	50	Most recent sample	0.500	4.0	MCL/HBL	NO
PZ-174	NE	PMP	2024 Q3	Sulfate, total	mg/L	07/18/24 - 07/18/24	1	0	Most recent sample	588	400	MCL/HBL	YES
PZ-174	NE	PMP	2024 Q4	Sulfate, total	mg/L	07/18/24 - 10/15/24	2	0	Most recent sample	640	400	MCL/HBL	YES
PZ-176	NE	PMP	2024 Q3	Boron, total	mg/L	07/22/24 - 07/22/24	1	0	Most recent sample	1.21	2.23	Background	NO
PZ-176	NE	PMP	2024 Q4	Boron, total	mg/L	07/22/24 - 10/15/24	2	0	Most recent sample	0.828	2.23	Background	NO
PZ-176	NE	PMP	2024 Q3	Fluoride, total	mg/L	07/22/24 - 07/22/24	1	0	Most recent sample	0.620	4.0	MCL/HBL	NO
PZ-176	NE	PMP	2024 Q4	Fluoride, total	mg/L	07/22/24 - 10/15/24	2	0	Most recent sample	0.540	4.0	MCL/HBL	NO
PZ-176	NE	PMP	2024 Q3	Sulfate, total	mg/L	07/22/24 - 07/22/24	1	0	Most recent sample	130	400	MCL/HBL	NO
PZ-176	NE	PMP	2024 Q4	Sulfate, total	mg/L	07/22/24 - 10/15/24	2	0	Most recent sample	118	400	MCL/HBL	NO
PZ-178	NE	PMP	2024 Q3	Boron, total	mg/L	07/22/24 - 07/22/24	1	0	Most recent sample	0.663	2.23	Background	NO
PZ-178	NE	PMP	2024 Q4	Boron, total	mg/L	07/22/24 - 10/15/24	2	0	Most recent sample	0.554	2.23	Background	NO
PZ-178	NE	PMP	2024 Q3	Fluoride, total	mg/L	07/22/24 - 07/22/24	1	0	Most recent sample	0.470	4.0	MCL/HBL	NO
PZ-178	NE	PMP	2024 Q4	Fluoride, total	mg/L	07/22/24 - 10/15/24	2	50	Most recent sample	0.500	4.0	MCL/HBL	NO
PZ-178	NE	PMP	2024 Q3	Sulfate, total	mg/L	07/22/24 - 07/22/24	1	0	Most recent sample	169	400	MCL/HBL	NO
PZ-178	NE	PMP	2024 Q4	Sulfate, total	mg/L	07/22/24 - 10/15/24	2	0	Most recent sample	176	400	MCL/HBL	NO

Notes:

GWPS = groundwater protection standard

HSU = hydrostratigraphic unit

UA = uppermost aquifer

PMP = potential migration pathway

mg/L = milligrams per liter

ND = non-detect

Statistical Calculation:

CB around linear reg = Confidence band around linear regression

CI around mean = Confidence interval around the mean

CI around median = Confidence interval around the median

CI around geomean = Confidence interval around the geometric mean

Most recent sample = Result for the most recently collected sample used due to insufficient data.

All ND - Last = All results were below the reporting limit, and the last determined reporting limit is shown.

CI around median (Last Sample, n<7) = Data characterization in accordance with the Statistical Analysis Plan indicated that a confidence interval around the median was the most appropriate statistic. However, fewer than seven samples (the minimum required to calculated a CI around the median) were available. Due to insufficient sample size, the result for the most recently collected sample was used.

Well Type:

C = Compliance

NE = Nature and Extent

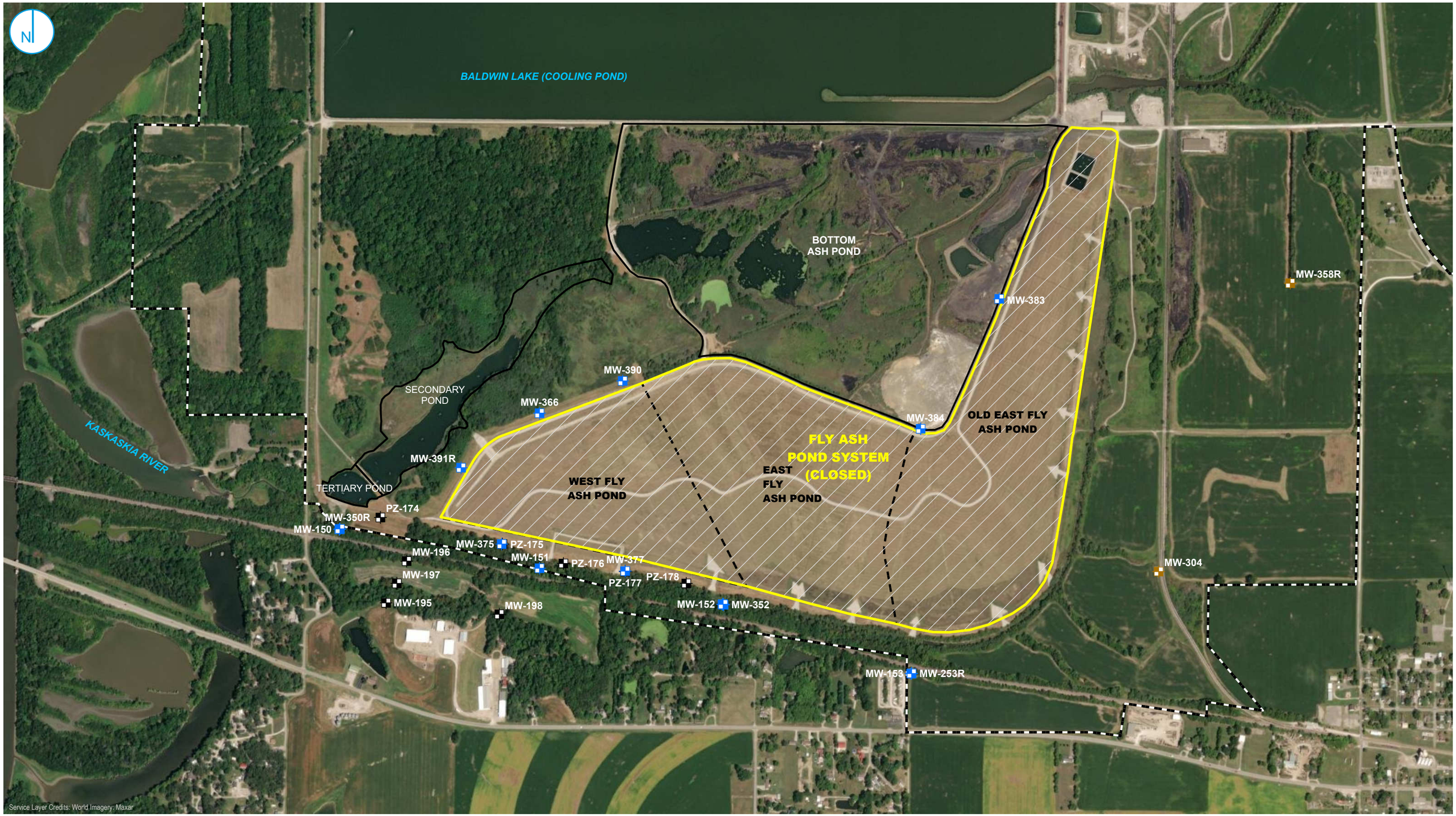
RAMBOLL

Table 3-2. Summary of Groundwater Data
Nature and Extent Report
Baldwin Fly Ash Pond System
Baldwin Power Plant
Baldwin, IL

Location	Well Type	HSU	Parameter	Unit	Sample Count	Non-Detect Results	Percent Non-Detect Results	First Sample	Last Sample	Minimum	Median	Mean	Maximum
MW-150	C	PMP	Boron, total	mg/L	9	0	0	09/16/2013	10/15/2024	0.680	3.6	0.680	4.47
MW-150	C	PMP	Fluoride, total	mg/L	8	0	0	03/15/2023	10/15/2024	0.680	0.71	0.730	0.850
MW-150	C	PMP	Sulfate, total	mg/L	9	0	0	09/16/2013	10/15/2024	570	880	570	970
MW-152	C	PMP	Boron, total	mg/L	9	0	0	09/16/2013	10/16/2024	0.477	9.1	9.09	23.0
MW-152	C	PMP	Fluoride, total	mg/L	8	0	0	03/15/2023	10/16/2024	0.200	0.29	0.290	0.390
MW-152	C	PMP	Sulfate, total	mg/L	9	0	0	09/16/2013	10/16/2024	242	730	873	988
MW-252	C	PMP	Boron, total	mg/L	9	0	0	09/16/2013	10/16/2024	0.135	0.17	0.240	0.240
MW-252	C	PMP	Fluoride, total	mg/L	8	1	12	03/15/2023	10/16/2024	<0.2	0.22	0.200	0.260
MW-252	C	PMP	Sulfate, total	mg/L	9	0	0	09/16/2013	10/16/2024	437	470	500	500
MW-253R	C	PMP	Boron, total	mg/L	3	0	0	07/18/2024	10/16/2024	0.182	0.22	0.182	0.254
MW-253R	C	PMP	Fluoride, total	mg/L	3	1	33	07/18/2024	10/16/2024	0.120	0.20	0.460	0.460
MW-253R	C	PMP	Sulfate, total	mg/L	3	0	0	07/18/2024	10/16/2024	434	500	549	549
MW-196	NE	PMP	Boron, total	mg/L	3	0	0	06/13/2024	10/17/2024	3.00	4.2	3.00	4.85
MW-196	NE	PMP	Fluoride, total	mg/L	3	0	0	06/13/2024	10/17/2024	0.410	0.42	0.410	0.470
MW-196	NE	PMP	Sulfate, total	mg/L	3	0	0	06/13/2024	10/17/2024	380	430	380	451
MW-197	NE	PMP	Boron, total	mg/L	3	1	33	06/13/2024	10/17/2024	<0.0092	0.025	0.0364	0.0364
MW-197	NE	PMP	Fluoride, total	mg/L	3	0	0	06/13/2024	10/17/2024	0.280	0.32	0.280	0.460
MW-197	NE	PMP	Sulfate, total	mg/L	3	0	0	06/13/2024	10/17/2024	148	160	174	174
MW-198	NE	PMP	Boron, total	mg/L	1	1	100	11/01/2024	11/01/2024	<0.0092	<0.0092	<0.0092	<0.0092
MW-198	NE	PMP	Fluoride, total	mg/L	1	1	100	11/01/2024	11/01/2024	<0.2	<0.2	<0.2	<0.2
MW-198	NE	PMP	Sulfate, total	mg/L	1	0	0	11/01/2024	11/01/2024	43.1	43.1	43.1	43.1
PZ-174	NE	PMP	Boron, total	mg/L	2	0	0	07/18/2024	10/15/2024	4.03	4.2	4.03	4.44
PZ-174	NE	PMP	Fluoride, total	mg/L	2	0	0	07/18/2024	10/15/2024	0.460	0.49	0.530	0.530
PZ-174	NE	PMP	Sulfate, total	mg/L	2	0	0	07/18/2024	10/15/2024	588	610	588	640
PZ-176	NE	PMP	Boron, total	mg/L	2	0	0	07/22/2024	10/15/2024	0.828	1.0	1.21	1.21
PZ-176	NE	PMP	Fluoride, total	mg/L	2	0	0	07/22/2024	10/15/2024	0.540	0.58	0.620	0.620
PZ-176	NE	PMP	Sulfate, total	mg/L	2	0	0	07/22/2024	10/15/2024	118	120	130	130
PZ-178	NE	PMP	Boron, total	mg/L	2	0	0	07/22/2024	10/15/2024	0.554	0.61	0.663	0.663
PZ-178	NE	PMP	Fluoride, total	mg/L	2	0	0	07/22/2024	10/15/2024	0.440	0.45	0.470	0.470
PZ-178	NE	PMP	Sulfate, total	mg/L	2	0	0	07/22/2024	10/15/2024	169	170	169	176
MW-366	C	UA	Boron, total	mg/L	27	0	0	01/20/2016	10/15/2024	1.19	1.7	1.42	3.60
MW-366	C	UA	Fluoride, total	mg/L	27	0	0	01/20/2016	10/15/2024	0.290	0.51	0.980	1.06
MW-366	C	UA	Sulfate, total	mg/L	27	0	0	01/20/2016	10/15/2024	33.0	490	38.0	838
MW-384	C	UA	Boron, total	mg/L	27	0	0	01/21/2016	10/14/2024	1.26	1.5	1.45	2.26
MW-384	C	UA	Fluoride, total	mg/L	27	0	0	01/21/2016	10/14/2024	1.39	3.1	1.50	4.93
MW-384	C	UA	Sulfate, total	mg/L	27	0	0	01/21/2016	10/14/2024	9.00	82	178	178

Notes:
< = result is less than the detection limit
HSU = hydrostratigraphic unit
UA = uppermost aquifer
PMP = potential migration pathway
mg/L = milligrams per liter
Well Type:
C = Compliance
NE = Nature and Extent

FIGURES



Y:\Mapping\Projects\22\2285\MXD\Nature_and_Extent\BAL\Nature_and_Extent_Report\NE_Addendum\BAL_FAPS.aprx\Figure 1-1 Site Map

PROJECT: 169000XXXX | DATED: 2/4/2025 | DESIGNER: GALARNMC

- COMPLIANCE MONITORING WELL
- BACKGROUND MONITORING WELL
- MONITORING WELL
- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- CAPPED AREA
- PROPERTY BOUNDARY

0 400 800 Feet

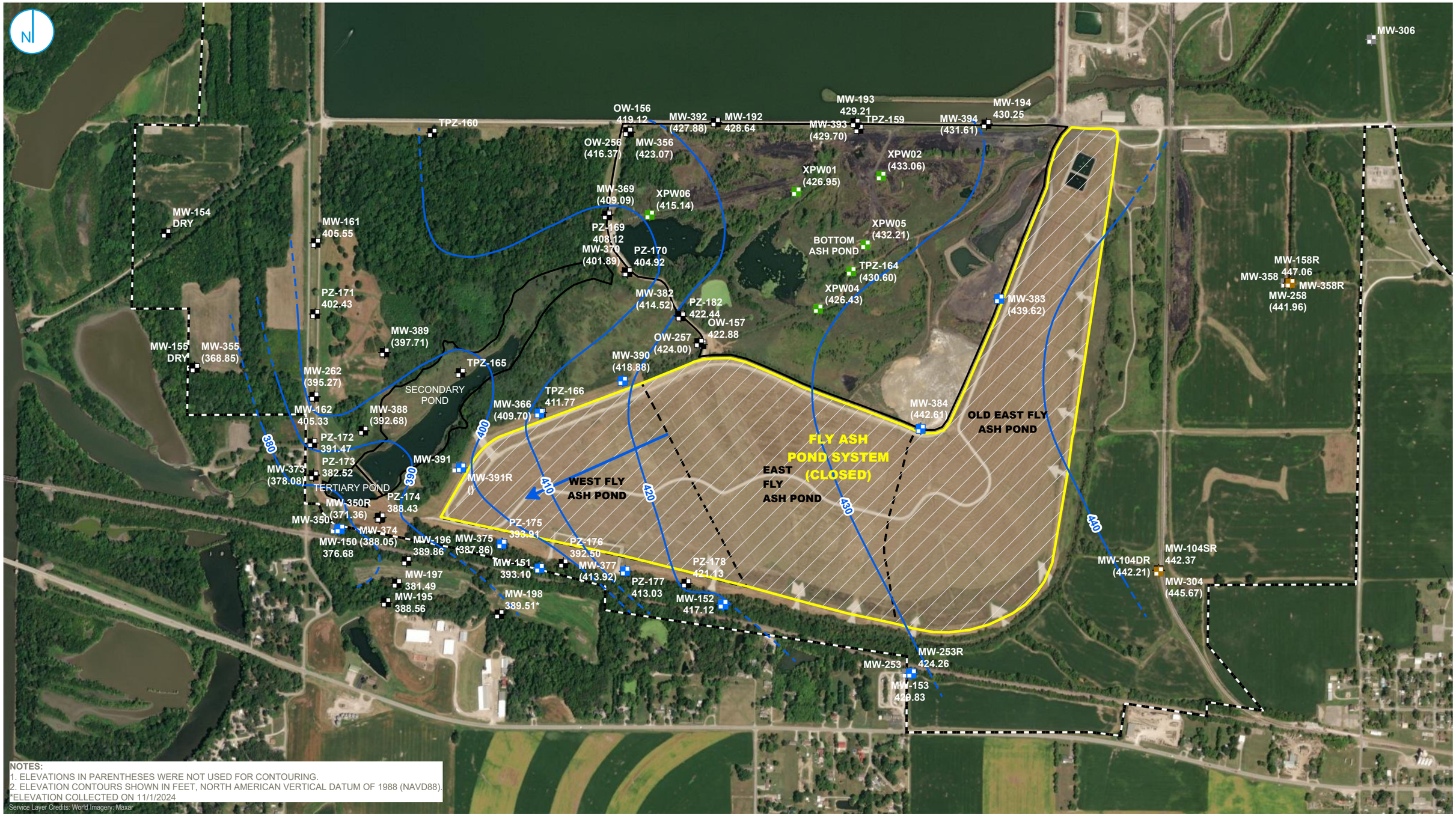
SITE MAP

NATURE AND EXTENT REPORT ADDENDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 1-1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



NOTES:
1. ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
2. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
*ELEVATION COLLECTED ON 11/1/2024

Service Layer Credits: World Imagery: Maxar

PROJECT: 169000XXXX | DATED: 1/28/2025 | DESIGNER: GALARNMC

Y:\Mapping\Projects\22\2285\MXD\GW_Contours\Round_2024\Baldwin\FAPS_605\FAPS_605_2024_aprxBAL 605 FAPS Unlith Pot Surface 20241014

- COMPLIANCE MONITORING WELL
- BACKGROUND MONITORING WELL
- MONITORING WELL
- PORE WATER WELL
- CLOSED MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (10-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- CAPPED AREA
- PROPERTY BOUNDARY

0 400 800 Feet

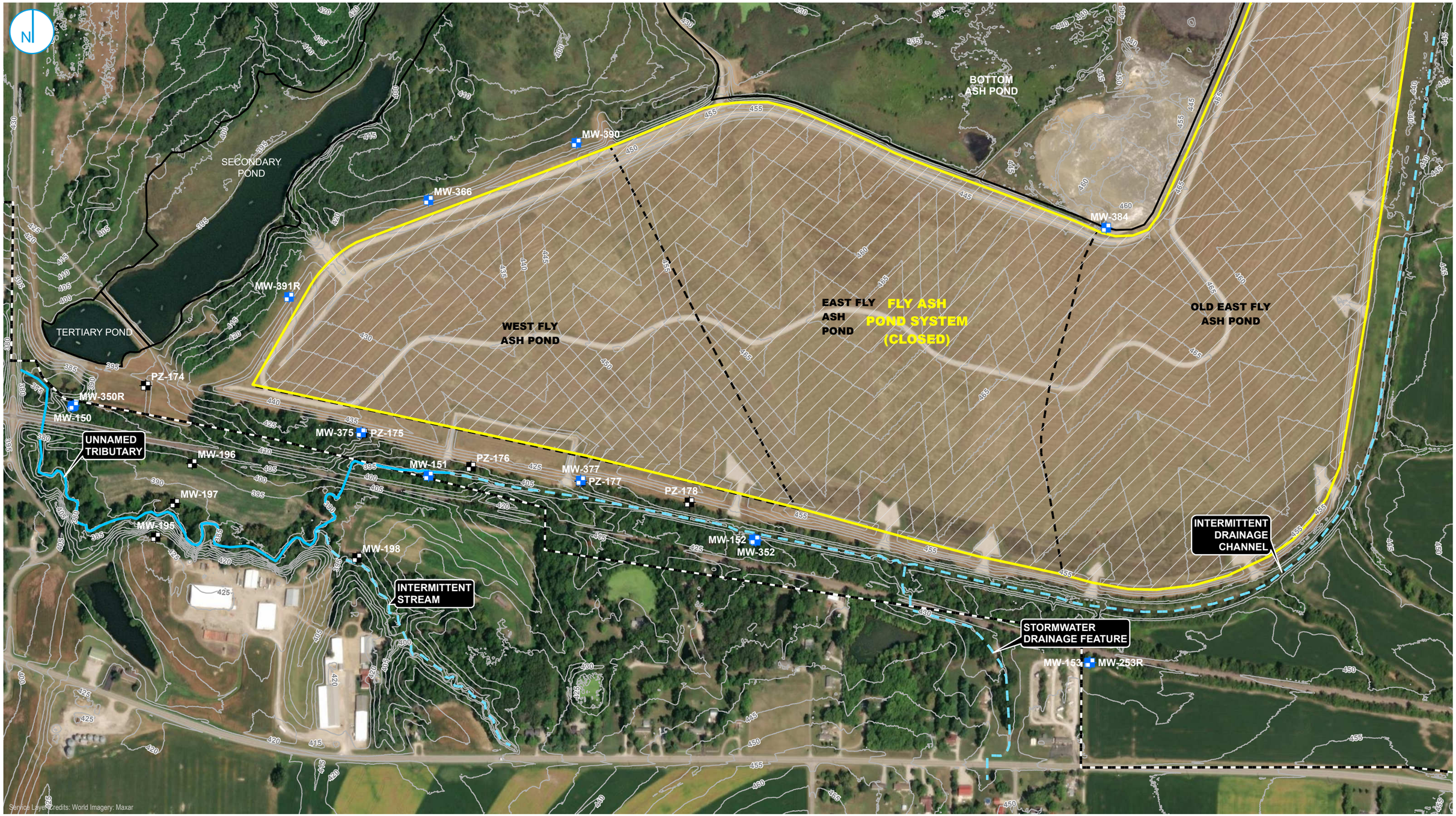
SHALLOW UNLITHIFIED POTENTIOMETRIC SURFACE MAP
OCTOBER 14, 2024

NATURE AND EXTENT REPORT ADDENDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 2-1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



Y:\Mapping\Projects\22\2285\MXD\Nature_and_Extent\BAL\Nature_and_Extent_Report\NE_Addendum\BAL_FAPS.aprx\Figure 2-3_South Topo Map

PROJECT: 169000XXXX | DATED: 4/2/2025 | DESIGNER: GALARNMC

COMPLIANCE MONITORING WELL
MONITORING WELL
UNNAMED TRIBUTARY
INTERMITTENT SURFACE WATER FEATURE

5-FT TOPOGRAPHIC CONTOUR

REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
CAPPED AREA
PROPERTY BOUNDARY

0 225 450 Feet

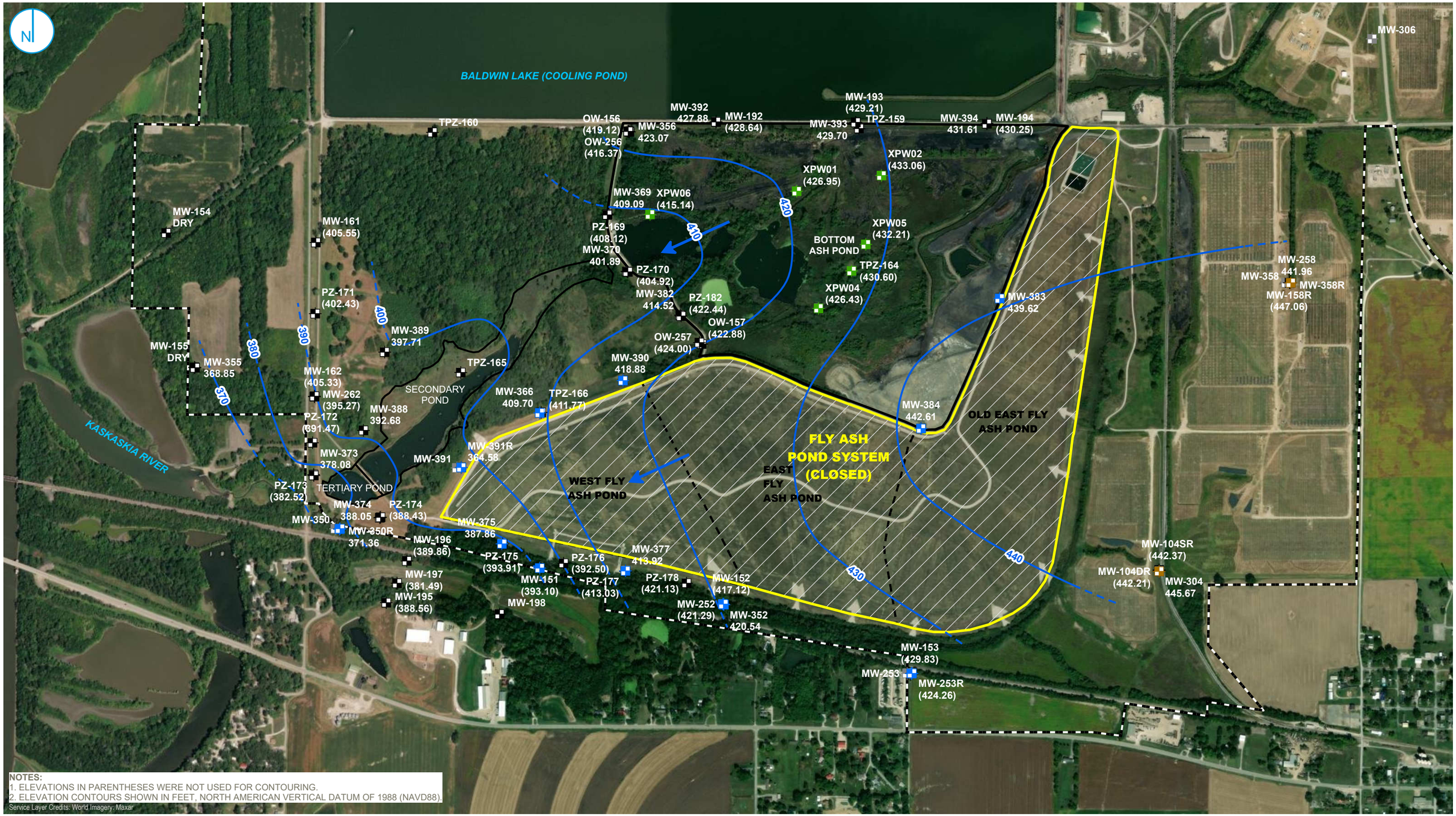
TOPOGRAPHIC MAP

NATURE AND EXTENT REPORT ADDENDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 2-2

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL



NOTES:
1. ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
2. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

Service Layer Credits: World Imagery: Maxar

PROJECT: 169000XXXX | DATED: 4/16/2025 | DESIGNER: GALARNMC

Y:\Mapping\Projects\22\2285\MXD\Nature_and_Extent\BAL\Nature_and_Extent_Report\NE_Addendum\BAL_FAPS.aprx\Figure 2-3 Uppermost Aquifer Potentiometric Surface Map

- COMPLIANCE MONITORING WELL
- BACKGROUND MONITORING WELL
- MONITORING WELL
- PORE WATER WELL
- CLOSED MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (10-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- CAPPED AREA
- PROPERTY BOUNDARY

0 400 800 Feet

UPPERMOST AQUIFER POTENTIOMETRIC SURFACE MAP
OCTOBER 14, 2024

NATURE AND EXTENT REPORT ADDENDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 2-3

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

Y:\Mapping\Projects\22\2285\MXD\Nature_and_Extent\BAL\Nature_and_Extent_Report\NE_Addendum\BAL_FAPS.aprx\Figure 2-4_Confirmed Private Well Locations

PROJECT: 169000XXXX | DATED: 4/2/2025 | DESIGNER: GALARNMC

- PRIVATE WELL LOCATION
- COMPLIANCE MONITORING WELL
- MONITORING WELL
- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- CAPPED AREA
- PROPERTY BOUNDARY

0 125 250 Feet

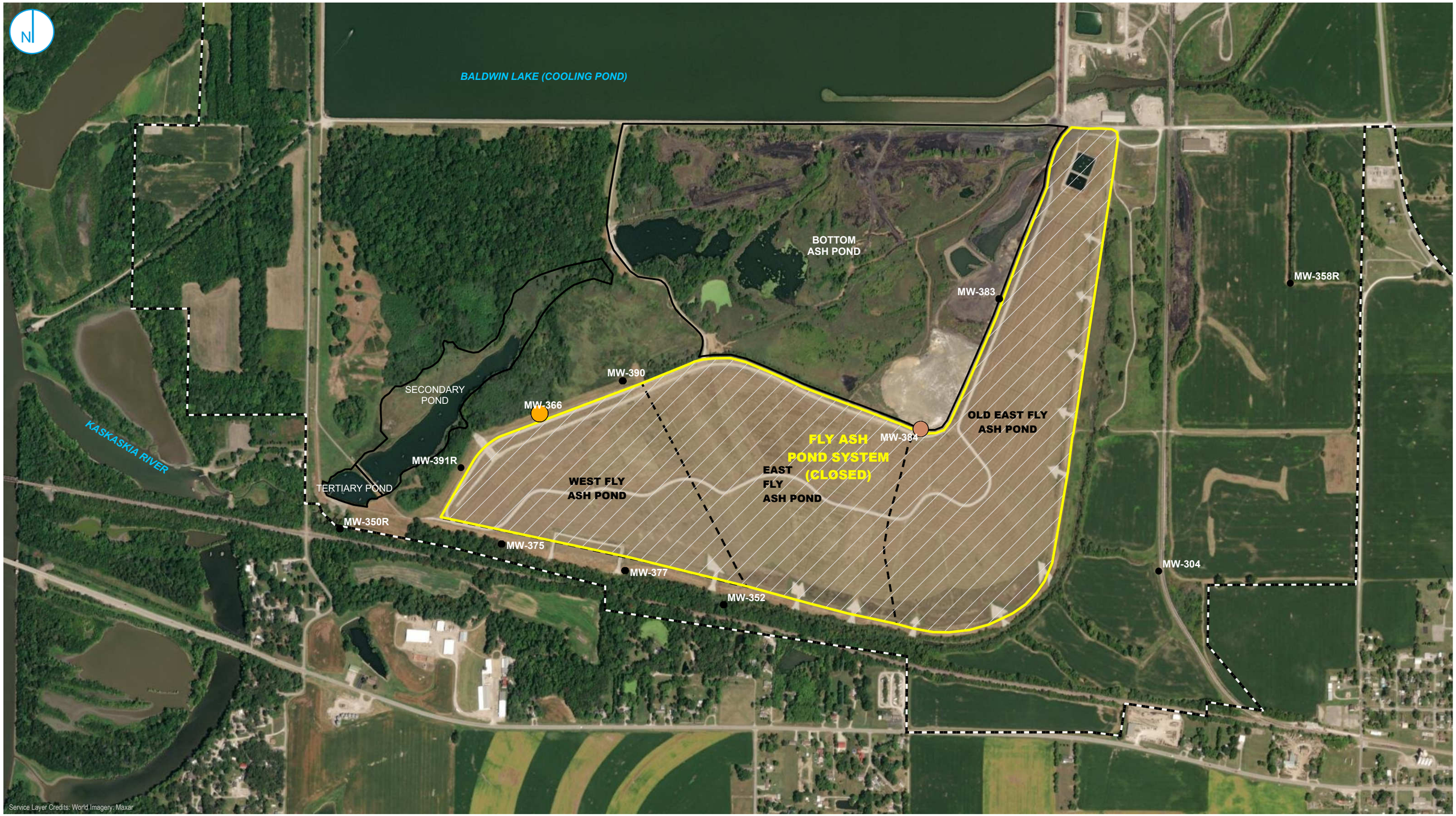
CONFIRMED PRIVATE WELL LOCATIONS

NATURE AND EXTENT REPORT ADDENDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 2-4

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



Y:\Mapping\Projects\22\2285\MXD\Nature_and_Extent\BAL\Nature_and_Extent_Report\NE_Addendum\BAL_FAPS.aprx\Figure 3-1_FAPS 605 GWPS UA

PROJECT: 169000XXXX | DATED: 2/4/2025 | DESIGNER: GALARNMC

- TOTAL FLUORIDE EXCEEDANCE
- TOTAL SULFATE EXCEEDANCE
- COMPLIANCE WELL WITHOUT EXCEEDANCE

- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- CAPPED AREA
- PROPERTY BOUNDARY

0 400 800 Feet

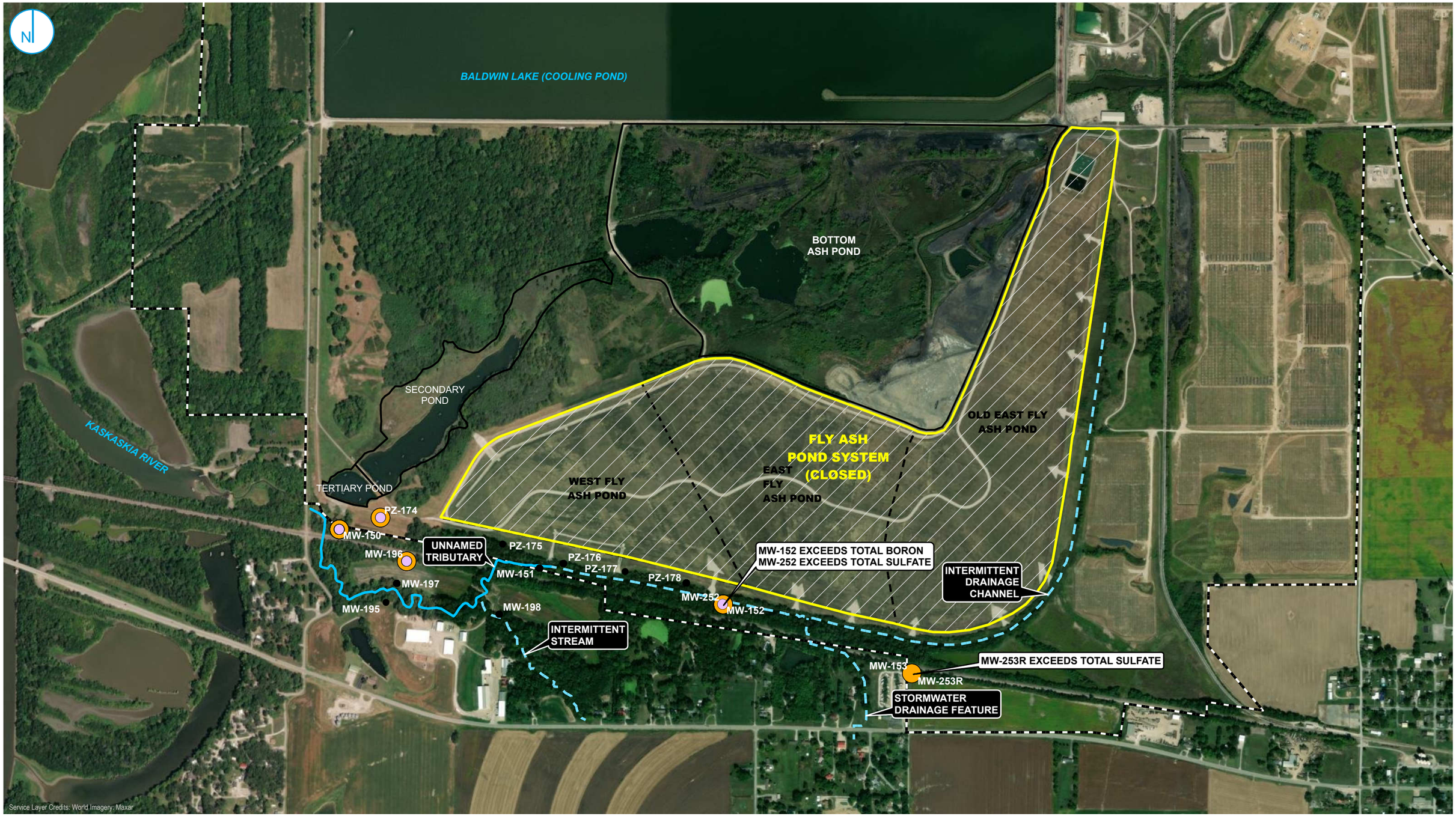
GWPS EXCEEDANCE MAP UPPERMOST AQUIFER

NATURE AND EXTENT REPORT ADDENDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 3-1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



Y:\Mapping\Projects\22\2285\MXD\Nature_and_Extent\BAL\Nature_and_Extent_Report\NE_Addendum\BAL_FAPS.aprx\Figure 3-2_FAPS 605 GWPS UU

PROJECT: 169000XXXX | DATED: 4/16/2025 | DESIGNER: GALARNMC

TOTAL BORON EXCEEDANCE

TOTAL SULFATE EXCEEDANCE

COMPLIANCE WELL WITHOUT EXCEEDANCE

Type

UNNAMED TRIBUTARY

INTERMITTENT SURFACE WATER FEATURE

REGULATED UNIT (SUBJECT UNIT)

SITE FEATURE

CAPPED AREA

PROPERTY BOUNDARY

0 400 800 Feet

GWPS EXCEEDANCE MAP UPPER UNIT AND POTENTIAL MIGRATION PATHWAYS

NATURE AND EXTENT SITE WORK MEMORANDUM
FLY ASH POND SYSTEM

BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 3-2

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

APPENDIX A
Technical Memorandum – Summary of Additional Investigation Activities and Private Well Survey at the Fly Ash Pond System

ENVIRONMENT
& HEALTH

TECHNICAL MEMORANDUM

To: Vic Modeer, Engineering Manager, Vistra Corp
Sam Davies, Vistra Corp
Brian Voelker, Vistra Corp

From: Evvan Plank, Baldwin Plant Coordinator

Re: Summary of Additional Investigation Activities and Private Well Survey at the Fly Ash Pond System
Baldwin Power Plant
Baldwin, Illinois

April 22, 2025

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INTRODUCTION

This Technical Memorandum (Tech Memo) for Baldwin Power Plant (BPP) was prepared by Ramboll America's Engineering Solutions, Inc. (Ramboll) for Dynegy Midwest Generation, LLC (DMG)to provide documentation of the nature and extent field activities and the results from the updated private well survey.

OBJECTIVES

The objectives of this work were as follows:

1. Install monitoring wells MW-195, MW-196, MW-197, and MW-198 in accordance with Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845.650(d)(1), to delineate the nature and extent of the boron and sulfate exceedances at MW-150 downgradient of the Fly Ash Pond System (FAPS),
2. Abandon monitoring well MW-307 and background well MW-306, abandon and replace compliance wells MW-253 and MW-350 due to grout contamination, and abandon and replace background monitoring well MW-358 and compliance monitoring well MW-391 due to surface water infiltration,
3. Complete priority monitoring well improvements and repairs at select monitoring wells, including replacing concrete well pads and installing bollards around wells to provide sufficient protection,
4. Collect data to further delineate and characterize the boron exceedances reported at MW-150, MW-152, and MW-391, and the sulfate exceedance at MW-150,
5. Update the BPP groundwater model, as appropriate, based on the findings from the field work.

SUMMARY OF COMPLETED WORK

At the request of DMG, Ramboll oversaw and completed the on-site work activities during several mobilizations including between April 29 and May 10, 2024, September 5 and September 6, 2024, and October 9 and October 17, 2024.

The integrity of well casings at MW-358 and MW-391 was investigated due to observed rapid changes in groundwater quality. A downhole camera was used on April 29, 2024 to inspect the integrity of the well

casings. Potentially compromised joints were observed in the well casings and still-shots of the video are provided in **Attachment A**.

In addition, a clean-water slug test was conducted at MW-391, to evaluate the connection of MW391 with the aquifer. Approximately 7.5 gallons of water was poured into the well casing instantaneously and was monitored using a pressure transducer to determine the rate at which it dispersed into the aquifer. Due to the negligible change in head, it was determined that there wasn't significant connection to the aquifer (or the aquifer was very low permeability) and the water was bailed out of the well. MW-358 and MW-391 were abandoned based on the findings from this investigation.

Well installations and well repair work was performed by Cascade Drilling, LLC with oversight from Ramboll.

The following sections discuss site work methods and provide documentation of completed work.

NATURE AND EXTENT MONITORING WELL INSTALLATION, ABANDONMENT AND REPLACEMENT, AND DEVELOPMENT

Prior to drilling, Ground Penetrating Radar Systems (GPRS) cleared the locations of the proposed replacement monitoring wells MW-253R, MW-350R, MW-358R, and MW-391R; proposed off-site monitoring wells MW-195, MW-196, MW-197 and MW-198; and proposed bollard installations. GPRS utilized a ground penetrating radar antenna to scan a 10-foot radius around each proposed boring and monitoring well location. Ramboll completed Ramboll's Subsurface Clearance Checklist, confirming all locations requiring intrusive work were cleared by GPRS and meet Ramboll's safety requirements.

Monitoring wells MW-306 and MW-307 were abandoned in accordance with Title 77 of the Illinois Administrative Code (77 I.A.C.) § 920.120 by grouting from the bottom up using bentonite grout followed by bentonite chips. These wells were not replaced. Monitoring well locations are shown in **Figure 1** and abandonment logs are provided in **Attachment B**.

Due to suspected failure of the annular seal, a Boart Longyear mini sonic LS250 drill rig equipped with a 6-inch core barrel was used to over-drill and abandon monitoring wells MW-253 (35 feet below ground surface [bgs]), MW-350 (47 feet bgs), MW-358 (90 feet bgs), and MW-391 (70 feet bgs). Replacement monitoring wells MW-253R, MW-350R, MW-358R, and MW-391R were constructed with the same specifications as MW-253, MW-350, MW-358, and MW-391, respectively. Monitoring well MW-195 was advanced to 48 feet bgs, and MW-196, MW-197, and MW-198 were all advanced to 20 feet bgs.

Soil lithology was logged continuously using the Unified Soil Classification System (USCS). Boring logs are provided in **Attachment C**. Analytical samples were collected by Ramboll from the location and sample intervals summarized in **Table A** on the following page. Samples were submitted to Terracon for total metals by 7-step sequential extraction, bulk mineralogy by Reitveld x-ray diffraction, loss on ignition, and cation exchange capacity.

Table A. Analytical Sample Locations and Intervals

Well Location	Sample Depth (feet bgs)	Field Description of Soil Sampled
MW-195	35 - 37	Silty Clay
	44 - 46	Well-Graded Sand
MW-196	6 - 8	Silty Clay
	10 - 12	Sandy Lean Clay/Lean Clay
MW-197	4 - 6	Silty Clay
	10 - 12	Sandy Lean Clay/Silty Clay
MW-350R	15 - 25	Highly Weathered to Unweathered Shale and Limestone Bedrock

Monitoring wells MW-195, MW-196, MW-197, MW-198, MW-253R, MW-350R, MW-358R, and MW-391R were constructed using 2-inch diameter schedule 40 polyvinyl chloride (PVC) casing with varying lengths of 0.010-inch slotted screen as summarized in **Table B** below.

Table B. Summary of Screen Lengths by Well

Screen Length (feet)	Well Locations
5	MW-253R and MW-350R
10	MW-195, MW-196, MW197, MW-198, and MW-358R
15	MW-391R

Following installation of the of the PVC wells, filter sand was placed in the annular space surrounding the PVC extending to at least one foot above the PVC screen depending on the depth of the well to ensure enough space to install an annular space seal. The annular space was sealed with 3/8-inch bentonite chips to one foot bgs. At each well a steel protective stick-up was installed to approximately three feet above the ground surface and set in a concrete pad extending horizontally approximately two feet by two feet and approximately 12 inches bgs. In addition, four 3.5-inch diameter concrete-filled steel bollards were installed around each well. A survey was conducted by IngenAE to capture the precise location and elevations of MW-195, MW-196, MW-197, MW-198, MW-253R, MW-350R, MW-358R, and MW-391R. Well construction logs are provided in **Attachment D** and a summary of well construction details is included in **Table 1**.

Following construction, monitoring wells MW-195, MW-196, and MW-197 were instrumented with pressure transducers. Monitoring wells MW-253R, MW-350R, MW-358R, and MW-391R were equipped with pressure transducers and dedicated bladder pumps were transferred from MW-253, MW-350, MW-358R, and MW-391R, respectively. Identification markers will be installed at each location when available. Monitoring well construction activities were completed between May 1 through 8, 2024 and October 10 through 15, 2024. **Attachment A** includes a photographic log of the monitoring well installations.

Monitoring wells MW-195, MW-196, MW-197, MW-198, MW-253R, MW-350R, MW-358R, and MW-391R were developed by Cascade using a purge and surge technique following installation of the wells. Ten well

volumes of groundwater were removed from MW-195 during development. Monitoring wells MW-196, MW-197, MW-198, MW-253R, MW-358R, and MW-391R were each purged dry three times. Monitoring well MW-350R was flushed with clean water to remove drill cuttings prior to purging ten well volumes of groundwater. Well development details including starting depths to water and volume of water removed are provided in **Attachment E**.

MONITORING WELL IMPROVEMENT AND REPAIR TASKS

The protective cover top and/or concrete surface seal pad were replaced at four locations summarized in **Table B** below. A skid-steer was utilized to lift the protective cover top vertically and remove it without disturbing the PVC well casing. Existing concrete surface seal pads that were observed to have fractures, undercutting, and/or heaving were removed by hand. The area was then hand excavated to approximately 12-inches bgs and concrete forms were placed for the construction of a new well pad.

A new protective cover top was installed, and concrete was mixed and poured into the surface seal forms. Weep holes, a padlock, and the identification tag were reinstalled with the new protective cover top. All surface seal debris and replaced bollards were disposed of on-site at the direction of BPP personnel. **Attachment D** includes a photographic log of surface seal and protective cover top replacements.

Additional 3.5-inch diameter, 5-foot-tall concrete filled bollards were installed at six locations that had less than three secure bollards present. Locations were identified in need of repair from the spring 2023 investigation performed by Ramboll. **Attachment D** includes a photographic log of the installed bollards. The number of bollards installed at each location is summarized in **Table C** below.

New monitoring wells MW-195, MW-196, MW-197, MW-198, MW-253R, MW-350R, MW-358R, and MW-391R were installed with concrete pads, protective cover tops, and four bollards.

Table C. Monitoring Well Repairs and Improvements Summary (May 2024)

Well Location	Number of Bollards Present Prior to May 2024	Number of Bollards Installed	Total Number of Bollards Present After May 2024	Protective Cover Replaced	Well Pad Replaced	Notes
MW-370	3	1	4	No	No	Previously missing adequate coverage
MW-383	3	2	4	No	Yes	Previously damaged bollards and pad
MW-390	3	1	4	No	No	Previously missing adequate coverage
OW-157	4	4	4	Yes	Yes	Previously buried bollards and pad
OW-257	0	4	4	No	No	Previously missing adequate coverage
TPZ-164	0	4	4	No	No	Previously missing adequate coverage
XPW06	1	0	1	No	Yes	XPW06 is a flush mount with previously damaged pad
Total	**10**	**16**	**25**	**1**	**3**	

MONITORING WELL REDEVELOPMENT

Piezometers PZ-174, PZ-176, and PZ-178 were installed in 2015 along the southern boundary of the FAPS but had not been sampled for analytical data following installation. Based on the exceedances reported in MW-150, groundwater samples from PZ-174, PZ-176, and PZ-178 were proposed to evaluate and characterize the water quality near MW-150. Since the piezometers had not been used since 2015, they were redeveloped to remove any fine-grained material that potentially accumulated within the well. Well redevelopment details including the starting depth to water and volume of water removed from each location are provided in **Attachment E**.

SLUG TEST RESULTS

Additionally, slug tests were performed on monitoring wells MW-195, MW-196, MW-197, and MW-198, as well as on piezometers PZ-174 and PZ-177, to estimate hydraulic conductivities along the south side of the FAPS for use in the updated groundwater model. Two rising head and falling head tests were performed at MW-195, PZ-174, and PZ-177, two falling head tests were performed at MW-196, and one falling head test was performed at MW-197. Results are summarized in **Table 2** and analysis reports are included in **Attachment F**.

PRIVATE WELL SURVEY

The private well survey completed in 2021 (Ramboll, 2023) was updated to evaluate and confirm whether additional wells were located south of the FAPS. The area of review included all properties south of the FAPS and north of State Route 154. The survey included the following components:

- Review of the Illinois State Geological Survey (ISGS) and Illinois State Water Survey (ISWS) databases to identify existing well records.
- Documentation of well locations identified during access discussions with adjacent property owners.
- A windshield survey to identify potential well features.
- A discussion with the village of Baldwin about village connections and well locations (Gary Schoenbeck, Maintenance Supervisor).
- A second windshield survey to review and discuss potential well features identified in the original survey with property owners onsite.

The details of the survey updates are summarized below and identified and confirmed wells are shown on **Figure 2**.

During discussions with representatives of the adjacent property owner (DKG Leasing, LLC). DMG was informed that private wells existed on the property that were not previously identified (during 2021) in the well databases. The owner provided any information they had on the wells and their locations. The identified wells include API#121572681800, well A, and well B (**Figure 2**).

Following the access discussions, Ramboll reviewed the well databases to identify potential well locations to be investigated during the windshield survey. The windshield survey was performed by Ramboll on January 28, 2025, and was completed by driving by the properties within the area of interest and looking for features or structures that could be potential wells. Observations are summarized in **Table 3** and photographs are included in **Attachment G**.

In addition to the database review and windshield survey, Ramboll contacted the Village of Baldwin to inquire about the availability of public water and whether the Village was aware of any wells in the area of interest. The Village indicated that there were two wells they were aware of: API#121572681800 and API#121570240900, that did not have a connection to Village Water (**Figure 2**). All other locations had a connection to the Village Water Supply.

Based on the above analysis, five wells were confirmed to exist south of the FAPs and their location and use is summarized below:

- One bored well (API#121572681800), approximately 37 feet deep and located at 7517 State Route 154 is used for potable purposes and is included in the ISGS database.
- One bored well (labeled "A"), approximately 40 feet deep and located at 7509 State Route 154 is used for non-potable purposes including truck washing
- One hand dug well (labeled "B") located at 7525 State Route 154 has an unknown depth and is used for non-potable purposes including livestock watering.
- One bored well (API#121570240900) located at 7601 State Route 154 and approximately 32 feet deep is used for potable purposes and is included in the ISGS database.
- One bored well (labeled "C") located at 7615 Ruby Lane has an unknown depth and historically provided water to a house that in no longer present onsite. The property owner has indicated that they plan to abandon the well in 2025.

REFERENCES

Ramboll Americas Engineering Solutions. (October 2021). *Hydrogeologic Site Characterization Report, Bottom Ash Pond, Baldwin Power Plant, Baldwin Illinois.*

Ramboll Americas Engineering Solutions, Inc. (August 1, 2023). *Hydrogeologic Site Characterization Report, Revision 1. Bottom Ash Pond, Baldwin Power Plant, Baldwin, Illinois. Dynegy Midwest Generation, LLC.*

Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2024. *Proposal for Nature and Extent and Data Gap Investigations, Monitoring Well Abandonment and Replacement, Repairs and Improvements to Select Monitoring Wells, and Model Updates Baldwin Power Plant*. April 5, 2024.

Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2025. *Groundwater Modeling Technical Memorandum, Fly Ash Pond System, Baldwin Power Plant.* April 24, 2025.

TABLES (IN TEXT)

Table A Analytical Sample Locations and Intervals
Table B Summary of Screen Lengths by Well
Table C Monitoring Well Repairs and Improvements Summary (May 2024)

TABLES (ATTACHED)

Table 1	Monitoring Well Construction Details
Table 2	Horizontal Permeability Test Results
Table 3	Windshield Survey Observations

FIGURES (ATTACHED)

Figure 1	Monitoring Well Location Map
Figure 2	Confirmed Private Well Locations

ATTACHMENTS

Attachment A	Monitoring Well Improvement and Repairs Photographic Log
Attachment B	Well Abandonment Logs
Attachment C	Soil Boring Logs
Attachment D	Well Construction Logs
Attachment E	Monitoring Well Development Logs
Attachment F	Slug Test Reports
Attachment G	Windshield Survey Photographic Log

TABLES

TABLE 1. MONITORING WELL CONSTRUCTION DETAILS

SUMMARY OF ADDITIONAL INVESTIGATION ACTIVITIES AND PRIVATE WELL SURVEY AT THE FLY ASH POND SYSTEM
TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

Well Number	Date Constructed	Driller	Measuring Point Elevation (Top of PVC, feet NAVD88)	Ground Elevation (feet NAVD88)	Screen Top Depth (feet bgs)	Screen Bottom Depth (feet bgs)	Well Depth (feet bgs)	Well Depth from Measuring Point (feet below Top of PVC)	Total Boring Depth (feet bgs)	Screen Top Elevation (feet NAVD88)	Screen Bottom Elevation (feet NAVD88)	Bottom of Boring Elevation (feet NAVD88)	Stickup of Measuring Point Above Ground Surface (feet above ground surface)	Screen Length[1] (feet)	Screen Diameter (inches)
MW-195	05/07/24	Cascade	426.76	423.30	38.0	48.0	48.0	51.5	48.0	385.3	375.3	375.3	3.45	10.0	2.0
MW-196	05/08/24	Cascade	397.15	394.17	8.0	18.0	18.0	21.0	20.0	386.2	376.2	374.2	2.98	10.0	2.0
MW-197	05/08/24	Cascade	389.58	386.42	7.0	17.0	17.0	20.2	20.0	379.4	369.4	366.4	3.15	10.0	2.0
MW-198	10/15/24	Cascade	398.31	396.37	8.0	18.0	18.0	19.9	20.0	388.4	378.4	376.4	1.94	10.0	2.0
MW-253R	05/01/24	Cascade	445.66	442.65	29.5	35.0	35.0	38.0	35.0	413.2	407.7	407.7	3.01	5.0	2.0
MW-350R	05/03/24	Cascade	396.30	394.13	42.0	47.0	47.0	49.2	47.0	352.1	347.1	347.1	2.17	5.0	2.0
MW-358R	10/12/24	Cascade	456.29	453.56	80.0	90.0	90.0	92.7	90.0	373.6	363.6	363.6	2.73	10.0	2.0
MW-391R	10/10/24	Cascade	426.99	424.66	55.0	70.0	70.0	72.3	72.0	369.7	354.7	352.7	2.33	15.0	2.0

Well Number	Date Constructed	Driller	State Planar Northing - Y (NAD83/ West Zone)	State Planar Easting - X (NAD 83/ West Zone)	Latitude (decimal degrees)	Longitude (decimal degrees)	Hydrostratigraphic Unit
MW-195	05/07/24	Cascade	553,919.52	2,379,823.86	38.187638	-89.877051	PMP
MW-196	05/08/24	Cascade	554,282.48	2,380,003.99	38.188634	-89.876420	PMP
MW-197	05/08/24	Cascade	554,086.04	2,379,918.21	38.188095	-89.876721	PMP
MW-198	10/15/24	Cascade	553,817.91	2,380,816.27	38.187344	-89.873593	PMP
MW-253R	05/01/24	Cascade	553,297.66	2,384,440.10	38.185890	-89.860997	PMP
MW-350R	05/03/24	Cascade	554,568.07	2,379,418.99	38.189423	-89.878453	UA
MW-358R	10/12/24	Cascade	556,727.07	2,387,763.29	38.195270	-89.849388	UA
MW-391R	10/10/24	Cascade	555,106.51	2,380,480.41	38.190885	-89.874748	UA

[O: EGP 4/3/2025; C: JJW 4/8/2025]

Notes:
1. Screen length (feet) presented as standard length and may vary from calculated length (screen top depth [feet bgs] minus screen bottom depth [feet bgs])
bgs = below ground surface
NAD83 = North American Datum of 1983
NAVD88 = North American Vertical Datum of 1988
PMP = potential migration pathway
PVC = polyvinyl chloride
UA = uppermost aquifer

TABLE 2. HORIZONTAL PERMEABILITY TEST RESULTS

SUMMARY OF ADDITIONAL INVESTIGATION ACTIVITIES AND PRIVATE WELL SURVEY AT THE FLY ASH POND SYSTEM

TECHNICAL MEMORANDUM

FLY ASH POND SYSTEM

BALDWIN POWER PLANT

BALDWIN, ILLINOIS

Horizontal Hydraulic Conductivity: Field Test Results				
Monitoring Well Number	**Depth Interval Tested (feet bgs)**	**Analysis Method**	**Primary Lithologies within Screened Well Interval**	**Horizontal Hydraulic Conductivity (cm/s)**
MW-195	38 - 48	Cooper-Bredehoeft-Papadopulos	Silty Clay, Clayey Sand, Well-Graded Sand, Lean Clay	1.6E-03
MW-196	8 - 18	Bouwer-Rice	Silty Clay, Sandy Lean Clay, Lean Clay, Clayey Sand	3.5E-07
MW-197	7 - 17	Cooper-Bredehoeft-Papadopulos	Silty Clay, Sandy Lean Clay, Clayey Sand	9.4E-08
MW-198	8 - 18	Cooper-Bredehoeft-Papadopulos	Silty Clay, Lean Clay, Clayey Sand, Lean Clay	7.8E-06
PZ-174	14.5 - 24.5	Cooper-Bredehoeft-Papadopulos	Lean Clay, Gravelly Clay with Sand	1.5E-03
PZ-177	20.5 - 30.5	Cooper-Bredehoeft-Papadopulos	Lean Clay, Silt, Well-Graded Sand, Silty Gravel	1.8E-04
			Geometric Mean Hydraulic Conductivity	**2.2E-05**

[O: JJW 4/4/25; C: KLT 4/8/25]

Notes:

bgs = below ground surface

cm/s = centimeters per second

References:

Bouwer-Rice = Bouwer and Rice Analytical Method for Unconfined Aquifers, 1976. (note: also used for Confined Aquifers)

Cooper-Bredehoeft-Papadopulos = Cooper, H.H., J.D. Bredehoeft and S.S. Papadopulos, 1967 (note: useful for estimating the hydraulic properties [transmissivity and storage coefficient] of nonleaky confined aquifers or where the screen is below the water table in an unconfined aquifer. Analysis involves matching a type curve to water-level displacement data from an overdamped slug test).

Table 3. Windshield Survey Observations

SUMMARY OF ADDITIONAL INVESTIGATION ACTIVITIES AND PRIVATE WELL SURVEY AT THE FLY ASH POND SYSTEM

TECHNICAL MEMORANDUM

FLY ASH POND SYSTEM

BALDWIN POWER PLANT

BALDWIN, ILLINOIS

Map Number	Source[1]	Site Address	Property Development Status	Property Located	Well Observed in Field	Notes[2]	Final Determination
02-15-200-013	ILWATER	--	No property development.	Yes	No	No visual signs of wells.	No well
02-15-178-001	ILWATER	10306 MAGNOLIA DR	Residential property	Yes	No	No visual signs of wells.	No well
02-15-177-003	ILWATER	10311 MAGNOLIA DR	Residential property	Yes	Potentially	One photo shows PVC in backyard, however, this is likely a sewer cleanout (Photo No. 1, Attachment G). No additional investigation.	No well
02-15-177-002	ILWATER	10351 MAGNOLIA DR	Residential Property	Yes	No	Fire hydrant observed on northern end of property. No visual signs of wells.	No well
02-15-177-005	ILWATER	10361 MAGNOLIA DR	Residential Property	Yes	Potentially	Well-like structure observed in backyard, but unable to confirm from public ROW (Photo No. 2, Attachment G). Additional investigation completed 3/19/2025.	No well
02-15-177-004	ILWATER	10381 MAGNOLIA DR	Residential Property	Yes	Potentially	Potential well/well cover identified (Photo No. 3, Attachment G). Determined feature was potentially cable, telephone, or other utility. No additional investigation.	No well
02-16-252-006	ILWATER	7525 STATE RT 154	Commercial or industrial property development	Yes	Potentially	One PVC/plastic structure observed (Photo No. 4, Attachment G). Wells on property were identified with the owner, photographed feature is not a well. No additional investigation.	No well
02-16-277-003	ILWATER	7597 STATE ROUTE 154	Residential Property	Yes	No	No visual signs of wells.	No well
02-15-152-015	ILWATER	7601 STATE ROUTE 154	Residential Property	Yes	No	No visual signs of wells.	No well
02-15-152-014	ILWATER	7603 STATE ROUTE 154	Residential Property	Yes	No	No visual signs of wells.	No well
02-15-152-016	ILWATER	7611 RUBY LN	Residential property to the east. Small shed/limited development.	Yes	No	Property heavily vegetated. No visuals signs of wells observed from the public ROW.	No well
02-15-152-012	ILWATER	7615 RUBY LN	Residential property	Yes	Potentially	A potential well/well vault was observed in one photograph (Photo No. 5, Attachment G). Additional investigation completed 3/19/2025.	Inactive well
02-15-152-009	ILWATER	7621 RUBY LN	Residential Property	Yes	No	No visual signs of wells.	No well
02-15-153-003	ILWATER	7647 STATE ROUTE 154	Residential Property	Yes	No	No visual signs of wells.	No well
02-15-153-004	ILWATER	7657 STATE ROUTE 154	Residential property	Yes	No	No visual signs of wells.	No well
02-15-153-005	ILWATER	7667 STATE ROUTE 154	Residential Property	Yes	No	No visual signs of wells.	No well
02-15-152-017	ILWATER	7683 STATE ROUTE 154	Residential property on the southeastern end of property.	Yes	No	No visual signs of wells.	No well
02-15-178-002	ILWATER	7739 STATE ROUTE 154	Residential Property	Yes	No	No visual signs of wells.	No well
02-15-178-005	ILWATER	7756 STATE ROUTE 154	Residential property on southern end of property boundary.	Yes	No	No visual signs of wells.	No well
02-15-178-003	ILWATER	7783 STATE ROUTE 154	Residential Property	Yes	No	No visual signs of wells.	No well
02-15-178-006	ILWATER	7795 STATE ROUTE 154	Commercial Property (Campground)	Yes	Potentially	Property has been developed as a hotel and campground. In the campground area, two potential wells observed (Photo No. 6, Attachment G). Identified as septic systems. No additional investigation required.	No well

Table 3. Windshield Survey Observations

SUMMARY OF ADDITIONAL INVESTIGATION ACTIVITIES AND PRIVATE WELL SURVEY AT THE FLY ASH POND SYSTEM

TECHNICAL MEMORANDUM

FLY ASH POND SYSTEM

BALDWIN POWER PLANT

BALDWIN, ILLINOIS

Map Number	Source[1]	Site Address	Property Development Status	Property Located	Well Observed in Field	Notes[2]	Final Determination
Not applicable	ILWATER	7797 STATE ROUTE 154	Residential Property (Hotel/Campground?)	Yes	Potentially	Property has been developed as a hotel and campground. In the campground area, two potential wells observed (as above)/ Identified as septic systems no additional investigation required.	No well

[O: NRK 4/8/25; C: JJW 4/8/25]

Notes:
1. Illinois Water Well (ILWATER) Interactive Map (https://stage.isgs-prod.web.illinois.edu/ilwater) accessed on 01/21/2025
2. Investigation completed 1/28/2025.

No. = number
PVC = polyvinyl chloride
ROW = right of way

FIGURES

Y:\Mapping\Projects\22\2285\MXD\Nature_and_Extent\BAL\Nature_and_Extent_Report\NE_TechMemorandum\BAL_FAPS_TechMemo.aprx\Figure 1. Monitoring Well Location Map

PROJECT: 169000XXXX | DATED: 4/4/2025 | DESIGNER: GALARNMC

- COMPLIANCE MONITORING WELL
- BACKGROUND MONITORING WELL
- MONITORING WELL
- PORE WATER WELL
- CLOSED MONITORING WELL

- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- CAPPED AREA
- PROPERTY BOUNDARY

0 400 800 Feet

MONITORING WELL LOCATION MAP

SUMMARY OF ADDITIONAL INVESTIGATION ACTIVITIES AND PRIVATE WELL SURVEY AT THE FLY ASH POND SYSTEM
TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

Y:\Mapping\Projects\22\2286\MXD\Nature_and_Extent\BAL\Nature_and_Extent_Report\NE_TechMemorandum\BAL_FAPS_TechMemo.aprx\Figure 2. Confirmed Private Well Locations

PROJECT: 169000XXXX | DATED: 4/4/2025 | DESIGNER: GALARNMC

- PRIVATE WELL LOCATION
- COMPLIANCE MONITORING WELL
- MONITORING WELL
- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- CAPPED AREA
- PROPERTY BOUNDARY

0 125 250 Feet

CONFIRMED PRIVATE WELL LOCATIONS

SUMMARY OF ADDITIONAL INVESTIGATION ACTIVITIES AND PRIVATE WELL SURVEY AT THE FLY ASH POND SYSTEM
TECHNICAL MEMORANDUM
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 2

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

ATTACHMENT A
Monitoring Well Improvement and Repairs Photographic Log

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
DMG, LLC	Baldwin Power Plant	1940108209

PHOTO NO.	DATE:
1	5/6/24

DESCRIPTION:

Bollard installation completed at OW-257.

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
DMG, LLC	Baldwin Power Plant – Off Site	1940108209

PHOTO NO.	DATE:
2	5/9/24

DESCRIPTION:

Completion of monitoring well MW-195.

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
DMG, LLC	Baldwin Power Plant – Off Site	1940108209

PHOTO NO.	DATE:
3	5/9/24

DESCRIPTION:

Well installation at MW-196.

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
DMG, LLC	Baldwin Power Plant – Off Site	1940108209

PHOTO NO.	DATE:
4	4/30/24

DESCRIPTION:

Well abandonment at MW-306.

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
DMG, LLC	Baldwin Power Plant – Off Site	1940108209

PHOTO NO.	DATE:
5	5/6/24

DESCRIPTION:

Installing bollards at TPZ-164.

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
DMG, LLC	Baldwin Power Plant – Off Site	1940108209

PHOTO NO.	DATE:
6	5/3/24

DESCRIPTION:

Well completion at MW-350R

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
DMG, LLC	Baldwin Power Plant – Off Site	1940108209

PHOTO NO.	DATE:
7	4/30/24

DESCRIPTION:

Well abandonment of MW-307.

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
DMG, LLC	Baldwin Power Plant – Off Site	1940108209

PHOTO NO.	DATE:
8	5/9/24

DESCRIPTION:

Well installation at MW-197.

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
DMG, LLC	Baldwin Power Plant – Off Site	1940108209

PHOTO NO.	DATE:
9	5/9/24

DESCRIPTION:

Well installation at MW-253R.

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
DMG, LLC	Baldwin Power Plant – Off Site	1940108209

PHOTO NO.	DATE:
10	4/30/24

DESCRIPTION:

Compromised casing joint in MW-391.

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
DMG, LLC	Baldwin Power Plant – Off Site	1940108209

PHOTO NO.	DATE:
11	10/15/24

DESCRIPTION:

Cascade drilling and installing monitoring well MW-198.

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
DMG, LLC	Baldwin Power Plant – Off Site	1940108209

PHOTO NO.	DATE:
12	10/16/24

DESCRIPTION:

Surface completion of replacement monitoring well MW-391R.

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
DMG, LLC	Baldwin Power Plant – Off Site	1940108209

PHOTO NO.	DATE:
13	10/15/24

DESCRIPTION:

Surface completion of replacement monitoring well MW-358R.

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
DMG, LLC	Baldwin Power Plant – Off Site	1940108209

PHOTO NO.	DATE:
14	9/6/24

DESCRIPTION:

Compromised joint at approximately 22 ft bgs at MW-358. Water visualized pouring into well casing from joint.

ATTACHMENT B
Well Abandonment Logs

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

(1) GENERAL INFORMATION

Unique Well No.: MW-253
Well ID No.:
County: Randolph

Common Well Name _____ _____ Gov't Lot (if applicable)

____ 1/4 of ____ 1/4 of Sec. ____ ; T. ____ R. ____
Grid Location

553298 ft. ☒ N. ☐ S., 2384430.09 ft. ☒ E. ☐ W.

Local Grid Origin ☐ (estimated: ☐) or Well Location ☒

Lat ____° ____' ____" Long ____° ____' ____" or
S C N

State Plane _____ ft. N. _____ ft. E.

Reason For Abandonment
Unique Well No.

(2) FACILITY /OWNER INFORMATION

Facility Name: Baldwin Power Plant

Facility ID
License/Permit/Monitoring No.

Street Address of Well: 10901 Baldwin Road

City, Village, or Town: Baldwin

Present Well Owner: Baldwin Power Plant
Original Owner: Dynegy Midwest Generation, LLC

Street Address or Route of Owner: 10901 Baldwin Road

City, State, Zip Code: Baldwin, IL 62217

(3) WELL/DRILLHOLE/BOREHOLE INFORMATION

Original Construction Date: 9/1/2010

☐ Monitoring Well
☐ Water Well
☐ Drillhole / Borehole

If a Well Construction Report is available, please attach.

Construction Type:
☐ Drilled ☐ Driven (Sandpoint) ☐ Dug
☐ Other (Specify) _____

Formation Type:
☐ Unconsolidated Formation ☐ Bedrock

Total Well Depth (ft) _____ (From ground surface)
Casing Diameter (in.) 2.00
Casing Depth (ft.) _____

Lower Drillhole Diameter (in.) 6.0

Was Well Annular Space Grouted? ☐ Yes ☐ No ☐ Unknown

If Yes, To What Depth? _____ Feet

Depth to Water (Feet) 14.5

(4) PUMP, LINER, SCREEN, CASING, & SEALING MATERIAL

Pump & Piping Removed?	☐ Yes	☐ No	☒ Not Applicable
Liner(s) Removed?	☐ Yes	☐ No	☒ Not Applicable
Screen Removed?	☒ Yes	☐ No	☐ Not Applicable
Casing Left in Place?	☐ Yes	☒ No	
Was Casing Cut Off Below Surface?	☒ Yes	☐ No	
Did Sealing Material Rise to Surface?	☒ Yes	☐ No	
Did Material Settle After 24 Hours?	☐ Yes	☒ No	
If Yes, Was Hole Retopped?	☐ Yes	☒ No	

Required Method of Placing Sealing Material
☐ Conductor Pipe - Gravity ☒ Conductor Pipe - Pumped
☐ Screened & Poured (Bentonite Chips) ☐ Other (Explain)

Sealing Materials
☐ Neat Cement Grout
☐ Sand-Cement (Concrete) Grout
☐ Concrete
☐ Clay-Sand Slurry
☐ Bentonite-Sand Slurry
☐ Chipped Bentonite

(5) Sealing Material Used	From (Ft.)	To (Ft.)		Mix Ratio or Mud Weight
Aquaguard	Surface	35.0	55	gallons

(6) Comments _____

(7) Name of Person or Firm Doing Sealing Work: Ramboll
Date of Abandonment: 5/1/24

Signature of Person Doing Work: EGP
Date Signed

Street or Route: 234 Florida Street, Fifth Floor,
Telephone Number: (414) 837-3607

City, State, Zip Code: Milwaukee, WI 53204

Comments

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

(1) GENERAL INFORMATION

Unique Well No.: MW-306
Well ID No.:
County: Randolph

Common Well Name _____ _____ Gov't Lot (if applicable)

____ 1/4 of ____ 1/4 of Sec. ____ ; T. ____ R. ____
Grid Location

558867.59 ft. ☒ N. ☐ S., 2388512.16 ft. ☒ E. ☐ W.

Local Grid Origin ☐ (estimated: ☐) or Well Location ☒

Lat ____° ____' ____" Long ____° ____' ____" or
S C N

State Plane _____ ft. N. _____ ft. E.

Reason For Abandonment
Unique Well No.

(2) FACILITY /OWNER INFORMATION

Facility Name: Baldwin Power Plant
Facility ID
License/Permit/Monitoring No.
Street Address of Well: 10901 Baldwin Road
City, Village, or Town: Baldwin
Present Well Owner: Baldwin Power Plant
Original Owner: Dynegy Midwest Generation, LLC
Street Address or Route of Owner: 10901 Baldwin Road
City, State, Zip Code: Baldwin, IL 62217

(3) WELL/DRILLHOLE/BOREHOLE INFORMATION

Original Construction Date: 9/25/1991

☐ Monitoring Well
☐ Water Well
☐ Drillhole / Borehole

If a Well Construction Report is available, please attach.

Construction Type:
☐ Drilled ☐ Driven (Sandpoint) ☐ Dug
☐ Other (Specify) _____

Formation Type:
☐ Unconsolidated Formation ☐ Bedrock

Total Well Depth (ft) _____ (From ground surface)
Casing Diameter (in.): 2.00
Casing Depth (ft.) _____
Lower Drillhole Diameter (in.): 6.0

Was Well Annular Space Grouted? ☐ Yes ☐ No ☐ Unknown
If Yes, To What Depth? _____ Feet
Depth to Water (Feet): 20.6

(4) PUMP, LINER, SCREEN, CASING, & SEALING MATERIAL

	Yes	No	Not Applicable
Pump & Piping Removed?	☐	☐	☒
Liner(s) Removed?	☐	☐	☒
Screen Removed?	☐	☒	☐
Casing Left in Place?	☒	☐	

	Yes	No
Was Casing Cut Off Below Surface?	☒	☐
Did Sealing Material Rise to Surface?	☒	☐
Did Material Settle After 24 Hours?	☐	☒
If Yes, Was Hole Retopped?	☐	☒

Required Method of Placing Sealing Material
☐ Conductor Pipe - Gravity ☒ Conductor Pipe - Pumped
☐ Screened & Poured (Bentonite Chips) ☐ Other (Explain)

Sealing Materials
☐ Neat Cement Grout
☐ Sand-Cement (Concrete) Grout
☐ Concrete
☐ Clay-Sand Slurry
☐ Bentonite-Sand Slurry
☐ Chipped Bentonite

(5) Sealing Material Used	From (Ft.)	To (Ft.)		Mix Ratio or Mud Weight
Aquaguard	Surface	89.0	18	gallons

(6) Comments _____

(7) Name of Person or Firm Doing Sealing Work: Ramboll
Date of Abandonment: 4/30/24
Signature of Person Doing Work: EGP
Date Signed
Street or Route: 234 Florida Street, Fifth Floor,
Telephone Number: (414) 837-3607
City, State, Zip Code: Milwaukee, WI 53204

Comments

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

(1) GENERAL INFORMATION

Unique Well No.: MW-307
Well ID No.:
County: Randolph

Common Well Name _____ _____ Gov't Lot (if applicable)

____ 1/4 of ____ 1/4 of Sec. ____ ; T. ____ R. ____

Grid Location

560127.01 ft. ☒ N. ☐ S., 2388402.69 ft. ☒ E. ☐ W.

Local Grid Origin ☐ (estimated: ☐) or Well Location ☒

Lat ____° ____' ____" Long ____° ____' ____" or
S C N

State Plane _____ ft. N. _____ ft. E.

Reason For Abandonment:
Unique Well No.:

(2) FACILITY /OWNER INFORMATION

Facility Name: Baldwin Power Plant

Facility ID:
License/Permit/Monitoring No.:

Street Address of Well: 10901 Baldwin Road

City, Village, or Town: Baldwin

Present Well Owner: Baldwin Power Plant
Original Owner: Dynegy Midwest Generation, LLC

Street Address or Route of Owner: 10901 Baldwin Road

City, State, Zip Code: Baldwin, IL 62217

(3) WELL/DRILLHOLE/BOREHOLE INFORMATION

Original Construction Date: 9/1/1991

☐ Monitoring Well
☐ Water Well
☐ Drillhole / Borehole

If a Well Construction Report is available, please attach.

Construction Type:

☐ Drilled ☐ Driven (Sandpoint) ☐ Dug
☐ Other (Specify) _____

Formation Type:

☐ Unconsolidated Formation ☐ Bedrock

Total Well Depth (ft) (From ground surface) _____ Casing Diameter (in.) 2.00

Casing Depth (ft.) _____

Lower Drillhole Diameter (in.) 6.0

Was Well Annular Space Grouted? ☐ Yes ☐ No ☐ Unknown

If Yes, To What Depth? _____ Feet

Depth to Water (Feet) 6.4

(4) PUMP, LINER, SCREEN, CASING, & SEALING MATERIAL

	Yes	No	Not Applicable
Pump & Piping Removed?	☐	☐	☒
Liner(s) Removed?	☐	☐	☒
Screen Removed?	☐	☒	☐
Casing Left in Place?	☒	☐	

	Yes	No
Was Casing Cut Off Below Surface?	☒	☐
Did Sealing Material Rise to Surface?	☒	☐
Did Material Settle After 24 Hours?	☐	☒
If Yes, Was Hole Retopped?	☐	☒

Required Method of Placing Sealing Material

☐ Conductor Pipe - Gravity ☒ Conductor Pipe - Pumped
☐ Screened & Poured (Bentonite Chips) ☐ Other (Explain)

Sealing Materials

☐ Neat Cement Grout
☐ Sand-Cement (Concrete) Grout
☐ Concrete
☐ Clay-Sand Slurry
☐ Bentonite-Sand Slurry
☐ Chipped Bentonite

(5) Sealing Material Used	From (Ft.)	To (Ft.)		Mix Ratio or Mud Weight
Aquaguard	Surface	17.8	7	gallons

(6) Comments: Well appears to be compromised. Original total depth measured to be 74.19 feet bgs.

(7) Name of Person or Firm Doing Sealing Work: Ramboll
Date of Abandonment: 4/30/24

Signature of Person Doing Work: EGP
Date Signed:

Street or Route: 234 Florida Street, Fifth Floor,
Telephone Number: (414) 837-3607

City, State, Zip Code: Milwaukee, WI 53204

Comments

Template: RAMBOLL_ABANDONMENT - Project: NE_BALDWIN_2024 1.GPJ

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

(1) GENERAL INFORMATION

Unique Well No.: MW-350
Well ID No.:
County: Randolph

Common Well Name _____ _____ Gov't Lot (if applicable)

____ 1/4 of ____ 1/4 of Sec. ____ ; T. ____ R. ____
Grid Location

554567.85 ft. ☒ N. ☐ S., 2379410.14 ft. ☒ E. ☐ W.

Local Grid Origin ☐ (estimated: ☐) or Well Location ☒

Lat ____° ____' ____" Long ____° ____' ____" or
S C N

State Plane _____ ft. N. _____ ft. E.

Reason For Abandonment
Unique Well No.

(2) FACILITY /OWNER INFORMATION

Facility Name: Baldwin Power Plant

Facility ID
License/Permit/Monitoring No.

Street Address of Well: 10901 Baldwin Road

City, Village, or Town: Baldwin

Present Well Owner: Baldwin Power Plant
Original Owner: Dynegy Midwest Generation, LLC

Street Address or Route of Owner: 10901 Baldwin Road

City, State, Zip Code: Baldwin, IL 62217

(3) WELL/DRILLHOLE/BOREHOLE INFORMATION

Original Construction Date 5/3/2024

☐ Monitoring Well
☐ Water Well
☐ Drillhole / Borehole

If a Well Construction Report is available, please attach.

Construction Type:
☐ Drilled ☐ Driven (Sandpoint) ☐ Dug
☐ Other (Specify) _____

Formation Type:
☐ Unconsolidated Formation ☐ Bedrock

Total Well Depth (ft) _____ (From ground surface)
Casing Diameter (in.) 2.00
Casing Depth (ft.) _____

Lower Drillhole Diameter (in.) 6.0

Was Well Annular Space Grouted? ☐ Yes ☐ No ☐ Unknown

If Yes, To What Depth? _____ Feet

Depth to Water (Feet) 23.5

(4) PUMP, LINER, SCREEN, CASING, & SEALING MATERIAL

Pump & Piping Removed?	☐ Yes	☐ No	☒ Not Applicable
Liner(s) Removed?	☐ Yes	☐ No	☒ Not Applicable
Screen Removed?	☒ Yes	☐ No	☐ Not Applicable
Casing Left in Place?	☐ Yes	☒ No	

Was Casing Cut Off Below Surface?	☒ Yes	☐ No
Did Sealing Material Rise to Surface?	☒ Yes	☐ No
Did Material Settle After 24 Hours?	☐ Yes	☒ No
If Yes, Was Hole Retopped?	☐ Yes	☒ No

Required Method of Placing Sealing Material
☐ Conductor Pipe - Gravity ☒ Conductor Pipe - Pumped
☐ Screened & Poured (Bentonite Chips) ☐ Other (Explain)

Sealing Materials
☐ Neat Cement Grout
☐ Sand-Cement (Concrete) Grout
☐ Concrete
☐ Clay-Sand Slurry
☐ Bentonite-Sand Slurry
☐ Chipped Bentonite

(5) Sealing Material Used	From (Ft.)	To (Ft.)		Mix Ratio or Mud Weight
Aquaguard	Surface	47.0	65	gallons

(6) Comments _____

(7) Name of Person or Firm Doing Sealing Work: Ramboll
Date of Abandonment: 5/3/24

Signature of Person Doing Work: EGP
Date Signed

Street or Route: 234 Florida Street, Fifth Floor,
Telephone Number: (414) 837-3607

City, State, Zip Code: Milwaukee, WI 53204

Comments

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

(1) GENERAL INFORMATION

Unique Well No.: MW-358
Well ID No.:
County: Randolph

Common Well Name _____ _____ Gov't Lot (if applicable)

____ 1/4 of ____ 1/4 of Sec. ____ ; T. ____ R. ____
Grid Location

556726.27 ft. ☒ N. ☐ S., 2387756.56 ft. ☒ E. ☐ W.

Local Grid Origin ☐ (estimated: ☐) or Well Location ☒

Lat ____° ____' ____" Long ____° ____' ____" or
S C N

State Plane _____ ft. N. _____ ft. E.

Reason For Abandonment
Unique Well No.

(2) FACILITY /OWNER INFORMATION

Facility Name: Baldwin Power Plant
Facility ID
License/Permit/Monitoring No.
Street Address of Well: 10901 Baldwin Road
City, Village, or Town: Baldwin
Present Well Owner: Baldwin Power Plant
Original Owner: Dynegy Midwest Generation, LLC
Street Address or Route of Owner: 10901 Baldwin Road
City, State, Zip Code: Baldwin, IL 62217

(3) WELL/DRILLHOLE/BOREHOLE INFORMATION

Original Construction Date: 10/8/2022

☐ Monitoring Well
☐ Water Well
☐ Drillhole / Borehole

If a Well Construction Report is available, please attach.

Construction Type:
☒ Drilled ☐ Driven (Sandpoint) ☐ Dug
☐ Other (Specify) _____

Formation Type:
☐ Unconsolidated Formation ☒ Bedrock

Total Well Depth (ft) (From ground surface): 90.0
Casing Diameter (in.): 2.00
Casing Depth (ft.): _____
Lower Drillhole Diameter (in.): 6.0

Was Well Annular Space Grouted? ☐ Yes ☐ No ☐ Unknown
If Yes, To What Depth? _____ Feet
Depth to Water (Feet): 2.2

(4) PUMP, LINER, SCREEN, CASING, & SEALING MATERIAL

	Yes	No	Not Applicable
Pump & Piping Removed?	☐	☐	☒
Liner(s) Removed?	☐	☐	☒
Screen Removed?	☒	☐	☐
Casing Left in Place?	☐	☒	

	Yes	No
Was Casing Cut Off Below Surface?	☒	☐
Did Sealing Material Rise to Surface?	☒	☐
Did Material Settle After 24 Hours?	☐	☒
If Yes, Was Hole Retopped?	☐	☒

Required Method of Placing Sealing Material
☐ Conductor Pipe - Gravity ☒ Conductor Pipe - Pumped
☐ Screened & Poured (Bentonite Chips) ☐ Other (Explain)

Sealing Materials
☐ Neat Cement Grout
☐ Sand-Cement (Concrete) Grout
☐ Concrete
☐ Clay-Sand Slurry
☐ Bentonite-Sand Slurry
☐ Chipped Bentonite

(5) Sealing Material Used	From (Ft.)	To (Ft.)	Gallons	Mix Ratio or Mud Weight
Aquaguard	Surface	70.0	110	gallons

(6) Comments _____

(7) Name of Person or Firm Doing Sealing Work: Ramboll
Date of Abandonment: 10/12/24
Signature of Person Doing Work: EGP
Date Signed
Street or Route: 234 Florida Street, Fifth Floor,
Telephone Number: (414) 837-3607
City, State, Zip Code: Milwaukee, WI 53204

Comments

WELL/DRILLHOLE/BOREHOLE ABANDONMENT

(1) GENERAL INFORMATION

Unique Well No.: MW-391
Well ID No.:
County: Randolph

Common Well Name _____ _____ Gov't Lot (if applicable)

____ 1/4 of ____ 1/4 of Sec. ____ ; T. ____ R. ____
Grid Location

555101 ft. ☒ N. ☐ S., 2380477.03 ft. ☒ E. ☐ W.

Local Grid Origin ☐ (estimated: ☐) or Well Location ☒

Lat ____° ____' ____" Long ____° ____' ____" or
S C N

State Plane _____ ft. N. _____ ft. E.

Reason For Abandonment
Unique Well No.

(2) FACILITY /OWNER INFORMATION

Facility Name: Baldwin Power Plant
Facility ID:
License/Permit/Monitoring No.:
Street Address of Well: 10901 Baldwin Road
City, Village, or Town: Baldwin
Present Well Owner: Baldwin Power Plant
Original Owner: Dynegy Midwest Generation, LLC
Street Address or Route of Owner: 10901 Baldwin Road
City, State, Zip Code: Baldwin, IL 62217

(3) WELL/DRILLHOLE/BOREHOLE INFORMATION

Original Construction Date: 3/10/2016

☐ Monitoring Well
☐ Water Well
☐ Drillhole / Borehole

If a Well Construction Report is available, please attach.

Construction Type:
☒ Drilled ☐ Driven (Sandpoint) ☐ Dug
☐ Other (Specify) _____

Formation Type:
☐ Unconsolidated Formation ☒ Bedrock

Total Well Depth (ft) (From ground surface): 70.0
Casing Diameter (in.): 2.00
Casing Depth (ft.): _____
Lower Drillhole Diameter (in.): 6.0

Was Well Annular Space Grouted? ☐ Yes ☐ No ☐ Unknown
If Yes, To What Depth? _____ Feet
Depth to Water (Feet): 66.4

(4) PUMP, LINER, SCREEN, CASING, & SEALING MATERIAL

	Yes	No	Not Applicable
Pump & Piping Removed?	☐	☐	☒
Liner(s) Removed?	☐	☐	☒
Screen Removed?	☒	☐	☐
Casing Left in Place?	☐	☒	

	Yes	No
Was Casing Cut Off Below Surface?	☒	☐
Did Sealing Material Rise to Surface?	☒	☐
Did Material Settle After 24 Hours?	☐	☒
If Yes, Was Hole Retopped?	☐	☒

Required Method of Placing Sealing Material
☐ Conductor Pipe - Gravity ☒ Conductor Pipe - Pumped
☐ Screened & Poured (Bentonite Chips) ☐ Other (Explain)

Sealing Materials
☐ Neat Cement Grout
☐ Sand-Cement (Concrete) Grout
☐ Concrete
☐ Clay-Sand Slurry
☐ Bentonite-Sand Slurry
☐ Chipped Bentonite

(5) Sealing Material Used	From (Ft.)	To (Ft.)	Gallons	Mix Ratio or Mud Weight
Aquaguard	Surface	90.0	120	gallons

(6) Comments _____

(7) Name of Person or Firm Doing Sealing Work: Ramboll
Date of Abandonment: 10/9/24
Signature of Person Doing Work: EGP
Date Signed:
Street or Route: 234 Florida Street, Fifth Floor,
Telephone Number: (414) 837-3607
City, State, Zip Code: Milwaukee, WI 53204

Comments

ATTACHMENT C
Soil Boring Logs

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Power Plant		MW-195

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Ethan Orange Cascade Drilling LP	5/7/2024	5/7/2024	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-195	Feet (NGVD29)	423.30 Feet (NGVD29)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 553919.523, 2379823.859 N, E E/W
1/4 of 1/4 of Section , T N, R
Lat 38 ° 11 ' 15.46 "
Long -89 ° 52 ' 37.42 "
Local Grid Location
Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	IL	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	120 79		1	0 - 7.6' **SILTY CLAY:** CL/ML, very dark grayish brown (10YR 3/2), organics (10-20%), gravel (0-10%), very soft, moist.					0					
			2											
			3	2.2' dark yellowish brown (10YR 4/4), black (10YR 2/1) mottling (0-10%), organics decrease, soft to medium stiffness.					2					
			4		CL/ML									
			5						2					
			6											
			7						4.5					
			8	7.6 - 11.1' **SANDY LEAN CLAY:** s(CL), strong brown (7.5YR 5/6), very fine sand, very stiff, hard, dry.										
			9		s(CL)				4.5					
2 CS	84 84		10											
			11	11.1 - 13.4' **SILTY CLAY:** CL/ML, brown (10YR 4/3), sand (10-20%), laminations throughout, stiff, dry.	CL/ML				4.5					
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	Tel:
	Ramboll	Fax:

Boring Number MW-195

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			13	11.1 - 13.4' **SILTY CLAY:** CL/ML, brown (10YR 4/3), sand (10-20%), laminations throughout, stiff, dry. *(continued)*	CL/ML				4.5					
			14	13.4 - 16.3' **POORLY-GRADED SAND:** SP, pale brown (10YR 6/3), fine sand, gravel (0-10%), loose, dry.	SP									
			15											
			16											
			17	16.3 - 17' **SILTY CLAY:** CL/ML, yellowish brown (10YR 5/4), fine sand (10-20%), stiff, dry.	CL/ML									
3 CS	156 110			17 - 18.4' **SILTY CLAY:** CL/ML, very dark grayish brown (10YR 3/2), low toughness, medium plasticity, moist.	CL/ML				4.5					
			18											
			19	18.4 - 19.4' **POORLY-GRADED SAND:** SP, pale brown (10YR 6/3), fine sand, gravel (0-10%), loose, dry.	SP				4.5					
			20	19.4 - 32.3' **SILTY CLAY:** CL/ML, yellowish brown (10YR 5/6), very fine sand (10-20%), very stiff, no dilatency, medium to high toughness, low plasticity, dry.										
			21						4.5					
			22											
			23						4.5					
			24											
			25						4.5					
			26		CL/ML									
			27						4.5					
			28											
			29						4.5					
4 CS	60 60		30	30' brown (10YR 5/3).										
			31						4.5					
			32											

Boring Number MW-195

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			33	32.3 - 34.3' **POORLY-GRADED SAND:** SP, brown (10YR 5/3), fine sand, silt (10-20%), loose, dry.	SP									
			34											
			35	34.3 - 35' **SILTY CLAY:** CL/ML, brown (10YR 5/3), fine sand (10-20%), stiff, no dilatency, medium toughness, low plasticity, dry.	CL/ML									
5 CS	96 84			35 - 42.3' **SILTY CLAY:** CL/ML, dark grayish brown (10YR 4/2), fine sand (10-20%), no dilatency, medium toughness, low to medium plasticity, moist.					4.5					
			36											
			37						3.5					
			38											
			39	39.2' brown (7.5YR 4/2), gray (10YR 6/1) clay nodules (0-10%).	CL/ML				3					
			40											
			41						3					
			42											
				42.2' 3" cobble.										
			43	42.3 - 43' **CLAYEY SAND:** SC, brown (10YR 5/3), fine to medium sand, gravel (10-20%), moist.	SC									
6 CS	60 60			43 - 44.2' **SILTY CLAY:** CL/ML, dark grayish brown (10YR 4/2), no dilatency, medium toughness, low to medium plasticity, moist.	CL/ML									
			44											
			45	44.2 - 46.4' **WELL-GRADED SAND:** SW, brown (10YR 5/3), subrounded gravel (10-20%), clay (0-10%), loose, wet.	SW									
			46											
			47	46.4 - 48' **LEAN CLAY:** CL, brown (10YR 5/3), silt (10-20%), gravel (0-10%), no dilatency medium toughness, medium plasticity, stiff, moist.	CL				4.5					
			48	48' End of Boring.										

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Power Plant		MW-196

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Ethan Orange Cascade Drilling LP	5/8/2024	5/8/2024	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-196	Feet (NGVD29)	394.17 Feet (NGVD29)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 554282.482, 2380003.993 N, E E/W
1/4 of 1/4 of Section , T N, R
Lat 38 ° 11 ' 19.04 "
Long -89 ° 52 ' 35.15 "
Local Grid Location Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	IL	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	120 120			0 - 0.5' **CLAYEY SILT:** ML/CL, dark gray (10YR 4/1), sand (10-20%), gravel, organics (0-10%), soft, wet.	ML/CL									
			1	0.5 - 9.3' **SILTY CLAY:** CL/ML, gray (10YR 5/1), gravel (10-20%), sand (0-10%), no dilatency, low to medium toughness, medium to high plasticity, moist.										
			2											
			3						2.25					
			4	3.4' dark yellowish brown (10YR 4/6) mottling (20-30%).										
			5		CL/ML				2					
			6											
			7						1.5					
			8											
			9						1.5					
			10	9.3 - 10.7' **SANDY LEAN CLAY:** s(CL), gray (10YR 5/1), yellowish brown (10YR 5/6) mottling (30-40%), gravel (0-10%), soft, wet.	s(CL)									
2 CS	120 120		11	10.7 - 11.9' **LEAN CLAY:** CL, gray (10YR 5/1), silt (20-30%), gravel (0-10%), stiff, no dilatency, medium toughness, high plasticity, moist.	CL				1.5					
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	Tel:
	Ramboll	Fax:

Boring Number MW-196

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
				11.9 - 12.8' **CLAYEY SAND:** SC, gray (10YR 5/1), gravel (0-10%), very soft, wet. *(continued)*	SC									
			13	12.8 - 16.2' **SILTY CLAY:** CL/ML, grayish brown (10YR 5/2), yellowish brown (10YR 5/6) mottling (10-20%), black (10YR 2/1) mottling (0-10%), no dilatency, medium to high toughness, medium plasticity, moist.										
			14											
			15		CL/ML				2.5					
			16											
			17	16.2 - 20' **SILTY CLAY:** CL/ML, brown (10YR 5/3), yellowish brown (10YR 5/6) mottling (30-40%), gravel (5-15%), no dilatency, medium toughness, medium plasticity, moist. 16.4' - 17.4' red (2.5YR 5/6) nodules (10-20%).					2.5					
			18		CL/ML									
			19						4.5					
			20	20' End of Boring.										

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Power Plant		MW-197

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Ethan Orange Cascade Drilling LP	5/8/2024	5/8/2024	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-197	Feet (NGVD29)	386.42 Feet (NGVD29)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 554086.035, 2379918.207 N, E E/W
1/4 of 1/4 of Section , T N, R
Lat 38 ° 11 ' 17.10 "
Long -89 ° 52 ' 36.23 "
Local Grid Location
Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	IL	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	120 120		1	0 - 4.2' **SANDY LEAN CLAY:** s(CL), dark grayish brown (10YR 4/2), gravel, organics (0-10%), soft, wet.	s(CL)				0					
			2	1.9' cobble.										
			3						0					
			4	4.1' cobble.										
			5	4.2 - 10' **SILTY CLAY:** CL/ML, brown (10YR 5/3), yellowish brown (10YR 5/6) mottling, gray (10YR 6/1) mottling, brown (10YR 4/3) mottling, stiff, no dilatency, high toughness, low to medium plasticity, dry to moist.	CL/ML				4.5					
			6											
			7	6.7' 2" sand and gravel layer.					4.5					
			8											
			9						4.8					
2 CS	120 120		10	10 - 10.8' **SANDY LEAN CLAY:** s(CL), yellowish brown (10YR 5/4), gravel (0-10%), soft, wet.	s(CL)									
			11	10.8 - 11.8' **SILTY CLAY:** CL/ML, brown (10YR 5/3), yellowish brown (10YR 5/6) mottling, gray (10YR 6/1) mottling, brown (10YR 4/3) mottling, stiff, no dilatency, high toughness, low to medium	CL/ML									
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	Tel:
	Ramboll	Fax:

Boring Number MW-197

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
				plasticity, dry to moist. 11.8 - 12.2' **CLAYEY SAND:** SC, yellowish brown (10YR 5/4), gravel (20-30%), loose, moist to wet. *(continued)*	SC									
			13	12.2 - 20' **SILTY CLAY:** CL/ML, brown (10YR 5/3), yellowish brown (10YR 5/6) mottling, gray (10YR 6/1) mottling, brown (10YR 4/3) mottling, gravel (0-10%), sand lenses and nodules throughout, very stiff, no dilatency, high toughness, medium to high plasticity, dry to moist.					4.5					
			14											
			15	12.8' 2" very fine sandy clay. 15.2' 2" red rock.					4.5					
			16		CL/ML									
			17						4.5					
			18											
			19						4.5					
			20	20' End of Boring.										

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Power Plant		MW-253R

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Ethan Orange Cascade Drilling LP	5/1/2024	5/1/2024	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-253R	Feet (NGVD29)	442.65 Feet (NGVD29)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 553297.657, 2384440.098 N, E E/W

1/4 of 1/4 of Section , T N, R

Lat 38 ° 11 ' 09.17 "

Long -89 ° 52 ' 39.63 "

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	IL	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	120 120		1 2 3 4 5 6 7 8 9 10	0 - 10.2' **SILTY CLAY:** CL/ML, brown (10YR 5/3), gravel (0-10%), hard, dry. 2.2' strong brown (7.5YR 4/6) mottling (20-30%), light gray (2.5Y 7/1) mottling (20-30%), very dark gray (10YR 3/1) mottling (0-10%).	CL/ML									
2 CS	120 120		11 12	10.2 - 15.4' **SILTY CLAY:** CL/ML, brown (10YR 5/3), strong brown (7.5YR 4/6) mottling (20-30%), light gray (2.5Y 7/1) mottling (20-30%), very dark gray (10YR 3/1) mottling (0-10%), sand (10-20%), gravel (0-10%), medium to high plasticity, moist.	CL/ML				3.5					

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	Tel:
	Ramboll	Fax:

Boring Number MW-253R

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			13	10.2 - 15.4' **SILTY CLAY:** CL/ML, brown (10YR 5/3), strong brown (7.5YR 4/6) mottling (20-30%), light gray (2.5Y 7/1) mottling (20-30%), very dark gray (10YR 3/1) mottling (0-10%), sand (10-20%), gravel (0-10%), medium to high plasticity, moist. *(continued)*	CL/ML				2.5					
			14											
			15						1.5					
			16	15.4 - 18.2' **LEAN CLAY WITH SAND:** (CL)s, yellowish brown (10YR 5/4), gravel (0-10%), soft, medium plasticity, moist.	(CL)s									
			17						1					
			18											
			19	18.2 - 27.2' **SILTY CLAY:** CL/ML, yellowish brown (10YR 5/4), strong brown (7.5YR 4/6) mottling (10-20%), light gray (2.5Y 7/1) mottling (10-20%), very dark gray (10YR 3/1) mottling (0-10%), sand (10-20%), gravel (0-10%), moist.					3					
3 CS	120 120		20	20' gravel (10-20%).										
			21						3.5					
			22	22' - 25' fine sand seams.	CL/ML									
			23						3.5					
			24											
			25	25' - 27.2' trace coal pieces.					3					
			26											
			27						4.5					
			28	27.2 - 28.3' **LEAN CLAY:** CL, light yellowish brown (10YR 6/4), shaly, laminated, platy, low plasticity.	CL									
			29	28.3 - 35' **SHALE:** BDX (SH), light olive brown (2.5Y 5/4), weathered shale.					4.5					
4 CS	60 60		30		BDX (SH)									
			31											
			32											

Boring Number MW-253R

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				28.3 - 35' **SHALE:** BDX (SH), light olive brown (2.5Y 5/4), weathered shale. *(continued)*	BDX (SH)									
			33											
			34											
			35	35' End of Boring.										

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Power Plant		MW-350R

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Ethan Orange Cascade Drilling LP	5/3/2024	5/3/2024	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-350R	Feet (NGVD29)	394.13 Feet (NGVD29)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 554568.067, 2379418.994 N, E E/W
1/4 of 1/4 of Section , T N, R
Lat 38 ° 11 ' 21.89 "
Long -89 ° 52 ' 42.47 "
Local Grid Location Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	IL	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	120 120		1	0 - 14.4' **SILTY CLAY:** CL/ML, grayish brown (10YR 5/2), yellowish brown (10YR 5/8) mottling (30-40%), organics, roots (0-10%), medium to high toughness, low to medium plasticity, moist.	CL/ML				1.5					
			2											
			3						2					
			4											
			5						2.5					
			6											
			7						3					
			8											
			9						4.5					
			10											
2 CS	120 120		11						3.5					
			12	11.5' sand (0-10%), soft.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	Tel:
	Ramboll	Fax:

Boring Number MW-350R

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			13	0 - 14.4' **SILTY CLAY:** CL/ML, grayish brown (10YR 5/2), yellowish brown (10YR 5/8) mottling (30-40%), organics, roots (0-10%), medium to high toughness, low to medium plasticity, moist. *(continued)*	CL/ML				3.5					
			14											
			15	14.4 - 19.7' **LEAN CLAY:** CL, brown (10YR 5/3), sand, silt (20-30%), light gray (10YR 7/1) mottling (20-30%), yellowish brown (10YR 5/8) mottling (20-30%), soft, low to medium plasticity, moist.					1.5					
			16											
			17		CL				1.5					
			18											
			19						1.5					
3 CS	60 60		20	19.7 - 24.6' **LEAN CLAY:** CL, brown (7.5YR 5/3), silt (20-30%), sand (0-10%), stiff, high plasticity, moist.										
			21						3					
			22	21.7' - 24.6' subangular gravel (10-20%).	CL									
			23						3					
			24											
4 CS	120 120		25	24.6 - 26.3' **SHALE:** BDX (SH), olive gray (5Y 5/2), highly weathered, soft.	BDX (SH)				2					
			26											
			27	26.3 - 27.1' **LIMESTONE:** BDX (LS), dark gray (10YR 4/1), unweathered, fossiliferous, banded, medium bedded, hard.	BDX (LS)									
			28	27.1 - 28.3' **SHALE:** BDX (SH), very dark gray (10YR 3/1), banded, medium bedded, soft to medium soft, dry.	BDX (SH)									
			29	28.3 - 28.9' **LIMESTONE:** BDX (LS), dark gray (10YR 4/1), unweathered, fossiliferous, banded, medium bedded, hard.	BDX (LS)									
			30	28.9 - 32.2' **SHALE:** BDX (SH), very dark gray (10YR 3/1), lightly to moderately weathered, banded, medium bedded.	BDX (SH)									
			31											
			32											

Boring Number MW-350R

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				32.2 - 39.5' **LIMESTONE:** BDX (LS), reddish gray (2.5YR 5/1), shaly, very lightly weathered, hard.										
			33											
			34											
				34.5' moderately weathered, banded.										
5 CS	60 60		35											
			36		BDX (LS)									
			37											
			38											
			39											
				39.5 - 41.7' **SHALE:** BDX (SH), gray (10YR 5/1), weathered, banded, soft to medium soft.										
6 CS	48 48		40											
			41		BDX (SH)									
			42	41.7 - 47' **LIMESTONE:** BDX (LS), light gray (10YR 7/1) banded, medium bedded, hard.										
			43											
7 CS	36 36		44		BDX (LS)									
			45											
			46											
			47	47' End of Boring.										

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Nature and Extent		MW-198

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Jeremy Triepke Cascade Drilling LP	10/15/2024	10/15/2024	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-198	Feet (NAVD88)	396.28 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☐
State Plane 553,817.91 N, 2,380,816.27 E E / W
1/4 of 1/4 of Section , T N, R
Lat ___ ° ___ ' ___ "
Long ___ ° ___ ' ___ "
Local Grid Location
Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	IL	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 42		0.5	0 - 5.1' **CLAYEY SILT:** ML/CL, brown (10YR 4/3), dark yellowish brown (10YR 4/6) mottling (20-30%), sand (10-20%), roots (10-20%), moist.										
			1.0	1.1' roots (0%).										
			1.5											
			2.0											
			2.5		ML/CL									
			3.0											
			3.5											
			4.0											PP = 2
			4.5											
			5.0											
2 CS	60 60		5.5	5.1 - 10.7' **SILTY CLAY:** CL/ML, brown (10YR 4/3), fine sand (10-20%), gravel (0-10%), no dilatancy, low to medium toughness, moist.										
			6.0	5.9' strong brown (7.5YR 5/8) to gray (10YR 6/1) mottling (10-20%), medium to high plasticity.										PP = 1.5
			6.5		CL/ML									
			7.0											
			7.5											
			8.0											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Ramboll
234 W Florida St, Milwaukee WI 53204
Tel: 262-901-0095
Fax:

Boring Number MW-198

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				5.1 - 10.7' **SILTY CLAY:** CL/ML, brown (10YR 4/3), fine sand (10-20%), gravel (0-10%), no dilatancy, low to medium toughness, moist. *(continued)*										PP = 4
			8.5											
			9.0	8.8' - 9.0' layer of fine sand, brownish yellow (10YR 6/8), moist to wet.										
			9.5		CL/ML									
3 CS	60 60		10.0											PP = 4
			10.5											
			11.0	10.7 - 12.7' **LEAN CLAY:** CL, gray (10YR 6/1), brownish yellow (10YR 6/8) mottling (10-20%), fine sand (10-20%), silt (10-20%), gravel (0-10%), moist to wet.										
			11.5		CL									
			12.0											PP = 0.5
			12.5											
			13.0	12.7 - 13.8' **CLAYEY SAND:** SC, brown (10YR 5/3), gravel (0-10%), moist to wet.										
			13.5		SC									
			14.0	13.7' layer of gravel, dark yellowish brown (10YR 4/6).										PP = 4.5
			14.5	13.8 - 20' **LEAN CLAY:** CL, brown (7.5YR 5/4), strong brown (7.5YR 5/6) mottling (10-20%), gray (10YR 6/1) mottling (10-20%), silt (10-20%), sand (0-10%), gravel (0-10%), no dilatancy, high toughness, low to medium plasticity, moist.										
4 CS	60 60		15.0											
			15.5											
			16.0	15.8' dark gray (7.5YR 4/1).										PP = 3.5
			16.5											
			17.0		CL									
			17.5	17.2' small coal chunks (0-10%).										
			18.0											PP = 2.5
			18.5											
			19.0											
			19.5	19.4' intermittent broken chunks of weathered shale bedrock, light olive brown (2.5Y 5/3).										
			20.0	20' End of Boring.										

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Nature and Extent		MW-358R

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Jeremy Triepke Cascade Drilling LP	10/12/2024	10/12/2024	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-358R	Feet (NAVD88)	453.45 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☐
State Plane 556,727.07 N, 2,387,763.29 E E / W
1/4 of 1/4 of Section , T N, R
Lat ___° ___' ___"
Long ___° ___' ___"
Local Grid Location
Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	IL	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				0 - 8' Cleared for utilities by vacuum truck.										
			1											
			2											
			3											
			4											
			5											
			6											
			7											
			8	8' - 90' Refer to MW-358 boring log.										
			9											
			10											
			11											
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	Tel:
	Ramboll 234 W Florida St, Milwaukee WI 53204	262-901-0095 Fax:

Boring Number MW-358R

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	

Boring Number MW-358R

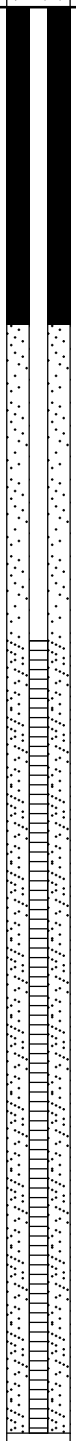
Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	

Boring Number MW-358R

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	

Boring Number MW-358R

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	



RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Nature and Extent		MW-391R

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Jeremy Triepke Cascade Drilling LP	10/10/2024	10/10/2024	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-391R	Feet (NAVD88)	424.45 Feet (NAVD88)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☐

State Plane 555,106.51 N, 2,380,480.41 E E / W

1/4 of 1/4 of Section , T N, R

Lat ___ ° ___ ' ___ "

Long ___ ° ___ ' ___ "

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	IL	Baldwin

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
				0' - 70' Refer to MW-391 boring log.										
			1											
			2											
			3											
			4											
			5											
			6											
			7											
			8											
			9											
			10											
			11											
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature

Firm Ramboll
234 W Florida St, Milwaukee WI 53204

Tel: 262-901-0095
Fax:

Template: RAMBOLL_IL_BORING LOG - Project: BALNANDE.GPJ

Boring Number MW-391R

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	

Boring Number MW-391R

Sample									Soil Properties					
Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments

Boring Number MW-391R

Sample		Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties					RQD/ Comments
Number and Type	Length Att. & Recovered (in)								Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	

ATTACHMENT D
Well Construction Logs

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Baldwin Power Plant	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: MW-195
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. ° ' " Long. ° ' " or	
Facility ID	St. Plane 553919.523 ft. N, 2379823.859 ft. E. S/C/N	Date Well Installed: 05/07/2024
Type of Well	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐ E ☐ W	Well Installed By: (Person's Name and Firm) Ethan Orange, Cascade Drilling LP
Distance from Waste/Source ft. / State IL	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number: ____

A. Protective pipe, top elevation ____ ft. (NAVD88)

B. Well casing, top elevation 426.76 ft. (NAVD88)

C. Land surface elevation 423.30 ft. (NAVD88)

D. Surface seal, bottom 422.30 ft. (NAVD88) or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☒ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ Hollow Stem Auger ☐ ____ Other ☐

15. Drilling fluid used: Water ☐ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☒

16. Drilling additives used? ☐ Yes ☒

Describe ____

17. Source of water (attach analysis, if required): ____

E. Bentonite seal, top 422.3 ft. (NAVD88) or 1.0 ft.

F. Fine sand, top 387.3 ft. (NAVD88) or 36.0 ft.

G. Filter pack, top 387.3 ft. (NAVD88) or 36.0 ft.

H. Screen joint, top 385.3 ft. (NAVD88) or 38.0 ft.

I. Well bottom 375.3 ft. (NAVD88) or 48.0 ft.

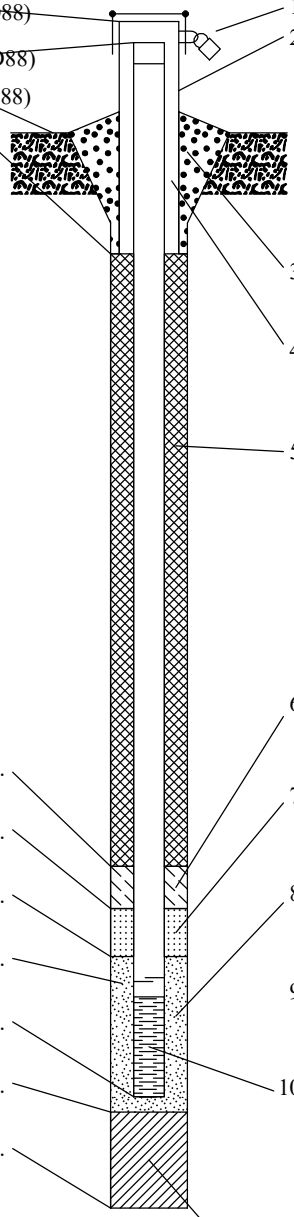
J. Filter pack, bottom 375.3 ft. (NAVD88) or 48.0 ft.

K. Borehole, bottom 375.3 ft. (NAVD88) or 48.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
   a. Inside diameter: 4.0 in.
   b. Length: 3.0 ft.
   c. Material: Steel ☒ Other ☐ ____
   d. Additional protection? ☒ Yes ☐ No
   If yes, describe: bollards
3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐ ____
4. Material between well casing and protective pipe: Bentonite ☐ Other ☒ well gravel
5. Annular space seal: a. Granular/Chipped Bentonite ☒
   b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
   c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐
   d. ____ % Bentonite . . . Bentonite-cement grout ☐
   e. 6.0 Ft^3 volume added for any of the above
   f. How installed: Tremie ☐ Tremie pumped ☐ Gravity ☒
6. Bentonite seal: a. Bentonite granules ☐
   b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
   c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
   a. ____
   b. Volume added ____ ft^3
8. Filter pack material: Manufacturer, product name & mesh size
   a. Filtersil
   b. Volume added 2.25: ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐ ____
10. Screen material: Schedule 40 PVC
    a. Screen Type: Factory cut ☒ Continuous slot ☐ Other ☐ ____
    b. Manufacturer ____
    c. Slot size: 0.010 in.
    d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☒ Other ☐ ____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Date Modified: 7/9/2024

Signature	Firm: Ramboll	Tel: Fax:

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Baldwin Power Plant	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: MW-196
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. ° ' " Long. ° ' " or	
Facility ID	St. Plane 554282.482 ft. N, 2380003.993 ft. E. S/C/N	Date Well Installed: 05/08/2024
Type of Well	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐ E ☐ W	Well Installed By: (Person's Name and Firm) Ethan Orange, Cascade Drilling LP
Distance from Waste/Source ft. / State IL	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number: ____

A. Protective pipe, top elevation ____ ft. (NAVD88)

B. Well casing, top elevation 397.15 ft. (NAVD88)

C. Land surface elevation 394.2 ft. (NAVD88)

D. Surface seal, bottom 393.2 ft. (NAVD88) or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☒ SP ☐
SM ☐ SC ☒ ML ☐ MH ☐ CL ☒ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ Hollow Stem Auger ☐ ____ Other ☐

15. Drilling fluid used: Water ☐ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☒

16. Drilling additives used? ☐ Yes ☒

Describe ____

17. Source of water (attach analysis, if required): ____

E. Bentonite seal, top 393.2 ft. (NAVD88) or 1.0 ft.

F. Fine sand, top 388.2 ft. (NAVD88) or 6.0 ft.

G. Filter pack, top 388.2 ft. (NAVD88) or 6.0 ft.

H. Screen joint, top 386.2 ft. (NAVD88) or 8.0 ft.

I. Well bottom 376.2 ft. (NAVD88) or 18.0 ft.

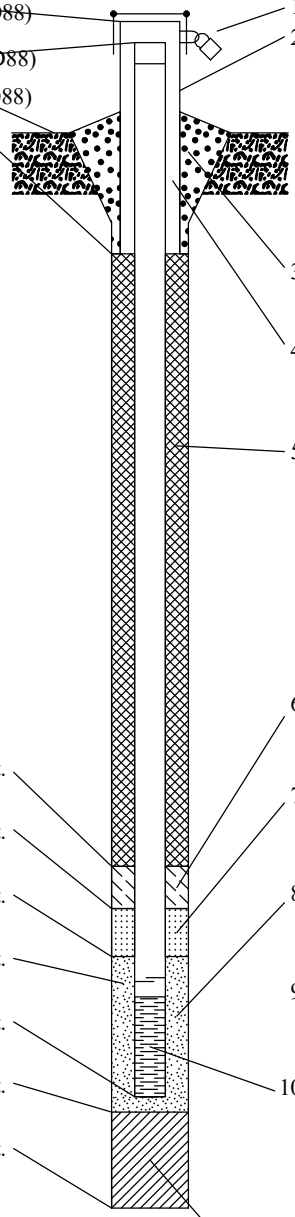
J. Filter pack, bottom 376.2 ft. (NAVD88) or 18.0 ft.

K. Borehole, bottom 374.2 ft. (NAVD88) or 20.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
   a. Inside diameter: 4.0 in.
   b. Length: 3.0 ft.
   c. Material: Steel ☒ Other ☐ ____
   d. Additional protection? ☒ Yes ☐ No
      If yes, describe: bollards
3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐ ____
4. Material between well casing and protective pipe: Filtersil Bentonite ☐ Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☒
   b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
   c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐
   d. ____ % Bentonite . . . Bentonite-cement grout ☐
   e. 1 Ft^3 volume added for any of the above
   f. How installed: Tremie ☐ Tremie pumped ☐ Gravity ☒
6. Bentonite seal: a. Bentonite granules ☐
   b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
   c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
   a. ____
   b. Volume added ____ ft^3
8. Filter pack material: Manufacturer, product name & mesh size
   a. Filtersil
   b. Volume added 2.0 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐ ____
10. Screen material: Schedule 40 PVC
    a. Screen Type: Factory cut ☒ Continuous slot ☐ Other ☐ ____
    b. Manufacturer ____
    c. Slot size: 0.010 in.
    d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☐ Other ☐ bentonite chips

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Date Modified: 7/9/2024

Signature	Firm: Ramboll	Tel: Fax:

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Baldwin Power Plant	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: MW-197
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. ° ' " Long. ° ' " or	
Facility ID	St. Plane 554086.035 ft. N, 2379918.207 ft. E. S/C/N	Date Well Installed: 05/08/2024
Type of Well	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐ E ☐ W	Well Installed By: (Person's Name and Firm) Ethan Orange, Cascade Drilling LP
Distance from Waste/Source ft. / State IL	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number ____

A. Protective pipe, top elevation ____ ft. (NAVD88)

B. Well casing, top elevation 389.58 ft. (NAVD88)

C. Land surface elevation 386.4 ft. (NAVD88)

D. Surface seal, bottom 385.4 ft. (NAVD88) or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☒ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ Hollow Stem Auger ☐ ____ Other ☐

15. Drilling fluid used: Water ☐ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☒

16. Drilling additives used? ☐ Yes ☒

Describe ____

17. Source of water (attach analysis, if required): ____

E. Bentonite seal, top 385.4 ft. (NAVD88) or 1.0 ft.

F. Fine sand, top 380.4 ft. (NAVD88) or 6.0 ft.

G. Filter pack, top 380.4 ft. (NAVD88) or 6.0 ft.

H. Screen joint, top 379.4 ft. (NAVD88) or 7.0 ft.

I. Well bottom 369.4 ft. (NAVD88) or 17.0 ft.

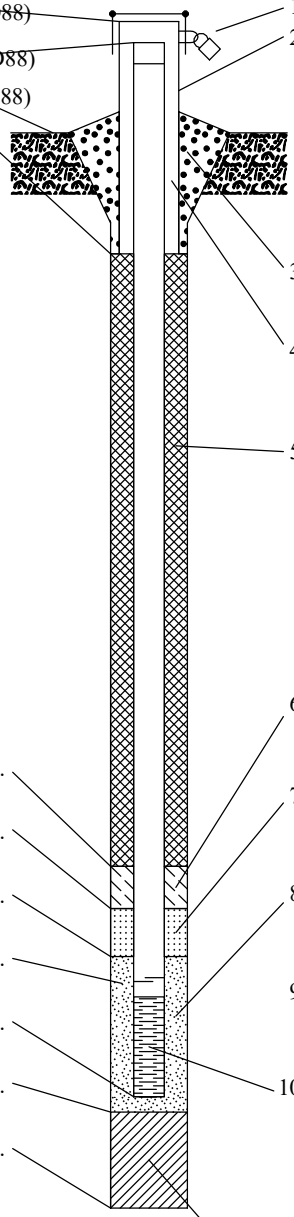
J. Filter pack, bottom 369.4 ft. (NAVD88) or 17.0 ft.

K. Borehole, bottom 366.4 ft. (NAVD88) or 20.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
   a. Inside diameter: 4.0 in.
   b. Length: 3.0 ft.
   c. Material: Steel ☒ Other ☐ ____
   d. Additional protection? ☒ Yes ☐ No
      If yes, describe: bollards
3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐ ____
4. Material between well casing and protective pipe: Filtersil Bentonite ☐ Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☒
   b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
   c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐
   d. ____ % Bentonite . . . Bentonite-cement grout ☐
   e. 1 Ft^3 volume added for any of the above
   f. How installed: Tremie ☐ Tremie pumped ☐ Gravity ☒
6. Bentonite seal: a. Bentonite granules ☐
   b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
   c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
   a. ____
   b. Volume added ____ ft^3
8. Filter pack material: Manufacturer, product name & mesh size
   a. Filtersil
   b. Volume added 2.0 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐ ____
10. Screen material: Schedule 40 PVC
    a. Screen Type: Factory cut ☒ Continuous slot ☐ Other ☐ ____
    b. Manufacturer ____
    c. Slot size: 0.010 in.
    d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ☐ Other ☐ bentonite chips

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Date Modified: 7/9/2024

Signature	Firm: Ramboll	Tel: Fax:

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Baldwin Power Plant	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: MW-253R
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. ° ' " Long. ° ' " or St. Plane 553297.657 ft. N, 2384440.098 ft. E. S/C/N	Date Well Installed: 05/01/2024
Facility ID	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐ E ☐ W	Well Installed By: (Person's Name and Firm) Ethan Orange, Cascade Drilling LP
Type of Well	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number: ____
Distance from Waste/Source: ____ ft. State: IL		

A. Protective pipe, top elevation ____ ft. (NAVD88)

B. Well casing, top elevation 445.66 ft. (NAVD88)

C. Land surface elevation 442.7 ft. (NAVD88)

D. Surface seal, bottom 441.7 ft. (NAVD88) or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☒

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ Hollow Stem Auger ☐ ____ Other ☐

15. Drilling fluid used: Water ☒ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒

Describe ____

17. Source of water (attach analysis, if required): ____

E. Bentonite seal, top 419.7 ft. (NAVD88) or 23.0 ft.

F. Fine sand, top 415.7 ft. (NAVD88) or 27.0 ft.

G. Filter pack, top 415.7 ft. (NAVD88) or 27.0 ft.

H. Screen joint, top 413.2 ft. (NAVD88) or 29.5 ft.

I. Well bottom 407.7 ft. (NAVD88) or 35.0 ft.

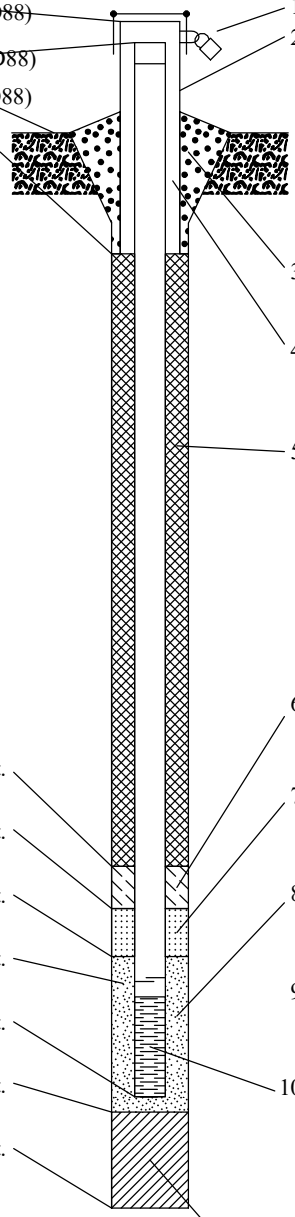
J. Filter pack, bottom 407.7 ft. (NAVD88) or 35.0 ft.

K. Borehole, bottom 407.7 ft. (NAVD88) or 35.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
   a. Inside diameter: 4.0 in.
   b. Length: 3.0 ft.
   c. Material: Steel ☒ Other ☐ ____
   d. Additional protection? ☒ Yes ☐ No
      If yes, describe: bollards
3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐ ____
4. Material between well casing and protective pipe: Filtersil Bentonite ☐ Other ☒
5. Annular space seal: a. Granular/Chipped Bentonite ☐
   b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
   c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐
   d. ____ % Bentonite . . . Bentonite-cement grout ☐
   e. 3.4 Ft^3 volume added for any of the above
   f. How installed: Tremie ☐ Tremie pumped ☒ Gravity ☐
6. Bentonite seal: a. Bentonite granules ☐
   b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
   c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
   a. ____
   b. Volume added ____ ft^3
8. Filter pack material: Manufacturer, product name & mesh size
   a. Filtersil
   b. Volume added 1.5 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐ ____
10. Screen material: Schedule 40 PVC
    a. Screen Type: Factory cut ☒ Continuous slot ☐ Other ☐ ____
    b. Manufacturer ____
    c. Slot size: 0.010 in.
    d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☒ Other ☐ ____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Date Modified: 7/9/2024

Signature:	Firm: Ramboll	Tel: Fax:

RAMBOLL

MONITORING WELL CONSTRUCTION

Facility/Project Name: Baldwin Power Plant	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: MW-350R
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. ° ' " Long. ° ' " or	
Facility ID	St. Plane 554568.067 ft. N, 2379418.994 ft. E. S/C/N	Date Well Installed: 05/03/2024
Type of Well	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐ E ☐ W	Well Installed By: (Person's Name and Firm) Ethan Orange, Cascade Drilling LP
Distance from Waste/Source ft. / State IL	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number: ____

A. Protective pipe, top elevation ____ ft. (NAVD88)

B. Well casing, top elevation 396.3 ft. (NAVD88)

C. Land surface elevation 394.1 ft. (NAVD88)

D. Surface seal, bottom 393.1 ft. (NAVD88) or 1.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☒

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ Hollow Stem Auger ☐ ____ Other ☐

15. Drilling fluid used: Water ☒ 0 2 Air ☐ Drilling Mud ☐ 0 3 None ☐

16. Drilling additives used? ☐ Yes ☒

Describe ____

17. Source of water (attach analysis, if required): ____

E. Bentonite seal, top 367.1 ft. (NAVD88) or 27.0 ft.

F. Fine sand, top 357.1 ft. (NAVD88) or 37.0 ft.

G. Filter pack, top 357.1 ft. (NAVD88) or 37.0 ft.

H. Screen joint, top 352.1 ft. (NAVD88) or 42.0 ft.

I. Well bottom 347.1 ft. (NAVD88) or 47.0 ft.

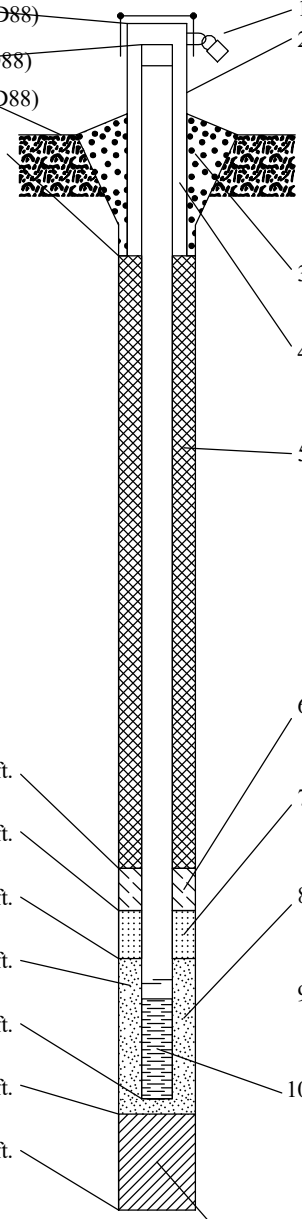
J. Filter pack, bottom 347.1 ft. (NAVD88) or 47.0 ft.

K. Borehole, bottom 347.1 ft. (NAVD88) or 47.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
   a. Inside diameter: 4.0 in.
   b. Length: 5.0 ft.
   c. Material: Steel ☒ Other ☐ ____
   d. Additional protection? ☒ Yes ☐ No
      If yes, describe: bollards
3. Surface seal: Bentonite ☐ Concrete ☒ Other ☐ ____
4. Material between well casing and protective pipe: Filtersil Bentonite ☐ Other ☒ ____
5. Annular space seal: a. Granular/Chipped Bentonite ☐
   b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐
   c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐
   d. ____ % Bentonite . . . Bentonite-cement grout ☐
   e. 4 Ft^3 volume added for any of the above
   f. How installed: Tremie ☐ Tremie pumped ☒ Gravity ☐
6. Bentonite seal: a. Bentonite granules ☐
   b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒
   c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
   a. ____
   b. Volume added ____ ft^3
8. Filter pack material: Manufacturer, product name & mesh size
   a. Filtersil
   b. Volume added 1.75 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ Flush threaded PVC schedule 80 ☐ Other ☐ ____
10. Screen material: Schedule 40 PVC
    a. Screen Type: Factory cut ☒ Continuous slot ☐ Other ☐ ____
    b. Manufacturer ____
    c. Slot size: 0.010 in.
    d. Slotted length: 5.0 ft.
11. Backfill material (below filter pack): None ☒ Other ☐ ____

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Date Modified: 7/9/2024

Signature	Firm: Ramboll	Tel: Fax:

MONITORING WELL CONSTRUCTION

Facility/Project Name: Vistra - Baldwin Nature and Extent	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: MW-198
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☐ Lat. ___° ___' ___" Long. ___° ___' ___" or	Unique Well No. / Well Number
Facility ID	St. Plane 553817.91 ft. N, 2380816.27 ft. E.	Date Well Installed: 10/15/2024
Type of Well: Monitoring Well	Section Location: ___ 1/4 of ___ 1/4 of Sec. ___, T. ___ R. ___	Well Installed By: (Person's Name and Firm) Jeremy Triepke / Cascade Drilling LP
Distance from Waste/Source ___ ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number

A. Protective pipe, top elevation ___ ft. MSL

B. Well casing, top elevation 398.305 ft. MSL

C. Land surface elevation 396.37 ft. MSL

D. Surface seal, bottom 396.37 ft. MSL or 0.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ■ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ■ No

14. Drilling method used: Rotary ☐ 5 0
Hollow Stem Auger ☐ 4 1
Sonic Other ☐

15. Drilling fluid used: Water ■ 0 2 Air ☐ 0 1
Drilling Mud ☐ 0 3 None ☐ 9 9

16. Drilling additives used? ☐ Yes ■ No

Describe ___

17. Source of water (attach analysis, if required):
On-site potable

E. Bentonite seal, top 396.37 ft. MSL or 0.0 ft.

F. Fine sand, top 391.37 ft. MSL or 5.0 ft.

G. Filter pack, top 390.37 ft. MSL or 6.0 ft.

H. Screen joint, top 388.37 ft. MSL or 8.0 ft.

I. Well bottom 378.37 ft. MSL or 18.0 ft.

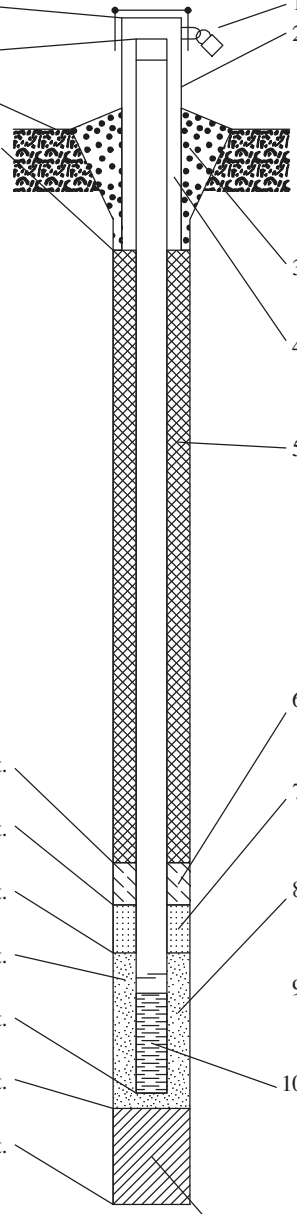
J. Filter pack, bottom 377.37 ft. MSL or 19.0 ft.

K. Borehole, bottom 376.37 ft. MSL or 20.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ■ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 3.0 ft.
c. Material: Steel ■ 0 4
___ Other ☐
d. Additional protection? ■ Yes ☐ No
If yes, describe: Four steel bollards

3. Surface seal: Bentonite ☐ 3 0
Concrete ■ 0 1
___ Other ☐

4. Material between well casing and protective pipe:
Bentonite ☐ 3 0
___ Other ☐

5. Annular space seal: a. Granular/Chipped Bentonite ■ 3 3
b. ___ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5
c. ___ Lbs/gal mud weight . . . Bentonite slurry ☐ 3 1
d. ___ % Bentonite . . . Bentonite-cement grout ☐ 5 0
e. 0.5 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 0 1
Tremie pumped ☐ 0 2
Gravity ■ 0 8

6. Bentonite seal: a. Bentonite granules ☐ 3 3
b. ☐ 1/4 in. ■ 3/8 in. ☐ 1/2 in. Bentonite chips ■ 3 2
c. ___ Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. Red Flint #20
b. Volume added 0.13 ft^3

8. Filter pack material: Manufacturer, product name & mesh size
a. Red Flint #40
b. Volume added 2.0 ft^3

9. Well casing: Flush threaded PVC schedule 40 ■ 2 3
Flush threaded PVC schedule 80 ☐ 2 4
___ Other ☐

10. Screen material: Schedule 40 PVC
a. Screen Type: Factory cut ■ 1 1
Continuous slot ☐ 0 1
___ Other ☐
b. Manufacturer Johnson
c. Slot size: 0.010 in.
d. Slotted length: 10.0 ft.

11. Backfill material (below filter pack): None ☐ 1 4
3/8 in. bentonite chips Other ■

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm
	Ramboll Americas Engineering Solutions

MONITORING WELL CONSTRUCTION

Facility/Project Name: Vistra - Baldwin Nature and Extent	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: MW-358R
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☐ Lat. ___° ___' ___" Long. ___° ___' ___" or	Unique Well No. / Well Number
Facility ID	St. Plane 556727.07 ft. N, 2387763.29 ft. E.	Date Well Installed: 10/12/2024
Type of Well: Monitoring Well	Section Location: ___ 1/4 of ___ 1/4 of Sec. ___, T. ___ R. ___	Well Installed By: (Person's Name and Firm) Jeremy Triepke, Cascade Drilling LP
Distance from Waste/Source ___ ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known; Gov. Lot Number ___	

A. Protective pipe, top elevation ___ ft. MSL

B. Well casing, top elevation 456.293 ft. MSL

C. Land surface elevation 453.562 ft. MSL

D. Surface seal, bottom 453.562 ft. MSL or 0.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ■

13. Sieve analysis attached? ☐ Yes ■ No

14. Drilling method used: Rotary ☐ 5 0
Hollow Stem Auger ☐ 4 1
Sonic Other ☐

15. Drilling fluid used: Water ■ 0 2 Air ☐ 0 1
Drilling Mud ☐ 0 3 None ☐ 9 9

16. Drilling additives used? ☐ Yes ■ No

Describe ___

17. Source of water (attach analysis, if required):
On-site potable

E. Bentonite seal, top 378.562 ft. MSL or 75.0 ft.

F. Fine sand, top 377.562 ft. MSL or 76.0 ft.

G. Filter pack, top 375.562 ft. MSL or 78.0 ft.

H. Screen joint, top 373.562 ft. MSL or 80.0 ft.

I. Well bottom 363.562 ft. MSL or 90.0 ft.

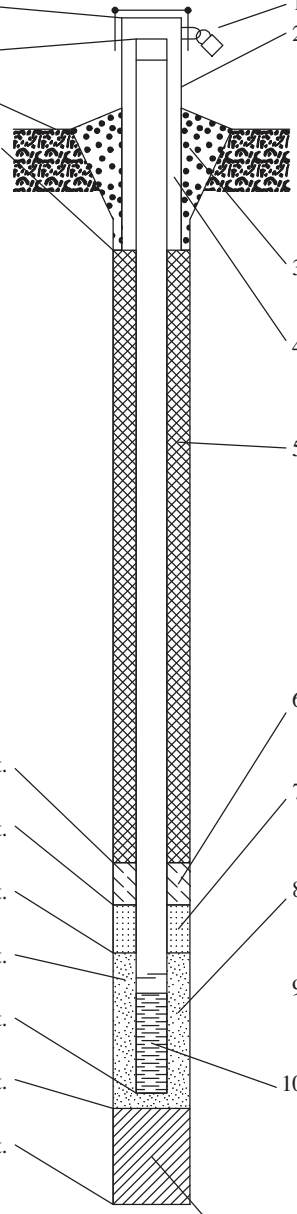
J. Filter pack, bottom 363.562 ft. MSL or 90.0 ft.

K. Borehole, bottom 363.562 ft. MSL or 90.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ■ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ■ 0 4
___ Other ☐
d. Additional protection? ■ Yes ☐ No
If yes, describe: Steel bollards
3. Surface seal: Bentonite ☐ 3 0
Concrete ■ 0 1
___ Other ☐
4. Material between well casing and protective pipe:
Bentonite ☐ 3 0
Bentonite-cement grout Other ■
5. Annular space seal: a. Granular/Chipped Bentonite ☐ 3 3
b. ___ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5
c. ___ Lbs/gal mud weight . . . Bentonite slurry ☐ 3 1
d. ___ % Bentonite . . . Bentonite-cement grout ■ 5 0
e. 1.88 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 0 1
Tremie pumped ■ 0 2
Gravity ☐ 0 8
6. Bentonite seal: a. Bentonite granules ☐ 3 3
b. ☐ 1/4 in. ■ 3/8 in. ☐ 1/2 in. Bentonite chips ■ 3 2
c. ___ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Red Flint #20
b. Volume added 0.13 ft^3
8. Filter pack material: Manufacturer, product name & mesh size
a. Red Flint #40
b. Volume added 2.0 ft^3
9. Well casing: Flush threaded PVC schedule 40 ■ 2 3
Flush threaded PVC schedule 80 ☐ 2 4
___ Other ☐
10. Screen material: Schedule 40 PVC
a. Screen Type: Factory cut ■ 1 1
Continuous slot ☐ 0 1
___ Other ☐
b. Manufacturer Johnson
c. Slot size: 0.010 in.
d. Slotted length: 10.0 ft.
11. Backfill material (below filter pack): None ■ 1 4
___ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm
	Ramboll Americas Engineering Solutions

MONITORING WELL CONSTRUCTION

Facility/Project Name: Vistra - Baldwin Nature and Extent	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: MW-391R
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☐ Lat. ___° ___' ___" Long. ___° ___' ___" or	Unique Well No. / Well Number
Facility ID	St. Plane 555106.51 ft. N, 2380480.41 ft. E.	Date Well Installed: 10/10/2024
Type of Well: Monitoring Well	Section Location: ___ 1/4 of ___ 1/4 of Sec. ___, T. ___ R. ___	Well Installed By: (Person's Name and Firm) Jeremy Triepke / Cascade Drilling LP
Distance from Waste/Source ___ ft.	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number

A. Protective pipe, top elevation ___ ft. MSL

B. Well casing, top elevation 426.989 ft. MSL

C. Land surface elevation 424.655 ft. MSL

D. Surface seal, bottom 424.655 ft. MSL or 0.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ■

13. Sieve analysis attached? ☐ Yes ■ No

14. Drilling method used: Rotary ☐ 5 0
Hollow Stem Auger ☐ 4 1
Sonic Other ☒

15. Drilling fluid used: Water ■ 0 2 Air ☐ 0 1
Drilling Mud ☐ 0 3 None ☐ 9 9

16. Drilling additives used? ☐ Yes ■ No

Describe ___

17. Source of water (attach analysis, if required):
On-site potable

E. Bentonite seal, top 377.655 ft. MSL or 47.0 ft.

F. Fine sand, top 374.655 ft. MSL or 50.0 ft.

G. Filter pack, top 371.655 ft. MSL or 53.0 ft.

H. Screen joint, top 369.655 ft. MSL or 55.0 ft.

I. Well bottom 354.655 ft. MSL or 70.0 ft.

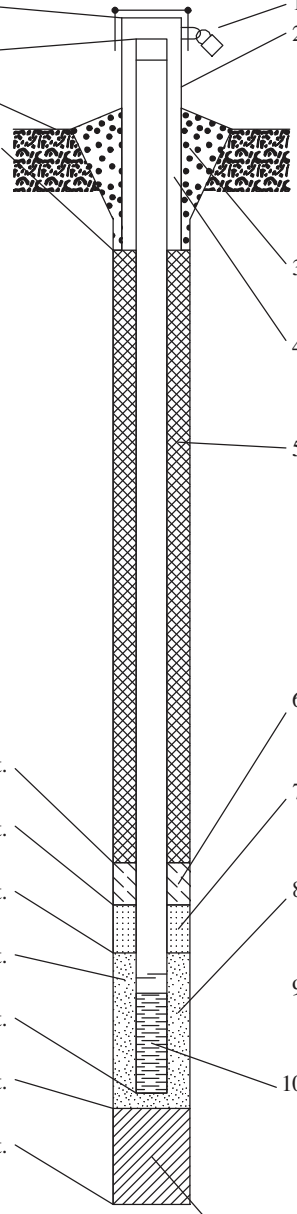
J. Filter pack, bottom 352.855 ft. MSL or 71.8 ft.

K. Borehole, bottom 352.655 ft. MSL or 72.0 ft.

L. Borehole, diameter 6.0 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.07 in.



1. Cap and lock? ■ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ■ 0 4
___ Other ☐
d. Additional protection? ■ Yes ☐ No
If yes, describe: Steel bollards
3. Surface seal: Bentonite ☐ 3 0
Concrete ■ 0 1
___ Other ☐
4. Material between well casing and protective pipe:
Bentonite ☐ 3 0
Bentonite-cement grout Other ■
5. Annular space seal: a. Granular/Chipped Bentonite ☐ 3 3
b. ___ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5
c. ___ Lbs/gal mud weight . . . Bentonite slurry ☐ 3 1
d. ___ % Bentonite . . . Bentonite-cement grout ■ 5 0
e. 1.25 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 0 1
Tremie pumped ■ 0 2
Gravity ☐ 0 8
6. Bentonite seal: a. Bentonite granules ☐ 3 3
b. ☐ 1/4 in. ■ 3/8 in. ☐ 1/2 in. Bentonite chips ■ 3 2
c. ___ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Red Flint #20
b. Volume added 0.13 ft^3
8. Filter pack material: Manufacturer, product name & mesh size
a. Red Flint #40
b. Volume added 2.0 ft^3
9. Well casing: Flush threaded PVC schedule 40 ■ 2 3
Flush threaded PVC schedule 80 ☐ 2 4
___ Other ☐
10. Screen material: Schedule 40 PVC
a. Screen Type: Factory cut ■ 1 1
Continuous slot ☐ 0 1
___ Other ☐
b. Manufacturer Johnson
c. Slot size: 0.010 in.
d. Slotted length: 15.0 ft.
11. Backfill material (below filter pack): None ■ 1 4
___ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm: Ramboll Americas Engineering Solutions

ATTACHMENT E
Monitoring Well Development Logs

RAMBOLL

MONITORING WELL DEVELOPMENT

Facility/Project Name	State	Well Name
Baldwin Power Plant	IL	MW-195

Facility License, Permit or Monitoring Number

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:
   - surged with bailer and bailed ☐
   - surged with bailer and pumped ☐
   - surged with block and bailed ☐
   - surged with block and pumped ☒
   - surged with block, bailed, and pumped ☐
   - compressed air ☐
   - bailed only ☐
   - pumped only ☐
   - pumped slowly ☐
   - other _____ ☐

3. Time spent developing well 40 min.

4. Depth of well (from top of well casing) 51.6 ft.

5. Inside diameter of well 2.07 in.

6. Volume of water in filter pack and well casing 6.97 gal.

7. Volume of water removed from well 20.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added not applicable

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	37.39 ft.	51.60 ft.
Date	b.	5/9/2024	5/9/2024
Time	c.	08:30 ☒ a.m. ☐ p.m.	09:10 ☒ a.m. ☐ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ Turbid ☒ (Describe)	Clear ☒ Turbid ☐ (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Evvan Plank
Ramboll

17. Additional comments on development:
Monitoring well developed by Cascade Drilling with oversight from Ramboll. Well purged dry on 5/9/2024 after removing appriximately 20 gallons.

Facility Address or Owner/Responsible Party Address

Name: Baldwin Power Plant

Firm: Dynegy Midwest Generation, LLC

Street: 10901 Baldwin Road

City/State/Zip: Baldwin IL 62217

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Evvan Plank

Print Name: Evvan Plank

Firm: Ramboll

Template: RAMBOLL_WELL DEVELOPMENT

Date Modified: 7/9/2024

RAMBOLL

MONITORING WELL DEVELOPMENT

Facility/Project Name	State	Well Name
Baldwin Power Plant	IL	MW-196

Facility License, Permit or Monitoring Number

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:
   - surged with bailer and bailed ☐
   - surged with bailer and pumped ☐
   - surged with block and bailed ☐
   - surged with block and pumped ☒
   - surged with block, bailed, and pumped ☐
   - compressed air ☐
   - bailed only ☐
   - pumped only ☐
   - pumped slowly ☐
   - other _____ ☐

3. Time spent developing well 20 min.

4. Depth of well (from top of well casing) 21.3 ft.

5. Inside diameter of well 2.07 in.

6. Volume of water in filter pack and well casing 7.2 gal.

7. Volume of water removed from well 14.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added not applicable

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	3.60 ft.	21.30 ft.
Date	b.	5/9/2024	5/9/2024
Time	c.	01:53 ☐ a.m. ☒ p.m.	04:01 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ Turbid ☒ (Describe)	Clear ☒ Turbid ☐ (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Evvan Plank
Ramboll

17. Additional comments on development:
Monitoring well developed by Cascade Drilling with oversight from Ramboll. Well purged dry 3 times on 5/9/2024 after removing approximately 14 gallons of water.

Facility Address or Owner/Responsible Party Address

Name: Baldwin Power Plant

Firm: Dynegy Midwest Generation, LLC

Street: 10901 Baldwin Road

City/State/Zip: Baldwin IL 62217

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Evvan Plank

Print Name: Evvan Plank

Firm: Ramboll

Template: RAMBOLL_WELL DEVELOPMENT

Date Modified: 7/9/2024

RAMBOLL

MONITORING WELL DEVELOPMENT

Facility/Project Name	State	Well Name
Baldwin Power Plant	IL	MW-197

Facility License, Permit or Monitoring Number

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:
   - surged with bailer and bailed ☐
   - surged with bailer and pumped ☐
   - surged with block and bailed ☐
   - surged with block and pumped ☒
   - surged with block, bailed, and pumped ☐
   - compressed air ☐
   - bailed only ☐
   - pumped only ☐
   - pumped slowly ☐
   - other _____ ☐

3. Time spent developing well 20 min.

4. Depth of well (from top of well casing) 20.7 ft.

5. Inside diameter of well 2.07 in.

6. Volume of water in filter pack and well casing 8.49 gal.

7. Volume of water removed from well 14.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added not applicable

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	4.48 ft.	20.66 ft.
Date	b.	5/9/2024	5/9/2024
Time	c.	02:30 ☐ a.m. ☒ p.m.	05:59 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ Turbid ☒ (Describe)	Clear ☒ Turbid ☐ (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Evvan Plank
Ramboll

17. Additional comments on development:
Monitoring well developed by Cascade Drilling with oversight from Ramboll. Well purged dry 3 times on 5/9/2024 after removing approximately 14 gallons of water.

Facility Address or Owner/Responsible Party Address

Name: Baldwin Power Plant

Firm: Dynegy Midwest Generation, LLC

Street: 10901 Baldwin Road

City/State/Zip: Baldwin IL 62217

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Evvan Plank

Print Name: Evvan Plank

Firm: Ramboll

Template: RAMBOLL_WELL DEVELOPMENT

Date Modified: 7/9/2024

RAMBOLL

MONITORING WELL DEVELOPMENT

Facility/Project Name	State	Well Name
Baldwin Power Plant	IL	MW-253R

Facility License, Permit or Monitoring Number

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:
   - surged with bailer and bailed ☐
   - surged with bailer and pumped ☐
   - surged with block and bailed ☐
   - surged with block and pumped ☒
   - surged with block, bailed, and pumped ☐
   - compressed air ☐
   - bailed only ☐
   - pumped only ☐
   - pumped slowly ☐
   - other _____ ☐

3. Time spent developing well 35 min.

4. Depth of well (from top of well casing) 37.6 ft.

5. Inside diameter of well 2.07 in.

6. Volume of water in filter pack and well casing 9.26 gal.

7. Volume of water removed from well 18.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added not applicable

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	10.65 ft.	37.60 ft.
Date	b.	5/7/2024	5/9/2024
Time	c.	08:30 ☒ a.m. ☐ p.m.	03:00 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ Turbid ☒ (Describe)	Clear ☒ Turbid ☐ (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Evvan Plank
Ramboll

17. Additional comments on development:
Monitoring well developed by Cascade Drilling with oversight from Ramboll. Well purged dry on 5/7/2024 after removing 13 gallons of water. Well purged dry 2 times on 5/9/24 after removing 5 gallons of water.

Facility Address or Owner/Responsible Party Address

Name: Baldwin Power Plant

Firm: Dynegy Midwest Generation, LLC

Street: 10901 Baldwin Road

City/State/Zip: Baldwin IL 62217

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Evvan Plank

Print Name: Evvan Plank

Firm: Ramboll

Template: RAMBOLL_WELL DEVELOPMENT

Date Modified: 7/9/2024

RAMBOLL

MONITORING WELL DEVELOPMENT

Facility/Project Name	State	Well Name
Baldwin Power Plant	IL	MW-350R

Facility License, Permit or Monitoring Number

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:
   - surged with bailer and bailed ☐
   - surged with bailer and pumped ☐
   - surged with block and bailed ☐
   - surged with block and pumped ☒
   - surged with block, bailed, and pumped ☐
   - compressed air ☐
   - bailed only ☐
   - pumped only ☐
   - pumped slowly ☐
   - other _____ ☐

3. Time spent developing well 120 min.

4. Depth of well (from top of well casing) 49.6 ft.

5. Inside diameter of well 2.07 in.

6. Volume of water in filter pack and well casing 10.96 gal.

7. Volume of water removed from well 70.0 gal.

8. Volume of water added (if any) 25.0 gal.

9. Source of water added Baldwin Municipal

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	12.65 ft.	49.60 ft.
Date	b.	5/6/2024	5/9/2024
Time	c.	11:35 ☒ a.m. ☐ p.m.	06:00 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ Turbid ☒ (Describe)	Clear ☒ Turbid ☐ (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Evvan Plank
Ramboll

17. Additional comments on development:
Monitoring well developed by Cascade Drilling with oversight from Ramboll. Well purged dry on 5/6/2024 after removing 20 gallons of water. Cascade pumped 25 gallons of water into well on 5/9/2024 and removed 50 gallons of water.

Facility Address or Owner/Responsible Party Address

Name: Baldwin Power Plant

Firm: Dynegy Midwest Generation, LLC

Street: 10901 Baldwin Road

City/State/Zip: Baldwin IL 62217

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Evvan Plank

Print Name: Evvan Plank

Firm: Ramboll

Template: RAMBOLL_WELL DEVELOPMENT

Date Modified: 7/9/2024

RAMBOLL

MONITORING WELL DEVELOPMENT

Facility/Project Name	State	Well Name
Baldwin Power Plant	IL	PZ-174

Facility License, Permit or Monitoring Number

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:
   - surged with bailer and bailed ☐
   - surged with bailer and pumped ☐
   - surged with block and bailed ☐
   - surged with block and pumped ☒
   - surged with block, bailed, and pumped ☐
   - compressed air ☐
   - bailed only ☐
   - pumped only ☐
   - pumped slowly ☐
   - other _____ ☐

3. Time spent developing well 32 min.

4. Depth of well (from top of well casing) 27.4 ft.

5. Inside diameter of well 2.07 in.

6. Volume of water in filter pack and well casing 7.13 gal.

7. Volume of water removed from well 25.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added not applicable

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	12.96 ft.	27.40 ft.
Date	b.	4/29/2024	4/29/2024
Time	c.	03:28 ☐ a.m. ☒ p.m.	04:00 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ Turbid ☒ (Describe)	Clear ☒ Turbid ☐ (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Evvan Plank
Ramboll

17. Additional comments on development:
Piezometer was redeveloped to clean up fine materials.

Facility Address or Owner/Responsible Party Address

Name: Baldwin Power Plant

Firm: Dynegy Midwest Generation, LLC

Street: 10901 Baldwin Road

City/State/Zip: Baldwin IL 62217

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Evvan Plank

Print Name: Evvan Plank

Firm: Ramboll

Template: RAMBOLL_WELL DEVELOPMENT

Date Modified: 7/9/2024

RAMBOLL

MONITORING WELL DEVELOPMENT

Facility/Project Name	State	Well Name
Baldwin Power Plant	IL	PZ-176

Facility License, Permit or Monitoring Number

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:
   - surged with bailer and bailed ☐
   - surged with bailer and pumped ☐
   - surged with block and bailed ☐
   - surged with block and pumped ☒
   - surged with block, bailed, and pumped ☐
   - compressed air ☐
   - bailed only ☐
   - pumped only ☐
   - pumped slowly ☐
   - other _____ ☐

3. Time spent developing well 57 min.

4. Depth of well (from top of well casing) 32.3 ft.

5. Inside diameter of well 2.07 in.

6. Volume of water in filter pack and well casing 8.49 gal.

7. Volume of water removed from well 22.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added not applicable

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	11.25 ft.	32.30 ft.
Date	b.	4/29/2024	4/29/2024
Time	c.	04:25 ☐ a.m. ☒ p.m.	05:22 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ Turbid ☒ (Describe)	Clear ☒ Turbid ☐ (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Evvan Plank
Ramboll

17. Additional comments on development:
Piezometer was redeveloped to clean up fine materials.

Facility Address or Owner/Responsible Party Address

Name: Baldwin Power Plant

Firm: Dynegy Midwest Generation, LLC

Street: 10901 Baldwin Road

City/State/Zip: Baldwin IL 62217

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Evvan Plank

Print Name: Evvan Plank

Firm: Ramboll

Template: RAMBOLL_WELL DEVELOPMENT

Date Modified: 7/9/2024

RAMBOLL

MONITORING WELL DEVELOPMENT

Facility/Project Name	State	Well Name
Baldwin Power Plant	IL	PZ-178

Facility License, Permit or Monitoring Number

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:
   - surged with bailer and bailed ☐
   - surged with bailer and pumped ☐
   - surged with block and bailed ☐
   - surged with block and pumped ☒
   - surged with block, bailed, and pumped ☐
   - compressed air ☐
   - bailed only ☐
   - pumped only ☐
   - pumped slowly ☐
   - other _____ ☐

3. Time spent developing well 18 min.

4. Depth of well (from top of well casing) 45.6 ft.

5. Inside diameter of well 2.07 in.

6. Volume of water in filter pack and well casing 11.09 gal.

7. Volume of water removed from well 20.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added not applicable

10. Analysis performed on water added? ☐ Yes ☒ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	9.06 ft.	45.60 ft.
Date	b.	4/30/2024	4/30/2024
Time	c.	08:52 ☒ a.m. ☐ p.m.	09:10 ☒ a.m. ☐ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ Turbid ☒ (Describe)	Clear ☒ Turbid ☐ (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Evvan Plank
Ramboll

17. Additional comments on development:
Piezometer was redeveloped to clean up fine materials.

Facility Address or Owner/Responsible Party Address

Name: Baldwin Power Plant

Firm: Dynegy Midwest Generation, LLC

Street: 10901 Baldwin Road

City/State/Zip: Baldwin IL 62217

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: Evvan Plank

Print Name: Evvan Plank

Firm: Ramboll

MONITORING WELL DEVELOPMENT

Facility/Project Name	State	Well Name
Vistra - Baldwin Nature and Extent	Illinois	MW-198

Facility License, Permit or Monitoring Number

1. Can this well be purged dry? ☑ Yes ☐ No

2. Well development method:
   - surged with bailer and bailed ☑
   - surged with bailer and pumped ☐
   - surged with block and bailed ☐
   - surged with block and pumped ☑
   - surged with block, bailed, and pumped ☐
   - compressed air ☐
   - bailed only ☐
   - pumped only ☐
   - pumped slowly ☐
   - other _____ ☐

3. Time spent developing well _____ min.

4. Depth of well (from top of well casing) 20.79 ft.

5. Inside diameter of well 2.0 in.

6. Volume of water in filter pack and well casing 14.74 gal.

7. Volume of water removed from well ~ 9 gal.

8. Volume of water added (if any) _____ gal.

9. Source of water added sonic drill

10. Analysis performed on water added? ☐ Yes ☑ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	7.40 ft.	DRY ft.
Date	b.	10/16/2024	10/17/2024
Time	c.	7:29 ☑ a.m. ☐ p.m.	10:05 ☑ a.m. ☐ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ Turbid ☑ (Describe) cloudy	Clear ☑ Turbid ☐ (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Evvan Plank
Ramboll Americas Engineering Solutions, Inc.

17. Additional comments on development:

10/16/24: ~ 7 gal removed; 10/17/24: ~ 5 bailers removed

Facility Address or Owner/Responsible Party Address

Name: _____

Firm: _____

Street: _____

City/State/Zip: _____

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: _____

Print Name: Evvan Plank

Firm: Ramboll Americas Engineering Solutions, Inc.

MONITORING WELL DEVELOPMENT

Facility/Project Name	State	Well Name
Vistra - Baldwin Nature and Extent	Illinois	MW-358R

Facility License, Permit or Monitoring Number

1. Can this well be purged dry? ☑ Yes ☐ No

2. Well development method:
   - surged with bailer and bailed ☑
   - surged with bailer and pumped ☐
   - surged with block and bailed ☐
   - surged with block and pumped ☑
   - surged with block, bailed, and pumped ☐
   - compressed air ☐
   - bailed only ☐
   - pumped only ☐
   - pumped slowly ☐
   - other _____ ☐

3. Time spent developing well _____ min.

4. Depth of well (from top of well casing) 92.80 ft.

5. Inside diameter of well 2.0 in.

6. Volume of water in filter pack and well casing 62.81 gal.

7. Volume of water removed from well ~ 26 gal.

8. Volume of water added (if any) _____ gal.

9. Source of water added sonic drill

10. Analysis performed on water added? ☐ Yes ☑ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	6.58 ft.	DRY ft.
Date	b.	10/15/2024	10/17/2024
Time	c.	4:02 ☐ a.m. ☑ p.m.	7:37 ☑ a.m. ☐ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ Turbid ☑ (Describe) cloudy	Clear ☑ Turbid ☐ (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Evvan Plank
Ramboll Americas Engineering Solutions, Inc.

17. Additional comments on development:

10/15/24: ~ 20 gal removed; 10/16/24: ~ 3 removed; 10/17/24: ~ 6 bailers removed

Facility Address or Owner/Responsible Party Address

Name: _____

Firm: _____

Street: _____

City/State/Zip: _____

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: _____

Print Name: Evvan Plank

Firm: Ramboll Americas Engineering Solutions, Inc.

MONITORING WELL DEVELOPMENT

Facility/Project Name	State	Well Name
Vistra - Baldwin Nature and Extent	Illinois	MW-391R

Facility License, Permit or Monitoring Number

1. Can this well be purged dry? ☑ Yes ☐ No

2. Well development method:
   - surged with bailer and bailed ☐
   - surged with bailer and pumped ☐
   - surged with block and bailed ☐
   - surged with block and pumped ☑
   - surged with block, bailed, and pumped ☐
   - compressed air ☐
   - bailed only ☐
   - pumped only ☐
   - pumped slowly ☐
   - other _____ ☐

3. Time spent developing well _____ min.

4. Depth of well (from top of well casing) 72.07 ft.

5. Inside diameter of well 2.0 in.

6. Volume of water in filter pack and well casing 52.40 gal.

7. Volume of water removed from well 39 gal.

8. Volume of water added (if any) _____ gal.

9. Source of water added sonic drill

10. Analysis performed on water added? ☐ Yes ☑ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	6.08 ft.	DRY ft.
Date	b.	10/13/2024	10/16/2024
Time	c.	12:30 ☐ a.m. ☑ p.m.	10:02 ☑ a.m. ☐ p.m.
12. Sediment in well bottom		inches	inches
13. Water clarity		Clear ☐ Turbid ☑ (Describe) cloudy brown	Clear ☐ Turbid ☑ (Describe) cloudy

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Lauren Anderson/Evvan Plank
Ramboll Americas Engineering Solutions, Inc.

17. Additional comments on development:

10/13/24: ~ 27 gal removed; 10/15/24: ~ 9 gal removed; 10/16/24: ~ 3 gal removed

Facility Address or Owner/Responsible Party Address

Name: _____

Firm: _____

Street: _____

City/State/Zip: _____

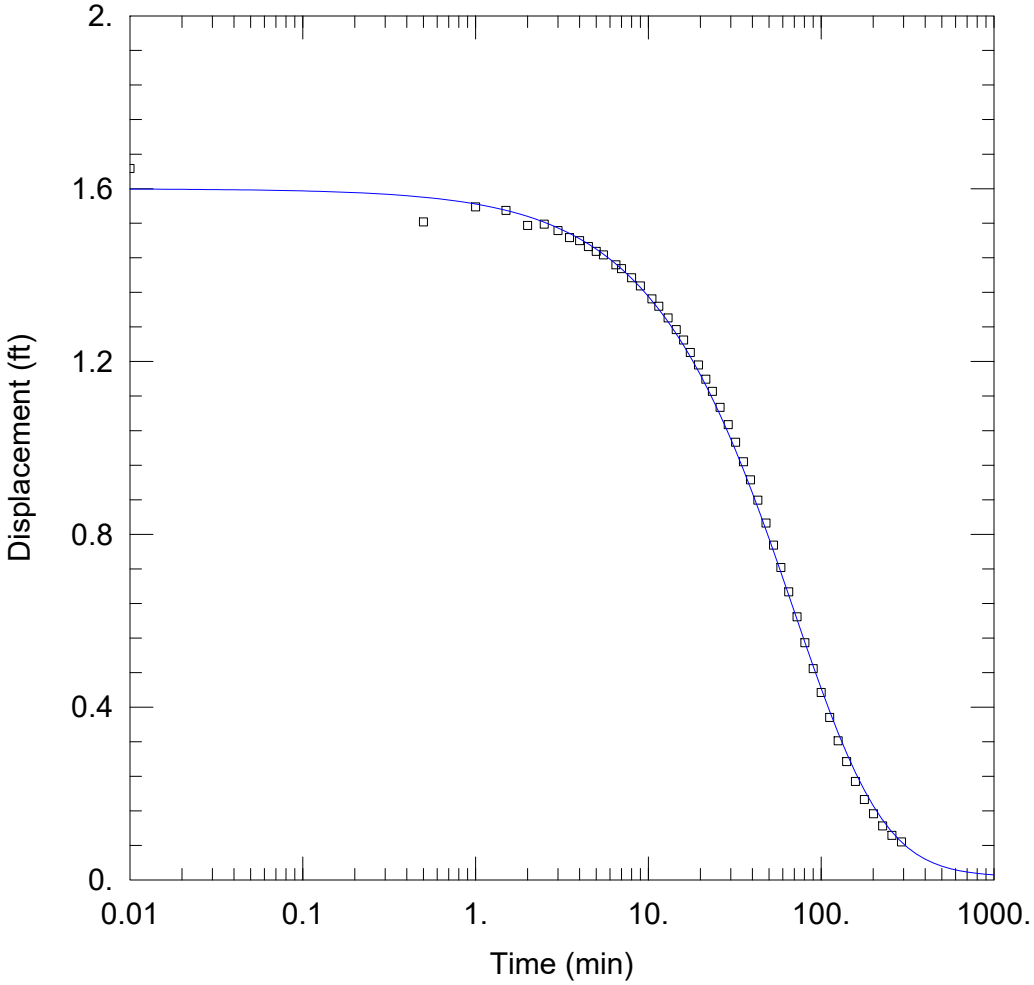
I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: _____

Print Name: Lauren Anderson/Evvan Plank

Firm: Ramboll Americas Engineering Solutions, Inc.

ATTACHMENT F
Slug Test Reports



MW-195 RISING HEAD TEST 1

PROJECT INFORMATION

Company: Ramboll
Client: Vistra
Project: 1940108209
Location: Baldwin, IL
Test Well: MW-195
Test Date: 9/5/2024

AQUIFER DATA

Saturated Thickness: 2.9 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-195)

Initial Displacement: 1.6 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.086 ft

Static Water Column Height: 11.75 ft
Screen Length: 10. ft
Well Radius: 0.25 ft

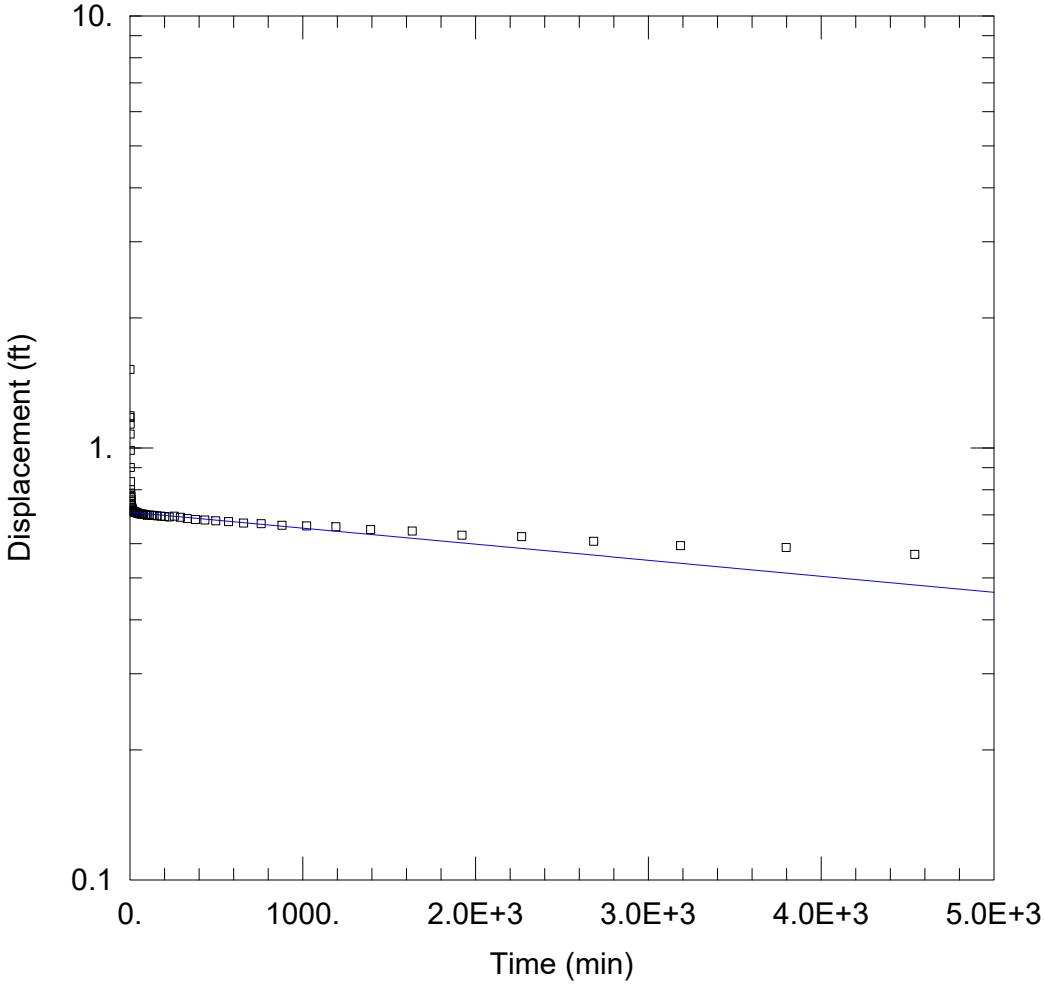
SOLUTION

Aquifer Model: Confined

Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.0047 cm^2/sec

S = 2.9E-6



MW-196 FALLING HEAD TEST 1

PROJECT INFORMATION

Company: Ramboll
Client: Vistra
Project: 1940108209
Location: Baldwin, IL
Test Well: MW-196
Test Date: 9/5/2024

AQUIFER DATA

Saturated Thickness: 1.9 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-196)

Initial Displacement: 1.52 ft
Total Well Penetration Depth: 1.9 ft
Casing Radius: 0.086 ft

Static Water Column Height: 1.9 ft
Screen Length: 1.9 ft
Well Radius: 0.25 ft
Gravel Pack Porosity: 0.25

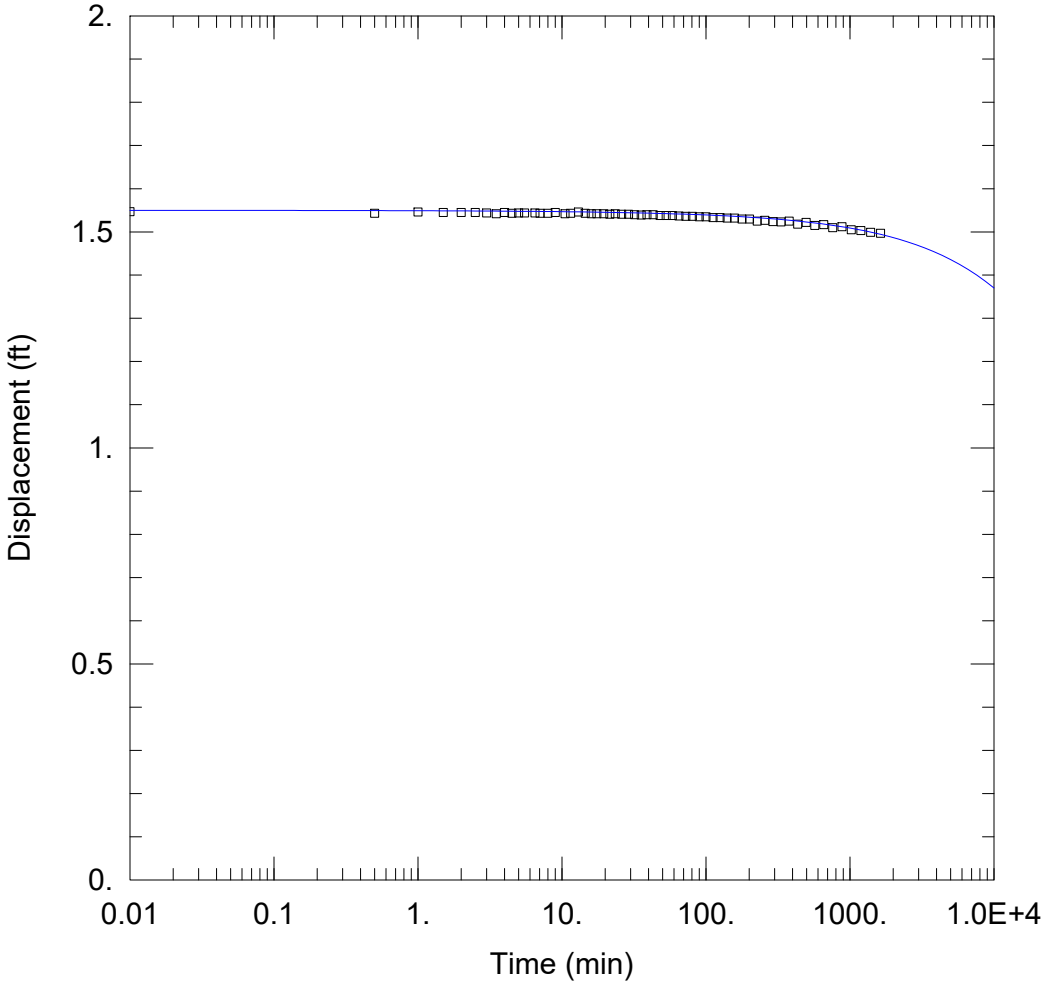
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 3.5E-7 cm/sec

y0 = 0.71 ft



MW-197 FALLING HEAD TEST 1

PROJECT INFORMATION

Company: Ramboll
Client: Vistra
Project: 1940108209
Location: Baldwin, IL
Test Well: MW-197
Test Date: 9/5/2024

AQUIFER DATA

Saturated Thickness: 10. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-197)

Initial Displacement: 1.55 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.086 ft

Static Water Column Height: 10.4 ft
Screen Length: 10. ft
Well Radius: 0.25 ft

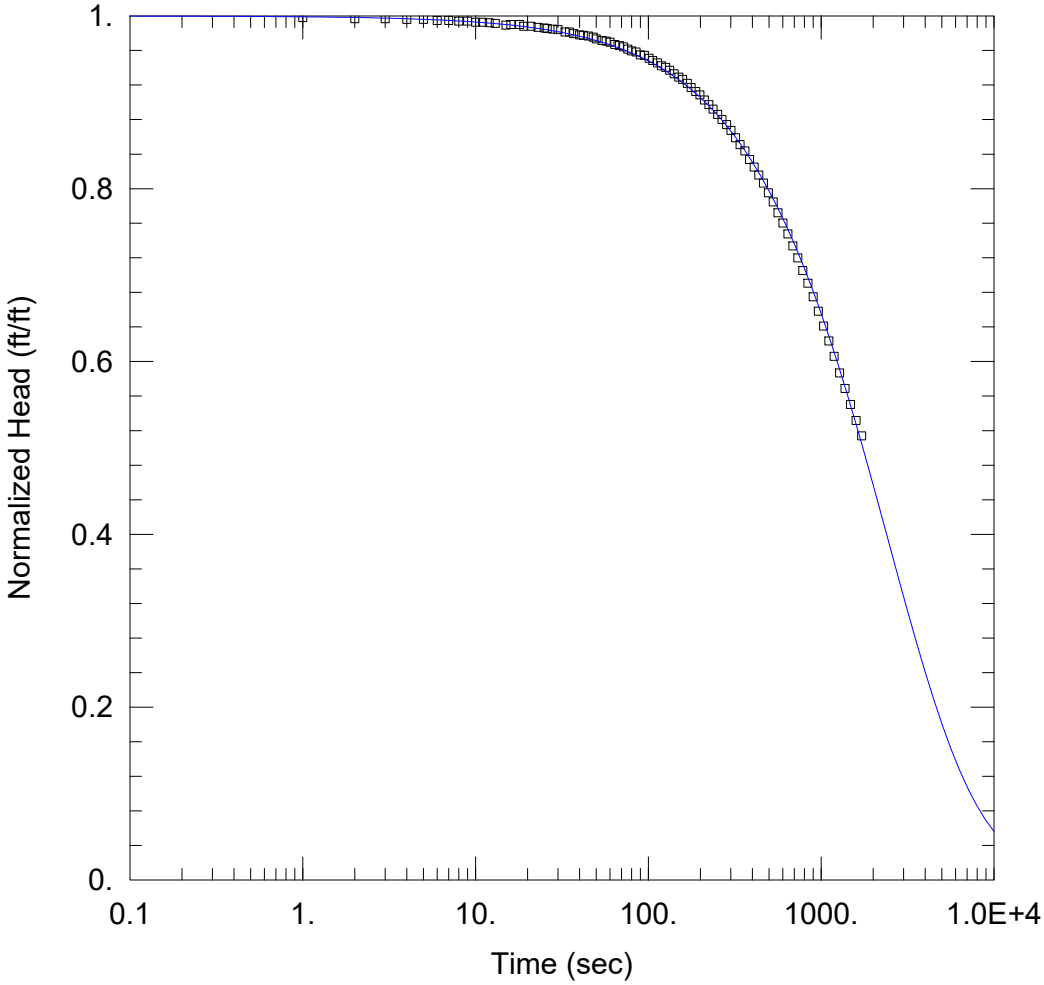
SOLUTION

Aquifer Model: Confined

Solution Method: Cooper-Bredehoeft-Papadopulos

T = 9.4E-7 cm^2/sec

S = 0.0011



MW-198 FH1

PROJECT INFORMATION

Company: Ramboll
Client: Vistra
Project: 1940110654
Location: Baldwin
Test Date: 12/11/24

AQUIFER DATA

Saturated Thickness: 12.79 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-198)

Initial Displacement: -1.51 ft
Total Well Penetration Depth: 20.8 ft
Casing Radius: 0.0833 ft

Static Water Column Height: 12.79 ft
Screen Length: 10. ft
Well Radius: 0.25 ft

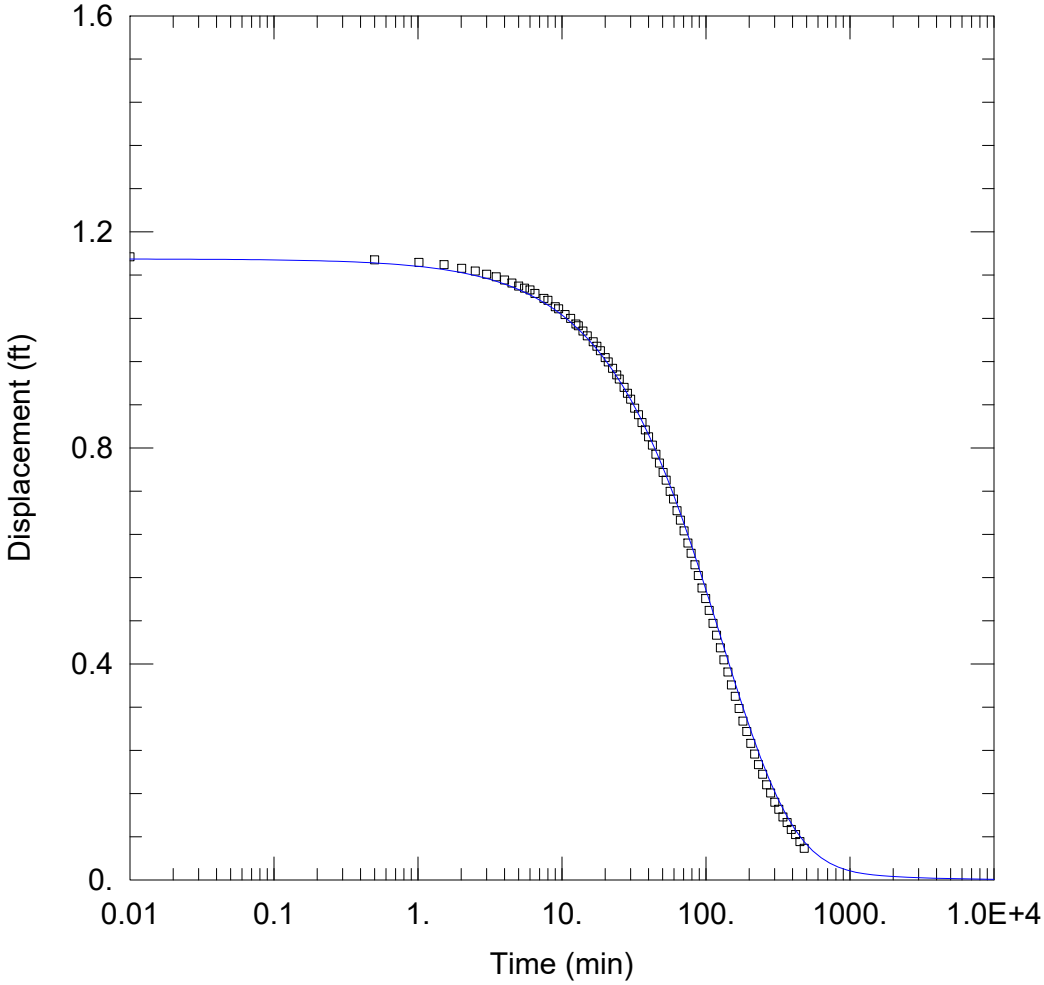
SOLUTION

Aquifer Model: Confined

Solution Method: Cooper-Bredehoeft-Papadopulos

T = 8.6E-6 ft^2/sec

S = 1.2E-6



PZ-174 RISING HEAD TEST 2

PROJECT INFORMATION

Company: Ramboll
Client: Vistra
Project: 1940108209
Location: Baldwin, IL
Test Well: PZ-174
Test Date: 9/5/2024

AQUIFER DATA

Saturated Thickness: 10. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (PZ-174)

Initial Displacement: 1.15 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.086 ft

Static Water Column Height: 13.4 ft
Screen Length: 10. ft
Well Radius: 0.34 ft

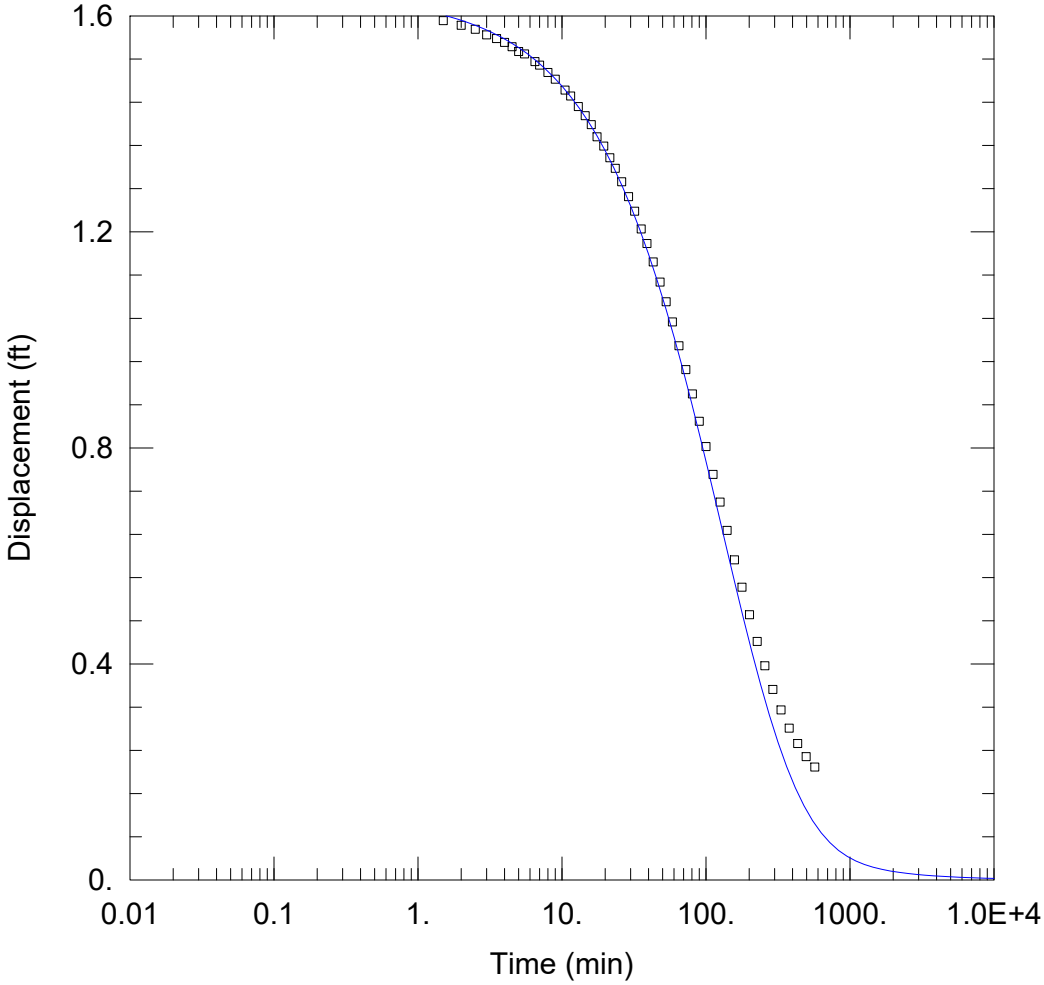
SOLUTION

Aquifer Model: Confined

Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.003 cm^2/sec

S = 2.4E-7



PZ-177 RISING HEAD TEST 2

PROJECT INFORMATION

Company: Ramboll
Client: Vistra
Project: 1940108209
Location: Baldwin, IL
Test Well: PZ-177
Test Date: 9/5/2024

AQUIFER DATA

Saturated Thickness: 10. ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (PZ-177)

Initial Displacement: 1.64 ft
Total Well Penetration Depth: 10. ft
Casing Radius: 0.086 ft

Static Water Column Height: 25.33 ft
Screen Length: 10. ft
Well Radius: 0.34 ft

SOLUTION

Aquifer Model: Confined

Solution Method: Cooper-Bredehoeft-Papadopulos

T = 0.0018 cm^2/sec

S = 3.3E-5

ATTACHMENT G
Windshield Survey Photographic Log

PHOTOGRAPHIC LOG

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
Dynegy	Baldwin Power Plant	1940108209

PHOTO NO.	DATE:
1	1/28/2025

DESCRIPTION:

10311 Magnolia Dr.

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
Dynegy	Baldwin Power Plant	1940108209

PHOTO NO.	DATE:
2	1/28/2025

DESCRIPTION:

10361 Magnolia Dr.

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
Dynegy	Baldwin Power Plant	1940108209

PHOTO NO.	DATE:
3	1/28/2025

DESCRIPTION:

10381 Magnolia Dr.

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
Dynegy	Baldwin Power Plant	1940108209

PHOTO NO.	DATE:
4	1/28/2025

DESCRIPTION:

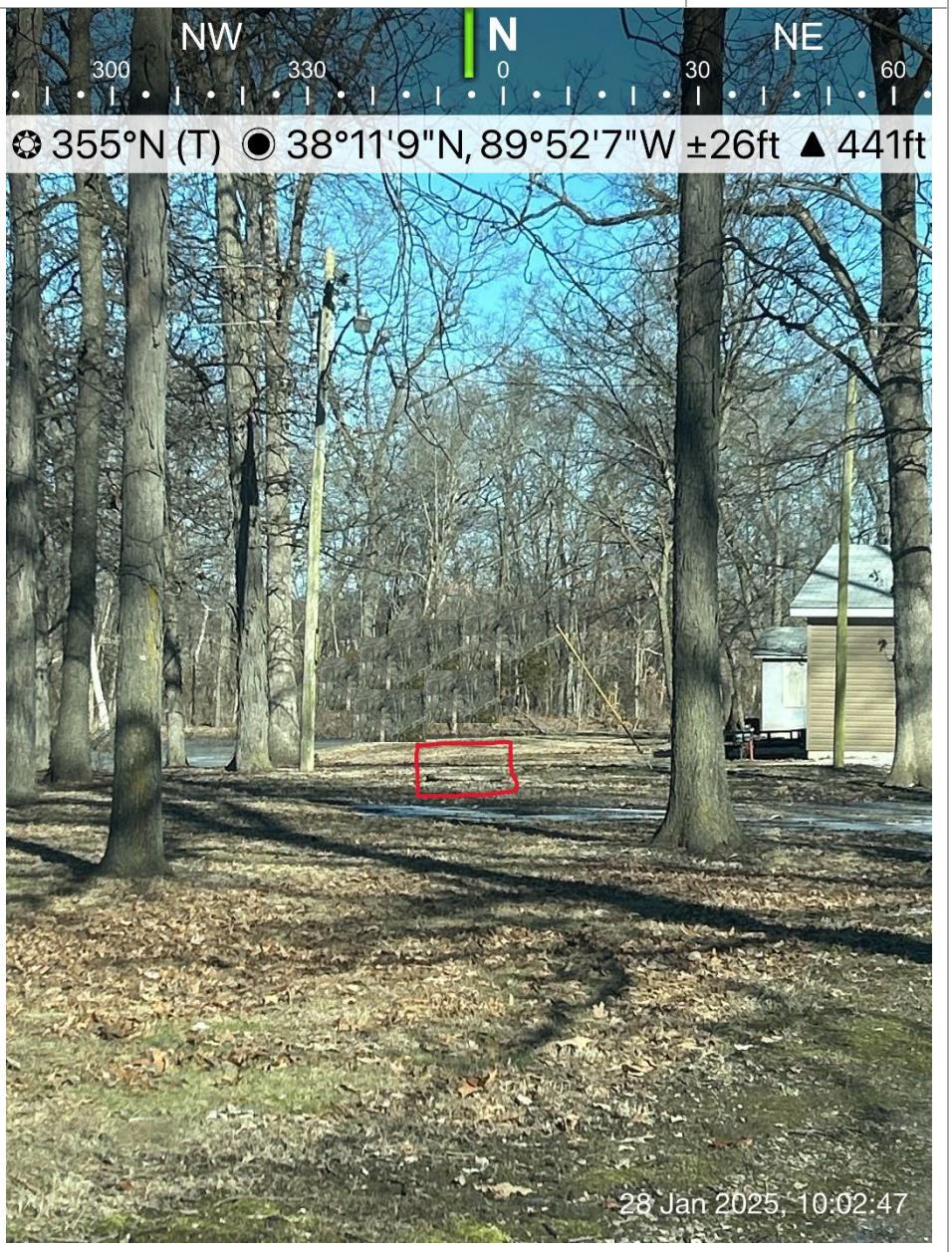
7525 State Route 154

CLIENT NAME:	SITE LOCATION:	PROJECT NO.
Dynegy	Baldwin Power Plant	1940108209

PHOTO NO.	DATE:
5	1/28/2025

DESCRIPTION:

7615 Ruby Ln



CLIENT NAME:	SITE LOCATION:	PROJECT NO.
Dynegy	Baldwin Power Plant	1940108209

PHOTO NO.	DATE:
6	1/28/2025

DESCRIPTION:

7795 State Route 154

APPENDIX B
Field Sampling Forms and Groundwater Analytical Laboratory Reports

August 12, 2024

Eric Bauer
Ramboll
234 W. Florida Street
Fifth Floor
Milwaukee, WI 53204
TEL: (414) 837-3607
FAX: (414) 837-3608

Illinois	100226
Illinois	1004652024-2
Kansas	E-10374
Louisiana	05002
Louisiana	05003
Oklahoma	9978

RE: BAL-24Q3 **WorkOrder:** 24061962

Dear Eric Bauer:

TEKLAB, INC received 8 samples for BAL_NE_605 on 7/23/2024 1:24:00 PM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report,Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR.
All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Elizabeth A. Hurley

Elizabeth A. Hurley
Director of Customer Service
(618)344-1004 ex 33
ehurley@teklabinc.com

Report Contents

http://www.teklabinc.com/

Client: Ramboll
Client Project: BAL-24Q3

Work Order: 24061962
Report Date: 12-Aug-24

This reporting package includes the following:

Cover Letter	1
Report Contents	2
Definitions	3
Case Narrative	5
Accreditations	6
Laboratory Results	7
Sample Summary	21
Quality Control Results	22
Receiving Check List	85
Chain of Custody	Appended

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

Abbr	Definition
*	Analytes on report marked with an asterisk are not NELAP accredited
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
CRQL	A Client Requested Quantitation Limit is a reporting limit that varies according to customer request. The CRQL may not be less than the MDL.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilution factors.
DNI	Did not ignite
DUP	Laboratory duplicate is a replicate aliquot prepared under the same laboratory conditions and independently analyzed to obtain a measure of precision.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample is a sample matrix, free from the analytes of interest,spiked with verified known amounts of analytes and analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	"The method detection limit is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results."
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
NC	Data is not acceptable for compliance purposes
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions.
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Definitions

Client: Ramboll

Work Order: 24061962

Client Project: BAL-24Q3

Report Date: 12-Aug-24

Qualifiers

# -	Unknown hydrocarbon	B -	Analyte detected in associated Method Blank
C -	RL shown is a Client Requested Quantitation Limit	E -	Value above quantitation range
H -	Holding times exceeded	I -	Associated internal standard was outside method criteria
J -	Analyte detected below quantitation limits	M -	Manual Integration used to determine area response
ND -	Not Detected at the Reporting Limit	R -	RPD outside accepted recovery limits
S -	Spike Recovery outside recovery limits	T -	TIC(Tentatively identified compound)
X -	Value exceeds Maximum Contaminant Level		

Case Narrative

http://www.teklabinc.com/

Client: Ramboll
Client Project: BAL-24Q3

Work Order: 24061962
Report Date: 12-Aug-24

Cooler Receipt Temp: 19.9 °C

An employee of Teklab, Inc. collected the sample(s).

Equipment Blank 2 was not needed.

MW-152, OW-256, and OW-257 collection times per field file. EAH 7/25/24

Per Eric Bauer's request, only BAL_NE_605 data is included in this report.

Locations

Collinsville

Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425
Phone	(618) 344-1004
Fax	(618) 344-1005
Email	jhriley@teklabinc.com

Springfield

Address	3920 Pintail Dr Springfield, IL 62711-9415
Phone	(217) 698-1004
Fax	(217) 698-1005
Email	KKlostermann@teklabinc.com

Kansas City

Address	8421 Nieman Road Lenexa, KS 66214
Phone	(913) 541-1998
Fax	(913) 541-1998
Email	jhriley@teklabinc.com

Collinsville Air

Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425
Phone	(618) 344-1004
Fax	(618) 344-1005
Email	EHurley@teklabinc.com

Chicago

Address	1319 Butterfield Rd. Downers Grove, IL 60515
Phone	(630) 324-6855
Fax	
Email	arenner@teklabinc.com

Accreditations

Client: Ramboll
Client Project: BAL-24Q3
Work Order: 24061962
Report Date: 12-Aug-24

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2025	Collinsville
Illinois	IEPA	1004652024-2	NELAP	4/30/2025	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2025	Collinsville
Louisiana	LDEQ	05002	NELAP	6/30/2025	Collinsville
Louisiana	LDEQ	05003	NELAP	6/30/2025	Collinsville
Oklahoma	ODEQ	9978	NELAP	8/31/2024	Collinsville
Arkansas	ADEQ	88-0966		3/14/2025	Collinsville
Illinois	IDPH	17584		5/31/2025	Collinsville
Iowa	IDNR	430		6/1/2026	Collinsville
Kentucky	UST	0073		1/31/2025	Collinsville
Mississippi	MSDH			4/30/2025	Collinsville
Missouri	MDNR	930		1/31/2025	Collinsville
Missouri	MDNR	00930		10/31/2026	Collinsville

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24061962
Client Project: BAL-24Q3
Report Date: 12-Aug-24
Lab ID: 24061962-012
Client Sample ID: MW-196
Matrix: GROUNDWATER
Collection Date: 07/23/2024 10:34

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS									
Depth to water from measuring point	*	0	0		**8.42**	ft	1	07/23/2024 10:34	R350621
STANDARD METHODS 2130 B FIELD									
Turbidity	*	1.0	1.0		**24**	NTU	1	07/23/2024 10:34	R350621
STANDARD METHODS 18TH ED. 2580 B FIELD									
Oxidation-Reduction Potential	*	-300	-300		**-18**	mV	1	07/23/2024 10:34	R350621
STANDARD METHODS 2510 B FIELD									
Spec. Conductance, Field	*	0	0		**1350**	µS/cm	1	07/23/2024 10:34	R350621
STANDARD METHODS 2550 B FIELD									
Temperature	*	0	0		**20.3**	°C	1	07/23/2024 10:34	R350621
STANDARD METHODS 4500-O G FIELD									
Oxygen, Dissolved	*	0	0		**1.75**	mg/L	1	07/23/2024 10:34	R350621
SW-846 9040B FIELD									
pH	*	0	1.00		**7.18**		1	07/23/2024 10:34	R350621
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**323**	mg/L	1	07/25/2024 11:55	R350768
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	07/25/2024 11:55	R350768
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	16	20		**978**	mg/L	1	07/27/2024 11:20	R350897
SW-846 9036 (TOTAL)									
Sulfate	NELAP	61	100		**428**	mg/L	10	07/26/2024 16:39	R350878
SW-846 9214 (TOTAL)									
Fluoride	NELAP	0.04	0.10		**0.42**	mg/L	1	07/25/2024 10:11	R350762
SW-846 9251 (TOTAL)									
Chloride	NELAP	1	4		**21**	mg/L	1	07/26/2024 16:35	R350886
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100		**162**	mg/L	1	07/24/2024 13:42	226078
Magnesium	NELAP	0.0055	0.0500		**64.4**	mg/L	1	07/24/2024 13:42	226078
Potassium	NELAP	0.0400	0.100		**2.30**	mg/L	1	07/24/2024 13:42	226078
Sodium	NELAP	0.0180	0.0500		**70.4**	mg/L	1	07/24/2024 13:42	226078
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.012	0.025	J	**0.017**	mg/L	5	07/26/2024 14:49	226086
Manganese	NELAP	0.0008	0.0020		**0.0473**	mg/L	5	07/25/2024 22:16	226086
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010	BJ	**0.0006**	mg/L	5	07/25/2024 0:04	226078
Arsenic	NELAP	0.0004	0.0010		**0.0028**	mg/L	5	07/25/2024 0:04	226078
Barium	NELAP	0.0007	0.0010		**0.133**	mg/L	5	07/25/2024 0:04	226078
Beryllium	NELAP	0.0002	0.0010	J	**0.0005**	mg/L	5	07/25/2024 0:04	226078
Boron	NELAP	0.0092	0.0250		**4.85**	mg/L	5	07/25/2024 0:04	226078
Cadmium	*	0.0002	0.0010		**< 0.0010**	mg/L	5	07/25/2024 0:04	226078
Chromium	NELAP	0.0007	0.0015		**0.0085**	mg/L	5	07/25/2024 19:23	226078
Cobalt	NELAP	0.0001	0.0010		**0.0028**	mg/L	5	07/25/2024 0:04	226078
Lead	NELAP	0.0006	0.0010		**0.0027**	mg/L	5	07/25/2024 19:23	226078
Lithium	*	0.0015	0.0030		**0.0219**	mg/L	5	07/25/2024 0:04	226078
Molybdenum	NELAP	0.0006	0.0015		**0.0035**	mg/L	5	07/26/2024 10:59	226078

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24061962
Client Project: BAL-24Q3
Report Date: 12-Aug-24
Lab ID: 24061962-012
Client Sample ID: MW-196
Matrix: GROUNDWATER
Collection Date: 07/23/2024 10:34

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Selenium	NELAP	0.0006	0.0010		**0.0062**	mg/L	5	07/25/2024 0:04	226078
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	07/25/2024 0:04	226078

Contamination present in the MBLK for Sb. Sample results below the reporting limit are reportable per the TNI Standard.
CCV recovered outside the upper control limits for Tl. Sample results are below the reporting limit. Data is reportable per the TNI standard.

SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	07/26/2024 13:00	226132

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24061962
Client Project: BAL-24Q3
Report Date: 12-Aug-24
Lab ID: 24061962-013
Client Sample ID: MW-197
Matrix: GROUNDWATER
Collection Date: 07/19/2024 10:24

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS									
Depth to water from measuring point	*	0	0		**4.56**	ft	1	07/19/2024 10:24	R350621
STANDARD METHODS 2130 B FIELD									
Turbidity	*	1.0	1.0		**2.0**	NTU	1	07/19/2024 10:24	R350621
STANDARD METHODS 18TH ED. 2580 B FIELD									
Oxidation-Reduction Potential	*	-300	-300		**1**	mV	1	07/19/2024 10:24	R350621
STANDARD METHODS 2510 B FIELD									
Spec. Conductance, Field	*	0	0		**1120**	µS/cm	1	07/19/2024 10:24	R350621
STANDARD METHODS 2550 B FIELD									
Temperature	*	0	0		**20.6**	°C	1	07/19/2024 10:24	R350621
STANDARD METHODS 4500-O G FIELD									
Oxygen, Dissolved	*	0	0		**4.12**	mg/L	1	07/19/2024 10:24	R350621
SW-846 9040B FIELD									
pH	*	0	1.00		**7.17**		1	07/19/2024 10:24	R350621
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**454**	mg/L	1	07/23/2024 14:03	R350627
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	07/23/2024 14:03	R350627
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	16	20		**730**	mg/L	1	07/24/2024 9:16	R350752
SW-846 9036 (TOTAL)									
Sulfate	NELAP	61	100		**155**	mg/L	10	07/26/2024 16:48	R350878
SW-846 9214 (TOTAL)									
Fluoride	NELAP	0.04	0.10		**0.32**	mg/L	1	07/22/2024 11:08	R350534
SW-846 9251 (TOTAL)									
Chloride	NELAP	1	4		**22**	mg/L	1	07/26/2024 16:43	R350886
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100		**122**	mg/L	1	07/23/2024 13:26	225998
Magnesium	NELAP	0.0055	0.0500		**67.7**	mg/L	1	07/23/2024 13:26	225998
Potassium	NELAP	0.0400	0.100		**1.48**	mg/L	1	07/23/2024 13:26	225998
Sodium	NELAP	0.0180	0.0500		**35.7**	mg/L	1	07/23/2024 13:26	225998
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.012	0.025	J	**0.014**	mg/L	5	07/23/2024 16:25	225989
Manganese	NELAP	0.0008	0.0020		**0.0415**	mg/L	5	07/23/2024 16:25	225989
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010		**< 0.0010**	mg/L	5	07/23/2024 23:18	225998
Arsenic	NELAP	0.0004	0.0010	J	**0.0009**	mg/L	5	07/23/2024 23:18	225998
Barium	NELAP	0.0007	0.0010		**0.200**	mg/L	5	07/23/2024 23:18	225998
Beryllium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	07/23/2024 23:18	225998
Boron	NELAP	0.0092	0.0250		**0.0254**	mg/L	5	07/23/2024 23:18	225998
Cadmium	*	0.0002	0.0010		**< 0.0010**	mg/L	5	07/23/2024 23:18	225998
Chromium	NELAP	0.0007	0.0015		**0.0084**	mg/L	5	07/23/2024 23:18	225998
Cobalt	NELAP	0.0001	0.0010		**< 0.0010**	mg/L	5	07/23/2024 23:18	225998
Lead	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	07/23/2024 23:18	225998
Lithium	*	0.0015	0.0030		**0.0141**	mg/L	5	07/23/2024 23:18	225998
Molybdenum	NELAP	0.0006	0.0015		**0.0024**	mg/L	5	07/24/2024 18:10	225998

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24061962
Client Project: BAL-24Q3
Report Date: 12-Aug-24
Lab ID: 24061962-013
Client Sample ID: MW-197
Matrix: GROUNDWATER
Collection Date: 07/19/2024 10:24

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Selenium	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	07/23/2024 23:18	225998
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	07/23/2024 23:18	225998
SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	07/23/2024 8:17	225987

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24061962
Client Project: BAL-24Q3
Report Date: 12-Aug-24
Lab ID: 24061962-045
Client Sample ID: Field Blank
Matrix: AQUEOUS
Collection Date: 07/23/2024 12:04

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**1**	mg/L	1	07/25/2024 12:02	R350768
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	07/25/2024 12:02	R350768
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	16	20		**< 20**	mg/L	1	07/27/2024 11:32	R350897
SW-846 9036 (TOTAL)									
Sulfate	NELAP	6	10		**< 10**	mg/L	1	07/29/2024 10:26	R350922
SW-846 9214 (TOTAL)									
Fluoride	NELAP	0.04	0.10		**< 0.10**	mg/L	1	07/25/2024 10:13	R350762
SW-846 9251 (TOTAL)									
Chloride	NELAP	1	4		**< 4**	mg/L	1	07/29/2024 10:26	R350942
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100		**< 0.100**	mg/L	1	07/24/2024 13:44	226078
Magnesium	NELAP	0.0055	0.0500		**< 0.0500**	mg/L	1	07/24/2024 13:44	226078
Potassium	NELAP	0.0400	0.100		**< 0.100**	mg/L	1	07/24/2024 13:44	226078
Sodium	NELAP	0.0180	0.0500		**< 0.0500**	mg/L	1	07/24/2024 13:44	226078
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.0115	0.0250		**< 0.0250**	mg/L	5	07/25/2024 22:27	226086
Manganese	NELAP	0.0008	0.0020		**< 0.0020**	mg/L	5	07/25/2024 22:27	226086
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010	B	**< 0.0010**	mg/L	5	07/25/2024 0:09	226078
Arsenic	NELAP	0.0004	0.0010		**< 0.0010**	mg/L	5	07/25/2024 0:09	226078
Barium	NELAP	0.0007	0.0010		**< 0.0010**	mg/L	5	07/25/2024 0:09	226078
Beryllium	NELAP	0.0002	0.0010	J	**0.0006**	mg/L	5	07/25/2024 0:09	226078
Boron	NELAP	0.0092	0.0250		**< 0.0250**	mg/L	5	07/25/2024 0:09	226078
Cadmium	*	0.0002	0.0010		**< 0.0010**	mg/L	5	07/25/2024 0:09	226078
Chromium	NELAP	0.0007	0.0015		**< 0.0015**	mg/L	5	07/25/2024 19:29	226078
Cobalt	NELAP	0.0001	0.0010	J	**0.0004**	mg/L	5	07/25/2024 0:09	226078
Lead	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	07/25/2024 0:09	226078
Lithium	*	0.0015	0.0030		**< 0.0030**	mg/L	5	07/25/2024 0:09	226078
Molybdenum	NELAP	0.0006	0.0015		**< 0.0015**	mg/L	5	07/25/2024 0:09	226078
Selenium	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	07/25/2024 0:09	226078
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	07/25/2024 0:09	226078

Contamination present in the MBLK for Sb. Sample results below the reporting limit are reportable per the TNI Standard.
CCV recovered outside the upper control limits for Tl. Sample results are below the reporting limit. Data is reportable per the TNI standard.

SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	07/26/2024 13:02	226132

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Client Project: BAL-24Q3
Lab ID: 24061962-047
Matrix: AQUEOUS

Work Order: 24061962
Report Date: 12-Aug-24
Client Sample ID: Equipment Blank 1
Collection Date: 07/23/2024 12:11

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**1**	mg/L	1	07/25/2024 12:05	R350768
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	07/25/2024 12:05	R350768
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	16	20		**< 20**	mg/L	1	07/27/2024 11:33	R350897
SW-846 9036 (TOTAL)									
Sulfate	NELAP	6	10		**< 10**	mg/L	1	07/29/2024 10:53	R350922
SW-846 9214 (TOTAL)									
Fluoride	NELAP	0.04	0.10		**< 0.10**	mg/L	1	07/25/2024 10:16	R350762
SW-846 9251 (TOTAL)									
Chloride	NELAP	1	4		**< 4**	mg/L	1	07/29/2024 10:52	R350942
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100		**0.142**	mg/L	1	07/24/2024 13:45	226078
Magnesium	NELAP	0.0055	0.050	J	**0.027**	mg/L	1	07/24/2024 13:45	226078
Potassium	NELAP	0.0400	0.100		**< 0.100**	mg/L	1	07/24/2024 13:45	226078
Sodium	NELAP	0.018	0.050	J	**0.028**	mg/L	1	07/24/2024 13:45	226078
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.012	0.025	J	**0.012**	mg/L	5	07/25/2024 22:33	226086
Manganese	NELAP	0.0008	0.0020	J	**0.0012**	mg/L	5	07/25/2024 22:33	226086
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010	B	**< 0.0010**	mg/L	5	07/25/2024 0:15	226078
Arsenic	NELAP	0.0004	0.0010		**< 0.0010**	mg/L	5	07/25/2024 0:15	226078
Barium	NELAP	0.0007	0.0010	J	**0.0008**	mg/L	5	07/25/2024 0:15	226078
Beryllium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	07/25/2024 0:15	226078
Boron	NELAP	0.0092	0.0250		**< 0.0250**	mg/L	5	07/25/2024 0:15	226078
Cadmium	*	0.0002	0.0010		**< 0.0010**	mg/L	5	07/25/2024 0:15	226078
Chromium	NELAP	0.0007	0.0015		**< 0.0015**	mg/L	5	07/25/2024 20:55	226078
Cobalt	NELAP	0.0001	0.0010	J	**0.0001**	mg/L	5	07/25/2024 0:15	226078
Lead	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	07/25/2024 0:15	226078
Lithium	*	0.0015	0.0030		**< 0.0030**	mg/L	5	07/25/2024 0:15	226078
Molybdenum	NELAP	0.0006	0.0015		**< 0.0015**	mg/L	5	07/25/2024 0:15	226078
Selenium	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	07/25/2024 0:15	226078
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	07/25/2024 0:15	226078

Contamination present in the MBLK for Sb. Sample results below the reporting limit are reportable per the TNI Standard.
CCV recovered outside the upper control limits for Tl. Sample results are below the reporting limit. Data is reportable per the TNI standard.

SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	07/26/2024 13:04	226132

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24061962
Client Project: BAL-24Q3
Report Date: 12-Aug-24
Lab ID: 24061962-048
Client Sample ID: PZ-174
Matrix: GROUNDWATER
Collection Date: 07/18/2024 15:01

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS									
Depth to water from measuring point	*	0	0		**7.24**	ft	1	07/18/2024 15:01	R350621
STANDARD METHODS 2130 B FIELD									
Turbidity	*	1.0	1.0		**39**	NTU	1	07/18/2024 15:01	R350621
STANDARD METHODS 18TH ED. 2580 B FIELD									
Oxidation-Reduction Potential	*	-300	-300		**80**	mV	1	07/18/2024 15:01	R350621
STANDARD METHODS 2510 B FIELD									
Spec. Conductance, Field	*	0	0		**1470**	µS/cm	1	07/18/2024 15:01	R350621
STANDARD METHODS 2550 B FIELD									
Temperature	*	0	0		**17.7**	°C	1	07/18/2024 15:01	R350621
STANDARD METHODS 4500-O G FIELD									
Oxygen, Dissolved	*	0	0		**3.74**	mg/L	1	07/18/2024 15:01	R350621
SW-846 9040B FIELD									
pH	*	0	1.00		**7.22**		1	07/18/2024 15:01	R350621
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**283**	mg/L	1	07/19/2024 13:46	R350481
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	07/19/2024 13:46	R350481
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	16	20		**1350**	mg/L	1	07/23/2024 9:09	R350690
SW-846 9036 (TOTAL)									
Sulfate	NELAP	123	200		**588**	mg/L	20	07/30/2024 11:17	R350996
SW-846 9214 (TOTAL)									
Fluoride	NELAP	0.04	0.10		**0.53**	mg/L	1	07/19/2024 12:48	R350479
SW-846 9251 (TOTAL)									
Chloride	NELAP	1	4		**30**	mg/L	1	07/29/2024 10:55	R350942
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100		**200**	mg/L	1	07/22/2024 20:09	225932
Magnesium	NELAP	0.0055	0.0500		**100**	mg/L	1	07/22/2024 20:09	225932
Potassium	NELAP	0.0400	0.100		**0.296**	mg/L	1	07/22/2024 20:09	225932
Sodium	NELAP	0.0180	0.0500		**34.2**	mg/L	1	07/22/2024 20:09	225932
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.0115	0.0250		**< 0.0250**	mg/L	5	07/23/2024 11:57	225949
Manganese	NELAP	0.0008	0.0020		**< 0.0020**	mg/L	5	07/22/2024 23:00	225949
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010		**< 0.0010**	mg/L	5	07/23/2024 1:47	225932
Arsenic	NELAP	0.0004	0.0010		**< 0.0010**	mg/L	5	07/23/2024 1:47	225932
Barium	NELAP	0.0007	0.0010		**0.0190**	mg/L	5	07/23/2024 1:47	225932
Beryllium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	07/23/2024 1:47	225932
Boron	NELAP	0.0092	0.0250		**4.03**	mg/L	5	07/23/2024 1:47	225932
Cadmium	*	0.0002	0.0010		**< 0.0010**	mg/L	5	07/23/2024 1:47	225932
Chromium	NELAP	0.0007	0.0015		**< 0.0015**	mg/L	5	07/23/2024 1:47	225932
Cobalt	NELAP	0.0001	0.0010		**< 0.0010**	mg/L	5	07/23/2024 15:57	225932
Lead	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	07/23/2024 1:47	225932
Lithium	*	0.0015	0.0030		**0.0213**	mg/L	5	07/23/2024 15:57	225932
Molybdenum	NELAP	0.0006	0.0015	J	**0.0014**	mg/L	5	07/23/2024 1:47	225932

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24061962
Client Project: BAL-24Q3
Report Date: 12-Aug-24
Lab ID: 24061962-048
Client Sample ID: PZ-174
Matrix: GROUNDWATER
Collection Date: 07/18/2024 15:01

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Selenium	NELAP	0.0006	0.0010		**0.0019**	mg/L	5	07/23/2024 1:47	225932
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	07/23/2024 15:57	225932
SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	07/22/2024 14:44	225937

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24061962
Client Project: BAL-24Q3
Report Date: 12-Aug-24
Lab ID: 24061962-049
Client Sample ID: PZ-176
Matrix: GROUNDWATER
Collection Date: 07/22/2024 10:56

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS									
Depth to water from measuring point	*	0	0		**11.45**	ft	1	07/22/2024 10:56	R350621
STANDARD METHODS 2130 B FIELD									
Turbidity	*	1.0	1.0		**54**	NTU	1	07/22/2024 10:56	R350621
STANDARD METHODS 18TH ED. 2580 B FIELD									
Oxidation-Reduction Potential	*	-300	-300		**57**	mV	1	07/22/2024 10:56	R350621
STANDARD METHODS 2510 B FIELD									
Spec. Conductance, Field	*	0	0		**1130**	µS/cm	1	07/22/2024 10:56	R350621
STANDARD METHODS 2550 B FIELD									
Temperature	*	0	0		**17.4**	°C	1	07/22/2024 10:56	R350621
STANDARD METHODS 4500-O G FIELD									
Oxygen, Dissolved	*	0	0		**0.42**	mg/L	1	07/22/2024 10:56	R350621
SW-846 9040B FIELD									
pH	*	0	1.00		**7.02**		1	07/22/2024 10:56	R350621
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**454**	mg/L	1	07/23/2024 13:31	R350627
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	07/23/2024 13:31	R350627
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	16	20		**676**	mg/L	1	07/25/2024 9:37	R350848
SW-846 9036 (TOTAL)									
Sulfate	NELAP	61	100		**130**	mg/L	10	07/29/2024 11:09	R350922
SW-846 9214 (TOTAL)									
Fluoride	NELAP	0.04	0.10		**0.62**	mg/L	1	07/23/2024 9:46	R350609
SW-846 9251 (TOTAL)									
Chloride	NELAP	1	4		**32**	mg/L	1	07/29/2024 11:03	R350942
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100		**125**	mg/L	1	07/23/2024 16:58	226025
Magnesium	NELAP	0.0055	0.0500		**54.8**	mg/L	1	07/23/2024 16:58	226025
Potassium	NELAP	0.0400	0.100		**2.31**	mg/L	1	07/23/2024 16:58	226025
Sodium	NELAP	0.0180	0.0500		**53.3**	mg/L	1	07/23/2024 16:58	226025
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.0115	0.0250		**< 0.0250**	mg/L	5	07/23/2024 17:45	226024
Manganese	NELAP	0.0008	0.0020		**0.0195**	mg/L	5	07/23/2024 17:45	226024
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010	BJ	**0.0006**	mg/L	5	07/24/2024 19:24	226025
Arsenic	NELAP	0.0004	0.0010		**0.0020**	mg/L	5	07/24/2024 19:24	226025
Barium	NELAP	0.0007	0.0010		**0.113**	mg/L	5	07/24/2024 19:24	226025
Beryllium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	07/24/2024 19:24	226025
Boron	NELAP	0.0092	0.0250		**1.21**	mg/L	5	07/24/2024 19:24	226025
Cadmium	*	0.0002	0.0010		**< 0.0010**	mg/L	5	07/24/2024 19:24	226025
Chromium	NELAP	0.0007	0.0015	J	**0.0010**	mg/L	5	07/24/2024 19:24	226025
Cobalt	NELAP	0.0001	0.0010		**0.0035**	mg/L	5	07/24/2024 19:24	226025
Lead	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	07/24/2024 19:24	226025
Lithium	*	0.0015	0.0030		**0.0518**	mg/L	5	07/24/2024 19:24	226025
Molybdenum	NELAP	0.0006	0.0015		**< 0.0015**	mg/L	5	07/24/2024 19:24	226025

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24061962
Client Project: BAL-24Q3
Report Date: 12-Aug-24
Lab ID: 24061962-049
Client Sample ID: PZ-176
Matrix: GROUNDWATER
Collection Date: 07/22/2024 10:56

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Selenium	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	07/24/2024 19:24	226025
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	07/24/2024 19:24	226025
Contamination present in the MBLK for Sb. Sample results below the reporting limit are reportable per the TNI Standard.									
SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	07/23/2024 12:37	226026

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24061962
Client Project: BAL-24Q3
Report Date: 12-Aug-24
Lab ID: 24061962-050
Client Sample ID: PZ-178
Matrix: GROUNDWATER
Collection Date: 07/22/2024 10:12

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS									
Depth to water from measuring point	*	0	0		**6.34**	ft	1	07/22/2024 10:12	R350621
STANDARD METHODS 2130 B FIELD									
Turbidity	*	1.0	1.0		**70**	NTU	1	07/22/2024 10:12	R350621
STANDARD METHODS 18TH ED. 2580 B FIELD									
Oxidation-Reduction Potential	*	-300	-300		**12**	mV	1	07/22/2024 10:12	R350621
STANDARD METHODS 2510 B FIELD									
Spec. Conductance, Field	*	0	0		**1270**	µS/cm	1	07/22/2024 10:12	R350621
STANDARD METHODS 2550 B FIELD									
Temperature	*	0	0		**21.0**	°C	1	07/22/2024 10:12	R350621
STANDARD METHODS 4500-O G FIELD									
Oxygen, Dissolved	*	0	0		**0.53**	mg/L	1	07/22/2024 10:12	R350621
SW-846 9040B FIELD									
pH	*	0	1.00		**7.04**		1	07/22/2024 10:12	R350621
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**484**	mg/L	1	07/23/2024 13:37	R350627
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	07/23/2024 13:37	R350627
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	16	20		**772**	mg/L	1	07/25/2024 9:38	R350848
SW-846 9036 (TOTAL)									
Sulfate	NELAP	61	100		**169**	mg/L	10	07/29/2024 11:17	R350922
SW-846 9214 (TOTAL)									
Fluoride	NELAP	0.04	0.10		**0.47**	mg/L	1	07/23/2024 9:48	R350609
SW-846 9251 (TOTAL)									
Chloride	NELAP	1	4		**44**	mg/L	1	07/29/2024 11:11	R350942
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100		**137**	mg/L	1	07/23/2024 17:00	226025
Magnesium	NELAP	0.0055	0.0500		**68.0**	mg/L	1	07/23/2024 17:00	226025
Potassium	NELAP	0.0400	0.100		**2.28**	mg/L	1	07/23/2024 17:00	226025
Sodium	NELAP	0.0180	0.0500		**53.0**	mg/L	1	07/23/2024 17:00	226025
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.0115	0.0250		**< 0.0250**	mg/L	5	07/23/2024 16:14	226024
Manganese	NELAP	0.0008	0.0020		**0.0547**	mg/L	5	07/23/2024 16:14	226024
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010	BJ	**0.0007**	mg/L	5	07/24/2024 19:30	226025
Arsenic	NELAP	0.0004	0.0010	J	**0.0005**	mg/L	5	07/24/2024 19:30	226025
Barium	NELAP	0.0007	0.0010		**0.141**	mg/L	5	07/24/2024 19:30	226025
Beryllium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	07/24/2024 19:30	226025
Boron	NELAP	0.0092	0.0250		**0.663**	mg/L	5	07/24/2024 19:30	226025
Cadmium	*	0.0002	0.0010		**< 0.0010**	mg/L	5	07/24/2024 19:30	226025
Chromium	NELAP	0.0007	0.0015	J	**0.0008**	mg/L	5	07/24/2024 19:30	226025
Cobalt	NELAP	0.0001	0.0010	J	**0.0006**	mg/L	5	07/24/2024 19:30	226025
Lead	NELAP	0.0006	0.0010	J	**0.0006**	mg/L	5	07/24/2024 19:30	226025
Lithium	*	0.0015	0.0030		**0.0788**	mg/L	5	07/24/2024 19:30	226025
Molybdenum	NELAP	0.0006	0.0015	J	**0.0010**	mg/L	5	07/24/2024 19:30	226025

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24061962
Client Project: BAL-24Q3
Report Date: 12-Aug-24
Lab ID: 24061962-050
Client Sample ID: PZ-178
Matrix: GROUNDWATER
Collection Date: 07/22/2024 10:12

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Selenium	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	07/24/2024 19:30	226025
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	07/24/2024 19:30	226025
Contamination present in the MBLK for Sb. Sample results below the reporting limit are reportable per the TNI Standard.									
SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	07/23/2024 12:49	226026

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24061962
Client Project: BAL-24Q3
Report Date: 12-Aug-24
Lab ID: 24061962-052
Client Sample ID: PZ-178 Duplicate
Matrix: GROUNDWATER
Collection Date: 07/22/2024 10:12

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS									
Depth to water from measuring point	*	0	0		**6.34**	ft	1	07/22/2024 10:12	R350621
STANDARD METHODS 2130 B FIELD									
Turbidity	*	1.0	1.0		**70**	NTU	1	07/22/2024 10:12	R350621
STANDARD METHODS 18TH ED. 2580 B FIELD									
Oxidation-Reduction Potential	*	-300	-300		**12**	mV	1	07/22/2024 10:12	R350621
STANDARD METHODS 2510 B FIELD									
Spec. Conductance, Field	*	0	0		**1270**	µS/cm	1	07/22/2024 10:12	R350621
STANDARD METHODS 2550 B FIELD									
Temperature	*	0	0		**21.0**	°C	1	07/22/2024 10:12	R350621
STANDARD METHODS 4500-O G FIELD									
Oxygen, Dissolved	*	0	0		**0.53**	mg/L	1	07/22/2024 10:12	R350621
SW-846 9040B FIELD									
pH	*	0	1.00		**7.04**		1	07/22/2024 10:12	R350621
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**485**	mg/L	1	07/23/2024 13:45	R350627
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	07/23/2024 13:45	R350627
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	16	20		**812**	mg/L	1	07/25/2024 9:38	R350848
SW-846 9036 (TOTAL)									
Sulfate	NELAP	61	100		**171**	mg/L	10	07/29/2024 11:24	R350922
SW-846 9214 (TOTAL)									
Fluoride	NELAP	0.04	0.10		**0.47**	mg/L	1	07/23/2024 9:50	R350609
SW-846 9251 (TOTAL)									
Chloride	NELAP	1	4		**44**	mg/L	1	07/29/2024 11:19	R350942
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100		**138**	mg/L	1	07/23/2024 17:09	226025
Magnesium	NELAP	0.0055	0.0500		**68.7**	mg/L	1	07/23/2024 17:09	226025
Potassium	NELAP	0.0400	0.100		**2.40**	mg/L	1	07/23/2024 17:09	226025
Sodium	NELAP	0.0180	0.0500		**53.8**	mg/L	1	07/23/2024 17:09	226025
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.0115	0.0250		**< 0.0250**	mg/L	5	07/23/2024 16:20	226024
Manganese	NELAP	0.0008	0.0020		**0.0510**	mg/L	5	07/23/2024 16:20	226024
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010	BJ	**0.0007**	mg/L	5	07/24/2024 19:36	226025
Arsenic	NELAP	0.0004	0.0010		**< 0.0010**	mg/L	5	07/24/2024 19:36	226025
Barium	NELAP	0.0007	0.0010		**0.125**	mg/L	5	07/24/2024 19:36	226025
Beryllium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	07/24/2024 19:36	226025
Boron	NELAP	0.0092	0.0250		**0.611**	mg/L	5	07/24/2024 19:36	226025
Cadmium	*	0.0002	0.0010		**< 0.0010**	mg/L	5	07/24/2024 19:36	226025
Chromium	NELAP	0.0007	0.0015	J	**0.0013**	mg/L	5	07/24/2024 19:36	226025
Cobalt	NELAP	0.0001	0.0010	J	**0.0008**	mg/L	5	07/24/2024 19:36	226025
Lead	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	07/24/2024 19:36	226025
Lithium	*	0.0015	0.0030		**0.0702**	mg/L	5	07/24/2024 19:36	226025
Molybdenum	NELAP	0.0006	0.0015	J	**0.0014**	mg/L	5	07/24/2024 19:36	226025

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24061962
Client Project: BAL-24Q3
Report Date: 12-Aug-24
Lab ID: 24061962-052
Client Sample ID: PZ-178 Duplicate
Matrix: GROUNDWATER
Collection Date: 07/22/2024 10:12

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Selenium	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	07/24/2024 19:36	226025
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	07/24/2024 19:36	226025
Contamination present in the MBLK for Sb. Sample results below the reporting limit are reportable per the TNI Standard.									
SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	07/23/2024 12:51	226026

Sample Summary

http://www.teklabinc.com/

Client: Ramboll
Client Project: BAL-24Q3

Work Order: 24061962
Report Date: 12-Aug-24

Lab Sample ID	Client Sample ID	Matrix	Fractions	Collection Date
24061962-012	MW-196	Groundwater	3	07/23/2024 10:34
24061962-013	MW-197	Groundwater	3	07/19/2024 10:24
24061962-045	Field Blank	Aqueous	4	07/23/2024 12:04
24061962-047	Equipment Blank 1	Aqueous	4	07/23/2024 12:11
24061962-048	PZ-174	Groundwater	3	07/18/2024 15:01
24061962-049	PZ-176	Groundwater	3	07/22/2024 10:56
24061962-050	PZ-178	Groundwater	3	07/22/2024 10:12
24061962-052	PZ-178 Duplicate	Groundwater	3	07/22/2024 10:12

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

STANDARD METHODS 2510 B FIELD

Batch R350621 **SampType:** LCS Units **µS/cm**
SampID: LCS-1J

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1410**	1412	0	100.0	90	110	07/16/2024

Batch R350621 **SampType:** LCS Units **µS/cm**
SampID: LCS-1T

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1410**	1412	0	99.7	90	110	07/17/2024

Batch R350621 **SampType:** LCS Units **µS/cm**
SampID: LCS-2B

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1420**	1412	0	100.3	90	110	07/17/2024

Batch R350621 **SampType:** LCS Units **µS/cm**
SampID: LCS-2J

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1410**	1412	0	99.9	90	110	07/17/2024

Batch R350621 **SampType:** LCS Units **µS/cm**
SampID: LCS-2T

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1410**	1412	0	100.1	90	110	07/18/2024

Batch R350621 **SampType:** LCS Units **µS/cm**
SampID: LCS-3B

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1410**	1412	0	100.1	90	110	07/18/2024

Batch R350621 **SampType:** LCS Units **µS/cm**
SampID: LCS-3J

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1410**	1412	0	100.1	90	110	07/18/2024

Batch R350621 **SampType:** LCS Units **µS/cm**
SampID: LCS-4B

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1420**	1412	0	100.4	90	110	07/19/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

STANDARD METHODS 2510 B FIELD

Batch R350621 **SampType:** LCS Units µS/cm
SampID: LCS-4J

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1400**	1412	0	99.5	90	110	07/19/2024

Batch R350621 **SampType:** LCS Units µS/cm
SampID: LCS-5J

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1410**	1412	0	99.6	90	110	07/22/2024

Batch R350621 **SampType:** LCS Units µS/cm
SampID: LCS-6J

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1410**	1412	0	99.8	90	110	07/23/2024

SW-846 9040B FIELD

Batch R350621 **SampType:** LCS Units
SampID: LCS-1J

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.00**	7.000	0	100.0	98.57	101.4	07/16/2024

Batch R350621 **SampType:** LCS Units
SampID: LCS-1T

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.02**	7.000	0	100.3	98.57	101.4	07/17/2024

Batch R350621 **SampType:** LCS Units
SampID: LCS-2B

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.01**	7.000	0	100.1	98.57	101.4	07/17/2024

Batch R350621 **SampType:** LCS Units
SampID: LCS-2J

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.00**	7.000	0	100.0	98.57	101.4	07/17/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 9040B FIELD

Batch R350621 **SampType:** LCS Units

SampID: LCS-2T

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.01**	7.000	0	100.1	98.57	101.4	07/18/2024

Batch R350621 **SampType:** LCS Units

SampID: LCS-3B

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.00**	7.000	0	100.0	98.57	101.4	07/18/2024

Batch R350621 **SampType:** LCS Units

SampID: LCS-3J

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.01**	7.000	0	100.1	98.57	101.4	07/18/2024

Batch R350621 **SampType:** LCS Units

SampID: LCS-4B

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.01**	7.000	0	100.1	98.57	101.4	07/19/2024

Batch R350621 **SampType:** LCS Units

SampID: LCS-4J

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**6.99**	7.000	0	99.9	98.57	101.4	07/19/2024

Batch R350621 **SampType:** LCS Units

SampID: LCS-5J

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**6.98**	7.000	0	99.7	98.57	101.4	07/22/2024

Batch R350621 **SampType:** LCS Units

SampID: LCS-6J

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.00**	7.000	0	100.0	98.57	101.4	07/23/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

STANDARD METHODS 2540 C (TOTAL) 1997, 2011

Batch R350547 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	07/19/2024

Batch R350547 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**940**	1000	0	94.0	90	110	07/19/2024

Batch R350547 **SampType:** DUP Units **mg/L** RPD Limit **10**
SampID: 24061962-030ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20		**1080**				1052	2.26	07/19/2024

Batch R350690 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	07/23/2024

Batch R350690 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**962**	1000	0	96.2	90	110	07/23/2024

Batch R350690 **SampType:** DUP Units **mg/L** RPD Limit **10**
SampID: 24061962-018ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20		**1340**				1320	1.20	07/23/2024

Batch R350752 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	07/24/2024

Batch R350752 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**1010**	1000	0	101.2	90	110	07/24/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

STANDARD METHODS 2540 C (TOTAL) 1997, 2011

Batch R350752 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 24071773-006ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		50		**3340**				3635	8.61	07/24/2024

Batch R350848 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	07/25/2024
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	07/25/2024

Batch R350848 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**962**	1000	0	96.2	90	110	07/25/2024
Total Dissolved Solids		20		**954**	1000	0	95.4	90	110	07/25/2024

Batch R350848 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 24071455-010ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20		**260**				256.0	1.55	07/25/2024

Batch R350848 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 24071732-001ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20		**242**				254.0	4.84	07/25/2024

Batch R350897 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	07/27/2024

Batch R350897 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**1020**	1000	0	102.2	90	110	07/27/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

STANDARD METHODS 2540 C (TOTAL) 1997, 2011

Batch R350897 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 24071132-027ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20		**314**				298.0	5.23	07/27/2024

Batch R350897 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 24071873-001ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		1000		**15600**				16600	6.21	07/27/2024

STANDARD METHODS 4500-NO2 B (TOTAL) 2000, 2011

Batch R350402 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**< 0.05**	0.0250	0	0	-100	100	07/18/2024

Batch R350402 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.31**	0.3045	0	100.5	90	110	07/18/2024

Batch R350402 **SampType:** MS Units **mg/L**

SampID: 24061962-046AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.49**	0.5000	0	97.8	85	115	07/18/2024

Batch R350402 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24061962-046AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.48**	0.5000	0	95.4	0.4890	2.48	07/18/2024

Batch R350402 **SampType:** MS Units **mg/L**

SampID: 24071526-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.56**	0.5000	0.05200	101.0	85	115	07/18/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

STANDARD METHODS 4500-NO2 B (TOTAL) 2000, 2011

Batch R350402 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24071526-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.56**	0.5000	0.05200	101.2	0.5570	0.18	07/18/2024

Batch R350402 **SampType:** MS Units **mg/L**

SampID: 24071605-010AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.48**	0.5000	0	95.4	85	115	07/18/2024

Batch R350402 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24071605-010AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.48**	0.5000	0	95.4	0.4770	0.00	07/18/2024

Batch R350489 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**< 0.05**	0.0250	0	0	-100	100	07/19/2024

Batch R350489 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.31**	0.3045	0	100.5	90	110	07/19/2024

Batch R350489 **SampType:** MS Units **mg/L**

SampID: 24061962-005AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.49**	0.5000	0	98.2	85	115	07/19/2024

Batch R350489 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24061962-005AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.49**	0.5000	0	98.2	0.4910	0.00	07/19/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

STANDARD METHODS 4500-NO2 B (TOTAL) 2000, 2011

Batch R350628 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**< 0.05**	0.0250	0	0	-100	100	07/23/2024
Nitrogen, Nitrite (as N)		0.05		**< 0.05**	0.0250	0	0	-100	100	07/23/2024

Batch R350628 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.32**	0.3045	0	106.7	90	110	07/23/2024
Nitrogen, Nitrite (as N)		0.05		**0.32**	0.3045	0	106.7	90	110	07/23/2024

Batch R350628 **SampType:** MS Units **mg/L**

SampID: 24071781-002AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.62**	0.5000	0.1470	94.8	85	115	07/23/2024

Batch R350628 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24071781-002AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.63**	0.5000	0.1470	95.8	0.6210	0.80	07/23/2024

Batch R350628 **SampType:** MS Units **mg/L**

SampID: 24071826-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.50**	0.5000	0	101.0	85	115	07/23/2024

Batch R350628 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24071826-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.50**	0.5000	0	100.4	0.5050	0.60	07/23/2024

STANDARD METHODS 4500-NO3 F (TOTAL) 2000, 2011

Batch R350393 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate (as N)		0.050		**< 0.050**						07/18/2024
Nitrogen, Nitrate-Nitrite (as N)		0.050		**< 0.050**	0.0090	0	0	-100	100	07/18/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

STANDARD METHODS 4500-NO3 F (TOTAL) 2000, 2011

Batch R350393 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.509**	0.5000	0	101.8	90	110	07/18/2024

Batch R350393 **SampType:** MS Units **mg/Kg-dry**
SampID: 24071290-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.511		**3.16**	2.557	0.6238	99.2	90	110	07/18/2024

Batch R350393 **SampType:** MSD Units **mg/Kg-dry** RPD Limit **10**
SampID: 24071290-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.511		**3.14**	2.557	0.6238	98.4	3.160	0.65	07/18/2024

Batch R350393 **SampType:** MS Units **mg/L**
SampID: 24071319-008AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.100		**1.39**	0.5000	0.8790	103.0	90	110	07/18/2024

Batch R350393 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 24071319-008AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.100		**1.39**	0.5000	0.8790	102.4	1.394	0.22	07/18/2024

Batch R350393 **SampType:** MS Units **mg/L**
SampID: 24071382-003AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.250		**4.67**	1.250	3.451	97.6	90	110	07/18/2024

Batch R350393 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 24071382-003AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.250		**4.70**	1.250	3.451	99.8	4.671	0.58	07/18/2024

Batch R350393 **SampType:** MS Units **mg/L**
SampID: 24071407-003BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.500		**4.56**	2.500	2.004	102.4	90	110	07/18/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

STANDARD METHODS 4500-NO3 F (TOTAL) 2000, 2011

Batch R350393 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24071407-003BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.500		**4.45**	2.500	2.004	97.8	4.563	2.55	07/18/2024

Batch R350393 **SampType:** MS Units **mg/L**

SampID: 24071407-010BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		1.00		**16.3**	5.000	11.04	105.8	90	110	07/18/2024

Batch R350393 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24071407-010BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		1.00		**15.7**	5.000	11.04	94.0	16.33	3.67	07/18/2024

Batch R350393 **SampType:** MS Units **mg/L**

SampID: 24071606-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		1.00		**9.77**	5.000	4.795	99.4	90	110	07/18/2024

Batch R350393 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24071606-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		1.00		**9.73**	5.000	4.795	98.7	9.767	0.40	07/18/2024

Batch R350520 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate (as N)		0.050		**< 0.050**						07/19/2024
Nitrogen, Nitrate-Nitrite (as N)		0.050		**< 0.050**	0.0090	0	0	-100	100	07/19/2024

Batch R350520 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.520**	0.5000	0	104.0	90	110	07/19/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

STANDARD METHODS 4500-NO3 F (TOTAL) 2000, 2011

Batch R350520 **SampType:** MS Units **mg/L**
SampID: 24061962-014AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.252**	0.2500	0.02000	92.8	85	115	07/19/2024

Batch R350520 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 24061962-014AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.247**	0.2500	0.02000	90.8	0.2520	2.00	07/19/2024

Batch R350520 **SampType:** MS Units **mg/L**
SampID: 24071316-005BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.250		**2.17**	1.250	0.8870	102.3	90	110	07/19/2024

Batch R350520 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 24071316-005BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.250		**2.16**	1.250	0.8870	101.8	2.166	0.28	07/19/2024

Batch R350520 **SampType:** MS Units **mg/L**
SampID: 24071605-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.283**	0.2500	0.04200	96.4	85	115	07/19/2024

Batch R350520 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 24071605-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.283**	0.2500	0.04200	96.4	0.2830	0.00	07/19/2024

Batch R350520 **SampType:** MS Units **mg/L**
SampID: 24071605-008BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.238**	0.2500	0	95.2	85	115	07/19/2024

Batch R350520 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 24071605-008BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.241**	0.2500	0	96.4	0.2380	1.25	07/19/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

STANDARD METHODS 4500-NO3 F (TOTAL) 2000, 2011

Batch R350645 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate (as N)		0.050		**< 0.050**						07/23/2024
Nitrogen, Nitrate-Nitrite (as N)		0.050		**< 0.050**	0.0090	0	0	-100	100	07/23/2024

Batch R350645 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.485**	0.5000	0	97.0	90	110	07/23/2024

Batch R350645 **SampType:** MS Units **mg/Kg-dry**
SampID: 24071492-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		70.0		**355**	350.1	25.77	93.9	85	115	07/23/2024

Batch R350645 **SampType:** MSD Units **mg/Kg-dry** RPD Limit **10**
SampID: 24071492-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		70.0		**342**	350.1	25.77	90.2	354.6	3.70	07/23/2024

Batch R350645 **SampType:** MS Units **mg/L**
SampID: 24071826-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.05		**0.25**	0.2500	0	100.4	90	110	07/23/2024

Batch R350645 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 24071826-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.05		**0.26**	0.2500	0	102.4	0.2510	1.97	07/23/2024

Batch R350645 **SampType:** MS Units **mg/L**
SampID: 24071835-002BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50		**34.9**	12.50	22.76	96.9	85	115	07/23/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

STANDARD METHODS 4500-NO3 F (TOTAL) 2000, 2011

Batch R350645 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24071835-002BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50		**34.7**	12.50	22.76	95.4	34.87	0.53	07/23/2024

SW-846 9036 (DISSOLVED)

Batch R350574 **SampType:** MS Units **mg/L**

SampID: 24071438-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		10		**36**	20.00	18.35	88.6	85	115	07/22/2024

Batch R350574 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24071438-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		10		**36**	20.00	18.35	85.8	36.07	1.59	07/22/2024

Batch R350671 **SampType:** MS Units **mg/L**

SampID: 24061962-002BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		50		**213**	100.0	113.6	99.4	85	115	07/24/2024

Batch R350671 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24061962-002BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		50		**220**	100.0	113.6	106.0	213.0	3.03	07/24/2024

Batch R350671 **SampType:** MS Units **mg/L**

SampID: 24071605-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		10	S	**39**	20.00	14.87	121.3	85	115	07/24/2024

Batch R350671 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24071605-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		10	S	**39**	20.00	14.87	120.6	39.12	0.33	07/24/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 9036 (DISSOLVED)

Batch R350671 **SampType:** MS Units **mg/L**
SampID: 24071605-003BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		20		**99**	40.00	63.71	89.2	85	115	07/24/2024

Batch R350671 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 24071605-003BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		20	E	**102**	40.00	63.71	94.9	99.39	2.27	07/24/2024

Batch R350878 **SampType:** MS Units **mg/L**
SampID: 24071773-005BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		1000		**3400**	2000	1559	92.2	85	115	07/26/2024

Batch R350878 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 24071773-005BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		1000		**3410**	2000	1559	92.5	3403	0.17	07/26/2024

Batch R350922 **SampType:** MS Units **mg/L**
SampID: 24061962-008BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		50		**166**	100.0	75.94	89.6	85	115	07/29/2024

Batch R350922 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 24061962-008BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		50		**164**	100.0	75.94	88.3	165.5	0.75	07/29/2024

SW-846 9036 (TOTAL)

Batch R350574 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		10		**< 10**	6.140	0	0	-100	100	07/22/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 9036 (TOTAL)

Batch R350574 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		10		**20**	20.00	0	99.7	90	110	07/22/2024

Batch R350574 **SampType:** MS Units **mg/L**
SampID: 24061962-009AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		10		**37**	20.00	17.81	93.7	85	115	07/22/2024

Batch R350574 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 24061962-009AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		10	S	**34**	20.00	17.81	82.4	36.55	6.38	07/22/2024

Batch R350574 **SampType:** MS Units **mg/L**
SampID: 24071384-001CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		50		**237**	100.0	140.4	96.7	90	110	07/22/2024

Batch R350574 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 24071384-001CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		50		**244**	100.0	140.4	103.3	237.2	2.73	07/22/2024

Batch R350671 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		10		**< 10**	6.140	0	0	-100	100	07/24/2024

Batch R350671 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		10		**19**	20.00	0	93.0	90	110	07/24/2024

Batch R350671 **SampType:** MS Units **mg/L**
SampID: 24071416-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		500		**2230**	1000	1275	95.5	90	110	07/24/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 9036 (TOTAL)

Batch R350671 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24071416-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		500		**2320**	1000	1275	104.8	2230	4.08	07/24/2024

Batch R350671 **SampType:** MS Units **mg/L**

SampID: 24071423-005BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		20	S	**88**	40.00	42.34	114.9	90	110	07/24/2024

Batch R350671 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24071423-005BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		20		**84**	40.00	42.34	104.4	88.28	4.83	07/24/2024

Batch R350671 **SampType:** MS Units **mg/L**

SampID: 24071772-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		200	S	**824**	400.0	377.6	111.7	90	110	07/24/2024

Batch R350671 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24071772-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		200	S	**828**	400.0	377.6	112.7	824.4	0.46	07/24/2024

Batch R350878 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		10		**< 10**	6.140	0	0	-100	100	07/26/2024

Batch R350878 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		10		**19**	20.00	0	95.8	90	110	07/26/2024

Batch R350878 **SampType:** MS Units **mg/L**

SampID: 24061962-016AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		100		**388**	200.0	201.3	93.1	85	115	07/26/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 9036 (TOTAL)

Batch R350878 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24061962-016AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		100		**397**	200.0	201.3	97.7	387.5	2.35	07/26/2024

Batch R350878 **SampType:** MS Units **mg/L**

SampID: 24061962-020AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		20		**85**	40.00	45.95	98.8	85	115	07/26/2024

Batch R350878 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24061962-020AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		20		**85**	40.00	45.95	97.3	85.45	0.69	07/26/2024

Batch R350878 **SampType:** MS Units **mg/L**

SampID: 24061962-025AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		100	S	**269**	200.0	102.7	83.3	85	115	07/26/2024

Batch R350878 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24061962-025AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		100		**275**	200.0	102.7	85.9	269.4	1.93	07/26/2024

Batch R350878 **SampType:** MS Units **mg/L**

SampID: 24071773-005AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		1000		**3460**	2000	1608	92.4	85	115	07/26/2024

Batch R350878 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24071773-005AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		1000		**3540**	2000	1608	96.5	3455	2.39	07/26/2024

Batch R350878 **SampType:** MS Units **mg/L**

SampID: 24071895-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		100		**325**	200.0	142.6	91.1	90	110	07/26/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 9036 (TOTAL)

Batch R350878 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24071895-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		100	S	**322**	200.0	142.6	89.7	324.8	0.88	07/26/2024

Batch R350922 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		10		**< 10**	6.140	0	0	-100	100	07/29/2024

Batch R350922 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		10		**19**	20.00	0	94.1	90	110	07/29/2024

Batch R350922 **SampType:** MS Units **mg/L**

SampID: 24071132-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		20	S	**75**	40.00	43.29	79.1	85	115	07/29/2024

Batch R350922 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24071132-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		20		**78**	40.00	43.29	86.6	74.94	3.91	07/29/2024

Batch R350922 **SampType:** MS Units **mg/L**

SampID: 24071132-002AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		10		**37**	20.00	16.61	99.6	85	115	07/29/2024

Batch R350922 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24071132-002AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		10		**36**	20.00	16.61	99.2	36.52	0.22	07/29/2024

Batch R350922 **SampType:** MS Units **mg/L**

SampID: 24071132-010AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		50		**141**	100.0	55.92	85.4	85	115	07/29/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 9036 (TOTAL)

Batch R350922 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24071132-010AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		50		**145**	100.0	55.92	89.2	141.4	2.59	07/29/2024

Batch R350922 **SampType:** MS Units **mg/L**

SampID: 24071132-013AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		20		**75**	40.00	36.86	95.0	85	115	07/29/2024

Batch R350922 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24071132-013AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		20		**74**	40.00	36.86	92.2	74.84	1.49	07/29/2024

Batch R350922 **SampType:** MS Units **mg/L**

SampID: 24072345-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		200		**720**	400.0	327.6	98.1	90	110	07/29/2024

Batch R350922 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24072345-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		200		**718**	400.0	327.6	97.7	720.0	0.22	07/29/2024

Batch R350922 **SampType:** MS Units **mg/L**

SampID: 24072346-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		200		**725**	400.0	351.0	93.6	90	110	07/29/2024

Batch R350922 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24072346-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		200	S	**709**	400.0	351.0	89.5	725.4	2.28	07/29/2024

Batch R350996 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		10		**< 10**	6.140	0	0	-100	100	07/30/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 9036 (TOTAL)

Batch R350996 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		10		**19**	20.00	0	93.3	90	110	07/30/2024

Batch R350996 **SampType:** MS Units **mg/L**
SampID: 24071292-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		10		**34**	20.00	16.11	91.2	85	115	07/30/2024

Batch R350996 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 24071292-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		10		**36**	20.00	16.11	97.1	34.35	3.38	07/30/2024

Batch R350996 **SampType:** MS Units **mg/L**
SampID: 24072173-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		100		**442**	200.0	260.3	90.7	85	115	07/30/2024

Batch R350996 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 24072173-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		100		**452**	200.0	260.3	95.7	441.8	2.24	07/30/2024

Batch R350996 **SampType:** MS Units **mg/L**
SampID: 24072173-006AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		50		**169**	100.0	78.49	90.7	85	115	07/30/2024

Batch R350996 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 24072173-006AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		50		**172**	100.0	78.49	93.8	169.2	1.83	07/30/2024

Batch R351041 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		10		**< 10**	6.140	0	0	-100	100	07/31/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 9036 (TOTAL)

Batch R351041 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		10		**19**	20.00	0	95.2	90	110	07/31/2024

Batch R351041 **SampType:** MS Units **mg/L**
SampID: 24072147-003BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		200		**827**	400.0	464.3	90.7	90	110	07/31/2024

Batch R351041 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 24072147-003BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		200		**834**	400.0	464.3	92.5	827.1	0.85	07/31/2024

SW-846 9214 (TOTAL)

Batch R350406 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**< 0.10**	0.0500	0	0	-100	100	07/18/2024

Batch R350406 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**1.05**	1.000	0	104.9	90	110	07/18/2024

Batch R350406 **SampType:** MS Units **mg/L**
SampID: 24061962-032AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**6.19**	2.000	4.189	100.1	75	125	07/18/2024

Batch R350406 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24061962-032AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.10		**6.22**	2.000	4.189	101.6	6.191	0.50	07/18/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 9214 (TOTAL)

Batch R350406 **SampType:** MS Units **mg/L**
SampID: 24061962-046AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**3.74**	2.000	1.649	104.3	75	125	07/18/2024

Batch R350406 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24061962-046AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.10		**3.80**	2.000	1.649	107.6	3.735	1.78	07/18/2024

Batch R350406 **SampType:** MS Units **mg/L**
SampID: 24071352-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**2.34**	2.000	0.4090	96.8	75	125	07/18/2024

Batch R350406 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071352-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.10		**2.42**	2.000	0.4090	100.8	2.345	3.31	07/18/2024

Batch R350406 **SampType:** MS Units **mg/L**
SampID: 24071438-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**2.90**	2.000	0.7960	105.4	75	125	07/18/2024

Batch R350406 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071438-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.10		**2.92**	2.000	0.7960	106.1	2.905	0.45	07/18/2024

Batch R350479 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**< 0.10**	0.0500	0	0	-100	100	07/19/2024

Batch R350479 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**1.09**	1.000	0	108.7	90	110	07/19/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 9214 (TOTAL)

Batch R350479 **SampType:** MS Units **mg/L**
SampID: 24061962-014AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**2.39**	2.000	0.2300	108.0	75	125	07/19/2024

Batch R350479 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24061962-014AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.10		**2.45**	2.000	0.2300	111.2	2.391	2.56	07/19/2024

Batch R350479 **SampType:** MS Units **mg/L**
SampID: 24061962-024AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**5.45**	2.000	3.126	116.0	75	125	07/19/2024

Batch R350479 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24061962-024AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.10		**5.42**	2.000	3.126	114.7	5.446	0.48	07/19/2024

Batch R350479 **SampType:** MS Units **mg/L**
SampID: 24061962-048AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**2.69**	2.000	0.5340	107.7	75	125	07/19/2024

Batch R350479 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24061962-048AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.10		**2.68**	2.000	0.5340	107.1	2.688	0.45	07/19/2024

Batch R350479 **SampType:** MS Units **mg/L**
SampID: 24071605-008BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**2.38**	2.000	0.2630	106.0	75	125	07/19/2024

Batch R350479 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071605-008BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.10		**2.13**	2.000	0.2630	93.2	2.382	11.36	07/19/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 9214 (TOTAL)

Batch R350534 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**< 0.10**	0.0500	0	0	-100	100	07/22/2024

Batch R350534 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**1.06**	1.000	0	106.1	90	110	07/22/2024

Batch R350534 **SampType:** MS Units **mg/L**
SampID: 24061962-031AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**3.56**	2.000	1.460	104.8	75	125	07/22/2024

Batch R350534 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24061962-031AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.10		**3.56**	2.000	1.460	104.8	3.556	0.00	07/22/2024

Batch R350609 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**< 0.10**	0.0500	0	0	-100	100	07/23/2024

Batch R350609 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**1.06**	1.000	0	106.0	90	110	07/23/2024

Batch R350609 **SampType:** MS Units **mg/L**
SampID: 24071772-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**2.39**	2.000	0.1960	109.7	75	125	07/23/2024

Batch R350609 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071772-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.10		**2.28**	2.000	0.1960	104.0	2.389	4.80	07/23/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 9214 (TOTAL)

Batch R350609 **SampType:** MS Units **mg/L**
SampID: 24071773-003AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**2.22**	2.000	0.1200	105.0	75	125	07/23/2024

Batch R350609 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071773-003AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.10		**2.11**	2.000	0.1200	99.6	2.219	4.99	07/23/2024

Batch R350609 **SampType:** MS Units **mg/L**
SampID: 24071773-006BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**2.31**	2.000	0.3530	97.8	75	125	07/23/2024

Batch R350609 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071773-006BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.10		**2.34**	2.000	0.3530	99.2	2.310	1.20	07/23/2024

Batch R350762 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**< 0.10**	0.0500	0	0	-100	100	07/25/2024

Batch R350762 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**1.08**	1.000	0	107.5	90	110	07/25/2024

Batch R350762 **SampType:** MS Units **mg/L**
SampID: 24071132-002AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**2.25**	2.000	0.1980	102.6	75	125	07/25/2024

Batch R350762 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071132-002AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.10		**2.33**	2.000	0.1980	106.5	2.251	3.36	07/25/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 9214 (TOTAL)

Batch R350762 **SampType:** MS Units **mg/L**
SampID: 24071132-011AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**2.35**	2.000	0.2160	106.8	75	125	07/25/2024

Batch R350762 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071132-011AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.10		**2.31**	2.000	0.2160	104.8	2.353	1.80	07/25/2024

Batch R350762 **SampType:** MS Units **mg/L**
SampID: 24071132-019AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**2.88**	2.000	0.7420	107.2	75	125	07/25/2024

Batch R350762 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071132-019AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.10		**2.88**	2.000	0.7420	106.7	2.885	0.31	07/25/2024

Batch R350762 **SampType:** MS Units **mg/L**
SampID: 24071292-006AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**2.11**	2.000	0.06500	102.1	75	125	07/25/2024

Batch R350762 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071292-006AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.10		**2.16**	2.000	0.06500	104.8	2.107	2.53	07/25/2024

Batch R350762 **SampType:** MS Units **mg/L**
SampID: 24071292-009AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**2.08**	2.000	0	103.8	75	125	07/25/2024

Batch R350762 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071292-009AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.10		**2.11**	2.000	0	105.4	2.076	1.58	07/25/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 9214 (TOTAL)

Batch R350762 **SampType:** MS Units **mg/L**
SampID: 24071895-003BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**2.88**	2.000	0.7650	105.8	75	125	07/25/2024

Batch R350762 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071895-003BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.10		**2.87**	2.000	0.7650	105.3	2.882	0.38	07/25/2024

SW-846 9251 (DISSOLVED)

Batch R350587 **SampType:** MS Units **mg/L**
SampID: 24061962-002BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**33**	20.00	15.42	89.5	85	115	07/22/2024

Batch R350587 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24061962-002BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		4		**33**	20.00	15.42	90.3	33.32	0.48	07/22/2024

Batch R350587 **SampType:** MS Units **mg/L**
SampID: 24071438-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**20**	20.00	1.170	95.6	85	115	07/22/2024

Batch R350587 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071438-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		4		**20**	20.00	1.170	94.6	20.28	0.99	07/22/2024

Batch R350677 **SampType:** MS Units **mg/L**
SampID: 24071605-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**21**	20.00	1.310	98.2	85	115	07/24/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 9251 (DISSOLVED)

Batch R350677 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24071605-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		4		**21**	20.00	1.310	97.7	20.95	0.48	07/24/2024

Batch R350677 **SampType:** MS Units **mg/L**

SampID: 24071605-003BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**23**	20.00	3.270	97.3	85	115	07/24/2024

Batch R350677 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24071605-003BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		4		**23**	20.00	3.270	97.0	22.72	0.26	07/24/2024

Batch R350886 **SampType:** MS Units **mg/L**

SampID: 24061962-008BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**35**	20.00	16.31	92.1	85	115	07/26/2024

Batch R350886 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24061962-008BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		4		**35**	20.00	16.31	92.0	34.73	0.03	07/26/2024

Batch R350886 **SampType:** MS Units **mg/L**

SampID: 24071773-005BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		40	E	**525**	200.0	333.7	95.8	85	115	07/26/2024

Batch R350886 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24071773-005BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		40	E	**517**	200.0	333.7	91.8	525.2	1.52	07/26/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 9251 (TOTAL)

Batch R350587 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**< 4**	0.5000	0	0	-100	100	07/22/2024

Batch R350587 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**20**	20.00	0	101.6	90	110	07/22/2024

Batch R350587 **SampType:** MS Units **mg/L**
SampID: 24061962-009AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**38**	20.00	20.03	88.4	85	115	07/22/2024

Batch R350587 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24061962-009AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		4		**38**	20.00	20.03	89.3	37.70	0.50	07/22/2024

Batch R350587 **SampType:** MS Units **mg/L**
SampID: 24071247-002AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		40		**297**	200.0	115.3	90.6	85	115	07/22/2024

Batch R350587 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071247-002AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		40		**295**	200.0	115.3	89.9	296.6	0.48	07/22/2024

Batch R350587 **SampType:** MS Units **mg/L**
SampID: 24071384-001CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		20		**152**	100.0	57.80	94.0	85	115	07/22/2024

Batch R350587 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071384-001CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		20		**152**	100.0	57.80	93.9	151.8	0.03	07/22/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 9251 (TOTAL)

Batch R350587 **SampType:** MS Units **mg/L**
SampID: 24071417-001CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		20		**181**	100.0	91.31	90.1	85	115	07/22/2024

Batch R350587 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071417-001CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		20		**183**	100.0	91.31	92.1	181.4	1.10	07/22/2024

Batch R350587 **SampType:** MS Units **mg/L**
SampID: 24071423-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		20		**174**	100.0	86.08	87.6	85	115	07/22/2024

Batch R350587 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071423-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		20		**174**	100.0	86.08	88.1	173.7	0.32	07/22/2024

Batch R350677 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**< 4**	0.5000	0	0	-100	100	07/24/2024

Batch R350677 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**19**	20.00	0	96.7	90	110	07/24/2024

Batch R350677 **SampType:** MS Units **mg/L**
SampID: 24071416-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		80		**749**	400.0	397.0	87.9	85	115	07/24/2024

Batch R350677 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071416-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		80		**743**	400.0	397.0	86.5	748.8	0.78	07/24/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 9251 (TOTAL)

Batch R350677 **SampType:** MS Units **mg/L**
SampID: 24071772-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**27**	20.00	8.180	93.9	85	115	07/24/2024

Batch R350677 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071772-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		4		**27**	20.00	8.180	93.3	26.96	0.45	07/24/2024

Batch R350886 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**< 4**	0.5000	0	0	-100	100	07/26/2024

Batch R350886 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**20**	20.00	0	98.0	90	110	07/26/2024

Batch R350886 **SampType:** MS Units **mg/L**
SampID: 24061962-016AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		20	E	**267**	100.0	168.7	98.2	85	115	07/26/2024

Batch R350886 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24061962-016AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		20	E	**261**	100.0	168.7	92.6	266.9	2.12	07/26/2024

Batch R350886 **SampType:** MS Units **mg/L**
SampID: 24061962-020AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**49**	20.00	30.94	91.8	85	115	07/26/2024

Batch R350886 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24061962-020AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		4		**49**	20.00	30.94	90.4	49.31	0.57	07/26/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 9251 (TOTAL)

Batch R350886 **SampType:** MS Units **mg/L**
SampID: 24061962-025AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		40		**275**	200.0	85.74	94.6	85	115	07/26/2024

Batch R350886 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24061962-025AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		40		**275**	200.0	85.74	94.6	275.0	0.04	07/26/2024

Batch R350942 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**< 4**	0.5000	0	0	-100	100	07/29/2024

Batch R350942 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**20**	20.00	0	98.2	90	110	07/29/2024

Batch R350942 **SampType:** MS Units **mg/L**
SampID: 24071132-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**33**	20.00	14.64	91.7	85	115	07/29/2024

Batch R350942 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071132-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		4		**33**	20.00	14.64	90.4	32.97	0.79	07/29/2024

Batch R350942 **SampType:** MS Units **mg/L**
SampID: 24071132-002AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**37**	20.00	19.34	90.2	85	115	07/29/2024

Batch R350942 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071132-002AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		4		**37**	20.00	19.34	88.4	37.39	0.97	07/29/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 9251 (TOTAL)

Batch R350942 **SampType:** MS Units **mg/L**
SampID: 24071132-013AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		8	E	**123**	40.00	84.65	95.8	85	115	07/29/2024

Batch R350942 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071132-013AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		8	E	**121**	40.00	84.65	91.7	123.0	1.34	07/29/2024

Batch R350942 **SampType:** MS Units **mg/L**
SampID: 24071773-005AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		80		**668**	400.0	315.5	88.1	85	115	07/29/2024

Batch R350942 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071773-005AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		80		**676**	400.0	315.5	90.0	667.9	1.16	07/29/2024

Batch R350942 **SampType:** MS Units **mg/L**
SampID: 24071875-002AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		40		**363**	200.0	188.6	87.3	85	115	07/29/2024

Batch R350942 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071875-002AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		40		**364**	200.0	188.6	87.5	363.1	0.13	07/29/2024

Batch R350942 **SampType:** MS Units **mg/L**
SampID: 24072346-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**27**	20.00	8.420	95.0	85	115	07/29/2024

Batch R350942 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24072346-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		4		**27**	20.00	8.420	95.2	27.41	0.15	07/29/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 9251 (TOTAL)

Batch R351030 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**< 4**	0.5000	0	0	-100	100	07/30/2024

Batch R351030 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**20**	20.00	0	97.8	90	110	07/30/2024

Batch R351030 **SampType:** MS Units **mg/L**
SampID: 24071132-010AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**22**	20.00	2.870	97.0	85	115	07/30/2024

Batch R351030 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071132-010AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		4		**22**	20.00	2.870	96.5	22.27	0.50	07/30/2024

Batch R351030 **SampType:** MS Units **mg/L**
SampID: 24071292-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**36**	20.00	18.52	88.0	85	115	07/30/2024

Batch R351030 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24071292-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		4		**37**	20.00	18.52	90.0	36.12	1.07	07/30/2024

Batch R351030 **SampType:** MS Units **mg/L**
SampID: 24072147-003BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		40	E	**686**	200.0	486.4	100.0	85	115	07/30/2024

Batch R351030 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24072147-003BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		40	E	**695**	200.0	486.4	104.1	686.4	1.18	07/30/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 9251 (TOTAL)

Batch R351044 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**< 4**	0.5000	0	0	-100	100	07/31/2024

Batch R351044 **SampType:** MBLK Units **mg/Kg**
SampID: MBLK-240730-2

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	*	40		**< 40**	0.5000	0	0	-100	100	07/31/2024

Batch R351044 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**20**	20.00	0	99.4	90	110	07/31/2024

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 225880 **SampType:** MBLK Units **mg/L**
SampID: MBLK-225880

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**< 0.100**	0.0350	0	0	-100	100	07/19/2024
Magnesium		0.0500		**< 0.0500**	0.0055	0	0	-100	100	07/19/2024
Potassium		0.100		**< 0.100**	0.0400	0	0	-100	100	07/19/2024
Sodium		0.0500		**< 0.0500**	0.0180	0	0	-100	100	07/19/2024

Batch 225880 **SampType:** LCS Units **mg/L**
SampID: LCS-225880

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**2.45**	2.500	0	97.9	85	115	07/19/2024
Magnesium		0.0500		**2.36**	2.500	0	94.3	85	115	07/24/2024
Potassium		0.100		**2.66**	2.500	0	106.3	85	115	07/19/2024
Sodium		0.0500		**2.52**	2.500	0	100.8	85	115	07/19/2024

Batch 225880 **SampType:** MS Units **mg/L**
SampID: 24061962-009BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**65.4**	2.500	62.25	124.4	75	125	07/19/2024
Magnesium		0.0500		**29.1**	2.500	26.64	100.2	75	125	07/19/2024
Potassium		0.100		**3.09**	2.500	0.5015	103.7	75	125	07/19/2024
Sodium		0.0500		**51.0**	2.500	48.74	91.2	75	125	07/19/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 225880 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24061962-009BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Calcium		0.100		**65.4**	2.500	62.25	124.8	65.36	0.02	07/19/2024
Magnesium		0.0500		**29.3**	2.500	26.64	106.4	29.14	0.52	07/19/2024
Potassium		0.100		**3.08**	2.500	0.5015	103.1	3.093	0.43	07/19/2024
Sodium		0.0500		**51.1**	2.500	48.74	92.8	51.02	0.08	07/19/2024

Batch 225880 **SampType:** MS Units **mg/L**

SampID: 24061962-032BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**26.3**	2.500	23.31	120.4	75	125	07/19/2024
Magnesium		1.00		**18.1**	2.500	15.66	99.5	75	125	07/24/2024
Potassium		0.100		**7.10**	2.500	4.429	106.7	75	125	07/19/2024
Sodium		1.00	S	**679**	2.500	668.6	400.0	75	125	07/24/2024

Batch 225880 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24061962-032BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Calcium		0.100		**25.3**	2.500	23.31	78.4	26.32	4.07	07/19/2024
Magnesium		1.00		**17.7**	2.500	15.66	80.7	18.15	2.62	07/24/2024
Potassium		0.100		**7.13**	2.500	4.429	108.1	7.097	0.47	07/19/2024
Sodium		1.00	S	**660**	2.500	668.6	-344.0	678.6	2.78	07/24/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 225932 **SampType:** MBLK Units **mg/L**

SampID: MBLK-225932

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**< 0.100**	0.0350	0	0	-100	100	07/22/2024
Chromium		0.0050		**< 0.0050**	0.0028	0	0	-100	100	07/22/2024
Cobalt		0.0050		**< 0.0050**	0.0020	0	0	-100	100	07/22/2024
Iron		0.0400		**< 0.0400**	0.0200	0	0	-100	100	07/22/2024
Lead		0.0150		**< 0.0150**	0.0014	0	0	-100	100	07/22/2024
Lithium		0.0500		**< 0.0500**	0.0019	0	0	-100	100	07/22/2024
Magnesium		0.0500		**< 0.0500**	0.0055	0	0	-100	100	07/22/2024
Manganese		0.0070		**< 0.0070**	0.0025	0	0	-100	100	07/22/2024
Molybdenum		0.0100		**< 0.0100**	0.0037	0	0	-100	100	07/22/2024
Potassium		0.100		**< 0.100**	0.0400	0	0	-100	100	07/22/2024
Selenium		0.0400		**< 0.0400**	0.0170	0	0	-100	100	07/22/2024
Sodium		0.0500		**< 0.0500**	0.0180	0	0	-100	100	07/22/2024
Thallium		0.0500		**< 0.0500**	0.0111	0	0	-100	100	07/22/2024

Batch 225932 **SampType:** LCS Units **mg/L**

SampID: LCS-225932

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**2.43**	2.500	0	97.3	85	115	07/22/2024
Chromium		0.0050		**0.195**	0.2000	0	97.7	85	115	07/22/2024
Cobalt		0.0050		**0.515**	0.5000	0	103.0	85	115	07/22/2024
Iron		0.0400		**1.91**	2.000	0	95.6	85	115	07/22/2024
Lead		0.0150		**0.493**	0.5000	0	98.5	85	115	07/22/2024
Lithium		0.0500		**0.510**	0.5000	0	102.0	85	115	07/22/2024
Magnesium		0.0500		**2.39**	2.500	0	95.6	85	115	07/22/2024
Manganese		0.0070		**0.495**	0.5000	0	99.0	85	115	07/22/2024
Molybdenum		0.0100		**0.493**	0.5000	0	98.7	85	115	07/22/2024
Potassium		0.100		**2.69**	2.500	0	107.7	85	115	07/22/2024
Selenium		0.0400		**0.504**	0.5000	0	100.8	85	115	07/22/2024
Sodium		0.0500		**2.54**	2.500	0	101.8	85	115	07/22/2024
Thallium		0.0500		**0.245**	0.2500	0	97.8	85	115	07/22/2024

Quality Control Results

http://www.teklabinc.com/

Client: Ramboll
Client Project: BAL-24Q3

Work Order: 24061962
Report Date: 12-Aug-24

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 225932 **SampType:** MS Units **mg/L**
SampID: 24061962-026BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**60.5**	2.500	57.78	108.4	75	125	07/22/2024
Magnesium		0.0500		**41.5**	2.500	38.79	107.7	75	125	07/22/2024
Potassium		0.100		**6.46**	2.500	3.723	109.3	75	125	07/22/2024
Sodium		0.0500	S	**143**	2.500	139.8	132.8	75	125	07/22/2024

Batch 225932 **SampType:** MSD Units **mg/L** RPD Limit **20**
SampID: 24061962-026BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Calcium		0.100	S	**59.6**	2.500	57.78	71.6	60.49	1.53	07/22/2024
Magnesium		0.0500		**40.7**	2.500	38.79	76.2	41.48	1.92	07/22/2024
Potassium		0.100		**6.34**	2.500	3.723	104.7	6.456	1.81	07/22/2024
Sodium		0.0500	S	**140**	2.500	139.8	26.4	143.1	1.88	07/22/2024

Batch 225998 **SampType:** MBLK Units **mg/L**
SampID: MBLK-225998

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Barium		0.0025		**< 0.0025**	0.0007	0	0	-100	100	07/23/2024
Beryllium		0.0005		**< 0.0005**	0.0002	0	0	-100	100	07/23/2024
Cadmium		0.0020		**< 0.0020**	0.0005	0	0	-100	100	07/23/2024
Calcium		0.100		**< 0.100**	0.0350	0	0	-100	100	07/23/2024
Chromium		0.0050		**< 0.0050**	0.0028	0	0	-100	100	07/23/2024
Cobalt		0.0050		**< 0.0050**	0.0020	0	0	-100	100	07/23/2024
Lead		0.0150		**< 0.0150**	0.0040	0	0	-100	100	07/23/2024
Magnesium		0.0500		**< 0.0500**	0.0055	0	0	-100	100	07/23/2024
Molybdenum		0.0100		**< 0.0100**	0.0037	0	0	-100	100	07/23/2024
Potassium		0.100		**< 0.100**	0.0400	0	0	-100	100	07/23/2024
Selenium		0.0400		**< 0.0400**	0.0170	0	0	-100	100	07/23/2024
Sodium		0.0500		**< 0.0500**	0.0180	0	0	-100	100	07/23/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 225998 **SampType:** LCS Units **mg/L**

SampID: LCS-225998

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Barium		0.0025		**1.96**	2.000	0	98.1	85	115	07/23/2024
Beryllium		0.0005		**0.0485**	0.0500	0	97.0	85	115	07/23/2024
Cadmium		0.0020		**0.0485**	0.0500	0	97.0	85	115	07/23/2024
Calcium		0.100		**2.40**	2.500	0	95.9	85	115	07/23/2024
Chromium		0.0050		**0.195**	0.2000	0	97.7	85	115	07/23/2024
Cobalt		0.0050		**0.499**	0.5000	0	99.8	85	115	07/23/2024
Lead		0.0150		**0.479**	0.5000	0	95.8	85	115	07/23/2024
Magnesium		0.0500		**2.40**	2.500	0	96.2	85	115	07/23/2024
Molybdenum		0.0100		**0.480**	0.5000	0	96.0	85	115	07/23/2024
Potassium		0.100		**2.63**	2.500	0	105.1	85	115	07/23/2024
Selenium		0.0400		**0.502**	0.5000	0	100.3	85	115	07/23/2024
Sodium		0.0500		**2.41**	2.500	0	96.3	85	115	07/23/2024

Batch 225998 **SampType:** MS Units **mg/L**

SampID: 24071547-002AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Barium		0.0025		**2.12**	2.000	0.1937	96.3	75	125	07/23/2024
Beryllium		0.0005		**0.0491**	0.0500	0	98.2	75	125	07/23/2024
Calcium		0.100		**84.4**	2.500	81.48	117.6	75	125	07/23/2024
Chromium		0.0050		**0.201**	0.2000	0.003300	98.9	75	125	07/23/2024
Lead		0.0150		**0.487**	0.5000	0	97.3	75	125	07/23/2024
Magnesium		0.0500		**33.8**	2.500	31.38	96.8	75	125	07/23/2024
Molybdenum		0.0100		**0.499**	0.5000	0.008000	98.2	75	125	07/23/2024

Batch 225998 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24071547-002AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Barium		0.0025		**2.07**	2.000	0.1937	93.8	2.120	2.39	07/23/2024
Beryllium		0.0005		**0.0481**	0.0500	0	96.2	0.04910	2.06	07/23/2024
Calcium		0.100	S	**81.3**	2.500	81.48	-6.0	84.42	3.73	07/23/2024
Chromium		0.0050		**0.198**	0.2000	0.003300	97.2	0.2011	1.71	07/23/2024
Lead		0.0150		**0.471**	0.5000	0	94.1	0.4867	3.36	07/23/2024
Magnesium		0.0500	S	**32.7**	2.500	31.38	54.5	33.80	3.18	07/23/2024
Molybdenum		0.0100		**0.490**	0.5000	0.008000	96.4	0.4992	1.90	07/23/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 226025 **SampType:** MBLK Units **mg/L**

SampID: MBLK-226025

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Barium		0.0025		**< 0.0025**	0.0007	0	0	-100	100	07/23/2024
Beryllium		0.0005		**< 0.0005**	0.0002	0	0	-100	100	07/23/2024
Boron		0.0200		**< 0.0200**	0.0090	0	0	-100	100	07/23/2024
Cadmium		0.0020		**< 0.0020**	0.0005	0	0	-100	100	07/23/2024
Calcium		0.100		**< 0.100**	0.0350	0	0	-100	100	07/23/2024
Chromium		0.0050		**< 0.0050**	0.0028	0	0	-100	100	07/23/2024
Cobalt		0.0050		**< 0.0050**	0.0020	0	0	-100	100	07/23/2024
Lead		0.0150		**< 0.0150**	0.0040	0	0	-100	100	07/23/2024
Magnesium		0.0500		**< 0.0500**	0.0055	0	0	-100	100	07/23/2024
Molybdenum		0.0100		**< 0.0100**	0.0037	0	0	-100	100	07/23/2024
Potassium		0.100		**< 0.100**	0.0400	0	0	-100	100	07/23/2024
Selenium		0.0400		**< 0.0400**	0.0170	0	0	-100	100	07/23/2024
Sodium		0.0500		**< 0.0500**	0.0180	0	0	-100	100	07/23/2024

Batch 226025 **SampType:** LCS Units **mg/L**

SampID: LCS-226025

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Barium		0.0025		**1.94**	2.000	0	97.2	85	115	07/23/2024
Beryllium		0.0005		**0.0485**	0.0500	0	97.0	85	115	07/23/2024
Boron		0.0200		**0.472**	0.5000	0	94.4	85	115	07/23/2024
Cadmium		0.0020		**0.0482**	0.0500	0	96.4	85	115	07/23/2024
Calcium		0.100		**2.38**	2.500	0	95.1	85	115	07/23/2024
Chromium		0.0050		**0.194**	0.2000	0	97.2	85	115	07/23/2024
Cobalt		0.0050		**0.501**	0.5000	0	100.1	85	115	07/23/2024
Lead		0.0150		**0.485**	0.5000	0	97.0	85	115	07/23/2024
Magnesium		0.0500		**2.40**	2.500	0	95.9	85	115	07/23/2024
Molybdenum		0.0100		**0.480**	0.5000	0	95.9	85	115	07/23/2024
Potassium		0.100		**2.59**	2.500	0	103.6	85	115	07/23/2024
Selenium		0.0400		**0.496**	0.5000	0	99.3	85	115	07/23/2024
Sodium		0.0500		**2.38**	2.500	0	95.4	85	115	07/23/2024

Quality Control Results

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Client: Ramboll
Client Project: BAL-24Q3

Work Order: 24061962
Report Date: 12-Aug-24

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 226025 **SampType:** MS Units **mg/L**
SampID: 24061962-044BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100	S	**84.7**	2.500	83.92	32.8	75	125	07/23/2024
Magnesium		0.0500		**22.8**	2.500	20.82	78.9	75	125	07/23/2024
Potassium		1.00		**26.5**	2.500	24.44	82.4	75	125	07/25/2024
Sodium		0.0500	S	**48.0**	2.500	46.87	45.6	75	125	07/23/2024

Batch 226025 **SampType:** MSD Units **mg/L** RPD Limit **20**
SampID: 24061962-044BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Calcium		0.100	S	**84.0**	2.500	83.92	5.2	84.74	0.82	07/23/2024
Magnesium		0.0500	S	**22.6**	2.500	20.82	70.3	22.80	0.95	07/23/2024
Potassium		1.00		**26.9**	2.500	24.44	99.2	26.50	1.57	07/25/2024
Sodium		0.0500	S	**47.8**	2.500	46.87	37.6	48.01	0.42	07/23/2024

Batch 226068 **SampType:** MBLK Units **mg/L**
SampID: MBLK-226068

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**< 0.100**	0.0350	0	0	-100	100	07/24/2024
Calcium		0.100		**< 0.100**	0.0350	0	0	-100	100	07/26/2024
Magnesium		0.0500		**< 0.0500**	0.0055	0	0	-100	100	07/24/2024
Potassium		0.100		**< 0.100**	0.0400	0	0	-100	100	07/26/2024
Potassium		0.100		**< 0.100**	0.0400	0	0	-100	100	07/24/2024
Sodium		0.0500		**< 0.0500**	0.0180	0	0	-100	100	07/26/2024
Sodium		0.0500		**< 0.0500**	0.0180	0	0	-100	100	07/24/2024

Batch 226068 **SampType:** LCS Units **mg/L**
SampID: LCS-226068

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**2.38**	2.500	0	95.4	85	115	07/24/2024
Calcium		0.100		**2.50**	2.500	0	99.8	85	115	07/26/2024
Magnesium		0.0500		**2.31**	2.500	0	92.3	85	115	07/24/2024
Potassium		0.100		**2.74**	2.500	0	109.7	85	115	07/24/2024
Potassium		0.100		**2.69**	2.500	0	107.5	85	115	07/26/2024
Sodium		0.0500		**2.52**	2.500	0	100.8	85	115	07/24/2024
Sodium		0.0500		**2.71**	2.500	0	108.5	85	115	07/26/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 226068 **SampType:** MS Units **mg/L**

SampID: 24061962-015CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100	S	**174**	2.500	170.3	155.6	75	125	07/25/2024
Magnesium		0.0500		**70.6**	2.500	67.62	119.7	75	125	07/25/2024
Potassium		0.100		**8.12**	2.500	5.300	112.8	75	125	07/25/2024
Sodium		0.0500	S	**91.5**	2.500	87.62	154.4	75	125	07/25/2024

Batch 226068 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24061962-015CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Calcium		0.100	S	**171**	2.500	170.3	37.2	174.2	1.71	07/25/2024
Magnesium		0.0500		**69.7**	2.500	67.62	81.8	70.61	1.35	07/25/2024
Potassium		0.100		**7.96**	2.500	5.300	106.3	8.120	2.02	07/25/2024
Sodium		0.0500		**90.0**	2.500	87.62	96.0	91.48	1.61	07/25/2024

Batch 226078 **SampType:** MBLK Units **mg/L**

SampID: MBLK-226078

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**< 0.100**	0.0350	0	0	-100	100	07/24/2024
Magnesium		0.0500		**< 0.0500**	0.0055	0	0	-100	100	07/24/2024
Potassium		0.100		**< 0.100**	0.0400	0	0	-100	100	07/24/2024
Sodium		0.0500		**< 0.0500**	0.0180	0	0	-100	100	07/24/2024

Batch 226078 **SampType:** LCS Units **mg/L**

SampID: LCS-226078

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**2.41**	2.500	0	96.6	85	115	07/24/2024
Magnesium		0.0500		**2.36**	2.500	0	94.6	85	115	07/24/2024
Potassium		0.100		**2.67**	2.500	0	106.7	85	115	07/24/2024
Sodium		0.0500		**2.48**	2.500	0	99.2	85	115	07/24/2024

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 225931 **SampType:** MBLK Units **mg/L**

SampID: MBLK-225931

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	07/19/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 225931 **SampType:** LCS Units **mg/L**

SampID: LCS-225931

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**0.461**	0.5000	0	92.3	80	120	07/19/2024

Batch 225931 **SampType:** MS Units **mg/L**

SampID: 24061962-002DMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**0.660**	0.5000	0.1840	95.2	75	125	07/19/2024

Batch 225931 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24061962-002DMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Boron		0.0250		**0.630**	0.5000	0.1840	89.2	0.6602	4.65	07/19/2024

Batch 225949 **SampType:** MBLK Units **mg/L**

SampID: MBLK-225949

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	07/22/2024
Iron		0.0250		**< 0.0250**	0.0115	0	0	-100	100	07/23/2024
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	07/22/2024

Batch 225949 **SampType:** LCS Units **mg/L**

SampID: LCS-225949

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**0.414**	0.5000	0	82.9	80	120	07/22/2024
Iron		0.0250		**1.98**	2.000	0	98.9	80	120	07/23/2024
Manganese		0.0020		**0.422**	0.5000	0	84.5	80	120	07/22/2024

Batch 225949 **SampType:** MS Units **mg/L**

SampID: 24061962-006DMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**0.483**	0.5000	0.03567	89.4	75	125	07/22/2024

Batch 225949 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24061962-006DMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Boron		0.0250		**0.472**	0.5000	0.03567	87.3	0.4826	2.17	07/22/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 225989 **SampType:** MBLK Units **mg/L**

SampID: MBLK-225989

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	07/23/2024
Iron		0.0250		**< 0.0250**	0.0115	0	0	-100	100	07/23/2024
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	07/23/2024

Batch 225989 **SampType:** LCS Units **mg/L**

SampID: LCS-225989

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**0.478**	0.5000	0	95.5	80	120	07/23/2024
Iron		0.0250		**2.13**	2.000	0	106.6	80	120	07/23/2024
Manganese		0.0020		**0.479**	0.5000	0	95.9	80	120	07/23/2024

Batch 225989 **SampType:** MS Units **mg/L**

SampID: 24061962-013CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Iron		0.0250		**2.02**	2.000	0.01413	100.2	75	125	07/23/2024
Manganese		0.0020		**0.483**	0.5000	0.04146	88.3	75	125	07/23/2024

Batch 225989 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24061962-013CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Iron		0.0250		**2.05**	2.000	0.01413	101.9	2.017	1.73	07/23/2024
Manganese		0.0020		**0.487**	0.5000	0.04146	89.1	0.4828	0.80	07/23/2024

Batch 226024 **SampType:** MBLK Units **mg/L**

SampID: MBLK-226024

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Iron		0.0250		**< 0.0250**	0.0115	0	0	-100	100	07/23/2024
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	07/23/2024

Batch 226024 **SampType:** LCS Units **mg/L**

SampID: LCS-226024

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Iron		0.0250		**2.12**	2.000	0	106.2	80	120	07/23/2024
Manganese		0.0020		**0.471**	0.5000	0	94.1	80	120	07/23/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 226024 **SampType:** MS Units **mg/L**

SampID: 24061962-049CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Iron		0.0250		**2.00**	2.000	0	99.9	75	125	07/23/2024
Manganese		0.0020		**0.488**	0.5000	0.01949	93.8	75	125	07/23/2024

Batch 226024 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24061962-049CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Iron		0.0250		**2.04**	2.000	0	102.1	1.998	2.11	07/23/2024
Manganese		0.0020		**0.480**	0.5000	0.01949	92.2	0.4883	1.62	07/23/2024

Batch 226086 **SampType:** MBLK Units **mg/L**

SampID: MBLK-226086

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	07/26/2024
Iron		0.0250		**< 0.0250**	0.0115	0	0	-100	100	07/25/2024
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	07/25/2024

Batch 226086 **SampType:** LCS Units **mg/L**

SampID: LCS-226086

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**0.438**	0.5000	0	87.5	80	120	07/26/2024
Iron		0.0250		**1.87**	2.000	0	93.7	80	120	07/26/2024
Manganese		0.0020		**0.505**	0.5000	0	101.1	80	120	07/25/2024

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 225814 **SampType:** MBLK Units **mg/L**

SampID: MBLK-225814

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**< 0.0010**	0.0004	0	0	-100	100	07/24/2024
Iron	*	0.0250		**< 0.0250**	0.0115	0	0	-100	100	07/24/2024
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	07/24/2024
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	07/24/2024
Thallium		0.0020		**< 0.0020**	0.0010	0	0	-100	100	07/24/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 225814 **SampType:** LCS Units **mg/L**

SampID: LCS-225814

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**0.537**	0.5000	0	107.4	85	115	07/24/2024
Iron	*	0.0250		**2.15**	2.000	0	107.3	85	115	07/24/2024
Manganese		0.0020		**0.501**	0.5000	0	100.1	85	115	07/24/2024
Selenium		0.0010		**0.524**	0.5000	0	104.8	85	115	07/24/2024
Thallium		0.0020		**0.230**	0.2500	0	91.9	85	115	07/24/2024

Batch 225814 **SampType:** MS Units **mg/L**

SampID: 24061962-007CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Iron		0.0250		**2.83**	2.000	0.7992	101.4	75	125	07/24/2024
Manganese		0.0020		**0.534**	0.5000	0.02682	101.4	75	125	07/24/2024

Batch 225814 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24061962-007CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Iron		0.0250		**2.81**	2.000	0.7992	100.8	2.827	0.44	07/24/2024
Manganese		0.0020		**0.537**	0.5000	0.02682	102.1	0.5339	0.63	07/24/2024

Batch 225814 **SampType:** MS Units **mg/L**

SampID: 24071772-001CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**0.521**	0.5000	0.001289	103.9	70	130	07/24/2024
Selenium		0.0010		**0.479**	0.5000	0	95.9	70	130	07/24/2024
Thallium		0.0020		**0.240**	0.2500	0	96.0	70	130	07/24/2024

Batch 225814 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24071772-001CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		0.0010		**0.526**	0.5000	0.001289	105.0	0.5207	1.02	07/24/2024
Selenium		0.0010		**0.503**	0.5000	0	100.6	0.4793	4.87	07/24/2024
Thallium		0.0020		**0.210**	0.2500	0	83.9	0.2401	13.49	07/24/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 225880 **SampType:** MBLK Units **mg/L**

SampID: MBLK-225880

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**< 0.0010**	0.0004	0	0	-100	100	07/22/2024
Antimony		0.0010	S	**0.0012**	0.0004	0	262.0	-100	100	07/19/2024
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	07/19/2024
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	07/22/2024
Beryllium		0.0010		**< 0.0010**	0.0002	0	0	-100	100	07/19/2024
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	07/19/2024
Cadmium	*	0.0010		**< 0.0010**	0.0001	0	0	-100	100	07/19/2024
Chromium		0.0015		**< 0.0015**	0.0007	0	0	-100	100	07/19/2024
Cobalt		0.0010		**< 0.0010**	0.0001	0	0	-100	100	07/19/2024
Iron		0.0250		**< 0.0250**	0.0115	0	0	-100	100	07/19/2024
Lead		0.0010		**< 0.0010**	0.0006	0	0	-100	100	07/19/2024
Lithium	*	0.0030		**< 0.0030**	0.0015	0	0	-100	100	07/19/2024
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	07/19/2024
Molybdenum		0.0015		**< 0.0015**	0.0006	0	0	-100	100	07/19/2024
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	07/19/2024
Thallium		0.0020		**< 0.0020**	0.0010	0	0	-100	100	07/19/2024

Batch 225880 **SampType:** LCS Units **mg/L**

SampID: LCS-225880

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010	B	**0.537**	0.5000	0	107.4	80	120	07/19/2024
Arsenic		0.0010		**0.488**	0.5000	0	97.5	80	120	07/19/2024
Barium		0.0010		**1.92**	2.000	0	96.0	80	120	07/22/2024
Beryllium		0.0010		**0.0464**	0.0500	0	92.8	80	120	07/19/2024
Boron		0.0250		**0.424**	0.5000	0	84.9	80	120	07/19/2024
Cadmium	*	0.0010		**0.0484**	0.0500	0	96.8	80	120	07/19/2024
Chromium		0.0015		**0.195**	0.2000	0	97.5	80	120	07/19/2024
Cobalt		0.0010		**0.474**	0.5000	0	94.7	80	120	07/19/2024
Iron		0.0250		**1.97**	2.000	0	98.5	80	120	07/19/2024
Lead		0.0010		**0.478**	0.5000	0	95.6	80	120	07/19/2024
Lithium	*	0.0030		**0.469**	0.5000	0	93.8	80	120	07/19/2024
Manganese		0.0020		**0.478**	0.5000	0	95.7	80	120	07/19/2024
Molybdenum		0.0015		**0.445**	0.5000	0	89.0	80	120	07/19/2024
Selenium		0.0010		**0.505**	0.5000	0	101.0	80	120	07/19/2024
Thallium		0.0020		**0.220**	0.2500	0	88.0	80	120	07/19/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 225880 **SampType:** MS Units **mg/L**

SampID: 24061962-009BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010	B	**0.591**	0.5000	0	118.3	75	125	07/19/2024
Arsenic		0.0010		**0.542**	0.5000	0.0005082	108.2	75	125	07/19/2024
Barium		0.0010		**1.89**	2.000	0.08327	90.2	75	125	07/22/2024
Beryllium		0.0010		**0.0520**	0.0500	0	104.0	75	125	07/19/2024
Boron		0.0250		**0.534**	0.5000	0.02486	101.9	75	125	07/19/2024
Cadmium	*	0.0010		**0.0531**	0.0500	0	106.2	75	125	07/19/2024
Chromium		0.0015		**0.212**	0.2000	0.001081	105.3	75	125	07/19/2024
Cobalt		0.0010		**0.514**	0.5000	0.0006623	102.7	75	125	07/19/2024
Lead		0.0010		**0.548**	0.5000	0	109.5	75	125	07/19/2024
Lithium	*	0.0030		**0.525**	0.5000	0.003745	104.3	75	125	07/19/2024
Molybdenum		0.0015		**0.436**	0.5000	0.001298	87.0	75	125	07/22/2024
Selenium		0.0010		**0.556**	0.5000	0	111.2	75	125	07/19/2024
Thallium		0.0020		**0.247**	0.2500	0	98.9	75	125	07/19/2024

Batch 225880 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24061962-009BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		0.0010	B	**0.581**	0.5000	0	116.3	0.5914	1.70	07/19/2024
Arsenic		0.0010		**0.532**	0.5000	0.0005082	106.4	0.5416	1.75	07/19/2024
Barium		0.0010		**1.96**	2.000	0.08327	94.1	1.886	4.08	07/22/2024
Beryllium		0.0010		**0.0518**	0.0500	0	103.7	0.05202	0.36	07/19/2024
Boron		0.0250		**0.528**	0.5000	0.02486	100.6	0.5343	1.22	07/19/2024
Cadmium	*	0.0010		**0.0516**	0.0500	0	103.2	0.05308	2.87	07/19/2024
Chromium		0.0015		**0.222**	0.2000	0.001081	110.5	0.2117	4.76	07/19/2024
Cobalt		0.0010		**0.505**	0.5000	0.0006623	100.9	0.5141	1.77	07/19/2024
Lead		0.0010		**0.542**	0.5000	0	108.3	0.5475	1.08	07/19/2024
Lithium	*	0.0030		**0.520**	0.5000	0.003745	103.3	0.5250	0.90	07/19/2024
Molybdenum		0.0015		**0.427**	0.5000	0.001298	85.1	0.4365	2.27	07/22/2024
Selenium		0.0010		**0.551**	0.5000	0	110.2	0.5560	0.92	07/19/2024
Thallium		0.0020		**0.247**	0.2500	0	98.7	0.2472	0.17	07/19/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 225880 **SampType:** MS Units **mg/L**

SampID: 24061962-032BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010	B	**0.556**	0.5000	0	111.1	75	125	07/19/2024
Arsenic		0.0010		**0.498**	0.5000	0	99.6	75	125	07/19/2024
Barium		0.0010		**1.98**	2.000	0.03651	97.0	75	125	07/22/2024
Beryllium		0.0010		**0.0502**	0.0500	0	100.4	75	125	07/19/2024
Boron		0.0250		**2.35**	0.5000	1.835	102.7	75	125	07/19/2024
Cadmium	*	0.0010		**0.0486**	0.0500	0	97.3	75	125	07/19/2024
Chromium		0.0015		**0.197**	0.2000	0	98.5	75	125	07/19/2024
Cobalt		0.0010		**0.480**	0.5000	0	95.9	75	125	07/19/2024
Lead		0.0010		**0.517**	0.5000	0	103.5	75	125	07/19/2024
Lithium	*	0.0030		**0.591**	0.5000	0.07795	102.6	75	125	07/19/2024
Molybdenum		0.0015		**0.474**	0.5000	0	94.8	75	125	07/19/2024
Selenium		0.0010		**0.502**	0.5000	0	100.5	75	125	07/19/2024
Thallium		0.0020		**0.226**	0.2500	0	90.6	75	125	07/19/2024

Batch 225880 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24061962-032BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		0.0010	B	**0.530**	0.5000	0	105.9	0.5557	4.80	07/19/2024
Arsenic		0.0010		**0.492**	0.5000	0	98.4	0.4979	1.19	07/19/2024
Barium		0.0010		**1.93**	2.000	0.03651	94.7	1.976	2.36	07/22/2024
Beryllium		0.0010		**0.0494**	0.0500	0	98.9	0.05022	1.56	07/19/2024
Boron		0.0250		**2.28**	0.5000	1.835	89.4	2.349	2.88	07/19/2024
Cadmium	*	0.0010		**0.0459**	0.0500	0	91.7	0.04864	5.90	07/19/2024
Chromium		0.0015		**0.186**	0.2000	0	92.9	0.1969	5.77	07/19/2024
Cobalt		0.0010		**0.461**	0.5000	0	92.1	0.4796	4.02	07/19/2024
Lead		0.0010		**0.500**	0.5000	0	99.9	0.5173	3.50	07/19/2024
Lithium	*	0.0030		**0.578**	0.5000	0.07795	99.9	0.5910	2.31	07/19/2024
Molybdenum		0.0015		**0.469**	0.5000	0	93.9	0.4741	1.00	07/19/2024
Selenium		0.0010		**0.493**	0.5000	0	98.5	0.5024	1.96	07/19/2024
Thallium		0.0020		**0.225**	0.2500	0	90.0	0.2264	0.63	07/19/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 225932 **SampType:** MBLK Units **mg/L**

SampID: MBLK-225932

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**< 0.0010**	0.0004	0	0	-100	100	07/22/2024
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	07/22/2024
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	07/22/2024
Beryllium		0.0010		**< 0.0010**	0.0002	0	0	-100	100	07/22/2024
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	07/22/2024
Cadmium	*	0.0010		**< 0.0010**	0.0001	0	0	-100	100	07/22/2024
Chromium		0.0015		**< 0.0015**	0.0007	0	0	-100	100	07/22/2024
Cobalt		0.0010		**< 0.0010**	0.0001	0	0	-100	100	07/24/2024
Cobalt		0.0010		**< 0.0010**	0.0001	0	0	-100	100	07/23/2024
Iron		0.0250		**< 0.0250**	0.0115	0	0	-100	100	07/23/2024
Lead		0.0010		**< 0.0010**	0.0006	0	0	-100	100	07/22/2024
Lithium	*	0.0030		**< 0.0030**	0.0015	0	0	-100	100	07/22/2024
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	07/22/2024
Molybdenum		0.0015		**< 0.0015**	0.0006	0	0	-100	100	07/22/2024
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	07/22/2024
Thallium		0.0020		**< 0.0020**	0.0010	0	0	-100	100	07/22/2024

Batch 225932 **SampType:** LCS Units **mg/L**

SampID: LCS-225932

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**0.495**	0.5000	0	99.0	80	120	07/22/2024
Arsenic		0.0010		**0.468**	0.5000	0	93.7	80	120	07/22/2024
Barium		0.0010		**1.96**	2.000	0	97.9	80	120	07/22/2024
Beryllium		0.0010		**0.0488**	0.0500	0	97.5	80	120	07/22/2024
Boron		0.0250		**0.463**	0.5000	0	92.7	80	120	07/22/2024
Cadmium	*	0.0010		**0.0471**	0.0500	0	94.3	80	120	07/22/2024
Chromium		0.0015		**0.193**	0.2000	0	96.7	80	120	07/22/2024
Cobalt		0.0010		**0.491**	0.5000	0	98.3	80	120	07/23/2024
Iron		0.0250		**2.13**	2.000	0	106.6	80	120	07/23/2024
Lead		0.0010		**0.475**	0.5000	0	95.0	80	120	07/22/2024
Lithium	*	0.0030		**0.529**	0.5000	0	105.7	80	120	07/23/2024
Manganese		0.0020		**0.484**	0.5000	0	96.9	80	120	07/22/2024
Molybdenum		0.0015		**0.442**	0.5000	0	88.3	80	120	07/22/2024
Selenium		0.0010		**0.493**	0.5000	0	98.5	80	120	07/22/2024
Thallium		0.0020		**0.223**	0.2500	0	89.4	80	120	07/23/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 225932 **SampType:** MS Units **mg/L**

SampID: 24061962-026BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**0.497**	0.5000	0	99.4	75	125	07/23/2024
Arsenic		0.0010		**0.461**	0.5000	0	92.2	75	125	07/23/2024
Barium		0.0010		**2.00**	2.000	0.05742	97.3	75	125	07/23/2024
Beryllium		0.0010		**0.0481**	0.0500	0	96.2	75	125	07/23/2024
Boron		0.0250		**2.17**	0.5000	1.625	108.9	75	125	07/23/2024
Cadmium	*	0.0010		**0.0460**	0.0500	0	92.0	75	125	07/23/2024
Chromium		0.0015		**0.177**	0.2000	0	88.4	75	125	07/23/2024
Cobalt		0.0010		**0.482**	0.5000	0	96.4	75	125	07/23/2024
Lead		0.0010		**0.466**	0.5000	0	93.2	75	125	07/23/2024
Lithium	*	0.0030		**0.581**	0.5000	0.06300	103.6	75	125	07/23/2024
Molybdenum		0.0015		**0.466**	0.5000	0	93.2	75	125	07/23/2024
Selenium		0.0010		**0.487**	0.5000	0	97.3	75	125	07/23/2024
Thallium		0.0020		**0.239**	0.2500	0	95.7	75	125	07/23/2024

Batch 225932 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24061962-026BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		0.0010		**0.481**	0.5000	0	96.3	0.4971	3.23	07/23/2024
Arsenic		0.0010		**0.464**	0.5000	0	92.9	0.4608	0.79	07/23/2024
Barium		0.0010		**1.94**	2.000	0.05742	94.0	2.004	3.41	07/23/2024
Beryllium		0.0010		**0.0465**	0.0500	0	93.0	0.04809	3.33	07/23/2024
Boron		0.0250		**2.10**	0.5000	1.625	94.4	2.169	3.40	07/23/2024
Cadmium	*	0.0010		**0.0443**	0.0500	0	88.7	0.04599	3.63	07/23/2024
Chromium		0.0015		**0.178**	0.2000	0	88.9	0.1767	0.59	07/23/2024
Cobalt		0.0010		**0.494**	0.5000	0	98.7	0.4818	2.44	07/23/2024
Lead		0.0010		**0.469**	0.5000	0	93.8	0.4662	0.59	07/23/2024
Lithium	*	0.0030		**0.563**	0.5000	0.06300	100.0	0.5810	3.13	07/23/2024
Molybdenum		0.0015		**0.443**	0.5000	0	88.7	0.4660	4.97	07/23/2024
Selenium		0.0010		**0.483**	0.5000	0	96.5	0.4867	0.84	07/23/2024
Thallium		0.0020		**0.229**	0.2500	0	91.6	0.2392	4.39	07/23/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 225998 **SampType:** MBLK Units **mg/L**

SampID: MBLK-225998

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**< 0.0010**	0.0004	0	0	-100	100	07/23/2024
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	07/23/2024
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	07/23/2024
Beryllium		0.0010		**< 0.0010**	0.0002	0	0	-100	100	07/23/2024
Boron	*	0.0250		**< 0.0250**	0.0093	0	0	-100	100	07/23/2024
Cadmium	*	0.0010		**< 0.0010**	0.0001	0	0	-100	100	07/23/2024
Chromium		0.0015		**< 0.0015**	0.0007	0	0	-100	100	07/23/2024
Cobalt		0.0010		**< 0.0010**	0.0001	0	0	-100	100	07/23/2024
Iron	*	0.0250		**< 0.0250**	0.0115	0	0	-100	100	07/23/2024
Lead		0.0010		**< 0.0010**	0.0006	0	0	-100	100	07/23/2024
Lithium	*	0.0030		**< 0.0030**	0.0015	0	0	-100	100	07/23/2024
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	07/23/2024
Molybdenum		0.0015		**< 0.0015**	0.0006	0	0	-100	100	07/23/2024
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	07/23/2024
Thallium		0.0020		**< 0.0020**	0.0010	0	0	-100	100	07/23/2024

Batch 225998 **SampType:** LCS Units **mg/L**

SampID: LCS-225998

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**0.527**	0.5000	0	105.4	85	115	07/23/2024
Arsenic		0.0010		**0.522**	0.5000	0	104.4	85	115	07/23/2024
Barium		0.0010		**2.07**	2.000	0	103.5	85	115	07/23/2024
Beryllium		0.0010		**0.0477**	0.0500	0	95.3	85	115	07/23/2024
Boron	*	0.0250		**0.459**	0.5000	0	91.7	85	115	07/23/2024
Cadmium	*	0.0010		**0.0498**	0.0500	0	99.7	85	115	07/23/2024
Chromium		0.0015		**0.211**	0.2000	0	105.7	85	115	07/23/2024
Cobalt		0.0010		**0.495**	0.5000	0	99.1	85	115	07/23/2024
Iron	*	0.0250		**2.22**	2.000	0	111.1	85	115	07/23/2024
Lead		0.0010		**0.477**	0.5000	0	95.5	85	115	07/23/2024
Lithium	*	0.0030		**0.477**	0.5000	0	95.5	85	115	07/23/2024
Manganese		0.0020		**0.510**	0.5000	0	102.0	85	115	07/23/2024
Molybdenum		0.0015		**0.447**	0.5000	0	89.3	85	115	07/23/2024
Selenium		0.0010		**0.512**	0.5000	0	102.4	85	115	07/23/2024
Thallium		0.0020		**0.246**	0.2500	0	98.3	85	115	07/23/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 225998 **SampType:** MS Units **mg/L**
SampID: 24071547-002AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Cadmium	*	0.0010		**0.0507**	0.0500	0.0002640	100.8	70	130	07/23/2024
Selenium		0.0010		**0.510**	0.5000	0.002438	101.5	70	130	07/23/2024

Batch 225998 **SampType:** MSD Units **mg/L** RPD Limit **20**
SampID: 24071547-002AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Cadmium	*	0.0010		**0.0488**	0.0500	0.0002640	97.1	0.05068	3.74	07/23/2024
Selenium		0.0010		**0.497**	0.5000	0.002438	99.0	0.5099	2.53	07/23/2024

Batch 225998 **SampType:** MS Units **mg/L**
SampID: 24071644-003AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Thallium		0.0020		**0.242**	0.2500	0	96.7	70	130	07/24/2024

Batch 225998 **SampType:** MSD Units **mg/L** RPD Limit **20**
SampID: 24071644-003AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Thallium		0.0020		**0.236**	0.2500	0	94.4	0.2416	2.41	07/24/2024

Batch 226025 **SampType:** MBLK Units **mg/L**
SampID: MBLK-226025

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010	S	**0.0012**	0.0004	0	261.6	-100	100	07/24/2024
Antimony		0.0010		**< 0.0010**	0.0004	0	0	-100	100	07/25/2024
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	07/24/2024
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	07/24/2024
Beryllium		0.0010		**< 0.0010**	0.0002	0	0	-100	100	07/24/2024
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	07/24/2024
Cadmium	*	0.0010		**< 0.0010**	0.0001	0	0	-100	100	07/24/2024
Chromium		0.0015		**< 0.0015**	0.0007	0	0	-100	100	07/24/2024
Cobalt		0.0010		**< 0.0010**	0.0001	0	0	-100	100	07/24/2024
Lead		0.0010		**< 0.0010**	0.0006	0	0	-100	100	07/24/2024
Lithium	*	0.0030		**< 0.0030**	0.0015	0	0	-100	100	07/24/2024
Molybdenum		0.0015		**< 0.0015**	0.0006	0	0	-100	100	07/24/2024
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	07/24/2024
Thallium		0.0020		**< 0.0020**	0.0010	0	0	-100	100	07/24/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 226025 **SampType:** LCS Units **mg/L**

SampID: LCS-226025

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010	B	**0.548**	0.5000	0	109.5	80	120	07/24/2024
Arsenic		0.0010		**0.501**	0.5000	0	100.1	80	120	07/24/2024
Barium		0.0010		**2.09**	2.000	0	104.7	80	120	07/24/2024
Beryllium		0.0010		**0.0495**	0.0500	0	99.0	80	120	07/24/2024
Boron		0.0250		**0.497**	0.5000	0	99.4	80	120	07/24/2024
Cadmium	*	0.0010		**0.0513**	0.0500	0	102.6	80	120	07/24/2024
Chromium		0.0015		**0.207**	0.2000	0	103.6	80	120	07/24/2024
Cobalt		0.0010		**0.492**	0.5000	0	98.3	80	120	07/24/2024
Lead		0.0010		**0.515**	0.5000	0	103.0	80	120	07/24/2024
Lithium	*	0.0030		**0.524**	0.5000	0	104.9	80	120	07/24/2024
Molybdenum		0.0015		**0.449**	0.5000	0	89.8	80	120	07/24/2024
Selenium		0.0010		**0.521**	0.5000	0	104.3	80	120	07/24/2024
Thallium		0.0020		**0.222**	0.2500	0	88.9	80	120	07/24/2024

Batch 226025 **SampType:** MS Units **mg/L**

SampID: 24061962-044BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010	B	**0.549**	0.5000	0.0004561	109.8	75	125	07/24/2024
Arsenic		0.0010		**0.512**	0.5000	0.004724	101.4	75	125	07/24/2024
Barium		0.0010		**2.21**	2.000	0.2377	98.6	75	125	07/24/2024
Beryllium		0.0010		**0.0508**	0.0500	0	101.5	75	125	07/24/2024
Cadmium	*	0.0010		**0.0503**	0.0500	0	100.7	75	125	07/24/2024
Chromium		0.0015		**0.206**	0.2000	0	103.2	75	125	07/24/2024
Cobalt		0.0010		**0.493**	0.5000	0.0005248	98.4	75	125	07/24/2024
Lead		0.0010		**0.495**	0.5000	0	99.0	75	125	07/24/2024
Lithium	*	0.0030		**0.535**	0.5000	0.01302	104.3	75	125	07/24/2024
Molybdenum		0.0015		**0.512**	0.5000	0.08787	84.7	75	125	07/24/2024
Selenium		0.0010		**0.500**	0.5000	0.001211	99.8	75	125	07/24/2024
Thallium		0.0020		**0.240**	0.2500	0	96.1	75	125	07/24/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 226025 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24061962-044BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		0.0010	B	**0.551**	0.5000	0.0004561	110.1	0.5493	0.28	07/24/2024
Arsenic		0.0010		**0.518**	0.5000	0.004724	102.6	0.5118	1.18	07/24/2024
Barium		0.0010		**2.22**	2.000	0.2377	99.2	2.209	0.56	07/24/2024
Beryllium		0.0010		**0.0494**	0.0500	0	98.8	0.05076	2.72	07/24/2024
Cadmium	*	0.0010		**0.0523**	0.0500	0	104.7	0.05034	3.89	07/24/2024
Chromium		0.0015		**0.212**	0.2000	0	106.2	0.2063	2.92	07/24/2024
Cobalt		0.0010		**0.507**	0.5000	0.0005248	101.2	0.4925	2.85	07/24/2024
Lead		0.0010		**0.473**	0.5000	0	94.7	0.4948	4.41	07/24/2024
Lithium	*	0.0030		**0.528**	0.5000	0.01302	103.0	0.5346	1.22	07/24/2024
Molybdenum		0.0015		**0.526**	0.5000	0.08787	87.6	0.5116	2.80	07/24/2024
Selenium		0.0010		**0.510**	0.5000	0.001211	101.7	0.5000	1.92	07/24/2024
Thallium		0.0020		**0.243**	0.2500	0	97.1	0.2403	1.03	07/24/2024

Batch 226025 **SampType:** MS Units **mg/L**

SampID: 24071773-006DMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**0.562**	0.5000	0.0007643	112.2	75	125	07/25/2024
Arsenic		0.0010		**0.586**	0.5000	0.03279	110.6	75	125	07/24/2024
Lithium	*	0.0030		**0.583**	0.5000	0.08986	98.5	75	125	07/24/2024
Thallium		0.0020		**0.245**	0.2500	0	98.2	75	125	07/24/2024

Batch 226025 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24071773-006DMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		0.0010		**0.572**	0.5000	0.0007643	114.3	0.5616	1.88	07/25/2024
Arsenic		0.0010		**0.624**	0.5000	0.03279	118.3	0.5860	6.29	07/24/2024
Lithium	*	0.0030		**0.591**	0.5000	0.08986	100.2	0.5826	1.43	07/24/2024
Thallium		0.0020		**0.243**	0.2500	0	97.1	0.2454	1.12	07/24/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch **226068** **SampType:** **MBLK** Units **mg/L**

SampID: MBLK-226068

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010	S	**0.0011**	0.0004	0	236.9	-100	100	07/25/2024
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	07/24/2024
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	07/24/2024
Beryllium		0.0010		**< 0.0010**	0.0002	0	0	-100	100	07/24/2024
Boron	*	0.0250		**< 0.0250**	0.0093	0	0	-100	100	07/26/2024
Cadmium	*	0.0010		**< 0.0010**	0.0001	0	0	-100	100	07/24/2024
Chromium		0.0015		**< 0.0015**	0.0007	0	0	-100	100	07/25/2024
Cobalt		0.0010		**< 0.0010**	0.0001	0	0	-100	100	07/25/2024
Iron	*	0.0250		**< 0.0250**	0.0115	0	0	-100	100	07/25/2024
Iron	*	0.0250		**< 0.0250**	0.0115	0	0	-100	100	07/24/2024
Lead		0.0010		**< 0.0010**	0.0006	0	0	-100	100	07/24/2024
Lithium	*	0.0030		**< 0.0030**	0.0015	0	0	-100	100	07/26/2024
Lithium	*	0.0030		**< 0.0030**	0.0015	0	0	-100	100	07/24/2024
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	07/25/2024
Molybdenum		0.0015		**< 0.0015**	0.0006	0	0	-100	100	07/24/2024
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	07/24/2024
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	07/25/2024
Thallium		0.0020		**< 0.0020**	0.0010	0	0	-100	100	07/24/2024
Thallium		0.0020		**< 0.0020**	0.0010	0	0	-100	100	07/26/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 226068 **SampType:** LCS Units **mg/L**

SampID: LCS-226068

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010	BS	**0.579**	0.5000	0	115.8	85	115	07/25/2024
Arsenic		0.0010		**0.524**	0.5000	0	104.9	85	115	07/25/2024
Barium		0.0010		**2.21**	2.000	0	110.7	85	115	07/25/2024
Beryllium		0.0010		**0.0533**	0.0500	0	106.7	85	115	07/25/2024
Boron	*	0.0250		**0.531**	0.5000	0	106.3	85	115	07/26/2024
Cadmium	*	0.0010		**0.0534**	0.0500	0	106.9	85	115	07/25/2024
Chromium		0.0015		**0.217**	0.2000	0	108.5	85	115	07/25/2024
Cobalt		0.0010		**0.519**	0.5000	0	103.7	85	115	07/25/2024
Iron	*	0.0250		**1.90**	2.000	0	95.0	85	115	07/26/2024
Lead		0.0010	E	**0.517**	0.5000	0	103.5	85	115	07/25/2024
Lithium	*	0.0030		**0.531**	0.5000	0	106.2	85	115	07/29/2024
Manganese		0.0020		**0.531**	0.5000	0	106.2	85	115	07/25/2024
Molybdenum		0.0015		**0.472**	0.5000	0	94.3	85	115	07/25/2024
Selenium		0.0010		**0.535**	0.5000	0	107.0	85	115	07/25/2024
Thallium		0.0020		**0.244**	0.2500	0	97.8	85	115	07/26/2024

Batch 226068 **SampType:** MS Units **mg/L**

SampID: 24061962-015CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010	B	**0.586**	0.5000	0.0006849	117.1	75	125	07/25/2024
Arsenic		0.0010		**0.551**	0.5000	0.001167	110.0	75	125	07/25/2024
Barium		0.0010		**2.34**	2.000	0.1113	111.6	75	125	07/25/2024
Beryllium		0.0010		**0.0539**	0.0500	0	107.7	75	125	07/25/2024
Boron		0.0250		**0.705**	0.5000	0.1819	104.6	75	125	07/26/2024
Cadmium	*	0.0010		**0.0545**	0.0500	0	109.1	75	125	07/25/2024
Chromium		0.0015		**0.215**	0.2000	0	107.4	75	125	07/25/2024
Cobalt		0.0010		**0.518**	0.5000	0	103.6	75	125	07/25/2024
Iron		0.0250		**2.34**	2.000	0.3898	97.3	75	125	07/26/2024
Lead		0.0010		**0.520**	0.5000	0	103.9	75	125	07/25/2024
Lithium	*	0.0030		**0.594**	0.5000	0.01422	116.1	75	125	07/29/2024
Manganese		0.0020		**0.621**	0.5000	0.08213	107.8	75	125	07/25/2024
Molybdenum		0.0015		**0.499**	0.5000	0.004104	99.0	75	125	07/25/2024
Selenium		0.0010		**0.562**	0.5000	0	112.4	75	125	07/25/2024
Thallium		0.0020		**0.249**	0.2500	0	99.4	75	125	07/25/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch **226068** **SampType:** **MSD** Units **mg/L** RPD Limit **20**

SampID: 24061962-015CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		0.0010	B	**0.561**	0.5000	0.0006849	112.0	0.5859	4.44	07/25/2024
Arsenic		0.0010		**0.532**	0.5000	0.001167	106.1	0.5513	3.60	07/25/2024
Barium		0.0010		**2.29**	2.000	0.1113	108.9	2.344	2.36	07/25/2024
Beryllium		0.0010		**0.0510**	0.0500	0	102.0	0.05386	5.50	07/25/2024
Boron		0.0250		**0.710**	0.5000	0.1819	105.7	0.7051	0.75	07/26/2024
Cadmium	*	0.0010		**0.0519**	0.0500	0	103.7	0.05455	5.05	07/25/2024
Chromium		0.0015		**0.206**	0.2000	0	102.8	0.2149	4.43	07/25/2024
Cobalt		0.0010		**0.503**	0.5000	0	100.6	0.5180	2.96	07/25/2024
Iron		0.0250		**2.34**	2.000	0.3898	97.4	2.335	0.12	07/26/2024
Lead		0.0010		**0.518**	0.5000	0	103.6	0.5196	0.34	07/25/2024
Lithium	*	0.0030		**0.566**	0.5000	0.01422	110.4	0.5945	4.84	07/29/2024
Manganese		0.0020		**0.602**	0.5000	0.08213	103.9	0.6213	3.19	07/25/2024
Molybdenum		0.0015		**0.478**	0.5000	0.004104	94.8	0.4992	4.34	07/25/2024
Selenium		0.0010		**0.540**	0.5000	0	107.9	0.5622	4.11	07/25/2024
Thallium		0.0020		**0.234**	0.2500	0	93.6	0.2486	6.06	07/25/2024

Batch **226078** **SampType:** **MBLK** Units **mg/L**

SampID: MBLK-226078

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010	S	**0.0010**	0.0004	0	225.8	-100	100	07/24/2024
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	07/24/2024
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	07/24/2024
Beryllium		0.0010		**< 0.0010**	0.0002	0	0	-100	100	07/24/2024
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	07/24/2024
Cadmium	*	0.0010		**< 0.0010**	0.0001	0	0	-100	100	07/24/2024
Chromium		0.0015		**< 0.0015**	0.0007	0	0	-100	100	07/25/2024
Cobalt		0.0010		**< 0.0010**	0.0001	0	0	-100	100	07/24/2024
Iron		0.0250		**< 0.0250**	0.0115	0	0	-100	100	07/24/2024
Lead		0.0010		**< 0.0010**	0.0006	0	0	-100	100	07/24/2024
Lithium	*	0.0030		**< 0.0030**	0.0015	0	0	-100	100	07/24/2024
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	07/24/2024
Molybdenum		0.0015		**< 0.0015**	0.0006	0	0	-100	100	07/24/2024
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	07/24/2024
Thallium		0.0020		**< 0.0020**	0.0010	0	0	-100	100	07/24/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 226078 **SampType:** LCS Units **mg/L**

SampID: LCS-226078

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010	B	**0.562**	0.5000	0	112.3	80	120	07/24/2024
Arsenic		0.0010		**0.543**	0.5000	0	108.6	80	120	07/24/2024
Barium		0.0010		**2.17**	2.000	0	108.7	80	120	07/24/2024
Beryllium		0.0010		**0.0501**	0.0500	0	100.2	80	120	07/24/2024
Boron		0.0250		**0.447**	0.5000	0	89.4	80	120	07/24/2024
Cadmium	*	0.0010		**0.0533**	0.0500	0	106.6	80	120	07/24/2024
Chromium		0.0015		**0.216**	0.2000	0	108.0	80	120	07/25/2024
Cobalt		0.0010		**0.546**	0.5000	0	109.2	80	120	07/24/2024
Iron		0.0250		**2.30**	2.000	0	115.1	80	120	07/24/2024
Lead		0.0010		**0.510**	0.5000	0	101.9	80	120	07/24/2024
Lithium	*	0.0030		**0.508**	0.5000	0	101.6	80	120	07/24/2024
Manganese		0.0020		**0.530**	0.5000	0	106.1	80	120	07/24/2024
Molybdenum		0.0015		**0.472**	0.5000	0	94.3	80	120	07/24/2024
Selenium		0.0010		**0.519**	0.5000	0	103.8	80	120	07/24/2024
Thallium		0.0020		**0.253**	0.2500	0	101.2	80	120	07/24/2024

Batch 226078 **SampType:** MS Units **mg/L**

SampID: 24061962-019CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Iron		0.0250		**2.30**	2.000	0.1626	106.8	75	125	07/25/2024
Manganese		0.0020		**0.542**	0.5000	0.06245	96.0	75	125	07/25/2024

Batch 226078 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24061962-019CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Iron		0.0250		**2.31**	2.000	0.1626	107.5	2.299	0.54	07/25/2024
Manganese		0.0020		**0.561**	0.5000	0.06245	99.7	0.5422	3.42	07/25/2024

Batch 226553 **SampType:** MBLK Units **mg/L**

SampID: MBLK-226553

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	08/05/2024
Boron	*	0.0250		**< 0.0250**	0.0093	0	0	-100	100	08/05/2024
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	08/05/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 226553 **SampType:** LCS Units **mg/L**

SampID: LCS-226553

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic		0.0010		**0.503**	0.5000	0	100.6	85	115	08/05/2024
Boron	*	0.0250		**0.465**	0.5000	0	93.1	85	115	08/05/2024
Selenium		0.0010		**0.520**	0.5000	0	103.9	85	115	08/05/2024

SW-846 7470A (TOTAL)

Batch 225881 **SampType:** MBLK Units **mg/L**

SampID: MBLK-225881

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**< 0.00020**	0.0001	0	0	-100	100	07/19/2024

Batch 225881 **SampType:** LCS Units **mg/L**

SampID: LCS-225881

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00482**	0.0050	0	96.4	85	115	07/19/2024

Batch 225881 **SampType:** MS Units **mg/L**

SampID: 24061962-009BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00470**	0.0050	0	94.0	75	125	07/19/2024

Batch 225881 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24061962-009BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00467**	0.0050	0	93.4	0.004699	0.58	07/19/2024

Batch 225881 **SampType:** MS Units **mg/L**

SampID: 24061962-040BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00481**	0.0050	0	96.1	75	125	07/19/2024

Batch 225881 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24061962-040BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00486**	0.0050	0	97.1	0.004806	1.03	07/19/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 7470A (TOTAL)

Batch 225937 **SampType:** MBLK Units **mg/L**
SampID: MBLK-225937

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**< 0.00020**	0.0001	0	0	-100	100	07/22/2024

Batch 225937 **SampType:** MS Units **mg/L**
SampID: 24061962-022BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00441**	0.0050	0	88.2	75	125	07/22/2024

Batch 225937 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24061962-022BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00454**	0.0050	0	90.7	0.004410	2.84	07/22/2024

Batch 225937 **SampType:** MS Units **mg/L**
SampID: 24061962-048BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00438**	0.0050	0	87.7	75	125	07/22/2024

Batch 225937 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24061962-048BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00459**	0.0050	0	91.8	0.004384	4.60	07/22/2024

Batch 225987 **SampType:** MBLK Units **mg/L**
SampID: MBLK-225987

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**< 0.00020**	0.0001	0	0	-100	100	07/23/2024

Batch 225987 **SampType:** LCS Units **mg/L**
SampID: LCS-225987

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00479**	0.0050	0	95.9	85	115	07/23/2024

Batch 225987 **SampType:** MS Units **mg/L**
SampID: 24061962-013BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00485**	0.0050	0	97.1	75	125	07/23/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 7470A (TOTAL)

Batch 225987 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24061962-013BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00472**	0.0050	0	94.4	0.004853	2.81	07/23/2024

Batch 226026 **SampType:** MBLK Units **mg/L**

SampID: MBLK-226026

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**< 0.00020**	0.0001	0	0	-100	100	07/23/2024

Batch 226026 **SampType:** LCS Units **mg/L**

SampID: LCS-226026

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00447**	0.0050	0	89.4	85	115	07/23/2024

Batch 226026 **SampType:** MS Units **mg/L**

SampID: 24061962-049BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00467**	0.0050	0	93.3	75	125	07/23/2024

Batch 226026 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24061962-049BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00462**	0.0050	0	92.4	0.004667	0.99	07/23/2024

Batch 226026 **SampType:** MS Units **mg/L**

SampID: 24071717-018BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00467**	0.0050	0	93.3	75	125	07/23/2024

Batch 226026 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24071717-018BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00475**	0.0050	0	95.1	0.004665	1.90	07/23/2024

Client: Ramboll **Work Order:** 24061962

Client Project: BAL-24Q3 **Report Date:** 12-Aug-24

SW-846 7470A (TOTAL)

Batch 226132 **SampType:** MBLK Units **mg/L**

SampID: MBLK-226132

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**< 0.00020**	0.0001	0	0	-100	100	07/29/2024
Mercury		0.00020		**< 0.00020**	0.0001	0	0	-100	100	07/26/2024

Batch 226132 **SampType:** LCS Units **mg/L**

SampID: LCS-226132

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00561**	0.0050	0	112.1	85	115	07/29/2024
Mercury		0.00020		**0.00469**	0.0050	0	93.8	85	115	07/26/2024

Batch 226132 **SampType:** MS Units **mg/L**

SampID: 24071862-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00557**	0.0050	0	111.5	75	125	07/29/2024

Batch 226132 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24071862-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00551**	0.0050	0	110.2	0.005574	1.19	07/29/2024

Batch 226132 **SampType:** MS Units **mg/L**

SampID: 24071896-003DMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00507**	0.0050	0	101.4	75	125	07/26/2024

Batch 226132 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24071896-003DMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00514**	0.0050	0	102.8	0.005069	1.35	07/26/2024

Receiving Check List

http://www.teklabinc.com/

Client: Ramboll
Client Project: BAL-24Q3

Work Order: 24061962
Report Date: 12-Aug-24

Carrier: Justin Colp

Received By: PRS

Completed by: Paul Schultz
On: 18-Jul-24

Reviewed by: Elizabeth A. Hurley
On: 23-Jul-24

Pages to follow: Chain of custody 12 Extra pages included 0

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C 19.9
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☑	No ☐		
Reported field parameters measured:	Field ☑	Lab ☐	NA ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐		

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☑	NA ☐
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑

Any No responses must be detailed below or on the COC.

pH strip #96651. - pschultz - 7/18/2024 8:30:22 AM

Additional Nitric Acid (98584) preservative was needed in MW304, MW393, MW394, PZ170, and MW304 Duplicate upon arrival at the laboratory. - pschultz - 7/18/2024 8:30:24 AM

Samples were received on 7/18/2024 at 16:30 on ice [10.7C - LTG#9]. - pschultz - 7/19/2024 8:24:42 AM

pH strip #96651. - pschultz - 7/19/2024 8:24:52 AM

Additional Nitric Acid (98584) was needed in MW369 upon arrival at the laboratory. - pschultz - 7/19/2024 8:24:54 AM

Samples were received on 7/19/24 at 1220 on ice [5.7C - LTG5]. pH strip #96651. - amberdilallo - 7/19/2024 1:51:13 PM

Samples were received on 7/22/24 at 1450 on ice [17.3C - LTG5]. Additional Nitric Acid (98584) was needed in PZ-178 Duplicate upon arrival at the laboratory. - amberdilallo - 7/22/2024 3:07:45 PM

pH strip #96651. - amberdilallo - 7/22/2024 3:07:47 PM

Samples were received on 7/23/24 at 1324 on ice [22.3C - LTG5]. Field Blank and Equipment Blank 1 were filtered unpreserved and preserved with Nitric Acid (98584) for the dissolved parameters upon arrival at the laboratory. - amberdilallo - 7/23/2024 1:58:51 PM

pH strip #96651. - amberdilallo - 7/23/2024 1:58:54 PM

CHAIN-OF-CUSTODY / Analytical Request Document

24061962

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	Vistra Corp-Baldwin	Report To:	Brian Voelker	Attention:	Brian Voelker
Address:	10901 Baldwin Road	Copy To:	Sam Davies: samantha.davies@vistracorp.com	Company Name:	Vistra Corp
	Baldwin, IL 62217		Kim Edmiaston	Address:	see Section A
Email To:	Brian.Voelker@VistraCorp.com	Purchase Order No.:	Kimberly.Edmiaston@vistracorp.com	Quote Reference:	
Phone:	(217) 753-8911 Fax:	Project Name:		Project Manager:	
Requested Due Date/TAT:	10 day	Project Number:	2285	Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes: MATRIX — DRINKING WATER DW, WATER WT, WASTE WATER WW, PRODUCT P, SOIL/SOLID SL, OIL OL, WIPE WP, AIR AR, OTHER OT, TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605	Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-104DR	WT	G	7.17.24	1207		4	2		2												X		24061962-001
2	MW-104SR	WT	G	7.17.24	1233		4	2		2												X		24061962-002
3	MW-150	WT	G				4	2		2								X		X		X		24061962-003
4	MW-151	WT	G				4	2		2								X		X		X		24061962-004
5	MW-152	WT	G				4	2		2								X		X		X		24061962-005
6	MW-153	WT	G				4	2		2								X		X		X		24061962-006
7	MW-154	WT	G				4	2		2												X		24061962-007
8	MW-155	WT	G				4	2		2												X		24061962-008
9	MW-192	WT	G	7.17.24	1412		2	1		1							X		X					24061962-009
10	MW-193	WT	G	7-17-24	0826		2	1		1							X		X					24061962-010
11	MW-195	WT	G				3	1		2											X			24061962-011
12	MW-196	WT	G				3	1		2											X			24061962-012
13	MW-197	WT	G				3	1		2											X			24061962-013
14	MW-252	WT	G				4	2		2								X		X		X		24061962-014
15	MW-253R	WT	G				4	2		2								X		X		X		24061962-015
16	MW-304	WT	G	7.17.24	1020		4	2		2							X	X	X	X		X		24061962-016

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
BAL-24Q3 Rev 0	J. Colp	7-17	1600	[signature]	7/17/24	1600		(X)	Z	
							19.9	2.69		
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Colp

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 7-17-24

PAV 94451

Added HNO_3 (98584) to MW304, MW393

MW 394, PZ 170, + MW304dup

CHAIN-OF-CUSTODY / Analytical Request Document

24061962

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Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Sam Davies: samantha.davies@vistracorp.com
	Kim Edmiaston
Purchase Order No.:	Kimberly.Edmiaston@vistracorp.com
Project Name:	
Project Number:	2285

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

	MATRIX
DRINKING WATER	DW
	WT
WATER	WW
WASTE WATER	P
PRODUCT	SL
SOIL/SOLID	OL
	WP
OIL	AR
	OT
WIPE	TS
AIR	
OTHER	

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605	Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-350R	WT	G				4	2		2								X		X		X		24061962-017
2	MW-352	WT	G				4	2		2								X		X		X		24061962-018
3	MW-355	WT	G				4	2		2												X		24061962-019
4	MW-356	WT	G				2	1		1							X		X					24061962-020
5	MW-358	WT	G				2	1		1							X	X	X	X				24061962-021
6	MW-366	WT	G				2	1		1								X		X				24061962-022
7	MW-369	WT	G				2	1		1							X		X					24061962-023
8	MW-370	WT	G				2	1		1							X		X					24061962-024
9	MW-375	WT	G				2	1		1								X		X				24061962-025
10	MW-377	WT	G				2	1		1								X		X				24061962-026
11	MW-382	WT	G				2	1		1							X		X					24061962-027
12	MW-383	WT	G	7-17-24	1115		2	1		1								X		X				24061962-028
13	MW-384	WT	G	7-17-24	1211		2	1		1								X		X				24061962-029
14	MW-390	WT	G	7-17-24	1332		2	1		1								X		X				24061962-030
15	MW-391	WT	G				2	1		1								X		X				24061962-031
16	MW-392	WT	G	7.17.24	1323		2	1		1							X		X					24061962-032

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS	Y	N	
BAL-24Q3 Rev 0	J. Colp	7-17	1600	Paul [illegible]	7/17/24	1600				
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Colp

SIGNATURE of SAMPLER: [illegible] DATE Signed (MM/DD/YY): 7-17-24

24061962

CHAIN-OF-CUSTODY / Analytical Request Document

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Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Sam Davies: samantha.davies@vistracorp.com
	Kim Edmiaston
Purchase Order No.:	Kimberly.Edmiaston@vistracorp.com
Project Name:	
Project Number:	2285

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES | GROUND WATER | DRINKING WATER
UST | RCRA | OTHER

Site Location STATE: IL

Valid Matrix Codes: DRINKING WATER DW, WT; WATER WW; WASTE WATER P; PRODUCT SL; SOIL/SOLID OL; OIL WP, AR, OT; WIPE TS; AIR; OTHER

Section D Required Client Information — SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605	Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-393	WT	G	7-17-24	0908		2	1		1							X		X					24061962-033
2	MW-394	WT	G	7-17-24	0954		2	1		1							X		X					24061962-034
3	OW-156	WT	G	7-17-24	0931		0															X		24061962-035
4	OW-157	WT	G	7-17-24	955		0															X		24061962-036
5	OW-256	WT	G	7-17-24	1033		2	1		1							X		X					24061962-037
6	OW-257	WT	G	7-17-24	1406		2	1		1							X		X					24061962-038
7	PZ-170	WT	G	7-17-24	1225		2	1		1							X		X					24061962-039
8	PZ-182	WT	G	7-17-24	1138		2	1		1							X		X					24061962-040
9	TPZ-164	WT	G				2	1		1							X		X					24061962-041
10	XPW01	WT	G				2	1		1							X		X					24061962-042
11	XPW05	WT	G				2	1		1							X		X					24061962-043
12	XPW06	WT	G				2	1		1							X		X					24061962-044
13	Field Blank	WT	G				4	2		2							X	X	X	X	X	X		24061962-045
14	MW-304 Duplicate	WT	G	7.17.24	1020		4	2		2							X	X	X	X		X		24061962-046
15	Equipment Blank 1	WT	G				4	2		2							X	X	X	X	X	X		24061962-047
16																								

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
BAL-24Q3 Rev 0	J. Colp	7-17	1600	[illegible]	7/17/24	1600

SAMPLE CONDITIONS	Y	N	
Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Colp

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 7-17-24

24061962

CHAIN-OF-CUSTODY / Analytical Request Document

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Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Sam Davies: samantha.davies@vistracorp.com
	Kim Edmiaston
Purchase Order No.:	Kimberly.Edmiaston@vistracorp.com
Project Name:	
Project Number:	2285

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER
UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

MATRIX	
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605							Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-104DR	WT	G				4	2		2												X								24061962-001
2	MW-104SR	WT	G				4	2		2												X								24061962-002
3	MW-150	WT	G	7-18-24	1257		4	2		2								X		X		X								24061962-003
4	MW-151	WT	G	7-18-24	1332		4	2		2								X		X		X								24061962-004
5	MW-152	WT	G	7-18-24	1046		4	2		2								X		X		X								24061962-005
6	MW-153	WT	G	7-18-24	0836		4	2		2								X		X		X								24061962-006
7	MW-154	WT	G				4	2		2												X								24061962-007
8	MW-155	WT	G				4	2		2												X								24061962-008
9	MW-192	WT	G				2	1		1							X		X											24061962-009
10	MW-193	WT	G				2	1		1							X		X											24061962-010
11	MW-195	WT	G				3	1		2											X									24061962-011
12	MW-196	WT	G				3	1		2											X									24061962-012
13	MW-197	WT	G				3	1		2											X									24061962-013
14	MW-252	WT	G	7-19-24	1118		4	2		2								X		X		X								24061962-014
15	MW-253R	WT	G	7-18-24	0924		4	2		2								X		X		X								24061962-015
16	MW-304	WT	G				4	2		2							X	X	X	X		X								24061962-016

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
BAL-24Q3 Rev 0	[signature]	7-18	1630	[signature]	7/18/24	1630		Y	N	
							10.7	Y		

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Colp

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 7-18-24

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

pH/96651 Added HNO_3 (985849) to MW369
PS 7/19

TG9 on ice

24061962

CHAIN-OF-CUSTODY / Analytical Request Document

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Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Sam Davies: samantha.davies@vistracorp.com
	Kim Edmiaston
Purchase Order No.:	Kimberly.Edmiaston@vistracorp.com
Project Name:	
Project Number:	2285

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes: DRINKING WATER DW; WATER WT; WASTE WATER WW; PRODUCT P; SOIL/SOLID SL; OIL OL; WIPE WP; AIR AR; OTHER OT; TISSUE TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605	Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-350R	WT	G	7-18-24	1348		4	2		2								X		X		X		24061962-017
2	MW-352	WT	G	7-18-24	1201		4	2		2								X		X		X		24061962-018
3	MW-355	WT	G				4	2		2												X		24061962-019
4	MW-356	WT	G	7-18-24	955		2	1		1							X		X					24061962-020
5	MW-358	WT	G	7-18-24	1110		2	1		1							X	X	X	X				24061962-021
6	MW-366	WT	G	7-18-24	1206		2	1		1								X		X				24061962-022
7	MW-369	WT	G	7.18.24	956		2	1		1							X		X					24061962-023
8	MW-370	WT	G	7.18.24	1051		2	1		1							X		X					24061962-024
9	MW-375	WT	G	7.18.24	1323		2	1		1								X		X				24061962-025
10	MW-377	WT	G	7.18.24	1441		2	1		1								X		X				24061962-026
11	MW-382	WT	G	7.18.24	1204		2	1		1							X		X					24061962-027
12	MW-383	WT	G				2	1		1								X		X				24061962-028
13	MW-384	WT	G				2	1		1								X		X				24061962-029
14	MW-390	WT	G				2	1		1								X		X				24061962-030
15	MW-391	WT	G				2	1		1								X		X				24061962-031
16	MW-392	WT	G				2	1		1							X		X					24061962-032

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
BAL-24Q3 Rev 0	[signature]	7-18	1630	[signature]	7/18/24	1630

SAMPLE CONDITIONS	Y	N
Temp in °C: 10.7		
Received on Ice (Y/N):	Y	
Custody Sealed Cooler (Y/N):		
Samples Intact (Y/N):		

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Colp

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 7-18-24

LTG 9 on ice

CHAIN-OF-CUSTODY / Analytical Request Document

24061962

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Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
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Copy To:	Sam Davies: samantha.davies@vistracorp.com
	Kim Edmiaston
Purchase Order No.:	Kimberly.Edmiaston@vistracorp.com
Project Name:	
Project Number:	2285

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

MATRIX	
DRINKING WATER	DW
	WT
WATER	WW
WASTE WATER	P
PRODUCT	SL
SOIL/SOLID	OL
	WP
OIL	AR
	OT
WIPE	TS
AIR	
OTHER	

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test Y/N	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605							Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-393	WT	G				2	1		1							X		X											24061962-033
2	MW-394	WT	G				2	1		1							X		X											24061962-034
3	OW-156	WT	G				0															X								24061962-035
4	OW-157	WT	G				0															X								24061962-036
5	OW-256	WT	G				2	1		1							X		X											24061962-037
6	OW-257	WT	G				2	1		1							X		X											24061962-038
7	PZ-170	WT	G				2	1		1							X		X											24061962-039
8	PZ-182	WT	G				2	1		1							X		X											24061962-040
9	TPZ-164	WT	G				2	1		1							X		X											24061962-041
10	XPW01	WT	G				2	1		1							X		X											24061962-042
11	XPW05	WT	G				2	1		1							X		X											24061962-043
12	XPW06	WT	G				2	1		1							X		X											24061962-044
13	Field Blank	WT	G				4	2		2							X	X	X	X	X	X								24061962-045
14	MW-304 Duplicate	WT	G				4	2		2							X	X	X	X		X								24061962-046
15	Equipment Blank 1	WT	G				4	2		2							X	X	X	X	X	X								24061962-047
18	PZ 174			7-18-24	1501																									24061962-048

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
BAL-24Q3 Rev 0	[signature]	7.18	1630	[signature]	7/18/24	1630

SAMPLE CONDITIONS	Y	N	
Temp in °C: 10.7	Y		
Received on Ice (Y/N)			
Custody Sealed Cooler (Y/N)			
Samples Intact (Y/N)			

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Colp

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 7-18-24

LTG 9 on ice

Temp: 5.7 LTG: 5 pH/9 4 6 5 1 TK 7/19/24

CHAIN-OF-CUSTODY / Analytical Request Document

24061962

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Sam Davies: samantha.davies@vistracorp.com
	Kim Edmiaston
Purchase Order No.:	Kimberly.Edmiaston@vistracorp.com
Project Name:	
Project Number:	2285

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Valid Matrix Codes: DRINKING WATER DW; WATER WT; WASTE WATER WW; PRODUCT P; SOIL/SOLID SL; OIL OL; WIPE WP; AIR AR; OTHER OT; TISSUE TS

Requested Analysis Filtered (Y/N)

ITEM #	Section D Required Client Information: SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605							Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-104DR	WT	G				4	2		2												X								24061962-001
2	MW-104SR	WT	G				4	2		2												X								24061962-002
3	MW-150	WT	G				4	2		2								X		X		X								24061962-003
4	MW-151	WT	G				4	2		2								X		X		X								24061962-004
5	MW-152	WT	G				4	2		2								X		X		X								24061962-005
6	MW-153	WT	G				4	2		2								X		X		X								24061962-006
7	MW-154	WT	G	7-19-24	1001		4	2		2												X								24061962-007
8	MW-155	WT	G				4	2		2												X								24061962-008
9	MW-192	WT	G				2	1		1							X		X											24061962-009
10	MW-193	WT	G				2	1		1							X		X											24061962-010
11	MW-195	WT	G	7-19-24	0943		3	1		2											X									24061962-011
12	MW-196	WT	G				3	1		2											X									24061962-012
13	MW-197	WT	G	7-19-24	1024		3	1		2											X									24061962-013
14	MW-252	WT	G				4	2		2								X		X		X								24061962-014
15	MW-253R	WT	G				4	2		2								X		X		X								24061962-015
16	MW-304	WT	G				4	2		2							X	X	X	X		X								24061962-016

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
BAL-24Q3 Rev 0	[signature]	7-19	1220	[signature]	7/19/24	1220	5.7	Y	N	Y
							#5			

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Cap

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 7-19-24

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

CHAIN-OF-CUSTODY / Analytical Request Document

24061962

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Sam Davies: samantha.davies@vistracorp.com
	Kim Edmiaston
Purchase Order No.:	Kimberly.Edmiaston@vistracorp.com
Project Name:	
Project Number:	2285

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

	MATRIX
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605	Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-350R	WT	G				4	2		2								X		X		X		24061962-017
2	MW-352	WT	G				4	2		2								X		X		X		24061962-018
3	MW-355	WT	G				4	2		2												X		24061962-019
4	MW-356	WT	G				2	1		1							X		X					24061962-020
5	MW-358	WT	G				2	1		1							X	X	X	X				24061962-021
6	MW-366	WT	G				2	1		1								X		X				24061962-022
7	MW-369	WT	G				2	1		1							X		X					24061962-023
8	MW-370	WT	G				2	1		1							X		X					24061962-024
9	MW-375	WT	G				2	1		1								X		X				24061962-025
10	MW-377	WT	G				2	1		1								X		X				24061962-026
11	MW-382	WT	G				2	1		1							X		X					24061962-027
12	MW-383	WT	G				2	1		1								X		X				24061962-028
13	MW-384	WT	G				2	1		1								X		X				24061962-029
14	MW-390	WT	G				2	1		1								X		X				24061962-030
15	MW-391	WT	G	7-19-24	1105		2	1		1								X		X				24061962-031
16	MW-392	WT	G				2	1		1							X		X					24061962-032

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS	Y	N	
BAL-24Q3 Rev 0	[signature]	7-19	1220	[signature]	7/19/24	1220				
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Cole

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 7-19-24

CHAIN-OF-CUSTODY / Analytical Request Document

24061962

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	Vistra Corp-Baldwin	Report To:	Brian Voelker	Attention:	Brian Voelker
Address:	10901 Baldwin Road	Copy To:	Sam Davies: samantha.davies@vistracorp.com	Company Name:	Vistra Corp
	Baldwin, IL 62217		Kim Edmiaston	Address:	see Section A
Email To:	Brian.Voelker@VistraCorp.com	Purchase Order No.:	Kimberly.Edmiaston@vistracorp.com	Quote Reference:	
Phone:	(217) 753-8911 Fax:	Project Name:		Project Manager:	
Requested Due Date/TAT:	10 day	Project Number:	2285	Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes: DRINKING WATER DW, WATER WT, WASTE WATER WW, PRODUCT P, SOIL/SOLID SL, OIL OL, WIPE WP, AIR AR, OTHER OT, TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605	Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-393	WT	G				2	1		1							X		X					24061962-033
2	MW-394	WT	G				2	1		1							X		X					24061962-034
3	OW-156	WT	G				0															X		24061962-035
4	OW-157	WT	G				0															X		24061962-036
5	OW-256	WT	G				2	1		1							X		X					24061962-037
6	OW-257	WT	G				2	1		1							X		X					24061962-038
7	~~PZ-170~~ PZ-178	WT	G	7-22	1012		2	1		1							X		X					24061962-~~039~~ 050
8	~~PZ-182~~ PZ-176	WT	G	7-22	1056		2	1		1							X		X					24061962-~~040~~ 049
9	TPZ-164	WT	G	7-22	1313		2	1		1							X		X					24061962-041
10	XPW01	WT	G	7-22	1203		2	1		1							X		X					24061962-042
11	XPW05	WT	G	7-22	1242		2	1		1							X		X					24061962-043
12	XPW06	WT	G	7-22	1127		2	1		1							X		X					24061962-044
13	Field Blank	WT	G				4	2		2							X	X	X	X	X	X		24061962-045
14	MW-304 Duplicate	WT	G				4	2		2							X	X	X	X		X		24061962-046
15	Equipment Blank 1	WT	G				4	2		2							X	X	X	X	X	X		24061962-047
16	PZ-178 Dup			7-22	1012																			24061962-052

TE 7/22/24

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
BAL-24Q3 Rev 0	J. Cole	7-22	1450	Amber DeCallo	7/22/24	1450	17.3	Y	N	Y
							17.5	Y	N-Y	TE 7/22/24
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Cole

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 7-22-24

Added HNO3 (98584) to PZ-178 Dup. pH ✓ 966651 7/22/24

24061962

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Sam Davies: samantha.davies@vistracorp.com
	Kim Edmiaston
Purchase Order No.:	Kimberly.Edmiaston@vistracorp.com
Project Name:	
Project Number:	2285

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

	MATRIX
DRINKING WATER	DW
	WT
WATER	WW
WASTE WATER	P
PRODUCT	SL
SOIL/SOLID	OL
	WP
OIL	AR
	OT
WIPE	TS
AIR	
OTHER	

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605							Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-104DR	WT	G				4	2		2												X								24061962-001
2	MW-104SR	WT	G				4	2		2												X								24061962-002
3	MW-150	WT	G				4	2		2								X		X		X								24061962-003
4	MW-151	WT	G				4	2		2								X		X		X								24061962-004
5	MW-152	WT	G				4	2		2								X		X		X								24061962-005
6	MW-153	WT	G				4	2		2								X		X		X								24061962-006
7	MW-154	WT	G				4	2		2												X								24061962-007
8	MW-155	WT	G	7-23-24	1128		4	2		2												X								24061962-008
9	MW-192	WT	G				2	1		1							X		X											24061962-009
10	MW-193	WT	G				2	1		1							X		X											24061962-010
11	MW-195	WT	G				3	1		2											X									24061962-011
12	MW-196	WT	G	7-23-24	1034		3	1		2											X									24061962-012
13	MW-197	WT	G				3	1		2											X									24061962-013
14	MW-252	WT	G				4	2		2								X		X		X								24061962-014
15	MW-253R	WT	G				4	2		2								X		X		X								24061962-015
16	MW-304	WT	G				4	2		2							X	X	X	X		X								24061962-016

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
BAL-24Q3 Rev 0	[illegible]	7/23/24	1324	[illegible]	7/23/24	1324	22.3	Y	N	
							#5			

SAMPLER NAME AND SIGNATURE			
PRINT Name of SAMPLER:	Justin Cole		
SIGNATURE of SAMPLER:	[illegible]	DATE Signed (MM/DD/YY):	7-23-24

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

pH ✓ 9 @ 1551
[illegible] 7/23/24

24061962

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Sam Davies: samantha.davies@vistracorp.com
	Kim Edmiaston
Purchase Order No.:	Kimberly.Edmiaston@vistracorp.com
Project Name:	
Project Number:	2285

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes: DRINKING WATER DW; WATER WT; WASTE WATER WW; PRODUCT P; SOIL/SOLID SL; OIL OL; WIPE WP; AIR AR; OTHER OT; TISSUE TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N): BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605	Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-350R	WT	G				4	2		2							X		X		X		24061962-017
2	MW-352	WT	G				4	2		2							X		X		X		24061962-018
3	MW-355	WT	G	7-23-24	1153		4	2		2											X		24061962-019
4	MW-356	WT	G				2	1		1						X		X					24061962-020
5	MW-358	WT	G				2	1		1						X	X	X	X				24061962-021
6	MW-366	WT	G				2	1		1							X		X				24061962-022
7	MW-369	WT	G				2	1		1						X		X					24061962-023
8	MW-370	WT	G				2	1		1						X		X					24061962-024
9	MW-375	WT	G				2	1		1							X		X				24061962-025
10	MW-377	WT	G				2	1		1							X		X				24061962-026
11	MW-382	WT	G				2	1		1						X		X					24061962-027
12	MW-383	WT	G				2	1		1							X		X				24061962-028
13	MW-384	WT	G				2	1		1							X		X				24061962-029
14	MW-390	WT	G				2	1		1							X		X				24061962-030
15	MW-391	WT	G				2	1		1							X		X				24061962-031
16	MW-392	WT	G				2	1		1						X		X					24061962-032

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS	Y	N	
BAL-24Q3 Rev 0	[signature]	7/23/24	1324	[signature]	7/23/24	1324				
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Cole

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 7-23-24

CHAIN-OF-CUSTODY / Analytical Request Document

24061962

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Sam Davies: samantha.davies@vistracorp.com
	Kim Edmiaston
Purchase Order No.:	Kimberly.Edmiaston@vistracorp.com
Project Name:	
Project Number:	2285

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

MATRIX	
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605							Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-393	WT	G				2	1		1							X		X											24061962-033
2	MW-394	WT	G				2	1		1							X		X											24061962-034
3	OW-156	WT	G				0															X								24061962-035
4	OW-157	WT	G				0															X								24061962-036
5	OW-256	WT	G				2	1		1							X		X											24061962-037
6	OW-257	WT	G				2	1		1							X		X											24061962-038
7	PZ-170	WT	G				2	1		1							X		X											24061962-039
8	PZ-182	WT	G				2	1		1							X		X											24061962-040
9	TPZ-164	WT	G				2	1		1							X		X											24061962-041
10	XPW01	WT	G				2	1		1							X		X											24061962-042
11	XPW05	WT	G				2	1		1							X		X											24061962-043
12	XPW06	WT	G				2	1		1							X		X											24061962-044
13	Field Blank	WT	G	7-23-24	1204		4	2		2							X	X	X	X	X	X								24061962-045
14	MW-304 Duplicate	WT	G				4	2		2							X	X	X	X		X								24061962-046
15	Equipment Blank 1	WT	G	7-23-24	1211		4	2		2							X	X	X	X	X	X								24061962-047
16																														

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS	Y	N	
BAL-24Q3 Rev 0	[signature]	7/23/24	1324	[signature]	7/23/24	1324				
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Cole

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 7-23-24

December 06, 2024

Eric Bauer
Ramboll
234 W. Florida Street
Fifth Floor
Milwaukee, WI 53204
TEL: (414) 837-3607
FAX: (414) 837-3608

Illinois	100226
Illinois	1004652024-2
Kansas	E-10374
Louisiana	05002
Louisiana	05003
Oklahoma	9978

RE: BAL-24Q4 **WorkOrder:** 24100001

Dear Eric Bauer:

TEKLAB, INC received 13 samples for BAL_NE_605 on 11/1/2024 1:24:00 PM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report,Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Elizabeth A. Hurley
Director of Customer Service
(618)344-1004 ex 33
ehurley@teklabinc.com

Report Contents

http://www.teklabinc.com/

Client: Ramboll

Client Project: BAL-24Q4

Work Order: 24100001

Report Date: 06-Dec-24

This reporting package includes the following:

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Quality Control Results	30
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Chain of Custody	Appended

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

Abbr	Definition
*	Analytes on report marked with an asterisk are not NELAP accredited
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
CRQL	A Client Requested Quantitation Limit is a reporting limit that varies according to customer request. The CRQL may not be less than the MDL.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilution factors.
DNI	Did not ignite
DUP	Laboratory duplicate is a replicate aliquot prepared under the same laboratory conditions and independently analyzed to obtain a measure of precision.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample is a sample matrix, free from the analytes of interest,spiked with verified known amounts of analytes and analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	"The method detection limit is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results."
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
NC	Data is not acceptable for compliance purposes
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions.
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Definitions

Client: Ramboll

Work Order: 24100001

Client Project: BAL-24Q4

Report Date: 06-Dec-24

Qualifiers

# -	Unknown hydrocarbon	B -	Analyte detected in associated Method Blank
C -	RL shown is a Client Requested Quantitation Limit	E -	Value above quantitation range
H -	Holding times exceeded	I -	Associated internal standard was outside method criteria
J -	Analyte detected below quantitation limits	M -	Manual Integration used to determine area response
ND -	Not Detected at the Reporting Limit	R -	RPD outside accepted recovery limits
S -	Spike Recovery outside recovery limits	T -	TIC(Tentatively identified compound)
X -	Value exceeds Maximum Contaminant Level		

Case Narrative

http://www.teklabinc.com/

Client: Ramboll
Client Project: BAL-24Q4

Work Order: 24100001
Report Date: 06-Dec-24

Cooler Receipt Temp: 12.1 °C

An employee of Teklab, Inc. collected the sample(s).

MW-195 was collected but not analyzed per Ramboll's request.

Per Eric Bauer's request, only BAL_NE_605 data is included in this report. EAH 12/6/24

Locations

Collinsville

Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425
Phone	(618) 344-1004
Fax	(618) 344-1005
Email	jhriley@teklabinc.com

Springfield

Address	3920 Pintail Dr Springfield, IL 62711-9415
Phone	(217) 698-1004
Fax	(217) 698-1005
Email	KKlostermann@teklabinc.com

Kansas City

Address	8421 Nieman Road Lenexa, KS 66214
Phone	(913) 541-1998
Fax	(913) 541-1998
Email	jhriley@teklabinc.com

Collinsville Air

Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425
Phone	(618) 344-1004
Fax	(618) 344-1005
Email	EHurley@teklabinc.com

Chicago

Address	1319 Butterfield Rd. Downers Grove, IL 60515
Phone	(630) 324-6855
Fax	
Email	arenner@teklabinc.com

Accreditations

Client: Ramboll
Client Project: BAL-24Q4
Work Order: 24100001
Report Date: 06-Dec-24

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2025	Collinsville
Illinois	IEPA	1004652024-2	NELAP	4/30/2025	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2025	Collinsville
Louisiana	LDEQ	05002	NELAP	6/30/2025	Collinsville
Louisiana	LDEQ	05003	NELAP	6/30/2025	Collinsville
Oklahoma	ODEQ	9978	NELAP	12/31/2024	Collinsville
Arkansas	ADEQ	88-0966		3/14/2025	Collinsville
Illinois	IDPH	17584		5/31/2025	Collinsville
Iowa	IDNR	430		6/1/2026	Collinsville
Kentucky	UST	0073		1/31/2025	Collinsville
Mississippi	MSDH			4/30/2025	Collinsville
Missouri	MDNR	930		1/31/2025	Collinsville
Missouri	MDNR	00930		10/31/2026	Collinsville

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24100001
Client Project: BAL-24Q4
Report Date: 06-Dec-24
Lab ID: 24100001-012
Client Sample ID: MW-196
Matrix: GROUNDWATER
Collection Date: 10/17/2024 11:34

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS									
Depth to water from measuring point	*	0	0		**11.26**	ft	1	10/17/2024 11:34	R354883
STANDARD METHODS 2130 B FIELD									
Turbidity	*	1.0	1.0		**94**	NTU	1	10/17/2024 11:34	R354883
STANDARD METHODS 18TH ED. 2580 B FIELD									
Oxidation-Reduction Potential	*	-2000	-2000		**-72**	mV	1	10/17/2024 11:34	R354883
STANDARD METHODS 2510 B FIELD									
Spec. Conductance, Field	*	0	0		**999**	µS/cm	1	10/17/2024 11:34	R354883
STANDARD METHODS 2550 B FIELD									
Temperature	*	0	0		**18.6**	°C	1	10/17/2024 11:34	R354883
STANDARD METHODS 4500-O G FIELD									
Oxygen, Dissolved	*	0	0		**3.29**	mg/L	1	10/17/2024 11:34	R354883
SW-846 9040B FIELD									
pH	*	0	1.00		**6.93**		1	10/17/2024 11:34	R354883
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**324**	mg/L	1	10/21/2024 11:46	R354929
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	10/21/2024 11:46	R354929
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	40	50		**1260**	mg/L	2.5	10/23/2024 9:16	R355153
SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY									
Fluoride	NELAP	0.20	0.50	J	**0.47**	mg/L	10	10/18/2024 9:52	R354816
Chloride	NELAP	1.00	5.00		**19.4**	mg/L	10	10/18/2024 9:52	R354816
Sulfate	NELAP	3.00	10.0		**451**	mg/L	10	10/18/2024 9:52	R354816
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100	S	**183**	mg/L	1	10/21/2024 10:27	229922
Magnesium	NELAP	0.0055	0.0500	S	**74.0**	mg/L	1	10/21/2024 10:27	229922
Potassium	NELAP	0.0400	0.100		**5.11**	mg/L	1	10/21/2024 10:27	229922
Sodium	NELAP	0.0180	0.0500	S	**71.9**	mg/L	1	10/21/2024 10:27	229922
Matrix spike control limits are not applicable due to high sample/spike ratio.									
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.012	0.025	J	**0.016**	mg/L	5	10/22/2024 15:47	230028
Manganese	NELAP	0.0008	0.0020		**0.0517**	mg/L	5	10/22/2024 15:47	230028
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010	J	**0.0007**	mg/L	5	10/23/2024 17:09	229922
Arsenic	NELAP	0.0004	0.0010		**0.0162**	mg/L	5	10/22/2024 1:15	229922
Barium	NELAP	0.0007	0.0010		**0.247**	mg/L	5	10/22/2024 1:15	229922
Beryllium	NELAP	0.0002	0.0010		**0.0013**	mg/L	5	10/22/2024 12:58	229922
Boron	NELAP	0.0092	0.0250	S	**4.23**	mg/L	5	10/22/2024 1:15	229922
Cadmium	NELAP	0.0002	0.0010	J	**0.0003**	mg/L	5	10/22/2024 1:15	229922
Chromium	NELAP	0.0007	0.0015		**0.0497**	mg/L	5	10/22/2024 12:58	229922
Cobalt	NELAP	0.0001	0.0010		**0.0193**	mg/L	5	10/22/2024 1:15	229922
Lead	NELAP	0.0006	0.0010		**0.0169**	mg/L	5	10/23/2024 17:09	229922
Lithium	*	0.0015	0.0030		**0.0362**	mg/L	5	10/22/2024 12:58	229922
Molybdenum	NELAP	0.0006	0.0015		**0.0043**	mg/L	5	10/22/2024 1:15	229922
Selenium	NELAP	0.0006	0.0010		**0.0053**	mg/L	5	10/22/2024 1:15	229922
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	10/22/2024 1:15	229922

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24100001
Client Project: BAL-24Q4
Report Date: 06-Dec-24
Lab ID: 24100001-012
Client Sample ID: MW-196
Matrix: GROUNDWATER
Collection Date: 10/17/2024 11:34

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Contamination present in the CCB for Sb. Sample results below the reporting limit are reportable per the TNI Standard.									
CCV recovered outside the upper control limits. Sample results are below the reporting limit. Data is reportable per the TNI standard.									
Matrix spike control limits are not applicable due to high sample/spike ratio.									
SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020	J	**0.00006**	mg/L	1	10/22/2024 8:35	229905

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24100001
Client Project: BAL-24Q4
Report Date: 06-Dec-24
Lab ID: 24100001-013
Client Sample ID: MW-197
Matrix: GROUNDWATER
Collection Date: 10/17/2024 12:35

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS									
Depth to water from measuring point	*	0	0		**8.14**	ft	1	10/17/2024 12:35	R354883
STANDARD METHODS 2130 B FIELD									
Turbidity	*	1.0	1.0		**96**	NTU	1	10/17/2024 12:35	R354883
STANDARD METHODS 18TH ED. 2580 B FIELD									
Oxidation-Reduction Potential	*	-2000	-2000		**25**	mV	1	10/17/2024 12:35	R354883
STANDARD METHODS 2510 B FIELD									
Spec. Conductance, Field	*	0	0		**581**	µS/cm	1	10/17/2024 12:35	R354883
STANDARD METHODS 2550 B FIELD									
Temperature	*	0	0		**17.0**	°C	1	10/17/2024 12:35	R354883
STANDARD METHODS 4500-O G FIELD									
Oxygen, Dissolved	*	0	0		**1.81**	mg/L	1	10/17/2024 12:35	R354883
SW-846 9040B FIELD									
pH	*	0	1.00		**6.85**		1	10/17/2024 12:35	R354883
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**470**	mg/L	1	10/21/2024 12:10	R354929
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	10/21/2024 12:10	R354929
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	40	50		**805**	mg/L	2.5	10/18/2024 13:14	R354960
SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY									
Fluoride	NELAP	0.20	0.50	J	**0.46**	mg/L	10	10/18/2024 10:04	R354816
Chloride	NELAP	1.00	5.00		**22.2**	mg/L	10	10/18/2024 10:04	R354816
Sulfate	NELAP	3.00	10.0		**148**	mg/L	10	10/18/2024 10:04	R354816
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100		**127**	mg/L	1	10/21/2024 10:07	229922
Magnesium	NELAP	0.0055	0.0500		**69.4**	mg/L	1	10/21/2024 10:07	229922
Potassium	NELAP	0.0400	0.100		**2.76**	mg/L	1	10/21/2024 10:07	229922
Sodium	NELAP	0.0180	0.0500		**38.8**	mg/L	1	10/21/2024 10:07	229922
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.0115	0.0250		**< 0.0250**	mg/L	5	10/22/2024 15:53	230028
Manganese	NELAP	0.0008	0.0020		**0.0629**	mg/L	5	10/22/2024 15:53	230028
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010	J	**0.0010**	mg/L	5	10/22/2024 11:45	229922
Arsenic	NELAP	0.0004	0.0010		**0.0035**	mg/L	5	10/22/2024 2:03	229922
Barium	NELAP	0.0007	0.0010		**0.167**	mg/L	5	10/22/2024 2:03	229922
Beryllium	NELAP	0.0002	0.0010	J	**0.0007**	mg/L	5	10/22/2024 2:03	229922
Boron	NELAP	0.0092	0.025	J	**0.015**	mg/L	5	10/22/2024 2:03	229922
Cadmium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	10/22/2024 2:03	229922
Chromium	NELAP	0.0007	0.0015		**0.0174**	mg/L	5	10/22/2024 11:45	229922
Cobalt	NELAP	0.0001	0.0010		**0.0051**	mg/L	5	10/22/2024 2:03	229922
Lead	NELAP	0.0006	0.0010		**0.0042**	mg/L	5	10/23/2024 16:45	229922
Lithium	*	0.0015	0.0030		**0.0127**	mg/L	5	10/22/2024 11:45	229922
Molybdenum	NELAP	0.0006	0.0015		**0.0025**	mg/L	5	10/22/2024 2:03	229922
Selenium	NELAP	0.0006	0.0010		**0.0011**	mg/L	5	10/22/2024 11:45	229922
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	10/22/2024 2:03	229922

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24100001
Client Project: BAL-24Q4
Report Date: 06-Dec-24
Lab ID: 24100001-013
Client Sample ID: MW-197
Matrix: GROUNDWATER
Collection Date: 10/17/2024 12:35

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Contamination present in the CCB for Sb. Sample results below the reporting limit are reportable per the TNI Standard.									
CCV recovered outside the upper control limits for Be. Sample results are below the reporting limit. Data is reportable per the TNI standard.									
SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	10/22/2024 8:37	229905

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24100001
Client Project: BAL-24Q4
Report Date: 06-Dec-24
Lab ID: 24100001-014
Client Sample ID: MW-198
Matrix: GROUNDWATER
Collection Date: 11/01/2024 10:42

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS									
Depth to water from measuring point	*	0	0		**8.99**	ft	1	11/01/2024 10:42	R354883
STANDARD METHODS 2130 B FIELD									
Turbidity	*	1.0	1.0		**20**	NTU	1	11/01/2024 10:42	R354883
STANDARD METHODS 18TH ED. 2580 B FIELD									
Oxidation-Reduction Potential	*	-2000	-2000		**97**	mV	1	11/01/2024 10:42	R354883
STANDARD METHODS 2510 B FIELD									
Spec. Conductance, Field	*	0	0		**767**	µS/cm	1	11/01/2024 10:42	R354883
STANDARD METHODS 2550 B FIELD									
Temperature	*	0	0		**14.5**	°C	1	11/01/2024 10:42	R354883
STANDARD METHODS 4500-O G FIELD									
Oxygen, Dissolved	*	0	0		**8.98**	mg/L	1	11/01/2024 10:42	R354883
SW-846 9040B FIELD									
pH	*	0	1.00		**6.65**		1	11/01/2024 10:42	R354883
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**410**	mg/L	1	11/04/2024 11:59	R355638
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	11/04/2024 11:59	R355638
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	16	20		**518**	mg/L	1	11/07/2024 12:46	R355895
SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY									
Fluoride	NELAP	0.20	0.50		**ND**	mg/L	10	11/05/2024 8:16	R355616
Chloride	NELAP	1.00	5.00		**11.8**	mg/L	10	11/05/2024 8:16	R355616
Sulfate	NELAP	3.00	10.0		**43.1**	mg/L	10	11/05/2024 8:16	R355616
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100	S	**85.2**	mg/L	1	11/05/2024 19:03	230648
Magnesium	NELAP	0.0055	0.0500	S	**37.1**	mg/L	1	11/05/2024 19:03	230648
Potassium	NELAP	0.0400	0.100		**3.25**	mg/L	1	11/05/2024 19:03	230648
Sodium	NELAP	0.0180	0.0500	S	**43.6**	mg/L	1	11/05/2024 19:03	230648
Matrix spike control limits are not applicable due to high sample/spike ratio.									
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.0115	0.0250		**< 0.0250**	mg/L	5	11/12/2024 21:37	230686
Manganese	NELAP	0.0008	0.0020		**0.457**	mg/L	5	11/12/2024 21:37	230686
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010	S	**< 0.0010**	mg/L	5	11/15/2024 9:35	231150
Arsenic	NELAP	0.0004	0.0010	J	**0.0008**	mg/L	5	11/12/2024 22:19	230648
Barium	NELAP	0.0007	0.0010		**0.167**	mg/L	5	11/14/2024 19:31	231150
Beryllium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	11/12/2024 22:19	230648
Boron	NELAP	0.0092	0.025	J	**0.0099**	mg/L	5	11/12/2024 22:19	230648
Cadmium	NELAP	0.0002	0.0010	J	**0.0002**	mg/L	5	11/12/2024 22:19	230648
Chromium	NELAP	0.0007	0.0015		**0.0023**	mg/L	5	11/13/2024 11:11	230648
Cobalt	NELAP	0.0001	0.0010		**0.0015**	mg/L	5	11/12/2024 22:19	230648
Lead	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	11/09/2024 5:37	230648
Lithium	*	0.0015	0.0030		**0.0066**	mg/L	5	11/13/2024 11:11	230648
Molybdenum	NELAP	0.0006	0.0015		**0.0059**	mg/L	5	11/13/2024 11:11	230648
Selenium	NELAP	0.0006	0.0010	J	**0.0008**	mg/L	5	11/12/2024 22:19	230648
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	11/09/2024 5:37	230648

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24100001
Client Project: BAL-24Q4
Report Date: 06-Dec-24
Lab ID: 24100001-014
Client Sample ID: MW-198
Matrix: GROUNDWATER
Collection Date: 11/01/2024 10:42

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Matrix spike recovered outside upper control limits. Sample results are below the reporting limit. Data is reportable.									
SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	11/05/2024 12:50	230651

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24100001
Client Project: BAL-24Q4
Report Date: 06-Dec-24
Lab ID: 24100001-017
Client Sample ID: MW-304
Matrix: GROUNDWATER
Collection Date: 10/16/2024 9:33

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS									
Depth to water from measuring point	*	0	0		**9.54**	ft	1	10/16/2024 9:33	R354883
STANDARD METHODS 2130 B FIELD									
Turbidity	*	1.0	1.0		**6.3**	NTU	1	10/16/2024 9:33	R354883
STANDARD METHODS 18TH ED. 2580 B FIELD									
Oxidation-Reduction Potential	*	-2000	-2000		**-32**	mV	1	10/16/2024 9:33	R354883
STANDARD METHODS 2510 B FIELD									
Spec. Conductance, Field	*	0	0		**2540**	µS/cm	1	10/16/2024 9:33	R354883
STANDARD METHODS 2550 B FIELD									
Temperature	*	0	0		**15.3**	°C	1	10/16/2024 9:33	R354883
STANDARD METHODS 4500-O G FIELD									
Oxygen, Dissolved	*	0	0		**1.24**	mg/L	1	10/16/2024 9:33	R354883
SW-846 9040B FIELD									
pH	*	0	1.00		**7.54**		1	10/16/2024 9:33	R354883
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**801**	mg/L	1	10/18/2024 12:32	R354869
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	10/18/2024 12:32	R354869
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	16	20		**1500**	mg/L	1	10/18/2024 13:34	R354960
SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY									
Fluoride	NELAP	0.20	0.50		**1.82**	mg/L	10	10/17/2024 10:50	R354743
Chloride	NELAP	1.00	5.00		**169**	mg/L	10	10/17/2024 10:50	R354743
Sulfate	NELAP	3.00	10.0		**190**	mg/L	10	10/17/2024 10:50	R354743
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100		**11.0**	mg/L	1	10/18/2024 13:25	229864
Magnesium	NELAP	0.0055	0.0500		**4.53**	mg/L	1	10/18/2024 13:25	229864
Potassium	NELAP	0.0400	0.100		**2.52**	mg/L	1	10/18/2024 13:25	229864
Sodium	NELAP	0.0180	0.0500		**582**	mg/L	1	10/18/2024 13:25	229864
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.0115	0.0250		**< 0.0250**	mg/L	5	10/22/2024 16:05	230028
Manganese	NELAP	0.0008	0.0020	J	**0.0014**	mg/L	5	10/22/2024 16:05	230028
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010	J	**0.0008**	mg/L	5	10/22/2024 11:09	229864
Arsenic	NELAP	0.0004	0.0010		**0.0028**	mg/L	5	10/19/2024 4:29	229864
Barium	NELAP	0.0007	0.0010		**0.0192**	mg/L	5	10/19/2024 4:29	229864
Beryllium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	10/19/2024 4:29	229864
Boron	NELAP	0.0092	0.0250		**1.90**	mg/L	5	10/21/2024 23:32	229864
Cadmium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	10/19/2024 4:29	229864
Chromium	NELAP	0.0007	0.0015		**< 0.0015**	mg/L	5	10/19/2024 4:29	229864
Cobalt	NELAP	0.0001	0.0010		**< 0.0010**	mg/L	5	10/19/2024 4:29	229864
Lead	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	10/19/2024 4:29	229864
Lithium	*	0.0015	0.0030		**0.0833**	mg/L	5	10/22/2024 11:09	229864
Molybdenum	NELAP	0.0006	0.0015		**0.0017**	mg/L	5	10/19/2024 4:29	229864
Selenium	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	10/19/2024 4:29	229864
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	10/19/2024 4:29	229864

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24100001
Client Project: BAL-24Q4
Report Date: 06-Dec-24
Lab ID: 24100001-017
Client Sample ID: MW-304
Matrix: GROUNDWATER
Collection Date: 10/16/2024 9:33

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Contamination present in the CCB for Sb. Sample results below the reporting limit are reportable per the TNI Standard.									
CCV recovered outside the upper control limits for Be. Sample results are below the reporting limit. Data is reportable per the TNI standard.									
SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	10/18/2024 13:22	229867

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24100001
Client Project: BAL-24Q4
Report Date: 06-Dec-24
Lab ID: 24100001-022
Client Sample ID: MW-358R
Matrix: GROUNDWATER
Collection Date: 11/01/2024 11:28

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS									
Depth to water from measuring point	*	0	0		**81.62**	ft	1	11/01/2024 11:28	R354883
STANDARD METHODS 2130 B FIELD									
Turbidity	*	1.0	1.0		**43**	NTU	1	11/01/2024 11:28	R354883
STANDARD METHODS 18TH ED. 2580 B FIELD									
Oxidation-Reduction Potential	*	-2000	-2000		**-107**	mV	1	11/01/2024 11:28	R354883
STANDARD METHODS 2510 B FIELD									
Spec. Conductance, Field	*	0	0		**3520**	µS/cm	1	11/01/2024 11:28	R354883
STANDARD METHODS 2550 B FIELD									
Temperature	*	0	0		**16.7**	°C	1	11/01/2024 11:28	R354883
STANDARD METHODS 4500-O G FIELD									
Oxygen, Dissolved	*	0	0		**2.65**	mg/L	1	11/01/2024 11:28	R354883
SW-846 9040B FIELD									
pH	*	0	1.00		**7.72**		1	11/01/2024 11:28	R354883
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**557**	mg/L	1	11/04/2024 12:25	R355638
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	11/04/2024 12:25	R355638
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	40	50		**2350**	mg/L	2.5	11/07/2024 12:47	R355895
SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY									
Fluoride	NELAP	0.20	0.50		**1.20**	mg/L	10	11/05/2024 8:28	R355616
Chloride	NELAP	1.00	5.00		**1040**	mg/L	10	11/05/2024 8:28	R355616
Sulfate	NELAP	3.00	10.0		**170**	mg/L	10	11/05/2024 8:28	R355616
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100		**48.6**	mg/L	1	11/05/2024 19:22	230648
Magnesium	NELAP	0.0055	0.0500		**14.7**	mg/L	1	11/05/2024 19:22	230648
Potassium	NELAP	0.200	0.500		**8.00**	mg/L	5	11/08/2024 9:22	230648
Sodium	NELAP	0.0900	0.250	S	**842**	mg/L	5	11/06/2024 18:03	230648
Matrix spike control limits are not applicable due to high sample/spike ratio.									
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.0115	0.0250		**0.0818**	mg/L	5	11/12/2024 21:43	230686
Manganese	NELAP	0.0008	0.0020		**0.251**	mg/L	5	11/12/2024 21:43	230686
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010		**0.0033**	mg/L	5	11/15/2024 9:51	231150
Arsenic	NELAP	0.0004	0.0010		**0.0037**	mg/L	5	11/12/2024 23:50	230648
Barium	NELAP	0.0007	0.0010		**0.167**	mg/L	5	11/14/2024 20:55	231150
Beryllium	NELAP	0.0002	0.0010	J	**0.0005**	mg/L	5	11/12/2024 23:50	230648
Boron	NELAP	0.0092	0.0250		**0.945**	mg/L	5	11/12/2024 23:50	230648
Cadmium	NELAP	0.0002	0.0010	J	**0.0002**	mg/L	5	11/12/2024 23:50	230648
Chromium	NELAP	0.0007	0.0015		**0.0267**	mg/L	5	11/12/2024 23:50	230648
Cobalt	NELAP	0.0001	0.0010		**0.0038**	mg/L	5	11/12/2024 23:50	230648
Lead	NELAP	0.0006	0.0010		**0.0019**	mg/L	5	11/09/2024 7:02	230648
Lithium	*	0.0015	0.0030		**0.0224**	mg/L	5	11/13/2024 11:54	230648
Molybdenum	NELAP	0.0006	0.0015		**0.142**	mg/L	5	11/13/2024 11:54	230648
Selenium	NELAP	0.0006	0.0010		**0.0033**	mg/L	5	11/12/2024 23:50	230648
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	11/09/2024 7:02	230648

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24100001
Client Project: BAL-24Q4
Report Date: 06-Dec-24
Lab ID: 24100001-022
Client Sample ID: MW-358R
Matrix: GROUNDWATER
Collection Date: 11/01/2024 11:28

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	11/05/2024 12:56	230651

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24100001
Client Project: BAL-24Q4
Report Date: 06-Dec-24
Lab ID: 24100001-041
Client Sample ID: PZ-174
Matrix: GROUNDWATER
Collection Date: 10/15/2024 12:40

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS									
Depth to water from measuring point	*	0	0		**13.29**	ft	1	10/15/2024 12:40	R354883
STANDARD METHODS 2130 B FIELD									
Turbidity	*	1.0	1.0		**5.2**	NTU	1	10/15/2024 12:40	R354883
STANDARD METHODS 18TH ED. 2580 B FIELD									
Oxidation-Reduction Potential	*	-2000	-2000		**52**	mV	1	10/15/2024 12:40	R354883
STANDARD METHODS 2510 B FIELD									
Spec. Conductance, Field	*	0	0		**1020**	µS/cm	1	10/15/2024 12:40	R354883
STANDARD METHODS 2550 B FIELD									
Temperature	*	0	0		**16.6**	°C	1	10/15/2024 12:40	R354883
STANDARD METHODS 4500-O G FIELD									
Oxygen, Dissolved	*	0	0		**1.02**	mg/L	1	10/15/2024 12:40	R354883
SW-846 9040B FIELD									
pH	*	0	1.00		**6.99**		1	10/15/2024 12:40	R354883
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**281**	mg/L	1	10/17/2024 12:01	R354803
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	10/17/2024 12:01	R354803
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	16	20		**1320**	mg/L	1	10/18/2024 12:14	R354960
SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY									
Fluoride	NELAP	0.20	0.50	J	**0.46**	mg/L	10	10/16/2024 17:59	R354678
Chloride	NELAP	1.00	5.00		**29.9**	mg/L	10	10/16/2024 17:59	R354678
Sulfate	NELAP	3.00	10.0		**640**	mg/L	10	10/16/2024 17:59	R354678
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100		**194**	mg/L	1	10/18/2024 14:01	229828
Magnesium	NELAP	0.0055	0.0500		**96.7**	mg/L	1	10/18/2024 14:01	229828
Potassium	NELAP	0.0400	0.100		**0.257**	mg/L	1	10/18/2024 14:01	229828
Sodium	NELAP	0.0180	0.0500		**35.6**	mg/L	1	10/21/2024 16:48	229828
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.0115	0.0250		**< 0.0250**	mg/L	5	10/21/2024 13:09	229830
Manganese	NELAP	0.0008	0.0020		**0.0168**	mg/L	5	10/21/2024 13:09	229830
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010	J	**0.0010**	mg/L	5	10/30/2024 6:56	230069
Arsenic	NELAP	0.0004	0.0010		**< 0.0010**	mg/L	5	10/19/2024 2:10	229828
Barium	NELAP	0.0007	0.0010		**0.0199**	mg/L	5	10/25/2024 1:47	230069
Beryllium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	10/19/2024 2:10	229828
Boron	NELAP	0.0092	0.0250		**4.44**	mg/L	5	10/23/2024 22:40	230069
Cadmium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	10/21/2024 21:25	229828
Chromium	NELAP	0.0007	0.0015		**< 0.0015**	mg/L	5	10/19/2024 2:10	229828
Cobalt	NELAP	0.0001	0.0010	J	**0.0001**	mg/L	5	10/19/2024 2:10	229828
Lead	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	10/19/2024 2:10	229828
Lithium	*	0.0015	0.0030		**0.0214**	mg/L	5	10/23/2024 22:40	230069
Molybdenum	NELAP	0.0006	0.0015		**0.0019**	mg/L	5	10/19/2024 2:10	229828
Selenium	NELAP	0.0006	0.0010		**0.0011**	mg/L	5	10/25/2024 1:47	230069
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	10/19/2024 2:10	229828

LCS recovered outside upper control limits for Cd and Se. Sample results are below the reporting limit. Data is reportable per the TNI Standard.

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24100001
Client Project: BAL-24Q4
Report Date: 06-Dec-24
Lab ID: 24100001-041
Client Sample ID: PZ-174
Matrix: GROUNDWATER
Collection Date: 10/15/2024 12:40

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	10/18/2024 17:04	229870

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24100001
Client Project: BAL-24Q4
Report Date: 06-Dec-24
Lab ID: 24100001-042
Client Sample ID: PZ-176
Matrix: GROUNDWATER
Collection Date: 10/15/2024 13:34

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS									
Depth to water from measuring point	*	0	0		**13.33**	ft	1	10/15/2024 13:34	R354883
STANDARD METHODS 2130 B FIELD									
Turbidity	*	1.0	1.0		**1.4**	NTU	1	10/15/2024 13:34	R354883
STANDARD METHODS 18TH ED. 2580 B FIELD									
Oxidation-Reduction Potential	*	-2000	-2000		**-125**	mV	1	10/15/2024 13:34	R354883
STANDARD METHODS 2510 B FIELD									
Spec. Conductance, Field	*	0	0		**559**	µS/cm	1	10/15/2024 13:34	R354883
STANDARD METHODS 2550 B FIELD									
Temperature	*	0	0		**15.2**	°C	1	10/15/2024 13:34	R354883
STANDARD METHODS 4500-O G FIELD									
Oxygen, Dissolved	*	0	0		**1.20**	mg/L	1	10/15/2024 13:34	R354883
SW-846 9040B FIELD									
pH	*	0	1.00		**6.78**		1	10/15/2024 13:34	R354883
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**442**	mg/L	1	10/17/2024 10:43	R354803
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	10/17/2024 10:43	R354803
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	16	20		**658**	mg/L	1	10/18/2024 12:24	R354960
SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY									
Fluoride	NELAP	0.20	0.50		**0.54**	mg/L	10	10/16/2024 18:11	R354678
Chloride	NELAP	1.00	5.00		**32.5**	mg/L	10	10/16/2024 18:11	R354678
Sulfate	NELAP	3.00	10.0		**118**	mg/L	10	10/16/2024 18:11	R354678
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100		**128**	mg/L	1	10/18/2024 15:42	229829
Magnesium	NELAP	0.0055	0.0500		**53.7**	mg/L	1	10/18/2024 15:42	229829
Potassium	NELAP	0.0400	0.100		**2.15**	mg/L	1	10/18/2024 15:42	229829
Sodium	NELAP	0.0180	0.0500		**47.8**	mg/L	1	10/21/2024 13:10	229829
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.0115	0.0250		**0.189**	mg/L	5	10/21/2024 13:58	229830
Manganese	NELAP	0.0008	0.0020		**0.121**	mg/L	5	10/21/2024 13:58	229830
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010		**0.0024**	mg/L	5	10/30/2024 7:36	230069
Arsenic	NELAP	0.0004	0.0010		**0.0017**	mg/L	5	10/23/2024 22:46	230069
Barium	NELAP	0.0007	0.0010		**0.0661**	mg/L	5	10/25/2024 1:53	230069
Beryllium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	10/23/2024 22:46	230069
Boron	NELAP	0.0092	0.0250		**0.828**	mg/L	5	10/23/2024 22:46	230069
Cadmium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	10/21/2024 21:37	229829
Chromium	NELAP	0.0007	0.0015		**0.0030**	mg/L	5	10/23/2024 22:46	230069
Cobalt	NELAP	0.0001	0.0010	J	**0.0009**	mg/L	5	10/21/2024 21:37	229829
Lead	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	10/23/2024 22:46	230069
Lithium	*	0.0015	0.0030		**0.0332**	mg/L	5	10/23/2024 22:46	230069
Molybdenum	NELAP	0.0006	0.0015		**< 0.0015**	mg/L	5	10/21/2024 21:37	229829
Selenium	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	10/21/2024 21:37	229829
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	10/21/2024 21:37	229829

LCS recovered outside upper control limits for Cd and Se. Sample results are below the reporting limit. Data is reportable per the TNI Standard.

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24100001
Client Project: BAL-24Q4
Report Date: 06-Dec-24
Lab ID: 24100001-042
Client Sample ID: PZ-176
Matrix: GROUNDWATER
Collection Date: 10/15/2024 13:34

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	10/18/2024 17:06	229870

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24100001
Client Project: BAL-24Q4
Report Date: 06-Dec-24
Lab ID: 24100001-043
Client Sample ID: PZ-178
Matrix: GROUNDWATER
Collection Date: 10/15/2024 14:31

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS									
Depth to water from measuring point	*	0	0		**9.78**	ft	1	10/15/2024 14:31	R354883
STANDARD METHODS 2130 B FIELD									
Turbidity	*	1.0	1.0		**98**	NTU	1	10/15/2024 14:31	R354883
STANDARD METHODS 18TH ED. 2580 B FIELD									
Oxidation-Reduction Potential	*	-2000	-2000		**-54**	mV	1	10/15/2024 14:31	R354883
STANDARD METHODS 2510 B FIELD									
Spec. Conductance, Field	*	0	0		**583**	µS/cm	1	10/15/2024 14:31	R354883
STANDARD METHODS 2550 B FIELD									
Temperature	*	0	0		**16.2**	°C	1	10/15/2024 14:31	R354883
STANDARD METHODS 4500-O G FIELD									
Oxygen, Dissolved	*	0	0		**0.93**	mg/L	1	10/15/2024 14:31	R354883
SW-846 9040B FIELD									
pH	*	0	1.00		**6.80**		1	10/15/2024 14:31	R354883
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**482**	mg/L	1	10/17/2024 11:18	R354803
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	10/17/2024 11:18	R354803
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	16	20		**816**	mg/L	1	10/18/2024 12:25	R354960
SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY									
Fluoride	NELAP	0.20	0.50	J	**0.44**	mg/L	10	10/16/2024 18:23	R354678
Chloride	NELAP	1.00	5.00		**45.8**	mg/L	10	10/16/2024 18:23	R354678
Sulfate	NELAP	3.00	10.0		**176**	mg/L	10	10/16/2024 18:23	R354678
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100		**145**	mg/L	1	10/18/2024 15:56	229829
Magnesium	NELAP	0.0055	0.0500		**70.8**	mg/L	1	10/18/2024 15:56	229829
Potassium	NELAP	0.0400	0.100		**2.30**	mg/L	1	10/18/2024 15:56	229829
Sodium	NELAP	0.0180	0.0500		**55.0**	mg/L	1	10/21/2024 13:12	229829
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.012	0.025	J	**0.014**	mg/L	5	10/21/2024 14:04	229830
Manganese	NELAP	0.0008	0.0020		**0.103**	mg/L	5	10/21/2024 14:04	229830
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010	J	**0.0009**	mg/L	5	10/29/2024 17:14	230069
Arsenic	NELAP	0.0004	0.0010		**< 0.0010**	mg/L	5	10/23/2024 22:52	230069
Barium	NELAP	0.0007	0.0010		**0.0871**	mg/L	5	10/25/2024 1:59	230069
Beryllium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	10/23/2024 22:52	230069
Boron	NELAP	0.0092	0.0250		**0.554**	mg/L	5	10/23/2024 22:52	230069
Cadmium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	10/21/2024 21:43	229829
Chromium	NELAP	0.0007	0.0015		**< 0.0015**	mg/L	5	10/23/2024 22:52	230069
Cobalt	NELAP	0.0001	0.0010	J	**0.0008**	mg/L	5	10/21/2024 21:43	229829
Lead	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	10/23/2024 22:52	230069
Lithium	*	0.0015	0.0030		**0.0594**	mg/L	5	10/23/2024 22:52	230069
Molybdenum	NELAP	0.0006	0.0015		**< 0.0015**	mg/L	5	10/21/2024 21:43	229829
Selenium	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	10/21/2024 21:43	229829
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	10/21/2024 21:43	229829

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24100001
Client Project: BAL-24Q4
Report Date: 06-Dec-24
Lab ID: 24100001-043
Client Sample ID: PZ-178
Matrix: GROUNDWATER
Collection Date: 10/15/2024 14:31

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
CCV recovered outside the upper control limits Sb. Sample results are below the reporting limit. Data is reportable per the TNI standard.									
LCS recovered outside upper control limits for Cd and Se. Sample results are below the reporting limit. Data is reportable per the TNI Standard.									
SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	10/18/2024 17:09	229870

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24100001
Client Project: BAL-24Q4
Report Date: 06-Dec-24
Lab ID: 24100001-049
Client Sample ID: Field Blank
Matrix: AQUEOUS
Collection Date: 10/17/2024 13:08

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	10/21/2024 13:04	R354929
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	10/21/2024 13:04	R354929
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	16	20		**< 20**	mg/L	1	10/18/2024 13:26	R354960
SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY									
Fluoride	NELAP	0.20	0.50		**ND**	mg/L	10	10/18/2024 11:25	R354816
Chloride	NELAP	1.00	5.00		**ND**	mg/L	10	10/18/2024 11:25	R354816
Sulfate	NELAP	3.00	10.0		**ND**	mg/L	10	10/18/2024 11:25	R354816
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100		**< 0.100**	mg/L	1	10/21/2024 11:11	229922
Magnesium	NELAP	0.0055	0.050	J	**0.0067**	mg/L	1	10/21/2024 11:11	229922
Potassium	NELAP	0.0400	0.100		**< 0.100**	mg/L	1	10/21/2024 11:11	229922
Sodium	NELAP	0.0180	0.0500		**< 0.0500**	mg/L	1	10/21/2024 11:11	229922
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.0115	0.0250		**< 0.0250**	mg/L	5	10/22/2024 17:23	230028
Manganese	NELAP	0.0008	0.0020		**< 0.0020**	mg/L	5	10/22/2024 17:23	230028
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010		**< 0.0010**	mg/L	5	10/22/2024 12:52	229922
Arsenic	NELAP	0.0004	0.0010		**< 0.0010**	mg/L	5	10/22/2024 2:34	229922
Barium	NELAP	0.0007	0.0010		**< 0.0010**	mg/L	5	10/22/2024 2:34	229922
Beryllium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	10/22/2024 2:34	229922
Boron	NELAP	0.0092	0.0250		**0.0292**	mg/L	5	10/22/2024 2:34	229922
Cadmium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	10/22/2024 2:34	229922
Chromium	NELAP	0.0007	0.0015		**< 0.0015**	mg/L	5	10/22/2024 2:34	229922
Cobalt	NELAP	0.0001	0.0010		**< 0.0010**	mg/L	5	10/22/2024 2:34	229922
Lead	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	10/22/2024 2:34	229922
Lithium	*	0.0015	0.0030		**< 0.0030**	mg/L	5	10/22/2024 2:34	229922
Molybdenum	NELAP	0.0006	0.0015		**< 0.0015**	mg/L	5	10/22/2024 2:34	229922
Selenium	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	10/22/2024 2:34	229922
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	10/22/2024 2:34	229922

Contamination present in the CCB for Sb. Sample results below the reporting limit are reportable per the TNI Standard.
CCV recovered outside the upper control limits. Sample results are below the reporting limit. Data is reportable per the TNI standard.

SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	10/21/2024 18:37	229905

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24100001
Client Project: BAL-24Q4
Report Date: 06-Dec-24
Lab ID: 24100001-050
Client Sample ID: MW-304 Duplicate
Matrix: GROUNDWATER
Collection Date: 10/16/2024 9:33

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS									
Depth to water from measuring point	*	0	0		**9.54**	ft	1	10/16/2024 9:33	R354883
STANDARD METHODS 2130 B FIELD									
Turbidity	*	1.0	1.0		**6.3**	NTU	1	10/16/2024 9:33	R354883
STANDARD METHODS 18TH ED. 2580 B FIELD									
Oxidation-Reduction Potential	*	-2000	-2000		**-32**	mV	1	10/16/2024 9:33	R354883
STANDARD METHODS 2510 B FIELD									
Spec. Conductance, Field	*	0	0		**2540**	µS/cm	1	10/16/2024 9:33	R354883
STANDARD METHODS 2550 B FIELD									
Temperature	*	0	0		**15.3**	°C	1	10/16/2024 9:33	R354883
STANDARD METHODS 4500-O G FIELD									
Oxygen, Dissolved	*	0	0		**1.24**	mg/L	1	10/16/2024 9:33	R354883
SW-846 9040B FIELD									
pH	*	0	1.00		**7.54**		1	10/16/2024 9:33	R354883
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**800**	mg/L	1	10/18/2024 12:50	R354869
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	10/18/2024 12:50	R354869
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	16	20		**1390**	mg/L	1	10/18/2024 13:38	R354960
SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY									
Fluoride	NELAP	0.20	0.50		**1.82**	mg/L	10	10/17/2024 11:13	R354743
Chloride	NELAP	1.00	5.00		**169**	mg/L	10	10/17/2024 11:13	R354743
Sulfate	NELAP	3.00	10.0		**190**	mg/L	10	10/17/2024 11:13	R354743
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100		**12.4**	mg/L	1	10/18/2024 13:33	229864
Magnesium	NELAP	0.0055	0.0500		**4.89**	mg/L	1	10/18/2024 13:33	229864
Potassium	NELAP	0.0400	0.100		**2.48**	mg/L	1	10/18/2024 13:33	229864
Sodium	NELAP	0.0180	0.0500		**572**	mg/L	1	10/18/2024 13:33	229864
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.0115	0.0250		**< 0.0250**	mg/L	5	10/22/2024 17:29	230028
Manganese	NELAP	0.0008	0.0020	J	**0.0011**	mg/L	5	10/22/2024 17:29	230028
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010		**< 0.0010**	mg/L	5	10/22/2024 11:39	229864
Arsenic	NELAP	0.0004	0.0010		**0.0032**	mg/L	5	10/19/2024 6:12	229864
Barium	NELAP	0.0007	0.0010		**0.0238**	mg/L	5	10/19/2024 6:12	229864
Beryllium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	10/19/2024 6:12	229864
Boron	NELAP	0.0092	0.0250		**1.83**	mg/L	5	10/22/2024 1:09	229864
Cadmium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	10/19/2024 6:12	229864
Chromium	NELAP	0.0007	0.0015		**< 0.0015**	mg/L	5	10/19/2024 6:12	229864
Cobalt	NELAP	0.0001	0.0010		**< 0.0010**	mg/L	5	10/19/2024 6:12	229864
Lead	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	10/19/2024 6:12	229864
Lithium	*	0.0015	0.0030		**0.0785**	mg/L	5	10/22/2024 11:39	229864
Molybdenum	NELAP	0.0006	0.0015	J	**0.0012**	mg/L	5	10/19/2024 6:12	229864
Selenium	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	10/19/2024 6:12	229864
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	10/19/2024 6:12	229864

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24100001
Client Project: BAL-24Q4
Report Date: 06-Dec-24
Lab ID: 24100001-050
Client Sample ID: MW-304 Duplicate
Matrix: GROUNDWATER
Collection Date: 10/16/2024 9:33

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Contamination present in the CCB for Sb. Sample results below the reporting limit are reportable per the TNI Standard.									
CCV recovered outside the upper control limits for Be, Se and Pb. Sample results are below the reporting limit. Data is reportable per the TNI standard.									
SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	10/18/2024 17:13	229870

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24100001
Client Project: BAL-24Q4
Report Date: 06-Dec-24
Lab ID: 24100001-051
Client Sample ID: PZ-178 Duplicate
Matrix: GROUNDWATER
Collection Date: 10/15/2024 14:31

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS									
Depth to water from measuring point	*	0	0		**9.78**	ft	1	10/15/2024 14:31	R354883
STANDARD METHODS 2130 B FIELD									
Turbidity	*	1.0	1.0		**98**	NTU	1	10/15/2024 14:31	R354883
STANDARD METHODS 18TH ED. 2580 B FIELD									
Oxidation-Reduction Potential	*	-2000	-2000		**-54**	mV	1	10/15/2024 14:31	R354883
STANDARD METHODS 2510 B FIELD									
Spec. Conductance, Field	*	0	0		**583**	µS/cm	1	10/15/2024 14:31	R354883
STANDARD METHODS 2550 B FIELD									
Temperature	*	0	0		**16.2**	°C	1	10/15/2024 14:31	R354883
STANDARD METHODS 4500-O G FIELD									
Oxygen, Dissolved	*	0	0		**0.93**	mg/L	1	10/15/2024 14:31	R354883
SW-846 9040B FIELD									
pH	*	0	1.00		**6.80**		1	10/15/2024 14:31	R354883
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**479**	mg/L	1	10/17/2024 10:55	R354803
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	10/17/2024 10:55	R354803
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	16	20		**782**	mg/L	1	10/18/2024 12:25	R354960
SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY									
Fluoride	NELAP	0.20	0.50	J	**0.42**	mg/L	10	10/16/2024 18:46	R354678
Chloride	NELAP	1.00	5.00		**45.2**	mg/L	10	10/16/2024 18:46	R354678
Sulfate	NELAP	3.00	10.0		**174**	mg/L	10	10/16/2024 18:46	R354678
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100	S	**145**	mg/L	1	10/18/2024 15:44	229829
Magnesium	NELAP	0.0055	0.0500	S	**70.6**	mg/L	1	10/18/2024 15:44	229829
Potassium	NELAP	0.0400	0.100		**2.35**	mg/L	1	10/18/2024 15:44	229829
Sodium	NELAP	0.0180	0.0500		**54.7**	mg/L	1	10/21/2024 13:27	229829
Matrix spike control limits are not applicable due to high sample/spike ratio.									
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.012	0.025	J	**0.012**	mg/L	5	10/21/2024 13:15	229830
Manganese	NELAP	0.0008	0.0020		**0.102**	mg/L	5	10/21/2024 13:15	229830
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010	J	**0.0006**	mg/L	5	10/30/2024 7:01	230069
Arsenic	NELAP	0.0004	0.0010		**< 0.0010**	mg/L	5	10/23/2024 23:04	230069
Barium	NELAP	0.0007	0.0010		**0.0838**	mg/L	5	10/25/2024 3:31	230069
Beryllium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	10/23/2024 23:04	230069
Boron	NELAP	0.0092	0.0250		**0.522**	mg/L	5	10/23/2024 23:04	230069
Cadmium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	10/21/2024 20:30	229829
Chromium	NELAP	0.0007	0.0015		**< 0.0015**	mg/L	5	10/23/2024 23:04	230069
Cobalt	NELAP	0.0001	0.0010	J	**0.0008**	mg/L	5	10/21/2024 20:30	229829
Lead	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	10/23/2024 23:04	230069
Lithium	*	0.0015	0.0030		**0.0568**	mg/L	5	10/23/2024 23:04	230069
Molybdenum	NELAP	0.0006	0.0015	J	**0.0008**	mg/L	5	10/21/2024 20:30	229829
Selenium	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	10/21/2024 20:30	229829
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	10/21/2024 20:30	229829

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24100001
Client Project: BAL-24Q4
Report Date: 06-Dec-24
Lab ID: 24100001-051
Client Sample ID: PZ-178 Duplicate
Matrix: GROUNDWATER
Collection Date: 10/15/2024 14:31

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
LCS recovered outside upper control limits for Cd and Se. Sample results are below the reporting limit. Data is reportable per the TNI Standard.									
SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	10/18/2024 17:15	229870

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 24100001
Client Project: BAL-24Q4
Report Date: 06-Dec-24
Lab ID: 24100001-052
Client Sample ID: Equipment Blank 1
Matrix: AQUEOUS
Collection Date: 10/17/2024 13:31

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**12**	mg/L	1	10/21/2024 13:00	R354929
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	10/21/2024 13:00	R354929
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	16	20		**20**	mg/L	1	10/18/2024 13:26	R354960
SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY									
Fluoride	NELAP	0.20	0.50		**ND**	mg/L	10	10/18/2024 11:37	R354816
Chloride	NELAP	1.00	5.00		**ND**	mg/L	10	10/18/2024 11:37	R354816
Sulfate	NELAP	3.00	10.0		**ND**	mg/L	10	10/18/2024 11:37	R354816
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100		**< 0.100**	mg/L	1	10/21/2024 11:13	229922
Magnesium	NELAP	0.0055	0.050	J	**0.0062**	mg/L	1	10/21/2024 11:13	229922
Potassium	NELAP	0.0400	0.100		**< 0.100**	mg/L	1	10/21/2024 11:13	229922
Sodium	NELAP	0.0180	0.0500		**< 0.0500**	mg/L	1	10/21/2024 11:13	229922
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.012	0.025	J	**0.014**	mg/L	5	10/22/2024 17:36	230028
Manganese	NELAP	0.0008	0.0020	J	**0.0019**	mg/L	5	10/22/2024 17:36	230028
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010		**< 0.0010**	mg/L	5	10/23/2024 18:41	229922
Arsenic	NELAP	0.0004	0.0010		**< 0.0010**	mg/L	5	10/22/2024 2:40	229922
Barium	NELAP	0.0007	0.0010		**< 0.0010**	mg/L	5	10/22/2024 2:40	229922
Beryllium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	10/22/2024 2:40	229922
Boron	NELAP	0.0092	0.0250		**< 0.0250**	mg/L	5	10/22/2024 2:40	229922
Cadmium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	10/22/2024 2:40	229922
Chromium	NELAP	0.0007	0.0015		**< 0.0015**	mg/L	5	10/22/2024 2:40	229922
Cobalt	NELAP	0.0001	0.0010		**< 0.0010**	mg/L	5	10/22/2024 2:40	229922
Lead	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	10/22/2024 2:40	229922
Lithium	*	0.0015	0.0030		**< 0.0030**	mg/L	5	10/22/2024 2:40	229922
Molybdenum	NELAP	0.0006	0.0015		**< 0.0015**	mg/L	5	10/22/2024 2:40	229922
Selenium	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	10/22/2024 2:40	229922
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	10/22/2024 2:40	229922

Contamination present in the CCB for Sb. Sample results below the reporting limit are reportable per the TNI Standard.
CCV recovered outside the upper control limits. Sample results are below the reporting limit. Data is reportable per the TNI standard.

SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	10/21/2024 18:39	229905

Sample Summary

http://www.teklabinc.com/

Client: Ramboll
Client Project: BAL-24Q4

Work Order: 24100001
Report Date: 06-Dec-24

Lab Sample ID	Client Sample ID	Matrix	Fractions	Collection Date
24100001-012	MW-196	Groundwater	3	10/17/2024 11:34
24100001-013	MW-197	Groundwater	3	10/17/2024 12:35
24100001-014	MW-198	Groundwater	3	11/01/2024 10:42
24100001-017	MW-304	Groundwater	4	10/16/2024 9:33
24100001-022	MW-358R	Groundwater	3	11/01/2024 11:28
24100001-041	PZ-174	Groundwater	3	10/15/2024 12:40
24100001-042	PZ-176	Groundwater	3	10/15/2024 13:34
24100001-043	PZ-178	Groundwater	3	10/15/2024 14:31
24100001-049	Field Blank	Aqueous	4	10/17/2024 13:08
24100001-050	MW-304 Duplicate	Groundwater	4	10/16/2024 9:33
24100001-051	PZ-178 Duplicate	Groundwater	3	10/15/2024 14:31
24100001-052	Equipment Blank 1	Aqueous	4	10/17/2024 13:31

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

STANDARD METHODS 2510 B FIELD

Batch R354883 **SampType:** LCS Units **µS/cm**
SampID: LCS-1-BG

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1420**	1412	0	100.4	90	110	10/17/2024

Batch R354883 **SampType:** LCS Units **µS/cm**
SampID: LCS-1-JC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1410**	1412	0	99.9	90	110	10/14/2024

Batch R354883 **SampType:** LCS Units **µS/cm**
SampID: LCS-1-TC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1410**	1412	0	99.9	90	110	10/15/2024

Batch R354883 **SampType:** LCS Units **µS/cm**
SampID: LCS-2- BG

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1420**	1412	0	100.4	90	110	11/01/2024

Batch R354883 **SampType:** LCS Units **µS/cm**
SampID: LCS-2-JC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1410**	1412	0	99.7	90	110	10/15/2024

Batch R354883 **SampType:** LCS Units **µS/cm**
SampID: LCS-2-TC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1420**	1412	0	100.4	90	110	10/16/2024

Batch R354883 **SampType:** LCS Units **µS/cm**
SampID: LCS-3-JC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1410**	1412	0	100.1	90	110	10/16/2024

Batch R354883 **SampType:** LCS Units **µS/cm**
SampID: LCS-3-TC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1410**	1412	0	100.1	90	110	10/17/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 9040B FIELD

Batch R354883 **SampType:** LCS Units
SampID: LCS-1-BG

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.00**	7.000	0	100.0	98.57	101.4	10/17/2024

Batch R354883 **SampType:** LCS Units
SampID: LCS-1-JC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**6.98**	7.000	0	99.7	98.57	101.4	10/14/2024

Batch R354883 **SampType:** LCS Units
SampID: LCS-1-TC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.00**	7.000	0	100.0	98.57	101.4	10/15/2024

Batch R354883 **SampType:** LCS Units
SampID: LCS-2- BG

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.00**	7.000	0	100.0	98.57	101.4	11/01/2024

Batch R354883 **SampType:** LCS Units
SampID: LCS-2-JC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.01**	7.000	0	100.1	98.57	101.4	10/15/2024

Batch R354883 **SampType:** LCS Units
SampID: LCS-2-TC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.08**	7.000	0	101.1	98.57	101.4	10/16/2024

Batch R354883 **SampType:** LCS Units
SampID: LCS-3-JC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.03**	7.000	0	100.4	98.57	101.4	10/16/2024

Batch R354883 **SampType:** LCS Units
SampID: LCS-3-TC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.06**	7.000	0	100.9	98.57	101.4	10/17/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

STANDARD METHODS 2540 C (TOTAL) 1997, 2011

Batch R354960 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	10/18/2024
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	10/18/2024
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	10/18/2024

Batch R354960 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**944**	1000	0	94.4	90	110	10/18/2024
Total Dissolved Solids		20		**926**	1000	0	92.6	90	110	10/18/2024
Total Dissolved Solids		20		**980**	1000	0	98.0	90	110	10/18/2024

Batch R354960 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 24100001-001ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20		**612**				616.0	0.65	10/18/2024

Batch R354960 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 24100001-042ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20		**628**				658.0	4.67	10/18/2024

Batch R354960 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 24100001-047ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		50		**535**				580.0	8.07	10/18/2024

Batch R355026 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	10/21/2024
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	10/21/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

STANDARD METHODS 2540 C (TOTAL) 1997, 2011

Batch R355026 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**970**	1000	0	97.0	90	110	10/21/2024
Total Dissolved Solids		20		**984**	1000	0	98.4	90	110	10/21/2024

Batch R355026 **SampType:** DUP Units **mg/L** RPD Limit **10**
SampID: 24101461-004BDUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20		**654**				660.0	0.91	10/21/2024

Batch R355026 **SampType:** DUP Units **mg/L** RPD Limit **10**
SampID: 24101563-001ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		50		**400**				435.0	8.38	10/21/2024

Batch R355026 **SampType:** DUP Units **mg/L** RPD Limit **10**
SampID: 24101587-001ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		50		**520**				510.0	1.94	10/21/2024

Batch R355153 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	10/23/2024
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	10/23/2024
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	10/23/2024

Batch R355153 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**974**	1000	0	97.4	90	110	10/23/2024
Total Dissolved Solids		20		**1010**	1000	0	100.6	90	110	10/23/2024
Total Dissolved Solids		20		**1010**	1000	0	100.6	90	110	10/23/2024

Batch R355153 **SampType:** DUP Units **mg/L** RPD Limit **10**
SampID: 24101717-001ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20		**1740**				1706	1.97	10/23/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

STANDARD METHODS 2540 C (TOTAL) 1997, 2011

Batch R355153 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 24101735-001ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		200		**5480**				5280	3.72	10/23/2024

Batch R355153 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 24101822-002ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20		**406**				414.0	1.95	10/23/2024

Batch R355895 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	11/07/2024
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	11/07/2024

Batch R355895 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**984**	1000	0	98.4	90	110	11/07/2024
Total Dissolved Solids		20		**1010**	1000	0	100.6	90	110	11/07/2024

Batch R355895 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 24101589-081ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20		**1830**				1828	0.11	11/07/2024

Batch R355895 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 24102207-021ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20		**1150**				1210	5.08	11/07/2024

Batch R356859 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	11/26/2024
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	11/26/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

STANDARD METHODS 2540 C (TOTAL) 1997, 2011

Batch R356859 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**902**	1000	0	90.2	90	110	11/26/2024
Total Dissolved Solids		20		**998**	1000	0	99.8	90	110	11/26/2024

Batch R356859 **SampType:** DUP Units **mg/L** RPD Limit **10**
SampID: 24111142-001ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		50	H	**410**				450.0	9.30	11/26/2024

Batch R356859 **SampType:** DUP Units **mg/L** RPD Limit **10**
SampID: 24111493-007ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		100	H	**10700**				10320	3.24	11/26/2024

STANDARD METHODS 4500-NO2 B (TOTAL) 2000, 2011

Batch R354571 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**< 0.05**	0.0250	0	0	-100	100	10/14/2024
Nitrogen, Nitrite (as N)		0.05		**< 0.05**	0.0250	0	0	-100	100	10/14/2024
Nitrogen, Nitrite (as N)		0.05		**< 0.05**	0.0250	0	0	-100	100	10/14/2024

Batch R354571 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.32**	0.3045	0	104.8	90	110	10/14/2024
Nitrogen, Nitrite (as N)		0.05		**0.32**	0.3045	0	103.4	90	110	10/14/2024
Nitrogen, Nitrite (as N)		0.05		**0.31**	0.3045	0	101.1	90	110	10/14/2024

Batch R354571 **SampType:** MS Units **mg/L**
SampID: 24101251-002AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.50**	0.5000	0.03100	93.0	85	115	10/14/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

STANDARD METHODS 4500-NO2 B (TOTAL) 2000, 2011

Batch R354571 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24101251-002AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.50**	0.5000	0.03100	93.2	0.4960	0.20	10/14/2024

Batch R354571 **SampType:** MS Units **mg/L**

SampID: 24101261-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.53**	0.5000	0.05200	95.4	85	115	10/14/2024

Batch R354571 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24101261-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.53**	0.5000	0.05200	95.4	0.5290	0.00	10/14/2024

Batch R354718 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**< 0.05**	0.0250	0	0	-100	100	10/16/2024
Nitrogen, Nitrite (as N)		0.05		**< 0.05**	0.0250	0	0	-100	100	10/16/2024
Nitrogen, Nitrite (as N)		0.05		**< 0.05**	0.0250	0	0	-100	100	10/16/2024
Nitrogen, Nitrite (as N)		0.05		**< 0.05**	0.0250	0	0	-100	100	10/16/2024

Batch R354718 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.30**	0.3045	0	99.5	90	110	10/16/2024
Nitrogen, Nitrite (as N)		0.05		**0.30**	0.3045	0	99.8	90	110	10/16/2024
Nitrogen, Nitrite (as N)		0.05		**0.30**	0.3045	0	97.2	90	110	10/16/2024
Nitrogen, Nitrite (as N)		0.05		**0.30**	0.3045	0	99.8	90	110	10/16/2024

Batch R354718 **SampType:** MS Units **mg/L**

SampID: 24101461-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05	H	**0.51**	0.5000	0.01800	98.6	85	115	10/16/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

STANDARD METHODS 4500-NO2 B (TOTAL) 2000, 2011

Batch R354718 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24101461-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05	H	**0.51**	0.5000	0.01800	97.6	0.5110	0.98	10/16/2024

Batch R354718 **SampType:** MS Units **mg/L**

SampID: 24101469-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05	S	**0.13**	0.5000	0	26.2	85	115	10/16/2024

Batch R354718 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24101469-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05	S	**0.12**	0.5000	0	24.2	0.1310	7.94	10/16/2024

Batch R354718 **SampType:** MS Units **mg/L**

SampID: 24101500-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.50**	0.5000	0.008000	97.6	85	115	10/16/2024

Batch R354718 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24101500-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.50**	0.5000	0.008000	98.8	0.4960	1.20	10/16/2024

Batch R354799 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**< 0.05**	0.0250	0	0	-100	100	10/17/2024
Nitrogen, Nitrite (as N)		0.05		**< 0.05**	0.0250	0	0	-100	100	10/17/2024

Batch R354799 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.30**	0.3045	0	98.2	90	110	10/17/2024
Nitrogen, Nitrite (as N)		0.05		**0.30**	0.3045	0	99.5	90	110	10/17/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

STANDARD METHODS 4500-NO2 B (TOTAL) 2000, 2011

Batch R354799 **SampType:** MS Units **mg/L**
SampID: 24100001-004AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.49**	0.5000	0	98.0	85	115	10/17/2024

Batch R354799 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 24100001-004AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.49**	0.5000	0	97.2	0.4900	0.82	10/17/2024

Batch R354799 **SampType:** MS Units **mg/L**
SampID: 24100001-015AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.48**	0.5000	0	96.4	85	115	10/17/2024

Batch R354799 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 24100001-015AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.48**	0.5000	0	97.0	0.4820	0.62	10/17/2024

Batch R354799 **SampType:** MS Units **mg/L**
SampID: 24101637-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.50**	0.5000	0	100.0	85	115	10/17/2024

Batch R354799 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 24101637-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.50**	0.5000	0	99.4	0.5000	0.60	10/17/2024

Batch R354799 **SampType:** MS Units **mg/L**
SampID: 24101637-004BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.50**	0.5000	0	99.4	85	115	10/17/2024

Batch R354799 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 24101637-004BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.50**	0.5000	0	100.8	0.4970	1.40	10/17/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

STANDARD METHODS 4500-NO2 B (TOTAL) 2000, 2011

Batch R354799 **SampType:** MS Units **mg/L**

SampID: 24101695-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.50**	0.5000	0.005000	98.2	85	115	10/17/2024

Batch R354799 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24101695-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.49**	0.5000	0.005000	97.8	0.4960	0.40	10/17/2024

STANDARD METHODS 4500-NO3 F (TOTAL) 2000, 2011

Batch R354637 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate (as N)		0.050		**< 0.050**						10/14/2024
Nitrogen, Nitrate-Nitrite (as N)		0.050		**< 0.050**	0.0090	0	0	-100	100	10/14/2024

Batch R354637 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.540**	0.5000	0	108.0	90	110	10/14/2024

Batch R354637 **SampType:** MS Units **mg/L**

SampID: 24101036-004AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50		**30.6**	12.50	18.54	96.7	90	110	10/14/2024

Batch R354637 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24101036-004AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50		**32.0**	12.50	18.54	107.6	30.63	4.33	10/14/2024

Batch R354637 **SampType:** MS Units **mg/L**

SampID: 24101179-003AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		1.00		**10.2**	5.000	5.223	99.2	90	110	10/14/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

STANDARD METHODS 4500-NO3 F (TOTAL) 2000, 2011

Batch R354637 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24101179-003AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		1.00		**10.6**	5.000	5.223	106.7	10.19	3.59	10/14/2024

Batch R354637 **SampType:** MS Units **mg/L**

SampID: 24101251-002AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		5.00		**54.1**	25.00	29.16	99.6	90	110	10/14/2024

Batch R354637 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24101251-002AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		5.00		**55.4**	25.00	29.16	105.1	54.05	2.54	10/14/2024

Batch R354747 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate (as N)		0.050		**< 0.050**						10/16/2024
Nitrogen, Nitrate-Nitrite (as N)		0.050		**< 0.050**	0.0090	0	0	-100	100	10/16/2024

Batch R354747 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.513**	0.5000	0	102.6	90	110	10/16/2024

Batch R354747 **SampType:** MS Units **mg/L**

SampID: 24101160-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.250		**1.73**	1.250	0.5190	96.9	90	110	10/16/2024

Batch R354747 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24101160-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.250		**1.73**	1.250	0.5190	97.0	1.730	0.06	10/16/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

STANDARD METHODS 4500-NO3 F (TOTAL) 2000, 2011

Batch R354747 **SampType:** MS Units **mg/L**
SampID: 24101453-001DMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.100		**1.47**	0.5000	1.005	93.0	90	110	10/16/2024

Batch R354747 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 24101453-001DMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.100		**1.53**	0.5000	1.005	105.4	1.470	4.13	10/16/2024

Batch R354747 **SampType:** MS Units **mg/L**
SampID: 24101500-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50		**33.8**	12.50	21.68	97.4	90	110	10/16/2024

Batch R354747 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 24101500-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50		**34.4**	12.50	21.68	101.7	33.85	1.59	10/16/2024

Batch R354821 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate (as N)		0.050		**< 0.050**						10/17/2024
Nitrogen, Nitrate-Nitrite (as N)		0.050		**< 0.050**	0.0090	0	0	-100	100	10/17/2024

Batch R354821 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.520**	0.5000	0	104.0	90	110	10/17/2024

Batch R354821 **SampType:** MS Units **mg/L**
SampID: 24101550-002BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50		**27.8**	12.50	14.52	106.0	90	110	10/17/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

STANDARD METHODS 4500-NO3 F (TOTAL) 2000, 2011

Batch R354821 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24101550-002BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50		**26.8**	12.50	14.52	98.0	27.77	3.68	10/17/2024

Batch R354821 **SampType:** MS Units **mg/L**

SampID: 24101563-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.235**	0.2500	0	94.0	85	115	10/17/2024

Batch R354821 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24101563-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.243**	0.2500	0	97.2	0.2350	3.35	10/17/2024

Batch R354821 **SampType:** MS Units **mg/L**

SampID: 24101587-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.230**	0.2500	0	92.0	85	115	10/17/2024

Batch R354821 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24101587-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.226**	0.2500	0	90.4	0.2300	1.75	10/17/2024

Batch R354821 **SampType:** MS Units **mg/L**

SampID: 24101654-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50		**32.9**	12.50	20.97	95.4	90	110	10/17/2024

Batch R354821 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24101654-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50		**33.8**	12.50	20.97	102.8	32.90	2.79	10/17/2024

Batch R354821 **SampType:** MS Units **mg/L**

SampID: 24101680-002AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50		**34.5**	12.50	22.10	99.4	90	110	10/17/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

STANDARD METHODS 4500-NO3 F (TOTAL) 2000, 2011

Batch R354821 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 24101680-002AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50		**34.2**	12.50	22.10	96.5	34.52	1.04	10/17/2024

SW846 9056A DISSOLVED ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R354625 **SampType:** MS Units **mg/L**

SampID: 24100001-008BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		5.00		**218**	200.0	15.42	101.4	80	120	10/15/2024
Sulfate		10.0		**253**	200.0	64.50	94.3	80	120	10/15/2024

Batch R354625 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24100001-008BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		5.00		**218**	200.0	15.42	101.4	218.2	0.03	10/15/2024
Sulfate		10.0		**253**	200.0	64.50	94.4	253.2	0.09	10/15/2024

Batch R354678 **SampType:** MS Units **mg/L**

SampID: 24100001-003BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		5.00		**256**	200.0	46.36	104.9	80	120	10/16/2024
Sulfate		10.0		**1080**	200.0	870.3	105.0	80	120	10/16/2024

Batch R354678 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24100001-003BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		5.00		**253**	200.0	46.36	103.5	256.2	1.08	10/16/2024
Sulfate		10.0		**1070**	200.0	870.3	101.8	1080	0.59	10/16/2024

Batch R354678 **SampType:** MS Units **mg/L**

SampID: 24100001-018BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		5.00		**219**	200.0	17.52	100.6	80	120	10/16/2024
Sulfate		10.0		**201**	200.0	16.52	92.2	80	120	10/16/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW846 9056A DISSOLVED ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R354678 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24100001-018BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		5.00		**219**	200.0	17.52	100.6	218.6	0.04	10/16/2024
Sulfate		10.0		**201**	200.0	16.52	92.2	200.9	0.01	10/16/2024

Batch R354678 **SampType:** MS Units **mg/L**

SampID: 24101461-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		5.00		**214**	200.0	11.10	101.6	80	120	10/16/2024
Sulfate		10.0		**187**	200.0	0	93.6	80	120	10/16/2024

Batch R354678 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101461-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		5.00		**216**	200.0	11.10	102.6	214.2	0.93	10/16/2024
Sulfate		10.0		**189**	200.0	0	94.5	187.1	1.04	10/16/2024

Batch R354678 **SampType:** MS Units **mg/L**

SampID: 24101461-002BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		5.00		**272**	200.0	59.10	106.5	80	120	10/16/2024
Sulfate		10.0		**275**	200.0	83.27	96.0	80	120	10/16/2024

Batch R354678 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101461-002BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		5.00		**272**	200.0	59.10	106.4	272.0	0.07	10/16/2024
Sulfate		10.0		**275**	200.0	83.27	95.9	275.3	0.08	10/16/2024

Batch R354743 **SampType:** MS Units **mg/L**

SampID: 24100001-004BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		5.00		**258**	200.0	49.43	104.5	80	120	10/17/2024
Sulfate		10.0		**306**	200.0	113.9	96.1	80	120	10/17/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW846 9056A DISSOLVED ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R354743 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24100001-004BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		5.00		**260**	200.0	49.43	105.2	258.4	0.53	10/17/2024
Sulfate		10.0		**306**	200.0	113.9	96.3	306.2	0.10	10/17/2024

Batch R354743 **SampType:** MS Units **mg/L**

SampID: 24100001-005BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		5.00		**268**	200.0	55.59	106.2	80	120	10/17/2024
Sulfate		10.0		**1190**	200.0	985.9	103.8	80	120	10/17/2024

Batch R354743 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24100001-005BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		5.00		**267**	200.0	55.59	105.8	268.0	0.32	10/17/2024
Sulfate		10.0		**1190**	200.0	985.9	101.8	1193	0.34	10/17/2024

Batch R354816 **SampType:** MS Units **mg/L**

SampID: 24101637-002BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		5.00		**233**	200.0	26.57	103.3	80	120	10/18/2024
Sulfate		10.0		**207**	200.0	18.73	94.1	80	120	10/18/2024

Batch R354816 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101637-002BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		5.00		**233**	200.0	26.57	103.4	233.1	0.15	10/18/2024
Sulfate		10.0		**207**	200.0	18.73	94.3	207.0	0.15	10/18/2024

Batch R354943 **SampType:** MS Units **mg/L**

SampID: 24101820-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		5.00		**237**	200.0	27.40	105.0	80	120	10/22/2024
Sulfate		10.0		**345**	200.0	150.5	97.4	80	120	10/22/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW846 9056A DISSOLVED ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R354943 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101820-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		5.00		**237**	200.0	27.40	105.0	237.5	0.00	10/22/2024
Sulfate		10.0		**344**	200.0	150.5	97.0	345.2	0.23	10/22/2024

Batch R354943 **SampType:** MS Units **mg/L**

SampID: 24101820-005BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		5.00		**208**	200.0	2.372	103.0	80	120	10/22/2024
Sulfate		10.0		**385**	200.0	186.7	99.4	80	120	10/22/2024

Batch R354943 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101820-005BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		5.00		**209**	200.0	2.372	103.2	208.4	0.20	10/22/2024
Sulfate		10.0		**385**	200.0	186.7	99.0	385.4	0.17	10/22/2024

Batch R354943 **SampType:** MS Units **mg/L**

SampID: 24101820-009BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		5.00		**294**	200.0	77.01	108.7	80	120	10/22/2024
Sulfate		10.0		**285**	200.0	90.80	96.9	80	120	10/22/2024

Batch R354943 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101820-009BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		5.00		**295**	200.0	77.01	108.9	294.3	0.18	10/22/2024
Sulfate		10.0		**285**	200.0	90.80	97.2	284.6	0.23	10/22/2024

Batch R355616 **SampType:** MS Units **mg/L**

SampID: 24101589-030BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		5.00		**267**	200.0	51.45	108.0	80	120	11/06/2024
Sulfate		10.0		**278**	200.0	85.79	96.2	80	120	11/06/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW846 9056A DISSOLVED ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R355616 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101589-030BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		5.00		**267**	200.0	51.45	107.6	267.5	0.35	11/06/2024
Sulfate		10.0		**277**	200.0	85.79	95.6	278.2	0.42	11/06/2024

SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R354625 **SampType:** MBLK Units **mg/L**

SampID: MBLK/ICB

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.05		**ND**						10/15/2024
Chloride		0.50		**ND**						10/15/2024
Sulfate		1.00		**ND**						10/15/2024

Batch R354625 **SampType:** LCS Units **mg/L**

SampID: LCS/ICV/QCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.05		**0.99**	1.000	0	99.5	90	110	10/15/2024
Chloride		0.50		**20.1**	20.00	0	100.5	90	110	10/15/2024
Sulfate		1.00		**18.6**	20.00	0	93.1	90	110	10/15/2024

Batch R354625 **SampType:** MS Units **mg/L**

SampID: 24100001-029AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**10.7**	10.00	0.6920	99.8	80	120	10/15/2024
Chloride		5.00		**248**	200.0	40.95	103.6	80	120	10/15/2024
Sulfate		10.0		**353**	200.0	159.9	96.7	80	120	10/15/2024

Batch R354625 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24100001-029AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**10.7**	10.00	0.6920	100.4	10.68	0.52	10/15/2024
Chloride		5.00		**249**	200.0	40.95	104.1	248.2	0.35	10/15/2024
Sulfate		10.0		**353**	200.0	159.9	96.7	353.3	0.01	10/15/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R354625 **SampType:** MS Units **mg/L**

SampID: 24101303-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		50.0		**8020**	2000	5939	104.1	80	120	10/15/2024
Sulfate		100		**2000**	2000	141.6	93.2	80	120	10/15/2024

Batch R354625 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101303-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		50.0		**8080**	2000	5939	106.9	8020	0.72	10/15/2024
Sulfate		100		**2010**	2000	141.6	93.5	2005	0.36	10/15/2024

Batch R354625 **SampType:** MS Units **mg/L**

SampID: 24101337-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.20		**4.25**	4.000	0.2264	100.5	80	120	10/16/2024
Chloride		2.00		**98.6**	80.00	15.56	103.8	80	120	10/16/2024
Sulfate		4.00		**142**	80.00	64.92	96.7	80	120	10/16/2024

Batch R354625 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101337-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.20		**4.26**	4.000	0.2264	100.7	4.247	0.21	10/16/2024
Chloride		2.00		**98.9**	80.00	15.56	104.2	98.61	0.30	10/16/2024
Sulfate		4.00		**143**	80.00	64.92	97.3	142.3	0.31	10/16/2024

Batch R354625 **SampType:** MS Units **mg/L**

SampID: 24101337-003AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.20		**4.78**	4.000	0.6580	103.0	80	120	10/16/2024
Chloride		2.00		**92.7**	80.00	10.61	102.6	80	120	10/16/2024
Sulfate		4.00		**264**	80.00	183.2	101.3	80	120	10/16/2024

Batch R354625 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101337-003AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.20		**4.80**	4.000	0.6580	103.6	4.780	0.48	10/16/2024
Chloride		2.00		**93.1**	80.00	10.61	103.1	92.68	0.46	10/16/2024
Sulfate		4.00		**266**	80.00	183.2	103.7	264.2	0.74	10/16/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R354678 **SampType:** MBLK Units **mg/L**
SampID: MBLK/ICB

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.05		**ND**						10/16/2024
Chloride		0.50		**ND**						10/16/2024
Sulfate		1.00		**ND**						10/16/2024

Batch R354678 **SampType:** LCS Units **mg/L**
SampID: LCS/ICV/QCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.05		**1.02**	1.000	0	102.3	90	110	10/16/2024
Chloride		0.50		**20.1**	20.00	0	100.7	90	110	10/16/2024
Sulfate		1.00		**18.6**	20.00	0	93.1	90	110	10/16/2024

Batch R354678 **SampType:** MS Units **mg/L**
SampID: 24100001-023AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**10.4**	10.00	0.2900	101.5	80	120	10/16/2024
Chloride		5.00		**264**	200.0	56.59	103.6	80	120	10/16/2024
Sulfate		10.0		**1040**	200.0	838.3	102.0	80	120	10/16/2024

Batch R354678 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24100001-023AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**10.5**	10.00	0.2900	101.9	10.44	0.34	10/16/2024
Chloride		5.00		**263**	200.0	56.59	103.4	263.8	0.12	10/16/2024
Sulfate		10.0		**1040**	200.0	838.3	101.4	1042	0.12	10/16/2024

Batch R354678 **SampType:** MS Units **mg/L**
SampID: 24100001-025AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**13.4**	10.00	3.142	102.4	80	120	10/16/2024
Sulfate		10.0		**441**	200.0	251.7	94.8	80	120	10/16/2024

Batch R354678 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24100001-025AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**13.4**	10.00	3.142	102.8	13.39	0.25	10/16/2024
Sulfate		10.0		**444**	200.0	251.7	95.9	441.2	0.51	10/16/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R354678 **SampType:** MS Units **mg/L**
SampID: 24101461-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**10.9**	10.00	0.4270	104.5	80	120	10/16/2024

Batch R354678 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24101461-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**11.0**	10.00	0.4270	105.7	10.88	1.12	10/16/2024

Batch R354678 **SampType:** MS Units **mg/L**
SampID: 24101461-002BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**10.9**	10.00	0.3760	105.4	80	120	10/16/2024

Batch R354678 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24101461-002BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**10.9**	10.00	0.3760	105.4	10.91	0.00	10/16/2024

Batch R354743 **SampType:** MBLK Units **mg/L**
SampID: MBLK/ICB

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.05		**ND**						10/17/2024
Chloride		0.50		**ND**						10/17/2024
Sulfate		1.00		**ND**						10/17/2024

Batch R354743 **SampType:** LCS Units **mg/L**
SampID: LCS/ICV/QCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.05		**1.06**	1.000	0	105.8	90	110	10/17/2024
Chloride		0.50		**20.1**	20.00	0	100.3	90	110	10/17/2024
Sulfate		1.00		**18.6**	20.00	0	93.0	90	110	10/17/2024

Batch R354743 **SampType:** MS Units **mg/L**
SampID: 24100001-025AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		10.0		**1920**	400.0	1521	100.6	80	120	10/17/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R354743 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24100001-025AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		10.0		**1920**	400.0	1521	100.3	1924	0.06	10/17/2024

Batch R354743 **SampType:** MS Units **mg/L**

SampID: 24101508-005AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**11.5**	10.00	0.6470	108.9	80	120	10/17/2024
Chloride		5.00		**284**	200.0	71.97	106.0	80	120	10/17/2024
Sulfate		10.0		**398**	200.0	203.2	97.3	80	120	10/17/2024

Batch R354743 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101508-005AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**11.5**	10.00	0.6470	108.7	11.53	0.16	10/17/2024
Chloride		5.00		**285**	200.0	71.97	106.3	284.0	0.22	10/17/2024
Sulfate		10.0		**399**	200.0	203.2	97.8	397.8	0.25	10/17/2024

Batch R354743 **SampType:** MS Units **mg/L**

SampID: 24101563-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**11.2**	10.00	0.3540	108.8	80	120	10/17/2024
Chloride		5.00		**282**	200.0	69.17	106.4	80	120	10/17/2024
Sulfate		10.0		**218**	200.0	28.07	94.8	80	120	10/17/2024

Batch R354743 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101563-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**11.3**	10.00	0.3540	109.5	11.23	0.61	10/17/2024
Chloride		5.00		**283**	200.0	69.17	106.7	281.9	0.25	10/17/2024
Sulfate		10.0		**218**	200.0	28.07	94.9	217.6	0.13	10/17/2024

Batch R354743 **SampType:** MS Units **mg/L**

SampID: 24101587-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**11.2**	10.00	0.2750	109.1	80	120	10/17/2024
Chloride		5.00		**331**	200.0	112.8	109.3	80	120	10/17/2024
Sulfate		10.0		**255**	200.0	62.86	96.0	80	120	10/17/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R354743 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101587-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**11.2**	10.00	0.2750	109.3	11.19	0.13	10/17/2024
Chloride		5.00		**331**	200.0	112.8	109.1	331.4	0.12	10/17/2024
Sulfate		10.0		**255**	200.0	62.86	96.1	254.8	0.05	10/17/2024

Batch R354816 **SampType:** MBLK Units **mg/L**

SampID: MBLK/ICB

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.05		**ND**						10/18/2024
Chloride		0.50		**ND**						10/18/2024
Sulfate		1.00		**ND**						10/18/2024

Batch R354816 **SampType:** LCS Units **mg/L**

SampID: LCS/ICV/QCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.05		**1.10**	1.000	0	109.5	90	110	10/18/2024
Chloride		0.50		**20.2**	20.00	0	101.2	90	110	10/18/2024
Sulfate		1.00		**18.8**	20.00	0	93.8	90	110	10/18/2024

Batch R354816 **SampType:** MS Units **mg/L**

SampID: 24100001-046AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**11.4**	10.00	0.5720	108.3	80	120	10/18/2024
Chloride		5.00		**232**	200.0	27.86	101.9	80	120	10/18/2024
Sulfate		10.0		**248**	200.0	60.39	93.6	80	120	10/18/2024

Batch R354816 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24100001-046AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**11.5**	10.00	0.5720	109.0	11.40	0.59	10/18/2024
Chloride		5.00		**234**	200.0	27.86	103.1	231.6	1.03	10/18/2024
Sulfate		10.0		**250**	200.0	60.39	94.8	247.6	0.95	10/18/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R354816 **SampType:** MS Units **mg/L**

SampID: 24101635-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		5.00		**326**	200.0	109.6	108.5	80	120	10/18/2024
Sulfate		10.0		**420**	200.0	223.5	98.4	80	120	10/18/2024

Batch R354816 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101635-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		5.00		**327**	200.0	109.6	108.5	326.5	0.02	10/18/2024
Sulfate		10.0		**420**	200.0	223.5	98.1	420.2	0.11	10/18/2024

Batch R354816 **SampType:** MS Units **mg/L**

SampID: 24101635-003AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**11.3**	10.00	0.3640	109.6	80	120	10/18/2024
Chloride		5.00		**289**	200.0	76.94	106.2	80	120	10/18/2024
Sulfate		10.0		**223**	200.0	34.39	94.2	80	120	10/18/2024

Batch R354816 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101635-003AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**11.4**	10.00	0.3640	109.9	11.32	0.33	10/18/2024
Chloride		5.00		**288**	200.0	76.94	105.8	289.2	0.26	10/18/2024
Sulfate		10.0		**223**	200.0	34.39	94.1	222.8	0.09	10/18/2024

Batch R354816 **SampType:** MS Units **mg/L**

SampID: 24101637-002BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**11.4**	10.00	0.3650	110.1	80	120	10/18/2024

Batch R354816 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101637-002BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**11.4**	10.00	0.3650	110.8	11.37	0.62	10/18/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R354943 **SampType:** MBLK Units **mg/L**
SampID: MBLK/ICB

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.05		**ND**						10/22/2024
Chloride		0.50		**ND**						10/22/2024
Sulfate		1.00		**ND**						10/22/2024

Batch R354943 **SampType:** MBLK Units **mg/L**
SampID: MBLK-229898

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	*	0.05		**ND**						10/23/2024
Chloride	*	0.50	J	**0.12**						10/23/2024
Sulfate	*	1.00		**ND**						10/23/2024

Batch R354943 **SampType:** LCS Units **mg/L**
SampID: LCS/ICV/QCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.05		**1.00**	1.000	0	100.1	90	110	10/22/2024
Chloride		0.50		**20.5**	20.00	0	102.4	90	110	10/22/2024
Sulfate		1.00		**18.8**	20.00	0	93.8	90	110	10/22/2024

Batch R354943 **SampType:** MS Units **mg/L**
SampID: 24101635-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**10.7**	10.00	0.5190	101.5	80	120	10/22/2024

Batch R354943 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24101635-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**10.7**	10.00	0.5190	102.1	10.67	0.54	10/22/2024

Batch R354943 **SampType:** MS Units **mg/L**
SampID: 24101651-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**10.5**	10.00	0.5210	99.8	80	120	10/23/2024
Chloride		5.00		**209**	200.0	3.787	102.6	80	120	10/23/2024
Sulfate		10.0		**1170**	200.0	960.2	102.9	80	120	10/23/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R354943 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101651-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**10.6**	10.00	0.5210	100.5	10.50	0.66	10/23/2024
Chloride		5.00		**210**	200.0	3.787	103.0	208.9	0.44	10/23/2024
Sulfate		10.0		**1170**	200.0	960.2	103.2	1166	0.05	10/23/2024

Batch R354943 **SampType:** MS Units **mg/L**

SampID: 24101819-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**10.1**	10.00	0	100.6	80	120	10/23/2024
Chloride		5.00		**212**	200.0	6.510	102.9	80	120	10/23/2024
Sulfate		10.0		**279**	200.0	84.81	97.0	80	120	10/23/2024

Batch R354943 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101819-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**10.1**	10.00	0	100.7	10.06	0.12	10/23/2024
Chloride		5.00		**212**	200.0	6.510	103.0	212.2	0.10	10/23/2024
Sulfate		10.0		**279**	200.0	84.81	97.1	278.9	0.04	10/23/2024

Batch R354943 **SampType:** MS Units **mg/L**

SampID: 24101819-003AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**10.2**	10.00	0	102.4	80	120	10/22/2024
Chloride		5.00		**265**	200.0	51.18	107.1	80	120	10/22/2024
Sulfate		10.0		**337**	200.0	140.6	98.2	80	120	10/22/2024

Batch R354943 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101819-003AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**10.3**	10.00	0	102.7	10.24	0.36	10/22/2024
Chloride		5.00		**266**	200.0	51.18	107.5	265.5	0.24	10/22/2024
Sulfate		10.0		**337**	200.0	140.6	98.4	337.0	0.13	10/22/2024

Batch R354943 **SampType:** MS Units **mg/L**

SampID: 24101820-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**10.2**	10.00	0.2090	99.8	80	120	10/22/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R354943 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101820-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**10.2**	10.00	0.2090	100.0	10.18	0.25	10/22/2024

Batch R354943 **SampType:** MS Units **mg/L**

SampID: 24101820-005BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**10.8**	10.00	0.7040	100.8	80	120	10/22/2024

Batch R354943 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101820-005BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**10.8**	10.00	0.7040	101.0	10.78	0.17	10/22/2024

Batch R354943 **SampType:** MS Units **mg/L**

SampID: 24101820-009BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**10.3**	10.00	0	102.6	80	120	10/22/2024

Batch R354943 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101820-009BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**10.3**	10.00	0	102.9	10.26	0.33	10/22/2024

Batch R354943 **SampType:** MS Units **mg/L**

SampID: 24101822-002AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**10.3**	10.00	0.3800	99.6	80	120	10/22/2024
Chloride		5.00		**208**	200.0	3.273	102.2	80	120	10/22/2024
Sulfate		10.0		**197**	200.0	9.222	93.9	80	120	10/22/2024

Batch R354943 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101822-002AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**10.4**	10.00	0.3800	99.7	10.34	0.18	10/22/2024
Chloride		5.00		**209**	200.0	3.273	102.9	207.7	0.63	10/22/2024
Sulfate		10.0		**197**	200.0	9.222	94.1	197.0	0.24	10/22/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R355616 **SampType:** MBLK Units **mg/L**

SampID: MBLK/ICB

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.05		**ND**						11/05/2024
Chloride		0.50		**ND**						11/05/2024
Sulfate		1.00		**ND**						11/05/2024

Batch R355616 **SampType:** LCS Units **mg/L**

SampID: LCS/ICV/QCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.05		**1.00**	1.000	0	100.4	90	110	11/05/2024
Chloride		0.50		**20.5**	20.00	0	102.7	90	110	11/05/2024
Sulfate		1.00		**18.5**	20.00	0	92.6	90	110	11/05/2024

Batch R355616 **SampType:** MS Units **mg/L**

SampID: 24100001-022AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**11.4**	10.00	1.197	101.9	80	120	11/05/2024
Chloride		5.00		**1220**	200.0	1042	91.0	80	120	11/05/2024
Sulfate		10.0		**365**	200.0	169.8	97.8	80	120	11/05/2024

Batch R355616 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24100001-022AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**11.4**	10.00	1.197	102.5	11.39	0.49	11/05/2024
Chloride		5.00		**1220**	200.0	1042	89.9	1224	0.19	11/05/2024
Sulfate		10.0		**366**	200.0	169.8	98.0	365.3	0.11	11/05/2024

Batch R355616 **SampType:** MS Units **mg/L**

SampID: 24101589-030BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**10.3**	10.00	0.3450	99.6	80	120	11/06/2024

Batch R355616 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101589-030BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**10.3**	10.00	0.3450	99.5	10.30	0.10	11/06/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R355616 **SampType:** MS Units **mg/L**

SampID: 24110188-003AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**9.88**	10.00	0	98.8	80	120	11/05/2024
Chloride		5.00		**374**	200.0	155.0	109.5	80	120	11/05/2024
Sulfate		10.0		**730**	200.0	531.6	99.1	80	120	11/05/2024

Batch R355616 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24110188-003AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**9.93**	10.00	0	99.3	9.875	0.53	11/05/2024
Chloride		5.00		**375**	200.0	155.0	110.1	374.1	0.30	11/05/2024
Sulfate		10.0		**731**	200.0	531.6	99.5	729.9	0.10	11/05/2024

Batch R355616 **SampType:** MS Units **mg/L**

SampID: 24110189-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**9.92**	10.00	0	99.2	80	120	11/05/2024
Chloride		5.00		**223**	200.0	16.85	103.1	80	120	11/05/2024
Sulfate		10.0		**1160**	200.0	953.2	101.9	80	120	11/05/2024

Batch R355616 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24110189-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**9.96**	10.00	0	99.6	9.923	0.37	11/05/2024
Chloride		5.00		**224**	200.0	16.85	103.5	223.1	0.31	11/05/2024
Sulfate		10.0		**1160**	200.0	953.2	103.3	1157	0.24	11/05/2024

Batch R355616 **SampType:** MS Units **mg/L**

SampID: 24110221-002AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**9.84**	10.00	0	98.4	80	120	11/05/2024
Chloride		5.00		**215**	200.0	9.207	102.7	80	120	11/05/2024
Sulfate		10.0		**220**	200.0	33.48	93.2	80	120	11/05/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R355616 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24110221-002AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**9.85**	10.00	0	98.5	9.843	0.03	11/05/2024
Chloride		5.00		**214**	200.0	9.207	102.6	214.7	0.14	11/05/2024
Sulfate		10.0		**219**	200.0	33.48	92.9	219.8	0.27	11/05/2024

Batch R355616 **SampType:** MS Units **mg/L**

SampID: 24110232-002BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**10.7**	10.00	0.7990	98.8	80	120	11/05/2024
Chloride		5.00		**213**	200.0	7.226	102.8	80	120	11/05/2024
Sulfate		10.0		**299**	200.0	107.0	95.8	80	120	11/05/2024

Batch R355616 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24110232-002BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**10.7**	10.00	0.7990	98.6	10.68	0.20	11/05/2024
Chloride		5.00		**213**	200.0	7.226	102.7	212.9	0.09	11/05/2024
Sulfate		10.0		**299**	200.0	107.0	95.8	298.6	0.01	11/05/2024

Batch R355616 **SampType:** MS Units **mg/L**

SampID: 24110234-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**9.91**	10.00	0	99.1	80	120	11/06/2024
Chloride		5.00		**225**	200.0	16.08	104.2	80	120	11/06/2024
Sulfate		10.0		**225**	200.0	39.18	93.1	80	120	11/06/2024

Batch R355616 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24110234-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**9.96**	10.00	0	99.6	9.907	0.54	11/06/2024
Chloride		5.00		**224**	200.0	16.08	103.7	224.5	0.43	11/06/2024
Sulfate		10.0		**225**	200.0	39.18	92.7	225.4	0.38	11/06/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R355616 **SampType:** MS Units **mg/L**

SampID: 24110236-003AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**9.87**	10.00	0	98.7	80	120	11/05/2024
Chloride		5.00		**207**	200.0	2.717	102.3	80	120	11/05/2024
Sulfate		10.0		**187**	200.0	0	93.4	80	120	11/05/2024

Batch R355616 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24110236-003AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**9.81**	10.00	0	98.1	9.870	0.59	11/05/2024
Chloride		5.00		**206**	200.0	2.717	101.7	207.3	0.64	11/05/2024
Sulfate		10.0		**186**	200.0	0	92.8	186.8	0.69	11/05/2024

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 229768 **SampType:** MBLK Units **mg/L**

SampID: MBLK-229768

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**< 0.100**	0.0350	0	0	-100	100	10/16/2024
Magnesium		0.0500		**< 0.0500**	0.0055	0	0	-100	100	10/16/2024
Potassium		0.100		**< 0.100**	0.0400	0	0	-100	100	10/16/2024
Sodium		0.0500		**< 0.0500**	0.0180	0	0	-100	100	10/16/2024

Batch 229768 **SampType:** LCS Units **mg/L**

SampID: LCS-229768

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**2.62**	2.500	0	104.8	85	115	10/16/2024
Magnesium		0.0500		**2.40**	2.500	0	95.9	85	115	10/16/2024
Potassium		0.100		**2.65**	2.500	0	105.9	85	115	10/16/2024
Sodium		0.0500		**2.66**	2.500	0	106.2	85	115	10/16/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 229828 **SampType:** MBLK Units **mg/L**

SampID: MBLK-229828

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**< 0.100**	0.0350	0	0	-100	100	10/18/2024
Calcium		0.100		**< 0.100**	0.0350	0	0	-100	100	10/21/2024
Cobalt		0.0050		**< 0.0050**	0.0020	0	0	-100	100	10/21/2024
Lead		0.0150		**< 0.0150**	0.0014	0	0	-100	100	10/21/2024
Magnesium		0.0500		**< 0.0500**	0.0055	0	0	-100	100	10/18/2024
Manganese		0.0070		**< 0.0070**	0.0025	0	0	-100	100	10/21/2024
Molybdenum		0.0100		**< 0.0100**	0.0037	0	0	-100	100	10/21/2024
Potassium		0.100		**< 0.100**	0.0400	0	0	-100	100	10/18/2024
Potassium		0.100		**< 0.100**	0.0400	0	0	-100	100	10/21/2024
Selenium		0.0400		**< 0.0400**	0.0170	0	0	-100	100	10/21/2024
Sodium		0.0500		**< 0.0500**	0.0180	0	0	-100	100	10/18/2024
Sodium		0.0500		**< 0.0500**	0.0180	0	0	-100	100	10/21/2024
Thallium		0.0500		**< 0.0500**	0.0111	0	0	-100	100	10/21/2024

Batch 229828 **SampType:** LCS Units **mg/L**

SampID: LCS-229828

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**2.50**	2.500	0	100.1	85	115	10/18/2024
Calcium		0.100		**2.70**	2.500	0	108.2	85	115	10/21/2024
Cobalt		0.0050		**0.544**	0.5000	0	108.7	85	115	10/21/2024
Lead		0.0150		**0.523**	0.5000	0	104.6	85	115	10/21/2024
Magnesium		0.0500		**2.39**	2.500	0	95.6	85	115	10/18/2024
Manganese		0.0070		**0.544**	0.5000	0	108.8	85	115	10/21/2024
Molybdenum		0.0100		**0.520**	0.5000	0	104.0	85	115	10/21/2024
Potassium		0.100		**2.52**	2.500	0	100.9	85	115	10/18/2024
Potassium		0.100		**2.71**	2.500	0	108.3	85	115	10/21/2024
Selenium		0.0400		**0.528**	0.5000	0	105.5	85	115	10/21/2024
Sodium		0.0500		**2.55**	2.500	0	102.0	85	115	10/18/2024
Sodium		0.0500		**2.68**	2.500	0	107.3	85	115	10/21/2024
Thallium		0.0500		**0.265**	0.2500	0	106.1	85	115	10/21/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 229828 **SampType:** MS Units **mg/L**

SampID: 24100001-031BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100	S	**97.6**	2.500	96.21	57.6	75	125	10/18/2024
Magnesium		0.0500	S	**42.0**	2.500	40.22	69.4	75	125	10/18/2024
Potassium		0.100		**5.50**	2.500	3.174	93.2	75	125	10/18/2024
Sodium		0.0500	S	**88.0**	2.500	86.40	62.8	75	125	10/21/2024

Batch 229828 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24100001-031BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Calcium		0.100		**98.6**	2.500	96.21	97.2	97.65	1.01	10/18/2024
Magnesium		0.0500		**42.3**	2.500	40.22	84.9	41.95	0.92	10/18/2024
Potassium		0.100		**5.62**	2.500	3.174	97.8	5.504	2.07	10/18/2024
Sodium		0.0500	S	**88.1**	2.500	86.40	68.4	87.97	0.16	10/21/2024

Batch 229829 **SampType:** MBLK Units **mg/L**

SampID: MBLK-229829

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0200		**< 0.0200**	0.0090	0	0	-100	100	10/18/2024
Calcium		0.100		**< 0.100**	0.0350	0	0	-100	100	10/18/2024
Iron		0.0400		**< 0.0400**	0.0200	0	0	-100	100	10/18/2024
Magnesium		0.0500		**< 0.0500**	0.0055	0	0	-100	100	10/18/2024
Manganese		0.0070		**< 0.0070**	0.0025	0	0	-100	100	10/18/2024
Potassium		0.100		**< 0.100**	0.0400	0	0	-100	100	10/18/2024
Sodium		0.0500		**< 0.0500**	0.0180	0	0	-100	100	10/18/2024

Batch 229829 **SampType:** LCS Units **mg/L**

SampID: LCS-229829

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0200		**0.488**	0.5000	0	97.7	85	115	10/18/2024
Calcium		0.100		**2.52**	2.500	0	100.8	85	115	10/18/2024
Iron		0.0400		**2.10**	2.000	0	105.0	85	115	10/18/2024
Magnesium		0.0500		**2.40**	2.500	0	96.2	85	115	10/18/2024
Manganese		0.0070		**0.500**	0.5000	0	100.1	85	115	10/18/2024
Potassium		0.100		**2.64**	2.500	0	105.6	85	115	10/18/2024
Sodium		0.0500		**2.53**	2.500	0	101.2	85	115	10/18/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 229829 **SampType:** MS Units **mg/L**
SampID: 24100001-051BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100	S	**145**	2.500	144.7	30.4	75	125	10/18/2024
Magnesium		0.0500	S	**71.8**	2.500	70.56	51.4	75	125	10/18/2024
Potassium		0.100		**5.03**	2.500	2.347	107.5	75	125	10/18/2024
Sodium		0.0500		**56.6**	2.500	54.68	77.2	75	125	10/21/2024

Batch 229829 **SampType:** MSD Units **mg/L** RPD Limit **20**
SampID: 24100001-051BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Calcium		0.100	S	**149**	2.500	144.7	184.4	145.4	2.61	10/18/2024
Magnesium		0.0500	S	**73.7**	2.500	70.56	125.5	71.85	2.55	10/18/2024
Potassium		0.100		**5.03**	2.500	2.347	107.2	5.033	0.13	10/18/2024
Sodium		0.0500		**57.7**	2.500	54.68	120.4	56.61	1.89	10/21/2024

Batch 229829 **SampType:** MS Units **mg/L**
SampID: 24101508-003BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**22.5**	2.500	20.07	96.4	75	125	10/18/2024

Batch 229829 **SampType:** MSD Units **mg/L** RPD Limit **20**
SampID: 24101508-003BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Calcium		0.100		**22.0**	2.500	20.07	79.2	22.48	1.93	10/18/2024

Batch 229864 **SampType:** MBLK Units **mg/L**
SampID: MBLK-229864

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0200		**< 0.0200**	0.0090	0	0	-100	100	10/18/2024
Calcium		0.100		**< 0.100**	0.0350	0	0	-100	100	10/18/2024
Iron		0.0400		**< 0.0400**	0.0200	0	0	-100	100	10/18/2024
Magnesium		0.0500		**< 0.0500**	0.0055	0	0	-100	100	10/18/2024
Manganese		0.0070		**< 0.0070**	0.0025	0	0	-100	100	10/18/2024
Potassium		0.100		**< 0.100**	0.0400	0	0	-100	100	10/18/2024
Sodium		0.0500		**< 0.0500**	0.0180	0	0	-100	100	10/18/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 229864 **SampType:** LCS Units **mg/L**

SampID: LCS-229864

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0200		**0.486**	0.5000	0	97.3	85	115	10/18/2024
Calcium		0.100		**2.52**	2.500	0	101.0	85	115	10/18/2024
Iron		0.0400		**1.98**	2.000	0	98.8	85	115	10/18/2024
Magnesium		0.0500		**2.37**	2.500	0	94.9	85	115	10/18/2024
Manganese		0.0070		**0.491**	0.5000	0	98.2	85	115	10/18/2024
Potassium		0.100		**2.65**	2.500	0	106.2	85	115	10/18/2024
Sodium		0.0500		**2.54**	2.500	0	101.7	85	115	10/18/2024

Batch 229864 **SampType:** MS Units **mg/L**

SampID: 24100001-015CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100	S	**212**	2.500	211.7	16.4	75	125	10/18/2024
Magnesium		0.0500	S	**83.5**	2.500	81.99	61.1	75	125	10/18/2024
Potassium		0.100		**4.51**	2.500	1.701	112.4	75	125	10/18/2024
Sodium		0.0500	S	**92.4**	2.500	90.97	55.6	75	125	10/18/2024

Batch 229864 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24100001-015CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Calcium		0.100	S	**213**	2.500	211.7	69.6	212.1	0.63	10/18/2024
Magnesium		0.0500		**84.4**	2.500	81.99	98.2	83.52	1.10	10/18/2024
Potassium		0.100		**4.50**	2.500	1.701	112.1	4.511	0.17	10/18/2024
Sodium		0.0500	S	**92.6**	2.500	90.97	65.6	92.36	0.27	10/18/2024

Batch 229922 **SampType:** MBLK Units **mg/L**

SampID: MBLK-229922

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**< 0.100**	0.0350	0	0	-100	100	10/21/2024
Magnesium		0.0500		**< 0.0500**	0.0055	0	0	-100	100	10/21/2024
Potassium		0.100		**< 0.100**	0.0400	0	0	-100	100	10/21/2024
Sodium		0.0500		**< 0.0500**	0.0180	0	0	-100	100	10/21/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 229922 **SampType:** LCS Units **mg/L**

SampID: LCS-229922

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**2.62**	2.500	0	104.9	85	115	10/21/2024
Magnesium		0.0500		**2.33**	2.500	0	93.2	85	115	10/21/2024
Potassium		0.100		**2.73**	2.500	0	109.3	85	115	10/21/2024
Sodium		0.0500		**2.69**	2.500	0	107.7	85	115	10/21/2024

Batch 229922 **SampType:** MS Units **mg/L**

SampID: 24100001-012BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100	S	**186**	2.500	183.0	131.6	75	125	10/21/2024
Magnesium		0.0500		**76.7**	2.500	74.05	106.4	75	125	10/21/2024
Potassium		0.100		**7.72**	2.500	5.115	104.2	75	125	10/21/2024
Sodium		0.0500		**74.6**	2.500	71.87	108.4	75	125	10/21/2024

Batch 229922 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24100001-012BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Calcium		0.100	S	**184**	2.500	183.0	44.4	186.3	1.18	10/21/2024
Magnesium		0.0500	S	**75.6**	2.500	74.05	61.3	76.71	1.48	10/21/2024
Potassium		0.100		**7.63**	2.500	5.115	100.6	7.720	1.18	10/21/2024
Sodium		0.0500	S	**73.4**	2.500	71.87	62.4	74.58	1.55	10/21/2024

Batch 229922 **SampType:** MS Units **mg/L**

SampID: 24100001-052CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**2.65**	2.500	0	106.1	75	125	10/21/2024
Magnesium		0.0500		**2.36**	2.500	0.006200	94.3	75	125	10/21/2024
Potassium		0.100		**2.70**	2.500	0	107.9	75	125	10/21/2024
Sodium		0.0500		**2.69**	2.500	0	107.6	75	125	10/21/2024

Batch 229922 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24100001-052CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Calcium		0.100		**2.66**	2.500	0	106.6	2.652	0.46	10/21/2024
Magnesium		0.0500		**2.35**	2.500	0.006200	93.7	2.364	0.62	10/21/2024
Potassium		0.100		**2.72**	2.500	0	108.7	2.697	0.78	10/21/2024
Sodium		0.0500		**2.69**	2.500	0	107.5	2.691	0.10	10/21/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 230069 **SampType:** MBLK Units **mg/L**

SampID: MBLK-230069

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**< 0.100**	0.0350	0	0	-100	100	10/23/2024
Magnesium		0.0500		**< 0.0500**	0.0055	0	0	-100	100	10/23/2024
Potassium		0.100		**< 0.100**	0.0400	0	0	-100	100	10/23/2024
Sodium		0.0500		**< 0.0500**	0.0180	0	0	-100	100	10/23/2024

Batch 230069 **SampType:** LCS Units **mg/L**

SampID: LCS-230069

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**2.41**	2.500	0	96.6	85	115	10/23/2024
Magnesium		0.0500		**2.26**	2.500	0	90.4	85	115	10/23/2024
Potassium		0.100		**2.61**	2.500	0	104.3	85	115	10/23/2024
Sodium		0.0500		**2.52**	2.500	0	100.9	85	115	10/23/2024

Batch 230147 **SampType:** MBLK Units **mg/L**

SampID: MBLK-230147

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0500		**< 0.0500**	0.0068	0	0	-100	100	10/24/2024
Arsenic		0.0250		**< 0.0250**	0.0087	0	0	-100	100	10/24/2024
Barium		0.0025		**< 0.0025**	0.0007	0	0	-100	100	10/24/2024
Beryllium		0.0005		**< 0.0005**	0.0002	0	0	-100	100	10/24/2024
Boron		0.0200		**< 0.0200**	0.0090	0	0	-100	100	10/24/2024
Cadmium		0.0020		**< 0.0020**	0.0005	0	0	-100	100	10/24/2024
Calcium		0.100		**< 0.100**	0.0350	0	0	-100	100	10/24/2024
Chromium		0.0050		**< 0.0050**	0.0028	0	0	-100	100	10/24/2024
Cobalt		0.0050		**< 0.0050**	0.0020	0	0	-100	100	10/24/2024
Iron		0.0400		**< 0.0400**	0.0200	0	0	-100	100	10/24/2024
Lead		0.0150		**< 0.0150**	0.0014	0	0	-100	100	10/24/2024
Magnesium		0.0500		**< 0.0500**	0.0055	0	0	-100	100	10/24/2024
Manganese		0.0070		**< 0.0070**	0.0025	0	0	-100	100	10/24/2024
Molybdenum		0.0100		**< 0.0100**	0.0037	0	0	-100	100	10/24/2024
Potassium		0.100		**< 0.100**	0.0400	0	0	-100	100	10/24/2024
Selenium		0.0400		**< 0.0400**	0.0170	0	0	-100	100	10/24/2024
Sodium		0.0500		**< 0.0500**	0.0180	0	0	-100	100	10/24/2024
Thallium		0.0500		**< 0.0500**	0.0111	0	0	-100	100	10/24/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 230147 **SampType:** LCS Units **mg/L**

SampID: LCS-230147

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0500		**0.522**	0.5000	0	104.4	85	115	10/24/2024
Arsenic		0.0250		**0.507**	0.5000	0	101.4	85	115	10/24/2024
Barium		0.0025		**1.98**	2.000	0	99.0	85	115	10/24/2024
Beryllium		0.0005		**0.0512**	0.0500	0	102.4	85	115	10/24/2024
Boron		0.0200		**0.488**	0.5000	0	97.7	85	115	10/24/2024
Cadmium		0.0020		**0.0488**	0.0500	0	97.6	85	115	10/24/2024
Calcium		0.100		**2.59**	2.500	0	103.5	85	115	10/24/2024
Chromium		0.0050		**0.206**	0.2000	0	103.0	85	115	10/24/2024
Cobalt		0.0050		**0.535**	0.5000	0	107.1	85	115	10/24/2024
Iron		0.0400		**2.23**	2.000	0	111.5	85	115	10/25/2024
Lead		0.0150		**0.508**	0.5000	0	101.5	85	115	10/24/2024
Magnesium		0.0500		**2.56**	2.500	0	102.3	85	115	10/24/2024
Manganese		0.0070		**0.504**	0.5000	0	100.9	85	115	10/24/2024
Molybdenum		0.0100		**0.507**	0.5000	0	101.4	85	115	10/24/2024
Potassium		0.100		**2.78**	2.500	0	111.0	85	115	10/24/2024
Selenium		0.0400		**0.507**	0.5000	0	101.4	85	115	10/24/2024
Sodium		0.0500		**2.56**	2.500	0	102.6	85	115	10/24/2024
Thallium		0.0500		**0.256**	0.2500	0	102.3	85	115	10/24/2024

Batch 230147 **SampType:** MS Units **mg/L**

SampID: 24100635-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**41.2**	2.500	38.10	124.8	75	125	10/24/2024
Magnesium		0.0500		**13.8**	2.500	11.22	104.6	75	125	10/24/2024
Potassium		0.100		**4.16**	2.500	1.430	109.2	75	125	10/24/2024
Sodium		0.0500	S	**76.5**	2.500	72.93	141.2	75	125	10/24/2024

Batch 230147 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24100635-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Calcium		0.100		**40.6**	2.500	38.10	102.0	41.22	1.39	10/24/2024
Magnesium		0.0500		**13.6**	2.500	11.22	97.0	13.83	1.39	10/24/2024
Potassium		0.100		**4.06**	2.500	1.430	105.4	4.159	2.29	10/24/2024
Sodium		0.0500		**75.2**	2.500	72.93	90.0	76.46	1.69	10/24/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 230147 **SampType:** MS Units **mg/L**

SampID: 24100635-005BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100	S	**84.7**	2.500	81.45	131.6	75	125	10/24/2024
Magnesium		0.0500		**25.3**	2.500	22.72	104.4	75	125	10/24/2024
Potassium		0.100		**5.64**	2.500	3.138	100.3	75	125	10/24/2024
Sodium		0.0500	S	**45.2**	2.500	43.36	72.4	75	125	10/24/2024

Batch 230147 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24100635-005BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Calcium		0.100	S	**82.8**	2.500	81.45	52.0	84.74	2.38	10/24/2024
Magnesium		0.0500		**24.7**	2.500	22.72	78.6	25.32	2.57	10/24/2024
Potassium		0.100		**5.66**	2.500	3.138	100.9	5.644	0.29	10/24/2024
Sodium		0.0500	S	**45.1**	2.500	43.36	69.6	45.17	0.16	10/24/2024

Batch 230648 **SampType:** MBLK Units **mg/L**

SampID: MBLK-230648

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**< 0.100**	0.0350	0	0	-100	100	11/05/2024
Magnesium		0.0500		**< 0.0500**	0.0055	0	0	-100	100	11/05/2024
Potassium		0.100		**< 0.100**	0.0400	0	0	-100	100	11/05/2024
Sodium		0.0500		**< 0.0500**	0.0180	0	0	-100	100	11/05/2024

Batch 230648 **SampType:** LCS Units **mg/L**

SampID: LCS-230648

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**5.12**	5.000	0	102.4	85	115	11/05/2024
Magnesium		0.0500		**4.75**	5.000	0	94.9	85	115	11/05/2024
Potassium		0.100		**4.99**	5.000	0	99.8	85	115	11/05/2024
Sodium		0.0500		**5.06**	5.000	0	101.3	85	115	11/05/2024

Batch 230648 **SampType:** MS Units **mg/L**

SampID: 24100001-014BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**90.3**	5.000	85.23	101.0	75	125	11/05/2024
Magnesium		0.0500		**41.6**	5.000	37.07	90.7	75	125	11/05/2024
Potassium		0.100		**7.72**	5.000	3.246	89.6	75	125	11/05/2024
Sodium		0.0500		**48.0**	5.000	43.58	88.6	75	125	11/05/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 230648 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24100001-014BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Calcium		0.100	S	**87.4**	5.000	85.23	43.0	90.28	3.26	11/05/2024
Magnesium		0.0500	S	**40.4**	5.000	37.07	66.4	41.60	2.96	11/05/2024
Potassium		0.100		**7.46**	5.000	3.246	84.2	7.724	3.53	11/05/2024
Sodium		0.0500	S	**46.2**	5.000	43.58	52.2	48.01	3.86	11/05/2024

Batch 230648 **SampType:** MS Units **mg/L**

SampID: 24100001-022BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**54.2**	5.000	48.56	111.8	75	125	11/05/2024
Magnesium		0.0500		**19.9**	5.000	14.66	105.0	75	125	11/05/2024
Potassium		0.500		**13.7**	5.000	8.000	113.5	75	125	11/08/2024
Sodium		0.250	S	**894**	5.000	842.2	1044	75	125	11/06/2024

Batch 230648 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24100001-022BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Calcium		0.100		**54.7**	5.000	48.56	123.4	54.15	1.07	11/05/2024
Magnesium		0.0500		**20.2**	5.000	14.66	111.2	19.91	1.54	11/05/2024
Potassium		0.500		**13.4**	5.000	8.000	107.2	13.67	2.33	11/08/2024
Sodium		0.250	S	**876**	5.000	842.2	678.0	894.4	2.07	11/06/2024

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 229735 **SampType:** MBLK Units **mg/L**

SampID: MBLK-229735

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	10/16/2024

Batch 229735 **SampType:** LCS Units **mg/L**

SampID: LCS-229735

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**0.528**	0.5000	0	105.5	80	120	10/17/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 229830 **SampType:** MBLK Units **mg/L**

SampID: MBLK-229830

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	10/21/2024
Iron		0.0250		**< 0.0250**	0.0115	0	0	-100	100	10/21/2024
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	10/21/2024

Batch 229830 **SampType:** LCS Units **mg/L**

SampID: LCS-229830

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**0.537**	0.5000	0	107.5	80	120	10/21/2024
Iron		0.0250		**2.04**	2.000	0	102.2	80	120	10/21/2024
Manganese		0.0020		**0.514**	0.5000	0	102.8	80	120	10/21/2024

Batch 229830 **SampType:** MS Units **mg/L**

SampID: 24100001-051CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Iron		0.0250		**1.97**	2.000	0.01197	97.7	75	125	10/21/2024
Manganese		0.0020		**0.603**	0.5000	0.1020	100.2	75	125	10/21/2024

Batch 229830 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24100001-051CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Iron		0.0250		**2.08**	2.000	0.01197	103.4	1.966	5.64	10/21/2024
Manganese		0.0020		**0.610**	0.5000	0.1020	101.6	0.6029	1.17	10/21/2024

Batch 230027 **SampType:** MBLK Units **mg/L**

SampID: MBLK-230027

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	10/22/2024

Batch 230027 **SampType:** LCS Units **mg/L**

SampID: LCS-230027

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**0.506**	0.5000	0	101.1	80	120	10/22/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 230027 **SampType: MS** Units **mg/L**
SampID: 24100001-001DMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**0.523**	0.5000	0.05222	94.2	75	125	10/22/2024

Batch 230027 **SampType: MSD** Units **mg/L** RPD Limit **20**
SampID: 24100001-001DMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Boron		0.0250		**0.521**	0.5000	0.05222	93.7	0.5233	0.46	10/22/2024

Batch 230028 **SampType: MBLK** Units **mg/L**
SampID: MBLK-230028

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	10/22/2024
Iron		0.0250		**< 0.0250**	0.0115	0	0	-100	100	10/22/2024
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	10/22/2024

Batch 230028 **SampType: LCS** Units **mg/L**
SampID: LCS-230028

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**0.460**	0.5000	0	91.9	80	120	10/22/2024
Iron		0.0250		**1.71**	2.000	0	85.6	80	120	10/22/2024
Manganese		0.0020		**0.447**	0.5000	0	89.3	80	120	10/22/2024

Batch 230028 **SampType: MS** Units **mg/L**
SampID: 24100001-016DMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**0.755**	0.5000	0.2026	110.6	75	125	10/30/2024

Batch 230028 **SampType: MSD** Units **mg/L** RPD Limit **20**
SampID: 24100001-016DMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Boron		0.0250		**0.751**	0.5000	0.2026	109.6	0.7554	0.61	10/30/2024

Batch 230686 **SampType: MBLK** Units **mg/L**
SampID: MBLK-230686

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Iron		0.0250		**< 0.0250**	0.0115	0	0	-100	100	11/13/2024
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	11/13/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch **230686** **SampType:** **LCS** Units **mg/L**

SampID: LCS-230686

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Iron		0.0250		**3.84**	4.000	0	95.9	80	120	11/13/2024
Manganese		0.0020		**0.969**	1.000	0	96.9	80	120	11/13/2024

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch **229768** **SampType:** **MBLK** Units **mg/L**

SampID: MBLK-229768

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**< 0.0010**	0.0004	0	0	-100	100	10/22/2024
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	10/17/2024
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	10/17/2024
Beryllium		0.0010		**< 0.0010**	0.0002	0	0	-100	100	10/17/2024
Boron	*	0.0250		**< 0.0250**	0.0093	0	0	-100	100	10/17/2024
Cadmium		0.0010		**< 0.0010**	0.0001	0	0	-100	100	10/17/2024
Chromium		0.0015		**< 0.0015**	0.0007	0	0	-100	100	10/17/2024
Cobalt		0.0010		**< 0.0010**	0.0001	0	0	-100	100	10/17/2024
Iron	*	0.0250		**< 0.0250**	0.0115	0	0	-100	100	10/17/2024
Lead		0.0010		**< 0.0010**	0.0006	0	0	-100	100	10/17/2024
Lithium	*	0.0030		**< 0.0030**	0.0015	0	0	-100	100	10/17/2024
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	10/17/2024
Molybdenum		0.0015		**< 0.0015**	0.0006	0	0	-100	100	10/21/2024
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	10/17/2024
Thallium		0.0020		**< 0.0020**	0.0010	0	0	-100	100	10/17/2024

Quality Control Results

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Client: Ramboll
Client Project: BAL-24Q4

Work Order: 24100001
Report Date: 06-Dec-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 229768 **SampType:** LCS Units **mg/L**
SampID: LCS-229768

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010	S	**0.603**	0.5000	0	120.7	85	115	10/22/2024
Arsenic		0.0010		**0.545**	0.5000	0	109.0	85	115	10/17/2024
Barium		0.0010		**2.13**	2.000	0	106.3	85	115	10/17/2024
Beryllium		0.0010		**0.0551**	0.0500	0	110.2	85	115	10/17/2024
Boron	*	0.0250		**0.525**	0.5000	0	105.1	85	115	10/17/2024
Cadmium		0.0010		**0.0528**	0.0500	0	105.6	85	115	10/17/2024
Chromium		0.0015		**0.216**	0.2000	0	107.8	85	115	10/17/2024
Cobalt		0.0010		**0.504**	0.5000	0	100.8	85	115	10/17/2024
Iron	*	0.0250		**2.04**	2.000	0	102.1	85	115	10/17/2024
Lead		0.0010	E	**0.544**	0.5000	0	108.8	85	115	10/17/2024
Lithium	*	0.0030		**0.539**	0.5000	0	107.7	85	115	10/17/2024
Manganese		0.0020		**0.534**	0.5000	0	106.9	85	115	10/17/2024
Molybdenum		0.0015		**0.532**	0.5000	0	106.5	85	115	10/21/2024
Selenium		0.0010		**0.572**	0.5000	0	114.3	85	115	10/22/2024
Selenium		0.0010	S	**0.595**	0.5000	0	119.0	85	115	10/17/2024
Thallium		0.0020		**0.248**	0.2500	0	99.0	85	115	10/17/2024

Batch 229768 **SampType:** MS Units **mg/L**
SampID: 24100001-008CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Iron		0.0250		**3.13**	2.000	0.8266	115.4	75	125	10/21/2024
Manganese		0.0400		**5.23**	0.5000	4.757	93.6	75	125	10/22/2024

Batch 229768 **SampType:** MSD Units **mg/L** RPD Limit **20**
SampID: 24100001-008CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Iron		0.0250		**3.03**	2.000	0.8266	110.0	3.134	3.51	10/21/2024
Manganese		0.0400	S	**4.73**	0.5000	4.757	-6.1	5.225	10.02	10/22/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 229828 **SampType:** MBLK Units **mg/L**

SampID: MBLK-229828

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**< 0.0010**	0.0004	0	0	-100	100	10/22/2024
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	10/18/2024
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	10/18/2024
Beryllium		0.0010		**< 0.0010**	0.0002	0	0	-100	100	10/18/2024
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	10/18/2024
Cadmium		0.0010		**< 0.0010**	0.0001	0	0	-100	100	10/18/2024
Chromium		0.0015		**< 0.0015**	0.0007	0	0	-100	100	10/18/2024
Cobalt		0.0010		**< 0.0010**	0.0001	0	0	-100	100	10/18/2024
Iron		0.0250		**< 0.0250**	0.0115	0	0	-100	100	10/18/2024
Lead		0.0010		**< 0.0010**	0.0006	0	0	-100	100	10/18/2024
Lithium	*	0.0030		**< 0.0030**	0.0015	0	0	-100	100	10/18/2024
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	10/22/2024
Molybdenum		0.0015		**< 0.0015**	0.0006	0	0	-100	100	10/18/2024
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	10/18/2024
Thallium		0.0020		**< 0.0020**	0.0010	0	0	-100	100	10/18/2024

Batch 229828 **SampType:** LCS Units **mg/L**

SampID: LCS-229828

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010	S	**0.611**	0.5000	0	122.2	80	120	10/22/2024
Arsenic		0.0010		**0.577**	0.5000	0	115.5	80	120	10/22/2024
Beryllium		0.0010		**0.0592**	0.0500	0	118.5	80	120	10/22/2024
Cadmium		0.0010	S	**0.0623**	0.0500	0	124.7	80	120	10/21/2024
Chromium		0.0015		**0.224**	0.2000	0	112.1	80	120	10/22/2024
Cobalt		0.0010		**0.525**	0.5000	0	105.0	80	120	10/22/2024
Lead		0.0010		**0.529**	0.5000	0	105.8	80	120	10/22/2024
Lithium	*	0.0030		**0.590**	0.5000	0	117.9	80	120	10/22/2024
Manganese		0.0020		**0.567**	0.5000	0	113.4	80	120	10/22/2024
Molybdenum		0.0015		**0.561**	0.5000	0	112.2	80	120	10/21/2024
Thallium		0.0020		**0.260**	0.2500	0	104.2	80	120	10/22/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 229828 **SampType:** MS Units **mg/L**

SampID: 24100001-031BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic		0.0010		**0.531**	0.5000	0.0008367	106.0	75	125	10/19/2024
Beryllium		0.0010		**0.0587**	0.0500	0	117.4	75	125	10/19/2024
Cadmium		0.0010		**0.0563**	0.0500	0	112.7	75	125	10/21/2024
Chromium		0.0015		**0.194**	0.2000	0	96.8	75	125	10/19/2024
Cobalt		0.0010		**0.481**	0.5000	0.0009323	96.1	75	125	10/19/2024
Lead		0.0010		**0.499**	0.5000	0	99.8	75	125	10/19/2024
Molybdenum		0.0015		**0.445**	0.5000	0.003056	88.4	75	125	10/19/2024
Thallium		0.0020		**0.246**	0.2500	0	98.3	75	125	10/19/2024

Batch 229828 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24100001-031BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Arsenic		0.0010		**0.527**	0.5000	0.0008367	105.2	0.5310	0.83	10/19/2024
Beryllium		0.0010		**0.0580**	0.0500	0	116.0	0.05868	1.14	10/19/2024
Cadmium		0.0010		**0.0568**	0.0500	0	113.6	0.05633	0.80	10/21/2024
Chromium		0.0015		**0.197**	0.2000	0	98.7	0.1936	1.89	10/19/2024
Cobalt		0.0010		**0.483**	0.5000	0.0009323	96.5	0.4813	0.42	10/19/2024
Lead		0.0010		**0.511**	0.5000	0	102.1	0.4992	2.27	10/19/2024
Molybdenum		0.0015		**0.454**	0.5000	0.003056	90.2	0.4452	1.94	10/19/2024
Thallium		0.0020		**0.253**	0.2500	0	101.3	0.2457	3.03	10/19/2024

Batch 229829 **SampType:** MBLK Units **mg/L**

SampID: MBLK-229829

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	10/19/2024
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	10/19/2024
Beryllium		0.0010		**< 0.0010**	0.0002	0	0	-100	100	10/19/2024
Boron	*	0.0250		**< 0.0250**	0.0093	0	0	-100	100	10/21/2024
Cadmium		0.0010		**< 0.0010**	0.0001	0	0	-100	100	10/19/2024
Chromium		0.0015		**< 0.0015**	0.0007	0	0	-100	100	10/19/2024
Cobalt		0.0010		**< 0.0010**	0.0001	0	0	-100	100	10/19/2024
Lead		0.0010		**< 0.0010**	0.0006	0	0	-100	100	10/19/2024
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	10/19/2024
Molybdenum		0.0015		**< 0.0015**	0.0006	0	0	-100	100	10/21/2024
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	10/19/2024
Thallium		0.0020		**< 0.0020**	0.0010	0	0	-100	100	10/19/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 229829 **SampType:** LCS Units **mg/L**

SampID: LCS-229829

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Cadmium		0.0010	S	**0.0586**	0.0500	0	117.2	85	115	10/21/2024
Cobalt		0.0010		**0.548**	0.5000	0	109.5	85	115	10/21/2024
Molybdenum		0.0015		**0.526**	0.5000	0	105.3	85	115	10/21/2024
Selenium		0.0010	S	**0.628**	0.5000	0	125.7	85	115	10/21/2024
Thallium		0.0020		**0.262**	0.2500	0	105.0	85	115	10/21/2024

Batch 229829 **SampType:** MS Units **mg/L**

SampID: 24100001-051BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Cadmium		0.0010		**0.0585**	0.0500	0	116.9	75	125	10/21/2024
Cobalt		0.0010		**0.539**	0.5000	0.0008436	107.6	75	125	10/21/2024
Molybdenum		0.0015		**0.546**	0.5000	0.0007502	109.1	75	125	10/21/2024
Selenium		0.0010		**0.610**	0.5000	0	122.0	75	125	10/21/2024
Thallium		0.0020		**0.274**	0.2500	0	109.5	75	125	10/21/2024

Batch 229829 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24100001-051BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Cadmium		0.0010		**0.0580**	0.0500	0	116.0	0.05847	0.83	10/21/2024
Cobalt		0.0010		**0.524**	0.5000	0.0008436	104.6	0.5389	2.86	10/21/2024
Molybdenum		0.0015		**0.539**	0.5000	0.0007502	107.7	0.5463	1.31	10/21/2024
Selenium		0.0010		**0.598**	0.5000	0	119.7	0.6101	1.95	10/21/2024
Thallium		0.0020		**0.263**	0.2500	0	105.3	0.2738	3.98	10/21/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 229864 **SampType:** MBLK Units **mg/L**

SampID: MBLK-229864

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**< 0.0010**	0.0004	0	0	-100	100	10/22/2024
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	10/19/2024
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	10/19/2024
Beryllium		0.0010		**< 0.0010**	0.0002	0	0	-100	100	10/19/2024
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	10/21/2024
Cadmium		0.0010		**< 0.0010**	0.0001	0	0	-100	100	10/19/2024
Chromium		0.0015		**< 0.0015**	0.0007	0	0	-100	100	10/19/2024
Cobalt		0.0010		**< 0.0010**	0.0001	0	0	-100	100	10/19/2024
Iron		0.0250		**< 0.0250**	0.0115	0	0	-100	100	10/19/2024
Lead		0.0010		**< 0.0010**	0.0006	0	0	-100	100	10/19/2024
Lithium	*	0.0030		**< 0.0030**	0.0015	0	0	-100	100	10/22/2024
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	10/19/2024
Molybdenum		0.0015		**< 0.0015**	0.0006	0	0	-100	100	10/19/2024
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	10/19/2024
Thallium		0.0020		**< 0.0020**	0.0010	0	0	-100	100	10/19/2024

Batch 229864 **SampType:** LCS Units **mg/L**

SampID: LCS-229864

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**0.578**	0.5000	0	115.7	80	120	10/22/2024
Arsenic		0.0010		**0.510**	0.5000	0	102.0	80	120	10/19/2024
Barium		0.0010		**2.26**	2.000	0	112.8	80	120	10/19/2024
Beryllium		0.0010		**0.0526**	0.0500	0	105.2	80	120	10/19/2024
Boron		0.0250		**0.588**	0.5000	0	117.7	80	120	10/21/2024
Cadmium		0.0010		**0.0597**	0.0500	0	119.5	80	120	10/19/2024
Chromium		0.0015		**0.192**	0.2000	0	95.9	80	120	10/19/2024
Cobalt		0.0010		**0.485**	0.5000	0	97.1	80	120	10/19/2024
Iron		0.0250		**1.90**	2.000	0	95.2	80	120	10/19/2024
Lead		0.0010		**0.488**	0.5000	0	97.5	80	120	10/19/2024
Lithium	*	0.0030		**0.558**	0.5000	0	111.7	80	120	10/22/2024
Manganese		0.0020		**0.493**	0.5000	0	98.5	80	120	10/19/2024
Molybdenum		0.0015		**0.435**	0.5000	0	86.9	80	120	10/19/2024
Selenium		0.0010		**0.538**	0.5000	0	107.5	80	120	10/19/2024
Thallium		0.0020		**0.237**	0.2500	0	94.8	80	120	10/19/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 229864 **SampType:** MS Units **mg/L**

SampID: 24100001-001CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Iron		0.0250		**2.04**	2.000	0.1519	94.4	75	125	10/19/2024
Manganese		0.0020		**0.661**	0.5000	0.1392	104.4	75	125	10/21/2024

Batch 229864 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24100001-001CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Iron		0.0250		**2.03**	2.000	0.1519	94.0	2.040	0.35	10/19/2024
Manganese		0.0020		**0.673**	0.5000	0.1392	106.8	0.6610	1.82	10/21/2024

Batch 229864 **SampType:** MS Units **mg/L**

SampID: 24100001-015CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**0.572**	0.5000	0	114.5	75	125	10/22/2024
Arsenic		0.0010		**0.506**	0.5000	0.0005044	101.2	75	125	10/19/2024
Barium		0.0010		**2.23**	2.000	0.02370	110.3	75	125	10/19/2024
Beryllium		0.0010		**0.0544**	0.0500	0	108.8	75	125	10/19/2024
Boron		0.0250		**0.730**	0.5000	0.1862	108.7	75	125	10/21/2024
Cadmium		0.0010		**0.0580**	0.0500	0	116.1	75	125	10/19/2024
Chromium		0.0015		**0.189**	0.2000	0	94.5	75	125	10/19/2024
Cobalt		0.0010		**0.457**	0.5000	0.002426	90.9	75	125	10/19/2024
Iron		0.0250		**2.70**	2.000	0.7735	96.2	75	125	10/19/2024
Lead		0.0010		**0.492**	0.5000	0.0007697	98.2	75	125	10/19/2024
Lithium	*	0.0030		**0.560**	0.5000	0.01572	108.9	75	125	10/22/2024
Manganese		0.0020		**0.961**	0.5000	0.4215	107.9	75	125	10/21/2024
Molybdenum		0.0015		**0.432**	0.5000	0	86.4	75	125	10/19/2024
Selenium		0.0010		**0.515**	0.5000	0	103.0	75	125	10/19/2024
Thallium		0.0020		**0.243**	0.2500	0	97.0	75	125	10/19/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 229864 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24100001-015CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		0.0010		**0.585**	0.5000	0	117.1	0.5723	2.27	10/22/2024
Arsenic		0.0010		**0.519**	0.5000	0.0005044	103.7	0.5065	2.45	10/19/2024
Barium		0.0010		**2.22**	2.000	0.02370	110.0	2.229	0.21	10/19/2024
Beryllium		0.0010		**0.0550**	0.0500	0	110.0	0.05442	1.06	10/19/2024
Boron		0.0250		**0.750**	0.5000	0.1862	112.7	0.7295	2.72	10/21/2024
Cadmium		0.0010		**0.0585**	0.0500	0	117.0	0.05805	0.79	10/19/2024
Chromium		0.0015		**0.191**	0.2000	0	95.7	0.1890	1.27	10/19/2024
Cobalt		0.0010		**0.471**	0.5000	0.002426	93.8	0.4570	3.10	10/19/2024
Iron		0.0250		**2.76**	2.000	0.7735	99.2	2.698	2.20	10/19/2024
Lead		0.0010		**0.497**	0.5000	0.0007697	99.2	0.4918	1.04	10/19/2024
Lithium	*	0.0030		**0.569**	0.5000	0.01572	110.7	0.5600	1.62	10/22/2024
Manganese		0.0020		**0.970**	0.5000	0.4215	109.6	0.9612	0.88	10/21/2024
Molybdenum		0.0015		**0.446**	0.5000	0	89.2	0.4319	3.21	10/19/2024
Selenium		0.0010		**0.526**	0.5000	0	105.3	0.5151	2.18	10/19/2024
Thallium		0.0020		**0.242**	0.2500	0	96.8	0.2426	0.26	10/19/2024

Batch 229922 **SampType:** MBLK Units **mg/L**

SampID: MBLK-229922

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**< 0.0010**	0.0004	0	0	-100	100	10/21/2024
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	10/21/2024
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	10/21/2024
Beryllium		0.0010		**< 0.0010**	0.0002	0	0	-100	100	10/21/2024
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	10/21/2024
Cadmium		0.0010		**< 0.0010**	0.0001	0	0	-100	100	10/21/2024
Chromium		0.0015		**< 0.0015**	0.0007	0	0	-100	100	10/21/2024
Cobalt		0.0010		**< 0.0010**	0.0001	0	0	-100	100	10/21/2024
Iron		0.0250		**< 0.0250**	0.0115	0	0	-100	100	10/21/2024
Lead		0.0010		**< 0.0010**	0.0006	0	0	-100	100	10/21/2024
Lithium	*	0.0030		**< 0.0030**	0.0015	0	0	-100	100	10/21/2024
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	10/22/2024
Molybdenum		0.0015		**< 0.0015**	0.0006	0	0	-100	100	10/21/2024
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	10/21/2024
Thallium		0.0020		**< 0.0020**	0.0010	0	0	-100	100	10/21/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 229922 **SampType:** LCS Units **mg/L**

SampID: LCS-229922

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**0.574**	0.5000	0	114.9	80	120	10/21/2024
Arsenic		0.0010		**0.537**	0.5000	0	107.5	80	120	10/21/2024
Barium		0.0010		**2.11**	2.000	0	105.3	80	120	10/21/2024
Beryllium		0.0010		**0.0512**	0.0500	0	102.3	80	120	10/21/2024
Boron		0.0250		**0.493**	0.5000	0	98.6	80	120	10/21/2024
Cadmium		0.0010		**0.0520**	0.0500	0	104.0	80	120	10/21/2024
Chromium		0.0015		**0.202**	0.2000	0	101.2	80	120	10/21/2024
Cobalt		0.0010		**0.503**	0.5000	0	100.6	80	120	10/21/2024
Iron		0.0250		**1.90**	2.000	0	94.9	80	120	10/21/2024
Lead		0.0010		**0.481**	0.5000	0	96.2	80	120	10/21/2024
Lithium	*	0.0030		**0.505**	0.5000	0	101.0	80	120	10/21/2024
Manganese		0.0020		**0.558**	0.5000	0	111.5	80	120	10/22/2024
Molybdenum		0.0015		**0.461**	0.5000	0	92.1	80	120	10/21/2024
Selenium		0.0010		**0.571**	0.5000	0	114.2	80	120	10/21/2024
Thallium		0.0020		**0.239**	0.2500	0	95.7	80	120	10/21/2024

Batch 229922 **SampType:** MS Units **mg/L**

SampID: 24100001-012BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**0.460**	0.5000	0.0007329	91.9	75	125	10/23/2024
Arsenic		0.0010		**0.533**	0.5000	0.01625	103.3	75	125	10/22/2024
Barium		0.0010		**2.60**	2.000	0.2474	117.4	75	125	10/22/2024
Beryllium		0.0010		**0.0521**	0.0500	0.001331	101.5	75	125	10/22/2024
Boron		0.0250	S	**4.43**	0.5000	4.225	40.2	75	125	10/22/2024
Cadmium		0.0010		**0.0553**	0.0500	0.0003260	109.9	75	125	10/22/2024
Chromium		0.0015		**0.245**	0.2000	0.04969	97.4	75	125	10/22/2024
Cobalt		0.0010		**0.502**	0.5000	0.01927	96.5	75	125	10/22/2024
Lead		0.0010		**0.507**	0.5000	0.01688	98.0	75	125	10/23/2024
Lithium	*	0.0030		**0.542**	0.5000	0.03620	101.1	75	125	10/22/2024
Molybdenum		0.0015		**0.496**	0.5000	0.004338	98.4	75	125	10/22/2024
Selenium		0.0010		**0.543**	0.5000	0.005309	107.5	75	125	10/22/2024
Thallium		0.0020		**0.245**	0.2500	0	97.8	75	125	10/22/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 229922 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24100001-012BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		0.0010		**0.451**	0.5000	0.0007329	90.1	0.4601	2.00	10/23/2024
Arsenic		0.0010		**0.548**	0.5000	0.01625	106.3	0.5326	2.84	10/22/2024
Barium		0.0010		**2.63**	2.000	0.2474	119.1	2.596	1.25	10/22/2024
Beryllium		0.0010		**0.0511**	0.0500	0.001331	99.5	0.05209	1.92	10/22/2024
Boron		0.0250	S	**4.42**	0.5000	4.225	39.7	4.426	0.06	10/22/2024
Cadmium		0.0010		**0.0554**	0.0500	0.0003260	110.2	0.05529	0.24	10/22/2024
Chromium		0.0015		**0.241**	0.2000	0.04969	95.9	0.2445	1.29	10/22/2024
Cobalt		0.0010		**0.520**	0.5000	0.01927	100.1	0.5019	3.51	10/22/2024
Lead		0.0010		**0.490**	0.5000	0.01688	94.6	0.5070	3.39	10/23/2024
Lithium	*	0.0030		**0.530**	0.5000	0.03620	98.7	0.5419	2.27	10/22/2024
Molybdenum		0.0015		**0.507**	0.5000	0.004338	100.5	0.4964	2.12	10/22/2024
Selenium		0.0010		**0.558**	0.5000	0.005309	110.5	0.5427	2.71	10/22/2024
Thallium		0.0020		**0.247**	0.2500	0	98.6	0.2446	0.83	10/22/2024

Batch 229922 **SampType:** MS Units **mg/L**

SampID: 24100001-052CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**0.595**	0.5000	0	118.9	75	125	10/23/2024
Arsenic		0.0010		**0.557**	0.5000	0	111.3	75	125	10/22/2024
Barium		0.0010		**2.48**	2.000	0	123.8	75	125	10/22/2024
Beryllium		0.0010		**0.0588**	0.0500	0	117.5	75	125	10/22/2024
Boron		0.0250		**0.571**	0.5000	0	114.2	75	125	10/22/2024
Cadmium		0.0010		**0.0559**	0.0500	0	111.9	75	125	10/22/2024
Chromium		0.0015		**0.223**	0.2000	0	111.5	75	125	10/22/2024
Cobalt		0.0010		**0.520**	0.5000	0	104.0	75	125	10/22/2024
Iron		0.0250		**2.11**	2.000	0	105.4	75	125	10/22/2024
Lead		0.0010		**0.556**	0.5000	0	111.3	75	125	10/22/2024
Lithium	*	0.0030		**0.586**	0.5000	0	117.2	75	125	10/22/2024
Manganese		0.0020		**0.543**	0.5000	0	108.5	75	125	10/22/2024
Molybdenum		0.0015		**0.499**	0.5000	0	99.8	75	125	10/22/2024
Selenium		0.0010		**0.593**	0.5000	0	118.5	75	125	10/22/2024
Thallium		0.0020		**0.255**	0.2500	0	102.1	75	125	10/22/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 229922 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24100001-052CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		0.0010		**0.609**	0.5000	0	121.9	0.5945	2.49	10/23/2024
Arsenic		0.0010		**0.566**	0.5000	0	113.2	0.5567	1.62	10/22/2024
Barium		0.0010		**2.48**	2.000	0	124.1	2.477	0.20	10/22/2024
Beryllium		0.0010		**0.0587**	0.0500	0	117.4	0.05877	0.09	10/22/2024
Boron		0.0250		**0.567**	0.5000	0	113.3	0.5711	0.77	10/22/2024
Cadmium		0.0010		**0.0564**	0.0500	0	112.8	0.05594	0.81	10/22/2024
Chromium		0.0015		**0.220**	0.2000	0	110.2	0.2230	1.15	10/22/2024
Cobalt		0.0010		**0.524**	0.5000	0	104.8	0.5199	0.78	10/22/2024
Iron		0.0250		**2.09**	2.000	0	104.5	2.107	0.80	10/22/2024
Lead		0.0010		**0.565**	0.5000	0	113.0	0.5563	1.57	10/22/2024
Lithium	*	0.0030		**0.581**	0.5000	0	116.2	0.5860	0.87	10/22/2024
Manganese		0.0020		**0.541**	0.5000	0	108.2	0.5426	0.31	10/22/2024
Molybdenum		0.0015		**0.507**	0.5000	0	101.4	0.4990	1.59	10/22/2024
Selenium		0.0010		**0.607**	0.5000	0	121.4	0.5925	2.40	10/22/2024
Thallium		0.0020		**0.260**	0.2500	0	104.1	0.2551	2.02	10/22/2024

Batch 230069 **SampType:** MBLK Units **mg/L**

SampID: MBLK-230069

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**< 0.0010**	0.0004	0	0	-100	100	10/29/2024
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	10/23/2024
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	10/23/2024
Beryllium		0.0010		**< 0.0010**	0.0002	0	0	-100	100	10/23/2024
Boron	*	0.0250		**< 0.0250**	0.0093	0	0	-100	100	10/23/2024
Chromium		0.0015		**< 0.0015**	0.0007	0	0	-100	100	10/23/2024
Iron	*	0.0250		**< 0.0250**	0.0115	0	0	-100	100	10/23/2024
Lead		0.0010		**< 0.0010**	0.0006	0	0	-100	100	10/23/2024
Lithium	*	0.0030		**< 0.0030**	0.0015	0	0	-100	100	10/23/2024
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	10/23/2024
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	10/23/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 230069 **SampType:** LCS Units **mg/L**

SampID: LCS-230069

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**0.547**	0.5000	0	109.3	80	120	10/30/2024
Arsenic		0.0010		**0.561**	0.5000	0	112.2	85	115	10/23/2024
Barium		0.0010		**2.38**	2.000	0	118.8	80	120	10/25/2024
Beryllium		0.0010		**0.0556**	0.0500	0	111.2	85	115	10/23/2024
Boron	*	0.0250		**0.570**	0.5000	0	114.0	85	115	10/23/2024
Chromium		0.0015		**0.220**	0.2000	0	110.1	85	115	10/23/2024
Iron	*	0.0250		**2.05**	2.000	0	102.7	85	115	10/23/2024
Lead		0.0010	E	**0.542**	0.5000	0	108.4	85	115	10/23/2024
Lithium	*	0.0030		**0.560**	0.5000	0	112.0	85	115	10/23/2024
Manganese		0.0020		**0.528**	0.5000	0	105.5	85	115	10/23/2024
Selenium		0.0010		**0.560**	0.5000	0	112.1	80	120	10/25/2024
Selenium		0.0010	S	**0.605**	0.5000	0	121.1	85	115	10/23/2024

Batch 230069 **SampType:** MS Units **mg/L**

SampID: 24100001-031BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010	S	**0.639**	0.5000	0.0005775	127.8	75	125	10/29/2024
Barium		0.0010		**2.44**	2.000	0.07429	118.3	75	125	10/25/2024
Boron		0.0250		**0.875**	0.5000	0.3849	97.9	75	125	10/23/2024
Lithium	*	0.0030		**0.524**	0.5000	0.01879	100.9	75	125	10/23/2024
Selenium		0.0010		**0.571**	0.5000	0	114.3	75	125	10/23/2024

Batch 230069 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24100001-031BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		0.0010	S	**0.641**	0.5000	0.0005775	128.0	0.6395	0.19	10/29/2024
Barium		0.0010		**2.40**	2.000	0.07429	116.1	2.440	1.85	10/25/2024
Boron		0.0250		**0.883**	0.5000	0.3849	99.6	0.8746	0.95	10/23/2024
Lithium	*	0.0030		**0.534**	0.5000	0.01879	103.1	0.5235	2.03	10/23/2024
Selenium		0.0010		**0.574**	0.5000	0	114.7	0.5714	0.37	10/23/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch **230069** **SampType:** **MS** Units **mg/L**

SampID: 24100001-051BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**0.614**	0.5000	0.0005575	122.6	75	125	10/30/2024
Arsenic		0.0010		**0.536**	0.5000	0	107.2	75	125	10/23/2024
Barium		0.0010		**2.35**	2.000	0.08384	113.1	75	125	10/25/2024
Beryllium		0.0010		**0.0543**	0.0500	0	108.5	75	125	10/23/2024
Boron		0.0250		**1.06**	0.5000	0.5219	108.1	75	125	10/23/2024
Chromium		0.0015		**0.208**	0.2000	0	103.8	75	125	10/23/2024
Lead		0.0010		**0.523**	0.5000	0	104.6	75	125	10/23/2024
Lithium	*	0.0030		**0.577**	0.5000	0.05676	104.1	75	125	10/23/2024

Batch **230069** **SampType:** **MSD** Units **mg/L** RPD Limit **20**

SampID: 24100001-051BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		0.0010		**0.606**	0.5000	0.0005575	121.0	0.6135	1.30	10/30/2024
Arsenic		0.0010		**0.528**	0.5000	0	105.6	0.5361	1.47	10/23/2024
Barium		0.0010		**2.34**	2.000	0.08384	112.9	2.345	0.16	10/25/2024
Beryllium		0.0010		**0.0534**	0.0500	0	106.9	0.05426	1.55	10/23/2024
Boron		0.0250		**1.04**	0.5000	0.5219	103.3	1.062	2.29	10/23/2024
Chromium		0.0015		**0.204**	0.2000	0	101.8	0.2077	1.95	10/23/2024
Lead		0.0010		**0.514**	0.5000	0	102.9	0.5228	1.63	10/23/2024
Lithium	*	0.0030		**0.566**	0.5000	0.05676	101.9	0.5772	1.92	10/23/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 230147 **SampType:** MBLK Units **mg/L**

SampID: MBLK-230147

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**< 0.0010**	0.0004	0	0	-100	100	11/11/2024
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	10/31/2024
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	10/31/2024
Beryllium		0.0010		**< 0.0010**	0.0002	0	0	-100	100	10/31/2024
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	10/31/2024
Cadmium		0.0010		**< 0.0010**	0.0001	0	0	-100	100	10/31/2024
Chromium		0.0015		**< 0.0015**	0.0007	0	0	-100	100	10/31/2024
Cobalt		0.0010		**< 0.0010**	0.0001	0	0	-100	100	11/06/2024
Lead		0.0010		**< 0.0010**	0.0006	0	0	-100	100	10/31/2024
Lithium	*	0.0030		**< 0.0030**	0.0015	0	0	-100	100	10/31/2024
Molybdenum		0.0015		**< 0.0015**	0.0006	0	0	-100	100	10/31/2024
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	10/31/2024
Thallium		0.0020		**< 0.0020**	0.0010	0	0	-100	100	10/31/2024

Batch 230147 **SampType:** LCS Units **mg/L**

SampID: LCS-230147

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**1.12**	1.000	0	112.5	80	120	11/08/2024
Arsenic		0.0010	S	**0.606**	0.5000	0	121.2	80	120	10/31/2024
Arsenic		0.0010		**0.561**	0.5000	0	112.1	80	120	11/06/2024
Arsenic		0.0010		**0.549**	0.5000	0	109.8	80	120	11/01/2024
Barium		0.0010		**1.87**	2.000	0	93.7	80	120	10/31/2024
Beryllium		0.0010		**0.0588**	0.0500	0	117.5	80	120	10/31/2024
Boron		0.0250		**0.576**	0.5000	0	115.1	80	120	10/31/2024
Cadmium		0.0010		**0.0530**	0.0500	0	106.0	80	120	10/31/2024
Chromium		0.0015		**0.240**	0.2000	0	119.8	80	120	10/31/2024
Lead		0.0010		**0.573**	0.5000	0	114.7	80	120	10/31/2024
Lithium	*	0.0030		**0.569**	0.5000	0	113.7	80	120	10/31/2024
Molybdenum		0.0015		**0.402**	0.5000	0	80.4	80	120	10/31/2024
Selenium		0.0010	S	**0.650**	0.5000	0	130.0	80	120	10/31/2024
Selenium		0.0010		**0.578**	0.5000	0	115.7	80	120	11/06/2024
Selenium		0.0010		**0.587**	0.5000	0	117.3	80	120	11/01/2024
Thallium		0.0020		**0.266**	0.2500	0	106.4	80	120	10/31/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch **230147** **SampType:** **MS** Units **mg/L**

SampID: 24100635-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**0.768**	1.000	0	76.8	75	125	11/11/2024
Arsenic		0.0010		**0.598**	0.5000	0.0006627	119.4	75	125	10/31/2024
Barium		0.0010		**2.20**	2.000	0.2083	99.5	75	125	10/31/2024
Beryllium		0.0010		**0.0606**	0.0500	0	121.3	75	125	10/31/2024
Boron		0.0250		**0.617**	0.5000	0.02260	118.8	75	125	10/31/2024
Cadmium		0.0010		**0.0579**	0.0500	0	115.8	75	125	10/31/2024
Chromium		0.0015		**0.237**	0.2000	0.002547	117.3	75	125	11/06/2024
Cobalt		0.0010		**0.588**	0.5000	0.001146	117.4	75	125	11/06/2024
Lead		0.0010		**0.573**	0.5000	0.0007377	114.4	75	125	10/31/2024
Lithium	*	0.0030		**0.595**	0.5000	0.001819	118.7	75	125	10/31/2024
Molybdenum		0.0015		**0.479**	0.5000	0.0007221	95.6	75	125	10/31/2024
Thallium		0.0020		**0.264**	0.2500	0	105.6	75	125	10/31/2024

Batch **230147** **SampType:** **MSD** Units **mg/L** RPD Limit **20**

SampID: 24100635-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		0.0010		**0.756**	1.000	0	75.6	0.7677	1.51	11/11/2024
Arsenic		0.0010		**0.601**	0.5000	0.0006627	120.1	0.5979	0.58	10/31/2024
Barium		0.0010		**2.16**	2.000	0.2083	97.7	2.198	1.61	10/31/2024
Beryllium		0.0010		**0.0605**	0.0500	0	121.1	0.06064	0.18	10/31/2024
Boron		0.0250		**0.615**	0.5000	0.02260	118.5	0.6165	0.21	10/31/2024
Cadmium		0.0010		**0.0545**	0.0500	0	109.0	0.05790	6.03	10/31/2024
Chromium		0.0015		**0.240**	0.2000	0.002547	118.6	0.2371	1.09	11/06/2024
Cobalt		0.0010		**0.607**	0.5000	0.001146	121.1	0.5880	3.11	11/06/2024
Lead		0.0010		**0.578**	0.5000	0.0007377	115.4	0.5726	0.92	10/31/2024
Lithium	*	0.0030		**0.591**	0.5000	0.001819	117.8	0.5954	0.81	10/31/2024
Molybdenum		0.0015		**0.509**	0.5000	0.0007221	101.6	0.4789	6.03	10/31/2024
Thallium		0.0020		**0.267**	0.2500	0	106.9	0.2639	1.30	10/31/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 230147 **SampType:** MS Units **mg/L**

SampID: 24100635-005BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**0.777**	1.000	0.0005124	77.7	75	125	11/12/2024
Arsenic		0.0010		**0.561**	0.5000	0.003115	111.5	75	125	11/01/2024
Barium		0.0010		**1.85**	2.000	0.05189	90.0	75	125	10/31/2024
Beryllium		0.0010		**0.0582**	0.0500	0.0004307	115.6	75	125	10/31/2024
Boron		0.0250		**3.81**	0.5000	3.335	95.2	75	125	10/31/2024
Cadmium		0.0010		**0.0525**	0.0500	0	105.0	75	125	10/31/2024
Chromium		0.0015		**0.238**	0.2000	0.01432	112.1	75	125	11/06/2024
Cobalt		0.0010		**0.568**	0.5000	0.003288	112.9	75	125	11/06/2024
Lead		0.0010		**0.570**	0.5000	0.004045	113.2	75	125	10/31/2024
Lithium	*	0.0030		**0.572**	0.5000	0.007794	112.9	75	125	10/31/2024
Molybdenum		0.0015		**0.461**	0.5000	0.0009294	92.1	75	125	10/31/2024
Selenium		0.0010		**0.585**	0.5000	0	117.1	75	125	10/31/2024
Thallium		0.0020		**0.263**	0.2500	0	105.2	75	125	10/31/2024

Batch 230147 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24100635-005BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		0.0010		**0.796**	1.000	0.0005124	79.6	0.7772	2.43	11/12/2024
Arsenic		0.0010		**0.559**	0.5000	0.003115	111.2	0.5606	0.23	11/01/2024
Barium		0.0010		**1.97**	2.000	0.05189	95.9	1.852	6.13	10/31/2024
Beryllium		0.0010		**0.0593**	0.0500	0.0004307	117.7	0.05822	1.78	10/31/2024
Boron		0.0250		**3.86**	0.5000	3.335	105.6	3.811	1.37	10/31/2024
Cadmium		0.0010		**0.0553**	0.0500	0	110.7	0.05250	5.24	10/31/2024
Chromium		0.0015		**0.247**	0.2000	0.01432	116.3	0.2385	3.50	11/06/2024
Cobalt		0.0010		**0.584**	0.5000	0.003288	116.2	0.5676	2.91	11/06/2024
Lead		0.0010		**0.587**	0.5000	0.004045	116.6	0.5702	2.95	10/31/2024
Lithium	*	0.0030		**0.578**	0.5000	0.007794	114.1	0.5723	1.07	10/31/2024
Molybdenum		0.0015		**0.421**	0.5000	0.0009294	83.9	0.4614	9.25	10/31/2024
Selenium		0.0010		**0.617**	0.5000	0	123.4	0.5853	5.25	10/31/2024
Thallium		0.0020		**0.265**	0.2500	0	106.1	0.2630	0.84	10/31/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 230648 **SampType:** MBLK Units **mg/L**

SampID: MBLK-230648

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	11/05/2024
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	11/13/2024
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	11/13/2024
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	11/13/2024
Beryllium		0.0010		**< 0.0010**	0.0002	0	0	-100	100	11/13/2024
Boron	*	0.0250		**< 0.0250**	0.0093	0	0	-100	100	11/13/2024
Cadmium		0.0010		**< 0.0010**	0.0001	0	0	-100	100	11/05/2024
Cadmium		0.0010		**< 0.0010**	0.0001	0	0	-100	100	11/13/2024
Chromium		0.0015		**< 0.0015**	0.0007	0	0	-100	100	11/13/2024
Cobalt		0.0010		**< 0.0010**	0.0001	0	0	-100	100	11/13/2024
Lead		0.0010		**< 0.0010**	0.0006	0	0	-100	100	11/09/2024
Lead		0.0010		**< 0.0010**	0.0006	0	0	-100	100	11/05/2024
Lithium	*	0.0030		**< 0.0030**	0.0015	0	0	-100	100	11/13/2024
Molybdenum		0.0015		**< 0.0015**	0.0006	0	0	-100	100	11/13/2024
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	11/13/2024
Thallium		0.0020		**< 0.0020**	0.0010	0	0	-100	100	11/09/2024

Batch 230648 **SampType:** LCS Units **mg/L**

SampID: LCS-230648

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic		0.0010		**1.05**	1.000	0	105.2	85	115	11/05/2024
Arsenic		0.0010		**1.05**	1.000	0	105.4	85	115	11/13/2024
Barium		0.0020		**4.74**	4.000	0	118.6	80	120	11/13/2024
Beryllium		0.0010		**0.104**	0.1000	0	103.6	85	115	11/13/2024
Boron	*	0.0250		**0.978**	1.000	0	97.8	85	115	11/13/2024
Cadmium		0.0010		**0.108**	0.1000	0	107.7	85	115	11/05/2024
Cadmium		0.0010		**0.103**	0.1000	0	102.9	85	115	11/13/2024
Chromium		0.0015		**0.425**	0.4000	0	106.2	85	115	11/13/2024
Cobalt		0.0010		**0.879**	1.000	0	87.9	85	115	11/13/2024
Lead		0.0010	E	**1.03**	1.000	0	103.1	85	115	11/05/2024
Lithium	*	0.0030		**1.06**	1.000	0	105.7	80	120	11/13/2024
Molybdenum		0.0015		**1.14**	1.000	0	113.9	80	120	11/13/2024
Selenium		0.0010		**1.02**	1.000	0	102.3	85	115	11/13/2024
Thallium		0.0020		**0.512**	0.5000	0	102.3	85	115	11/13/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 230648 **SampType:** MS Units **mg/L**

SampID: 24100001-014BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic		0.0010		**1.12**	1.000	0.0008266	112.0	75	125	11/12/2024
Beryllium		0.0010		**0.118**	0.1000	0	117.8	75	125	11/12/2024
Boron		0.0250		**1.17**	1.000	0.009906	115.7	75	125	11/12/2024
Cadmium		0.0010		**0.115**	0.1000	0.0001852	114.5	75	125	11/12/2024
Chromium		0.0015		**0.405**	0.4000	0.002346	100.8	75	125	11/13/2024
Cobalt		0.0010		**0.912**	1.000	0.001498	91.0	75	125	11/12/2024
Lead		0.0010		**1.10**	1.000	0	110.0	75	125	11/09/2024
Lithium	*	0.0030		**1.06**	1.000	0.006638	105.3	75	125	11/13/2024
Molybdenum		0.0015		**1.17**	1.000	0.005940	116.7	75	125	11/13/2024
Selenium		0.0010		**1.10**	1.000	0.0007882	109.6	75	125	11/12/2024
Thallium		0.0020		**0.537**	0.5000	0	107.5	75	125	11/09/2024

Batch 230648 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24100001-014BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Arsenic		0.0010		**1.10**	1.000	0.0008266	110.1	1.121	1.74	11/12/2024
Beryllium		0.0010		**0.114**	0.1000	0	114.3	0.1178	3.02	11/12/2024
Boron		0.0250		**1.13**	1.000	0.009906	112.2	1.167	3.06	11/12/2024
Cadmium		0.0010		**0.110**	0.1000	0.0001852	109.8	0.1147	4.17	11/12/2024
Chromium		0.0015		**0.404**	0.4000	0.002346	100.5	0.4055	0.26	11/13/2024
Cobalt		0.0010		**0.900**	1.000	0.001498	89.9	0.9115	1.26	11/12/2024
Lead		0.0010		**1.08**	1.000	0	108.3	1.100	1.53	11/09/2024
Lithium	*	0.0030		**1.05**	1.000	0.006638	104.5	1.059	0.73	11/13/2024
Molybdenum		0.0015		**1.16**	1.000	0.005940	115.3	1.173	1.25	11/13/2024
Selenium		0.0010		**1.07**	1.000	0.0007882	107.1	1.096	2.26	11/12/2024
Thallium		0.0020		**0.528**	0.5000	0	105.6	0.5373	1.72	11/09/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 230648 **SampType:** MS Units **mg/L**

SampID: 24100001-022BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic		0.0010		**1.10**	1.000	0.003658	110.1	75	125	11/12/2024
Beryllium		0.0010		**0.113**	0.1000	0.0005454	112.9	75	125	11/12/2024
Boron		0.0250		**2.06**	1.000	0.9447	111.9	75	125	11/12/2024
Cadmium		0.0010		**0.104**	0.1000	0.0002374	103.6	75	125	11/12/2024
Chromium		0.0015		**0.473**	0.4000	0.02670	111.6	75	125	11/12/2024
Cobalt		0.0010		**0.899**	1.000	0.003790	89.5	75	125	11/12/2024
Lead		0.0010		**1.13**	1.000	0.001916	113.2	75	125	11/09/2024
Lithium	*	0.0030		**1.07**	1.000	0.02243	104.6	75	125	11/13/2024
Molybdenum		0.0015	E	**1.27**	1.000	0.1420	112.8	75	125	11/13/2024
Selenium		0.0010		**1.04**	1.000	0.003275	103.3	75	125	11/12/2024
Thallium		0.0020		**0.545**	0.5000	0	109.1	75	125	11/09/2024

Batch 230648 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24100001-022BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Arsenic		0.0010		**1.12**	1.000	0.003658	111.6	1.104	1.43	11/13/2024
Beryllium		0.0010		**0.110**	0.1000	0.0005454	109.1	0.1134	3.37	11/13/2024
Boron		0.0250		**2.01**	1.000	0.9447	106.2	2.064	2.80	11/13/2024
Cadmium		0.0010		**0.106**	0.1000	0.0002374	105.4	0.1038	1.78	11/13/2024
Chromium		0.0015		**0.470**	0.4000	0.02670	110.7	0.4731	0.75	11/13/2024
Cobalt		0.0010		**0.905**	1.000	0.003790	90.1	0.8991	0.67	11/13/2024
Lead		0.0010		**1.11**	1.000	0.001916	110.5	1.134	2.39	11/09/2024
Lithium	*	0.0030		**1.09**	1.000	0.02243	107.2	1.069	2.36	11/13/2024
Molybdenum		0.0015	E	**1.37**	1.000	0.1420	122.8	1.270	7.51	11/13/2024
Selenium		0.0010		**1.04**	1.000	0.003275	104.0	1.036	0.65	11/13/2024
Thallium		0.0020		**0.534**	0.5000	0	106.8	0.5453	2.11	11/09/2024

Batch 231150 **SampType:** MBLK Units **mg/L**

SampID: MBLK-231150

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**< 0.0010**	0.0004	0	0	-100	100	11/15/2024
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	11/14/2024
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	11/14/2024
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	11/14/2024
Cobalt		0.0010		**< 0.0010**	0.0001	0	0	-100	100	11/14/2024
Iron		0.0250		**< 0.0250**	0.0115	0	0	-100	100	11/14/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 231150 **SampType:** LCS Units **mg/L**

SampID: LCS-231150

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**1.19**	1.000	0	119.2	80	120	11/15/2024
Arsenic		0.0010		**1.04**	1.000	0	103.7	80	120	11/14/2024
Barium		0.0010		**4.77**	4.000	0	119.3	80	120	11/14/2024
Boron		0.0250		**1.09**	1.000	0	108.7	80	120	11/14/2024
Cobalt		0.0010		**1.15**	1.000	0	115.0	80	120	11/14/2024
Iron		0.0250		**4.04**	4.000	0	101.0	80	120	11/14/2024

Batch 231150 **SampType:** MS Units **mg/L**

SampID: 24100001-014BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010	SE	**1.38**	1.000	0	138.1	75	125	11/15/2024
Barium		0.0010		**4.76**	4.000	0.1666	114.7	75	125	11/14/2024

Batch 231150 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24100001-014BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		0.0010	SE	**1.41**	1.000	0	140.9	1.381	1.95	11/15/2024
Barium		0.0010		**4.80**	4.000	0.1666	115.8	4.756	0.88	11/14/2024

Batch 231150 **SampType:** MS Units **mg/L**

SampID: 24100001-022BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**0.912**	1.000	0.003322	90.9	75	125	11/15/2024
Barium		0.0010		**4.68**	4.000	0.1666	112.8	75	125	11/14/2024

Batch 231150 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 24100001-022BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		0.0010		**0.894**	1.000	0.003322	89.1	0.9122	1.99	11/15/2024
Barium		0.0010		**4.71**	4.000	0.1666	113.7	4.680	0.73	11/14/2024

SW-846 7470A (TOTAL)

Batch 229867 **SampType:** MBLK Units **mg/L**

SampID: MBLK-229867

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**< 0.00020**	0.0001	0	0	-100	100	10/18/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 7470A (TOTAL)

Batch 229867 **SampType:** LCS Units **mg/L**
SampID: LCS-229867

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00491**	0.0050	0	98.2	85	115	10/18/2024

Batch 229867 **SampType:** MS Units **mg/L**
SampID: 24100001-006CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00542**	0.0050	0	108.4	75	125	10/18/2024

Batch 229867 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24100001-006CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00526**	0.0050	0	105.3	0.005418	2.88	10/18/2024

Batch 229867 **SampType:** MS Units **mg/L**
SampID: 24100001-030BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00453**	0.0050	0	90.6	75	125	10/18/2024

Batch 229867 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 24100001-030BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00445**	0.0050	0	88.9	0.004529	1.84	10/18/2024

Batch 229870 **SampType:** MBLK Units **mg/L**
SampID: MBLK-229870

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**< 0.00020**	0.0001	0	0	-100	100	10/18/2024

Batch 229870 **SampType:** LCS Units **mg/L**
SampID: LCS-229870

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00473**	0.0050	0	94.6	85	115	10/18/2024

Batch 229870 **SampType:** MS Units **mg/L**
SampID: 24100001-051BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00486**	0.0050	0	97.3	75	125	10/18/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 7470A (TOTAL)

Batch 229870 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24100001-051BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00478**	0.0050	0	95.6	0.004865	1.76	10/18/2024

Batch 229870 **SampType:** MS Units **mg/L**

SampID: 24101395-003BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00469**	0.0050	0	93.8	75	125	10/18/2024

Batch 229870 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24101395-003BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00448**	0.0050	0	89.5	0.004688	4.60	10/18/2024

Batch 229905 **SampType:** MBLK Units **mg/L**

SampID: MBLK-229905

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**< 0.00020**	0.0001	0	0	-100	100	10/21/2024

Batch 229905 **SampType:** LCS Units **mg/L**

SampID: LCS-229905

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00480**	0.0050	0	96.0	85	115	10/21/2024

Batch 229905 **SampType:** MS Units **mg/L**

SampID: 24100001-013BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00542**	0.0050	0	108.4	75	125	10/22/2024

Batch 229905 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24100001-013BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00536**	0.0050	0	107.3	0.005418	1.00	10/22/2024

Batch 230651 **SampType:** MBLK Units **mg/L**

SampID: MBLK-230651

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**< 0.00020**	0.0001	0	0	-100	100	11/05/2024

Client: Ramboll **Work Order:** 24100001

Client Project: BAL-24Q4 **Report Date:** 06-Dec-24

SW-846 7470A (TOTAL)

Batch 230651 **SampType:** LCS Units **mg/L**

SampID: LCS-230651

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00454**	0.0050	0	90.8	85	115	11/05/2024

Batch 230651 **SampType:** MS Units **mg/L**

SampID: 24100001-014BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00471**	0.0050	0	94.2	75	125	11/05/2024

Batch 230651 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24100001-014BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00481**	0.0050	0	96.1	0.004712	1.96	11/05/2024

Batch 230651 **SampType:** MS Units **mg/L**

SampID: 24110123-005BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00437**	0.0050	0	87.4	75	125	11/05/2024

Batch 230651 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 24110123-005BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00451**	0.0050	0	90.2	0.004372	3.17	11/05/2024

Receiving Check List

http://www.teklabinc.com/

Client: Ramboll
Client Project: BAL-24Q4

Work Order: 24100001
Report Date: 06-Dec-24

Carrier: Justin Colp

Received By: LEH

Completed by: Laura Henson
On: 14-Oct-24

Reviewed by: Ellie Hopkins
On: 04-Nov-24

Pages to follow: Chain of custody 18 Extra pages included 0

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C **12.1**
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☑	No ☐		
Reported field parameters measured:	Field ☑	Lab ☐	NA ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐		

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☑	NA ☐
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑

Any No responses must be detailed below or on the COC.

pH strip #96651. - lhenson - 10/14/2024 4:12:25 PM

Additional nitric acid (9964) was needed in MW383, MW384, and PZ170 upon arrival at the laboratory. - lhenson - 10/14/2024 4:12:28 PM

Samples were received on 10/15/24 at 4:48 PM on ice 8.1C LTG #5. pH strip 99651. Additional nitric acid (99964) was needed in MW393 and MW394 upon arrival at the laboratory. - lhenson - 10/16/2024 8:45:27 AM

Samples were received on 10/16/24 at 1615 on ice [11.9C - LTG#5]. Additional Nitric Acid (99964) was needed upon arrival at the laboratory for MW304 and MW304 Dup. pH strip #96651. - amberdilallo - 10/17/2024 8:39:16 AM

Samples were received on 10/17/24 at 3:12pm on ice [9.9C - LTG9]. ph strip #99651. - lhenson - 10/17/2024 5:03:17 PM

Samples were filtered and preserved with nitric acid (99964) and left unpreserved for the dissolved parameters upon arrival at the laboratory for sample Field Blank and Equipment Blank1. - lhenson - 10/18/2024 12:26:35 PM

Samples were received on 11/1/24 at 1324 on ice [1.3C - LTG#5]. Additional Nitric Acid (99964) was needed upon arrival at the laboratory for MW358R. pH strip #96651. Date changes per Brett Gillihan. - JD/amberdilallo - 11/1/2024 11:52:44 AM

CHAIN-OF-CUSTODY / Analytical Request Document

24100001

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Sam Davies: samantha.davies@vistracorp.com
	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES, GROUND WATER, DRINKING WATER, UST, RCRA, OTHER

Site Location STATE: IL

Section D Required Client Information

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605							Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-104DR	WT	G				4	2		2												X								24100001-001
2	MW-104SR	WT	G				4	2		2												X								24100001-002
3	MW-150	WT	G				4	2		2								X		X		X								24100001-003
4	MW-151	WT	G				4	2		2								X		X		X								24100001-004
5	MW-152	WT	G				4	2		2								X		X		X								24100001-005
6	MW-153	WT	G				4	2		2								X		X		X								24100001-006
7	MW-154	WT	G	10-14-24	DRY		4	2		2												X								24100001-007
8	MW-155	WT	G	10-14-24	1032		4	2		2												X								24100001-008
9	MW-192	WT	G				2	1		1							X		X											24100001-009
10	MW-193	WT	G				2	1		1							X		X											24100001-010
11	MW-195	WT	G				3	1		2											X									24100001-011
12	MW-196	WT	G				3	1		2											X									24100001-012
13	MW-197	WT	G				3	1		2											X									24100001-013
14	MW-198	WT	G				3	1		2											X									24100001-014
15	MW-252	WT	G				4	2		2								X		X		X								24100001-015
16	MW-253R	WT	G				4	2		2								X		X		X								24100001-016

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
BAL-24Q4 Rev 1	J. Colp	10-14	1540	[signature]	10/14	1540		Y	N	
MW-195 : collect but hold all analyses pending instruction from Rambol							12.1	Y		
							Temp in °C	Received on ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Colp

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 10-14-24

Added HNO3 (99964) to Samples LTG 10
MW 383, MW 384, P2170
PH 96651

JD 10/14/24

CHAIN-OF-CUSTODY / Analytical Request Document

24100001

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	Vistra Corp-Baldwin	Report To:	Brian Voelker	Attention:	Brian Voelker
Address:	10901 Baldwin Road	Copy To:	Sam Davies: samantha.davies@vistracorp.com	Company Name:	Vistra Corp
	Baldwin, IL 62217		Kim Edmiaston Kimberly.Edmiaston@vistracorp.com	Address:	see Section A
Email To:	Brian.Voelker@VistraCorp.com	Purchase Order No.:		Quote Reference:	
Phone:	(217) 753-8911 Fax:	Project Name:		Project Manager:	
Requested Due Date/TAT:	10 day	Project Number:		Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605	Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-304	WT	G				4	2		2							X	X	X	X	X	X		24100001-017
2	MW-350R	WT	G				4	2		2								X		X		X		24100001-018
3	MW-352	WT	G				3	1		2								X		X		X		24100001-019
4	MW-355	WT	G				4	2		2												X		24100001-020
5	MW-356	WT	G				2	1		1							X		X					24100001-021
6	MW-358R	WT	G				3	1		2							X	X	X	X	X			24100001-022
7	MW-366	WT	G				2	1		1								X		X				24100001-023
8	MW-369	WT	G				2	1		1							X		X					24100001-024
9	MW-370	WT	G				2	1		1							X		X					24100001-025
10	MW-375	WT	G				2	1		1								X		X				24100001-026
11	MW-377	WT	G				2	1		1								X		X				24100001-027
12	MW-382	WT	G	~~10-14-24~~	~~1416~~ TE		2	1		1							X		X					24100001-028
13	MW-383	WT	G	10-14-24	1341		2	1		1								X		X				24100001-029
14	MW-384	WT	G	10-14-24	1416 *		2	1		1								X		X				24100001-030
15	MW-390	WT	G				2	1		1								X		X				24100001-031
16	MW-391R	WT	G				2	1		1								X		X				24100001-032

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
BAL-24Q4 Rev 1	J. Colp	10-14	1540	[signature]	10/14	1540

SAMPLE CONDITIONS	Y	N	
12.1	Y		
Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

*per Justin Colp. Sm 10/14/24

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Colp

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 10-14-24

LTG 10

CHAIN-OF-CUSTODY / Analytical Request Document

24100001

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Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Sam Davies: samantha.davies@vistracorp.com
	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
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AIR	AR
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SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605							Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-392	WT	G				2	1		1							X		X											24100001-033
2	MW-393	WT	G				2	1		1							X		X											24100001-034
3	MW-394	WT	G				2	1		1							X		X											24100001-035
4	OW-156	WT	G				0															X								24100001-036
5	OW-157	WT	G				0															X								24100001-037
6	OW-256	WT	G				2	1		1							X		X											24100001-038
7	OW-257	WT	G	10-14-24	1306		2	1		1							X		X											24100001-039
8	PZ-170	WT	G	10-14-24	1144		2	1		1							X		X											24100001-040
9	PZ-174	WT	G				3	1		2											X									24100001-041
10	PZ-176	WT	G				3	1		2											X									24100001-042
11	PZ-178	WT	G				3	1		2											X									24100001-043
12	PZ-182	WT	G				2	1		1							X		X											24100001-044
13	TPZ-164	WT	G				2	1		1							X		X											24100001-045
14	XPW01	WT	G				2	1		1							X		X											24100001-046
15	XPW05	WT	G				2	1		1							X		X											24100001-047
16	XPW06	WT	G				2	1		1							X		X											24100001-048

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS	Y	N	
BAL-24Q4 Rev 1	J. Colp	10/14	1540	[signature]	10/14	1540				
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Colp

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 10-14-24

CHAIN-OF-CUSTODY / Analytical Request Document

24100001

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Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
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Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Sam Davies: samantha.davies@vistracorp.com
	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605							Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-104DR	WT	G				4	2		2												X								24100001-001
2	MW-104SR	WT	G				4	2		2												X								24100001-002
3	MW-150	WT	G	10-15-24	1728		4	2		2								X		X		X								24100001-003
4	MW-151	WT	G				4	2		2								X		X		X								24100001-004
5	MW-152	WT	G				4	2		2								X		X		X								24100001-005
6	MW-153	WT	G				4	2		2								X		X		X								24100001-006
7	MW-154	WT	G				4	2		2												X								24100001-007
8	MW-155	WT	G				4	2		2												X								24100001-008
9	MW-192	WT	G	10-15-24	1058		2	1		1							X		X											24100001-009
10	MW-193	WT	G	10-15-24	0954		2	1		1							X		X											24100001-010
11	MW-195	WT	G				3	1		2											X									24100001-011
12	MW-196	WT	G				3	1		2											X									24100001-012
13	MW-197	WT	G				3	1		2											X									24100001-013
14	MW-198	WT	G				3	1		2											X									24100001-014
15	MW-252	WT	G				4	2		2								X		X		X								24100001-015
16	MW-253R	WT	G				4	2		2								X		X		X								24100001-016

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
BAL-24Q4 Rev 1	J. Colp	10-15	1648	Amber DiSalle	10/15/24	1648	8.1	Y	N	
MW-195 : collect but hold all analyses pending instruction from Ramboll							#5			

SAMPLER NAME AND SIGNATURE			
PRINT Name of SAMPLER:	Justin Colp		
SIGNATURE of SAMPLER:	Justin Colp	DATE Signed (MM/DD/YY):	10-15-24

Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

added HNO_3 (99964) to MW393 and MW394 PHN 96657

LH 10/16/24

CHAIN-OF-CUSTODY / Analytical Request Document

24100001

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Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Sam Davies: samantha.davies@vistracorp.com
	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
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WASTE WATER	WW
PRODUCT	P
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OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605							Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-304	WT	G				4	2		2							X	X	X	X	X	X								24100001-017
2	MW-350R	WT	G	10-15-24	1252		4	2		2								X		X		X								24100001-018
3	MW-352	WT	G				3	1		2								X		X		X								24100001-019
4	MW-355	WT	G				4	2		2												X								24100001-020
5	MW-356	WT	G				2	1		1							X		X											24100001-021
6	MW-358R	WT	G				3	1		2							X	X	X	X	X									24100001-022
7	MW-366	WT	G	10-15-24	1704		2	1		1								X		X										24100001-023
8	MW-369	WT	G	10-15-24	1125		2	1		1							X		X											24100001-024
9	MW-370	WT	G	10-15-24	1356		2	1		1							X		X											24100001-025
10	MW-375	WT	G				2	1		1								X		X										24100001-026
11	MW-377	WT	G				2	1		1								X		X										24100001-027
12	MW-382	WT	G	10-15-24	1332		2	1		1							X		X											24100001-028
13	MW-383	WT	G				2	1		1								X		X										24100001-029
14	MW-384	WT	G				2	1		1								X		X										24100001-030
15	MW-390	WT	G	10-15-24	1146		2	1		1								X		X										24100001-031
16	MW-391R	WT	G				2	1		1								X		X										24100001-032

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS	Y	N	
BAL-24Q4 Rev 1	J. Colp	10-15	1648	[illegible]	10/15/24	1648				
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Colp

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 10-15-24

CHAIN-OF-CUSTODY / Analytical Request Document

24100001

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Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Valid Matrix Codes

MATRIX	CODE
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WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
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TISSUE	TS

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605							Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-392	WT	G	10-15-24	1038		2	1		1							X		X											24100001-033
2	MW-393	WT	G	10-15-24	1014		2	1		1							X		X											24100001-034
3	MW-394	WT	G	10-15-24	0929		2	1		1							X		X											24100001-035
4	OW-156	WT	G				0															X								24100001-036
5	OW-157	WT	G				0															X								24100001-037
6	OW-256	WT	G	10-15-24	1140		2	1		1							X		X											24100001-038
7	OW-257	WT	G				2	1		1							X		X											24100001-039
8	PZ-170	WT	G				2	1		1							X		X											24100001-040
9	PZ-174	WT	G	10-15-24	1240		3	1		2											X									24100001-041
10	PZ-176	WT	G	10-15-24	1334		3	1		2											X									24100001-042
11	PZ-178	WT	G	10-15-24	1431		3	1		2											X									24100001-043
12	PZ-182	WT	G	10-15-24	1038		2	1		1							X		X											24100001-044
13	TPZ-164	WT	G				2	1		1							X		X											24100001-045
14	XPW01	WT	G				2	1		1							X		X											24100001-046
15	XPW05	WT	G				2	1		1							X		X											24100001-047
16	XPW06	WT	G				2	1		1							X		X											24100001-048

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS	Y	N	
BAL-24Q4 Rev 1	J. Colp	10-15	1648	[illegible]	10/15/24	1648				

SAMPLER NAME AND SIGNATURE			
PRINT Name of SAMPLER:	Justin Colp		
SIGNATURE of SAMPLER:	[illegible]	DATE Signed (MM/DD/YY):	10-15-24

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

CHAIN-OF-CUSTODY / Analytical Request Document

24100001

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Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Valid Matrix Codes

MATRIX	CODE
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1	Field Blank	WT	G				4	3		1							X	X	X	X	X	X		24100001-049
2	MW-304 Duplicate	WT	G				4	2		2							X	X	X	X	X	X		24100001-050
3	PZ-178 Duplicate	WT	G	10-15-24	1431		3	1		2											X			24100001-051
4	Equipment Blank 1	WT	G				4	3		1							X	X	X	X	X	X		24100001-052
5	Equipment Blank 2	WT	G				4	3		1							X	X	X	X	X	X		24100001-053
6	Equipment Blank 3	WT	G				4	3		1							X	X	X	X	X	X		24100001-054
7																								
8																								
9																								
10																								
11																								
12																								
13																								
14																								
15																								
16																								

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
BAL-24Q4 Rev 1	J. Colp	10-15	1648	[illegible]	10/15/24	1648

SAMPLE CONDITIONS: Y / N

Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Colp

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 10-15-24

CHAIN-OF-CUSTODY / Analytical Request Document

24100001

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	Baldwin, IL 62217
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Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Valid Matrix Codes

MATRIX	CODE
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WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N): BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605	Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-104DR	WT	G	10-16-24	1029		4	2		2											X		24100001-001
2	MW-104SR	WT	G	10-16-24	1104		4	2		2											X		24100001-002
3	MW-150	WT	G				4	2		2							X		X		X		24100001-003
4	MW-151	WT	G	10.16.24	1020		4	2		2							X		X		X		24100001-004
5	MW-152	WT	G	10.16.24	1231		4	2		2							X		X		X		24100001-005
6	MW-153	WT	G	10-16-24	1147		4	2		2							X		X		X		24100001-006
7	MW-154	WT	G				4	2		2											X		24100001-007
8	MW-155	WT	G				4	2		2											X		24100001-008
9	MW-192	WT	G				2	1		1						X		X					24100001-009
10	MW-193	WT	G				2	1		1						X		X					24100001-010
11	MW-195	WT	G				3	1		2										X			24100001-011
12	MW-196	WT	G				3	1		2										X			24100001-012
13	MW-197	WT	G				3	1		2										X			24100001-013
14	MW-198	WT	G				3	1		2										X			24100001-014
15	MW-252	WT	G	10.16.24	1151		4	2		2							X		X		X		24100001-015
16	MW-253R	WT	G	10-16-24	1215		4	2		2							X		X		X		24100001-016

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
BAL-24Q4 Rev 1	J. Colp	10-16	1615	[signature]	10/16	1615
MW-195 : collect but hold all analyses pending instruction from Ramboll						

SAMPLE CONDITIONS			
Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
11.1	Y	N	

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Colp

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 10-16-24

PHR96651

Added HN03(99964) to MW304 and MW304 Dup

LH 10/17/24

LTC5

CHAIN-OF-CUSTODY / Analytical Request Document

24100001

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Sam Davies: samantha.davies@vistracorp.com
	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605	Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-304	WT	G	10-16-24	0933		4	2		2							X	X	X	X	X	X		24100001-017
2	MW-350R	WT	G				4	2		2								X		X		X		24100001-018
3	MW-352	WT	G	10.16.24	1118		3	1		2								X		X		X		24100001-019
4	MW-355	WT	G	10-16-24	1428		4	2		2												X		24100001-020
5	MW-356	WT	G	10.16.24	1426		2	1		1							X		X					24100001-021
6	MW-358R Dry	WT	G	10/16/24			3	1		2							X	X	X	X	X			24100001-022
7	MW-366	WT	G				2	1		1								X		X				24100001-023
8	MW-369	WT	G				2	1		1							X		X					24100001-024
9	MW-370	WT	G				2	1		1							X		X					24100001-025
10	MW-375	WT	G	10-16-24	1304		2	1		1								X		X				24100001-026
11	MW-377	WT	G	10-16-24	1339		2	1		1								X		X				24100001-027
12	MW-382	WT	G				2	1		1							X		X					24100001-028
13	MW-383	WT	G				2	1		1								X		X				24100001-029
14	MW-384	WT	G				2	1		1								X		X				24100001-030
15	MW-390	WT	G				2	1		1								X		X				24100001-031
16	MW-391R	WT	G				2	1		1								X		X				24100001-032

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS	Y	N	
BAL-24Q4 Rev 1	J. Colp	10-16	1615	[signature]	10/16	1615				
MW-358R dry							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

Per Justin Colp + Brett Gillihan ERH 10/18/24

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Colp

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 10-16-24

CHAIN-OF-CUSTODY / Analytical Request Document

24100001

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Sam Davies: samantha.davies@vistracorp.com
	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES, GROUND WATER, DRINKING WATER, UST, RCRA, OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N): BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605	Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-392	WT	G				2	1		1						X		X					24100001-033
2	MW-393	WT	G				2	1		1						X		X					24100001-034
3	MW-394	WT	G				2	1		1						X		X					24100001-035
4	OW-156	WT	G	10.16.24	1435		0														X		24100001-036
5	OW-157	WT	G				0														X		24100001-037
6	OW-256	WT	G				2	1		1						X		X					24100001-038
7	OW-257	WT	G				2	1		1						X		X					24100001-039
8	PZ-170	WT	G				2	1		1						X		X					24100001-040
9	PZ-174	WT	G				3	1		2										X			24100001-041
10	PZ-176	WT	G				3	1		2										X			24100001-042
11	PZ-178	WT	G				3	1		2										X			24100001-043
12	PZ-182	WT	G				2	1		1						X		X					24100001-044
13	TPZ-164	WT	G				2	1		1						X		X					24100001-045
14	XPW01	WT	G				2	1		1						X		X					24100001-046
15	XPW05	WT	G				2	1		1						X		X					24100001-047
16	XPW06	WT	G				2	1		1						X		X					24100001-048

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS	Y	N	
BAL-24Q4 Rev 1	J. Colp	10-16	1615	[signature]	10/16	1615				
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Colp

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 10-16-24

CHAIN-OF-CUSTODY / Analytical Request Document

24100001

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Sam Davies: samantha.davies@vistracorp.com
	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605							Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	Field Blank	WT	G				4	3		1							X	X	X	X	X	X								24100001-049
2	MW-304 Duplicate	WT	G	10-16-24	0933		4	2		2							X	X	X	X	X	X								24100001-050
3	PZ-178 Duplicate	WT	G				3	1		2											X									24100001-051
4	Equipment Blank 1	WT	G				4	3		1							X	X	X	X	X	X								24100001-052
5	Equipment Blank 2	WT	G				4	3		1							X	X	X	X	X	X								24100001-053
6	Equipment Blank 3	WT	G				4	3		1							X	X	X	X	X	X								24100001-054
7																														
8																														
9																														
10																														
11																														
12																														
13																														
14																														
15																														
16																														

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS	Y	N	
BAL-24Q4 Rev 1	J. Colp	10-16	1615		10/16	1615				

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Colp

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 10-16-24

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

24100001

CHAIN-OF-CUSTODY / Analytical Request Document

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Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Sam Davies: samantha.davies@vistracorp.com
	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605						Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-104DR	WT	G				4	2		2												X							24100001-001
2	MW-104SR	WT	G				4	2		2												X							24100001-002
3	MW-150	WT	G				4	2		2								X		X		X							24100001-003
4	MW-151	WT	G				4	2		2								X		X		X							24100001-004
5	MW-152	WT	G				4	2		2								X		X		X							24100001-005
6	MW-153	WT	G	ERH 10/18/24			4	2		2								X		X		X							24100001-006
7	MW-154	WT	G	~~dry~~	~~dry~~		4	2		2												X							24100001-007
8	MW-155	WT	G				4	2		2												X							24100001-008
9	MW-192	WT	G				2	1		1							X		X										24100001-009
10	MW-193	WT	G				2	1		1							X		X										24100001-010
11	MW-195	WT	G	10-17-24	1318		3	1		2											X								24100001-011
12	MW-196	WT	G	↓	1134		3	1		2											X								24100001-012
13	MW-197	WT	G		1235		3	1		2											X								24100001-013
14	MW-198 10/18/24	WT	G	BG			3	1		2											X								24100001-014
15	MW-252 BG/ERH	WT	G	ERH 10/18/24			4	2		2								X		X		X							24100001-015
16	MW-253R ~~TTY~~	WT	G	10-17-24			4	2		2								X		X		X							24100001-016

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
BAL-24Q4 Rev 1	[signature]	10.17.24	1512	[signature]	10/17/24	1512
MW-195 : collect but hold all analyses pending instruction from Ramboll						

SAMPLE CONDITIONS	Y	N	
Temp in °C: 99	Received on Ice (Y/N): Y	Custody Sealed Cooler (Y/N):	Samples Intact (Y/N):

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Culp

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 10-17-24

PW 96/05

LH 10/17/24

CTG9

CHAIN-OF-CUSTODY / Analytical Request Document

24100001

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Sam Davies: samantha.davies@vistracorp.com
	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605	Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-392	WT	G				2	1		1							X		X					24100001-033
2	MW-393	WT	G				2	1		1							X		X					24100001-034
3	MW-394	WT	G				2	1		1							X		X					24100001-035
4	OW-156	WT	G				0															X		24100001-036
5	OW-157	WT	G	10-17-24	1302		0															X		24100001-037
6	OW-256	WT	G				2	1		1							X		X					24100001-038
7	OW-257	WT	G				2	1		1							X		X					24100001-039
8	PZ-170	WT	G				2	1		1							X		X					24100001-040
9	PZ-174	WT	G				3	1		2											X			24100001-041
10	PZ-176	WT	G				3	1		2											X			24100001-042
11	PZ-178	WT	G				3	1		2											X			24100001-043
12	PZ-182	WT	G				2	1		1							X		X					24100001-044
13	TPZ-164	WT	G	10-17-24	1217		2	1		1							X		X					24100001-045
14	XPW01	WT	G	10-17-24	1154		2	1		1							X		X					24100001-046
15	XPW05	WT	G	↓	1135		2	1		1							X		X					24100001-047
16	XPW06	WT	G		1018		2	1		1							X		X					24100001-048

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS	Y	N	
BAL-24Q4 Rev 1	Justin Carroll	10/17/24	1512	[signature]	10/17/24	1512				
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Carroll

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 10-17-24

CHAIN-OF-CUSTODY / Analytical Request Document

24100001

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	Vistra Corp-Baldwin	Report To:	Brian Voelker	Attention:	Brian Voelker
Address:	10901 Baldwin Road	Copy To:	Sam Davies: samantha.davies@vistracorp.com	Company Name:	Vistra Corp
	Baldwin, IL 62217		Kim Edmiaston Kimberly.Edmiaston@vistracorp.com	Address:	see Section A
Email To:	Brian.Voelker@VistraCorp.com	Purchase Order No.:		Quote Reference:	
Phone: (217) 753-8911	Fax:	Project Name:		Project Manager:	
Requested Due Date/TAT:	10 day	Project Number:		Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605	Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	Field Blank	WT	G	10-17-24	1308		4	3		1							X	X	X	X	X	X		24100001-049
2	MW-304 Duplicate	WT	G				4	2		2							X	X	X	X	X	X		24100001-050
3	PZ-178 Duplicate	WT	G				3	1		2											X			24100001-051
4	Equipment Blank 1	WT	G	10-17-24	1331		4	3		1							X	X	X	X	X	X		24100001-052
5	Equipment Blank 2	WT	G				4	3		1							X	X	X	X	X	X		24100001-053
6	Equipment Blank 3	WT	G				4	3		1							X	X	X	X	X	X		24100001-054
7																								
8																								
9																								
10																								
11																								
12																								
13																								
14																								
15																								
16																								

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
BAL-24Q4 Rev 1	[signature]	10/17/24	1512	[signature]	10/17/24	1512		Y	N	
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Colp

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 10-17-24

CHAIN-OF-CUSTODY / Analytical Request Document

24100001

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Sam Davies: samantha.davies@vistracorp.com
	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES | GROUND WATER | DRINKING WATER
UST | RCRA | OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605							Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-104DR	WT	G				4	2		2												X								24100001-001
2	MW-104SR	WT	G				4	2		2												X								24100001-002
3	MW-150	WT	G				4	2		2								X		X		X								24100001-003
4	MW-151	WT	G				4	2		2								X		X		X								24100001-004
5	MW-152	WT	G				4	2		2								X		X		X								24100001-005
6	MW-153	WT	G				4	2		2								X		X		X								24100001-006
7	MW-154	WT	G	11-1-24	Dry		4	2		2												X								24100001-007
8	MW-155	WT	G				4	2		2												X								24100001-008
9	MW-192	WT	G				2	1		1							X		X											24100001-009
10	MW-193	WT	G				2	1		1							X		X											24100001-010
11	MW-195	WT	G				3	1		2											X									24100001-011
12	MW-196	WT	G		TE Gm		3	1		2											X									24100001-012
13	MW-197	WT	G	~~11-1-24~~	~~1042~~		3	1		2											X									24100001-013
14	MW-198	WT	G	11-1-24	1042 ⊗		3	1		2											X									24100001-014
15	MW-252	WT	G				4	2		2								X		X		X								24100001-015
16	MW-253R	WT	G				4	2		2								X		X		X								24100001-016

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS
BAL-24Q4 Rev 1	[signature]	11-1	1324	[signature]	11/1/24	13:24	1.3
MW-195 : collect but hold all analyses pending instruction from Ramboll							#5

Added HNO3 (99964) to Sample MW358R

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Brett Gilliken

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY):

Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
	Y	N	

PH 96657 JD 11/1/24

⊗ per Brett Gilliken Gm 11/1/24

CHAIN-OF-CUSTODY / Analytical Request Document

24100001

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Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Sam Davies: samantha.davies@vistracorp.com
	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES | GROUND WATER | DRINKING WATER
UST | RCRA | OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605						Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-304	WT	G				4	2		2							X	X	X	X	X	X							24100001-017
2	MW-350R	WT	G				4	2		2								X		X		X							24100001-018
3	MW-352	WT	G				3	1		2								X		X		X							24100001-019
4	MW-355	WT	G		TE UM		4	2		2												X							24100001-020
5	MW-356	WT	G	~~11-1-24~~	~~1127~~		2	1		1							X		X										24100001-021
6	MW-358R	WT	G	11-1-24	1128		3	1		2							X	X	X	X	X								24100001-022
7	MW-366	WT	G				2	1		1								X		X									24100001-023
8	MW-369	WT	G				2	1		1							X		X										24100001-024
9	MW-370	WT	G				2	1		1							X		X										24100001-025
10	MW-375	WT	G				2	1		1								X		X									24100001-026
11	MW-377	WT	G				2	1		1								X		X									24100001-027
12	MW-382	WT	G				2	1		1							X		X										24100001-028
13	MW-383	WT	G				2	1		1								X		X									24100001-029
14	MW-384	WT	G				2	1		1								X		X									24100001-030
15	MW-390	WT	G				2	1		1								X		X									24100001-031
16	MW-391R	WT	G	11-1-24	Dry		2	1		1								X		X									24100001-032

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
BAL-24Q4 Rev 1	[signature]	11-1	1324	Jacki Davis	11/1/24	13:24		Y	N	
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Brett Gillihan

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY):

CHAIN-OF-CUSTODY / Analytical Request Document

24100001

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	Baldwin, IL 62217
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Copy To:	Sam Davies: samantha.davies@vistracorp.com
	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605							Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-392	WT	G				2	1		1							X		X											24100001-033
2	MW-393	WT	G				2	1		1							X		X											24100001-034
3	MW-394	WT	G				2	1		1							X		X											24100001-035
4	OW-156	WT	G				0															X								24100001-036
5	OW-157	WT	G				0															X								24100001-037
6	OW-256	WT	G				2	1		1							X		X											24100001-038
7	OW-257	WT	G				2	1		1							X		X											24100001-039
8	PZ-170	WT	G				2	1		1							X		X											24100001-040
9	PZ-174	WT	G				3	1		2											X									24100001-041
10	PZ-176	WT	G				3	1		2											X									24100001-042
11	PZ-178	WT	G				3	1		2											X									24100001-043
12	PZ-182	WT	G				2	1		1							X		X											24100001-044
13	TPZ-164	WT	G				2	1		1							X		X											24100001-045
14	XPW01	WT	G				2	1		1							X		X											24100001-046
15	XPW05	WT	G				2	1		1							X		X											24100001-047
16	XPW06	WT	G				2	1		1							X		X											24100001-048

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
BAL-24Q4 Rev 1	[signature]	11-1	1324	Jackie Davis	11/1/24	13:24		Y	N	
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

SIGNATURE of SAMPLER: DATE Signed (MM/DD/YY):

CHAIN-OF-CUSTODY / Analytical Request Document

24100001

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	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES | GROUND WATER | DRINKING WATER
UST | RCRA | OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605							Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	Field Blank	WT	G				4	3		1							X	X	X	X	X	X								24100001-049
2	MW-304 Duplicate	WT	G				4	2		2							X	X	X	X	X	X								24100001-050
3	PZ-178 Duplicate	WT	G				3	1		2											X									24100001-051
4	Equipment Blank 1	WT	G				4	3		1							X	X	X	X	X	X								24100001-052
5	Equipment Blank 2	WT	G				4	3		1							X	X	X	X	X	X								24100001-053
6	Equipment Blank 3	WT	G				4	3		1							X	X	X	X	X	X								24100001-054
7																														
8																														
9																														
10																														
11																														
12																														
13																														
14																														
15																														
16																														

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
BAL-24Q4 Rev 1	[signature]	11-1	1324	Jodie Davis	11/1/24	13:24		Y	N	
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

SIGNATURE of SAMPLER: DATE Signed (MM/DD/YY):

Site Samping Event: BAL- 24Q3
LIMS Workorder: 24061962
Technician(s): DC, JC, TC, BG, PY

Groundwater Sampling Field Forms- Groudnwater Quality Parameters
Baldwin- 3Q 2024

Well ID	Date	Time	DTW	Temp (°C)	Temp (°F)	pH (SU)	Sp Cond (µS/cm)	ODO (mg/L)	Turbidity (NTU)	ORP (mV)
MW-196	7/23/2024	10:16	8.42	18.8	65.9	7.22	1,342.8	3.51	14.20	-17.1
MW-196	7/23/2024	10:19	8.42	18.7	65.6	7.18	1,335.4	2.87	13.73	-22.4
MW-196	7/23/2024	10:22	8.42	19.3	66.8	7.16	1,332.4	2.39	14.71	-23.1
MW-196	7/23/2024	10:25	8.42	19.5	67.2	7.20	1,332.0	2.12	41.40	-22.8
MW-196	7/23/2024	10:28	8.42	20.3	68.6	7.20	1,335.7	1.98	39.72	-21.9
MW-196	7/23/2024	10:31	8.42	20.1	68.2	7.19	1,339.8	1.84	29.31	-19.8
MW-196	7/23/2024	10:34	8.42	20.3	68.5	7.18	1,345.7	1.75	24.05	-17.6

Site Samping Event: BAL- 24Q3
LIMS Workorder: 24061962
Technician(s): DC, JC, TC, BG, PY

Groundwater Sampling Field Forms- Groudnwater Quality Parameters
Baldwin- 3Q 2024

Well ID	Date	Time	DTW	Temp (°C)	Temp (°F)	pH (SU)	Sp Cond (µS/cm)	ODO (mg/L)	Turbidity (NTU)	ORP (mV)
MW-197	7/19/2024	10:03	4.56	19.3	66.7	7.12	1,110.8	5.19	8.65	-16.4
MW-197	7/19/2024	10:06	4.56	19.5	67.0	7.13	1,113.1	4.94	8.23	-16.0
MW-197	7/19/2024	10:09	4.56	19.5	67.1	7.14	1,112.6	4.74	6.79	-13.3
MW-197	7/19/2024	10:12	4.56	19.8	67.6	7.14	1,113.3	4.55	4.74	-10.7
MW-197	7/19/2024	10:15	4.56	20.0	68.0	7.14	1,113.7	4.41	3.50	-7.9
MW-197	7/19/2024	10:18	4.56	20.4	68.8	7.15	1,114.3	4.28	2.99	-5.2
MW-197	7/19/2024	10:21	4.56	20.5	69.0	7.16	1,116.9	4.20	2.45	-2.2
MW-197	7/19/2024	10:24	4.56	20.6	69.0	7.17	1,116.8	4.12	1.98	0.9

Site Samping Event: BAL- 24Q3
LIMS Workorder: 24061962
Technician(s): DC, JC, TC, BG, PY

Groundwater Sampling Field Forms- Groudnwater Quality Parameters
Baldwin- 3Q 2024

Well ID	Date	Time	DTW	Temp (°C)	Temp (°F)	pH (SU)	Sp Cond (µS/cm)	ODO (mg/L)	Turbidity (NTU)	ORP (mV)
PZ-174	7/18/2024	14:52	7.24	17.9	64.3	7.25	1,473.6	3.93	31.32	76.5
PZ-174	7/18/2024	14:55	7.24	17.7	63.9	7.24	1,472.7	3.87	34.83	77.7
PZ-174	7/18/2024	14:58	7.24	17.7	63.9	7.23	1,471.1	3.77	35.58	78.7
PZ-174	7/18/2024	15:01	7.24	17.7	63.9	7.22	1,473.6	3.74	38.65	79.5

Site Samping Event: BAL- 24Q3
LIMS Workorder: 24061962
Technician(s): DC, JC, TC, BG, PY

Groundwater Sampling Field Forms- Groudnwater Quality Parameters
Baldwin- 3Q 2024

Well ID	Date	Time	DTW	Temp (°C)	Temp (°F)	pH (SU)	Sp Cond (µS/cm)	ODO (mg/L)	Turbidity (NTU)	ORP (mV)
PZ-176	7/22/2024	10:41	11.45	18.0	64.5	7.08	1,143.1	1.09	57.18	59.2
PZ-176	7/22/2024	10:44	11.45	16.6	61.8	7.05	1,139.3	0.76	64.73	58.9
PZ-176	7/22/2024	10:47	11.45	16.8	62.3	7.03	1,138.1	0.58	57.12	58.4
PZ-176	7/22/2024	10:50	11.45	16.7	62.0	7.03	1,139.5	0.50	80.22	57.8
PZ-176	7/22/2024	10:53	11.45	16.9	62.4	7.02	1,139.7	0.45	53.31	57.4
PZ-176	7/22/2024	10:56	11.45	17.4	63.4	7.02	1,133.8	0.42	53.71	56.8

Site Samping Event: BAL- 24Q3
LIMS Workorder: 24061962
Technician(s): DC, JC, TC, BG, PY

Groundwater Sampling Field Forms- Groudnwater Quality Parameters
Baldwin- 3Q 2024

Well ID	Date	Time	DTW	Temp (°C)	Temp (°F)	pH (SU)	Sp Cond (µS/cm)	ODO (mg/L)	Turbidity (NTU)	ORP (mV)
PZ-178	7/22/2024	10:00	6.34	19.0	66.3	7.04	1,256.8	0.67	68.82	11.8
PZ-178	7/22/2024	10:03	6.34	20.5	68.9	7.02	1,261.7	0.55	139.70	6.5
PZ-178	7/22/2024	10:06	6.34	19.9	67.7	7.04	1,267.9	0.55	72.21	6.9
PZ-178	7/22/2024	10:09	6.34	20.2	68.4	7.04	1,268.9	0.55	89.43	9.2
PZ-178	7/22/2024	10:12	6.34	21.0	69.7	7.04	1,272.3	0.53	69.99	11.6

Site Samping Event: BAL- 24Q3
LIMS Workorder: 24061962
Technician(s): DC, JC, TC, BG, PY

Groundwater Sampling Field Forms- Groudnwater Quality Parameters
Baldwin- 3Q 2024

Well ID	Date	Time	DTW	Temp (°C)	Temp (°F)	pH (SU)	Sp Cond (µS/cm)	ODO (mg/L)	Turbidity (NTU)	ORP (mV)
PZ-178 Duplicate	7/22/2024	10:00	6.34	19.0	66.3	7.04	1,256.8	0.67	68.82	11.8
PZ-178 Duplicate	7/22/2024	10:03	6.34	20.5	68.9	7.02	1,261.7	0.55	139.70	6.5
PZ-178 Duplicate	7/22/2024	10:06	6.34	19.9	67.7	7.04	1,267.9	0.55	72.21	6.9
PZ-178 Duplicate	7/22/2024	10:09	6.34	20.2	68.4	7.04	1,268.9	0.55	89.43	9.2
PZ-178 Duplicate	7/22/2024	10:12	6.34	21.0	69.7	7.04	1,272.3	0.53	69.99	11.6

Site Samping Event: BAL- 24Q3
LIMS Workorder: 24061962
Technician(s): DC, JC, TC, BG, PY

Field Calibration Log(s)
Baldwin- 3Q 2024

Field Temp SOP 1156 - SM 2550 B
Field pH SOP 1152 - SW-846 9040B - SM 4500-H B
Field Cond. SOP 1155 - SW-846 9050A - SM 2510 B

Field Meter ID: Pine 218083 Technician(s): Tracy Carroll Date: 7/17/2024

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	WC230830B	4.01	7/17/24 9:42
7.0 Buffer	WC240307F	6.99	7/17/24 9:39
10.0 Buffer	WC230619B	9.99	7/17/24 9:44
LCS/CCV (7.0 Buffer)	WC231207A		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	98627	1412	7/17/24 9:44

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1		
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-1	LCS	7/17/24 9:45	28.1	7.02	1,408	1.52		
CCV-1	CCV	7/17/24 14:41	25.4	7.02	1,436	1.19		

Comments:

Field Meter ID: Pine 218083 Technician(s): Tracy Carroll Date: 7/18/2024

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	WC230830B	4.00	7/18/24 9:25
7.0 Buffer	WC240307F	7.01	7/18/24 9:24
10.0 Buffer	WC230619B	10.01	7/18/24 9:25
LCS/CCV (7.0 Buffer)	WC231207A		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	98627	1412	7/18/24 9:26

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1		
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-2	LCS	7/18/24 9:27	22.2	7.01	1,413	1.32		
CCV-M-2	CCV	7/18/24 12:01	23.3	7.04	1,430	1.26		
CCV-2	CCV	7/18/24 14:45	24	7.09	1,440	1.34		

Comments:

Site Samping Event: BAL- 24Q3
LIMS Workorder: 24061962
Technician(s): DC, JC, TC, BG, PY

Field Calibration Log(s)
Baldwin- 3Q 2024

Field Temp SOP 1156 - SM 2550 B
Field pH SOP 1152 - SW-846 9040B - SM 4500-H B
Field Cond. SOP 1155 - SW-846 9050A - SM 2510 B

Field Meter ID: Pine 45720 Technician(s): Brett Gillihan Date: 7/17/2024

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	WC230830B	4.02	7/17/24 9:08
7.0 Buffer	WC24307F	7.02	7/17/24 9:01
10.0 Buffer	WC240521B	10.00	7/17/24 9:12
LCS/CCV (7.0 Buffer)	WC231207A		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	98627	1416	7/17/24 9:14

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1	1.6	7/17/24 9:15
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-2	LCS	7/17/24 9:19	20.7	7.01	1,416	1.6		
CCV-M-2	CCV	7/17/24 12:12	21.6	7.03	1,422	1.4		
CCV-2	CCV	7/17/24 14:46	22.6	7.05	1,423	1.64		

Comments:

Field Meter ID: Pine 45720 Technician(s): Brett Gillihan Date: 7/18/2024

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	WC230830B	4.01	7/18/24 8:54
7.0 Buffer	WC24307F	7.01	7/18/24 8:48
10.0 Buffer	WC240521B	10.00	7/18/24 9:02
LCS/CCV (7.0 Buffer)	WC231207A		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	98627	1414	7/18/24 9:10

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1	1.6	7/18/24 9:12
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-3	LCS	7/18/24 9:17	19.8	7.00	1,414	1.6		
CCV-M-3	CCV	7/18/24 11:46	20.4	7.03	1,417	1.08		
CCV-3	CCV	7/18/24 14:44	21.7	7.06	1,422	1.46		

Comments:

Site Samping Event: BAL- 24Q3
LIMS Workorder: 24061962
Technician(s): DC, JC, TC, BG, PY

Field Calibration Log(s)
Baldwin- 3Q 2024

Field Temp SOP 1156 - SM 2550 B
Field pH SOP 1152 - SW-846 9040B - SM 4500-H B
Field Cond. SOP 1155 - SW-846 9050A - SM 2510 B

Field Meter ID: Pine 45720 Technician(s): Brett Gillihan Date: 7/19/2024

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	WC230830B	3.99	7/19/24 9:29
7.0 Buffer	WC24307F	7.00	7/19/24 9:26
10.0 Buffer	WC240521B	10.02	7/19/24 9:36
LCS/CCV (7.0 Buffer)	WC231207A		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	98627	1417	7/19/24 9:38

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1	1.4	7/19/24 9:40
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-4	LCS	7/19/24 9:41	19.9	7.01	1,417	0.96		
CCV-4	CCV	7/19/24 11:08	20.3	7.02	1,420	1.23		

Comments:

Site Samping Event: BAL- 24Q3
LIMS Workorder: 24061962
Technician(s): DC, JC, TC, BG, PY

Field Calibration Log(s)
Baldwin- 3Q 2024

Field Temp SOP 1156 - SM 2550 B
Field pH SOP 1152 - SW-846 9040B - SM 4500-H B
Field Cond. SOP 1155 - SW-846 9050A - SM 2510 B

Field Meter ID: Pine 51294 Technician(s): justin colp Date: 7/16/2024

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	wc230830b	4.00	7/16/24 6:39
7.0 Buffer	wc240307f	6.99	7/16/24 6:34
10.0 Buffer	wc240521b	10.00	7/16/24 6:44
LCS/CCV (7.0 Buffer)	wc231207a		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	98627	1412	7/16/24 6:48

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1	0.91	7/16/24 6:48
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-1	LCS	7/16/24 6:51	25.1	7.00	1,412	0.91		

Comments: No sampling on 7/16- rain out

Field Meter ID: Pine 51294 Technician(s): justin colp Date: 7/17/2024

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	wc230830b	3.98	7/17/24 6:41
7.0 Buffer	wc240307f	7.00	7/17/24 6:37
10.0 Buffer	wc240521b	10.01	7/17/24 6:46
LCS/CCV (7.0 Buffer)	wc231207a		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	98627	1411	7/17/24 6:52

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1	0.93	7/17/24 6:52
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-2	LCS	7/17/24 6:55	24.7	7.00	1,411	0.93		
CCV-M-2	CCV	7/17/24 11:36	25.4	7.02	1,422	0.99		
CCV-2	CCV	7/17/24 14:44	27.2	7.04	1,427	0.97		

Comments:

Site Samping Event: BAL- 24Q3
LIMS Workorder: 24061962
Technician(s): DC, JC, TC, BG, PY

Field Calibration Log(s)
Baldwin- 3Q 2024

Field Temp SOP 1156 - SM 2550 B
Field pH SOP 1152 - SW-846 9040B - SM 4500-H B
Field Cond. SOP 1155 - SW-846 9050A - SM 2510 B

Field Meter ID: Pine 51294 Technician(s): justin colp Date: 7/18/2024

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	wc230830b	3.99	7/18/24 6:39
7.0 Buffer	wc240307f	7.01	7/18/24 6:35
10.0 Buffer	wc240521b	10.01	7/18/24 6:43
LCS/CCV (7.0 Buffer)	wc231207a		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	98627	1413	7/18/24 6:48

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1	0.96	7/18/24 6:49
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-3	LCS	7/18/24 6:57	21.5	7.01	1,413	0.96		
CCV-M-3	CCV	7/18/24 11:19	22.8	7.01	1,421	0.92		
CCV-3	CCV	7/18/24 14:41	23.9	7.03	1,420	0.93		

Comments:

Field Meter ID: Pine 51294 Technician(s): justin colp Date: 7/19/2024

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	wc230830b	4.02	7/19/24 8:45
7.0 Buffer	wc240307f	6.99	7/19/24 8:39
10.0 Buffer	wc240521b	10.00	7/19/24 8:52
LCS/CCV (7.0 Buffer)	wc231207a		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	98627	1405	7/19/24 8:57

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1	0.87	7/19/24 8:58
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-4	LCS	7/19/24 9:10	20.9	6.99	1,405	0.87		
CCV-4	CCV	7/19/24 11:14	22	7.02	1,401	0.88		

Comments:

Site Samping Event: BAL- 24Q3
LIMS Workorder: 24061962
Technician(s): DC, JC, TC, BG, PY

Field Calibration Log(s)
Baldwin- 3Q 2024

Field Temp SOP 1156 - SM 2550 B
Field pH SOP 1152 - SW-846 9040B - SM 4500-H B
Field Cond. SOP 1155 - SW-846 9050A - SM 2510 B

Field Meter ID: Pine 51294 Technician(s): justin colp Date: 7/22/2024

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	wc230830b	4.01	7/22/24 9:29
7.0 Buffer	wc240307f	6.98	7/22/24 9:25
10.0 Buffer	wc240521b	10.01	7/22/24 9:34
LCS/CCV (7.0 Buffer)	wc231207a		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	98627	1406	7/22/24 9:39

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1	0.84	7/22/24 9:40
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-5	LCS	7/22/24 9:42	21.7	6.98	1,406	0.84		
CCV-5	CCV	7/22/24 13:20	24.5	7.04	1,418	0.87		

Comments:

Field Meter ID: Pine 51294 Technician(s): justin colp Date: 7/23/2024

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	wc230830b	4.00	7/23/24 7:26
7.0 Buffer	wc240307f	7.00	7/23/24 7:21
10.0 Buffer	wc240521b	10.02	7/23/24 7:31
LCS/CCV (7.0 Buffer)	wc231207a		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	98627	1409	7/23/24 7:37

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1	0.89	7/23/24 7:37
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-6	LCS	7/23/24 7:41	21.2	7.00	1,409	0.89		
CCV-6	CCV	7/23/24 12:11	25.4	7.03	1,424	0.93		

Comments:

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC

11669 Lilburn Park Rd.
St. Louis, MO 63146
Office: 314.344.1079

Pine Environmental Services, Inc.

Instrument ID 45720
Description YSI Pro DSS
Calibrated 6/27/2024 10:15:34AM

Manufacturer YSI
Model Number Pro DSS
Serial Number/ Lot Number 19E101794
Location St. Louis
Department

State Certified
Status Pass
Temp °C 22.2
Humidity % 43

Calibration Specifications

Group # 1
Group Name PH
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
7.00 / 7.00	PH	7.00	PH	7.00	7.02	0.29%	Pass
4.00 / 4.00	PH	4.00	PH	3.89	4.00	0.00%	Pass
10.00 / 10.00	PH	10.00	PH	10.05	10.04	0.40%	Pass

Group # 2
Group Name Turbidity
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
0.00 / 0.00	NTU	0.00	NTU	-0.43	0.00	0.00%	Pass
124.00 / 124.00	NTU	124.00	NTU	128.39	124.00	0.00%	Pass

Group # 3
Group Name Conductivity
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.000

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
1.413 / 1.413	ms/cm	1.413	ms/cm	1.378	1.413	0.00%	Pass

Group # 4
Group Name Redox (ORP)
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
240.00 / 240.00	mv	240.00	mv	244.10	240.00	0.00%	Pass

Group # 5
Group Name Disolved Oxygen Span
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC

11669 Lilburn Park Rd.
St. Louis, MO 63146
Office: 314.344.1079

Pine Environmental Services, Inc.

Instrument ID 51294
Description YSI Pro DSS Sonde
Calibrated 7/5/2024 11:57:06AM

Manufacturer YSI
Model Number Pro DSS
Serial Number/ Lot Number 21D103486
Location St. Louis
Department

State Certified
Status Pass
Temp °C 22.2
Humidity % 43

Calibration Specifications

Group # 1
Group Name PH
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
7.00 / 7.00	PH	7.00	PH	7.23	7.02	0.29%	Pass
4.00 / 4.00	PH	4.00	PH	4.42	4.00	0.00%	Pass
10.00 / 10.00	PH	10.00	PH	9.95	10.05	0.50%	Pass

Group # 2
Group Name Turbidity
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
0.00 / 0.00	NTU	0.00	NTU	0.25	0.00	0.00%	Pass
124.00 / 124.00	NTU	124.00	NTU	100.99	124.00	0.00%	Pass

Group # 3
Group Name Conductivity
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.000

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
1.413 / 1.413	ms/cm	1.413	ms/cm	1.491	1.413	0.00%	Pass

Group # 4
Group Name Redox (ORP)
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
240.00 / 240.00	mv	240.00	mv	229.10	240.00	0.00%	Pass

Group # 5
Group Name Dissolved Oxygen Span
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC
11669 Lilburn Park Rd.
St. Louis, MO 63146
Office: 314.344.1079

Pine Environmental Services, Inc.

Instrument ID 218083
Description YSI Pro DSS Sonde
Calibrated 6/27/2024 10:21:25AM

Manufacturer YSI
Model Number Pro DSS
Serial Number/ Lot Number 23F102674
Location St. Louis
Department

State Certified
Status Pass
Temp °C 22.2
Humidity % 43

Calibration Specifications

Group # 1
Group Name PH
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
7.00 / 7.00	PH	7.00	PH	7.01	7.02	0.29%	Pass
4.00 / 4.00	PH	4.00	PH	4.07	4.00	0.00%	Pass
10.00 / 10.00	PH	10.00	PH	10.04	10.04	0.40%	Pass

Group # 2
Group Name Turbidity (NTU)
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
0.00 / 0.00	FNU	0.00	FNU	0.34	0.00	0.00%	Pass
124.00 / 124.00	FNU	124.00	FNU	126.32	124.00	0.00%	Pass

Group # 3
Group Name Conductivity
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.000

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
1.413 / 1.413	ms/cm	1.413	ms/cm	1.501	1.413	0.00%	Pass

Group # 4
Group Name Redox (ORP)
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
240.00 / 240.00	mv	240.00	mv	242.90	240.00	0.00%	Pass

Group # 5
Group Name Dissolved Oxygen Span
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail

Field Data Sheet

Project Name:	BAL-24Q4	**Monitoring Point:**	MW-196
Project Location:	Baldwin, Illinois	**Sample ID:**	012
W.O. Number (s):	24100001	**Date (s):**	10/17/2024

Field Team Members

Name: Tracy Carroll Affiliation: TekLab, Inc.

Name: Affiliation:

Weather Conditions

Temp: 62 °F Wind Direction: ☑ N ☐ S ☐ W ☐ E ☐ SE ☐ SW ☐ NE ☐ NW

Precipitation: ☑ None ☐ Light ☐ Heavy Sky: ☑ Clear ☐ Partly Cloudy ☐ Cloudy

Well Observations

		Locks	Yes	No
Well Pad	Good	Protective Casing	X	
Casing	Good	Well		X
Protective Casing	Good			
Reference Mark/Identification	Yes			

Groundwater Level Measurements

Date/Time Measured: 10/17/2024 11:04

Static Water Level: 11.26 feet below TOC

Total Depth: 21.25 feet below TOC

Water Column: 9.99 feet

Purging Activities

Purged By: TC Purge Date: 10/17/2024

Purge Method: Submersible Pump Well Diameter: 2"

Purge Volume Calculation (L): 9.99 ft. x 0.022 = 0.22 L x 3 Vol. = 0.66 L **Based on Low-Flow (3/8" discharge)*

Actual Purge Volume (L): 6.00 L

Physical appearance of purge water: Slightly cloudy Odor: None Color: Lt orange

Purge Time	Cumulative Purge Vol.(L)	Purge Rate (mL/m)	pH (S.U.)	Specific Conductivity (µS/cm)	Temp (°C)	Dissolved Oxygen (mg/L)	ORP (mV)	Turbidity (NTU)	Other
11:04	0.0	200	purge start time						
11:19	3.0	↓	6.89	1,030.30	18.05	3.28	-34.60	188.29	
11:22	3.6		6.90	1,024.20	18.17	3.21	-62.70	156.76	
11:25	4.2		6.91	1,016.30	18.20	3.02	-74.10	143.12	
11:28	4.8		6.92	1,008.80	18.22	2.88	-78.60	122.53	
11:31	5.4		6.93	1,003.40	18.48	3.09	-74.90	100.00	
11:34	6.0		6.93	998.70	18.59	3.29	-72.40	93.69	

Sampling Activities

Sampled By: TC Sample Date/Time: 10/17/2024 11:34

Sample Method: Low Flow Sample Equipment: Submersible Pump

Sample Parameters: 6.93 pH 998.70 Spec. Cond. 18.59 Temp

Field Filtered: Yes Filter Type: In-Line Disposable

Water Level: 13.99 feet below TOC Drawdown: 2.73 feet

Observations/Comments: (i.e., equipment malfunctions, contamination sources, sampling difficulties; duplicate sample)

- Field Meter: 46868

Form Completed By: Tracy Carroll **Date:** 10/17/2024

Field Data Sheet

Project Name:	BAL-24Q4	**Monitoring Point:**	MW-197
Project Location:	Baldwin, Illinois	**Sample ID:**	013
W.O. Number (s):	24100001	**Date (s):**	10/17/2024

Field Team Members

Name: Tracy Carroll Affiliation: TekLab, Inc.

Name: Affiliation:

Weather Conditions

Temp: 62 °F Wind Direction: ☑ N ☐ S ☐ W ☐ E ☐ SE ☐ SW ☐ NE ☐ NW

Precipitation: ☑ None ☐ Light ☐ Heavy Sky: ☑ Clear ☐ Partly Cloudy ☐ Cloudy

Well Observations

		Locks	Yes	No
Well Pad	Good	Protective Casing	X	
Casing	Good	Well		X
Protective Casing	Good			
Reference Mark/Identification	Yes			

Groundwater Level Measurements

Date/Time Measured: 10/17/2024 11:50

Static Water Level: 8.14 feet below TOC

Total Depth: 20.66 feet below TOC

Water Column: 12.52 feet

Purging Activities

Purged By: TC Purge Date: 10/17/2024

Purge Method: Submersible Pump Well Diameter: 2"

Purge Volume Calculation (L): 12.52 ft. x 0.022 = 0.28 L x 3 Vol. = 0.84 L **Based on Low-Flow (3/8" discharge)*

Actual Purge Volume (L): 8.50 L

Physical appearance of purge water: Slightly cloudy Odor: None Color: lt oange

Purge Time	Cumulative Purge Vol.(L)	Purge Rate (mL/m)	pH (S.U.)	Specific Conductivity (µS/cm)	Temp (°C)	Dissolved Oxygen (mg/L)	ORP (mV)	Turbidity (NTU)	Other
11:50	0.0	189	purge start time						
12:11	4.0	↓	6.80	605.90	16.24	2.15	-37.80	172.85	
12:14	4.5		6.80	602.90	16.86	2.12	-30.30	148.11	
12:17	5.1		6.80	599.50	16.91	2.09	-17.90	122.48	
12:20	5.7		6.80	597.10	17.06	1.76	-3.10	105.31	
12:23	6.2		6.81	593.50	17.11	1.69	9.30	99.50	
12:26	6.8		6.83	589.70	17.17	1.58	16.10	87.84	
12:29	7.4		6.85	585.30	17.12	1.67	20.50	80.68	
12:32	7.9		6.86	583.60	17.05	1.77	23.50	87.83	
12:35	8.5		6.85	581.20	16.95	1.81	25.20	95.90	

Sampling Activities

Sampled By: TC Sample Date/Time: 10/17/2024 12:35

Sample Method: Low Flow Sample Equipment: Submersible Pump

Sample Parameters: 6.85 pH 581.20 Spec. Cond. 16.95 Temp

Field Filtered: Yes Filter Type: In-Line Disposable

Water Level: 13.89 feet below TOC Drawdown: 5.75 feet

Observations/Comments: (i.e., equipment malfunctions, contamination sources, sampling difficulties; duplicate sample)

- Field Meter: 46868

Form Completed By: Tracy Carroll **Date:** 10/17/2024

Field Data Sheet

Project Name:	BAL-24Q4	**Monitoring Point:**	MW-198
Project Location:	Baldwin, Illinois	**Sample ID:**	014
W.O. Number (s):	24100001	**Date (s):**	11/1/2024

Field Team Members

Name: Brett Gillihan Affiliation: TekLab, Inc.

Name: Danny Crump Affiliation: TekLab, Inc.

Weather Conditions

Temp: 50 °F

Wind Direction: ☐ N ☐ S ☐ W ☐ E ☐ SE ☑ SW ☐ NE ☐ NW

Precipitation: ☑ None ☐ Light ☐ Heavy

Sky: ☑ Clear ☐ Partly Cloudy ☐ Cloudy

Well Observations

Well Pad	Good
Casing	Good
Protective Casing	Good
Reference Mark/Identification	No

Locks	Yes	No
Protective Casing		X
Well		X

Groundwater Level Measurements

Date/Time Measured: 11/1/2024 10:25

Static Water Level: 8.99 feet below TOC

Total Depth: 20.57 feet below TOC

Water Column: 11.58 feet

Purging Activities

Purged By: BG Purge Date: 11/1/2024

Purge Method: Peristaltic Pump Well Diameter: 2"

Purge Volume Calculation (L): 11.58 ft. x 0.022 = 0.25 L x 3 Vol. = 0.75 L **Based on Low-Flow (3/8" discharge)*

Actual Purge Volume (L): 3.00 L

Physical appearance of purge water: Clear Odor: None Color: Clear

Purge Time	Cumulative Purge Vol.(L)	Purge Rate (mL/m)	pH (S.U.)	Specific Conductivity (µS/cm)	Temp (°C)	Dissolved Oxygen (mg/L)	ORP (mV)	Turbidity (NTU)	Other
10:25	0.0	176	purge start time						
10:30	0.9	↓	6.48	766.70	14.25	8.26	79.70	19.76	
10:33	1.4		6.52	773.50	14.24	8.60	85.80	18.00	
10:36	1.9		6.59	773.60	14.27	8.91	90.20	314.09	
10:39	2.5		6.63	771.20	14.35	9.03	93.90	17.74	
10:42	3.0		6.65	767.30	14.55	8.98	97.30	19.99	

Sampling Activities

Sampled By: BG Sample Date/Time: 11/1/2024 10:42

Sample Method: Low Flow Sample Equipment: Peristaltic Pump

Sample Parameters: 6.65 pH 767.30 Spec. Cond. 14.55 Temp

Field Filtered: Yes Filter Type: In-Line Disposable

Water Level: 9.41 feet below TOC Drawdown: 0.42 feet

Observations/Comments: (i.e., equipment malfunctions, contamination sources, sampling difficulties; duplicate sample)

- Field Meter: 210760

Form Completed By: Brett Gillihan **Date:** 11/1/2024

Field Data Sheet

Project Name:	BAL-24Q4	**Monitoring Point:**	PZ-174
Project Location:	Baldwin, Illinois	**Sample ID:**	041
W.O. Number (s):	24100001	**Date (s):**	10/15/2024

Field Team Members

Name: Tracy Carroll Affiliation: TekLab, Inc.

Name: Affiliation:

Weather Conditions

Temp: 52 °F Wind Direction: ☐ N ☑ S ☐ W ☐ E ☐ SE ☐ SW ☐ NE ☐ NW

Precipitation: ☑ None ☐ Light ☐ Heavy Sky: ☐ Clear ☐ Partly Cloudy ☐ Cloudy

Well Observations

		Locks	Yes	No
Well Pad	Good	Protective Casing	X	
Casing	Good	Well		X
Protective Casing	Good			
Reference Mark/Identification	Yes			

Groundwater Level Measurements

Date/Time Measured: 10/15/2024 12:08

Static Water Level: 13.29 feet below TOC

Total Depth: 27.84 feet below TOC

Water Column: 14.55 feet

Purging Activities

Purged By: TC Purge Date: 10/15/2024

Purge Method: Peristaltic Pump Well Diameter: 2"

Purge Volume Calculation (L): 14.55 ft. x 0.022 = 0.32 L x 3 Vol. = 0.96 L **Based on Low-Flow (3/8" discharge)*

Actual Purge Volume (L): 7.00 L

Physical appearance of purge water: Clear Odor: None Color: None

Purge Time	Cumulative Purge Vol.(L)	Purge Rate (mL/m)	pH (S.U.)	Specific Conductivity (µS/cm)	Temp (°C)	Dissolved Oxygen (mg/L)	ORP (mV)	Turbidity (NTU)	Other
12:08	0.0	219	purge start time						
12:16	1.7	↓	6.93	1,090.60	16.27	2.56	56.70	12.66	
12:19	2.4		6.94	1,086.80	16.31	2.33	60.20	13.78	
12:22	3.1		6.94	1,076.80	16.41	2.13	61.60	16.55	
12:25	3.7		6.95	1,071.50	16.49	1.92	61.70	17.68	
12:28	4.4		6.97	1,058.00	16.40	1.69	60.10	15.12	
12:31	5.0		6.98	1,040.20	16.50	1.41	57.40	10.33	
12:34	5.7		6.99	1,030.60	16.58	1.22	55.10	7.36	
12:37	6.3		6.99	1,026.70	16.61	1.10	53.30	5.95	
12:40	7.0		6.99	1,024.30	16.64	1.02	51.70	5.19	

Sampling Activities

Sampled By: TC Sample Date/Time: 10/15/2024 12:40

Sample Method: Low Flow Sample Equipment: Peristaltic Pump

Sample Parameters: 6.99 pH 1,024.30 Spec. Cond. 16.64 Temp

Field Filtered: Yes Filter Type: In-Line Disposable

Water Level: 13.85 feet below TOC Drawdown: 0.56 feet

Observations/Comments: (i.e., equipment malfunctions, contamination sources, sampling difficulties; duplicate sample)

- Field Meter: 46868

Form Completed By: Tracy Carroll **Date:** 10/15/2024

Field Data Sheet

Project Name:	BAL-24Q4	**Monitoring Point:**	PZ-176
Project Location:	Baldwin, Illinois	**Sample ID:**	042
W.O. Number (s):	24100001	**Date (s):**	10/15/2024

Field Team Members

Name: Tracy Carroll Affiliation: TekLab, Inc.

Name: Affiliation:

Weather Conditions

Temp: 53 °F Wind Direction: ☐ N ☑ S ☐ W ☐ E ☐ SE ☐ SW ☐ NE ☐ NW

Precipitation: ☑ None ☐ Light ☐ Heavy Sky: ☐ Clear ☐ Partly Cloudy ☐ Cloudy

Well Observations

		Locks	Yes	No
Well Pad	Good	Protective Casing	X	
Casing	Good	Well		X
Protective Casing	Good			
Reference Mark/Identification	Yes			

Groundwater Level Measurements

Date/Time Measured: 10/15/2024 13:03

Static Water Level: 13.33 feet below TOC

Total Depth: 31.43 feet below TOC

Water Column: 18.10 feet

Purging Activities

Purged By: TC Purge Date: 10/15/2024

Purge Method: Peristaltic Pump Well Diameter: 2"

Purge Volume Calculation (L): 18.1 ft. x 0.022 = 0.4 L x 3 Vol. = 1.2 L **Based on Low-Flow (3/8" discharge)*

Actual Purge Volume (L): 5.00 L

Physical appearance of purge water: Clear Odor: None Color: None

Purge Time	Cumulative Purge Vol.(L)	Purge Rate (mL/m)	pH (S.U.)	Specific Conductivity (µS/cm)	Temp (°C)	Dissolved Oxygen (mg/L)	ORP (mV)	Turbidity (NTU)	Other
13:04	0.0	167	purge start time						
13:13	1.5	↓	6.83	546.40	15.58	1.89	-217.90	4.09	
13:16	2.0		6.82	544.90	15.40	1.73	-196.00	3.84	
13:19	2.5		6.81	544.30	15.36	1.64	-180.60	3.20	
13:22	3.0		6.81	545.00	15.47	1.62	-168.10	2.82	
13:25	3.5		6.79	551.40	15.28	1.50	-152.00	2.08	
13:28	4.0		6.78	558.00	15.14	1.38	-140.90	1.43	
13:31	4.5		6.78	559.30	15.09	1.28	-134.20	1.71	
13:34	5.0		6.78	558.80	15.23	1.20	-125.30	1.43	

Sampling Activities

Sampled By: TC Sample Date/Time: 10/15/2024 13:34

Sample Method: Low Flow Sample Equipment: Peristaltic Pump

Sample Parameters: 6.78 pH 558.80 Spec. Cond. 15.23 Temp

Field Filtered: Yes Filter Type: In-Line Disposable

Water Level: 14.13 feet below TOC Drawdown: 0.80 feet

Observations/Comments: (i.e., equipment malfunctions, contamination sources, sampling difficulties; duplicate sample)

- Field Meter: 46868

Form Completed By: Tracy Carroll **Date:** 10/15/2024

Field Data Sheet

Project Name:	BAL-24Q4	**Monitoring Point:**	PZ-178
Project Location:	Baldwin, Illinois	**Sample ID:**	043
W.O. Number (s):	24100001	**Date (s):**	10/15/2024

Field Team Members

Name: Tracy Carroll Affiliation: TekLab, Inc.

Name: Affiliation:

Weather Conditions

Temp: 53 °F Wind Direction: ☐ N ☑ S ☐ W ☐ E ☐ SE ☐ SW ☐ NE ☐ NW

Precipitation: ☑ None ☐ Light ☐ Heavy Sky: ☐ Clear ☐ Partly Cloudy ☐ Cloudy

Well Observations

		Locks	Yes	No
Well Pad	Good	Protective Casing	X	
Casing	Good	Well		X
Protective Casing	Good			
Reference Mark/Identification	Yes			

Groundwater Level Measurements

Date/Time Measured: 10/15/2024 13:59

Static Water Level: 9.78 feet below TOC

Total Depth: 45.71 feet below TOC

Water Column: 35.93 feet

Purging Activities

Purged By: TC Purge Date: 10/15/2024

Purge Method: Peristaltic Pump Well Diameter: 2"

Purge Volume Calculation (L): 35.93 ft. x 0.022 = 0.79 L x 3 Vol. = 2.37 L **Based on Low-Flow (3/8" discharge)*

Actual Purge Volume (L): 5.00 L

Physical appearance of purge water: Clear Odor: None Color: None

Purge Time	Cumulative Purge Vol.(L)	Purge Rate (mL/m)	pH (S.U.)	Specific Conductivity (µS/cm)	Temp (°C)	Dissolved Oxygen (mg/L)	ORP (mV)	Turbidity (NTU)	Other
14:00	0.0	161	purge start time						
14:19	3.1	↓	6.79	584.90	16.06	1.18	-66.10	162.55	
14:22	3.5		6.79	583.40	15.79	1.11	-62.70	178.17	
14:25	4.0		6.79	583.10	15.64	0.99	-58.50	80.95	
14:28	4.5		6.80	580.20	16.12	0.96	-56.50	91.89	
14:31	5.0		6.80	583.10	16.19	0.93	-54.50	97.76	

Sampling Activities

Sampled By: TC Sample Date/Time: 10/15/2024 14:31

Sample Method: Low Flow Sample Equipment: Peristaltic Pump

Sample Parameters: 6.80 pH 583.10 Spec. Cond. 16.19 Temp

Field Filtered: Yes Filter Type: In-Line Disposable

Water Level: 16.21 feet below TOC Drawdown: 6.43 feet

Observations/Comments: (i.e., equipment malfunctions, contamination sources, sampling difficulties; duplicate sample)

- Field Meter: 46868

Form Completed By: Tracy Carroll **Date:** 10/15/2024

Field Data Sheet

Project Name:	BAL-24Q4	**Monitoring Point:**	PZ-178 Duplicate
Project Location:	Baldwin, Illinois	**Sample ID:**	051
W.O. Number (s):	24100001	**Date (s):**	10/15/2024

Field Team Members

Name: Tracy Carroll Affiliation: TekLab, Inc.

Name: Affiliation:

Weather Conditions

Temp: 53 °F Wind Direction: ☐ N ☑ S ☐ W ☐ E ☐ SE ☐ SW ☐ NE ☐ NW

Precipitation: ☑ None ☐ Light ☐ Heavy Sky: ☐ Clear ☐ Partly Cloudy ☐ Cloudy

Well Observations

		Locks	Yes	No
Well Pad	Good	Protective Casing	X	
Casing	Good	Well		X
Protective Casing	Good			
Reference Mark/Identification	Yes			

Groundwater Level Measurements

Date/Time Measured: 10/15/2024 13:59

Static Water Level: 9.78 feet below TOC

Total Depth: 45.71 feet below TOC

Water Column: 35.93 feet

Purging Activities

Purged By: TC Purge Date: 10/15/2024

Purge Method: Peristaltic Pump Well Diameter: 2"

Purge Volume Calculation (L): 35.93 ft. x 0.022 = 0.79 L x 3 Vol. = 2.37 L **Based on Low-Flow (3/8" discharge)*

Actual Purge Volume (L): 5.00 L

Physical appearance of purge water: Clear Odor: None Color: None

Purge Time	Cumulative Purge Vol.(L)	Purge Rate (mL/m)	pH (S.U.)	Specific Conductivity (µS/cm)	Temp (°C)	Dissolved Oxygen (mg/L)	ORP (mV)	Turbidity (NTU)	Other
14:00	0.0	161	purge start time						
14:19	3.1	↓	6.79	584.90	16.06	1.18	-66.10	162.55	
14:22	3.5		6.79	583.40	15.79	1.11	-62.70	178.17	
14:25	4.0		6.79	583.10	15.64	0.99	-58.50	80.95	
14:28	4.5		6.80	580.20	16.12	0.96	-56.50	91.89	
14:31	5.0		6.80	583.10	16.19	0.93	-54.50	97.76	

Sampling Activities

Sampled By: TC Sample Date/Time: 10/15/2024 14:31

Sample Method: Low Flow Sample Equipment: Peristaltic Pump

Sample Parameters: 6.80 pH 583.10 Spec. Cond. 16.19 Temp

Field Filtered: Yes Filter Type: In-Line Disposable

Water Level: 16.21 feet below TOC Drawdown: 6.43 feet

Observations/Comments: (i.e., equipment malfunctions, contamination sources, sampling difficulties; duplicate sample)

- Field Meter: 46868

Form Completed By: Tracy Carroll **Date:** 10/15/2024

Site Samping Event: BAL-24Q4
LIMS Workorder: 24100001
Technician(s): DC, JC, TC, BG

Field Calibration Log(s)
Baldwin- 4Q 2024

Field Temp SOP 1156 - SM 2550 B
Field pH SOP 1152 - SW-846 9040B - SM 4500-H B
Field Cond. SOP 1155 - SW-846 9050A - SM 2510 B

Field Meter ID: Pine 43918 Technician(s): justin colp Date: 10/14/2024

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	wc240612a	4.00	10/14/24 8:51
7.0 Buffer	wc240913b	7.00	10/14/24 8:46
10.0 Buffer	wc240625b	10.00	10/14/24 8:55
LCS/CCV (7.0 Buffer)	wc240913c		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	100029	1412	10/14/24 9:00

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1	0.31	10/14/24 9:00
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-1-JC	LCS	10/14/24 9:02	15.4	6.98	1,410	0.33		
CCV-1-JC	CCV	10/14/24 14:25	21.6	7.04	1,424	0.37		

Comments:

Field Meter ID: Pine 43918 Technician(s): justin colp Date: 10/15/2024

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	wc240612a	4.00	10/15/24 8:47
7.0 Buffer	wc240913b	7.00	10/15/24 8:41
10.0 Buffer	wc240625b	10.00	10/15/24 8:51
LCS/CCV (7.0 Buffer)	wc240913c		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	100029	1412	10/15/24 8:55

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1	0.41	10/15/24 8:55
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-2-JC	LCS	10/15/24 8:59	15.1	7.01	1,408	0.42		
CCV-2-JC	CCV	10/15/24 15:31	18.5	7.02	1,420	0.34		

Comments:

Site Samping Event: BAL-24Q4
LIMS Workorder: 24100001
Technician(s): DC, JC, TC, BG

Field Calibration Log(s)
Baldwin- 4Q 2024

Field Temp SOP 1156 - SM 2550 B
Field pH SOP 1152 - SW-846 9040B - SM 4500-H B
Field Cond. SOP 1155 - SW-846 9050A - SM 2510 B

Field Meter ID: Pine 43918 Technician(s): justin colp Date: 10/16/2024

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	wc240612a	4.00	10/16/24 8:40
7.0 Buffer	wc240913b	7.00	10/16/24 8:35
10.0 Buffer	wc240625b	10.00	10/16/24 8:44
LCS/CCV (7.0 Buffer)	wc240913c		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	100029	1412	10/16/24 8:51

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1	0.41	10/16/24 8:52
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-3-JC	LCS	10/16/24 8:58	7.3	7.03	1,414	0.45		
CCV-3-JC	CCV	10/16/24 15:05	16.3	7.03	1,425	0.47		

Comments:

Site Samping Event: BAL-24Q4
LIMS Workorder: 24100001
Technician(s): DC, JC, TC, BG

Field Calibration Log(s)
Baldwin- 4Q 2024

Field Temp SOP 1156 - SM 2550 B
Field pH SOP 1152 - SW-846 9040B - SM 4500-H B
Field Cond. SOP 1155 - SW-846 9050A - SM 2510 B

Field Meter ID: Pine 223357 Technician(s): Brett Gillihan Date: 10/17/2024

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	WC240612A	3.99	10/17/24 9:00
7.0 Buffer	WC240913B	7.00	10/17/24 8:58
10.0 Buffer	WC240625B	9.99	10/17/24 9:03
LCS/CCV (7.0 Buffer)	WC240913C		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	100029	1418	10/17/24 9:07

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1	1.8	10/17/24 9:10
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-1-BG	LCS	10/17/24 9:10	18.8	7.00	1,418	1.8		
CCV-1-BG	CCV	10/17/24 13:04	22.5	6.99	1,418	1.8		

Comments:

Site Samping Event: BAL-24Q4
LIMS Workorder: 24100001
Technician(s): DC, JC, TC, BG

Field Calibration Log(s)
Baldwin- 4Q 2024

Field Temp SOP 1156 - SM 2550 B
Field pH SOP 1152 - SW-846 9040B - SM 4500-H B
Field Cond. SOP 1155 - SW-846 9050A - SM 2510 B

Field Meter ID: Pine 46868 Technician(s): Tracy Carroll Date: 10/15/2024

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	WC240612A	4.00	10/15/24 9:40
7.0 Buffer	WC240913B	7.00	10/15/24 9:34
10.0 Buffer	WC240625B	10.00	10/15/24 9:45
LCS/CCV (7.0 Buffer)	WC240913C		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	100029	1412	10/15/24 9:56

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1		
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-1-TC	LCS	10/15/24 9:46	14.2	7.00	1,410	1.26		
CCV-1-TC	CCV	10/15/24 14:53	17.5	7.00	1,418	0.88		

Comments:

Field Meter ID: Pine 46868 Technician(s): Tracy Carroll Date: 10/16/2024

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	WC240612A	4.00	10/16/24 9:16
7.0 Buffer	WC240913B	7.00	10/16/24 9:10
10.0 Buffer	WC240625B	10.00	10/16/24 9:20
LCS/CCV (7.0 Buffer)	WC240913C		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	100029	1412	10/16/24 9:20

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1		
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-2-TC	LCS	10/16/24 9:20	9.2	7.08	1,418	0.88		
CCV-2-TC	CCV	10/16/24 15:04	19.7	7.09	1,422	0.99		

Comments:

Site Samping Event: BAL-24Q4
LIMS Workorder: 24100001
Technician(s): DC, JC, TC, BG

Field Calibration Log(s)
Baldwin- 4Q 2024

Field Temp SOP 1156 - SM 2550 B
Field pH SOP 1152 - SW-846 9040B - SM 4500-H B
Field Cond. SOP 1155 - SW-846 9050A - SM 2510 B

Field Meter ID: Pine 46868 Technician(s): Tracy Carroll Date: 10/17/2024

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	WC240612A	4.00	10/17/24 9:08
7.0 Buffer	WC240913B	7.00	10/17/24 9:06
10.0 Buffer	WC240625B	10.00	10/17/24 9:09
LCS/CCV (7.0 Buffer)	WC240913C		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	100029	1412	10/17/24 9:14

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1		
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-3-TC	LCS	10/17/24 9:16	9.3	7.06	1,413	1.02		
CCV-3-TC	CCV	10/17/24 15:04	15.6	7.08	1,444	0.99		

Comments:

Site Samping Event: BAL-24Q4
LIMS Workorder: 24100001
Technician(s): DC, JC, TC, BG

Field Calibration Log(s)
Baldwin- 4Q 2024

Field Temp SOP 1156 - SM 2550 B
Field pH SOP 1152 - SW-846 9040B - SM 4500-H B
Field Cond. SOP 1155 - SW-846 9050A - SM 2510 B

Field Meter ID: Pine 210760 Technician(s): Brett Gillihan Date: 11/1/2024

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	WC240612A	3.99	11/1/24 9:41
7.0 Buffer	WC240913B	7.00	11/1/24 9:40
10.0 Buffer	WC240625B	10.01	11/1/24 9:41
LCS/CCV (7.0 Buffer)	WC240913C		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	100029	1418	11/1/24 9:41

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1	1.6	11/1/24 9:41
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-1-BG-2	LCS	11/1/24 9:42	18.5	7.00	1,418	1.6		
CCV-1-BG-2	CCV	11/1/24 12:15	20	7.01	1,418	1.6		

Comments:

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC
797 Cromwell Park Dr.
Suite Q
Glen Burnie, MD 21061

Pine Environmental Services, Inc.

Instrument ID 43918
Description YSI Pro DSS
Calibrated 9/30/2024 12:11:47PM

Group # 5
Group Name Disolved Oxygen Span
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.0

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
100.0 / 100.0	%	100.0	%	96.6	100.0	0.00%	Pass

Test Instruments Used During the Calibration (As Of Cal Entry Date)

Test Standard ID	Description	Manufacturer	Model Number	Serial Number / Lot Number	Last Cal Date/ Opened Date	Next Cal Date / Expiration Date
MD COND 1.413 3GH1514	CA 1.413 COND (LOT# 4GB0749	GFS	31986	1.413 COND (LOT# 4GB0749		2/5/2025
MD ORP 240 4GE1370	MD ORP 240 4GE1370	AquaPhoenix Scientific	32001	4GE1370	6/24/2024	2/28/2025
MD PH10 2GI302	MD PH10 2GI302	AquaPhoenix Scientific	32034	2GI302		9/30/2024
MD PH4 3GI0465	MD PH4 3GI0465	AquaPhoenix Scientific	32017	3GI0465		9/30/2025
MD PH7 2GI0389	MD PH7 2GI0389	AquaPhoenix Scientific	32025	3GI0389	12/20/2024	9/30/2025
MD TURB 0 NTU 24007124	MD TURB 0 NTU 24007124	AMCOCLEAR	8483	24007124	2/1/2024	12/31/2024

Notes about this calibration

Calibration Result Calibration Successful
Who Calibrated Chuck Wallace

All instruments are calibrated by Pine Environmental Services LLC according to the manufacturer's specifications, but it is the customer's responsibility to calibrate and maintain this unit in accordance with the manufacturer's specifications and/or the customer's own specific needs.

Notify Pine Environmental Services LLC of any defect within 24 hours of receipt of equipment
Please call 800-301-9663 for Technical Assistance

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC
797 Cromwell Park Dr.
Suite Q
Glen Burnie, MD 21061

Pine Environmental Services, Inc.

Instrument ID 43918
Description YSI Pro DSS
Calibrated 9/30/2024 12:11:47PM

Manufacturer YSI
Model Number Pro DSS
Serial Number/ Lot Number 18K101874
Location Maryland
Department

State Certified
Status Pass
Temp °C 23
Humidity % 69

Calibration Specifications

Group # 1
Group Name PH
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
7.00 / 7.00	PH	7.00	PH	6.90	7.00	0.00%	Pass
4.00 / 4.00	PH	4.00	PH	3.94	4.00	0.00%	Pass
10.00 / 10.00	PH	10.00	PH	10.03	10.00	0.00%	Pass

Group # 2
Group Name Turbidity
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
0.00 / 0.00	FNU	0.00	FNU	0.70	0.00	0.00%	Pass
124.00 / 124.00	FNU	124.00	FNU	130.54	124.00	0.00%	Pass

Group # 3
Group Name Conductivity
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.000

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
1.413 / 1.413	ms/cm	1.413	ms/cm	1.323	1.413	0.00%	Pass

Group # 4
Group Name Redox (ORP)
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
240.00 / 240.00	mv	240.00	mv	247.60	240.00	0.00%	Pass

Group # 5
Group Name Disolved Oxygen Span
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.0

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC

92 North Main St, Building 20
Windsor, NJ 08561
Toll-free: (800) 301-9663

Pine Environmental Services, Inc.

Instrument ID 46868
Description YSI Pro DSS Sonde
Calibrated 9/26/2024 8:31:10AM

Group # 5
Group Name Dissolved Oxygen Span
Stated Accy Pct of Reading

Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
100.00 / 100.00	%	100.00	%	99.10	100.30	0.30%	Pass

Test Instruments Used During the Calibration (As Of Cal Entry Date)

Test Standard ID	Description	Manufacturer	Model Number	Serial Number / Lot Number	Last Cal Date/ Opened Date	Next Cal Date / Expiration Date
NJ COND 1413: 4GC1194	1413 conductivity standard	AquaPhoenix Scientific	CS1413	4GC1194	5/20/2024	3/31/2025
NJ ORP 240MV: 4GD1716	ORP solution 240mv	AquaPhoenix Scientific	ORP 240mV	4GD1716	5/30/2024	1/31/2025
NJ PH 10: 4GC0600	BUFFER, PH10 BLUE	AquaPhoenix Scientific	PH10	4GC0600	5/23/2024	3/31/2026
NJ PH 4: 4GC0528	BUFFER, PH4 RED	AquaPhoenix Scientific	BU5004	4GC0528	5/23/2024	3/31/2026
NJ PH 7: 4GC0526	BUFFER, PH7 YELLOW	AquaPhoenix Scientific	BU5007	4GC0526	5/20/2024	3/31/2026
NJ TURB 0.0 NTU: 24010121	0.0 NTU STANDARD	GFS	8483	24010121	5/15/2024	3/31/2025
NJ TURB 124 NTU LOT: 24011758	124 NTU STANDARD	GFS	8172	24011758	5/24/2024	5/31/2025

Notes about this calibration

Calibration Result Calibration Successful
Who Calibrated James Stelle

All instruments are calibrated by Pine Environmental Services LLC according to the manufacturer's specifications, but it is the customer's responsibility to calibrate and maintain this unit in accordance with the manufacturer's specifications and/or the customer's own specific needs.

Notify Pine Environmental Services LLC of any defect within 24 hours of receipt of equipment
Please call 800-301-9663 for Technical Assistance

Pine Environmental Services LLC

92 North Main St, Building 20
Windsor, NJ 08561
Toll-free: (800) 301-9663

Pine Environmental Services, Inc.

Instrument ID 46868
Description YSI Pro DSS Sonde
Calibrated 9/26/2024 8:31:10AM

Manufacturer YSI
Model Number Pro DSS
Serial Number/ Lot Number 19K103392
Location New Jersey
Department

State Certified
Status Pass
Temp °C 22.5
Humidity % 62

Calibration Specifications

Group # 1
Group Name PH
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
7.00 / 7.00	PH	7.00	PH	7.11	7.02	0.29%	Pass
4.00 / 4.00	PH	4.00	PH	4.09	4.00	0.00%	Pass
10.00 / 10.00	PH	10.00	PH	9.84	10.03	0.30%	Pass

Group # 2
Group Name Turbidity (NTU)
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
0.00 / 0.00	NTU	0.00	NTU	4.20	0.00	0.00%	Pass
124.00 / 124.00	NTU	124.00	NTU	117.70	124.00	0.00%	Pass

Group # 3
Group Name Conductivity
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.000

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
1.413 / 1.413	ms/cm	1.413	ms/cm	1.453	1.413	0.00%	Pass

Group # 4
Group Name Redox (ORP)
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
240.00 / 240.00	mv	240.00	mv	235.80	240.00	0.00%	Pass

Group # 5
Group Name Dissolved Oxygen Span
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC

11669 Lilburn Park Rd.
St. Louis, MO 63146
Office: 314.344.1079

Pine Environmental Services, Inc.

Instrument ID 210760
Description YSI Pro DSS Sonde
Calibrated 10/24/2024 5:28:01PM

Manufacturer YSI
Model Number Pro DSS
Serial Number/ Lot Number 22C103125
Location St. Louis
Department

State Certified
Status Pass
Temp °C 22.2
Humidity % 43

Calibration Specifications

Group # 1
Group Name PH
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
7.00 / 7.00	PH	7.00	PH	7.20	7.00	0.00%	Pass
4.00 / 4.00	PH	4.00	PH	4.14	4.00	0.00%	Pass
10.00 / 10.00	PH	10.00	PH	10.10	10.00	0.00%	Pass

Group # 2
Group Name Turbidity
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
0.00 / 0.00	NTU	0.00	NTU	0.16	0.00	0.00%	Pass
124.00 / 124.00	NTU	124.00	NTU	135.47	124.00	0.00%	Pass

Group # 3
Group Name Conductivity
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.000

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
1.413 / 1.413	ms/cm	1.413	ms/cm	1.484	1.413	0.00%	Pass

Group # 4
Group Name Redox (ORP)
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
240.00 / 240.00	mv	240.00	mv	235.60	240.00	0.00%	Pass

Group # 5
Group Name Dissolved Oxygen Span
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC
11669 Lilburn Park Rd.
St. Louis, MO 63146
Office: 314.344.1079

Pine Environmental Services, Inc.

Instrument ID 210760
Description YSI Pro DSS Sonde
Calibrated 10/24/2024 5:28:01PM

Group # 5
Group Name Dissolved Oxygen Span
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
100.00 / 100.00	%	100.00	%	98.90	100.00	0.00%	Pass

Test Instruments Used During the Calibration (As Of Cal Entry Date)

Test Standard ID	Description	Manufacturer	Model Number	Serial Number / Lot Number	Last Cal Date/ Opened Date	Next Cal Date / Expiration Date
STL 1413 COND L#4GB0749	STL 1413 COND L#4GB0749	AquaPhoenix Scientific	31986	4GB0749		2/25/2025
STL ORP SOLUTION 240MV L#4GG0438	STL ORP SOLUTION 240MV L#4GG0438	AquaPhoenix Scientific	ORP Solution	4GG0438		4/25/2025
STL PH10 #4GB0253	STL PH10 #4GB0253	Absolute Accuracy	PH 10	4GB0253		2/25/2026
STL PH4 L#4GB0637	STL pH4 L#4GB0637	AquaPhoenix Scientific	pH 4	4GB0637		2/25/2026
STL PH7 L#4GG1129	STL PH7 L#4GG1129	AquaPhoenix Scientific	PH7	4GG1129		7/25/2026

Notes about this calibration

Calibration Result Calibration Successful
Who Calibrated Austin Carter

All instruments are calibrated by Pine Environmental Services LLC according to the manufacturer's specifications, but it is the customer's responsibility to calibrate and maintain this unit in accordance with the manufacturer's specifications and/or the customer's own specific needs.

Notify Pine Environmental Services LLC of any defect within 24 hours of receipt of equipment
Please call 800-301-9663 for Technical Assistance

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC

10521 Research Drive
Suite 102
Knoxville, TN 37932
Toll-free: (865) 777-1418

Pine Environmental Services, Inc.

Instrument ID 223357
Description YSI Pro DSS Sonde
Calibrated 9/26/2024 10:44:47AM

Group # 5
Group Name Dissolved Oxygen Span
Stated Accy Pct of Reading

Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
100.00 / 100.00	%	100.00	%	99.10	100.00	0.00%	Pass

Test Instruments Used During the Calibration (As Of Cal Entry Date)

Test Standard ID	Description	Manufacturer	Model Number	Serial Number / Lot Number	Last Cal Date/ Opened Date	Next Cal Date / Expiration Date
TN 1.413 3GL1056	TN 1.413 3GL1056	AquaPhoenix Scientific	31986	3GL1056		12/21/2024
TN 126 TURB NTU	TN TURB 126 NTU	YSI	607300	24G24012705		7/30/2025
TN AUTOCAL 24010121	TN AUTOCAL 24010121	GFS	8483	24010121		4/29/2025
TN ORP 4GD1716	TN ORP 4GD1716	AquaPhoenix Scientific	32001	4GD1716		1/1/2025
TN PH10 2GJ290	TN PH10 2GJ290	AquaPhoenix Scientific	32034	2GJ290		10/21/2024
TN PH4 3GL0108	TN PH4 3GL0108	AquaPhoenix Scientific	32017	3GL0108		12/21/2024
TN PH7 4GA0071	TN PH7 4GA0071	AquaPhoenix Scientific	32025	4GA0071		1/25/2025

Notes about this calibration

Calibration Result Calibration Successful
Who Calibrated Justin C. Moore

All instruments are calibrated by Pine Environmental Services LLC according to the manufacturer's specifications, but it is the customer's responsibility to calibrate and maintain this unit in accordance with the manufacturer's specifications and/or the customer's own specific needs.

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Please call 800-301-9663 for Technical Assistance

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC
10521 Research Drive
Suite 102
Knoxville, TN 37932
Toll-free: (865) 777-1418

Pine Environmental Services, Inc.

Instrument ID 223357
Description YSI Pro DSS Sonde
Calibrated 9/26/2024 10:44:47AM

Manufacturer YSI
Model Number Pro DSS
Serial Number/ Lot Number 24b105093
Location Tennessee
Department

State Certified
Status Pass
Temp °C 73
Humidity % 64

Calibration Specifications

Group # 1
Group Name PH
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
7.00 / 7.00	PH	7.00	PH	6.99	7.00	0.00%	Pass
4.00 / 4.00	PH	4.00	PH	4.12	4.00	0.00%	Pass
10.00 / 10.00	PH	10.00	PH	9.97	10.00	0.00%	Pass

Group # 2
Group Name Turbidity
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
0.00 / 0.00	NTU	0.00	NTU	0.81	0.00	0.00%	Pass
124.00 / 124.00	NTU	124.00	NTU	119.56	124.00	0.00%	Pass

Group # 3
Group Name Conductivity
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.000

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
1.413 / 1.413	ms/cm	1.413	ms/cm	1.421	1.413	0.00%	Pass

Group # 4
Group Name Redox (ORP)
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
240.00 / 240.00	mv	240.00	mv	217.50	240.00	0.00%	Pass

Group # 5
Group Name Dissolved Oxygen Span
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Field Data Sheet

Project Name:	BAL-25Q1	**Monitoring Point:**	MW-196
Project Location:	Baldwin, IL	**Sample ID:**	011
W.O. Number (s):	25010181	**Date (s):**	1/27/2025

Field Team Members

Name: Justin Colp — Affiliation: TekLab, Inc.

Name: Payton Yoch — Affiliation: TekLab, Inc.

Weather Conditions

Temp: 30 °F — Wind Direction: ☐ N ☐ S ☑ E ☐ EW ☐ SW ☐ NE ☐ NW

Precipitation: ☑ None ☐ Light ☐ Heavy — Sky: ☑ Clear ☐ Partly Cloudy ☐ Cloudy

Well Observations

Well Pad	Good
Casing	Good
Protective Casing	Good
Reference Mark/Identification	Yes

Locks	Yes	No
Protective Casing	X	
Well		X

Groundwater Level Measurements

Date/Time Measured: 1/27/2025 10:12

Static Water Level: 6.42 feet below TOC

Total Depth: 21.25 feet below TOC

Water Column: 14.83 feet

Purging Activities

Purged By: JC — Purge Date: 1/27/2025

Purge Method: Peristaltic Pump — Well Diameter: 2"

Purge Volume Calculation (L): 14.83 ft. x 0.022 = 0.33 L x 3 Vol. = 0.99 L **Based on Low-Flow (3/8" discharge)*

Actual Purge Volume (L): 3.00 L

Physical appearance of purge water: Slightly cloudy — Odor: None — Color: none

Purge Time	Cumulative Purge Vol.(L)	Purge Rate (mL/m)	pH (S.U.)	Specific Conductivity (µS/cm)	Temp (°C)	Dissolved Oxygen (mg/L)	ORP (mV)	Turbidity (NTU)	Other
10:12	0.0	214	purge start time						
10:17	1.1	↓	6.98	2,049.00	11.74	3.66	89.80	43.69	
10:20	1.7		6.99	2,052.30	12.04	3.58	88.20	36.31	
10:23	2.4		6.99	2,051.60	11.82	3.58	86.90	38.03	
10:26	3.0		6.99	2,044.60	11.78	3.55	85.80	37.87	

Sampling Activities

Sampled By: JC — Sample Date/Time: 1/27/2025 10:26

Sample Method: Low Flow — Sample Equipment: Peristaltic Pump

Sample Parameters: 6.99 pH — 2,044.60 Spec. Cond. — 11.78 Temp

Field Filtered: Yes — Filter Type: Inline Disposable

Water Level: 9.41 feet below TOC — Drawdown: 2.99 feet

Observations/Comments: (i.e., equipment malfunctions, contamination sources, sampling difficulties; duplicate sample)

- Field Meter: 44954

Form Completed By: Justin Colp — **Date:** 1/27/2025

Field Data Sheet

Project Name:	BAL-25Q1	**Monitoring Point:**	MW-197
Project Location:	Baldwin, IL	**Sample ID:**	012
W.O. Number (s):	25010181	**Date (s):**	1/27/2025

Field Team Members

Name: Justin Colp Affiliation: TekLab, Inc.

Name: Affiliation:

Weather Conditions

Temp: 30 °F Wind Direction: ☐ N ☐ S ☑ E ☐ EW ☐ SW ☐ NE ☐ NW

Precipitation: ☑ None ☐ Light ☐ Heavy Sky: ☑ Clear ☐ Partly Cloudy ☐ Cloudy

Well Observations

			Yes	No
Well Pad	Good	**Locks**		
Casing	Good	Protective Casing		X
Protective Casing	Good	Well		X
Reference Mark/Identification	Yes			

Groundwater Level Measurements

Date/Time Measured: 1/27/2025 10:39

Static Water Level: 4.92 feet below TOC

Total Depth: 20.66 feet below TOC

Water Column: 15.74 feet

Purging Activities

Purged By: JC Purge Date: 1/27/2025

Purge Method: Peristaltic Pump Well Diameter: 2"

Purge Volume Calculation (L): 15.74 ft. x 0.022 = 0.35 L x 3 Vol. = 1.05 L **Based on Low-Flow (3/8" discharge)*

Actual Purge Volume (L): 2.50 L

Physical appearance of purge water: Clear Odor: None Color: none

Purge Time	Cumulative Purge Vol.(L)	Purge Rate (mL/m)	pH (S.U.)	Specific Conductivity (µS/cm)	Temp (°C)	Dissolved Oxygen (mg/L)	ORP (mV)	Turbidity (NTU)	Other
10:39	0.0	167	purge start time						
10:45	1.0	↓	6.95	1,551.20	8.88	5.08	92.00	7.95	
10:48	1.5		6.94	1,550.10	9.16	4.94	92.20	7.25	
10:51	2.0		6.94	1,545.50	8.96	4.90	92.30	9.73	
10:54	2.5		6.95	1,538.50	8.90	4.85	91.90	11.69	

Sampling Activities

Sampled By: JC Sample Date/Time: 1/27/2025 10:54

Sample Method: Low Flow Sample Equipment: Peristaltic Pump

Sample Parameters: 6.95 pH 1,538.50 Spec. Cond. 8.90 Temp

Field Filtered: Yes Filter Type: Inline Disposable

Water Level: 8.98 feet below TOC Drawdown: 4.06 feet

Observations/Comments: (i.e., equipment malfunctions, contamination sources, sampling difficulties; duplicate sample)

- Field Meter: 44954

Form Completed By: Justin Colp **Date:** 1/27/2025

Field Data Sheet

Project Name:	BAL-25Q1	**Monitoring Point:**	MW-198
Project Location:	Baldwin, IL	**Sample ID:**	013
W.O. Number (s):	25010181	**Date (s):**	1/27/2025

Field Team Members

Name: Justin Colp — Affiliation: TekLab, Inc.

Name: — Affiliation:

Weather Conditions

Temp: 28 °F — Wind Direction: ☐ N ☐ S ☑ E ☐ EW ☐ SW ☐ NE ☐ NW

Precipitation: ☑ None ☐ Light ☐ Heavy — Sky: ☑ Clear ☐ Partly Cloudy ☐ Cloudy

Well Observations

			Yes	No
Well Pad	Good	**Locks**		
Casing	Good	Protective Casing		X
Protective Casing	Good	Well		X
Reference Mark/Identification	Yes			

Groundwater Level Measurements

Date/Time Measured: 1/27/2025 9:32

Static Water Level: 7.12 feet below TOC

Total Depth: 20.71 feet below TOC

Water Column: 13.59 feet

Purging Activities

Purged By: JC — Purge Date: 1/27/2025

Purge Method: Peristaltic Pump — Well Diameter: 2"

Purge Volume Calculation (L): 13.59 ft. x 0.022 = 0.3 L x 3 Vol. = 0.9 L **Based on Low-Flow (3/8" discharge)*

Actual Purge Volume (L): 3.00 L

Physical appearance of purge water: Cloudy — Odor: None — Color: orange

Purge Time	Cumulative Purge Vol.(L)	Purge Rate (mL/m)	pH (S.U.)	Specific Conductivity (µS/cm)	Temp (°C)	Dissolved Oxygen (mg/L)	ORP (mV)	Turbidity (NTU)	Other
9:36	0.0	200	purge start time						
9:39	0.6	↓	6.50	1,699.90	10.98	2.24	96.60	19.94	
9:42	1.2		6.56	1,617.90	10.93	1.80	91.50	22.16	
9:45	1.8		6.56	1,582.50	10.82	1.64	89.70	20.92	
9:48	2.4		6.56	1,558.00	10.74	1.57	88.00	19.30	
9:51	3.0		6.56	1,535.20	10.73	1.54	87.10	17.52	

Sampling Activities

Sampled By: JC — Sample Date/Time: 1/27/2025 9:51

Sample Method: Low Flow — Sample Equipment: Peristaltic Pump

Sample Parameters: 6.56 pH — 1,535.20 Spec. Cond. — 10.73 Temp

Field Filtered: Yes — Filter Type: Inline Disposable

Water Level: 10.82 feet below TOC — Drawdown: 3.70 feet

Observations/Comments: (i.e., equipment malfunctions, contamination sources, sampling difficulties; duplicate sample)

- Field Meter: 44954

Form Completed By: Justin Colp — **Date:** 1/27/2025

Field Data Sheet

Project Name: BAL-25Q1
Project Location: Baldwin, IL
W.O. Number (s): 25010181

Monitoring Point: MW-198 Duplicate
Sample ID: 047
Date (s): 1/27/2025

Field Team Members

Name: Justin Colp Affiliation: TekLab, Inc.
Name: Affiliation:

Weather Conditions

Temp: 28 °F Wind Direction: ☐ N ☐ S ☑ E ☐ EW ☐ SW ☐ NE ☐ NW

Precipitation: ☑ None ☐ Light ☐ Heavy Sky: ☑ Clear ☐ Partly Cloudy ☐ Cloudy

Well Observations

Well Pad	Good
Casing	Good
Protective Casing	Good
Reference Mark/Identification	Yes

Locks	Yes	No
Protective Casing	X	
Well		X

Groundwater Level Measurements

Date/Time Measured: 1/27/2025 9:32

Static Water Level: 7.12 feet below TOC
Total Depth: 20.71 feet below TOC
Water Column: 13.59 feet

Purging Activities

Purged By: JC Purge Date: 1/27/2025
Purge Method: Peristaltic Pump Well Diameter: 2"
Purge Volume Calculation (L): 13.59 ft. x 0.022 = 0.3 L x 3 Vol. = 0.9 L **Based on Low-Flow (3/8" discharge)*
Actual Purge Volume (L): 3.00 L
Physical appearance of purge water: Cloudy Odor: None Color: orange

Purge Time	Cumulative Purge Vol.(L)	Purge Rate (mL/m)	pH (S.U.)	Specific Conductivity (µS/cm)	Temp (°C)	Dissolved Oxygen (mg/L)	ORP (mV)	Turbidity (NTU)	Other
9:36	0.0	200	purge start time						
9:39	0.6	↓	6.50	1,699.90	10.98	2.24	96.60	19.94	
9:42	1.2		6.56	1,617.90	10.93	1.80	91.50	22.16	
9:45	1.8		6.56	1,582.50	10.82	1.64	89.70	20.92	
9:48	2.4		6.56	1,558.00	10.74	1.57	88.00	19.30	
9:51	3.0		6.56	1,535.20	10.73	1.54	87.10	17.52	

Sampling Activities

Sampled By: JC Sample Date/Time: 1/27/2025 9:51
Sample Method: Low Flow Sample Equipment: Peristaltic Pump
Sample Parameters: 6.56 pH 1,535.20 Spec. Cond. 10.73 Temp
Field Filtered: Yes Filter Type: Inline Disposable
Water Level: 10.82 feet below TOC Drawdown: 3.70 feet

Observations/Comments: (i.e., equipment malfunctions, contamination sources, sampling difficulties; duplicate sample)

- Field Meter: 44954

Form Completed By: Justin Colp **Date:** 1/27/2025

Site Samping Event: BAL- 25Q1
LIMS Workorder: 25010181
Technician(s): DC, JC, TC, BG, PY

Field Calibration Log(s)
Baldwin- 1Q 2025

Field Temp SOP 1156 - SM 2550 B
Field pH SOP 1152 - SW-846 9040B - SM 4500-H B
Field Cond. SOP 1155 - SW-846 9050A - SM 2510 B

Field Meter ID: Pine 44954 Technician(s): justin colp Date: 1/22/2025

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	wc240612a	4.00	1/22/25 8:24
7.0 Buffer	wc240913b	7.00	1/22/25 8:21
10.0 Buffer	wc240625b	10.00	1/22/25 8:27
LCS/CCV (7.0 Buffer)	wc240913c		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	102040	1410	1/22/25 8:33

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1	0.61	1/22/25 8:34
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-1-JC	LCS	1/22/25 8:36	19.3	6.97	1,407	0.61		
CCV-1-JC	CCV	1/22/25 14:59	19.8	7.04	1,425	0.36		

Comments:

Field Meter ID: Pine 44954 Technician(s): justin colp Date: 1/23/2025

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	wc240612a	4.00	1/23/25 8:19
7.0 Buffer	wc240913b	7.00	1/23/25 8:16
10.0 Buffer	wc240625b	10.00	1/23/25 8:25
LCS/CCV (7.0 Buffer)	wc240913c		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	102040	1413	1/23/25 8:32

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1	0.6	1/23/25 8:32
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-2-JC	LCS	1/23/25 8:34	19.8	7.01	1,413	0.64		
CCV-M-2-JC	CCV	1/23/25 11:59	19.7	7.03	1,422	0.77		
CCV-2-JC	CCV	1/23/25 14:38	19.6	7.06	1,441	0.7		

Comments:

Site Samping Event: BAL- 25Q1
LIMS Workorder: 25010181
Technician(s): DC, JC, TC, BG, PY

Field Calibration Log(s)
Baldwin- 1Q 2025

Field Temp SOP 1156 - SM 2550 B
Field pH SOP 1152 - SW-846 9040B - SM 4500-H B
Field Cond. SOP 1155 - SW-846 9050A - SM 2510 B

Field Meter ID: Pine 44954 Technician(s): justin colp Date: 1/27/2025

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	wc240612a	4.00	1/27/25 8:58
7.0 Buffer	wc240913b	7.00	1/27/25 8:55
10.0 Buffer	wc240625b	10.00	1/27/25 9:01
LCS/CCV (7.0 Buffer)	wc240913c		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	102040	1412	1/27/25 9:04

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1	0.61	1/27/25 9:07
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-3-JC	LCS	1/27/25 9:10	18.8	7.01	1,414	0.63		
CCV-3-JC	CCV	1/27/25 13:00	19	7.04	1,420	0.68		

Comments:

Site Samping Event: BAL- 25Q1
LIMS Workorder: 25010181
Technician(s): DC, JC, TC, BG, PY

Field Calibration Log(s)
Baldwin- 1Q 2025

Field Temp SOP 1156 - SM 2550 B
Field pH SOP 1152 - SW-846 9040B - SM 4500-H B
Field Cond. SOP 1155 - SW-846 9050A - SM 2510 B

Field Meter ID: Pine 210769 Technician(s): Tracy Carroll Date: 1/22/2025

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	WC240612A	4.01	1/22/25 12:19
7.0 Buffer	WC241913B	7.00	1/22/25 12:16
10.0 Buffer	WC240625B	10.02	1/22/25 12:22
LCS/CCV (7.0 Buffer)	WC240913C		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	102040	1412	1/22/25 12:25

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1	1.39	1/22/25 12:28
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-1-TC	LCS	1/22/25 12:30	19	7.06	1,413	1.45		
CCV-1-TC	CCV	1/22/25 15:12	18.9	7.08	1,428	1.88		

Comments:

Field Meter ID: Pine 210769 Technician(s): Tracy Carroll Date: 1/24/2025

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	WC240612A	4.00	1/24/25 9:47
7.0 Buffer	WC241913B	7.00	1/24/25 9:44
10.0 Buffer	WC240625B	10.00	1/24/25 10:12
LCS/CCV (7.0 Buffer)	WC240913C		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	102040	1412	1/24/25 10:18

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1	1.66	1/24/25 10:19
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-2-TC	LCS	1/24/25 10:19	19.4	7.03	1,412	1.88		
CCV-2-TC	CCV	1/24/25 12:22	19.6	7.04	1,419	1.46		

Comments:

Site Samping Event: BAL- 25Q1
LIMS Workorder: 25010181
Technician(s): DC, JC, TC, BG, PY

Field Calibration Log(s)
Baldwin- 1Q 2025

Field Temp SOP 1156 - SM 2550 B
Field pH SOP 1152 - SW-846 9040B - SM 4500-H B
Field Cond. SOP 1155 - SW-846 9050A - SM 2510 B

Field Meter ID: Pine 210769 Technician(s): Tracy Carroll Date: 1/27/2025

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	WC240612A	4.00	1/27/25 9:22
7.0 Buffer	WC241913B	7.02	1/27/25 9:21
10.0 Buffer	WC240625B	10.00	1/27/25 9:26
LCS/CCV (7.0 Buffer)	WC240913C		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	102040	1412	1/27/25 9:29

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1		
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-3-TC	LCS	1/27/25 9:30	20.1	7.07	1,410	1.12		
CCV-3-TC	CCV	1/27/25 12:35	20.1	7.04	1,408	1.66		

Comments:

Site Samping Event: BAL- 25Q1
LIMS Workorder: 25010181
Technician(s): DC, JC, TC, BG, PY

Field Calibration Log(s)
Baldwin- 1Q 2025

Field Temp SOP 1156 - SM 2550 B
Field pH SOP 1152 - SW-846 9040B - SM 4500-H B
Field Cond. SOP 1155 - SW-846 9050A - SM 2510 B

Field Meter ID: Pine 46868 Technician(s): Brett Gillihan Date: 1/22/2024

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	WC240612A	3.99	1/22/25 12:46
7.0 Buffer	WC240913B	7.03	1/22/25 12:44
10.0 Buffer	WC240913C	10.02	1/22/25 12:50
LCS/CCV (7.0 Buffer)	WC240913C		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	102040	1421	1/22/25 12:54

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1	1.1	1/22/25 12:57
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-1-BG	LCS	1/22/25 12:59	18.7	7.03	1,421	1.13		
CCV-1-BG	CCV	1/22/25 15:04	19.3	7.02	1,421	1.22		

Comments:

Field Meter ID: Pine 46868 Technician(s): Brett Gillihan Date: 1/23/2025

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	WC240612A	3.97	1/23/25 8:30
7.0 Buffer	WC240913A	6.99	1/23/25 8:28
10.0 Buffer	WC240913A	10.00	1/23/25 8:33
LCS/CCV (7.0 Buffer)	WC240913C		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	102040	1420	1/23/25 8:35

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1	0.96	1/23/25 8:36
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-2-BG	LCS	1/23/25 8:38	18.3	7.00	1,420	0.84		
CCV-2-BG	CCV	1/23/25 14:32	19.6	7.00	1,420	1.01		

Comments:

Site Samping Event: BAL- 25Q1
LIMS Workorder: 25010181
Technician(s): DC, JC, TC, BG, PY

Field Calibration Log(s)
Baldwin- 1Q 2025

Field Temp SOP 1156 - SM 2550 B
Field pH SOP 1152 - SW-846 9040B - SM 4500-H B
Field Cond. SOP 1155 - SW-846 9050A - SM 2510 B

Field Meter ID: Pine 46868 Technician(s): Brett Gillihan Date: 1/27/2025

pH Standards	LIMS ID	Calibration reading	Date/Time
4.0 Buffer	WC240612A	3.99	1/27/25 8:46
7.0 Buffer	WC240913A	7.00	1/27/25 8:41
10.0 Buffer	WC240913A	10.02	1/27/25 8:48
LCS/CCV (7.0 Buffer)	WC240913C		

Conductivity Standard	LIMS ID	Reading	Date/Time
1,412 µS Std.	102040	1419	1/27/25 8:53

Turbidity Standard	LIMS ID	Reading	Date/Time
0 NTU (DI Water)	1	0.78	1/27/25 8:55
124 NTU	95834		

ORP Standard	LIMS ID/Lot#	Reading	Date/Time

D.O. Saturation	LIMS ID/Lot#	Reading	Date/Time
100%	N/A		

Sample ID	Sample Type	Date/Time	Temp. °C	pH S.U.	Conductivity µS	Turbidity NTU	ORP mV	D.O. %
LCS-3-BG	LCS	1/27/25 8:58	17.9	7.00	1,419	1.68		
CCV-M-3-BG	CCV	1/27/25 11:12	18.1	7.01	1,422	1.23		
CCV-3-BG	CCV	1/27/25 14:34	18.5	7.01	1,426	1.44		

Comments:

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC

11669 Lilburn Park Rd.
St. Louis, MO 63146
Office: 314.344.1079

Pine Environmental Services, Inc.

Instrument ID 44954
Description YSI Pro DSS Sonde
Calibrated 12/27/2024 7:06:37PM

Manufacturer YSI
Model Number Pro DSS
Serial Number/ Lot Number 18L101938
Location St. Louis
Department

State Certified
Status Pass
Temp °C 22.2
Humidity % 43

Calibration Specifications

Group # 1
Group Name PH
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
7.00 / 7.00	PH	7.00	PH	7.00	7.02	0.29%	Pass
4.00 / 4.00	PH	4.00	PH	4.20	4.00	0.00%	Pass
10.00 / 10.00	PH	10.00	PH	9.91	10.04	0.40%	Pass

Group # 2
Group Name Turbidity
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
0.00 / 0.00	NTU	0.00	NTU	0.51	0.00	0.00%	Pass
124.00 / 124.00	NTU	124.00	NTU	107.87	124.00	0.00%	Pass

Group # 3
Group Name Conductivity
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.000

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
1.413 / 1.413	ms/cm	1.413	ms/cm	1.592	1.413	0.00%	Pass

Group # 4
Group Name Redox (ORP)
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
240.00 / 240.00	mv	240.00	mv	245.30	240.00	0.00%	Pass

Group # 5
Group Name Dissolved Oxygen Span
Stated Accy Pct of Reading Range
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC

11669 Lilburn Park Rd.
St. Louis, MO 63146
Office: 314.344.1079

Pine Environmental Services, Inc.

Instrument ID 44954
Description YSI Pro DSS Sonde
Calibrated 12/27/2024 7:06:37PM

Group # 5
Group Name Dissolved Oxygen Span
Stated Accy Pct of Reading Range

Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
100.00 / 100.00	%Volume	100.00	%Volume	92.70	99.60	-0.40%	Pass

Test Instruments Used During the Calibration **(As Of Cal Entry Date)**

Test Standard ID	Description	Manufacturer	Model Number	Serial Number / Lot Number	Last Cal Date/ Opened Date	Next Cal Date / Expiration Date
STL 126 NTU L#24G24012705	STL 126 NTU L#24G24012705	YSI	126 NTU	24G24012705		7/25/2025
STL 1413 COND L#4GG1360	STL 1413 COND L#4GG1360	AquaPhoenix Scientific	31986	4GG1360		7/25/2025
STL AUTOCAL LOT#24014218	Auto Cal Solution 0 NTU/PH 4	GFS	8483	24014218		9/25/2025
STL ORP SOLUTION 240MV L#4GG0438	STL ORP SOLUTION 240MV L#4GG0438	AquaPhoenix Scientific	ORP Solution	4GG0438		4/25/2025
STL PH10 #4GB0253	STL PH10 #4GB0253	Absolute Accuracy	PH 10	4GB0253		2/25/2026
STL PH4 L#4GG0029	STL pH4 L#4GG0029	AquaPhoenix Scientific	pH 4	4GG0029		7/25/2026
STL PH7 L#4GG1129	STL PH7 L#4GG1129	AquaPhoenix Scientific	PH7	4GG1129		7/25/2026

Notes about this calibration

Calibration Result Calibration Successful
Who Calibrated Chris Harkins

All instruments are calibrated by Pine Environmental Services LLC according to the manufacturer's specifications, but it is the customer's responsibility to calibrate and maintain this unit in accordance with the manufacturer's specifications and/or the customer's own specific needs.

Notify Pine Environmental Services LLC of any defect within 24 hours of receipt of equipment
Please call 800-301-9663 for Technical Assistance

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC

11669 Lilburn Park Rd.
St. Louis, MO 63146
Office: 314.344.1079

Pine Environmental Services, Inc.

Instrument ID 46868
Description YSI Pro DSS Sonde
Calibrated 12/27/2024 7:01:15PM

Manufacturer YSI
Model Number Pro DSS
Serial Number/ Lot Number 19K103392
Location St. Louis
Department

State Certified
Status Pass
Temp °C 22.2
Humidity % 43

Calibration Specifications

Group # 1
Group Name PH
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
7.00 / 7.00	PH	7.00	PH	7.20	7.02	0.29%	Pass
4.00 / 4.00	PH	4.00	PH	4.41	4.00	0.00%	Pass
10.00 / 10.00	PH	10.00	PH	9.99	10.04	0.40%	Pass

Group # 2
Group Name Turbidity (NTU)
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
0.00 / 0.00	NTU	0.00	NTU	0.50	0.00	0.00%	Pass
124.00 / 124.00	NTU	124.00	NTU	97.41	124.00	0.00%	Pass

Group # 3
Group Name Conductivity
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.000

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
1.413 / 1.413	ms/cm	1.413	ms/cm	1.048	1.413	0.00%	Pass

Group # 4
Group Name Redox (ORP)
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
240.00 / 240.00	mv	240.00	mv	234.90	240.00	0.00%	Pass

Group # 5
Group Name Dissolved Oxygen Span
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC

11669 Lilburn Park Rd.
St. Louis, MO 63146
Office: 314.344.1079

Pine Environmental Services, Inc.

Instrument ID 46868
Description YSI Pro DSS Sonde
Calibrated 12/27/2024 7:01:15PM

Group # 5
Group Name Dissolved Oxygen Span
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
100.00 / 100.00	%	100.00	%	88.10	99.60	-0.40%	Pass

Test Instruments Used During the Calibration (As Of Cal Entry Date)

Test Standard ID	Description	Manufacturer	Model Number	Serial Number / Lot Number	Last Cal Date/ Opened Date	Next Cal Date / Expiration Date
STL 126 NTU L#24G24012705	STL 126 NTU L#24G24012705	YSI	126 NTU	24G24012705		7/25/2025
STL 1413 COND L#4GG1360	STL 1413 COND L#4GG1360	AquaPhoenix Scientific	31986	4GG1360		7/25/2025
STL AUTOCAL LOT#24014218	Auto Cal Solution 0 NTU/PH 4	GFS	8483	24014218		9/25/2025
STL ORP SOLUTION 240MV L#4GG0438	STL ORP SOLUTION 240MV L#4GG0438	AquaPhoenix Scientific	ORP Solution	4GG0438		4/25/2025
STL PH10 #4GB0253	STL PH10 #4GB0253	Absolute Accuracy	PH 10	4GB0253		2/25/2026
STL PH4 L#4GG0029	STL pH4 L#4GG0029	AquaPhoenix Scientific	pH 4	4GG0029		7/25/2026
STL PH7 L#4GG1129	STL PH7 L#4GG1129	AquaPhoenix Scientific	PH7	4GG1129		7/25/2026

Notes about this calibration

Calibration Result Calibration Successful
Who Calibrated Chris Harkins

All instruments are calibrated by Pine Environmental Services LLC according to the manufacturer's specifications, but it is the customer's responsibility to calibrate and maintain this unit in accordance with the manufacturer's specifications and/or the customer's own specific needs.

Notify Pine Environmental Services LLC of any defect within 24 hours of receipt of equipment
Please call 800-301-9663 for Technical Assistance

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC

11669 Lilburn Park Rd.
St. Louis, MO 63146
Office: 314.344.1079

Pine Environmental Services, Inc.

Instrument ID 210769
Description YSI Pro DSS Sonde
Calibrated 12/27/2024 7:04:11PM

Manufacturer YSI
Model Number Pro DSS
Serial Number/ Lot Number 16B102807
Location St. Louis
Department

State Certified
Status Pass
Temp °C 22.2
Humidity % 43

Calibration Specifications

Group # 1
Group Name PH
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
7.00 / 7.00	PH	7.00	PH	7.75	7.02	0.29%	Pass
4.00 / 4.00	PH	4.00	PH	4.90	4.00	0.00%	Pass
10.00 / 10.00	PH	10.00	PH	10.54	10.04	0.40%	Pass

Group # 2
Group Name Turbidity (NTU)
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
0.00 / 0.00	NTU	0.00	NTU	5.52	0.00	0.00%	Pass
124.00 / 124.00	NTU	124.00	NTU	94.34	124.00	0.00%	Pass

Group # 3
Group Name Conductivity
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.000

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
1.413 / 1.413	ms/cm	1.413	ms/cm	1.545	1.413	0.00%	Pass

Group # 4
Group Name Redox (ORP)
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
240.00 / 240.00	mv	240.00	mv	186.50	240.00	0.00%	Pass

Group # 5
Group Name Dissolved Oxygen Span
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC

11669 Lilburn Park Rd.
St. Louis, MO 63146
Office: 314.344.1079

Pine Environmental Services, Inc.

Instrument ID 210769
Description YSI Pro DSS Sonde
Calibrated 12/27/2024 7:04:11PM

Group # 5
Group Name Dissolved Oxygen Span
Stated Accy Pct of Reading

Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
100.00 / 100.00	%	100.00	%	85.50	99.60	-0.40%	Pass

Test Instruments Used During the Calibration **(As Of Cal Entry Date)**

Test Standard ID	Description	Manufacturer	Model Number	Serial Number / Lot Number	Last Cal Date/ Opened Date	Next Cal Date / Expiration Date
STL 126 NTU L#24G24012705	STL 126 NTU L#24G24012705	YSI	126 NTU	24G24012705		7/25/2025
STL 1413 COND L#4GG1360	STL 1413 COND L#4GG1360	AquaPhoenix Scientific	31986	4GG1360		7/25/2025
STL AUTOCAL LOT#24014218	Auto Cal Solution 0 NTU/PH 4	GFS	8483	24014218		9/25/2025
STL ORP SOLUTION 240MV L#4GG0438	STL ORP SOLUTION 240MV L#4GG0438	AquaPhoenix Scientific	ORP Solution	4GG0438		4/25/2025
STL PH10 #4GB0253	STL PH10 #4GB0253	Absolute Accuracy	PH 10	4GB0253		2/25/2026
STL PH4 L#4GG0029	STL pH4 L#4GG0029	AquaPhoenix Scientific	pH 4	4GG0029		7/25/2026
STL PH7 L#4GG1129	STL PH7 L#4GG1129	AquaPhoenix Scientific	PH7	4GG1129		7/25/2026

Notes about this calibration

Calibration Result Calibration Successful
Who Calibrated Chris Harkins

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Notify Pine Environmental Services LLC of any defect within 24 hours of receipt of equipment
Please call 800-301-9663 for Technical Assistance

March 04, 2025

Eric Bauer
Ramboll
234 W. Florida Street
Fifth Floor
Milwaukee, WI 53204
TEL: (414) 837-3607
FAX: (414) 837-3608

Illinois	100226
Illinois	1004652024-2
Kansas	E-10374
Louisiana	05002
Louisiana	05003
Oklahoma	9978

RE: BAL-25Q1 **WorkOrder:** 25010181

Dear Eric Bauer:

TEKLAB, INC received 5 samples for BAL_NE_605 on 1/27/2025 2:15:00 PM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report,Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Elizabeth A. Hurley
Director of Customer Service
(618)344-1004 ex 33
ehurley@teklabinc.com

Report Contents

http://www.teklabinc.com/

Client: Ramboll
Client Project: BAL-25Q1

Work Order: 25010181
Report Date: 04-Mar-25

This reporting package includes the following:

Cover Letter	1
Report Contents	2
Definitions	3
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Chain of Custody	Appended

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

Abbr	Definition
*	Analytes on report marked with an asterisk are not NELAP accredited
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
CRQL	A Client Requested Quantitation Limit is a reporting limit that varies according to customer request. The CRQL may not be less than the MDL.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilution factors.
DNI	Did not ignite
DUP	Laboratory duplicate is a replicate aliquot prepared under the same laboratory conditions and independently analyzed to obtain a measure of precision.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample is a sample matrix, free from the analytes of interest,spiked with verified known amounts of analytes and analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	"The method detection limit is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results."
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
NC	Data is not acceptable for compliance purposes
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions.
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Client: Ramboll

Work Order: 25010181

Client Project: BAL-25Q1

Report Date: 04-Mar-25

Qualifiers

# -	Unknown hydrocarbon	B -	Analyte detected in associated Method Blank
C -	RL shown is a Client Requested Quantitation Limit	E -	Value above quantitation range
H -	Holding times exceeded	I -	Associated internal standard was outside method criteria
J -	Analyte detected below quantitation limits	M -	Manual Integration used to determine area response
ND -	Not Detected at the Reporting Limit	R -	RPD outside accepted recovery limits
S -	Spike Recovery outside recovery limits	T -	TIC(Tentatively identified compound)
X -	Value exceeds Maximum Contaminant Level		

Case Narrative

http://www.teklabinc.com/

Client: Ramboll
Client Project: BAL-25Q1

Work Order: 25010181
Report Date: 04-Mar-25

Cooler Receipt Temp: 12.9 °C

An employee of Teklab, Inc. collected the sample(s).

Equipment Blanks were not needed.

Per Eric Bauer's request, only BAL_NE_605 data is included in this report. EAH 3/4/25

Locations

Collinsville

Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425
Phone	(618) 344-1004
Fax	(618) 344-1005
Email	jhriley@teklabinc.com

Springfield

Address	3920 Pintail Dr Springfield, IL 62711-9415
Phone	(217) 698-1004
Fax	(217) 698-1005
Email	KKlostermann@teklabinc.com

Kansas City

Address	8421 Nieman Road Lenexa, KS 66214
Phone	(913) 541-1998
Fax	(913) 541-1998
Email	jhriley@teklabinc.com

Collinsville Air

Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425
Phone	(618) 344-1004
Fax	(618) 344-1005
Email	EHurley@teklabinc.com

Chicago

Address	1319 Butterfield Rd. Downers Grove, IL 60515
Phone	(630) 324-6855
Fax	
Email	arenner@teklabinc.com

Accreditations

Client: Ramboll
Client Project: BAL-25Q1
Work Order: 25010181
Report Date: 04-Mar-25

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2026	Collinsville
Illinois	IEPA	1004652024-2	NELAP	4/30/2026	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2025	Collinsville
Louisiana	LDEQ	05002	NELAP	6/30/2025	Collinsville
Louisiana	LDEQ	05003	NELAP	6/30/2025	Collinsville
Oklahoma	ODEQ	9978	NELAP	8/31/2025	Collinsville
Arkansas	ADEQ	88-0966		3/14/2025	Collinsville
Illinois	IDPH	17584		5/31/2025	Collinsville
Iowa	IDNR	430		6/1/2026	Collinsville
Kentucky	KWLCP	KY98050		12/31/2025	Collinsville
Kentucky	KWLCP	KY98006		12/31/2025	Collinsville
Kentucky	UST	0073		1/31/2026	Collinsville
Mississippi	MSDH			4/30/2025	Collinsville
Missouri	MDNR	930		1/31/2028	Collinsville
Missouri	MDNR	00930		10/31/2026	Collinsville

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 25010181
Client Project: BAL-25Q1
Report Date: 04-Mar-25
Lab ID: 25010181-011
Client Sample ID: MW-196
Matrix: GROUNDWATER
Collection Date: 01/27/2025 10:26

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS									
Depth to water from measuring point	*	0	0		**6.42**	ft	1	01/27/2025 10:26	R359614
STANDARD METHODS 2130 B FIELD									
Turbidity	*	1.0	1.0		**38**	NTU	1	01/27/2025 10:26	R359614
STANDARD METHODS 18TH ED. 2580 B FIELD									
Oxidation-Reduction Potential	*	-2000	-2000		**86**	mV	1	01/27/2025 10:26	R359614
STANDARD METHODS 2510 B FIELD									
Spec. Conductance, Field	*	0	0		**2040**	µS/cm	1	01/27/2025 10:26	R359614
STANDARD METHODS 2550 B FIELD									
Temperature	*	0	0		**11.8**	°C	1	01/27/2025 10:26	R359614
STANDARD METHODS 4500-O G FIELD									
Oxygen, Dissolved	*	0	0		**3.55**	mg/L	1	01/27/2025 10:26	R359614
SW-846 9040B FIELD									
pH	*	0	1.00		**6.99**		1	01/27/2025 10:26	R359614
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**317**	mg/L	1	01/28/2025 9:22	R359451
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	01/28/2025 9:22	R359451
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	16	20		**1110**	mg/L	1	01/27/2025 16:22	R359464
SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY									
Fluoride	NELAP	0.20	0.50	J	**0.48**	mg/L	10	01/28/2025 17:17	R359470
Chloride	NELAP	1.00	5.00		**18.8**	mg/L	10	01/28/2025 17:17	R359470
Sulfate	NELAP	3.00	10.0		**468**	mg/L	10	01/28/2025 17:17	R359470
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100		**169**	mg/L	1	01/28/2025 11:25	233933
Magnesium	NELAP	0.0055	0.0500		**68.5**	mg/L	1	01/28/2025 11:25	233933
Potassium	NELAP	0.0400	0.100		**1.15**	mg/L	1	01/28/2025 11:25	233933
Sodium	NELAP	0.0180	0.0500		**73.1**	mg/L	1	01/28/2025 11:25	233933
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.012	0.025	J	**0.021**	mg/L	5	01/28/2025 12:32	233950
Manganese	NELAP	0.0008	0.0020		**0.0051**	mg/L	5	01/28/2025 12:32	233950
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010		**0.0013**	mg/L	5	01/28/2025 16:32	233933
Arsenic	NELAP	0.0004	0.0010		**0.0016**	mg/L	5	01/28/2025 16:32	233933
Barium	NELAP	0.0007	0.0010		**0.0679**	mg/L	5	01/28/2025 16:32	233933
Beryllium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	01/29/2025 15:49	233933
Boron	NELAP	0.0092	0.0250		**3.13**	mg/L	5	01/29/2025 15:49	233933
Cadmium	NELAP	0.0002	0.0010	J	**0.0002**	mg/L	5	01/28/2025 16:32	233933
Chromium	NELAP	0.0007	0.0015		**0.0028**	mg/L	5	01/29/2025 15:49	233933
Cobalt	NELAP	0.0001	0.0010	J	**0.0007**	mg/L	5	01/28/2025 16:32	233933
Lead	NELAP	0.0006	0.0010		**0.0030**	mg/L	5	01/28/2025 16:32	233933
Lithium	*	0.0015	0.0030		**0.0136**	mg/L	5	01/29/2025 15:49	233933
Molybdenum	NELAP	0.0006	0.0015		**0.0030**	mg/L	5	01/29/2025 15:49	233933
Selenium	NELAP	0.0006	0.0010		**0.0077**	mg/L	5	01/28/2025 16:32	233933
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	01/28/2025 16:32	233933

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 25010181
Client Project: BAL-25Q1
Report Date: 04-Mar-25
Lab ID: 25010181-011
Client Sample ID: MW-196
Matrix: GROUNDWATER
Collection Date: 01/27/2025 10:26

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	01/28/2025 14:45	233951

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 25010181
Client Project: BAL-25Q1
Report Date: 04-Mar-25
Lab ID: 25010181-012
Client Sample ID: MW-197
Matrix: GROUNDWATER
Collection Date: 01/27/2025 10:54

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS									
Depth to water from measuring point	*	0	0		**4.92**	ft	1	01/27/2025 10:54	R359614
STANDARD METHODS 2130 B FIELD									
Turbidity	*	1.0	1.0		**12**	NTU	1	01/27/2025 10:54	R359614
STANDARD METHODS 18TH ED. 2580 B FIELD									
Oxidation-Reduction Potential	*	-2000	-2000		**92**	mV	1	01/27/2025 10:54	R359614
STANDARD METHODS 2510 B FIELD									
Spec. Conductance, Field	*	0	0		**1540**	µS/cm	1	01/27/2025 10:54	R359614
STANDARD METHODS 2550 B FIELD									
Temperature	*	0	0		**8.9**	°C	1	01/27/2025 10:54	R359614
STANDARD METHODS 4500-O G FIELD									
Oxygen, Dissolved	*	0	0		**4.85**	mg/L	1	01/27/2025 10:54	R359614
SW-846 9040B FIELD									
pH	*	0	1.00		**6.95**		1	01/27/2025 10:54	R359614
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**455**	mg/L	1	01/28/2025 10:17	R359451
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	01/28/2025 10:17	R359451
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	16	20		**732**	mg/L	1	01/27/2025 16:23	R359464
SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY									
Fluoride	NELAP	0.20	0.50	J	**0.35**	mg/L	10	01/28/2025 18:04	R359470
Chloride	NELAP	1.00	5.00		**19.6**	mg/L	10	01/28/2025 18:04	R359470
Sulfate	NELAP	3.00	10.0		**131**	mg/L	10	01/28/2025 18:04	R359470
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100		**118**	mg/L	1	01/28/2025 11:26	233933
Magnesium	NELAP	0.0055	0.0500		**65.3**	mg/L	1	01/28/2025 11:26	233933
Potassium	NELAP	0.0400	0.100		**1.05**	mg/L	1	01/28/2025 11:26	233933
Sodium	NELAP	0.0180	0.0500		**37.8**	mg/L	1	01/28/2025 11:26	233933
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.0115	0.0250		**0.0476**	mg/L	5	01/28/2025 12:38	233950
Manganese	NELAP	0.0008	0.0020	J	**0.0020**	mg/L	5	01/28/2025 12:38	233950
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010		**< 0.0010**	mg/L	5	01/28/2025 16:38	233933
Arsenic	NELAP	0.0004	0.0010	J	**0.0006**	mg/L	5	01/28/2025 16:38	233933
Barium	NELAP	0.0007	0.0010		**0.116**	mg/L	5	01/28/2025 16:38	233933
Beryllium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	01/29/2025 16:35	233933
Boron	NELAP	0.0092	0.025	J	**0.022**	mg/L	5	01/29/2025 16:35	233933
Cadmium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	01/28/2025 16:38	233933
Chromium	NELAP	0.0007	0.0015		**0.0017**	mg/L	5	01/29/2025 16:35	233933
Cobalt	NELAP	0.0001	0.0010	J	**0.0003**	mg/L	5	01/28/2025 16:38	233933
Lead	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	01/28/2025 16:38	233933
Lithium	*	0.0015	0.0030		**0.0076**	mg/L	5	01/29/2025 16:35	233933
Molybdenum	NELAP	0.0006	0.0015		**0.0029**	mg/L	5	01/29/2025 16:35	233933
Selenium	NELAP	0.0006	0.0010		**0.0012**	mg/L	5	01/28/2025 16:38	233933
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	01/28/2025 16:38	233933

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 25010181
Client Project: BAL-25Q1
Report Date: 04-Mar-25
Lab ID: 25010181-012
Client Sample ID: MW-197
Matrix: GROUNDWATER
Collection Date: 01/27/2025 10:54

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	01/28/2025 14:47	233951

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 25010181
Client Project: BAL-25Q1
Report Date: 04-Mar-25
Lab ID: 25010181-013
Client Sample ID: MW-198
Matrix: GROUNDWATER
Collection Date: 01/27/2025 9:51

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS									
Depth to water from measuring point	*	0	0		**7.12**	ft	1	01/27/2025 9:51	R359614
STANDARD METHODS 2130 B FIELD									
Turbidity	*	1.0	1.0		**18**	NTU	1	01/27/2025 9:51	R359614
STANDARD METHODS 18TH ED. 2580 B FIELD									
Oxidation-Reduction Potential	*	-2000	-2000		**87**	mV	1	01/27/2025 9:51	R359614
STANDARD METHODS 2510 B FIELD									
Spec. Conductance, Field	*	0	0		**1540**	µS/cm	1	01/27/2025 9:51	R359614
STANDARD METHODS 2550 B FIELD									
Temperature	*	0	0		**10.7**	°C	1	01/27/2025 9:51	R359614
STANDARD METHODS 4500-O G FIELD									
Oxygen, Dissolved	*	0	0		**1.54**	mg/L	1	01/27/2025 9:51	R359614
SW-846 9040B FIELD									
pH	*	0	1.00		**6.56**		1	01/27/2025 9:51	R359614
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**393**	mg/L	1	01/28/2025 10:32	R359451
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	01/28/2025 10:32	R359451
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	40	50		**675**	mg/L	2.5	01/27/2025 16:24	R359464
SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY									
Fluoride	NELAP	0.20	0.50	J	**0.20**	mg/L	10	01/28/2025 18:15	R359470
Chloride	NELAP	1.00	5.00		**15.3**	mg/L	10	01/28/2025 18:15	R359470
Sulfate	NELAP	3.00	10.0		**46.0**	mg/L	10	01/28/2025 18:15	R359470
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100		**86.8**	mg/L	1	01/28/2025 16:30	233949
Magnesium	NELAP	0.0055	0.0500		**42.6**	mg/L	1	01/28/2025 16:30	233949
Potassium	NELAP	0.0400	0.100		**3.85**	mg/L	1	01/28/2025 16:30	233949
Sodium	NELAP	0.0180	0.0500	B	**47.0**	mg/L	1	01/28/2025 16:30	233949
Sample result for Na exceeds 10 times the method blank contamination. Data is reportable per the TNI Standard.									
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.0115	0.0250		**< 0.0250**	mg/L	5	01/28/2025 12:43	233950
Manganese	NELAP	0.0008	0.0020		**0.721**	mg/L	5	01/28/2025 12:43	233950
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010	J	**0.0008**	mg/L	5	01/28/2025 14:07	233949
Arsenic	NELAP	0.0004	0.0010		**0.0063**	mg/L	5	01/28/2025 14:07	233949
Barium	NELAP	0.0007	0.0010	B	**0.243**	mg/L	5	01/29/2025 16:41	233949
Beryllium	NELAP	0.0002	0.0010	J	**0.0008**	mg/L	5	01/28/2025 14:07	233949
Boron	NELAP	0.0092	0.0250		**0.0452**	mg/L	5	01/28/2025 14:07	233949
Cadmium	NELAP	0.0002	0.0010	J	**0.0002**	mg/L	5	01/28/2025 14:07	233949
Chromium	NELAP	0.0007	0.0015		**0.0298**	mg/L	5	01/28/2025 14:07	233949
Cobalt	NELAP	0.0001	0.0010		**0.0093**	mg/L	5	01/28/2025 14:07	233949
Lead	NELAP	0.0006	0.0010		**0.0089**	mg/L	5	01/28/2025 14:07	233949
Lithium	*	0.0015	0.0030		**0.0147**	mg/L	5	01/28/2025 14:07	233949
Molybdenum	NELAP	0.0006	0.0015		**0.0057**	mg/L	5	01/29/2025 16:41	233949
Selenium	NELAP	0.0006	0.0010	J	**0.0007**	mg/L	5	01/28/2025 14:07	233949
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	01/28/2025 14:07	233949

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 25010181
Client Project: BAL-25Q1
Report Date: 04-Mar-25
Lab ID: 25010181-013
Client Sample ID: MW-198
Matrix: GROUNDWATER
Collection Date: 01/27/2025 9:51

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Sample result(s) for Ba exceed 10 times the method blank contamination. Data is reportable per the TNI Standard.									
SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	01/28/2025 14:49	233951

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 25010181
Client Project: BAL-25Q1
Report Date: 04-Mar-25
Lab ID: 25010181-045
Client Sample ID: Field Blank
Matrix: AQUEOUS
Collection Date: 01/27/2025 13:00

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**2**	mg/L	1	01/28/2025 10:24	R359451
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	01/28/2025 10:24	R359451
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	16	20		**< 20**	mg/L	1	01/28/2025 12:14	R359518
SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY									
Fluoride	NELAP	0.20	0.50		**ND**	mg/L	10	01/28/2025 20:47	R359470
Chloride	NELAP	1.00	5.00		**ND**	mg/L	10	01/28/2025 20:47	R359470
Sulfate	NELAP	3.00	10.0		**ND**	mg/L	10	01/28/2025 20:47	R359470
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100		**< 0.100**	mg/L	1	01/28/2025 16:55	233949
Magnesium	NELAP	0.0055	0.0500		**< 0.0500**	mg/L	1	01/28/2025 16:55	233949
Potassium	NELAP	0.0400	0.100		**< 0.100**	mg/L	1	01/28/2025 16:55	233949
Sodium	NELAP	0.0180	0.0500	B	**< 0.0500**	mg/L	1	01/28/2025 16:55	233949
Contamination present in the MBLK for Na. Sample results below the reporting limit are reportable per the TNI Standard.									
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.0115	0.0250		**< 0.0250**	mg/L	5	01/28/2025 13:56	233950
Manganese	NELAP	0.0008	0.0020		**< 0.0020**	mg/L	5	01/28/2025 13:56	233950
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010		**< 0.0010**	mg/L	5	01/28/2025 16:54	233949
Arsenic	NELAP	0.0004	0.0010		**< 0.0010**	mg/L	5	01/28/2025 16:54	233949
Barium	NELAP	0.0007	0.0010		**< 0.0010**	mg/L	5	02/03/2025 8:17	233949
Beryllium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	01/28/2025 16:54	233949
Boron	NELAP	0.0092	0.0250		**< 0.0250**	mg/L	5	01/30/2025 11:59	233949
Cadmium	NELAP	0.0002	0.0010		**< 0.0010**	mg/L	5	01/28/2025 16:54	233949
Chromium	NELAP	0.0007	0.0015		**< 0.0015**	mg/L	5	01/28/2025 16:54	233949
Cobalt	NELAP	0.0001	0.0010		**< 0.0010**	mg/L	5	01/28/2025 16:54	233949
Lead	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	01/28/2025 16:54	233949
Lithium	*	0.0015	0.0030		**< 0.0030**	mg/L	5	01/30/2025 11:59	233949
Molybdenum	NELAP	0.0006	0.0015		**< 0.0015**	mg/L	5	01/30/2025 11:59	233949
Selenium	NELAP	0.0006	0.0010		**< 0.0010**	mg/L	5	01/28/2025 16:54	233949
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	01/28/2025 16:54	233949
CCV recovered outside the upper control limits for Be. Sample results are below the reporting limit. Data is reportable per the TNI standard.									
SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	01/28/2025 15:22	233951

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 25010181
Client Project: BAL-25Q1
Report Date: 04-Mar-25
Lab ID: 25010181-047
Client Sample ID: MW-198 Duplicate
Matrix: GROUNDWATER
Collection Date: 01/27/2025 9:51

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS									
Depth to water from measuring point	*	0	0		**7.12**	ft	1	01/27/2025 9:51	R359614
STANDARD METHODS 2130 B FIELD									
Turbidity	*	1.0	1.0		**18**	NTU	1	01/27/2025 9:51	R359614
STANDARD METHODS 18TH ED. 2580 B FIELD									
Oxidation-Reduction Potential	*	-2000	-2000		**87**	mV	1	01/27/2025 9:51	R359614
STANDARD METHODS 2510 B FIELD									
Spec. Conductance, Field	*	0	0		**1540**	µS/cm	1	01/27/2025 9:51	R359614
STANDARD METHODS 2550 B FIELD									
Temperature	*	0	0		**10.7**	°C	1	01/27/2025 9:51	R359614
STANDARD METHODS 4500-O G FIELD									
Oxygen, Dissolved	*	0	0		**1.54**	mg/L	1	01/27/2025 9:51	R359614
SW-846 9040B FIELD									
pH	*	0	1.00		**6.56**		1	01/27/2025 9:51	R359614
STANDARD METHODS 2320 B (TOTAL) 1997, 2011									
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0	0		**385**	mg/L	1	01/28/2025 10:09	R359451
STANDARD METHODS 2320 B 1997, 2011									
Alkalinity, Carbonate (as CaCO3)	NELAP	0	0		**0**	mg/L	1	01/28/2025 10:09	R359451
STANDARD METHODS 2540 C (TOTAL) 1997, 2011									
Total Dissolved Solids	NELAP	40	50		**600**	mg/L	2.5	01/27/2025 16:27	R359464
SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY									
Fluoride	NELAP	0.20	0.50		**ND**	mg/L	10	01/28/2025 20:59	R359470
Chloride	NELAP	1.00	5.00		**15.0**	mg/L	10	01/28/2025 20:59	R359470
Sulfate	NELAP	3.00	10.0		**45.8**	mg/L	10	01/28/2025 20:59	R359470
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)									
Calcium	NELAP	0.0350	0.100		**87.5**	mg/L	1	01/28/2025 17:00	233949
Magnesium	NELAP	0.0055	0.0500		**43.3**	mg/L	1	01/28/2025 17:00	233949
Potassium	NELAP	0.0400	0.100		**4.14**	mg/L	1	01/28/2025 17:00	233949
Sodium	NELAP	0.0180	0.0500	B	**46.3**	mg/L	1	01/28/2025 17:00	233949
Sample result for Na exceeds 10 times the method blank contamination. Data is reportable per the TNI Standard.									
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)									
Iron	NELAP	0.0115	0.0250		**< 0.0250**	mg/L	5	01/28/2025 14:01	233950
Manganese	NELAP	0.0008	0.0020		**0.704**	mg/L	5	01/28/2025 14:01	233950
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Antimony	NELAP	0.0004	0.0010		**0.0010**	mg/L	5	01/28/2025 16:21	233949
Arsenic	NELAP	0.0004	0.0010		**0.0097**	mg/L	5	01/28/2025 16:21	233949
Barium	NELAP	0.0007	0.0010	B	**0.230**	mg/L	5	01/30/2025 10:19	233949
Beryllium	NELAP	0.0002	0.0010	J	**0.0006**	mg/L	5	01/30/2025 10:19	233949
Boron	NELAP	0.0092	0.0250		**0.0358**	mg/L	5	01/30/2025 10:19	233949
Cadmium	NELAP	0.0002	0.0010	J	**0.0004**	mg/L	5	01/28/2025 16:21	233949
Chromium	NELAP	0.0007	0.0015		**0.0420**	mg/L	5	01/28/2025 16:21	233949
Cobalt	NELAP	0.0001	0.0010		**0.0014**	mg/L	5	02/11/2025 10:26	234366
Lead	NELAP	0.0006	0.0010		**0.0146**	mg/L	5	01/28/2025 16:21	233949
Lithium	*	0.0015	0.0030		**0.0106**	mg/L	5	01/30/2025 10:19	233949
Molybdenum	NELAP	0.0006	0.0015		**0.0047**	mg/L	5	01/30/2025 10:19	233949
Selenium	NELAP	0.0006	0.0010	J	**0.0007**	mg/L	5	01/30/2025 10:19	233949
Thallium	NELAP	0.0010	0.0020		**< 0.0020**	mg/L	5	01/28/2025 16:21	233949

Laboratory Results

http://www.teklabinc.com/

Client: Ramboll
Work Order: 25010181
Client Project: BAL-25Q1
Report Date: 04-Mar-25
Lab ID: 25010181-047
Client Sample ID: MW-198 Duplicate
Matrix: GROUNDWATER
Collection Date: 01/27/2025 9:51

Analyses	Certification	MDL	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)									
Sample result(s) for Ba exceed 10 times the method blank contamination. Data is reportable per the TNI Standard.									
SW-846 7470A (TOTAL)									
Mercury	NELAP	0.00006	0.00020		**< 0.00020**	mg/L	1	01/28/2025 15:24	233951

Sample Summary

http://www.teklabinc.com/

Client: Ramboll
Client Project: BAL-25Q1

Work Order: 25010181
Report Date: 04-Mar-25

Lab Sample ID	Client Sample ID	Matrix	Fractions	Collection Date
25010181-011	MW-196	Groundwater	3	01/27/2025 10:26
25010181-012	MW-197	Groundwater	3	01/27/2025 10:54
25010181-013	MW-198	Groundwater	3	01/27/2025 9:51
25010181-045	Field Blank	Aqueous	4	01/27/2025 13:00
25010181-047	MW-198 Duplicate	Groundwater	3	01/27/2025 9:51

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

STANDARD METHODS 2510 B FIELD

Batch R359614 **SampType:** LCS Units µS/cm
SampID: LCS-1-BG

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1420**	1412	0	100.6	90	110	01/22/2025

Batch R359614 **SampType:** LCS Units µS/cm
SampID: LCS-1-JC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1410**	1412	0	99.6	90	110	01/22/2025

Batch R359614 **SampType:** LCS Units µS/cm
SampID: LCS-1-TC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1410**	1412	0	100.1	90	110	01/22/2025

Batch R359614 **SampType:** LCS Units µS/cm
SampID: LCS-2-BG

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1420**	1412	0	100.6	90	110	01/23/2025

Batch R359614 **SampType:** LCS Units µS/cm
SampID: LCS-2-JC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1410**	1412	0	100.1	90	110	01/23/2025

Batch R359614 **SampType:** LCS Units µS/cm
SampID: LCS-2-TC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1410**	1412	0	100.0	90	110	01/24/2025

Batch R359614 **SampType:** LCS Units µS/cm
SampID: LCS-3-BG

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1420**	1412	0	100.5	90	110	01/27/2025

Batch R359614 **SampType:** LCS Units µS/cm
SampID: LCS-3-JC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1410**	1412	0	100.1	90	110	01/27/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

STANDARD METHODS 2510 B FIELD

Batch R359614 **SampType:** LCS Units **µS/cm**

SampID: LCS-3-TC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Spec. Conductance, Field	*	0		**1410**	1412	0	99.9	90	110	01/27/2025

SW-846 9040B FIELD

Batch R359614 **SampType:** LCS Units

SampID: LCS-1-BG

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.03**	7.000	0	100.4	98.57	101.4	01/22/2025

Batch R359614 **SampType:** LCS Units

SampID: LCS-1-JC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**6.97**	7.000	0	99.6	98.57	101.4	01/22/2025

Batch R359614 **SampType:** LCS Units

SampID: LCS-1-TC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.06**	7.000	0	100.9	98.57	101.4	01/22/2025

Batch R359614 **SampType:** LCS Units

SampID: LCS-2-BG

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.00**	7.000	0	100.0	98.57	101.4	01/23/2025

Batch R359614 **SampType:** LCS Units

SampID: LCS-2-JC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.01**	7.000	0	100.1	98.57	101.4	01/23/2025

Batch R359614 **SampType:** LCS Units

SampID: LCS-2-TC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.03**	7.000	0	100.4	98.57	101.4	01/24/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 9040B FIELD

Batch R359614 **SampType:** LCS Units
SampID: LCS-3-BG

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.00**	7.000	0	100.0	98.57	101.4	01/27/2025

Batch R359614 **SampType:** LCS Units
SampID: LCS-3-JC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.01**	7.000	0	100.1	98.57	101.4	01/27/2025

Batch R359614 **SampType:** LCS Units
SampID: LCS-3-TC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	*	1.00		**7.07**	7.000	0	101.0	98.57	101.4	01/27/2025

STANDARD METHODS 2540 C (TOTAL) 1997, 2011

Batch R359240 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	01/23/2025
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	01/23/2025
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	01/22/2025
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	01/23/2025
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	01/23/2025

Batch R359240 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**904**	1000	0	90.4	90	110	01/22/2025
Total Dissolved Solids		20		**930**	1000	0	93.0	90	110	01/23/2025
Total Dissolved Solids		20		**956**	1000	0	95.6	90	110	01/23/2025
Total Dissolved Solids		20		**976**	1000	0	97.6	90	110	01/23/2025
Total Dissolved Solids		20		**908**	1000	0	90.8	90	110	01/23/2025

Batch R359240 **SampType:** DUP Units **mg/L** RPD Limit **10**
SampID: 25010181-001ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20		**602**				626.0	3.91	01/23/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

STANDARD METHODS 2540 C (TOTAL) 1997, 2011

Batch R359240 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 25010181-020ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20		**672**				652.0	3.02	01/23/2025

Batch R359240 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 25010181-050ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20		**1930**				1922	0.62	01/23/2025

Batch R359240 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 24121807-075ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20		**3950**				3960	0.20	01/23/2025

Batch R359240 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 25010791-002BDUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20		**1070**				1118	4.39	01/23/2025

Batch R359240 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 25011014-001BDUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20	H	**234**				224.0	4.37	01/23/2025

Batch R359240 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 25011014-002BDUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20	H	**412**				410.0	0.49	01/23/2025

Batch R359240 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 25011014-005BDUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20	H	**600**				600.0	0.00	01/23/2025

Batch R359240 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 25011225-001ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		33		**544**				554.4	1.82	01/22/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

STANDARD METHODS 2540 C (TOTAL) 1997, 2011

Batch R359240 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 25011425-001ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20		**2270**				2366	4.05	01/23/2025

Batch R359340 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	01/24/2025

Batch R359340 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**930**	1000	0	93.0	90	110	01/24/2025

Batch R359340 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 25010181-019ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20		**620**				660.0	6.25	01/24/2025

Batch R359340 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 25011561-001ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		33		**605**				594.5	1.67	01/24/2025

Batch R359340 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 25011562-001ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		33		**548**				571.1	4.18	01/24/2025

Batch R359340 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 25011591-001ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		1000		**120000**				130300	8.23	01/24/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

STANDARD METHODS 2540 C (TOTAL) 1997, 2011

Batch R359464 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	01/27/2025
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	01/27/2025

Batch R359464 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**958**	1000	0	95.8	90	110	01/27/2025
Total Dissolved Solids		20		**972**	1000	0	97.2	90	110	01/27/2025

Batch R359464 **SampType:** DUP Units **mg/L** RPD Limit **10**
SampID: 25010181-011ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20		**1140**				1110	2.67	01/27/2025

Batch R359464 **SampType:** DUP Units **mg/L** RPD Limit **10**
SampID: 25010181-047ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		50		**615**				600.0	2.47	01/27/2025

Batch R359464 **SampType:** DUP Units **mg/L** RPD Limit **10**
SampID: 25011584-001BDUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		25		**882**				900.0	1.96	01/27/2025

Batch R359518 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	01/28/2025

Batch R359518 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**960**	1000	0	96.0	90	110	01/28/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

STANDARD METHODS 2540 C (TOTAL) 1997, 2011

Batch R359518 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 25010181-005ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		25		**932**				917.5	1.62	01/28/2025

Batch R359518 **SampType:** DUP Units **mg/L** RPD Limit **10**

SampID: 25011714-001CDUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20		**640**				652.0	1.86	01/28/2025

STANDARD METHODS 4500-NO2 B (TOTAL) 2000, 2011

Batch R359170 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**< 0.05**	0.0250	0	0	-100	100	01/22/2025
Nitrogen, Nitrite (as N)		0.05		**< 0.05**	0.0250	0	0	-100	100	01/22/2025

Batch R359170 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.29**	0.3045	0	94.9	90	110	01/22/2025
Nitrogen, Nitrite (as N)		0.05		**0.30**	0.3045	0	96.9	90	110	01/22/2025

Batch R359170 **SampType:** MS Units **mg/L**

SampID: 25011363-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.45**	0.5000	0.01800	87.0	85	115	01/22/2025

Batch R359170 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 25011363-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.45**	0.5000	0.01800	86.8	0.4530	0.22	01/22/2025

Batch R359233 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**< 0.05**	0.0250	0	0	-100	100	01/23/2025
Nitrogen, Nitrite (as N)		0.05		**< 0.05**	0.0250	0	0	-100	100	01/23/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

STANDARD METHODS 4500-NO2 B (TOTAL) 2000, 2011

Batch R359233 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.28**	0.3045	0	93.3	90	110	01/23/2025
Nitrogen, Nitrite (as N)		0.05		**0.29**	0.3045	0	93.9	90	110	01/23/2025

Batch R359233 **SampType:** MS Units **mg/L**
SampID: 25011495-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.47**	0.5000	0	94.2	85	115	01/23/2025

Batch R359233 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 25011495-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.47**	0.5000	0	94.0	0.4710	0.21	01/23/2025

Batch R359233 **SampType:** MS Units **mg/L**
SampID: 25011495-011BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.48**	0.5000	0	96.4	85	115	01/23/2025

Batch R359233 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 25011495-011BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.48**	0.5000	0	96.6	0.4820	0.21	01/23/2025

Batch R359233 **SampType:** MS Units **mg/L**
SampID: 25011501-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.50		**4.37**	5.000	0	87.4	85	115	01/23/2025

Batch R359233 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 25011501-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.50		**4.42**	5.000	0	88.4	4.370	1.14	01/23/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

STANDARD METHODS 4500-NO2 B (TOTAL) 2000, 2011

Batch R359233 **SampType:** MS Units **mg/L**
SampID: 25011561-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.47**	0.5000	0	93.8	85	115	01/23/2025

Batch R359233 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 25011561-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.46**	0.5000	0	93.0	0.4690	0.86	01/23/2025

Batch R359233 **SampType:** MS Units **mg/L**
SampID: 25011562-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.47**	0.5000	0	93.2	85	115	01/23/2025

Batch R359233 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 25011562-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.46**	0.5000	0	92.4	0.4660	0.86	01/23/2025

Batch R359373 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**< 0.05**	0.0250	0	0	-100	100	01/27/2025
Nitrogen, Nitrite (as N)		0.05		**< 0.05**	0.0250	0	0	-100	100	01/27/2025

Batch R359373 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.30**	0.3045	0	96.9	90	110	01/27/2025
Nitrogen, Nitrite (as N)		0.05		**0.28**	0.3045	0	90.6	90	110	01/27/2025

Batch R359373 **SampType:** MS Units **mg/L**
SampID: 25011657-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.50**	0.5000	0	100.2	85	115	01/27/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

STANDARD METHODS 4500-NO2 B (TOTAL) 2000, 2011

Batch R359373 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 25011657-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.48**	0.5000	0	96.8	0.5010	3.45	01/27/2025

Batch R359373 **SampType:** MS Units **mg/L**

SampID: 25011681-002AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.50**	0.5000	0.02800	95.4	85	115	01/27/2025

Batch R359373 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 25011681-002AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.50**	0.5000	0.02800	94.8	0.5050	0.60	01/27/2025

STANDARD METHODS 4500-NO3 F (TOTAL) 2000, 2011

Batch R359246 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate (as N)		0.050		**< 0.050**						01/22/2025
Nitrogen, Nitrate-Nitrite (as N)		0.050		**< 0.050**	0.0090	0	0	-100	100	01/22/2025

Batch R359246 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.490**	0.5000	0	98.0	90	110	01/22/2025

Batch R359246 **SampType:** MS Units **mg/L**

SampID: 25010985-008BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50	S	**32.6**	12.50	18.23	114.9	90	110	01/23/2025

Batch R359246 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 25010985-008BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50	S	**32.1**	12.50	18.23	110.8	32.59	1.59	01/23/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

STANDARD METHODS 4500-NO3 F (TOTAL) 2000, 2011

Batch R359246 **SampType:** MS Units **mg/L**
SampID: 25011104-002BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50	S	**30.8**	12.50	15.94	119.3	90	110	01/23/2025

Batch R359246 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 25011104-002BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50	S	**30.1**	12.50	15.94	113.4	30.84	2.42	01/23/2025

Batch R359246 **SampType:** MS Units **mg/L**
SampID: 25011363-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50		**25.2**	12.50	11.79	107.3	90	110	01/23/2025

Batch R359246 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 25011363-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50		**25.1**	12.50	11.79	106.4	25.20	0.47	01/23/2025

Batch R359295 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate (as N)		0.050		**< 0.050**						01/23/2025
Nitrogen, Nitrate-Nitrite (as N)		0.050		**< 0.050**	0.0090	0	0	-100	100	01/23/2025

Batch R359295 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.489**	0.5000	0	97.8	90	110	01/23/2025

Batch R359295 **SampType:** MS Units **mg/L**
SampID: 25011333-008AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		1.00		**19.7**	5.000	14.31	107.9	90	110	01/23/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

STANDARD METHODS 4500-NO3 F (TOTAL) 2000, 2011

Batch R359295 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 25011333-008AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		1.00		**19.7**	5.000	14.31	106.8	19.71	0.28	01/23/2025

Batch R359295 **SampType:** MS Units **mg/L**

SampID: 25011373-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.250		**3.46**	1.250	2.303	92.8	90	110	01/23/2025

Batch R359295 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 25011373-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.250		**3.66**	1.250	2.303	108.5	3.463	5.50	01/23/2025

Batch R359295 **SampType:** MS Units **mg/L**

SampID: 25011561-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.237**	0.2500	0	94.8	85	115	01/23/2025

Batch R359295 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 25011561-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.229**	0.2500	0	91.6	0.2370	3.43	01/23/2025

Batch R359295 **SampType:** MS Units **mg/L**

SampID: 25011562-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050	S	**0.179**	0.2500	0	71.6	85	115	01/23/2025

Batch R359295 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 25011562-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050	S	**0.183**	0.2500	0	73.2	0.1790	2.21	01/23/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

STANDARD METHODS 4500-NO3 F (TOTAL) 2000, 2011

Batch R359444 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate (as N)		0.050		**< 0.050**						01/27/2025
Nitrogen, Nitrate-Nitrite (as N)		0.050		**< 0.050**	0.0090	0	0	-100	100	01/27/2025

Batch R359444 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.472**	0.5000	0	94.4	90	110	01/27/2025

Batch R359444 **SampType:** MS Units **mg/L**
SampID: 25011602-002AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		1.00		**16.3**	5.000	11.03	106.2	90	110	01/27/2025

Batch R359444 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 25011602-002AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		1.00		**16.3**	5.000	11.03	106.1	16.34	0.02	01/27/2025

Batch R359444 **SampType:** MS Units **mg/L**
SampID: 25011681-002AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50		**37.8**	12.50	26.44	90.9	90	110	01/27/2025

Batch R359444 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 25011681-002AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50		**39.1**	12.50	26.44	100.9	37.80	3.26	01/27/2025

SW846 9056A DISSOLVED ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R359271 **SampType:** MS Units **mg/L**
SampID: 25010181-003BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		5.00		**255**	200.0	46.01	104.3	80	120	01/23/2025
Sulfate		10.0		**1090**	200.0	886.7	100.8	80	120	01/23/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW846 9056A DISSOLVED ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R359271 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 25010181-003BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		5.00		**256**	200.0	46.01	104.9	254.6	0.51	01/23/2025
Sulfate		10.0		**1090**	200.0	886.7	101.1	1088	0.06	01/23/2025

Batch R359271 **SampType:** MS Units **mg/L**

SampID: 25010181-016BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		5.00		**383**	200.0	161.4	110.6	80	120	01/23/2025
Sulfate		10.0		**374**	200.0	178.2	97.9	80	120	01/23/2025

Batch R359271 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 25010181-016BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		5.00		**380**	200.0	161.4	109.5	382.7	0.61	01/23/2025
Sulfate		10.0		**372**	200.0	178.2	96.9	374.0	0.52	01/23/2025

Batch R359271 **SampType:** MS Units **mg/L**

SampID: 25010181-017BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		5.00		**220**	200.0	15.95	101.9	80	120	01/23/2025
Sulfate		10.0		**255**	200.0	66.80	93.9	80	120	01/23/2025

Batch R359271 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 25010181-017BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		5.00		**220**	200.0	15.95	102.0	219.7	0.13	01/23/2025
Sulfate		10.0		**255**	200.0	66.80	94.1	254.6	0.11	01/23/2025

Batch R359271 **SampType:** MS Units **mg/L**

SampID: 25010181-048BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		5.00		**380**	200.0	161.9	109.0	80	120	01/23/2025
Sulfate		10.0		**372**	200.0	178.8	96.5	80	120	01/23/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW846 9056A DISSOLVED ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R359271 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 25010181-048BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		5.00		**381**	200.0	161.9	109.3	379.9	0.18	01/23/2025
Sulfate		10.0		**372**	200.0	178.8	96.8	371.8	0.15	01/23/2025

Batch R359272 **SampType:** MS Units **mg/L**

SampID: 25010181-002BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		5.00		**220**	200.0	14.32	102.9	80	120	01/24/2025
Sulfate		10.0		**330**	200.0	134.4	97.9	80	120	01/24/2025

Batch R359272 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 25010181-002BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		5.00		**220**	200.0	14.32	102.8	220.1	0.09	01/24/2025
Sulfate		10.0		**329**	200.0	134.4	97.5	330.2	0.27	01/24/2025

Batch R359272 **SampType:** MS Units **mg/L**

SampID: 25010181-019BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		5.00		**222**	200.0	16.44	102.9	80	120	01/24/2025
Sulfate		10.0		**249**	200.0	59.86	94.7	80	120	01/24/2025

Batch R359272 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 25010181-019BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		5.00		**222**	200.0	16.44	102.6	222.3	0.28	01/24/2025
Sulfate		10.0		**249**	200.0	59.86	94.5	249.3	0.20	01/24/2025

Batch R359272 **SampType:** MS Units **mg/L**

SampID: 25011495-007BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		2.50		**110**	100.0	9.870	99.9	80	120	01/24/2025
Sulfate		5.00		**409**	100.0	306.5	102.9	80	120	01/24/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW846 9056A DISSOLVED ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R359272 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 25011495-007BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		2.50		**111**	100.0	9.870	100.8	109.7	0.87	01/24/2025
Sulfate		5.00		**410**	100.0	306.5	103.5	409.4	0.15	01/24/2025

Batch R359470 **SampType:** MS Units **mg/L**

SampID: 25010181-005BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		5.00		**214**	200.0	11.84	100.8	80	120	01/28/2025
Sulfate		10.0		**520**	200.0	316.6	101.7	80	120	01/28/2025

Batch R359470 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 25010181-005BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		5.00		**215**	200.0	11.84	101.5	213.5	0.67	01/28/2025
Sulfate		10.0		**521**	200.0	316.6	102.4	519.9	0.29	01/28/2025

Batch R359470 **SampType:** MS Units **mg/L**

SampID: 25010181-014BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		5.00		**244**	200.0	36.08	104.0	80	120	01/28/2025
Sulfate		10.0		**682**	200.0	472.2	105.1	80	120	01/28/2025

Batch R359470 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 25010181-014BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		5.00		**244**	200.0	36.08	104.0	244.1	0.03	01/28/2025
Sulfate		10.0		**679**	200.0	472.2	103.2	682.4	0.54	01/28/2025

SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R359271 **SampType:** MBLK Units **mg/L**

SampID: MBLK/ICB

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.05		**ND**						01/23/2025
Chloride		0.50		**ND**						01/23/2025
Sulfate		1.00		**ND**						01/23/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R359271 **SampType:** LCS Units **mg/L**

SampID: LCS/ICV/QCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.05		**0.91**	1.000	0	91.1	90	110	01/23/2025
Chloride		0.50		**20.1**	20.00	0	100.5	90	110	01/23/2025
Sulfate		1.00		**18.4**	20.00	0	91.8	90	110	01/23/2025

Batch R359271 **SampType:** MS Units **mg/L**

SampID: 25011476-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**9.36**	10.00	0.2780	90.9	80	120	01/23/2025
Chloride		5.00		**214**	200.0	12.15	100.8	80	120	01/23/2025
Sulfate		10.0		**424**	200.0	227.4	98.4	80	120	01/23/2025

Batch R359271 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 25011476-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**9.40**	10.00	0.2780	91.2	9.364	0.40	01/23/2025
Chloride		5.00		**215**	200.0	12.15	101.5	213.8	0.62	01/23/2025
Sulfate		10.0		**425**	200.0	227.4	98.8	424.3	0.19	01/23/2025

Batch R359271 **SampType:** MS Units **mg/L**

SampID: 25011484-002AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**9.46**	10.00	0.3300	91.3	80	120	01/23/2025
Chloride		5.00		**426**	200.0	207.7	109.0	80	120	01/23/2025
Sulfate		10.0		**189**	200.0	7.414	90.7	80	120	01/23/2025

Batch R359271 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 25011484-002AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**9.45**	10.00	0.3300	91.2	9.461	0.12	01/23/2025
Chloride		5.00		**425**	200.0	207.7	108.8	425.6	0.06	01/23/2025
Sulfate		10.0		**189**	200.0	7.414	90.9	188.8	0.23	01/23/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R359272 **SampType:** MBLK Units **mg/L**

SampID: MBLK/ICB

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.05		**ND**						01/24/2025
Chloride		0.50		**ND**						01/24/2025
Sulfate		1.00		**ND**						01/24/2025

Batch R359272 **SampType:** LCS Units **mg/L**

SampID: LCS/ICV/QCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.05		**0.93**	1.000	0	92.9	90	110	01/24/2025
Chloride		0.50		**20.5**	20.00	0	102.5	90	110	01/24/2025
Sulfate		1.00		**18.7**	20.00	0	93.7	90	110	01/24/2025

Batch R359272 **SampType:** MS Units **mg/L**

SampID: 25011495-007BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.25		**4.52**	5.000	0.1150	88.1	80	120	01/24/2025

Batch R359272 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 25011495-007BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.25		**4.60**	5.000	0.1150	89.6	4.520	1.66	01/24/2025

Batch R359272 **SampType:** MS Units **mg/L**

SampID: 25011561-002AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**9.47**	10.00	0.2910	91.8	80	120	01/24/2025
Chloride		5.00		**236**	200.0	29.71	103.3	80	120	01/24/2025
Sulfate		10.0		**215**	200.0	29.16	92.8	80	120	01/24/2025

Batch R359272 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 25011561-002AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**9.55**	10.00	0.2910	92.6	9.473	0.77	01/24/2025
Chloride		5.00		**237**	200.0	29.71	103.8	236.3	0.44	01/24/2025
Sulfate		10.0		**216**	200.0	29.16	93.2	214.7	0.44	01/24/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW846 9056A TOTAL ANIONIC COMPOUNDS BY ION CHROMATOGRAPHY

Batch R359272 **SampType:** MS Units **mg/L**

SampID: 25011562-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.50		**9.48**	10.00	0	94.8	80	120	01/24/2025
Chloride		5.00		**260**	200.0	48.73	105.6	80	120	01/24/2025
Sulfate		10.0		**221**	200.0	33.57	93.8	80	120	01/24/2025

Batch R359272 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 25011562-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.50		**9.52**	10.00	0	95.2	9.485	0.40	01/24/2025
Chloride		5.00		**261**	200.0	48.73	106.2	260.0	0.41	01/24/2025
Sulfate		10.0		**222**	200.0	33.57	94.1	221.3	0.25	01/24/2025

Batch R359272 **SampType:** MS Units **mg/L**

SampID: 25011584-007AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		1.00		**305**	40.00	270.5	86.6	80	120	01/25/2025
Sulfate		2.00		**37.4**	40.00	0	93.5	80	120	01/25/2025

Batch R359272 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 25011584-007AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		1.00		**306**	40.00	270.5	88.6	305.1	0.27	01/25/2025
Sulfate		2.00		**37.5**	40.00	0	93.8	37.39	0.29	01/25/2025

Batch R359470 **SampType:** MBLK Units **mg/L**

SampID: MBLK/ICB

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.05		**ND**						01/28/2025
Chloride		0.50		**ND**						01/28/2025
Sulfate		1.00		**ND**						01/28/2025

Batch R359470 **SampType:** LCS Units **mg/L**

SampID: LCS/ICV/QCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.05		**0.95**	1.000	0	95.5	90	110	01/28/2025
Chloride		0.50		**21.2**	20.00	0	106.0	90	110	01/28/2025
Sulfate		1.00		**19.4**	20.00	0	97.2	90	110	01/28/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 233786 **SampType:** MBLK Units **mg/L**

SampID: MBLK-233786

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**< 0.100**	0.0350	0	0	-100	100	01/23/2025
Magnesium		0.0500		**< 0.0500**	0.0055	0	0	-100	100	01/23/2025
Potassium		0.100		**< 0.100**	0.0400	0	0	-100	100	01/23/2025
Sodium		0.0500		**< 0.0500**	0.0180	0	0	-100	100	01/23/2025

Batch 233786 **SampType:** LCS Units **mg/L**

SampID: LCS-233786

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**4.64**	5.000	0	92.8	85	115	01/23/2025
Magnesium		0.0500		**4.82**	5.000	0	96.4	85	115	01/23/2025
Potassium		0.100		**4.93**	5.000	0	98.6	85	115	01/23/2025
Sodium		0.0500		**4.90**	5.000	0	98.0	85	115	01/23/2025

Batch 233786 **SampType:** MS Units **mg/L**

SampID: 25011343-002BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100	S	**364**	5.000	325.1	769.6	75	125	01/23/2025
Magnesium		0.0500	S	**155**	5.000	147.8	143.8	75	125	01/23/2025

Batch 233786 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 25011343-002BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Calcium		0.100	S	**378**	5.000	325.1	1059	363.6	3.91	01/23/2025
Magnesium		0.0500	S	**155**	5.000	147.8	141.4	155.0	0.08	01/23/2025

Batch 233790 **SampType:** MBLK Units **mg/L**

SampID: MBLK-233790

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**< 0.100**	0.0350	0	0	-100	100	01/24/2025
Magnesium		0.0500		**< 0.0500**	0.0055	0	0	-100	100	01/24/2025
Potassium		0.100		**< 0.100**	0.0400	0	0	-100	100	01/24/2025
Sodium		0.0500		**< 0.0500**	0.0180	0	0	-100	100	01/24/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 233790 **SampType:** LCS Units **mg/L**

SampID: LCS-233790

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**4.93**	5.000	0	98.6	85	115	01/24/2025
Magnesium		0.0500		**4.87**	5.000	0	97.3	85	115	01/24/2025
Potassium		0.100		**5.09**	5.000	0	101.8	85	115	01/24/2025
Sodium		0.0500		**5.25**	5.000	0	105.0	85	115	01/24/2025

Batch 233790 **SampType:** MS Units **mg/L**

SampID: 25010181-016CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**16.2**	5.000	11.09	103.0	75	125	01/24/2025
Magnesium		0.0500		**9.05**	5.000	4.357	93.8	75	125	01/24/2025
Potassium		0.100		**7.56**	5.000	2.161	108.0	75	125	01/24/2025
Sodium		0.500	S	**572**	5.000	556.3	312.0	75	125	01/28/2025

Batch 233790 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 25010181-016CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Calcium		0.100		**16.4**	5.000	11.09	106.4	16.24	1.04	01/24/2025
Magnesium		0.0500		**9.17**	5.000	4.357	96.3	9.049	1.33	01/24/2025
Potassium		0.100		**7.62**	5.000	2.161	109.1	7.559	0.76	01/24/2025
Sodium		0.500	S	**560**	5.000	556.3	74.0	571.9	2.10	01/28/2025

Batch 233790 **SampType:** MS Units **mg/L**

SampID: 25010181-050BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**31.7**	5.000	27.65	81.8	75	125	01/24/2025
Magnesium		0.0500		**20.6**	5.000	16.71	77.1	75	125	01/24/2025
Potassium		1.00		**10.1**	5.000	4.460	113.3	75	125	01/28/2025
Sodium		0.500	S	**724**	5.000	723.7	8.0	75	125	01/28/2025

Batch 233790 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 25010181-050BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Calcium		0.100		**31.9**	5.000	27.65	85.4	31.74	0.57	01/24/2025
Magnesium		0.0500		**20.8**	5.000	16.71	82.3	20.56	1.24	01/24/2025
Potassium		1.00		**10.0**	5.000	4.460	111.5	10.12	0.89	01/28/2025
Sodium		0.500	S	**717**	5.000	723.7	-138.0	724.1	1.01	01/28/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 233831 **SampType:** MBLK Units **mg/L**

SampID: MBLK-233831

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**< 0.100**	0.0350	0	0	-100	100	01/27/2025
Magnesium		0.0500		**< 0.0500**	0.0055	0	0	-100	100	01/27/2025
Potassium		0.100		**< 0.100**	0.0400	0	0	-100	100	01/27/2025
Sodium		0.0500	S	**0.108**	0.0180	0	601.1	-100	100	01/27/2025
Sodium		0.0500		**< 0.0500**	0.0180	0	0	-100	100	01/28/2025

Batch 233831 **SampType:** LCS Units **mg/L**

SampID: LCS-233831

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**5.29**	5.000	0	105.8	85	115	01/28/2025
Iron		0.0400		**4.44**	4.000	0	111.0	85	115	01/28/2025
Magnesium		0.0500		**4.95**	5.000	0	99.0	85	115	01/27/2025
Potassium		0.100		**5.42**	5.000	0	108.4	85	115	01/27/2025
Sodium		0.0500	B	**5.37**	5.000	0	107.4	85	115	01/27/2025
Sodium		0.0500		**5.41**	5.000	0	108.2	85	115	01/28/2025

Batch 233831 **SampType:** MS Units **mg/L**

SampID: 25011532-003CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Iron		0.0400		**4.38**	4.000	0	109.5	75	125	01/28/2025

Batch 233831 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 25011532-003CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Iron		0.0400		**4.34**	4.000	0	108.5	4.380	0.92	01/28/2025

Batch 233831 **SampType:** MS Units **mg/L**

SampID: 25011561-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Iron		0.0400		**9.68**	4.000	5.050	115.8	75	125	01/28/2025

Batch 233831 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 25011561-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Iron		0.0400		**9.57**	4.000	5.050	113.0	9.680	1.14	01/28/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch **233903** **SampType:** **MBLK** Units **mg/L**

SampID: MBLK-233903

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0500		**< 0.0500**	0.0068	0	0	-100	100	01/28/2025
Arsenic		0.0250		**< 0.0250**	0.0087	0	0	-100	100	01/28/2025
Barium		0.0025		**< 0.0025**	0.0007	0	0	-100	100	01/28/2025
Beryllium		0.0005		**< 0.0005**	0.0002	0	0	-100	100	01/28/2025
Cadmium		0.0020		**< 0.0020**	0.0005	0	0	-100	100	01/28/2025
Calcium		0.100		**< 0.100**	0.0350	0	0	-100	100	01/28/2025
Chromium		0.0050		**< 0.0050**	0.0028	0	0	-100	100	01/28/2025
Cobalt		0.0050		**< 0.0050**	0.0020	0	0	-100	100	01/28/2025
Iron		0.0400		**< 0.0400**	0.0200	0	0	-100	100	01/28/2025
Lead		0.0150		**< 0.0150**	0.0040	0	0	-100	100	01/28/2025
Lithium	*	0.0500		**< 0.0500**	0.0019	0	0	-100	100	01/28/2025
Magnesium		0.0500		**< 0.0500**	0.0055	0	0	-100	100	01/28/2025
Manganese		0.0070		**< 0.0070**	0.0025	0	0	-100	100	01/28/2025
Molybdenum		0.0100		**< 0.0100**	0.0037	0	0	-100	100	01/28/2025
Potassium		0.100		**< 0.100**	0.0400	0	0	-100	100	01/28/2025
Selenium		0.0400		**< 0.0400**	0.0170	0	0	-100	100	01/28/2025
Sodium		0.0500	S	**0.0682**	0.0180	0	378.9	-100	100	01/28/2025
Thallium		0.0500		**< 0.0500**	0.0111	0	0	-100	100	01/28/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 233903 **SampType:** LCS Units **mg/L**

SampID: LCS-233903

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0500		**1.01**	1.000	0	100.5	85	115	01/28/2025
Arsenic		0.0250		**0.979**	1.000	0	97.9	85	115	01/28/2025
Barium		0.0025		**3.89**	4.000	0	97.2	85	115	01/28/2025
Beryllium		0.0005		**0.0990**	0.1000	0	99.0	85	115	01/28/2025
Cadmium		0.0020		**0.0932**	0.1000	0	93.2	85	115	01/28/2025
Calcium		0.100		**4.96**	5.000	0	99.2	85	115	01/28/2025
Chromium		0.0050		**0.396**	0.4000	0	98.9	85	115	01/28/2025
Cobalt		0.0050		**1.02**	1.000	0	101.6	85	115	01/28/2025
Iron		0.0400		**4.11**	4.000	0	102.8	85	115	01/28/2025
Lead		0.0150		**0.972**	1.000	0	97.2	85	115	01/28/2025
Lithium	*	0.0500		**0.910**	1.000	0	91.0	85	115	01/28/2025
Magnesium		0.0500		**4.63**	5.000	0	92.6	85	115	01/28/2025
Manganese		0.0070		**0.974**	1.000	0	97.4	85	115	01/28/2025
Molybdenum		0.0100		**0.976**	1.000	0	97.6	85	115	01/28/2025
Potassium		0.100		**5.10**	5.000	0	101.9	85	115	01/28/2025
Selenium		0.0400		**0.967**	1.000	0	96.7	85	115	01/28/2025
Sodium		0.0500	B	**5.11**	5.000	0	102.2	85	115	01/28/2025
Thallium		0.0500		**0.481**	0.5000	0	96.2	85	115	01/28/2025

Batch 233903 **SampType:** MS Units **mg/L**

SampID: 25011604-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Barium		0.0025		**7.39**	4.000	3.340	101.2	75	125	01/28/2025

Batch 233903 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 25011604-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Barium		0.0025		**7.22**	4.000	3.340	97.0	7.390	2.33	01/28/2025

Batch 233933 **SampType:** MBLK Units **mg/L**

SampID: MBLK-233933

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**< 0.100**	0.0350	0	0	-100	100	01/28/2025
Magnesium		0.0500		**< 0.0500**	0.0055	0	0	-100	100	01/28/2025
Potassium		0.100		**< 0.100**	0.0400	0	0	-100	100	01/28/2025
Sodium		0.0500		**< 0.0500**	0.0180	0	0	-100	100	01/28/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 233933 **SampType:** LCS Units **mg/L**

SampID: LCS-233933

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**5.02**	5.000	0	100.4	85	115	01/28/2025
Magnesium		0.0500		**4.92**	5.000	0	98.3	85	115	01/28/2025
Potassium		0.100		**5.24**	5.000	0	104.9	85	115	01/28/2025
Sodium		0.0500		**5.21**	5.000	0	104.2	85	115	01/28/2025

Batch 233949 **SampType:** MBLK Units **mg/L**

SampID: MBLK-233949

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Barium		0.0025		**< 0.0025**	0.0007	0	0	-100	100	01/28/2025
Beryllium		0.0005		**< 0.0005**	0.0002	0	0	-100	100	01/28/2025
Cadmium		0.0020		**< 0.0020**	0.0005	0	0	-100	100	01/28/2025
Calcium		0.100		**< 0.100**	0.0350	0	0	-100	100	01/28/2025
Chromium		0.0050		**< 0.0050**	0.0028	0	0	-100	100	01/28/2025
Cobalt		0.0050		**< 0.0050**	0.0020	0	0	-100	100	01/28/2025
Iron		0.0400		**< 0.0400**	0.0200	0	0	-100	100	01/28/2025
Lead		0.0150		**< 0.0150**	0.0014	0	0	-100	100	01/28/2025
Lithium		0.0500		**< 0.0500**	0.0019	0	0	-100	100	01/28/2025
Magnesium		0.0500		**< 0.0500**	0.0055	0	0	-100	100	01/28/2025
Manganese		0.0070		**< 0.0070**	0.0025	0	0	-100	100	01/28/2025
Molybdenum		0.0100		**< 0.0100**	0.0037	0	0	-100	100	01/28/2025
Potassium		0.100		**< 0.100**	0.0400	0	0	-100	100	01/28/2025
Selenium		0.0400		**< 0.0400**	0.0170	0	0	-100	100	01/28/2025
Sodium		0.0500	S	**0.0952**	0.0180	0	528.9	-100	100	01/28/2025
Thallium		0.0500		**< 0.0500**	0.0111	0	0	-100	100	01/28/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 233949 **SampType:** LCS Units **mg/L**

SampID: LCS-233949

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Barium		0.0025		**3.91**	4.000	0	97.8	85	115	01/28/2025
Beryllium		0.0005		**0.102**	0.1000	0	101.6	85	115	01/28/2025
Cadmium		0.0020		**0.0930**	0.1000	0	93.0	85	115	01/28/2025
Calcium		0.100		**5.03**	5.000	0	100.6	85	115	01/28/2025
Chromium		0.0050		**0.404**	0.4000	0	100.9	85	115	01/28/2025
Cobalt		0.0050		**1.05**	1.000	0	105.3	85	115	01/28/2025
Iron		0.0400		**4.21**	4.000	0	105.2	85	115	01/28/2025
Lead		0.0150		**0.994**	1.000	0	99.4	85	115	01/28/2025
Lithium		0.0500		**0.949**	1.000	0	94.9	85	115	01/28/2025
Magnesium		0.0500		**4.73**	5.000	0	94.7	85	115	01/28/2025
Manganese		0.0070		**0.995**	1.000	0	99.5	85	115	01/28/2025
Molybdenum		0.0100		**0.999**	1.000	0	99.9	85	115	01/28/2025
Potassium		0.100		**5.23**	5.000	0	104.6	85	115	01/28/2025
Selenium		0.0400		**1.00**	1.000	0	100.0	85	115	01/28/2025
Sodium		0.0500	B	**5.23**	5.000	0	104.5	85	115	01/28/2025
Thallium		0.0500		**0.488**	0.5000	0	97.6	85	115	01/28/2025

Batch 233949 **SampType:** MS Units **mg/L**

SampID: 25010181-040BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100	S	**141**	5.000	161.8	-422.6	75	125	01/28/2025
Magnesium		0.0500	S	**55.6**	5.000	61.18	-112.0	75	125	01/28/2025
Potassium		0.100		**5.77**	5.000	0.5472	104.4	75	125	01/28/2025
Sodium		0.0500	BS	**43.5**	5.000	47.42	-78.2	75	125	01/28/2025

Batch 233949 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 25010181-040BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Calcium		0.100	S	**141**	5.000	161.8	-413.4	140.7	0.33	01/28/2025
Magnesium		0.0500	S	**55.6**	5.000	61.18	-111.0	55.58	0.09	01/28/2025
Potassium		0.100		**5.75**	5.000	0.5472	104.0	5.770	0.36	01/28/2025
Sodium		0.0500	BS	**43.6**	5.000	47.42	-77.2	43.51	0.11	01/28/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 233949 **SampType:** MS Units **mg/L**

SampID: 25010181-045CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Calcium		0.100		**5.05**	5.000	0	101.0	75	125	01/28/2025
Magnesium		0.0500		**4.74**	5.000	0	94.7	75	125	01/28/2025
Potassium		0.100		**5.18**	5.000	0	103.7	75	125	01/28/2025
Sodium		0.0500	B	**5.17**	5.000	0	103.5	75	125	01/28/2025

Batch 233949 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 25010181-045CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Calcium		0.100		**4.96**	5.000	0	99.2	5.050	1.77	01/28/2025
Magnesium		0.0500		**4.65**	5.000	0	93.0	4.737	1.87	01/28/2025
Potassium		0.100		**5.07**	5.000	0	101.3	5.183	2.28	01/28/2025
Sodium		0.0500	B	**5.05**	5.000	0	101.0	5.175	2.40	01/28/2025

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 233791 **SampType:** MBLK Units **mg/L**

SampID: MBLK-233791

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	01/23/2025

Batch 233791 **SampType:** LCS Units **mg/L**

SampID: LCS-233791

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**0.909**	1.000	0	90.9	80	120	01/23/2025

Batch 233863 **SampType:** MBLK Units **mg/L**

SampID: MBLK-233863

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	01/24/2025

Batch 233863 **SampType:** LCS Units **mg/L**

SampID: LCS-233863

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**0.978**	1.000	0	97.8	80	120	01/24/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 233950 **SampType:** MBLK Units **mg/L**

SampID: MBLK-233950

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	01/28/2025
Iron		0.0250		**< 0.0250**	0.0115	0	0	-100	100	01/28/2025
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	01/28/2025

Batch 233950 **SampType:** LCS Units **mg/L**

SampID: LCS-233950

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**0.914**	1.000	0	91.4	80	120	01/28/2025
Iron		0.0250		**3.42**	4.000	0	85.6	80	120	01/28/2025
Manganese		0.0020		**0.908**	1.000	0	90.8	80	120	01/28/2025

Batch 233950 **SampType:** MS Units **mg/L**

SampID: 25010181-014DMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron		0.0250		**1.06**	1.000	0.1644	89.9	75	125	01/28/2025

Batch 233950 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 25010181-014DMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Boron		0.0250		**1.06**	1.000	0.1644	89.5	1.064	0.43	01/28/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 233786 **SampType:** MBLK Units **mg/L**

SampID: MBLK-233786

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**< 0.0010**	0.0004	0	0	-100	100	01/23/2025
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	01/23/2025
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	01/23/2025
Beryllium		0.0010		**< 0.0010**	0.0002	0	0	-100	100	01/23/2025
Boron	*	0.0250		**< 0.0250**	0.0093	0	0	-100	100	01/23/2025
Cadmium		0.0010		**< 0.0010**	0.0001	0	0	-100	100	01/23/2025
Chromium		0.0015		**< 0.0015**	0.0007	0	0	-100	100	01/23/2025
Cobalt		0.0010		**< 0.0010**	0.0001	0	0	-100	100	01/23/2025
Iron	*	0.0250		**< 0.0250**	0.0115	0	0	-100	100	01/23/2025
Lead		0.0010		**< 0.0010**	0.0006	0	0	-100	100	01/23/2025
Lithium	*	0.0030		**< 0.0030**	0.0015	0	0	-100	100	01/23/2025
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	01/23/2025
Molybdenum		0.0015		**< 0.0015**	0.0006	0	0	-100	100	01/23/2025
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	01/23/2025
Thallium		0.0020		**< 0.0020**	0.0010	0	0	-100	100	01/23/2025

Batch 233786 **SampType:** LCS Units **mg/L**

SampID: LCS-233786

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010	SE	**1.27**	1.000	0	126.9	85	115	01/23/2025
Antimony		0.0010		**0.960**	1.000	0	96.0	80	120	01/24/2025
Arsenic		0.0010		**0.976**	1.000	0	97.6	85	115	01/23/2025
Barium		0.0010		**4.43**	4.000	0	110.8	80	120	01/24/2025
Beryllium		0.0010		**0.0990**	0.1000	0	99.0	85	115	01/23/2025
Boron	*	0.0250		**0.980**	1.000	0	98.0	85	115	01/23/2025
Cadmium		0.0010	S	**0.117**	0.1000	0	117.0	85	115	01/23/2025
Chromium		0.0015		**0.395**	0.4000	0	98.7	85	115	01/23/2025
Cobalt		0.0010		**0.934**	1.000	0	93.4	85	115	01/23/2025
Iron	*	0.0250		**3.88**	4.000	0	97.0	85	115	01/23/2025
Lead		0.0010	E	**0.976**	1.000	0	97.6	85	115	01/23/2025
Lithium	*	0.0030		**1.05**	1.000	0	105.2	85	115	01/23/2025
Manganese		0.0020		**0.984**	1.000	0	98.4	85	115	01/23/2025
Molybdenum		0.0015		**1.12**	1.000	0	111.9	85	115	01/23/2025
Selenium		0.0010		**0.984**	1.000	0	98.4	85	115	01/23/2025
Thallium		0.0020		**0.469**	0.5000	0	93.8	85	115	01/23/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 233786 **SampType:** MS Units **mg/L**

SampID: 25011405-002AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Cadmium		0.0010		**0.118**	0.1000	0	118.5	70	130	01/23/2025

Batch 233786 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 25011405-002AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Cadmium		0.0010		**0.112**	0.1000	0	111.8	0.1185	5.82	01/23/2025

Batch 233790 **SampType:** MBLK Units **mg/L**

SampID: MBLK-233790

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**< 0.0010**	0.0004	0	0	-100	100	01/24/2025
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	01/24/2025
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	01/24/2025
Beryllium		0.0010		**< 0.0010**	0.0002	0	0	-100	100	01/24/2025
Boron	*	0.0250		**< 0.0250**	0.0093	0	0	-100	100	01/24/2025
Cadmium		0.0010		**< 0.0010**	0.0001	0	0	-100	100	01/24/2025
Chromium		0.0015		**< 0.0015**	0.0007	0	0	-100	100	01/24/2025
Cobalt		0.0010		**< 0.0010**	0.0001	0	0	-100	100	01/24/2025
Iron	*	0.0250		**< 0.0250**	0.0115	0	0	-100	100	01/24/2025
Lead		0.0010		**< 0.0010**	0.0006	0	0	-100	100	01/24/2025
Lithium	*	0.0030		**< 0.0030**	0.0015	0	0	-100	100	01/24/2025
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	01/24/2025
Molybdenum		0.0015		**< 0.0015**	0.0006	0	0	-100	100	01/24/2025
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	01/24/2025
Thallium		0.0020		**< 0.0020**	0.0010	0	0	-100	100	01/24/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 233790 **SampType:** LCS Units **mg/L**

SampID: LCS-233790

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**1.01**	1.000	0	100.9	85	115	01/24/2025
Arsenic		0.0010		**1.01**	1.000	0	100.6	85	115	01/24/2025
Barium		0.0010		**4.55**	4.000	0	113.7	85	115	01/24/2025
Beryllium		0.0010		**0.0993**	0.1000	0	99.3	85	115	01/24/2025
Boron	*	0.0250		**0.976**	1.000	0	97.6	85	115	01/24/2025
Cadmium		0.0010	S	**0.128**	0.1000	0	127.8	85	115	01/24/2025
Chromium		0.0015		**0.383**	0.4000	0	95.8	85	115	01/24/2025
Cobalt		0.0010		**0.867**	1.000	0	86.7	85	115	01/24/2025
Iron	*	0.0250		**3.80**	4.000	0	94.9	85	115	01/24/2025
Lead		0.0010	E	**0.964**	1.000	0	96.4	85	115	01/24/2025
Lithium	*	0.0030		**1.05**	1.000	0	104.9	85	115	01/24/2025
Manganese		0.0020		**0.975**	1.000	0	97.5	85	115	01/24/2025
Molybdenum		0.0015		**0.949**	1.000	0	94.9	85	115	01/24/2025
Selenium		0.0010		**1.00**	1.000	0	100.2	85	115	01/24/2025
Thallium		0.0020		**0.457**	0.5000	0	91.4	85	115	01/24/2025

Batch 233790 **SampType:** MS Units **mg/L**

SampID: 25010181-016CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**0.929**	1.000	0	92.9	75	125	01/24/2025
Arsenic		0.0010		**0.880**	1.000	0.002558	87.8	75	125	01/27/2025
Barium		0.0010		**4.16**	4.000	0.01745	103.5	75	125	01/27/2025
Beryllium		0.0010		**0.0990**	0.1000	0	99.0	75	125	01/24/2025
Boron		0.0250		**2.78**	1.000	1.824	96.1	75	125	01/24/2025
Cadmium		0.0010		**0.116**	0.1000	0	115.7	75	125	01/24/2025
Chromium		0.0015		**0.359**	0.4000	0.0007586	89.6	75	125	01/24/2025
Cobalt		0.0010		**0.813**	1.000	0	81.3	75	125	01/24/2025
Iron		0.0250		**3.59**	4.000	0.05691	88.4	75	125	01/24/2025
Lead		0.0010		**0.866**	1.000	0	86.6	75	125	01/24/2025
Lithium	*	0.0030		**1.12**	1.000	0.09620	102.8	75	125	01/24/2025
Manganese		0.0020		**0.893**	1.000	0.003524	88.9	75	125	01/24/2025
Molybdenum		0.0015		**0.886**	1.000	0.001007	88.5	75	125	01/24/2025
Selenium		0.0010		**0.931**	1.000	0	93.1	75	125	01/24/2025
Thallium		0.0020		**0.451**	0.5000	0	90.2	75	125	01/24/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 233790 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 25010181-016CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		0.0010		**0.982**	1.000	0	98.2	0.9287	5.60	01/24/2025
Arsenic		0.0010		**0.906**	1.000	0.002558	90.4	0.8803	2.88	01/27/2025
Barium		0.0010		**4.38**	4.000	0.01745	108.9	4.156	5.13	01/27/2025
Beryllium		0.0010		**0.0994**	0.1000	0	99.4	0.09896	0.42	01/24/2025
Boron		0.0250		**2.76**	1.000	1.824	94.0	2.785	0.76	01/24/2025
Cadmium		0.0010		**0.122**	0.1000	0	122.3	0.1157	5.56	01/24/2025
Chromium		0.0015		**0.362**	0.4000	0.0007586	90.3	0.3593	0.75	01/24/2025
Cobalt		0.0010		**0.823**	1.000	0	82.3	0.8131	1.26	01/24/2025
Iron		0.0250		**3.62**	4.000	0.05691	89.1	3.592	0.83	01/24/2025
Lead		0.0010		**0.906**	1.000	0	90.6	0.8659	4.49	01/24/2025
Lithium	*	0.0030		**1.14**	1.000	0.09620	104.4	1.124	1.47	01/24/2025
Manganese		0.0020		**0.914**	1.000	0.003524	91.0	0.8928	2.33	01/24/2025
Molybdenum		0.0015		**0.941**	1.000	0.001007	94.0	0.8861	6.00	01/24/2025
Selenium		0.0010		**0.947**	1.000	0	94.7	0.9315	1.67	01/24/2025
Thallium		0.0020		**0.467**	0.5000	0	93.4	0.4510	3.51	01/24/2025

Batch 233790 **SampType:** MS Units **mg/L**

SampID: 25010181-050BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**1.02**	1.000	0	102.3	75	125	01/24/2025
Arsenic		0.0010		**1.04**	1.000	0	104.1	75	125	01/24/2025
Barium		0.0010		**4.57**	4.000	0.05137	113.0	75	125	01/24/2025
Beryllium		0.0010		**0.104**	0.1000	0	104.3	75	125	01/24/2025
Boron		0.0250		**2.93**	1.000	1.756	117.4	75	125	01/27/2025
Cadmium		0.0010		**0.114**	0.1000	0	113.7	75	125	01/24/2025
Chromium		0.0015		**0.390**	0.4000	0	97.5	75	125	01/24/2025
Cobalt		0.0010		**0.941**	1.000	0	94.1	75	125	01/24/2025
Lead		0.0010		**0.912**	1.000	0	91.2	75	125	01/24/2025
Lithium	*	0.0030		**1.18**	1.000	0.1263	105.0	75	125	01/24/2025
Molybdenum		0.0015		**1.20**	1.000	0.0007215	119.8	75	125	01/24/2025
Selenium		0.0010		**0.999**	1.000	0	99.9	75	125	01/24/2025
Thallium		0.0020		**0.505**	0.5000	0	101.0	75	125	01/24/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 233790 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 25010181-050BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		0.0010		**1.01**	1.000	0	101.0	1.023	1.30	01/24/2025
Arsenic		0.0010		**1.01**	1.000	0	101.5	1.041	2.55	01/24/2025
Barium		0.0010		**4.53**	4.000	0.05137	111.9	4.572	0.96	01/24/2025
Beryllium		0.0010		**0.103**	0.1000	0	102.5	0.1043	1.71	01/24/2025
Boron		0.0250		**2.90**	1.000	1.756	114.2	2.930	1.10	01/27/2025
Cadmium		0.0010		**0.114**	0.1000	0	114.1	0.1137	0.38	01/24/2025
Chromium		0.0015		**0.385**	0.4000	0	96.1	0.3900	1.42	01/24/2025
Cobalt		0.0010		**0.924**	1.000	0	92.4	0.9413	1.90	01/24/2025
Lead		0.0010		**0.903**	1.000	0	90.3	0.9115	0.92	01/24/2025
Lithium	*	0.0030		**1.16**	1.000	0.1263	103.6	1.176	1.15	01/24/2025
Molybdenum		0.0015		**1.20**	1.000	0.0007215	119.7	1.199	0.08	01/24/2025
Selenium		0.0010		**0.987**	1.000	0	98.7	0.9994	1.21	01/24/2025
Thallium		0.0020		**0.490**	0.5000	0	97.9	0.5049	3.07	01/24/2025

Batch 233831 **SampType:** MBLK Units **mg/L**

SampID: MBLK-233831

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**< 0.0010**	0.0004	0	0	-100	100	01/24/2025
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	01/24/2025
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	01/24/2025
Beryllium		0.0010		**< 0.0010**	0.0002	0	0	-100	100	01/24/2025
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	01/24/2025
Cadmium		0.0010		**< 0.0010**	0.0001	0	0	-100	100	01/24/2025
Chromium		0.0015		**< 0.0015**	0.0007	0	0	-100	100	01/24/2025
Cobalt		0.0010		**< 0.0010**	0.0001	0	0	-100	100	01/24/2025
Iron		0.0250		**< 0.0250**	0.0115	0	0	-100	100	01/24/2025
Lead		0.0010		**< 0.0010**	0.0006	0	0	-100	100	01/24/2025
Lithium	*	0.0030		**< 0.0030**	0.0015	0	0	-100	100	01/24/2025
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	01/24/2025
Molybdenum		0.0015		**< 0.0015**	0.0006	0	0	-100	100	01/24/2025
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	01/24/2025
Thallium		0.0020		**< 0.0020**	0.0010	0	0	-100	100	01/24/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 233831 **SampType:** LCS Units **mg/L**

SampID: LCS-233831

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**1.02**	1.000	0	102.1	80	120	01/24/2025
Arsenic		0.0010		**1.03**	1.000	0	103.2	80	120	01/24/2025
Barium		0.0010		**4.54**	4.000	0	113.5	80	120	01/24/2025
Beryllium		0.0010		**0.101**	0.1000	0	101.5	80	120	01/24/2025
Boron		0.0250		**1.03**	1.000	0	103.5	80	120	01/24/2025
Cadmium		0.0010		**0.114**	0.1000	0	113.9	80	120	01/24/2025
Chromium		0.0015		**0.402**	0.4000	0	100.4	80	120	01/24/2025
Cobalt		0.0010		**0.948**	1.000	0	94.8	80	120	01/24/2025
Iron		0.0250		**4.02**	4.000	0	100.4	80	120	01/24/2025
Lead		0.0010		**1.00**	1.000	0	100.0	80	120	01/24/2025
Lithium	*	0.0030		**1.09**	1.000	0	108.9	80	120	01/24/2025
Manganese		0.0020		**0.999**	1.000	0	99.9	80	120	01/24/2025
Molybdenum		0.0015		**1.16**	1.000	0	115.8	80	120	01/24/2025
Selenium		0.0010		**1.04**	1.000	0	104.4	80	120	01/24/2025
Thallium		0.0020		**0.472**	0.5000	0	94.3	80	120	01/24/2025

Batch 233903 **SampType:** MBLK Units **mg/L**

SampID: MBLK-233903

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**< 0.0010**	0.0004	0	0	-100	100	01/28/2025
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	01/28/2025
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	01/28/2025
Beryllium		0.0010		**< 0.0010**	0.0002	0	0	-100	100	01/28/2025
Boron	*	0.0250		**< 0.0250**	0.0093	0	0	-100	100	01/28/2025
Cadmium		0.0010		**< 0.0010**	0.0001	0	0	-100	100	01/28/2025
Chromium		0.0015		**< 0.0015**	0.0007	0	0	-100	100	01/28/2025
Cobalt		0.0010		**< 0.0010**	0.0001	0	0	-100	100	01/28/2025
Iron	*	0.0250		**< 0.0250**	0.0115	0	0	-100	100	01/28/2025
Lead		0.0010		**< 0.0010**	0.0006	0	0	-100	100	01/28/2025
Lithium	*	0.0030		**< 0.0030**	0.0015	0	0	-100	100	01/28/2025
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	01/28/2025
Molybdenum		0.0015		**< 0.0015**	0.0006	0	0	-100	100	01/28/2025
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	01/28/2025
Thallium		0.0020		**< 0.0020**	0.0010	0	0	-100	100	01/28/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 233903 **SampType:** LCS Units **mg/L**

SampID: LCS-233903

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**1.07**	1.000	0	106.9	85	115	01/28/2025
Arsenic		0.0010		**1.01**	1.000	0	101.0	85	115	01/28/2025
Barium		0.0010		**4.13**	4.000	0	103.1	85	115	01/28/2025
Beryllium		0.0010		**0.0936**	0.1000	0	93.6	85	115	01/29/2025
Boron	*	0.0250		**0.928**	1.000	0	92.8	85	115	01/29/2025
Cadmium		0.0010		**0.100**	0.1000	0	100.2	85	115	01/28/2025
Chromium		0.0015		**0.388**	0.4000	0	97.1	85	115	01/28/2025
Cobalt		0.0010		**0.946**	1.000	0	94.6	85	115	01/28/2025
Iron	*	0.0250		**3.61**	4.000	0	90.3	85	115	01/28/2025
Lead		0.0010	E	**0.994**	1.000	0	99.4	85	115	01/28/2025
Lithium	*	0.0030		**0.982**	1.000	0	98.2	85	115	01/29/2025
Manganese		0.0020		**0.993**	1.000	0	99.3	85	115	01/28/2025
Molybdenum		0.0015		**0.964**	1.000	0	96.4	85	115	01/29/2025
Selenium		0.0010		**1.05**	1.000	0	105.1	85	115	01/28/2025
Thallium		0.0020		**0.473**	0.5000	0	94.6	85	115	01/28/2025

Batch 233933 **SampType:** MBLK Units **mg/L**

SampID: MBLK-233933

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**< 0.0010**	0.0004	0	0	-100	100	01/28/2025
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	01/28/2025
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	01/28/2025
Beryllium		0.0010		**< 0.0010**	0.0002	0	0	-100	100	01/28/2025
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	01/28/2025
Cadmium		0.0010		**< 0.0010**	0.0001	0	0	-100	100	01/28/2025
Chromium		0.0015		**< 0.0015**	0.0007	0	0	-100	100	01/28/2025
Cobalt		0.0010		**< 0.0010**	0.0001	0	0	-100	100	01/28/2025
Iron		0.0250		**< 0.0250**	0.0115	0	0	-100	100	01/28/2025
Lead		0.0010		**< 0.0010**	0.0006	0	0	-100	100	01/28/2025
Lithium	*	0.0030		**< 0.0030**	0.0015	0	0	-100	100	01/28/2025
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	01/28/2025
Molybdenum		0.0015		**< 0.0015**	0.0006	0	0	-100	100	01/28/2025
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	01/28/2025
Thallium		0.0020		**< 0.0020**	0.0010	0	0	-100	100	01/28/2025

Quality Control Results

http://www.teklabinc.com/

Client: Ramboll
Client Project: BAL-25Q1

Work Order: 25010181
Report Date: 04-Mar-25

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 233933 **SampType:** LCS Units **mg/L**
SampID: LCS-233933

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**1.05**	1.000	0	104.7	85	115	01/28/2025
Arsenic		0.0010		**0.979**	1.000	0	97.9	80	120	01/28/2025
Barium		0.0010		**4.26**	4.000	0	106.4	80	120	01/28/2025
Beryllium		0.0010		**0.0940**	0.1000	0	94.0	80	120	01/29/2025
Boron		0.0250		**0.941**	1.000	0	94.1	80	120	01/29/2025
Cadmium		0.0010		**0.101**	0.1000	0	101.4	80	120	01/28/2025
Chromium		0.0015		**0.389**	0.4000	0	97.4	80	120	01/28/2025
Cobalt		0.0010		**0.937**	1.000	0	93.7	80	120	01/28/2025
Iron		0.0250		**3.98**	4.000	0	99.5	80	120	01/28/2025
Lead		0.0010		**0.992**	1.000	0	99.2	80	120	01/28/2025
Lithium	*	0.0030		**0.990**	1.000	0	99.0	80	120	01/29/2025
Manganese		0.0020		**0.996**	1.000	0	99.6	80	120	01/28/2025
Molybdenum		0.0015		**0.969**	1.000	0	96.9	80	120	01/29/2025
Selenium		0.0010		**0.920**	1.000	0	92.0	85	115	01/28/2025
Thallium		0.0020		**0.479**	0.5000	0	95.8	85	115	01/28/2025

Batch 233933 **SampType:** MS Units **mg/L**
SampID: 25011699-001CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**1.07**	1.000	0.0006642	106.7	70	130	01/28/2025
Selenium		0.0010		**0.976**	1.000	0.0006973	97.5	70	130	01/28/2025
Thallium		0.0020		**0.461**	0.5000	0.001809	91.8	70	130	01/28/2025

Batch 233933 **SampType:** MSD Units **mg/L** RPD Limit **20**
SampID: 25011699-001CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		0.0010		**1.06**	1.000	0.0006642	106.4	1.068	0.27	01/28/2025
Selenium		0.0010		**0.972**	1.000	0.0006973	97.2	0.9760	0.37	01/28/2025
Thallium		0.0020		**0.452**	0.5000	0.001809	90.1	0.4608	1.87	01/28/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 233949 **SampType:** MBLK Units **mg/L**

SampID: MBLK-233949

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**< 0.0010**	0.0004	0	0	-100	100	01/28/2025
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	01/28/2025
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	02/03/2025
Barium		0.0010	S	**0.0015**	0.0007	0	212.9	-100	100	01/29/2025
Beryllium		0.0010		**< 0.0010**	0.0002	0	0	-100	100	01/28/2025
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	01/28/2025
Cadmium		0.0010		**< 0.0010**	0.0001	0	0	-100	100	01/28/2025
Chromium		0.0015		**< 0.0015**	0.0007	0	0	-100	100	01/28/2025
Cobalt		0.0010		**< 0.0010**	0.0001	0	0	-100	100	01/28/2025
Iron		0.0250		**< 0.0250**	0.0115	0	0	-100	100	01/28/2025
Lead		0.0010		**< 0.0010**	0.0006	0	0	-100	100	01/28/2025
Lithium	*	0.0030		**< 0.0030**	0.0015	0	0	-100	100	01/28/2025
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	01/28/2025
Molybdenum		0.0015		**< 0.0015**	0.0006	0	0	-100	100	01/29/2025
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	01/28/2025
Thallium		0.0020		**< 0.0020**	0.0010	0	0	-100	100	01/28/2025

Batch 233949 **SampType:** LCS Units **mg/L**

SampID: LCS-233949

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**1.12**	1.000	0	111.9	80	120	01/28/2025
Arsenic		0.0010		**1.04**	1.000	0	104.0	80	120	01/28/2025
Barium		0.0010	B	**4.25**	4.000	0	106.3	80	120	01/29/2025
Beryllium		0.0010		**0.102**	0.1000	0	101.6	80	120	01/28/2025
Boron		0.0250		**1.03**	1.000	0	102.9	80	120	01/28/2025
Cadmium		0.0010		**0.104**	0.1000	0	104.3	80	120	01/28/2025
Chromium		0.0015		**0.408**	0.4000	0	101.9	80	120	01/28/2025
Cobalt		0.0010		**0.970**	1.000	0	97.0	80	120	01/28/2025
Iron		0.0250		**4.06**	4.000	0	101.4	80	120	01/28/2025
Lead		0.0010		**1.01**	1.000	0	100.7	80	120	01/28/2025
Lithium	*	0.0030		**1.10**	1.000	0	109.8	80	120	01/28/2025
Manganese		0.0020		**1.03**	1.000	0	103.3	80	120	01/28/2025
Molybdenum		0.0015		**1.04**	1.000	0	103.9	80	120	01/29/2025
Selenium		0.0010		**1.08**	1.000	0	108.0	80	120	01/28/2025
Thallium		0.0020		**0.480**	0.5000	0	95.9	80	120	01/28/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 233949 **SampType:** MS Units **mg/L**

SampID: 25010181-040BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**1.10**	1.000	0	110.1	75	125	01/28/2025
Arsenic		0.0010		**1.03**	1.000	0.0008714	102.5	75	125	01/28/2025
Barium		0.0010	B	**4.18**	4.000	0.06750	102.7	75	125	01/29/2025
Beryllium		0.0010		**0.101**	0.1000	0	101.2	75	125	01/28/2025
Boron		0.0250		**1.42**	1.000	0.5510	87.4	75	125	01/29/2025
Cadmium		0.0010		**0.102**	0.1000	0	101.8	75	125	01/28/2025
Chromium		0.0015		**0.390**	0.4000	0	97.5	75	125	01/28/2025
Cobalt		0.0010		**0.934**	1.000	0.0002385	93.4	75	125	01/28/2025
Lead		0.0010		**1.03**	1.000	0	103.2	75	125	01/28/2025
Lithium	*	0.0030		**0.968**	1.000	0.01454	95.3	75	125	01/29/2025
Molybdenum		0.0015		**1.03**	1.000	0	102.7	75	125	01/29/2025
Selenium		0.0010		**1.05**	1.000	0	105.2	75	125	01/28/2025
Thallium		0.0020		**0.484**	0.5000	0	96.8	75	125	01/28/2025

Batch 233949 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 25010181-040BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		0.0010		**1.11**	1.000	0	110.5	1.101	0.41	01/28/2025
Arsenic		0.0010		**1.03**	1.000	0.0008714	102.8	1.026	0.21	01/28/2025
Barium		0.0010	B	**4.17**	4.000	0.06750	102.6	4.176	0.08	01/29/2025
Beryllium		0.0010		**0.102**	0.1000	0	102.3	0.1012	1.06	01/28/2025
Boron		0.0250		**1.40**	1.000	0.5510	85.4	1.425	1.42	01/29/2025
Cadmium		0.0010		**0.102**	0.1000	0	101.7	0.1018	0.06	01/28/2025
Chromium		0.0015		**0.403**	0.4000	0	100.8	0.3901	3.27	01/28/2025
Cobalt		0.0010		**0.938**	1.000	0.0002385	93.8	0.9344	0.38	01/28/2025
Lead		0.0010		**0.992**	1.000	0	99.2	1.032	3.91	01/28/2025
Lithium	*	0.0030		**0.975**	1.000	0.01454	96.1	0.9675	0.80	01/29/2025
Molybdenum		0.0015		**1.01**	1.000	0	101.4	1.027	1.31	01/29/2025
Selenium		0.0010		**1.06**	1.000	0	106.0	1.052	0.83	01/28/2025
Thallium		0.0020		**0.474**	0.5000	0	94.8	0.4838	2.04	01/28/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 233949 **SampType:** MS Units **mg/L**

SampID: 25010181-045CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**1.08**	1.000	0	107.5	75	125	01/28/2025
Arsenic		0.0010		**1.01**	1.000	0	100.8	75	125	01/28/2025
Barium		0.0010		**4.58**	4.000	0	114.6	75	125	02/03/2025
Beryllium		0.0010		**0.0978**	0.1000	0	97.8	75	125	01/28/2025
Boron		0.0250		**1.01**	1.000	0	101.3	75	125	01/30/2025
Cadmium		0.0010		**0.0999**	0.1000	0	99.9	75	125	01/28/2025
Chromium		0.0015		**0.393**	0.4000	0	98.2	75	125	01/28/2025
Cobalt		0.0010		**0.948**	1.000	0	94.8	75	125	01/28/2025
Iron		0.0250		**4.11**	4.000	0.01332	102.3	75	125	01/28/2025
Lead		0.0010		**1.01**	1.000	0	101.2	75	125	01/28/2025
Lithium	*	0.0030		**1.06**	1.000	0	106.3	75	125	01/30/2025
Manganese		0.0020		**1.01**	1.000	0	101.1	75	125	01/28/2025
Molybdenum		0.0015		**0.962**	1.000	0	96.2	75	125	01/30/2025
Selenium		0.0010		**1.06**	1.000	0	106.5	75	125	01/28/2025
Thallium		0.0020		**0.462**	0.5000	0	92.4	75	125	01/28/2025

Batch 233949 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 25010181-045CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		0.0010		**1.07**	1.000	0	106.6	1.075	0.80	01/28/2025
Arsenic		0.0010		**1.00**	1.000	0	100.2	1.008	0.68	01/28/2025
Barium		0.0010		**4.46**	4.000	0	111.5	4.583	2.70	02/03/2025
Beryllium		0.0010		**0.0959**	0.1000	0	95.9	0.09776	1.91	01/28/2025
Boron		0.0250		**1.01**	1.000	0	101.1	1.013	0.12	01/30/2025
Cadmium		0.0010		**0.0997**	0.1000	0	99.7	0.09985	0.14	01/28/2025
Chromium		0.0015		**0.391**	0.4000	0	97.7	0.3929	0.57	01/28/2025
Cobalt		0.0010		**0.946**	1.000	0	94.6	0.9484	0.22	01/28/2025
Iron		0.0250		**3.91**	4.000	0.01332	97.4	4.105	4.90	01/28/2025
Lead		0.0010		**0.969**	1.000	0	96.9	1.012	4.33	01/28/2025
Lithium	*	0.0030		**1.05**	1.000	0	104.7	1.063	1.56	01/30/2025
Manganese		0.0020		**0.993**	1.000	0	99.3	1.011	1.82	01/28/2025
Molybdenum		0.0015		**0.944**	1.000	0	94.4	0.9624	1.98	01/30/2025
Selenium		0.0010		**1.05**	1.000	0	105.1	1.065	1.32	01/28/2025
Thallium		0.0020		**0.465**	0.5000	0	92.9	0.4620	0.56	01/28/2025

Quality Control Results

http://www.teklabinc.com/

Client: Ramboll
Client Project: BAL-25Q1

Work Order: 25010181
Report Date: 04-Mar-25

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 234366 **SampType:** MBLK Units **mg/L**
SampID: MBLK-234366

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**< 0.0010**	0.0004	0	0	-100	100	02/06/2025
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	02/06/2025
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	02/06/2025
Beryllium		0.0010		**< 0.0010**	0.0002	0	0	-100	100	02/06/2025
Boron	*	0.0250		**< 0.0250**	0.0093	0	0	-100	100	02/06/2025
Cadmium		0.0010		**< 0.0010**	0.0001	0	0	-100	100	02/06/2025
Chromium		0.0015		**< 0.0015**	0.0007	0	0	-100	100	02/06/2025
Cobalt		0.0010		**< 0.0010**	0.0001	0	0	-100	100	02/06/2025
Iron	*	0.0250		**< 0.0250**	0.0115	0	0	-100	100	02/06/2025
Lead		0.0010		**< 0.0010**	0.0006	0	0	-100	100	02/06/2025
Lithium	*	0.0030		**< 0.0030**	0.0015	0	0	-100	100	02/06/2025
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	02/06/2025
Molybdenum		0.0015		**< 0.0015**	0.0006	0	0	-100	100	02/06/2025
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	02/06/2025
Thallium		0.0020		**< 0.0020**	0.0010	0	0	-100	100	02/06/2025

Batch 234366 **SampType:** LCS Units **mg/L**
SampID: LCS-234366

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**1.03**	1.000	0	102.5	85	115	02/06/2025
Arsenic		0.0010		**0.963**	1.000	0	96.3	85	115	02/06/2025
Barium		0.0010		**3.78**	4.000	0	94.5	85	115	02/06/2025
Beryllium		0.0010		**0.0922**	0.1000	0	92.2	85	115	02/06/2025
Boron	*	0.0250		**0.910**	1.000	0	91.0	85	115	02/06/2025
Cadmium		0.0010		**0.0934**	0.1000	0	93.4	85	115	02/06/2025
Chromium		0.0015		**0.362**	0.4000	0	90.5	85	115	02/06/2025
Cobalt		0.0010		**0.907**	1.000	0	90.7	85	115	02/06/2025
Iron	*	0.0250		**3.62**	4.000	0	90.6	85	115	02/06/2025
Lead		0.0010	E	**0.858**	1.000	0	85.8	85	115	02/06/2025
Lithium	*	0.0030		**0.987**	1.000	0	98.7	85	115	02/06/2025
Manganese		0.0020		**0.913**	1.000	0	91.3	85	115	02/06/2025
Molybdenum		0.0015		**0.917**	1.000	0	91.7	85	115	02/06/2025
Selenium		0.0010		**0.967**	1.000	0	96.7	85	115	02/06/2025
Thallium		0.0020		**0.473**	0.5000	0	94.6	85	115	02/07/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 234691 **SampType:** MBLK Units **mg/L**

SampID: MBLK-234691

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**< 0.0010**	0.0004	0	0	-100	100	02/13/2025
Arsenic		0.0010		**< 0.0010**	0.0004	0	0	-100	100	02/13/2025
Barium		0.0010		**< 0.0010**	0.0007	0	0	-100	100	02/13/2025
Beryllium		0.0010		**< 0.0010**	0.0002	0	0	-100	100	02/13/2025
Boron		0.0250		**< 0.0250**	0.0093	0	0	-100	100	02/13/2025
Cadmium		0.0010		**< 0.0010**	0.0001	0	0	-100	100	02/13/2025
Chromium		0.0015		**< 0.0015**	0.0007	0	0	-100	100	02/13/2025
Cobalt		0.0010		**< 0.0010**	0.0001	0	0	-100	100	02/13/2025
Iron		0.0250		**< 0.0250**	0.0115	0	0	-100	100	02/13/2025
Lead		0.0010		**< 0.0010**	0.0006	0	0	-100	100	02/13/2025
Lithium	*	0.0030		**< 0.0030**	0.0015	0	0	-100	100	02/13/2025
Manganese		0.0020		**< 0.0020**	0.0008	0	0	-100	100	02/13/2025
Molybdenum		0.0015		**< 0.0015**	0.0006	0	0	-100	100	02/13/2025
Selenium		0.0010		**< 0.0010**	0.0006	0	0	-100	100	02/13/2025
Thallium		0.0020		**< 0.0020**	0.0010	0	0	-100	100	02/13/2025

Batch 234691 **SampType:** LCS Units **mg/L**

SampID: LCS-234691

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0010		**1.07**	1.000	0	107.5	80	120	02/13/2025
Arsenic		0.0010		**0.957**	1.000	0	95.7	80	120	02/13/2025
Barium		0.0010		**4.14**	4.000	0	103.5	80	120	02/13/2025
Beryllium		0.0010		**0.0876**	0.1000	0	87.6	80	120	02/13/2025
Boron		0.0250		**0.875**	1.000	0	87.5	80	120	02/13/2025
Cadmium		0.0010		**0.107**	0.1000	0	106.9	80	120	02/13/2025
Chromium		0.0015		**0.395**	0.4000	0	98.6	80	120	02/13/2025
Cobalt		0.0010		**1.04**	1.000	0	104.1	80	120	02/13/2025
Iron		0.0250		**3.90**	4.000	0	97.4	80	120	02/13/2025
Lead		0.0010		**1.02**	1.000	0	101.6	80	120	02/13/2025
Lithium	*	0.0030		**0.900**	1.000	0	90.0	80	120	02/13/2025
Manganese		0.0020		**0.977**	1.000	0	97.7	80	120	02/13/2025
Molybdenum		0.0015		**1.07**	1.000	0	106.5	80	120	02/13/2025
Selenium		0.0010		**1.09**	1.000	0	108.7	80	120	02/13/2025
Thallium		0.0020		**0.474**	0.5000	0	94.9	80	120	02/13/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 7470A (TOTAL)

Batch 233801 **SampType:** MBLK Units **mg/L**

SampID: MBLK-233801

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**< 0.00020**	0.0001	0	0	-100	100	01/24/2025

Batch 233801 **SampType:** LCS Units **mg/L**

SampID: LCS-233801

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00482**	0.0050	0	96.4	85	115	01/24/2025

Batch 233801 **SampType:** MS Units **mg/L**

SampID: 25010181-016CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00494**	0.0050	0	98.8	75	125	01/24/2025

Batch 233801 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 25010181-016CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00461**	0.0050	0	92.1	0.004940	6.99	01/24/2025

Batch 233801 **SampType:** MS Units **mg/L**

SampID: 25010181-050BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00456**	0.0050	0	91.2	75	125	01/24/2025

Batch 233801 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 25010181-050BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00438**	0.0050	0	87.6	0.004560	4.05	01/24/2025

Batch 233858 **SampType:** MBLK Units **mg/L**

SampID: MBLK-233858

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**< 0.00020**	0.0001	0	0	-100	100	01/24/2025

Batch 233858 **SampType:** LCS Units **mg/L**

SampID: LCS-233858

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00454**	0.0050	0	90.7	85	115	01/24/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 7470A (TOTAL)

Batch 233858 **SampType:** MS Units **mg/L**
SampID: 25010181-030BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00472**	0.0050	0	94.4	75	125	01/24/2025

Batch 233858 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 25010181-030BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00481**	0.0050	0	96.3	0.004720	1.94	01/24/2025

Batch 233858 **SampType:** MS Units **mg/L**
SampID: 25011527-001BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00466**	0.0050	0	93.1	75	125	01/24/2025

Batch 233858 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 25011527-001BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00466**	0.0050	0	93.2	0.004656	0.12	01/24/2025

Batch 233951 **SampType:** MBLK Units **mg/L**
SampID: MBLK-233951

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**< 0.00020**	0.0001	0	0	-100	100	01/28/2025

Batch 233951 **SampType:** LCS Units **mg/L**
SampID: LCS-233951

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00460**	0.0050	0	92.1	85	115	01/28/2025

Batch 233951 **SampType:** MS Units **mg/L**
SampID: 25010181-014CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00463**	0.0050	0	92.5	75	125	01/28/2025

Batch 233951 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 25010181-014CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00462**	0.0050	0	92.4	0.004626	0.11	01/28/2025

Client: Ramboll **Work Order:** 25010181

Client Project: BAL-25Q1 **Report Date:** 04-Mar-25

SW-846 7470A (TOTAL)

Batch **233951** **SampType:** **MS** Units **mg/L**

SampID: 25010181-047BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00477**	0.0050	0	95.5	75	125	01/28/2025

Batch **233951** **SampType:** **MSD** Units **mg/L** RPD Limit **15**

SampID: 25010181-047BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00485**	0.0050	0	97.1	0.004774	1.65	01/28/2025

Receiving Check List

http://www.teklabinc.com/

Client: Ramboll
Client Project: BAL-25Q1

Work Order: 25010181
Report Date: 04-Mar-25

Carrier: Daniel Crump

Received By: AMD

Completed by: Amber Dilallo
On: 22-Jan-25

Reviewed by: Ellie Hopkins
On: 27-Jan-25

Pages to follow: Chain of custody 11 Extra pages included 0

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C 12.9
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☑	No ☐		
Reported field parameters measured:	Field ☑	Lab ☐	NA ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐		
When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.				
Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑	
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑	
Water - pH acceptable upon receipt?	Yes ☐	No ☑	NA ☐	
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑	

Any No responses must be detailed below or on the COC.

Samples were received on 1/22/25 at 1620 on ice (additional coolers: 12.9, 11.1, 10.1, 6.5 and 10.3C - LTG#5). Additional Nitric Acid (101262) was needed in MW-304, MW-393, MW-393, MW-394, PZ-170, and MW-304 Duplicate upon arrival at the laboratory. pH strip #96651. - JD/amberdilallo - 1/22/2025 4:48:48 PM

Samples were received on 1/23/25 at 1545 on ice [10.3, 9.1 and 12.7C - LTG#5]. Additional Nitric Acid (101262) was needed upon arrival at the laboratory for MW383, MW382, MW375, MW366, MW356 and MW151. pH strip #96651. - JD/amberdilallo - 1/23/2025 4:21:17 PM

Samples were received on 1/24/25 at 1330 on ice [3.9C - LTG#5]. Additional Nitric Acid (101262) was needed upon arrival at the laboratory for MW358R and MW358R Dup. pH strip #96651. - JD/amberdilallo - 1/24/2025 2:29:06 PM

Samples were received on 1/27/25 at 1415 on ice [10.3, 7.5, 9.7, 12.9 and 9.9C - LTG#5]. Additional Nitric Acid (101262) was needed upon arrival at the laboratory for TPZ-164. pH strip #96651. - LH/amberdilallo - 1/27/2025 2:39:40 PM

25010181

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	Vistra Corp-Baldwin	Report To:	Brian Voelker	Attention:	Brian Voelker
Address:	10901 Baldwin Road	Copy To:	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com	Company Name:	Vistra Corp
	Baldwin, IL 62217			Address:	see Section A
Email To:	Brian.Voelker@VistraCorp.com	Purchase Order No.:		Quote Reference:	
Phone:	(217) 753-8911 Fax:	Project Name:		Project Manager:	
Requested Due Date/TAT:	10 day	Project Number:		Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605	Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-104DR	WT	G	1/22/25	1435		4	2		2												X		25010181-001
2	MW-104SR	WT	G				4	2		2												X		25010181-002
3	MW-150	WT	G	1-22-25	1424		4	2		2								X		X		X		25010181-003
4	MW-151	WT	G				4	2		2								X		X		X		25010181-004
5	MW-152	WT	G				4	2		2								X		X		X		25010181-005
6	MW-153	WT	G				4	2		2								X		X		X		25010181-006
7	MW-154	WT	G	1-22-25	1129		4	2		2												X		25010181-007
8	MW-155	WT	G	1-22-25	DRY		4	2		2												X		25010181-008
9	MW-192	WT	G	1-22-25	1310		2	1		1							X		X					25010181-009
10	MW-193	WT	G	1-22-25	1349		2	1		1							X		X					25010181-010
11	MW-196	WT	G				3	1		2											X			25010181-011
12	MW-197	WT	G				3	1		2											X			25010181-012
13	MW-198	WT	G				3	1		2											X			25010181-013
14	MW-252	WT	G				4	2		2								X		X		X		25010181-014
15	MW-253R	WT	G				4	2		2								X		X		X		25010181-015
16	MW-304	WT	G	1/22/25	1332		4	2		2							X	X	X	X		X		25010181-016

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS	Y	N	
BAL-25Q1 Rev 0	[signature]	1-22	1620	[signature]	1/22/25	1620	Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Cole

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 1-22-25

Added HNO3 (10/262)
MW304, MW393, MW394,
PZ170, MW304 Dup
PH 91 / 5

12.9, 11.1, 10.1
6.5, 10.3 #5

JD 1/22/25

25010181

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER
UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605	Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-350R	WT	G	1-22-25	1338		4	2		2								X		X		X		25010181-017
2	MW-352	WT	G				4	2		2								X		X		X		25010181-018
3	MW-355	WT	G				4	2		2												X		25010181-019
4	MW-356	WT	G				2	1		1							X		X					25010181-020
5	MW-358R	WT	G				2	1		1							X	X	X	X				25010181-021
6	MW-366	WT	G				2	1		1								X		X				25010181-022
7	MW-369	WT	G				2	1		1							X		X					25010181-023
8	MW-370	WT	G				2	1		1							X		X					25010181-024
9	MW-375	WT	G				2	1		1								X		X				25010181-025
10	MW-377	WT	G				2	1		1								X		X				25010181-026
11	MW-382	WT	G				2	1		1							X		X					25010181-027
12	MW-383	WT	G				2	1		1								X		X				25010181-028
13	MW-384	WT	G				2	1		1								X		X				25010181-029
14	MW-390	WT	G				2	1		1								X		X				25010181-030
15	MW-391R	WT	G	1-22-25	DRY		2	1		1								X		X				25010181-031
16	MW-392	WT	G	1-22-25	1237		2	1		1							X		X					25010181-032

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS	Y	N	
BAL-25Q1 Rev 0	[illegible] SO	1-22	1620	[illegible]	1/22/25	1620				
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Cob

SIGNATURE of SAMPLER: [illegible] DATE Signed (MM/DD/YY): 1-22-25

25010181

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605	Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-393	WT	G	1-22-25	1413		2	1		1							X		X					25010181-033
2	MW-394	WT	G	1-22-25	1441		2	1		1							X		X					25010181-034
3	OW-156	WT	G				0															X		25010181-035
4	OW-157	WT	G				0															X		25010181-036
5	OW-256	WT	G				2	1		1							X		X					25010181-037
6	OW-257	WT	G	1-22-25	0946		2	1		1							X		X					25010181-038
7	PZ-170	WT	G	1-22-25	0914		2	1		1							X		X					25010181-039
8	PZ-182	WT	G				2	1		1							X		X					25010181-040
9	TPZ-164	WT	G				2	1		1							X		X					25010181-041
10	XPW01	WT	G				2	1		1							X		X					25010181-042
11	XPW05	WT	G				2	1		1							X		X					25010181-043
12	XPW06	WT	G				2	1		1							X		X					25010181-044
13	Field Blank	WT	G				4	2		2							X	X	X	X	X	X		25010181-045
14	MW-104DR Duplicate	WT	G	1/22/25	1435		4	2		2												X		25010181-046
15	MW-198 Duplicate	WT	G				3	1		2											X			25010181-047
16	MW-304 Duplicate	WT	G	1/22/25	1332		4	2		2							X	X	X	X		X		25010181-048

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS	Y	N	
BAL-25Q1 Rev 0	[signature]	1-22	1620	[signature]	1/22/25	1620				
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Gle

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 1-22-25

25010181

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605	Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-358R Duplicate	WT	G				2	1		1							X	X	X	X				25010181-049
2	MW-392 Duplicate	WT	G	1-22-25	1237		2	1		1							X		X					25010181-050
3	Equipment Blank 1	WT	G				4	2		2							X	X	X	X	X	X		25010181-051
4	Equipment Blank 2	WT	G				4	2		2							X	X	X	X	X	X		25010181-052
5	Equipment Blank 3	WT	G				4	2		2							X	X	X	X	X	X		25010181-053
6																								
7																								
8																								
9																								
10																								
11																								
12																								
13																								
14																								
15																								
16																								

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS	Y	N	
BAL-25Q1 Rev 0	[illegible]	1-22	1620	[illegible]	1/22/25	1620				
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Cole

SIGNATURE of SAMPLER: Justin Cole

DATE Signed (MM/DD/YY): 1-22-25

25010181

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER
UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N): BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605	Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-104DR	WT	G				4	2		2											X		25010181-001
2	MW-104SR	WT	G	1-23-25	0919		4	2		2											X		25010181-002
3	MW-150	WT	G				4	2		2							X		X		X		25010181-003
4	MW-151	WT	G	1-23-25	1327		4	2		2							X		X		X		25010181-004
5	MW-152	WT	G				4	2		2							X		X		X		25010181-005
6	MW-153	WT	G	1-23-25	1007		4	2		2							X		X		X		25010181-006
7	MW-154	WT	G				4	2		2											X		25010181-007
8	MW-155	WT	G				4	2		2											X		25010181-008
9	MW-192	WT	G				2	1		1						X		X					25010181-009
10	MW-193	WT	G				2	1		1						X		X					25010181-010
11	MW-196	WT	G				3	1		2										X			25010181-011
12	MW-197	WT	G				3	1		2										X			25010181-012
13	MW-198	WT	G				3	1		2										X			25010181-013
14	MW-252	WT	G				4	2		2							X		X		X		25010181-014
15	MW-253R	WT	G	1-23-25	1036		4	2		2							X		X		X		25010181-015
16	MW-304	WT	G				4	2		2						X	X	X	X		X		25010181-016

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS
BAL-25Q1 Rev 0	[illegible] SO	1-23	1545	[illegible]	1/23/25	1545	Y / N

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Colp

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 1-23-25

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

PH96651 10.3, 9.1, 12.7 #5 Ice

Added HNO3 (101262)

MW 383, MW 382, MW 375

JD 1/23/25

25010181

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER
UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605	Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-350R	WT	G				4	2		2								X		X		X		25010181-017
2	MW-352	WT	G				4	2		2								X		X		X		25010181-018
3	MW-355	WT	G	1-23-25	1110		4	2		2												X		25010181-019
4	MW-356	WT	G	1-23-25	1147		2	1		1							X		X					25010181-020
5	MW-358R	WT	G				2	1		1							X	X	X	X				25010181-021
6	MW-366	WT	G	1-23-25	1005		2	1		1								X		X				25010181-022
7	MW-369	WT	G	1-23-25	1344		2	1		1							X		X					25010181-023
8	MW-370	WT	G	1-23-25	1470		2	1		1							X		X					25010181-024
9	MW-375	WT	G	1-23-25	1052		2	1		1								X		X				25010181-025
10	MW-377	WT	G	1-23-25	1304		2	1		1								X		X				25010181-026
11	MW-382	WT	G	1-23-25	1223		2	1		1							X		X					25010181-027
12	MW-383	WT	G	1-23-25	1224		2	1		1								X		X				25010181-028
13	MW-384	WT	G	1-23-25	1155		2	1		1								X		X				25010181-029
14	MW-390	WT	G	1-23-25	0924		2	1		1								X		X				25010181-030
15	MW-391R	WT	G				2	1		1								X		X				25010181-031
16	MW-392	WT	G				2	1		1							X		X					25010181-032

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS	Y	N	
BAL-25Q1 Rev 0	[illegible] SO	1-23	1545	[illegible]	1/23/25	1545				
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: JUSTIN GAP

SIGNATURE of SAMPLER: [illegible] DATE Signed (MM/DD/YY): 1-23-25

3.9 #5 ICe JD 1/24/25
PH 96651
Added HNO3 (10262)
TE 2/2 MW358R, MW358R Dup

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

25010181

Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER
UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605	Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-350R	WT	G				4	2		2								X		X		X		25010181-017
2	MW-352	WT	G				4	2		2								X		X		X		25010181-018
3	MW-355	WT	G				4	2		2												X		25010181-019
4	MW-356	WT	G				2	1		1							X		X					25010181-020
5	MW-358R	WT	G	1/24/25	1134		2	1		1							X	X	X	X				25010181-021
6	MW-366	WT	G				2	1		1								X		X				25010181-022
7	MW-369	WT	G				2	1		1							X		X					25010181-023
8	MW-370	WT	G				2	1		1							X		X					25010181-024
9	MW-375	WT	G				2	1		1								X		X				25010181-025
10	MW-377	WT	G				2	1		1								X		X				25010181-026
11	MW-382	WT	G				2	1		1							X		X					25010181-027
12	MW-383	WT	G				2	1		1								X		X				25010181-028
13	MW-384	WT	G				2	1		1								X		X				25010181-029
14	MW-390	WT	G				2	1		1								X		X				25010181-030
15	MW-391R	WT	G				2	1		1								X		X				25010181-031
16	MW-392	WT	G				2	1		1							X		X					25010181-032

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS	Y	N	
BAL-25Q1 Rev 0	Tracy Carroll	1/24/25	1330	[illegible]	1/24/25	1330				

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Tracy Carroll

SIGNATURE of SAMPLER: Tracy Carroll DATE Signed (MM/DD/YY): 1/24/25

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

25010181

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605	Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-358R Duplicate	WT	G	1/24/25	1134		2	1		1							X	X	X	X				25010181-049
2	MW-392 Duplicate	WT	G				2	1		1							X		X					25010181-050
3	Equipment Blank 1	WT	G				4	2		2							X	X	X	X	X	X		25010181-051
4	Equipment Blank 2	WT	G				4	2		2							X	X	X	X	X	X		25010181-052
5	Equipment Blank 3	WT	G				4	2		2							X	X	X	X	X	X		25010181-053
6																								
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13																								
14																								
15																								
16																								

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS	Y	N	
BAL-25Q1 Rev 0	Tracy Carroll	1/24/25	1330	[illegible]	1/24/25	1330				

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Tracy Carroll

SIGNATURE of SAMPLER: [illegible] DATE Signed (MM/DD/YY): 1/24/25

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

25010181

CHAIN-OF-CUSTODY / Analytical Request Document

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Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

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Report To:	Brian Voelker
Copy To:	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N): BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605	Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-104DR	WT	G				4	2		2											X		25010181-001
2	MW-104SR	WT	G				4	2		2											X		25010181-002
3	MW-150	WT	G				4	2		2							X		X		X		25010181-003
4	MW-151	WT	G				4	2		2							X		X		X		25010181-004
5	MW-152	WT	G	1-27-25	1046		4	2		2							X		X		X		25010181-005
6	MW-153	WT	G				4	2		2							X		X		X		25010181-006
7	MW-154	WT	G				4	2		2											X		25010181-007
8	MW-155	WT	G				4	2		2											X		25010181-008
9	MW-192	WT	G				2	1		1						X		X					25010181-009
10	MW-193	WT	G				2	1		1						X		X					25010181-010
11	MW-196	WT	G	1-27-25	1026		3	1		2										X			25010181-011
12	MW-197	WT	G	1-27-25	1054		3	1		2										X			25010181-012
13	MW-198	WT	G	1-27-25	0951		3	1		2										X			25010181-013
14	MW-252	WT	G	1-27-25	1016		4	2		2							X		X		X		25010181-014
15	MW-253R	WT	G				4	2		2							X		X		X		25010181-015
16	MW-304	WT	G				4	2		2						X	X	X	X		X		25010181-016

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS	Y	N	
BAL-25Q1 Rev 0	[signature]	1-27	1415	[signature]	1/27/25	1415				
								X		

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Colp

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 1-27-25

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

PHV 96651
added HNO3 (101262) to TP2164
LH 1/27/25

Temp UG5
10.3
7.5
9.7
12.9

25010181

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER

UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605							Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-350R	WT	G				4	2		2								X		X		X								25010181-017
2	MW-352	WT	G	1-27-25	0955		4	2		2								X		X		X								25010181-018
3	MW-355	WT	G				4	2		2												X								25010181-019
4	MW-356	WT	G				2	1		1							X		X											25010181-020
5	MW-358R	WT	G				2	1		1							X	X	X	X										25010181-021
6	MW-366	WT	G				2	1		1								X		X										25010181-022
7	MW-369	WT	G				2	1		1							X		X											25010181-023
8	MW-370	WT	G				2	1		1							X		X											25010181-024
9	MW-375	WT	G				2	1		1								X		X										25010181-025
10	MW-377	WT	G				2	1		1								X		X										25010181-026
11	MW-382	WT	G				2	1		1							X		X											25010181-027
12	MW-383	WT	G				2	1		1								X		X										25010181-028
13	MW-384	WT	G				2	1		1								X		X										25010181-029
14	MW-390	WT	G				2	1		1								X		X										25010181-030
15	MW-391R	WT	G				2	1		1								X		X										25010181-031
16	MW-392	WT	G				2	1		1							X		X											25010181-032

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
BAL-25Q1 Rev 0	[signature]	1-27	1415	[signature]	1/27/25	1415		Y	N	
							Temp in °C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Justin Cole

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 1-27-25

25010181

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information:

Company:	Vistra Corp-Baldwin
Address:	10901 Baldwin Road
	Baldwin, IL 62217
Email To:	Brian.Voelker@VistraCorp.com
Phone: (217) 753-8911	Fax:
Requested Due Date/TAT:	10 day

Section B Required Project Information:

Report To:	Brian Voelker
Copy To:	Kim Edmiaston Kimberly.Edmiaston@vistracorp.com
Purchase Order No.:	
Project Name:	
Project Number:	

Section C Invoice Information:

Attention:	Brian Voelker
Company Name:	Vistra Corp
Address:	see Section A
Quote Reference:	
Project Manager:	
Profile #:	

REGULATORY AGENCY

NPDES GROUND WATER DRINKING WATER
UST RCRA OTHER

Site Location STATE: IL

Section D Required Client Information

SAMPLE ID (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

Requested Analysis Filtered (Y/N)

ITEM #	SAMPLE ID	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED DATE	COLLECTED TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Analysis Test (Y/N)	BAL-257-601	BAL-257-605	BAL-845-601	BAL-845-605	BAL-NE-605	BAL-WPCP-605	Residual Chlorine (Y/N)	Project No./ Lab I.D.
1	MW-393	WT	G				2	1		1							X		X					25010181-033
2	MW-394	WT	G				2	1		1							X		X					25010181-034
3	OW-156	WT	G	1-27-25	1145		0															X		25010181-035
4	OW-157	WT	G	1-27-25	1209		0															X		25010181-036
5	OW-256	WT	G	1-27-25	1119		2	1		1							X		X					25010181-037
6	OW-257	WT	G				2	1		1							X		X					25010181-038
7	PZ-170	WT	G				2	1		1							X		X					25010181-039
8	PZ-182	WT	G	1-27-25	1202		2	1		1							X		X					25010181-040
9	TPZ-164	WT	G	1-27-25	1303		2	1		1							X		X					25010181-041
10	XPW01	WT	G	1-27-25	1045		2	1		1							X		X					25010181-042
11	XPW05	WT	G	1-27-25	1012		2	1		1							X		X					25010181-043
12	XPW06	WT	G	1-27-25	1118		2	1		1							X		X					25010181-044
13	Field Blank	WT	G	1-27-25	1300		4	2		2							X	X	X	X	X	X		25010181-045
14	MW-104DR Duplicate	WT	G				4	2		2												X		25010181-046
15	MW-198 Duplicate	WT	G	1-27-25	0951		3	1		2											X			25010181-047
16	MW-304 Duplicate	WT	G				4	2		2							X	X	X	X		X		25010181-048

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
BAL-25Q1 Rev 0	[signature]	1-27	1415	[signature]	1/27	1415		Y	N	

SAMPLER NAME AND SIGNATURE			
PRINT Name of SAMPLER:	Justin Gale		
SIGNATURE of SAMPLER:	[signature]	DATE Signed (MM/DD/YY):	1-27-25

Temp in °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

APPENDIX C
Baldwin Fly Ash Pond System Update to the Geochemical Conceptual Site Model (Nature)

Geosyntec consultants

engineers | scientists | innovators

Geochemical Conceptual Site Model - Addendum

Baldwin Power Plant – Fly Ash Pond System

(IEPA ID NO. W1578510001-01, W1578510001-02, AND W1578510001-03)

Prepared for

Dynegy Midwest Generation, LLC
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Prepared by

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Project Number: GLP8068

April 2025

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ACRONYMS AND ABBREVIATIONS

BAP	Bottom Ash Pond
BPP	Baldwin Power Plant
CEC	cation exchange capacity
CCR	coal combustion residuals
COCs	constituents of concern
FAPS	Fly Ash Pond System
HSU	hydrostratigraphic unit
GCSM	geochemical conceptual site model
GWPS	groundwater protection standards
I.A.C.	Illinois Administrative Code
IEPA	Illinois Environmental Protection Agency
LOI	loss on ignition
meq/100 g	milliequivalents per 100 grams
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
N&E	nature and extent
ORP	oxidation-reduction potential
PMP	potential migration pathway
SEP	sequential extraction procedure
SU	standard units
UU	upper unit
µg/g	micrograms per gram
XRD	X-Ray diffraction

1. INTRODUCTION

This report is an addendum to the geochemical conceptual site model (GCSM) to describe subsurface conditions at the Baldwin Power Plant (BPP) Fly Ash Pond System (FAPS) coal combustion residuals (CCR) unit with the results of an additional investigation to further characterize the site. The initial GCSM described the geochemical processes that contribute to the mobilization, distribution, and attenuation of chemicals in the environment. The initial GCSM was prepared as an appendix to the BPP FAPS Nature and Extent (N&E) Report prepared by Ramboll Americas Engineering Solutions. Inc. (Ramboll) and submitted to the Illinois Environmental Protection Agency (IEPA) on 24 April 2024 (Ramboll 2024). Subsequent to the N&E report submittal, an additional investigation was conducted to further characterize the site, including the following:

- Installation of the following monitoring wells within the upper unit (UU) potential migration pathway (PMP) hydrostratigraphic unit: MW-195, MW-196, MW-197, and MW-198;
- Collection of solids samples from two intervals at MW-195, MW-196, and MW-197;
- Collection of groundwater samples from MW-196, and MW-197 in June, July, and October of 2024;
- Collection of groundwater samples from existing piezometers PZ-174, PZ-176, and PZ-178 in July and October of 2024;
- Collection of groundwater samples from MW-198 in November of 2024.

Exceedances addressed in the initial GCSM included boron at compliance wells MW-150, MW-152, and MW-391 and an exceedance of sulfate at MW-150 (Geosyntec 2024). The four additional monitoring wells MW-195, MW-196, MW-197, and MW-198 were installed past the BPP property boundary to the southwest of the Old West Fly Ash Pond to evaluate the lateral extent of boron and sulfate concentrations above the groundwater protection standard (GWPS) (Attachment A). Similarly, additional groundwater samples were collected at PZ-174, PZ-176, and PZ-178 to better characterize the concentrations of boron and sulfate within groundwater in the vicinity of the southern border of the FAPS.

Parameters with exceedances[1] above the GWPS at the Baldwin FAPS for the 2024 sampling events completed under Illinois Administrative Code (I.A.C.) Title 35 § 845.630 included boron and sulfate. Of the samples collected to support this additional investigation, exceedances of both

[1] Throughout this document, "exceedance" or "exceedances" is intended to refer only to potential exceedances of proposed applicable background statistics or groundwater protection standards (GWPSs) as described in the proposed groundwater monitoring program which was submitted to the IEPA on October 25, 2021 as part of Dynegy Midwest Generation, LLC's operating permit application for the FAPS. That operating permit application, including the proposed groundwater monitoring program, remains under review by the IEPA and therefore Dynegy Midwest Generation, LLC has not identified any actual exceedances.

boron and sulfate were reported at additional investigation wells MW-196 and PZ-174 within the UU PMP.

2. UPDATES TO THE GEOCHEMICAL CONCEPTUAL SITE MODEL

The BPP FAPS GCSM (Geosyntec 2024), which was submitted as Appendix B to the N&E Report (Ramboll 2024) provides an overview of the geochemical conditions at the BPP FAPS. This addendum provides details on the additional investigation samples, and an interpretation of how these samples align with or modify the GCSM for the Site provided in the 2024 GCSM document. Specifically, this addendum discusses the aquifer solids characterization, redox status and constituents of concern (boron and sulfate) for samples collected at monitoring locations outside of the proposed groundwater monitoring network during 2024 sampling events.

2.1 Constituent Transport and Fate

Boron is primarily present in groundwater as boric acid (H_3BO_3) or borate ($B[OH]^{4-}$) (Bolan et al. 2023). The speciation of boron depends on pH: at pH below 9.2 standard units (SU), H_3BO_3 is the dominant species (NCBI 2024a). Boron is not subject to oxidation/reduction reactions (Lemarchand et al. 2015; Bolan et al. 2023). Boron primarily sorbs to positively charged sites on solid metal oxide phases, including iron and aluminum oxides (Goldberg and Glaubig 1985; Bolan et al. 2023). Boron sorbs to amorphous metal oxides between pH 7 SU and 8 SU (Goldberg and Glaubig, 1985). Boron can also sorb to organic surfaces such as humic acids or coal under favorable conditions, most extensively between pH 8 and 10 SU (LeMarchand et al. 2015). Clay minerals have been correlated with boron sorption in soils (Goldberg, 1997), with this sorption mechanism presenting an additional potential attenuation mechanism for boron under favorable geochemical conditions.

Sulfate is the primary form of oxidized sulfur (S(VI)) in the environment and is a divalent oxyanion at pH values greater than 2 SU (Stumm and Morgan 1996). Sulfate in groundwater may sorb onto positively charged sites on solid metal oxide phases, most commonly iron and manganese oxides (Brown et al. 1999). The extent and strength of sulfate sorption to metal oxide surfaces depends on pH, ionic strength, and oxide surface area available for sorption. Sulfate can also form insoluble complexes such as barite ($BaSO_4$) (NCBI 2024b). Sulfate in groundwater may be reduced to elemental sulfur (S(0)) or sulfide (S(-II)) under sufficiently reducing conditions, a process governed by local microbial communities (Stumm and Morgan 1996). Generally, reduced sulfur is less mobile in groundwater than sulfate. Reduced sulfur readily precipitates as metal sulfides and sorbs to solid phases such as iron and manganese oxides (Stumm and Morgan 1996).

2.2 Solids Characterization

Additional solids were characterized from two intervals at MW-195, MW-196, and MW-197 to determine the type and abundance of minerals present in the UU PMP, their geochemical properties, and their effect on the geochemistry of the groundwater system. Solids were collected at these locations as follows:

- MW-195, located to the south of MW-196 and MW-197, outside of the BPP property boundary and downgradient of the Old West Fly Ash Pond. Solids were collected from two

intervals within the UU that represent the PMP, with one sample each from an upper silty clay interval and a lower sand interval.

- MW-196, located outside of the BPP property boundary to the south, downgradient of the Old West Fly Ash Pond. Solids were collected from two intervals within the UU that represent the PMP, with one sample each from an upper silty clay interval and a lower sandy clay interval.
- MW-197, located to the south of MW-196, outside of the BPP property boundary and downgradient of the Old West Fly Ash Pond. Solids were collected from two intervals within the UU that represent the PMP, with both intervals predominantly described as silty clay.

The monitoring well locations are shown on Attachment A. Boring logs for these locations are provided in Attachment B.

2.2.1 Loss on Ignition and Cation Exchange Capacity

Loss on ignition (LOI) represents the combustible portions of a solid material and is often used as an approximation of organic matter in a sample. The cation exchange capacity (CEC) of a solid represents the total negative surface charge of that material, which is related to the material's surface potential to sorb cations. Amorphous iron hydroxides, organic matter, and clays all tend to possess high negative surface charges and therefore tend to contribute to higher CEC values. The CEC and LOI values for solids are presented in Table 1 and laboratory analytical results are provided in Attachment C[2].

CEC values for the additional samples collected in 2024 ranged from 11.1 to 56.6 meq/100 g solid, while LOI ranged from 16 to 31% (Table 1). Both the CEC and LOI were greater in the additional samples from the UU PMP compared to those previously analyzed (CEC of 12.9 to 18.9 meq/100 g solid; LOI of 3.8 to 15.5 %; Table 1), suggesting that there is greater organic matter content and greater negative surface charge within solids downgradient of the FAPS within the UU PMP than previously thought.

2.2.2 Sequential Extraction Procedure Analysis of Iron and Boron

Material from each of the six additional samples was submitted for sequential extraction procedure (SEP) for iron to inform understanding of classes of solid phase which may interact with the COCs. SEPs are chemical extractions used to dissolve metals from specific solid-associated phases. SEPs use progressively stronger reagents to solubilize metals from increasingly recalcitrant phases. Although these procedures do not identify the discrete solid phases in a soil/aquifer matrix, they do provide a means to evaluate the class of solids and relative stability in relation to general

[2] Analytical laboratory reports are only provided for the additional data collected in 2024. For additional data that was previously collected and is shown within table for comparison, the analytical data were provided as attachments to the GCSM (Geosyntec 2024).

solubility, changes in oxidation/reduction (redox) potential, and pH fluctuations (Tessier et al. 1979, Kuo et al. 1983, Sposito et al. 1984, Hickey and Kittrick 1984, Gruebel et al. 1988). Therefore, SEP data are useful to infer the mechanism and potential reversibility of attenuation processes. The results of the 7-step extraction procedure and analysis are provided in Table 2 and Attachment D. Solids samples from previous investigations were analyzed for metal association via SEP by a different 6-step extraction procedure (as reported in Geosyntec 2024); therefore, the results are not directly comparable to the additional investigation samples.

The total amount of iron measured in the SEP analysis of UU PMP solids was similar for the additional solids (9,100 to 34,000 micrograms per gram [µg/g]; Table 2) compared to previous samples at the site (20,600 to 29,200 µg/g; Geosyntec 2024). Iron within the additional sample solids is bound within the residual metals fraction (>20%) and sulfide fractions (>42%), consistent with previous analyses in which iron was associated with these relatively recalcitrant phases (Geosyntec 2024). However, iron was also identified in the fractions typically associated with non-crystalline materials (including amorphous metal oxides; 1% to 5%) and crystalline iron or manganese oxides, with proportions ranging from 9% to 35% (Table 2). Despite the relatively greater LOI of the more recent samples, no iron was identified above the reporting limits associated with the fraction bound to organic matter, despite the increased sorptive capacity expected to be associated with this organic matter content.

2.2.3 Mineralogical Analysis

X-Ray diffraction (XRD) with Rietveld refinement was conducted for identification of minerals in solid samples. XRD is an analytical technique that provides information about the identity of the crystalline material within a sample but does not provide information about non-crystalline or amorphous phases. XRD results are normalized to 100% of the total weight, meaning that material not characterized by XRD is ignored in the percent calculation.

The 2024 solids samples from the UU PMP were predominantly composed of quartz, ranging from 50.3 to 75.8% of the minerals characterized (Table 3; Attachment E)[3]. Mica (3.3 to 13%), feldspar minerals including K-feldspar (3.3 to 16.6% total), carbonates include dolomite and calcite (0 to 30.4% total), and clays identified as chlorite and kaolinite (0.5 to 9.6% total) were reported as additional major crystalline mineral phases. These results are consistent with the field observations documented in the boring logs provided in Attachment B. Unlike previously analyzed UU PMP solids with low abundances of magnetite detected (detected to 0.9%; Geosyntec 2024), no crystalline forms of iron oxides were detected in the additional sample solids. Crystalline iron sulfides were also not detected in the additional samples.

[3] 2021 solids samples included in the GCSM were analyzed by SGS Minerals (Ontario, Canada), whereas 2024 samples were analyzed by Eurofins J3 Resources, Inc. (Pasadena, Texas). Due to differences in analytical reporting methodology, only 2024 samples are presented in Table 3.

2.3 Aqueous Characterization

Monitoring well locations at the BPP, including those not included in the proposed groundwater monitoring network, are shown in Attachment A. As discussed in Section 1, additional groundwater sampling was completed at select locations in 2024 to evaluate the nature and extent of boron and sulfate exceedances.

2.3.1 Redox/pH Summary

The oxidation-reduction (redox) potential (ORP) and pH in aqueous systems are major controls on the speciation of redox-active chemicals such as iron, manganese, and sulfate. Measured UU PMP groundwater pH had previously varied between 6.5 to 7.5 SU, consistent with the lower buffering capacity anticipate with the sandy clay substrate of this HSU compared to the shale and limestone bedrock lithologies. All additional groundwater samples had reported pH values within the same range previously recorded for UU PMP groundwaters (Table 4). ORP values reported previously for UU PMP wells had been consistently oxidizing (generally 0 to 150 mV), except MW-150 which had more variable redox conditions (-300 to 100 mV; Geosyntec 2024). Greater variability was also detected at the additional sampling locations, with groundwater from most of the wells detected fluctuating between slightly more oxidizing to slightly more reducing (-125 to 97 mV; Table 4).

2.3.2 Exceedance Parameters

Exceedances of total boron above the GWPS of 2.23 mg/L for the additional groundwater samples are limited to PZ-174 (4.0 to 4.4 mg/L) and MW-196 (3.0 to 4.9 mg/L) (Table 4). Similarly, exceedances of total sulfate above the GWPS of 400 mg/L for the additional groundwater samples are limited to PZ-174 (588 to 640 mg/L) and MW-196 (380 to 451 mg/L) (Table 4). The samples were not analyzed for dissolved boron and sulfate; however, where data for both were previously available there were limited differences between the total and dissolved reported values for these constituents (Geosyntec 2024).

2.3.3 Pourbaix Diagrams

Eh-pH (Pourbaix) diagrams can be used to illustrate the predicted stability of specific phases at thermodynamic equilibrium under the conditions observed for a groundwater sample. Select crystalline mineral species were suppressed to be representative of anticipated groundwater conditions (e.g. mineral formation not anticipated to be kinetically favored), except when identified in XRD data from solids in the site.

Using conditions detected at well MW-196 sampled on 23 July 2024 to represent groundwater within the UU PMP in the area of interest (Table 5)[4], amorphous iron oxyhydroxides (represented by ferrihydrite) are generally predicted to be stable under groundwater conditions at most locations

[4] Field ORP measurements were converted to Eh by adding +200 millivolts to correct for the Ag/AgCl electrode.

(Figure 1). Groundwater conditions at PZ-174 appear to be favorable for ferrihydrite stability for both recent sampling events, while conditions at PZ-175 appear to be in dynamic equilibrium between ferrihydrite stability and favoring dissolved iron. This variability in amorphous iron oxyhydroxide stability is consistent with the predicted iron mineral stability using conditions observed at MW-150 (Geosyntec 2024). Crystalline magnetite is expected to be stable at the additional groundwater sample locations (Figure 2), which is consistent with the low abundances of magnetite detected via XRD in solids near MW-150 (Table 3). A review of Eh-pH conditions for manganese found that solid phase manganese minerals, including manganese oxides, are not predicted to be stable under conditions within the UU PMP for any additional groundwater samples (Figure 3), which is consistent with previous results (Geosyntec 2024).

2.3.4 Total and Dissolved Iron and Manganese Concentrations

The distribution of iron and manganese between total and dissolved phases can provide insights on site redox conditions and constituent behavior. A comparison of the total and dissolved iron data is provided in Table 4. Total iron was detected in all samples where it was analyzed during the additional investigation, with reported values ranging from 0.038 mg/L at PZ-178 to 8.18 mg/L at MW-197. Dissolved iron was detected in only five of the 13 samples analyzed, with three reported values ranging from 0.014 mg/L to 0.017 mg/L and one at 0.672 mg/L. Where dissolved iron was detected, the dissolved concentration was typically less than 50% of the total iron value, providing evidence that iron in the sample is largely associated with particulates suspended in the sample. The low dissolved iron concentrations in all but one of the new groundwater samples indicate that iron-bearing solids are stable at those locations. Total manganese was not analyzed in the additional groundwater samples; dissolved manganese was detected in 12 of the 13 additional samples, with concentrations ranging from 0.0168 mg/L to 0.914 mg/L.

2.3.5 Major Ion Distribution and Groundwater Signatures

A Piper diagram was constructed using data from the UU PMP to visualize major ion distributions in groundwater. Piper diagrams are a common tool for assessing geochemical similarities or differences in terms of the major ion distributions between aqueous samples.

Pore water is a sodium-sulfate type water. The additional groundwater samples are similar to previous UU PMP groundwater in that they have relatively consistent major cation distributions with relatively even proportions of magnesium and calcium, and relatively lower proportions of sodium and potassium (Figure 4). Groundwater samples from additional wells with GWPS exceedances (PZ-174 and MW-196) have major anion compositions that are sulfate-dominated, similar to UU PMP wells with prior exceedances (MW-150), and hence are Ca/Mg-sulfate type waters. Additional groundwater samples from locations without GWPS exceedances have major anion compositions that are bicarbonate-dominated and are Ca/Mg-bicarbonate type waters, typical of shallow groundwater background conditions. These similar groundwater compositions provide an additional line of evidence that wells MW-150, MW-196, and PZ-174 are being influenced by the same source water.

3. EXTENSION AND MODIFICATION OF GEOCHEMICAL SITE CONDITIONS

3.1 Source and Mobilization Mechanisms

Boron is naturally abundant in coals and is concentrated within CCR, primarily as polyborate (B_2O_3) surface coatings on particles (EPRI 1998). Boron was identified in the CCR porewater at concentrations up to 102 mg/L. The likely primary source of boron to the UU PMP remains the FAPS CCR porewater, based on boron concentrations within the source and relationships to hydrogeological patterns at the site (i.e., correlated detection of boron above the GWPS in the cluster of downgradient wells MW-150, MW-196, and PZ-174). While no additional data were collected from the UA (bedrock) during the additional investigation, the previous GSCM noted that aquifer solids in the UA (bedrock) could provide a secondary additional potential natural geogenic source of boron to groundwater (Geosyntec 2024).

Reduced sulfur species (e.g. pyrite) can be naturally abundant in coals; after coal fly ash production, sulfate is the dominant sulfur species associated with fly ash. Sulfate is concentrated on the surface of fly ash particles and the majority of sulfate mineral phases are soluble under environmental conditions, such that sulfate associated with fly ash is leachable (Izquierdo and Querol 2012). The likely primary source of sulfate to the UU PMP remains the FAPS CCR porewater.

3.2 Potential and Observed Attenuation Mechanisms

For sulfate and boron exceedances, the primary mechanism of potential attenuation remains sorption to onto iron oxides and oxyhydroxides associated with solids. At most locations within the UU PMP, redox conditions are typically predicted to favor iron oxide stability, and SEP analyses of sample solids support the presence of amorphous iron oxide phases across the UU PMP. Furthermore, the high organic matter content inferred from LOI values and XRD and CEC results indicating the presence of a number of clay minerals across the UU PMP could be additional geosorbents for boron downgradient of the FAPS. Overall, the results of the additional sampling support the potential and observed attenuation mechanisms for sulfate and boron described in the previously submitted GCSM (Geosyntec 2024).

4. REFERENCES

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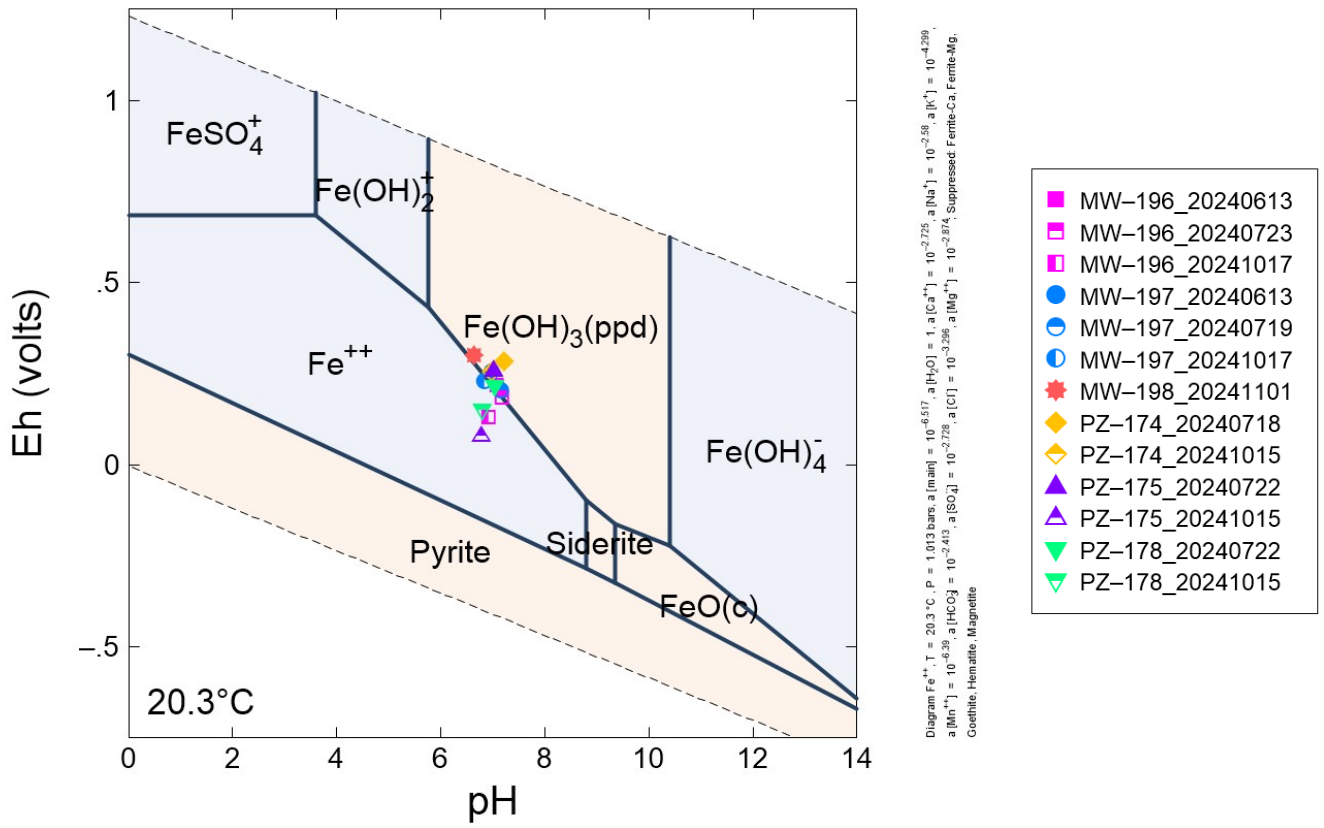
FIGURES



Notes:

1. Diagram was generated using conditions observed at well MW-196 on 7/23/2024. Dissolved iron was used due to the substantially lower dissolved concentrations compared to total iron in groundwater.
2. The most recent available pH and ORP data points for each location are displayed.
3. Hematite, ferrite-Ca, ferrite-Mg, goethite, crystalline iron oxide, and magnetite were suppressed during model generation.

Iron Pourbaix Diagram, Ferrihydrite – Potential Migration Pathway

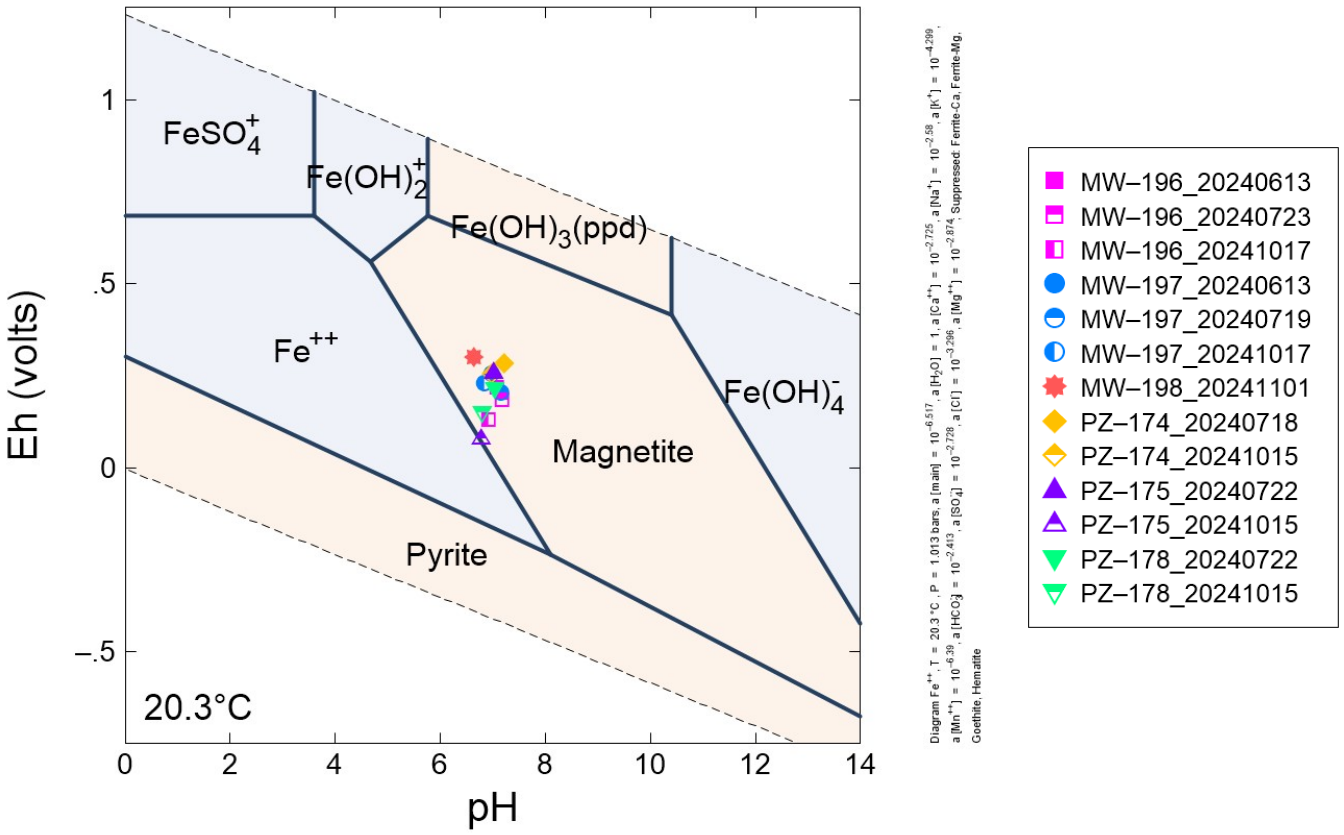
Baldwin Power Plant – Fly Ash Pond System
Additional Investigation

Geosyntec consultants

Columbus, Ohio | April 2025

Figure **1**

Vistra - Groundwater Compliance - Documents\General\GCSM\Baldwin\Figures



Notes:

1. Diagram was generated using conditions observed at well MW-196 on 7/23/2024. Dissolved iron was used due to the substantially lower dissolved
2. The most recent available pH and ORP data points for each location are displayed.
3. Hematite, ferrite-Ca, ferrite-Mg, goethite, and crystalline iron oxide were suppressed during model generation.

Iron Pourbaix Diagram, Magnetite – Potential Migration Pathway

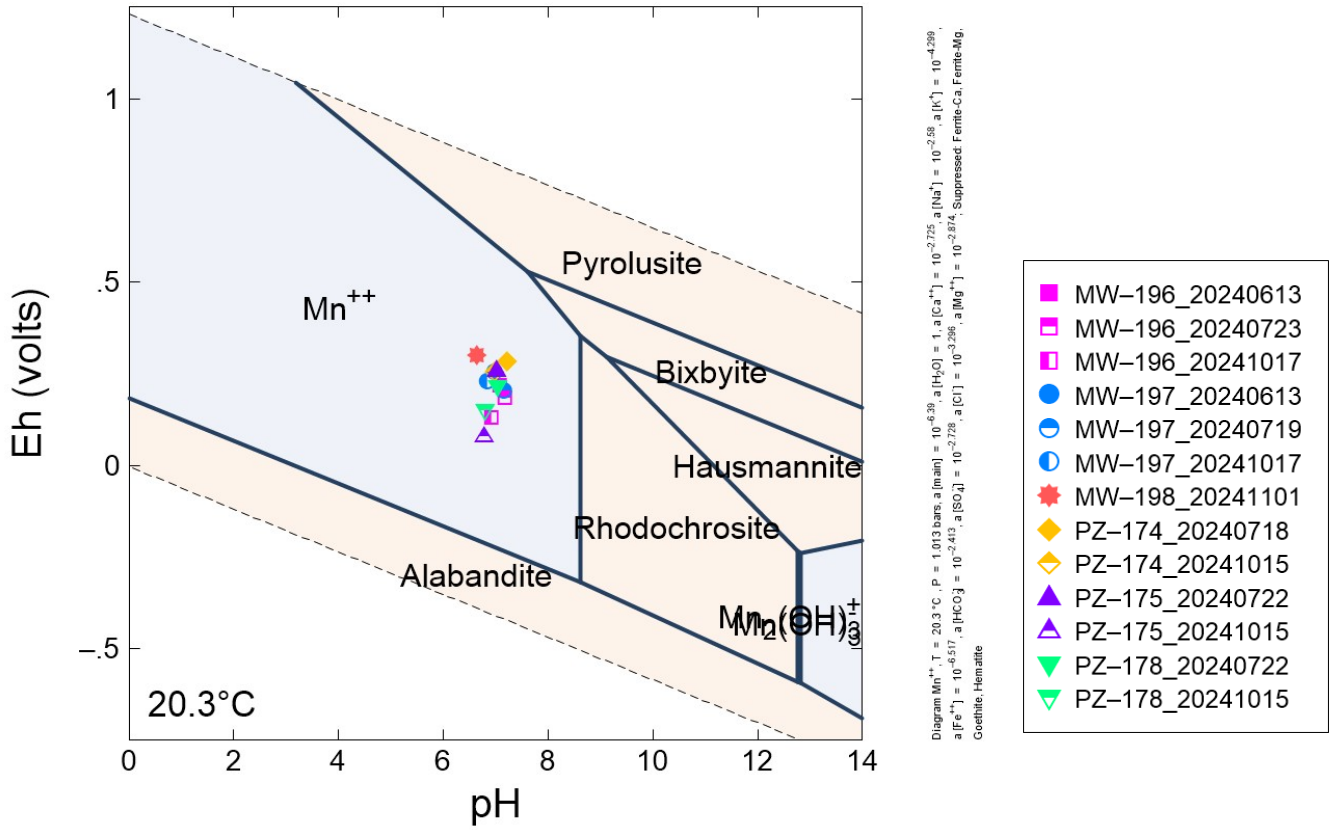
Baldwin Power Plant – Fly Ash Pond System
Additional Investigation

Geosyntec consultants

Columbus, Ohio | April 2025

Figure **2**

Vistra - Groundwater Compliance - Documents\General\GCSM\Baldwin\Figures



Notes:

1. Diagram was generated using conditions observed at well MW-196 on 7/23/2024. Dissolved manganese concentration was used as an input parameter because total manganese data was not available.
2. The most recent available pH and ORP data points for each location are displayed.
3. Alabandite was suppressed during model generation.

Manganese Pourbaix Diagram – Potential Migration Pathway

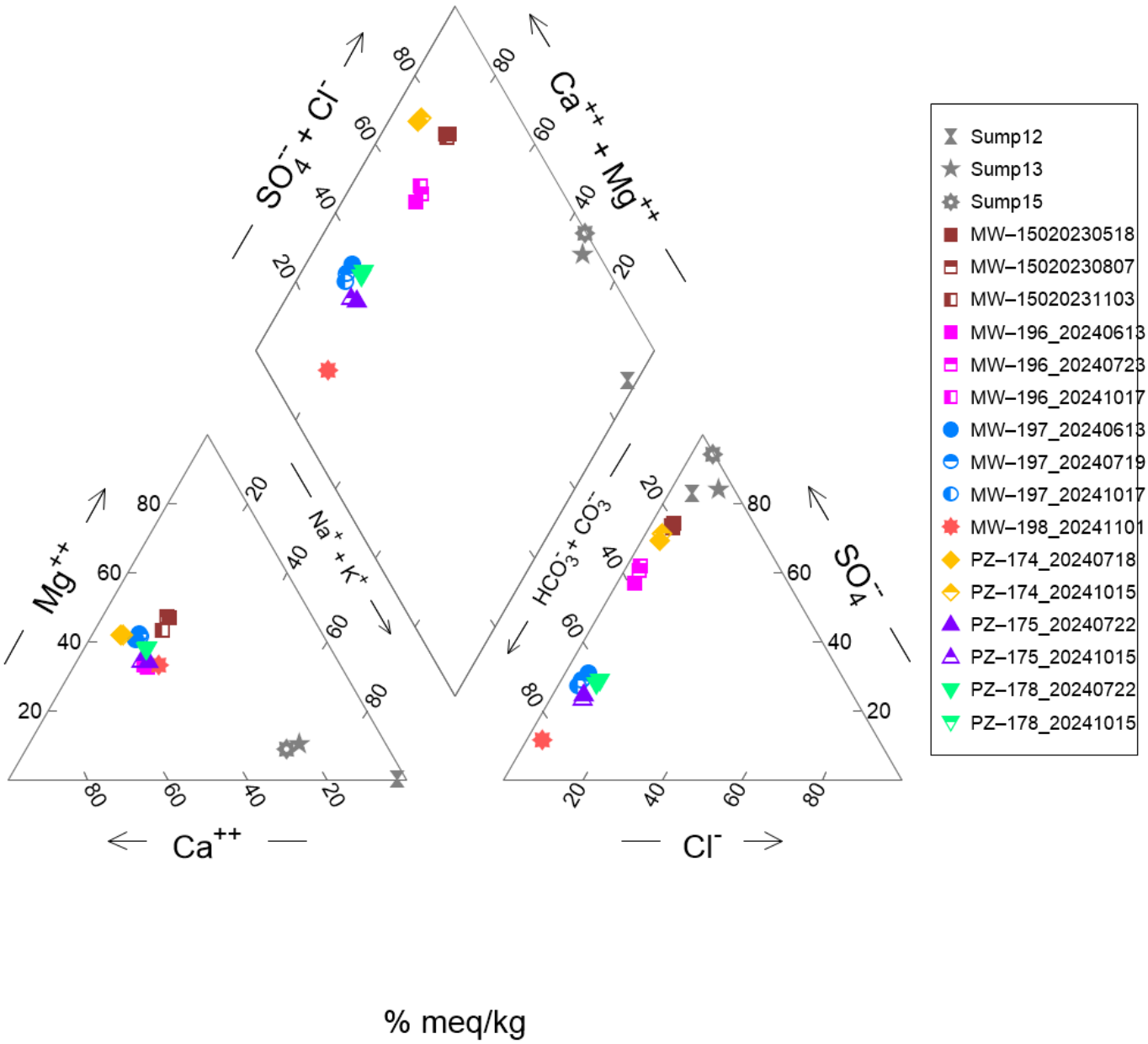
Baldwin Power Plant – Fly Ash Pond System
Additional Investigation

Geosyntec consultants

Columbus, Ohio | April 2025

Figure **3**

Vistra - Groundwater Compliance - Documents\General\GCSM\Baldwin\Figures



Notes:

1. The most recent available data points for each location are displayed.
2. FAPS porewater locations Sump12, Sump13, and Sump15 are shown with gray coloring and solid symbology.
3. % meq/kg: percent milliequivalents per kilogram

Piper Diagram – Potential Migration Pathway
Baldwin Power Plant – Fly Ash Pond System
Additional Investigation

Geosyntec consultants

Columbus, Ohio | April 2025

Figure 4

Vistra - Groundwater Compliance - Documents\General\GCSM\Baldwin\Figures

TABLES

Table 1. CEC and LOI of UU PMP Solids Solids
Geochemical Conceptual Site Model - Addendum
Baldwin Power Plant - Fly Ash Pond System

	Previous Results					
Well ID	**MW-150**	**MW-150**	**MW-358**	**MW-392**	**MW-393**	**MW-394**
Depth (ft bgs)	**(15-20)**	**(20-25)**	**(13-15)**	**(32-33.5)**	**(24-25.5)**	**(20.5-22)**
Well Characterization	**FAPS Compliance**	**FAPS Compliance**	**Background**	**BAP Compliance**	**BAP Compliance**	**BAP Compliance**
Sampled Aquifer Unit	**UU PMP**	**UU PMP**	**UU PMP**	**UU PMP**	**UU PMP**	**UU PMP**
Field Boring Log Description	**Sandy clay**	**Sandy clay**	**Silty clay**	**Clay with increasing sand content**	**Clayey sand**	**Silty sand**
CEC (meq/100 g solid)	12.9	18.9	-	-	-	-
LOI (%)	8.4	15.5	5.5	6.2	3.8	5.1

	Additional Investigation Samples					
Well ID	**MW-195**	**MW-195**	**MW-196**	**MW-196**	**MW-197**	**MW-197**
Depth (ft bgs)	**(35-37)**	**(44-46)**	**(6-8)**	**(10-12)**	**(4-6)**	**(10-12)**
Well Characterization	**FAPS Additional Investigation**	**FAPS Additional Investigation**	**FAPS Additional Investigation**	**FAPS Additional Investigation**	**FAPS Additional Investigation**	**FAPS Additional Investigation**
Sampled Aquifer Unit	**UU PMP**	**UU PMP**	**UU PMP**	**UU PMP**	**UU PMP**	**UU PMP**
Field Boring Log Description	**Silty clay**	**Sand**	**Silty clay**	**Sandy clay**	**Silty clay**	**Silty clay**
CEC (meq/100 g solid)	50	11.1	48.6	52	56.6	13.7
LOI (%)	16	17	29	31	21	23

Notes
Sample depth is shown in feet below ground surface (ft bgs)
Dashes indicate sample was not analyzed for analyte
BAP: Bottom Ash Pond
CEC: cation exchange capacity
FAPS: Fly Ash Pond System
meq/100 g solid: milliequivalents per 100 grams solids
LOI: loss on ignition
UU PMP: upper unit primary migration pathway

Table 2. SEP Analytical Results for Iron
Geochemical Conceptual Site Model - Addendum
Baldwin Power Plant - Fly Ash Pond System

Well ID			**MW-195**		**MW-195**		**MW-196**		**MW-196**		**MW-197**		**MW-197**	
Sample Depth (ft bgs)			**(35-37)**		**(44-46)**		**(6-8)**		**(10-12)**		**(4-6)**		**(10-12)**	
Well Characterization			**FAPS Additional Investigation**		**FAPS Additional Investigation**		**FAPS Additional Investigation**		**FAPS Additional Investigation**		**FAPS Additional Investigation**		**FAPS Additional Investigation**	
Sampled Aquifer Unit			**UU PMP**		**UU PMP**		**UU PMP**		**UU PMP**		**UU PMP**		**UU PMP**	
Field Boring Description			**Silty clay**		**Sand**		**Silty clay**		**Sandy clay**		**Silty clay**		**Silty clay**	
Fraction	**Reagent**	**Iron SEP**	µg/g	% of Total	µg/g	% of Total	µg/g	% of Total	µg/g	% of Total	µg/g	% of Total	µg/g	% of Total
1	$MgSO_4$	Exchangeable Metals	< 13	-	< 13	-	< 14	-	< 15	-	< 14	-	< 14	-
2	Sodium acetate, acetic acid	Bound to Carbonates	< 10	-	45	0%	< 11	-	< 11	-	< 10	-	13 J	-
3	Ammonium oxalate	Bound to Non-Crystalline Materials	510	2%	430	4%	170	1%	1100	5%	360	1%	500	2%
4	Hydroxylamine HCl and acetic acid	Bound to Metal Oxides	6200	27%	2700	23%	1300	9%	5800	27%	9300	27%	7400	35%
5	NaClO	Bound to Organic Material	< 51	-	< 48	-	< 54	-	< 57	-	< 52	-	< 53	-
6	HNO_3, HCl, and H_2O	Bound to Sulfides	11000	48%	5200	44%	7900	52%	8900	42%	15000	44%	8800	42%
7	HF, HNO_3, HCl, and H_3BO_3	Residual Metals	5300	23%	3,400	29%	5900	39%	5,400	25%	9,400	28%	4200	20%
SEP Total			**23,000**	**-**	**9,100**	**-**	**15,000**	**-**	**21,000**	**-**	**34,000**	**-**	**21,000**	**-**

Notes

SEP totals provided in laboratory analytical report (Attachment D). Percent of total for each fraction was calculated using the sum of the reported concentrations for each fraction.
Sample depth is shown in feet below ground surface (ft bgs)
Non-detect values are shown as less than the detection limit
SEP - sequential extraction procedure
µg/g - microgram per gram
J - indicates result is less than the reporting limit but greater than or equal to the detection limit and the concentration is an approximate value
FAPS: Fly Ash Pond System
UU PMP: upper unit primary migration pathway

Table 3. XRD Analysis of UU PMP Solids
Geochemical Conceptual Site Model - Addendum
Baldwin Power Plant - Fly Ash Pond System

Well ID			**MW-195**	**MW-195**	**MW-196**	**MW-196**	**MW-197**	**MW-197**
Depth (ft bgs)			**(35-37)**	**(44-46)**	**(6-8)**	**(10-12)**	**(4-6)**	**(10-12)**
Well Characterization			**FAPS Additional Investigation**	**FAPS Additional Investigation**	**FAPS Additional Investigation**	**FAPS Additional Investigation**	**FAPS Additional Investigation**	**FAPS Additional Investigation**
Sampled Aquifer Unit			**UU PMP**	**UU PMP**	**UU PMP**	**UU PMP**	**UU PMP**	**UU PMP**
Field Boring Log Description			**Silty clay**	**Sand**	**Silty clay**	**Sandy clay**	**Silty clay**	**Silty clay**
Mineral/Compound	**Formula**	**Mineral Type**	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)	(wt %)
Quartz	SiO_2	Silicate	71.0	50.3	62.3	75.8	67.8	52.4
Feldspar	$(Na,Ca)(Si,Al)_4O_8$	Feldspar	12.1	15.3	10.4	9.6	1.8	13.0
K-feldspar	$KAlSi_3O_8$	Feldspar	4.2	0.2	2.6	1.6	1.5	3.6
Dolomite	$CaMg(CO_3)_2$	Carbonate	-	23.5	6.8	-	0.9	11.0
Calcite	$CaCO_3$	Carbonate	-	6.9	4.7	-	10.5	10.6
Amphibole	-	Amphibole	2.2	-	0.7	-	-	-
Mica	$KAl_2(Si_3Al)O_{10}(OH,F)_2$	Mica	6.5	3.3	7.7	8.3	13	5.5
Clay Minerals								
Chlorite/Vermiculite	-	Sheet silicate	1.7	2.7	3.1	2.5	5.4	4.0
Kaolinite	$Al_2Si_2O_5(OH)_4$	Clay	1.5	2.1	2.1	1.3	4.2	2.0
Clay Minerals Total			3.2	4.8	5.2	3.8	9.6	6.0

Notes
Dashes indicate mineral was not identified by lab
Sample depth is shown in feet below ground surface (ft bgs).
The weight percent quantities indicated have been normalized to a sum of 100% using only minerals included in the refinement.
FAPS: Fly Ash Pond System
ft bgs: feet below ground surface
UU PMP: upper unit potential migration pathway
wt %: percentage by weight

Table 4. Groundwater Sampling Results - Additional 2024 Data
Geochemical Conceptual Site Model - Addendum
Baldwin Power Plant - Fly Ash Pond System

Location Name	Sample Date	pH (SU)	ORP (mV)	Total Sulfate (mg/L)	Total Boron (mg/L)	Total Iron (mg/L)	Dissolved Iron (mg/L)	Dissolved Manganese (mg/L)
MW-196	**2024/06/13**	7.09	16	380	3	-	0.672	0.914
	2024/07/23	7.18	-18	428	4.85	7.48	0.017	0.0473
	2024/10/17	6.93	-72	451	4.23	-	< 0.025	0.0517
MW-197	**2024/06/13**	6.99	51	174	0.0364	-	< 0.0115	0.399
	2024/07/19	7.17	1	155	0.0254	0.148	0.014	0.0415
	2024/10/17	6.85	25	148	< 0.025	8.18	< 0.0115	0.0629
MW-198	**2024/11/01**	6.65	97	43.1	< 0.025	0.805	< 0.0115	0.457
PZ-174	**2024/07/18**	7.22	80	588	4.03	0.258	< 0.0115	< 0.0008
	2024/10/15	6.99	52	640	4.44	0.048	< 0.0115	0.0168
PZ-176	**2024/07/22**	7.02	57	130	1.21	0.438	< 0.0115	0.0195
	2024/10/15	6.78	-125	118	0.828	0.214	0.189	0.121
PZ-178	**2024/07/22**	7.04	12	169	0.663	0.131	< 0.0115	0.0547
	2024/10/15	6.8	-54	176	0.554	0.038	0.014	0.103

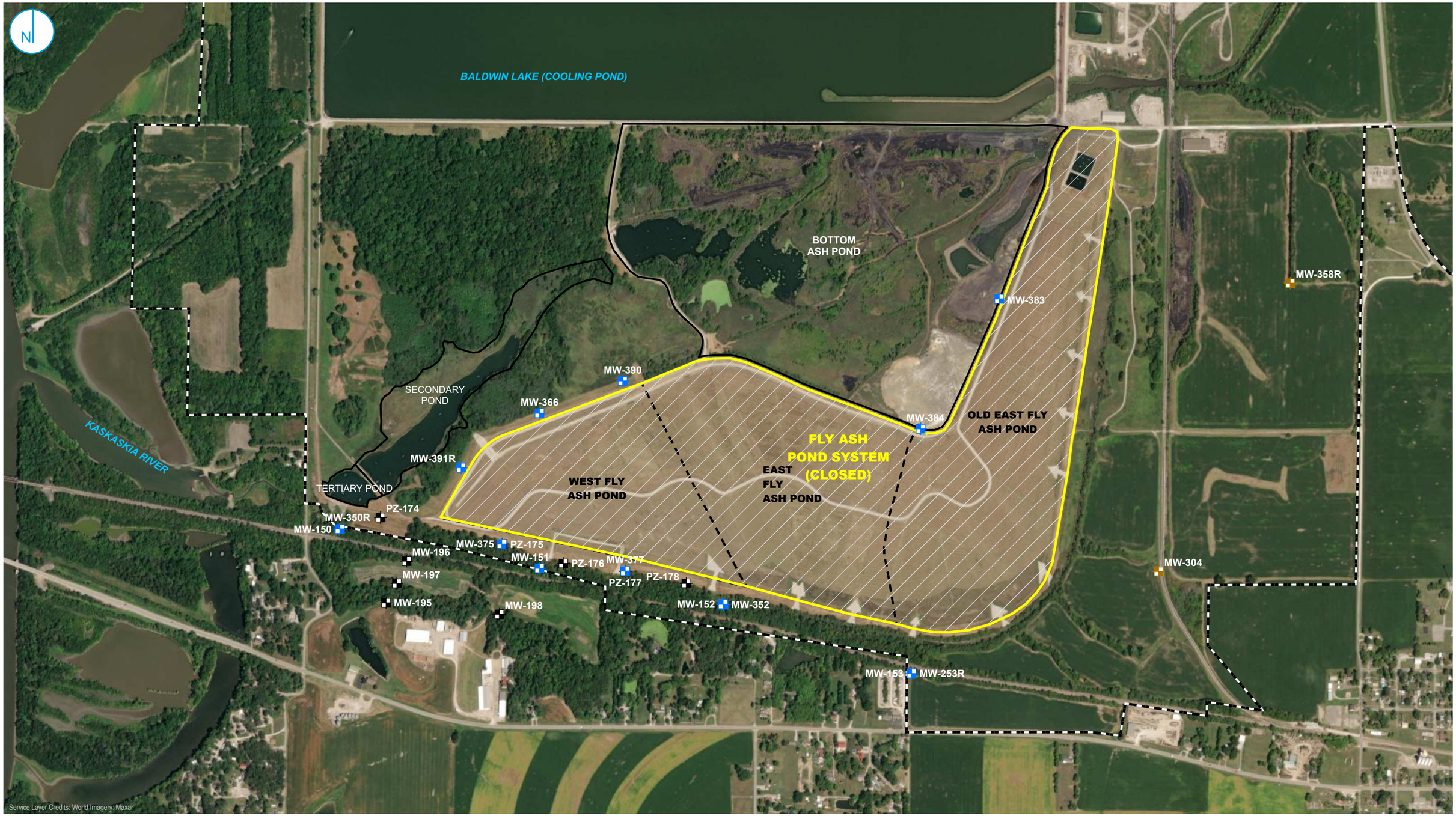
Notes
SU: standard units
mg/L: milligrams per liter
ORP: oxidation-reduction potential
mV: millivolts
Dashes indicate analyte information is not available for sample date

Table 5. Eh-pH Diagram Inputs
Geochemical Conceptual Site Model - Addendum
Baldwin Power Plant - Fly Ash Pond System

Well ID		**MW-196**
Sample Date		**7/23/2024**
Input Parameter	**Unit**	
Temperature	°C	20.3
pH	SU	7.18
Calcium	mg/L	162
Chloride	mg/L	21
Bicarbonate Alkalinity	mg/L	323
Magnesium	mg/L	64.4
Sodium	mg/L	70.4
Potassium	mg/L	2.3
Sulfate	mg/L	428
Dissolved Manganese	mg/L	0.0473
Dissolved Iron	mg/L	0.017

Notes
°C - degrees Celsius
mg/L - milligrams per liter
SU - standard units

Attachment A



Y:\Mapping\Projects\22\2285\MXD\Nature_and_Extent\BAL\Nature_and_Extent_Report\NE_Addendum\BAL_FAPS.aprx\Figure 1-1 Site Map

PROJECT: 169000XXXX | DATED: 2/4/2025 | DESIGNER: GALARNMC

- COMPLIANCE MONITORING WELL
- BACKGROUND MONITORING WELL
- MONITORING WELL
- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- CAPPED AREA
- PROPERTY BOUNDARY

0 400 800 Feet

SITE MAP

NATURE AND EXTENT SITE WORK MEMORANDUM
FLY ASH POND SYSTEM

BALDWIN POWER PLANT
BALDWIN, ILLINOIS

FIGURE 1-1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

Attachment B

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Power Plant		MW-195

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Ethan Orange Cascade Drilling LP	5/7/2024	5/7/2024	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-195	Feet (NGVD29)	423.30 Feet (NGVD29)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 553919.523, 2379823.859 N, E E/W
1/4 of 1/4 of Section , T N, R
Lat 38 ° 11 ' 15.46 "
Long -89 ° 52 ' 37.42 "
Local Grid Location
Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	IL	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	120 79		1	0 - 7.6' **SILTY CLAY:** CL/ML, very dark grayish brown (10YR 3/2), organics (10-20%), gravel (0-10%), very soft, moist.					0					
			2											
			3	2.2' dark yellowish brown (10YR 4/4), black (10YR 2/1) mottling (0-10%), organics decrease, soft to medium stiffness.					2					
			4		CL/ML									
			5						2					
			6											
			7						4.5					
			8	7.6 - 11.1' **SANDY LEAN CLAY:** s(CL), strong brown (7.5YR 5/6), very fine sand, very stiff, hard, dry.										
			9		s(CL)				4.5					
2 CS	84 84		10											
			11	11.1 - 13.4' **SILTY CLAY:** CL/ML, brown (10YR 4/3), sand (10-20%), laminations throughout, stiff, dry.	CL/ML				4.5					
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	Tel:
	Ramboll	Fax:

Boring Number MW-195

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			13	11.1 - 13.4' **SILTY CLAY:** CL/ML, brown (10YR 4/3), sand (10-20%), laminations throughout, stiff, dry. *(continued)*	CL/ML				4.5					
			14 15 16	13.4 - 16.3' **POORLY-GRADED SAND:** SP, pale brown (10YR 6/3), fine sand, gravel (0-10%), loose, dry.	SP									
			17	16.3 - 17' **SILTY CLAY:** CL/ML, yellowish brown (10YR 5/4), fine sand (10-20%), stiff, dry.	CL/ML									
3 CS	156 110		18	17 - 18.4' **SILTY CLAY:** CL/ML, very dark grayish brown (10YR 3/2), low toughness, medium plasticity, moist.	CL/ML				4.5					
			19	18.4 - 19.4' **POORLY-GRADED SAND:** SP, pale brown (10YR 6/3), fine sand, gravel (0-10%), loose, dry.	SP				4.5					
			20 21 22 23 24 25 26 27 28 29	19.4 - 32.3' **SILTY CLAY:** CL/ML, yellowish brown (10YR 5/6), very fine sand (10-20%), very stiff, no dilatency, medium to high toughness, low plasticity, dry.	CL/ML				4.5 4.5 4.5 4.5 4.5					
4 CS	60 60		30 31 32	30' brown (10YR 5/3).					4.5					

Boring Number MW-195

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			33	32.3 - 34.3' **POORLY-GRADED SAND:** SP, brown (10YR 5/3), fine sand, silt (10-20%), loose, dry.	SP									
			34	34.3 - 35' **SILTY CLAY:** CL/ML, brown (10YR 5/3), fine sand (10-20%), stiff, no dilatency, medium toughness, low plasticity, dry.	CL/ML									
5 CS	96 84		35	35 - 42.3' **SILTY CLAY:** CL/ML, dark grayish brown (10YR 4/2), fine sand (10-20%), no dilatency, medium toughness, low to medium plasticity, moist.					4.5					
			36											
			37						3.5					
			38		CL/ML									
			39	39.2' brown (7.5YR 4/2), gray (10YR 6/1) clay nodules (0-10%).					3					
			40											
			41						3					
			42	42.2' 3" cobble.										
			43	42.3 - 43' **CLAYEY SAND:** SC, brown (10YR 5/3), fine to medium sand, gravel (10-20%), moist.	SC									
6 CS	60 60		44	43 - 44.2' **SILTY CLAY:** CL/ML, dark grayish brown (10YR 4/2), no dilatency, medium toughness, low to medium plasticity, moist.	CL/ML									
			45	44.2 - 46.4' **WELL-GRADED SAND:** SW, brown (10YR 5/3), subrounded gravel (10-20%), clay (0-10%), loose, wet.	SW									
			46											
			47	46.4 - 48' **LEAN CLAY:** CL, brown (10YR 5/3), silt (10-20%), gravel (0-10%), no dilatency medium toughness, medium plasticity, stiff, moist.	CL				4.5					
			48	48' End of Boring.										

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Power Plant		MW-196

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Ethan Orange Cascade Drilling LP	5/8/2024	5/8/2024	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-196	Feet (NGVD29)	394.17 Feet (NGVD29)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 554282.482, 2380003.993 N, E E/W
1/4 of 1/4 of Section , T N, R
Lat 38 ° 11 ' 19.04 "
Long -89 ° 52 ' 35.15 "
Local Grid Location Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	IL	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	120 120			0 - 0.5' **CLAYEY SILT:** ML/CL, dark gray (10YR 4/1), sand (10-20%), gravel, organics (0-10%), soft, wet.	ML/CL									
			1	0.5 - 9.3' **SILTY CLAY:** CL/ML, gray (10YR 5/1), gravel (10-20%), sand (0-10%), no dilatency, low to medium toughness, medium to high plasticity, moist.										
			2											
			3						2.25					
			4	3.4' dark yellowish brown (10YR 4/6) mottling (20-30%).										
			5		CL/ML				2					
			6											
			7						1.5					
			8											
			9						1.5					
2 CS	120 120		10	9.3 - 10.7' **SANDY LEAN CLAY:** s(CL), gray (10YR 5/1), yellowish brown (10YR 5/6) mottling (30-40%), gravel (0-10%), soft, wet.	s(CL)									
			11	10.7 - 11.9' **LEAN CLAY:** CL, gray (10YR 5/1), silt (20-30%), gravel (0-10%), stiff, no dilatency, medium toughness, high plasticity, moist.	CL				1.5					
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	Tel:
	Ramboll	Fax:

Boring Number MW-196

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
				11.9 - 12.8' **CLAYEY SAND:** SC, gray (10YR 5/1), gravel (0-10%), very soft, wet. *(continued)*	SC									
			13	12.8 - 16.2' **SILTY CLAY:** CL/ML, grayish brown (10YR 5/2), yellowish brown (10YR 5/6) mottling (10-20%), black (10YR 2/1) mottling (0-10%), no dilatency, medium to high toughness, medium plasticity, moist.										
			14											
					CL/ML									
			15						2.5					
			16											
				16.2 - 20' **SILTY CLAY:** CL/ML, brown (10YR 5/3), yellowish brown (10YR 5/6) mottling (30-40%), gravel (5-15%), no dilatency, medium toughness, medium plasticity, moist. 16.4' - 17.4' red (2.5YR 5/6) nodules (10-20%).										
			17						2.5					
			18		CL/ML									
			19						4.5					
			20	20' End of Boring.										

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Power Plant		MW-197

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Ethan Orange Cascade Drilling LP	5/8/2024	5/8/2024	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-197	Feet (NGVD29)	386.42 Feet (NGVD29)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 554086.035, 2379918.207 N, E E/W
1/4 of 1/4 of Section , T N, R
Lat 38 ° 11 ' 17.10 "
Long -89 ° 52 ' 36.23 "
Local Grid Location Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	IL	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	120 120		1	0 - 4.2' **SANDY LEAN CLAY:** s(CL), dark grayish brown (10YR 4/2), gravel, organics (0-10%), soft, wet.	s(CL)				0					
			2	1.9' cobble.										
			3						0					
			4	4.1' cobble.										
			5	4.2 - 10' **SILTY CLAY:** CL/ML, brown (10YR 5/3), yellowish brown (10YR 5/6) mottling, gray (10YR 6/1) mottling, brown (10YR 4/3) mottling, stiff, no dilatency, high toughness, low to medium plasticity, dry to moist.	CL/ML				4.5					
			6											
			7	6.7' 2" sand and gravel layer.					4.5					
			8											
			9						4.8					
2 CS	120 120		10	10 - 10.8' **SANDY LEAN CLAY:** s(CL), yellowish brown (10YR 5/4), gravel (0-10%), soft, wet.	s(CL)									
			11	10.8 - 11.8' **SILTY CLAY:** CL/ML, brown (10YR 5/3), yellowish brown (10YR 5/6) mottling, gray (10YR 6/1) mottling, brown (10YR 4/3) mottling, stiff, no dilatency, high toughness, low to medium	CL/ML									
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	Tel:
	Ramboll	Fax:

Boring Number MW-197

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
				plasticity, dry to moist. 11.8 - 12.2' **CLAYEY SAND:** SC, yellowish brown (10YR 5/4), gravel (20-30%), loose, moist to wet. *(continued)*	SC									
			13	12.2 - 20' **SILTY CLAY:** CL/ML, brown (10YR 5/3), yellowish brown (10YR 5/6) mottling, gray (10YR 6/1) mottling, brown (10YR 4/3) mottling, gravel (0-10%), sand lenses and nodules throughout, very stiff, no dilatency, high toughness, medium to high plasticity, dry to moist.					4.5					
			14											
			15	12.8' 2" very fine sandy clay. 15.2' 2" red rock.					4.5					
			16		CL/ML									
			17						4.5					
			18											
			19						4.5					
			20	20' End of Boring.										

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Power Plant		MW-253R

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Ethan Orange Cascade Drilling LP	5/1/2024	5/1/2024	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-253R	Feet (NGVD29)	442.65 Feet (NGVD29)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒

State Plane 553297.657, 2384440.098 N, E E/W

1/4 of 1/4 of Section , T N, R

Lat 38 ° 11 ' 09.17 "

Long -89 ° 52 ' 39.63 "

Local Grid Location

Feet ☐ N ☐ S Feet ☐ E ☐ W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	IL	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	120 120		1	0 - 10.2' **SILTY CLAY:** CL/ML, brown (10YR 5/3), gravel (0-10%), hard, dry.	CL/ML									
			2	2.2' strong brown (7.5YR 4/6) mottling (20-30%), light gray (2.5Y 7/1) mottling (20-30%), very dark gray (10YR 3/1) mottling (0-10%).										
			3											
			4											
			5											
			6											
			7											
			8											
			9											
			10											
2 CS	120 120		11	10.2 - 15.4' **SILTY CLAY:** CL/ML, brown (10YR 5/3), strong brown (7.5YR 4/6) mottling (20-30%), light gray (2.5Y 7/1) mottling (20-30%), very dark gray (10YR 3/1) mottling (0-10%), sand (10-20%), gravel (0-10%), medium to high plasticity, moist.	CL/ML				3.5					
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	Tel:
	Ramboll	Fax:

Boring Number MW-253R

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			13	10.2 - 15.4' **SILTY CLAY:** CL/ML, brown (10YR 5/3), strong brown (7.5YR 4/6) mottling (20-30%), light gray (2.5Y 7/1) mottling (20-30%), very dark gray (10YR 3/1) mottling (0-10%), sand (10-20%), gravel (0-10%), medium to high plasticity, moist. *(continued)*	CL/ML				2.5					
			14											
			15						1.5					
			16	15.4 - 18.2' **LEAN CLAY WITH SAND:** (CL)s, yellowish brown (10YR 5/4), gravel (0-10%), soft, medium plasticity, moist.	(CL)s									
			17						1					
			18											
			19	18.2 - 27.2' **SILTY CLAY:** CL/ML, yellowish brown (10YR 5/4), strong brown (7.5YR 4/6) mottling (10-20%), light gray (2.5Y 7/1) mottling (10-20%), very dark gray (10YR 3/1) mottling (0-10%), sand (10-20%), gravel (0-10%), moist.					3					
3 CS	120 120		20	20' gravel (10-20%).										
			21						3.5					
			22	22' - 25' fine sand seams.										
			23		CL/ML				3.5					
			24											
			25	25' - 27.2' trace coal pieces.					3					
			26											
			27						4.5					
			28	27.2 - 28.3' **LEAN CLAY:** CL, light yellowish brown (10YR 6/4), shaly, laminated, platy, low plasticity.	CL									
			29	28.3 - 35' **SHALE:** BDX (SH), light olive brown (2.5Y 5/4), weathered shale.					4.5					
4 CS	60 60		30		BDX (SH)									
			31											
			32											

Boring Number MW-253R

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
				28.3 - 35' **SHALE:** BDX (SH), light olive brown (2.5Y 5/4), weathered shale. *(continued)*	BDX (SH)									
			33											
			34											
			35	35' End of Boring.										

RAMBOLL

SOIL BORING LOG INFORMATION

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Baldwin Power Plant		MW-350R

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Ethan Orange Cascade Drilling LP	5/3/2024	5/3/2024	Sonic

Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
MW-350R	Feet (NGVD29)	394.13 Feet (NGVD29)	6.0 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 554568.067, 2379418.994 N, E E/W
1/4 of 1/4 of Section , T N, R
Lat 38 ° 11 ' 21.89 "
Long -89 ° 52 ' 42.47 "
Local Grid Location Feet ☐N ☐S Feet ☐E ☐W

Facility ID	County	State	Civil Town/City/ or Village
	Randolph	IL	Baldwin

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	120 120		1	0 - 14.4' **SILTY CLAY:** CL/ML, grayish brown (10YR 5/2), yellowish brown (10YR 5/8) mottling (30-40%), organics, roots (0-10%), medium to high toughness, low to medium plasticity, moist.	CL/ML				1.5					
			2											
			3						2					
			4											
			5						2.5					
			6											
			7						3					
			8											
			9						4.5					
			10											
2 CS	120 120		11						3.5					
			12	11.5' sand (0-10%), soft.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	Tel:
	Ramboll	Fax:

Boring Number MW-350R

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			13	0 - 14.4' **SILTY CLAY:** CL/ML, grayish brown (10YR 5/2), yellowish brown (10YR 5/8) mottling (30-40%), organics, roots (0-10%), medium to high toughness, low to medium plasticity, moist. *(continued)*	CL/ML				3.5					
			14											
			15	14.4 - 19.7' **LEAN CLAY:** CL, brown (10YR 5/3), sand, silt (20-30%), light gray (10YR 7/1) mottling (20-30%), yellowish brown (10YR 5/8) mottling (20-30%), soft, low to medium plasticity, moist.					1.5					
			16											
			17		CL				1.5					
			18											
			19						1.5					
3 CS	60 60		20	19.7 - 24.6' **LEAN CLAY:** CL, brown (7.5YR 5/3), silt (20-30%), sand (0-10%), stiff, high plasticity, moist.										
			21						3					
			22	21.7' - 24.6' subangular gravel (10-20%).	CL									
			23						3					
			24											
4 CS	120 120		25	24.6 - 26.3' **SHALE:** BDX (SH), olive gray (5Y 5/2), highly weathered, soft.	BDX (SH)				2					
			26											
			27	26.3 - 27.1' **LIMESTONE:** BDX (LS), dark gray (10YR 4/1), unweathered, fossiliferous, banded, medium bedded, hard.	BDX (LS)									
			28	27.1 - 28.3' **SHALE:** BDX (SH), very dark gray (10YR 3/1), banded, medium bedded, soft to medium soft, dry.	BDX (SH)									
			29	28.3 - 28.9' **LIMESTONE:** BDX (LS), dark gray (10YR 4/1), unweathered, fossiliferous, banded, medium bedded, hard.	BDX (LS)									
			30	28.9 - 32.2' **SHALE:** BDX (SH), very dark gray (10YR 3/1), lightly to moderately weathered, banded, medium bedded.	BDX (SH)									
			31											
			32											

Boring Number MW-350R

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	U S C S	Graphic Log	Well Diagram	PID 10.6 eV Lamp	Soil Properties: Compressive Strength (tsf)	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
				32.2 - 39.5' **LIMESTONE:** BDX (LS), reddish gray (2.5YR 5/1), shaly, very lightly weathered, hard.										
			33											
			34											
				34.5' moderately weathered, banded.										
5 CS	60 60		35											
			36		BDX (LS)									
			37											
			38											
			39											
				39.5 - 41.7' **SHALE:** BDX (SH), gray (10YR 5/1), weathered, banded, soft to medium soft.										
6 CS	48 48		40											
			41		BDX (SH)									
			42	41.7 - 47' **LIMESTONE:** BDX (LS), light gray (10YR 7/1) banded, medium bedded, hard.										
			43											
7 CS	36 36		44		BDX (LS)									
			45											
			46											
			47	47' End of Boring.										

Attachment C

eurofins | Environment Testing

ANALYTICAL REPORT

PREPARED FOR

Attn: Michael Davis
Ramboll Americas Engineering Solutions
333 W Wacker Drive
Suite 1050
Chicago, Illinois 60606

Generated 7/22/2024 11:48:46 AM

JOB DESCRIPTION

Baldwin Nature & Extent CEC Analysis

JOB NUMBER

860-76249-1

Eurofins Houston
4145 Greenbriar Dr
Stafford TX 77477

See page two for job notes and contact information.

my EOL

Eurofins Houston

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Authorization

Generated
7/22/2024 11:48:46 AM

Authorized for release by
Sachin Kudchadkar, Senior Project Manager
Sachin.Kudchadkar@et.eurofinsus.com
(281)748-9025

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Qualifiers

Metals

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.

General Chemistry

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Appendix A

Laboratory Data Package Cover Page - Page 1 of 4

This data package is for Job No. 860-76249-1 and consists of:

This signature page, the laboratory review checklist, and the following reportable data:

- ☑ R1- Field chain-of-custody documentation;
- ☑ R2 - Sample identification cross-reference;
- ☑ R3 - Test reports (analytical data sheets) for each environmental sample that includes:
  - a. Items consistent with NELAC Chapter 5,
  - b. dilution factors,
  - c. preparation methods,
  - d. cleanup methods, and
  - e. if required for the project, tentatively identified coumpounds (TICs).
- ☐ R4 - Surrogate recovery data including:
  - a. Calculated recovery (%R), and
  - b. The laboratory's surrogate QC limits.
- ☑ R5 - Test reports/summary forms for blank samples;
- ☑ R6 - Test reports/summary forms for laboratory control samples (LCSs) including:
  - a. LCS spiking amounts,
  - b. Calculated %R for each analyte, and
  - c. The laboratory's LCS QC limits.
- ☑ R7 - Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including:
  - a. Samples associated with the MS/MSD clearly identified,
  - b. MS/MSD spiking amounts,
  - c. Concentration of each MS/MSD analyte measured in the parent and spiked samples,
  - d. Calculated %Rs and relative percent differences (RPDs), and
  - e. The laboratory's MS/MSD QC limits
- ☑ R8 - Laboratory analytical duplicate (if applicable) recovery and precision:
  - a. The amount of analyte measured in the duplicate,
  - b. The calculated RPD, and
  - c. The laboratory's QC limits for analytical duplicates.
- ☑ R9 - List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix;
- ☑ R10 - Other problems or anomalies.
- ☐ Exception Report for every "No" or "Not Reviewed (NR)" item in Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory does not hold NELAC accreditation under the Texas Laboratory Accreditation Program .

Release Statement: I am responsible for the release of this laboratory data package. This laboratory is NELAC accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature below, I affirm to the best of my knowledge all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information affecting the quality of the data has been knowingly withheld.

Check, if applicable: ☐ This laboratory meets an exception under 30 TAC §25.6 and was last inspected by ☐ TCEQ or ☐ _____ on __/__/__. Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Name (Printed)	Signature	Official Title (Printed)	Date

Laboratory Data Package Cover Page - Page 2 of 4

Laboratory Name: Eurofins Houston	LRC Date: 07/22/2024
Project Name: Baldwin Nature & Extent CEC Analysis	Laboratory Job Number: 860-76249-1
Reviewer Name:	

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
R1	OI	**Chain-of-custody (C-O-C)**					
		Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	✓				
		Were all departures from standard conditions described in an exception report?	✓				
R2	OI	**Sample and quality control (QC) identification**					
		Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	✓				
		Are all laboratory ID numbers cross-referenced to the corresponding QC data?	✓				
R3	OI	**Test reports**					
		Were all samples prepared and analyzed within holding times?		✓			1
		Other than those results < MQL, were all other raw values bracketed by calibration standards?	✓				
		Were calculations checked by a peer or supervisor?	✓				
		Were all analyte identifications checked by a peer or supervisor?	✓				
		Were sample detection limits reported for all analytes not detected?	✓				
		Were all results for soil and sediment samples reported on a dry weight basis?	✓				
		Were % moisture (or solids) reported for all soil and sediment samples?	✓				
		Were bulk soils/solids samples for volatile analysis extracted with methanol per SW846 Method 5035?			✓		
		If required for the project, are TICs reported?			✓		
R4	O	**Surrogate recovery data**					
		Were surrogates added prior to extraction?			✓		
		Were surrogate percent recoveries in all samples within the laboratory QC limits?			✓		
R5	OI	**Test reports/summary forms for blank samples**					
		Were appropriate type(s) of blanks analyzed?	✓				
		Were blanks analyzed at the appropriate frequency?	✓				
		Were method blanks taken through the entire analytical process , including preparation and, if applicable, cleanup procedures?	✓				
		Were blank concentrations < MQL?	✓				
R6	OI	**Laboratory control samples (LCS):**					
		Were all COCs included in the LCS?	✓				
		Was each LCS taken through the entire analytical procedure , including prep and cleanup steps?	✓				
		Were LCSs analyzed at the required frequency?	✓				
		Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	✓				
		Does the detectability check sample data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs?	✓				
		Was the LCSD RPD within QC limits?	✓				
R7	OI	**Matrix spike (MS) and matrix spike duplicate (MSD) data**					
		Were the project/method specified analytes included in the MS and MSD?	✓				
		Were MS/MSD analyzed at the appropriate frequency?	✓				
		Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?		✓			2
		Were MS/MSD RPDs within laboratory QC limits?	✓				
R8	OI	**Analytical duplicate data**					
		Were appropriate analytical duplicates analyzed for each matrix?	✓				
		Were analytical duplicates analyzed at the appropriate frequency?	✓				
		Were RPDs or relative standard deviations within the laboratory QC limits?	✓				
R9	OI	**Method quantitation limits (MQLs):**					
		Are the MQLs for each method analyte included in the laboratory data package?	✓				
		Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	✓				
		Are unadjusted MQLs and DCSs included in the laboratory data package?	✓				
R10	OI	**Other problems/anomalies**					
		Are all known problems/anomalies/special conditions noted in this LRC and ER?	✓				
		Was applicable and available technology used to lower the SDL to minimize the matrix interference effects on the sample results?	✓				
		Is the laboratory NELAC-accredited under the Texas Laboratory Accreditation Program for the analytes, matrices and methods associated with this laboratory data package?	✓				

Laboratory Data Package Cover Page - Page 3 of 4

Laboratory Name:	Eurofins Houston	LRC Date:	07/22/2024
Project Name:	Baldwin Nature & Extent CEC Analysis	Laboratory Job Number:	860-76249-1
Reviewer Name:			

#[1]	A[2]	Description	Yes	No	NA[3]	NR[4]	ER#[5]
S1	OI	**Initial calibration (ICAL)**					
		Were response factors and/or relative response factors for each analyte within QC limits?	✓				
		Were percent RSDs or correlation coefficient criteria met?	✓				
		Was the number of standards recommended in the method used for all analytes?	✓				
		Were all points generated between the lowest and highest standard used to calculate the curve?	✓				
		Are ICAL data available for all instruments used?	✓				
		Has the initial calibration curve been verified using an appropriate second source standard?	✓				
S2	OI	**Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):**					
		Was the CCV analyzed at the method-required frequency?	✓				
		Were percent differences for each analyte within the method-required QC limits?	✓				
		Was the ICAL curve verified for each analyte?	✓				
		Was the absolute value of the analyte concentration in the inorganic CCB < MDL?	✓				
S3	O	**Mass spectral tuning**					
		Was the appropriate compound for the method used for tuning?			✓		
		Were ion abundance data within the method-required QC limits?			✓		
S4	O	**Internal standards (IS)**					
		Were IS area counts and retention times within the method-required QC limits?			✓		
S5	OI	**Raw data (NELAC Section 5.5.10)**					
		Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	✓				
		Were data associated with manual integrations flagged on the raw data?	✓				
S6	O	**Dual column confirmation**					
		Did dual column confirmation results meet the method-required QC?			✓		
S7	O	**Tentatively identified compounds (TICs)**					
		If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			✓		
S8	I	**Interference Check Sample (ICS) results**					
		Were percent recoveries within method QC limits?	✓				
S9	I	**Serial dilutions, post digestion spikes, and method of standard additions**					
		Were percent differences, recoveries, and the linearity within the QC limits specified in the method?	✓				
S10	OI	**Method detection limit (MDL) studies**					
		Was a MDL study performed for each reported analyte?	✓				
		Is the MDL either adjusted or supported by the analysis of DCSs?	✓				
S11	OI	**Proficiency test reports**					
		Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	✓				
S12	OI	**Standards documentation**					
		Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	✓				
S13	OI	**Compound/analyte identification procedures**					
		Are the procedures for compound/analyte identification documented?	✓				
S14	OI	**Demonstration of analyst competency (DOC)**					
		Was DOC conducted consistent with NELAC Chapter 5?	✓				
		Is documentation of the analyst's competency up-to-date and on file?	✓				
S15	OI	**Verification/validation documentation for methods (NELAC Chapter 5)**					
		Are all the methods used to generate the data documented, verified, and validated, where applicable?	✓				
S16	OI	**Laboratory standard operating procedures (SOPs)**					
		Are laboratory SOPs current and on file for each method performed?	✓				

1. Items identified by the letter "R" must be included in the laboratory data package submitted in the TRRP -required report(s). Items identified by the letter "S" should be retained and made available upon request for the appropriate retention period;
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if "NR" or "No" is checked).

Laboratory Data Package Cover Page - Page 4 of 4

Laboratory Name: Eurofins Houston	LRC Date: 07/22/2024
Project Name: Baldwin Nature & Extent CEC Analysis	Laboratory Job Number: 860-76249-1
Reviewer Name:	

ER#[1]	Description
1	Method Moisture: The following sample(s) was received with less than 1 day remaining on the holding time. As such, the laboratory had insufficient time remaining to perform the analysis within holding time : MW-350R (15-25) (860-76249-1), MW-195 (35-37) (860-76249-2), MW-195 (44-46) (860-76249-3), MW-196 (6-8) (860-76249-4) and MW-196 (10-12) (860-76249-5).
2	Method 6010D: The matrix spike / matrix spike duplicate (MS/MSD) recoveries for preparation batch 860-169667 and analytical batch 860-169979 were outside control limits. Sample matrix interference is suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

1. ER# = Exception Report identification number (an Exception Report should be completed for an item if “NR” or “No” is checked).

Job Narrative
860-76249-1

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers and/or narrative comments are included to explain any exceptions, if applicable.

- Matrix QC may not be reported if insufficient sample is provided or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt
The samples were received on 6/13/2024 9:31 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 21.2°C.

Metals
Method 6010D: The matrix spike / matrix spike duplicate (MS/MSD) recoveries for preparation batch 860-169667 and analytical batch 860-169979 were outside control limits. Sample matrix interference is suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

General Chemistry
Method Moisture: The following sample(s) was received with less than 1 day remaining on the holding time. As such, the laboratory had insufficient time remaining to perform the analysis within holding time: MW-350R (15-25) (860-76249-1), MW-195 (35-37) (860-76249-2), MW-195 (44-46) (860-76249-3), MW-196 (6-8) (860-76249-4) and MW-196 (10-12) (860-76249-5).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Detection Summary

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent CEC Analysis

Job ID: 860-76249-1

Client Sample ID: MW-350R (15-25) — Lab Sample ID: 860-76249-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sodium	142		51.2	12.6	mg/Kg	1	☼	6010D	Total/NA
Cation Exchange Capacity	28.3		0.605	0.605	meq/100gm	1	☼	9081	Total/NA

Client Sample ID: MW-195 (35-37) — Lab Sample ID: 860-76249-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sodium	61.2		47.5	11.7	mg/Kg	1	☼	6010D	Total/NA
Cation Exchange Capacity	50.0		0.569	0.569	meq/100gm	1	☼	9081	Total/NA

Client Sample ID: MW-195 (44-46) — Lab Sample ID: 860-76249-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sodium	83.4		47.6	11.7	mg/Kg	1	☼	6010D	Total/NA
Cation Exchange Capacity	11.1		0.552	0.552	meq/100gm	1	☼	9081	Total/NA

Client Sample ID: MW-196 (6-8) — Lab Sample ID: 860-76249-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sodium	179		55.4	13.7	mg/Kg	1	☼	6010D	Total/NA
Cation Exchange Capacity	48.6		0.632	0.632	meq/100gm	1	☼	9081	Total/NA

Client Sample ID: MW-196 (10-12) — Lab Sample ID: 860-76249-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sodium	133		54.5	13.4	mg/Kg	1	☼	6010D	Total/NA
Cation Exchange Capacity	52.0		0.643	0.643	meq/100gm	1	☼	9081	Total/NA

Client Sample ID: MW-197 (4-6) — Lab Sample ID: 860-76249-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sodium	116		52.7	13.0	mg/Kg	1	☼	6010D	Total/NA
Cation Exchange Capacity	56.6		0.632	0.632	meq/100gm	1	☼	9081	Total/NA

Client Sample ID: MW-197 (10-12) — Lab Sample ID: 860-76249-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sodium	93.0		49.4	12.2	mg/Kg	1	☼	6010D	Total/NA
Cation Exchange Capacity	13.7		0.573	0.573	meq/100gm	1	☼	9081	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: Ramboll Americas Engineering Solutions
Job ID: 860-76249-1
Project/Site: Baldwin Nature & Extent CEC Analysis

Client Sample ID: MW-350R (15-25)
Lab Sample ID: 860-76249-1

Date Collected: 05/03/24 10:00
Matrix: Solid
Date Received: 06/13/24 09:31
Percent Solids: 82.7

Method: SW846 6010D - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sodium	142		51.2	12.6	mg/Kg	☼	07/05/24 09:18	07/05/24 16:04	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cation Exchange Capacity (SW846 9081)	28.3		0.605	0.605	meq/100gm	☼	07/19/24 18:43	07/22/24 11:35	1

Client Sample ID: MW-195 (35-37)
Lab Sample ID: 860-76249-2

Date Collected: 05/07/24 15:30
Matrix: Solid
Date Received: 06/13/24 09:31
Percent Solids: 87.8

Method: SW846 6010D - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sodium	61.2		47.5	11.7	mg/Kg	☼	07/05/24 09:18	07/05/24 16:18	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cation Exchange Capacity (SW846 9081)	50.0		0.569	0.569	meq/100gm	☼	07/19/24 18:43	07/22/24 11:35	1

Client Sample ID: MW-195 (44-46)
Lab Sample ID: 860-76249-3

Date Collected: 05/07/24 15:40
Matrix: Solid
Date Received: 06/13/24 09:31
Percent Solids: 90.6

Method: SW846 6010D - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sodium	83.4		47.6	11.7	mg/Kg	☼	07/05/24 09:18	07/05/24 16:19	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cation Exchange Capacity (SW846 9081)	11.1		0.552	0.552	meq/100gm	☼	07/19/24 18:43	07/22/24 11:35	1

Client Sample ID: MW-196 (6-8)
Lab Sample ID: 860-76249-4

Date Collected: 05/08/24 10:30
Matrix: Solid
Date Received: 06/13/24 09:31
Percent Solids: 79.1

Method: SW846 6010D - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sodium	179		55.4	13.7	mg/Kg	☼	07/05/24 09:18	07/05/24 16:21	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cation Exchange Capacity (SW846 9081)	48.6		0.632	0.632	meq/100gm	☼	07/19/24 18:43	07/22/24 11:35	1

Client Sample ID: MW-196 (10-12)
Lab Sample ID: 860-76249-5

Date Collected: 05/08/24 10:40
Matrix: Solid
Date Received: 06/13/24 09:31
Percent Solids: 77.8

Method: SW846 6010D - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sodium	133		54.5	13.4	mg/Kg	☼	07/05/24 09:18	07/05/24 16:23	1

Client Sample Results

Client: Ramboll Americas Engineering Solutions
Job ID: 860-76249-1
Project/Site: Baldwin Nature & Extent CEC Analysis

Client Sample ID: MW-196 (10-12)
Lab Sample ID: 860-76249-5

Date Collected: 05/08/24 10:40
Matrix: Solid
Date Received: 06/13/24 09:31
Percent Solids: 77.8

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cation Exchange Capacity (SW846 9081)	52.0		0.643	0.643	meq/100gm	☼	07/19/24 18:43	07/22/24 11:35	1

Client Sample ID: MW-197 (4-6)
Lab Sample ID: 860-76249-6

Date Collected: 05/08/24 11:30
Matrix: Solid
Date Received: 06/13/24 09:31
Percent Solids: 79.1

Method: SW846 6010D - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sodium	116		52.7	13.0	mg/Kg	☼	07/05/24 09:18	07/05/24 16:24	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cation Exchange Capacity (SW846 9081)	56.6		0.632	0.632	meq/100gm	☼	07/19/24 18:43	07/22/24 11:35	1

Client Sample ID: MW-197 (10-12)
Lab Sample ID: 860-76249-7

Date Collected: 05/08/24 11:40
Matrix: Solid
Date Received: 06/13/24 09:31
Percent Solids: 87.3

Method: SW846 6010D - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sodium	93.0		49.4	12.2	mg/Kg	☼	07/05/24 09:18	07/05/24 16:26	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cation Exchange Capacity (SW846 9081)	13.7		0.573	0.573	meq/100gm	☼	07/19/24 18:43	07/22/24 11:35	1

Method: 6010D - Metals (ICP)

Lab Sample ID: MB 860-169667/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 169979 — **Prep Batch: 169667**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sodium	12.3	U	50.0	12.3	mg/Kg		07/05/24 09:18	07/05/24 15:59	1

Lab Sample ID: LCS 860-169667/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 169979 — **Prep Batch: 169667**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Sodium	2500	2340		mg/Kg		94	80 - 120

Lab Sample ID: LCSD 860-169667/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 169979 — **Prep Batch: 169667**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Sodium	2500	2330		mg/Kg		93	80 - 120	0	20

Lab Sample ID: 860-76249-1 MS — **Client Sample ID: MW-350R (15-25)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 169979 — **Prep Batch: 169667**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec Limits
Sodium	142		2650	2514		mg/Kg	☼	89	75 - 125

Lab Sample ID: 860-76249-1 MSD — **Client Sample ID: MW-350R (15-25)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 169979 — **Prep Batch: 169667**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Sodium	142		2650	2514		mg/Kg	☼	89	75 - 125	0	20

Method: 9081 - Cation Exchange Capacity (CEC)

Lab Sample ID: MB 860-171438/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 175457 — **Prep Batch: 171438**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cation Exchange Capacity	0.500	U	0.500	0.500	meq/100gm		07/19/24 18:43	07/22/24 11:35	1

QC Association Summary

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent CEC Analysis

Job ID: 860-76249-1

Metals

Prep Batch: 169667

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
860-76249-1	MW-350R (15-25)	Total/NA	Solid	3051A	
860-76249-2	MW-195 (35-37)	Total/NA	Solid	3051A	
860-76249-3	MW-195 (44-46)	Total/NA	Solid	3051A	
860-76249-4	MW-196 (6-8)	Total/NA	Solid	3051A	
860-76249-5	MW-196 (10-12)	Total/NA	Solid	3051A	
860-76249-6	MW-197 (4-6)	Total/NA	Solid	3051A	
860-76249-7	MW-197 (10-12)	Total/NA	Solid	3051A	
MB 860-169667/1-A	Method Blank	Total/NA	Solid	3051A	
LCS 860-169667/2-A	Lab Control Sample	Total/NA	Solid	3051A	
LCSD 860-169667/3-A	Lab Control Sample Dup	Total/NA	Solid	3051A	
860-76249-1 MS	MW-350R (15-25)	Total/NA	Solid	3051A	
860-76249-1 MSD	MW-350R (15-25)	Total/NA	Solid	3051A	

Analysis Batch: 169979

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
860-76249-1	MW-350R (15-25)	Total/NA	Solid	6010D	169667
860-76249-2	MW-195 (35-37)	Total/NA	Solid	6010D	169667
860-76249-3	MW-195 (44-46)	Total/NA	Solid	6010D	169667
860-76249-4	MW-196 (6-8)	Total/NA	Solid	6010D	169667
860-76249-5	MW-196 (10-12)	Total/NA	Solid	6010D	169667
860-76249-6	MW-197 (4-6)	Total/NA	Solid	6010D	169667
860-76249-7	MW-197 (10-12)	Total/NA	Solid	6010D	169667
MB 860-169667/1-A	Method Blank	Total/NA	Solid	6010D	169667
LCS 860-169667/2-A	Lab Control Sample	Total/NA	Solid	6010D	169667
LCSD 860-169667/3-A	Lab Control Sample Dup	Total/NA	Solid	6010D	169667
860-76249-1 MS	MW-350R (15-25)	Total/NA	Solid	6010D	169667
860-76249-1 MSD	MW-350R (15-25)	Total/NA	Solid	6010D	169667

General Chemistry

Analysis Batch: 169459

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
860-76249-7	MW-197 (10-12)	Total/NA	Solid	Moisture	
MB 860-169459/1	Method Blank	Total/NA	Solid	Moisture	

Analysis Batch: 169857

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
860-76249-6	MW-197 (4-6)	Total/NA	Solid	Moisture	
MB 860-169857/1	Method Blank	Total/NA	Solid	Moisture	
860-76249-6 DU	MW-197 (4-6)	Total/NA	Solid	Moisture	

Analysis Batch: 170133

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
860-76249-1	MW-350R (15-25)	Total/NA	Solid	Moisture	
860-76249-2	MW-195 (35-37)	Total/NA	Solid	Moisture	
860-76249-3	MW-195 (44-46)	Total/NA	Solid	Moisture	
860-76249-4	MW-196 (6-8)	Total/NA	Solid	Moisture	
860-76249-5	MW-196 (10-12)	Total/NA	Solid	Moisture	
MB 860-170133/1	Method Blank	Total/NA	Solid	Moisture	

QC Association Summary

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent CEC Analysis

Job ID: 860-76249-1

General Chemistry

Prep Batch: 171438

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
860-76249-1	MW-350R (15-25)	Total/NA	Solid	9081	
860-76249-2	MW-195 (35-37)	Total/NA	Solid	9081	
860-76249-3	MW-195 (44-46)	Total/NA	Solid	9081	
860-76249-4	MW-196 (6-8)	Total/NA	Solid	9081	
860-76249-5	MW-196 (10-12)	Total/NA	Solid	9081	
860-76249-6	MW-197 (4-6)	Total/NA	Solid	9081	
860-76249-7	MW-197 (10-12)	Total/NA	Solid	9081	
MB 860-171438/1-A	Method Blank	Total/NA	Solid	9081	

Analysis Batch: 175457

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
860-76249-1	MW-350R (15-25)	Total/NA	Solid	9081	171438
860-76249-2	MW-195 (35-37)	Total/NA	Solid	9081	171438
860-76249-3	MW-195 (44-46)	Total/NA	Solid	9081	171438
860-76249-4	MW-196 (6-8)	Total/NA	Solid	9081	171438
860-76249-5	MW-196 (10-12)	Total/NA	Solid	9081	171438
860-76249-6	MW-197 (4-6)	Total/NA	Solid	9081	171438
860-76249-7	MW-197 (10-12)	Total/NA	Solid	9081	171438
MB 860-171438/1-A	Method Blank	Total/NA	Solid	9081	171438

Lab Chronicle

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent CEC Analysis

Job ID: 860-76249-1

Client Sample ID: MW-350R (15-25)

Lab Sample ID: 860-76249-1
Date Collected: 05/03/24 10:00
Matrix: Solid
Date Received: 06/13/24 09:31

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1			170133	07/14/24 11:52	JC	EET HOU

Client Sample ID: MW-350R (15-25)

Lab Sample ID: 860-76249-1
Date Collected: 05/03/24 10:00
Matrix: Solid
Date Received: 06/13/24 09:31
Percent Solids: 82.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			.59 g	50 mL	169667	07/05/24 09:18	PB	EET HOU
Total/NA	Analysis	6010D		1			169979	07/05/24 16:04	JDM	EET HOU
Total/NA	Prep	9081			2.51 g	50 mL	171438	07/19/24 18:43	PB	EET HOU
Total/NA	Analysis	9081		1			175457	07/22/24 11:35	JDM	EET HOU

Client Sample ID: MW-195 (35-37)

Lab Sample ID: 860-76249-2
Date Collected: 05/07/24 15:30
Matrix: Solid
Date Received: 06/13/24 09:31

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1			170133	07/14/24 11:52	JC	EET HOU

Client Sample ID: MW-195 (35-37)

Lab Sample ID: 860-76249-2
Date Collected: 05/07/24 15:30
Matrix: Solid
Date Received: 06/13/24 09:31
Percent Solids: 87.8

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			.6 g	50 mL	169667	07/05/24 09:18	PB	EET HOU
Total/NA	Analysis	6010D		1			169979	07/05/24 16:18	JDM	EET HOU
Total/NA	Prep	9081			2.51 g	50 mL	171438	07/19/24 18:43	PB	EET HOU
Total/NA	Analysis	9081		1			175457	07/22/24 11:35	JDM	EET HOU

Client Sample ID: MW-195 (44-46)

Lab Sample ID: 860-76249-3
Date Collected: 05/07/24 15:40
Matrix: Solid
Date Received: 06/13/24 09:31

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1			170133	07/14/24 11:52	JC	EET HOU

Client Sample ID: MW-195 (44-46)

Lab Sample ID: 860-76249-3
Date Collected: 05/07/24 15:40
Matrix: Solid
Date Received: 06/13/24 09:31
Percent Solids: 90.6

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			.58 g	50 mL	169667	07/05/24 09:18	PB	EET HOU
Total/NA	Analysis	6010D		1			169979	07/05/24 16:19	JDM	EET HOU
Total/NA	Prep	9081			2.56 g	50 mL	171438	07/19/24 18:43	PB	EET HOU
Total/NA	Analysis	9081		1			175457	07/22/24 11:35	JDM	EET HOU

Lab Chronicle

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent CEC Analysis

Job ID: 860-76249-1

Client Sample ID: MW-196 (6-8)

Lab Sample ID: 860-76249-4
Date Collected: 05/08/24 10:30
Matrix: Solid
Date Received: 06/13/24 09:31

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1			170133	07/14/24 11:52	JC	EET HOU

Client Sample ID: MW-196 (6-8)

Lab Sample ID: 860-76249-4
Date Collected: 05/08/24 10:30
Matrix: Solid
Date Received: 06/13/24 09:31
Percent Solids: 79.1

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			.57 g	50 mL	169667	07/05/24 09:18	PB	EET HOU
Total/NA	Analysis	6010D		1			169979	07/05/24 16:21	JDM	EET HOU
Total/NA	Prep	9081			2.51 g	50 mL	171438	07/19/24 18:43	PB	EET HOU
Total/NA	Analysis	9081		1			175457	07/22/24 11:35	JDM	EET HOU

Client Sample ID: MW-196 (10-12)

Lab Sample ID: 860-76249-5
Date Collected: 05/08/24 10:40
Matrix: Solid
Date Received: 06/13/24 09:31

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1			170133	07/14/24 11:52	JC	EET HOU

Client Sample ID: MW-196 (10-12)

Lab Sample ID: 860-76249-5
Date Collected: 05/08/24 10:40
Matrix: Solid
Date Received: 06/13/24 09:31
Percent Solids: 77.8

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			.59 g	50 mL	169667	07/05/24 09:18	PB	EET HOU
Total/NA	Analysis	6010D		1			169979	07/05/24 16:23	JDM	EET HOU
Total/NA	Prep	9081			2.53 g	50 mL	171438	07/19/24 18:43	PB	EET HOU
Total/NA	Analysis	9081		1			175457	07/22/24 11:35	JDM	EET HOU

Client Sample ID: MW-197 (4-6)

Lab Sample ID: 860-76249-6
Date Collected: 05/08/24 11:30
Matrix: Solid
Date Received: 06/13/24 09:31

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1			169857	07/06/24 15:39	JC	EET HOU

Client Sample ID: MW-197 (4-6)

Lab Sample ID: 860-76249-6
Date Collected: 05/08/24 11:30
Matrix: Solid
Date Received: 06/13/24 09:31
Percent Solids: 79.1

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			.6 g	50 mL	169667	07/05/24 09:18	PB	EET HOU
Total/NA	Analysis	6010D		1			169979	07/05/24 16:24	JDM	EET HOU
Total/NA	Prep	9081			2.54 g	50 mL	171438	07/19/24 18:43	PB	EET HOU
Total/NA	Analysis	9081		1			175457	07/22/24 11:35	JDM	EET HOU

Lab Chronicle

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent CEC Analysis

Job ID: 860-76249-1

Client Sample ID: MW-197 (10-12)

Lab Sample ID: 860-76249-7

Date Collected: 05/08/24 11:40
Matrix: Solid
Date Received: 06/13/24 09:31

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1			169459	07/03/24 11:42	JC	EET HOU

Client Sample ID: MW-197 (10-12)

Lab Sample ID: 860-76249-7

Date Collected: 05/08/24 11:40
Matrix: Solid
Date Received: 06/13/24 09:31
Percent Solids: 87.3

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			.58 g	50 mL	169667	07/05/24 09:18	PB	EET HOU
Total/NA	Analysis	6010D		1			169979	07/05/24 16:26	JDM	EET HOU
Total/NA	Prep	9081			2.55 g	50 mL	171438	07/19/24 18:43	PB	EET HOU
Total/NA	Analysis	9081		1			175457	07/22/24 11:35	JDM	EET HOU

Laboratory References:

EET HOU = Eurofins Houston, 4145 Greenbriar Dr, Stafford, TX 77477, TEL (281)240-4200

Accreditation/Certification Summary

Client: Ramboll Americas Engineering Solutions
Job ID: 860-76249-1
Project/Site: Baldwin Nature & Extent CEC Analysis

Laboratory: Eurofins Houston

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Arkansas DEQ	State	88-00759	08-03-24
Florida	NELAP	E871002	06-30-25
Louisiana (All)	NELAP	03054	06-30-25
Oklahoma	NELAP	1306	08-31-24
Oklahoma	State	2023-139	08-31-24
Texas	NELAP	T104704215	06-30-25
Texas	TCEQ Water Supply	T104704215	12-28-25
USDA	US Federal Programs	525-23-79-79507	03-20-26

Method Summary

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent CEC Analysis

Job ID: 860-76249-1

Method	Method Description	Protocol	Laboratory
6010D	Metals (ICP)	SW846	EET HOU
9081	Cation Exchange Capacity (CEC)	SW846	EET HOU
Moisture	Percent Moisture	EPA	EET HOU
3051A	Preparation, Metals, Microwave Assisted	SW846	EET HOU
9081	Cation Exchange Capacity (CEC)	SW846	EET HOU

Protocol References:

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

EET HOU = Eurofins Houston, 4145 Greenbriar Dr, Stafford, TX 77477, TEL (281)240-4200

Sample Summary

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent CEC Analysis

Job ID: 860-76249-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
860-76249-1	MW-350R (15-25)	Solid	05/03/24 10:00	06/13/24 09:31
860-76249-2	MW-195 (35-37)	Solid	05/07/24 15:30	06/13/24 09:31
860-76249-3	MW-195 (44-46)	Solid	05/07/24 15:40	06/13/24 09:31
860-76249-4	MW-196 (6-8)	Solid	05/08/24 10:30	06/13/24 09:31
860-76249-5	MW-196 (10-12)	Solid	05/08/24 10:40	06/13/24 09:31
860-76249-6	MW-197 (4-6)	Solid	05/08/24 11:30	06/13/24 09:31
860-76249-7	MW-197 (10-12)	Solid	05/08/24 11:40	06/13/24 09:31

Address: 4147 Greenbriar Dr.
Stafford, TX 77477

Chain of Custody Record 727612

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7/22/2024

Regulatory Program ☐ DW ☐ NPDES ☐ RCRA ☐ Other

TAL-8210

Client Contact	Project Manager: Evvan Plank	Site Contact:	Date: 5/22/24	COC No: 1940108209-003
Company Name: RAMBOLL	Tel/Email: Evvan.plank@ramboll.com	Lab Contact: Sachin Kudchadkar	Carrier:	1 of 1 COCs
Address: 234 W Florida St	Analysis Turnaround Time			Sampler: Evvan Plank
City/State/Zip: Milwaukee / WI / 53214	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
Phone: 414-531-0142	TAT if different from Below _____			Walk-in Client:
Fax:	☐ 2 weeks			Lab Sampling:
Project Name: Baldwin	☐ 1 week			
Site:	☐ 2 days			Job / SDG No.
P O #	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	Cation Exchange Capacity	Sample Specific Notes:
MW-350R (15-25)	5/3/24	10 00	G	Soil	1	N	N	X	
MW-195 (35-37)	5/7/24	15:30	G	Soil	1	N	N	X	
MW-195 (44-46)	5/7/24	15 40	G	Soil	1	N	N	X	
MW-196 (6-8)	5/8/24	10.30	G	Soil	1	N	N	X	
MW-196 (10-12)	5/8/24	10 40	G	Soil	1	N	N	X	
MW-197 (4-6)	5/8/24	11 30	G	Soil	1	N	N	X	
MW-197 (10-12)	5/8/24	11 40	G	Soil	1	N	N	X	

860-76249 Chain of Custody

Temp 21.0 IR ID.HOU-368
C/F +0.2
Corrected Temp. 21.2

Preservation Used: 1=Ice, 2=HCl, 3=H2SO4, 4=HNO3, 5=NaOH, 6=Other

Possible Hazard Identification
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☒ Disposal by Lab ☐ Archive for _____ Months

Special Instructions/QC Requirements & Comments.

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No. | Cooler Temp. (°C): Obs'd. _____ Corr'd. _____ | Therm ID No. _____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	Ramboll	6/12/24 13:00	[signature]	Eurofins	6/12/24 1300
[signature]	Eurofins 6-12-24	1630	[signature]		
[signature]			Received in Laboratory by: [signature]		6/13/24 9:31

Login Sample Receipt Checklist

Client: Ramboll Americas Engineering Solutions

Job Number: 860-76249-1

Login Number: 76249

List Source: Eurofins Houston

List Number: 1

Creator: Torrez, Lisandra

Question	Answer	Comment
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	N/A	
Cooler Temperature is acceptable.	False	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	

Login Sample Receipt Checklist

Client: Ramboll Americas Engineering Solutions

Job Number: 860-76249-1

Login Number: 76249
List Number: 2
Creator: Grandits, Corey

List Source: Eurofins Houston

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	False	No ice per client request.
Cooler Temperature is acceptable.	False	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	True	

Attachment D

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ANALYTICAL REPORT

PREPARED FOR

Attn: Michael Davis
Ramboll Americas Engineering Solutions
333 W Wacker Drive
Suite 1050
Chicago, Illinois 60606

Generated 6/28/2024 2:05:49 PM

JOB DESCRIPTION

Baldwin Nature & Extent SEP

JOB NUMBER

140-36896-1

Eurofins Knoxville
5815 Middlebrook Pike
Knoxville TN 37921

See page two for job notes and contact information.

my EOL

Eurofins Knoxville

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins TestAmerica Project Manager.

Authorization

Ryan Henry

Generated
6/28/2024 2:05:49 PM

Authorized for release by
Ryan Henry, Project Manager I
WilliamR.Henry@et.eurofinsus.com
(865)291-3006

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Qualifiers

Metals

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
F3	Duplicate RPD exceeds the control limit
F5	Duplicate RPD exceeds limit, and one or both sample results are less than 5 times RL, and the absolute difference between results is < the upper reporting limits for both.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
L	A negative instrument reading had an absolute value greater than the reporting limit

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

Job Narrative
140-36896-1

Receipt
The samples were received on 5/24/2024 at 9:30am and arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 20.1º C.

Metals
Methods 6010B, 6010B SEP: The serial dilution performed for the following samples associated with batch 140-88099 were outside control limits: MW-195 (35-37) (140-36896-2), (140-36896-A-2-A SD ^5) and (140-36896-A-2-W SD ^5)

Methods 6010B, 6010B SEP: The following samples were diluted due to the presence of Silicon which interferes with Arsenic, Cobalt, Lead, Selenium and Thallium: MW-35DR (15-25) (140-36896-1), MW-195 (35-37) (140-36896-2), MW-195 (44-46) (140-36896-3), MW-196 (6-8) (140-36896-4), MW-196 (10-12) (140-36896-5), MW-197 (4-6) (140-36896-6) and MW-197 (10-12) (140-36896-7). Elevated reporting limits (RLs) are provided.

Methods 6010B, 6010B SEP: The following samples were diluted due to the presence of Titanium which interferes with Cobalt, Lead and Thallium: MW-35DR (15-25) (140-36896-1), MW-195 (35-37) (140-36896-2), MW-196 (6-8) (140-36896-4), MW-196 (10-12) (140-36896-5), MW-197 (4-6) (140-36896-6) and MW-197 (10-12) (140-36896-7). Elevated reporting limits (RLs) are provided.

Method 6010B: The following samples were diluted to bring the concentration of target analyte, Calcium, within the calibration range: MW-196 (6-8) (140-36896-4) and MW-197 (4-6) (140-36896-6). Elevated reporting limits (RLs) are provided.

Method 6010B: The following sample was diluted to bring the concentration of target analyte, Manganese, within the calibration range: MW-196 (10-12) (140-36896-5). Elevated reporting limits (RLs) are provided.

Method 6010B: The following sample was diluted to bring the concentration of target analyte, Iron, within the calibration range: MW-197 (4-6) (140-36896-6). Elevated reporting limits (RLs) are provided.

Method 6010B: The following sample was diluted due to the presence of Manganese which interferes with Selenium: MW-196 (10-12) (140-36896-5). Elevated reporting limits (RLs) are provided.

Method 6010B: The following sample was diluted due to the presence of Iron which interferes with Arsenic, Cadmium, Lead and Selenium: MW-197 (4-6) (140-36896-6). Elevated reporting limits (RLs) are provided.

Method 6010B: The following samples were diluted due to the nature of the sample matrix: MW-35DR (15-25) (140-36896-1), MW-195 (35-37) (140-36896-2), MW-195 (44-46) (140-36896-3), MW-196 (6-8) (140-36896-4), MW-196 (10-12) (140-36896-5), MW-197 (4-6) (140-36896-6) and MW-197 (10-12) (140-36896-7). Elevated reporting limits (RLs) are provided for Aluminum and Calcium.

Method 6010B SEP: The sample duplicate (DUP) precision for preparation batch 140-87265, 140-87312, 140-87328 and 140-87354 and analytical batch 140-87914 was outside control limits. Sample non-homogeneity is suspected.

Method 6010B SEP: The sample duplicate (DUP) precision for preparation batch 140-87365, 140-87438, 140-87482 and 140-87584 and analytical batch 140-88045 was outside control limits. Sample non-homogeneity is suspected.

Method 6010B SEP: The serial dilution performed for the following samples associated with batch 140-88045 was outside control limits: MW-195 (35-37) (140-36896-2) and (140-36896-A-2-S SD ^5)

Method 6010B SEP: The following sample was diluted to bring the concentration of target analyte, Manganese, within the calibration range: MW-196 (10-12) (140-36896-5). Elevated reporting limits (RLs) are provided.

Method 6010B SEP: The following sample was diluted due to the presence of Manganese which interferes with Selenium: MW-196 (10-12) (140-36896-5). Elevated reporting limits (RLs) are provided.

Method 6010B SEP: The following samples were diluted due to the nature of the sample matrix: MW-35DR (15-25) (140-36896-1), MW-195 (35-37) (140-36896-2), MW-195 (44-46) (140-36896-3), MW-196 (6-8) (140-36896-4), MW-196 (10-12) (140-36896-5), MW-197 (4-6) (140-36896-6) and MW-197 (10-12) (140-36896-7). Elevated reporting limits (RLs) are provided for Aluminum.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Job ID: 140-36896-1 (Continued)

General Chemistry

% Moisture: The samples were analyzed for percent moisture using SOP number KNOX-WC-0012 (based on Modified MCAWW 160.3 and SM2540B and on the percent moisture determinations described in methods 3540C and 3550B).

Loss On Ignition: Loss on Ignition (LOI) is based on ASTM test method D 7348. LOI is analyzed in a manner that is similar to ash content in that the data collection process is the same, although the ignition conditions may be different. The result expresses the sample lost during ignition as a percentage instead of measuring the concentration of sample residue retained under the ignition conditions. LOI applies only to solid samples.

One gram of a solid sample is ignited in an air atmosphere at 750°C (combustion industries or for general information) or 950°C (cement industry). The sample weight lost during the ignition is calculated as a percentage of the original sample weight.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Sample Summary

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
140-36896-1	MW-35DR (15-25)	Solid	05/03/24 10:00	05/24/24 09:30
140-36896-2	MW-195 (35-37)	Solid	05/07/24 15:30	05/24/24 09:30
140-36896-3	MW-195 (44-46)	Solid	05/07/24 15:40	05/24/24 09:30
140-36896-4	MW-196 (6-8)	Solid	05/08/24 10:30	05/24/24 09:30
140-36896-5	MW-196 (10-12)	Solid	05/08/24 10:40	05/24/24 09:30
140-36896-6	MW-197 (4-6)	Solid	05/08/24 11:30	05/24/24 09:30
140-36896-7	MW-197 (10-12)	Solid	05/08/24 11:40	05/24/24 09:30

Client Sample Results

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-35DR (15-25)

Date Collected: 05/03/24 10:00
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-1

Matrix: Solid
Percent Solids: 79.6

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		50	8.0	mg/Kg	☼	06/04/24 07:00	06/20/24 14:49	4
Antimony	ND		15	1.4	mg/Kg	☼	06/04/24 07:00	06/20/24 14:49	4
Arsenic	ND		2.5	0.65	mg/Kg	☼	06/04/24 07:00	06/20/24 14:49	4
Barium	**0.66**	**J**	13	0.60	mg/Kg	☼	06/04/24 07:00	06/20/24 14:49	4
Beryllium	ND		1.3	0.39	mg/Kg	☼	06/04/24 07:00	06/20/24 14:49	4
Cadmium	ND		1.3	0.080	mg/Kg	☼	06/04/24 07:00	06/20/24 14:49	4
Calcium	**1300**		1300	9.5	mg/Kg	☼	06/04/24 07:00	06/20/24 14:49	4
Chromium	ND		2.5	0.35	mg/Kg	☼	06/04/24 07:00	06/20/24 14:49	4
Cobalt	ND		13	0.23	mg/Kg	☼	06/04/24 07:00	06/20/24 14:49	4
Iron	ND		25	15	mg/Kg	☼	06/04/24 07:00	06/20/24 14:49	4
Lead	**0.61**	**J**	2.5	0.55	mg/Kg	☼	06/04/24 07:00	06/20/24 14:49	4
Lithium	ND		13	0.75	mg/Kg	☼	06/04/24 07:00	06/20/24 14:49	4
Manganese	ND		3.8	0.16	mg/Kg	☼	06/04/24 07:00	06/20/24 14:49	4
Molybdenum	ND		10	0.41	mg/Kg	☼	06/04/24 07:00	06/20/24 14:49	4
Selenium	ND		2.5	0.85	mg/Kg	☼	06/04/24 07:00	06/20/24 14:49	4
Thallium	ND		8.8	1.1	mg/Kg	☼	06/04/24 07:00	06/20/24 14:49	4

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 2

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**15**	**J**	38	6.0	mg/Kg	☼	06/05/24 07:00	06/20/24 15:58	3
Antimony	ND		11	1.1	mg/Kg	☼	06/05/24 07:00	06/20/24 15:58	3
Arsenic	ND		1.9	0.49	mg/Kg	☼	06/05/24 07:00	06/20/24 15:58	3
Barium	**5.5**	**J**	9.4	0.45	mg/Kg	☼	06/05/24 07:00	06/20/24 15:58	3
Beryllium	ND		0.94	0.060	mg/Kg	☼	06/05/24 07:00	06/21/24 12:32	3
Cadmium	**0.19**	**J**	0.94	0.041	mg/Kg	☼	06/05/24 07:00	06/20/24 15:58	3
Calcium	**20000**		940	8.3	mg/Kg	☼	06/05/24 07:00	06/20/24 15:58	3
Chromium	**0.37**	**J**	1.9	0.26	mg/Kg	☼	06/05/24 07:00	06/20/24 15:58	3
Cobalt	ND		9.4	0.24	mg/Kg	☼	06/05/24 07:00	06/20/24 15:58	3
Iron	ND		19	11	mg/Kg	☼	06/05/24 07:00	06/20/24 15:58	3
Lead	**0.45**	**J**	1.9	0.41	mg/Kg	☼	06/05/24 07:00	06/20/24 15:58	3
Lithium	**0.96**	**J**	9.4	0.57	mg/Kg	☼	06/05/24 07:00	06/20/24 15:58	3
Manganese	**33**		2.8	1.1	mg/Kg	☼	06/05/24 07:00	06/20/24 15:58	3
Molybdenum	ND		7.5	0.31	mg/Kg	☼	06/05/24 07:00	06/20/24 15:58	3
Selenium	ND		1.9	0.64	mg/Kg	☼	06/05/24 07:00	06/20/24 15:58	3
Thallium	ND		6.6	0.79	mg/Kg	☼	06/05/24 07:00	06/20/24 15:58	3

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 3

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**88**		13	2.6	mg/Kg	☼	06/06/24 07:00	06/20/24 17:15	1
Antimony	ND		3.8	0.35	mg/Kg	☼	06/06/24 07:00	06/20/24 17:15	1
Arsenic	**0.45**	**J**	0.63	0.16	mg/Kg	☼	06/06/24 07:00	06/20/24 17:15	1
Barium	**4.1**		3.1	0.15	mg/Kg	☼	06/06/24 07:00	06/20/24 17:15	1
Beryllium	**0.041**	**J**	0.31	0.019	mg/Kg	☼	06/06/24 07:00	06/21/24 13:42	1
Cadmium	ND		0.31	0.014	mg/Kg	☼	06/06/24 07:00	06/20/24 17:15	1
Calcium	**7.8**	**J**	310	1.9	mg/Kg	☼	06/06/24 07:00	06/20/24 17:15	1
Chromium	**0.36**	**J**	0.63	0.088	mg/Kg	☼	06/06/24 07:00	06/20/24 17:15	1
Cobalt	**4.7**		3.1	0.057	mg/Kg	☼	06/06/24 07:00	06/20/24 17:15	1
Iron	**310**		6.3	3.6	mg/Kg	☼	06/06/24 07:00	06/20/24 17:15	1
Lead	**0.17**	**J**	0.63	0.14	mg/Kg	☼	06/06/24 07:00	06/20/24 17:15	1
Lithium	ND		3.1	0.19	mg/Kg	☼	06/06/24 07:00	06/20/24 17:15	1

Client Sample ID: MW-35DR (15-25)

Date Collected: 05/03/24 10:00
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-1

Matrix: Solid
Percent Solids: 79.6

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 3 (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Manganese	**400**	**B**	0.94	0.034	mg/Kg	☼	06/06/24 07:00	06/20/24 17:15	1
Molybdenum	**0.20**	**J**	2.5	0.10	mg/Kg	☼	06/06/24 07:00	06/20/24 17:15	1
Selenium	ND		0.63	0.21	mg/Kg	☼	06/06/24 07:00	06/20/24 17:15	1
Thallium	ND		2.2	0.26	mg/Kg	☼	06/06/24 07:00	06/20/24 17:15	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 4

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**1400**		13	2.0	mg/Kg	☼	06/11/24 07:00	06/24/24 11:45	1
Antimony	ND		3.8	0.57	mg/Kg	☼	06/11/24 07:00	06/24/24 11:45	1
Arsenic	**2.2**		0.63	0.28	mg/Kg	☼	06/11/24 07:00	06/24/24 11:45	1
Barium	**27**		3.1	0.15	mg/Kg	☼	06/11/24 07:00	06/24/24 11:45	1
Beryllium	**0.32**		0.31	0.020	mg/Kg	☼	06/11/24 07:00	06/24/24 11:45	1
Cadmium	**0.097**	**J**	0.31	0.014	mg/Kg	☼	06/11/24 07:00	06/24/24 11:45	1
Calcium	**7300**		310	2.8	mg/Kg	☼	06/11/24 07:00	06/24/24 11:45	1
Chromium	**4.2**		0.63	0.088	mg/Kg	☼	06/11/24 07:00	06/24/24 11:45	1
Cobalt	**2.1**	**J**	3.1	0.067	mg/Kg	☼	06/11/24 07:00	06/24/24 11:45	1
Iron	**4900**		6.3	3.6	mg/Kg	☼	06/11/24 07:00	06/24/24 11:45	1
Lead	**4.9**		0.63	0.14	mg/Kg	☼	06/11/24 07:00	06/24/24 11:45	1
Lithium	**4.0**		3.1	0.19	mg/Kg	☼	06/11/24 07:00	06/24/24 11:45	1
Manganese	**160**		0.94	0.16	mg/Kg	☼	06/11/24 07:00	06/24/24 11:45	1
Molybdenum	**0.24**	**J**	2.5	0.10	mg/Kg	☼	06/11/24 07:00	06/24/24 11:45	1
Selenium	ND		0.63	0.59	mg/Kg	☼	06/11/24 07:00	06/24/24 11:45	1
Thallium	ND		2.2	0.36	mg/Kg	☼	06/11/24 07:00	06/24/24 11:45	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 5

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**57**	**J**	190	30	mg/Kg	☼	06/13/24 07:00	06/24/24 12:54	5
Antimony	ND		57	5.3	mg/Kg	☼	06/13/24 07:00	06/24/24 12:54	5
Arsenic	ND		9.4	2.4	mg/Kg	☼	06/13/24 07:00	06/24/24 12:54	5
Barium	**42**	**J**	47	2.3	mg/Kg	☼	06/13/24 07:00	06/24/24 12:54	5
Beryllium	**1.1**	**J B**	4.7	0.40	mg/Kg	☼	06/13/24 07:00	06/24/24 12:54	5
Cadmium	ND		4.7	0.20	mg/Kg	☼	06/13/24 07:00	06/24/24 12:54	5
Calcium	**8700**	**B**	4700	14	mg/Kg	☼	06/13/24 07:00	06/24/24 12:54	5
Chromium	**2.7**	**J**	9.4	1.3	mg/Kg	☼	06/13/24 07:00	06/24/24 12:54	5
Cobalt	ND		47	0.75	mg/Kg	☼	06/13/24 07:00	06/24/24 12:54	5
Iron	ND		94	55	mg/Kg	☼	06/13/24 07:00	06/24/24 12:54	5
Lead	ND		9.4	2.1	mg/Kg	☼	06/13/24 07:00	06/24/24 12:54	5
Lithium	**2.8**	**J**	47	2.8	mg/Kg	☼	06/13/24 07:00	06/24/24 12:54	5
Manganese	**15**		14	2.3	mg/Kg	☼	06/13/24 07:00	06/24/24 12:54	5
Molybdenum	ND		38	1.6	mg/Kg	☼	06/13/24 07:00	06/24/24 12:54	5
Selenium	ND		9.4	3.3	mg/Kg	☼	06/13/24 07:00	06/24/24 12:54	5
Thallium	ND		33	4.4	mg/Kg	☼	06/13/24 07:00	06/24/24 12:54	5

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 6

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**6600**		13	2.0	mg/Kg	☼	06/11/24 11:00	06/24/24 14:04	1
Antimony	ND		3.8	0.35	mg/Kg	☼	06/11/24 11:00	06/24/24 14:04	1
Arsenic	**1.7**		0.63	0.19	mg/Kg	☼	06/11/24 11:00	06/24/24 14:04	1
Barium	**35**		3.1	0.15	mg/Kg	☼	06/11/24 11:00	06/24/24 14:04	1
Beryllium	**0.30**	**J B**	0.31	0.015	mg/Kg	☼	06/11/24 11:00	06/24/24 14:04	1

Client Sample ID: MW-35DR (15-25)

Date Collected: 05/03/24 10:00
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-1

Matrix: Solid
Percent Solids: 79.6

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 6 (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.31	0.014	mg/Kg	☼	06/11/24 11:00	06/24/24 14:04	1
Calcium	**4400**		310	2.6	mg/Kg	☼	06/11/24 11:00	06/24/24 14:04	1
Chromium	**11**		0.63	0.088	mg/Kg	☼	06/11/24 11:00	06/24/24 14:04	1
Cobalt	**2.7**	**J**	3.1	0.058	mg/Kg	☼	06/11/24 11:00	06/24/24 14:04	1
Iron	**10000**		6.3	3.6	mg/Kg	☼	06/11/24 11:00	06/24/24 14:04	1
Lead	**3.1**		0.63	0.14	mg/Kg	☼	06/11/24 11:00	06/24/24 14:04	1
Lithium	**7.2**		3.1	0.19	mg/Kg	☼	06/11/24 11:00	06/24/24 14:04	1
Manganese	**92**		0.94	0.31	mg/Kg	☼	06/11/24 11:00	06/24/24 14:04	1
Molybdenum	ND		2.5	0.12	mg/Kg	☼	06/11/24 11:00	06/24/24 14:04	1
Selenium	ND		0.63	0.21	mg/Kg	☼	06/11/24 11:00	06/24/24 14:04	1
Thallium	ND		2.2	0.26	mg/Kg	☼	06/11/24 11:00	06/24/24 14:04	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**29000**		130	20	mg/Kg	☼	06/12/24 07:00	06/25/24 11:26	10
Antimony	ND		3.8	0.18	mg/Kg	☼	06/12/24 07:00	06/25/24 12:20	1
Arsenic	**1.7**		1.3	0.75	mg/Kg	☼	06/12/24 07:00	06/25/24 15:11	2
Barium	**240**		3.1	0.058	mg/Kg	☼	06/12/24 07:00	06/25/24 12:20	1
Beryllium	**0.59**	**B**	0.31	0.020	mg/Kg	☼	06/12/24 07:00	06/25/24 12:20	1
Cadmium	ND		0.31	0.014	mg/Kg	☼	06/12/24 07:00	06/25/24 12:20	1
Calcium	**1800**		310	7.2	mg/Kg	☼	06/12/24 07:00	06/25/24 12:20	1
Chromium	**24**	**B**	0.63	0.088	mg/Kg	☼	06/12/24 07:00	06/25/24 12:20	1
Cobalt	**1.1**	**J**	6.3	0.065	mg/Kg	☼	06/12/24 07:00	06/25/24 15:11	2
Iron	**6400**		6.3	5.1	mg/Kg	☼	06/12/24 07:00	06/25/24 12:20	1
Lead	**2.1**		1.3	0.28	mg/Kg	☼	06/12/24 07:00	06/25/24 15:11	2
Lithium	**13**		3.1	0.19	mg/Kg	☼	06/12/24 07:00	06/25/24 12:20	1
Manganese	**48**		0.94	0.39	mg/Kg	☼	06/12/24 07:00	06/25/24 12:20	1
Molybdenum	**0.13**	**J**	2.5	0.10	mg/Kg	☼	06/12/24 07:00	06/25/24 12:20	1
Selenium	ND		1.3	0.43	mg/Kg	☼	06/12/24 07:00	06/25/24 15:11	2
Thallium	**1.0**	**J**	4.4	0.45	mg/Kg	☼	06/12/24 07:00	06/25/24 15:11	2

Method: SW846 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**38000**		10	1.6	mg/Kg			06/28/24 11:53	1
Antimony	ND		3.0	0.14	mg/Kg			06/28/24 11:53	1
Arsenic	**6.0**		0.50	0.13	mg/Kg			06/28/24 11:53	1
Barium	**350**		2.5	0.12	mg/Kg			06/28/24 11:53	1
Beryllium	**2.3**		0.25	0.0075	mg/Kg			06/28/24 11:53	1
Cadmium	**0.29**		0.25	0.011	mg/Kg			06/28/24 11:53	1
Calcium	**43000**		250	0.74	mg/Kg			06/28/24 11:53	1
Chromium	**43**		0.50	0.070	mg/Kg			06/28/24 11:53	1
Cobalt	**11**		2.5	0.023	mg/Kg			06/28/24 11:53	1
Iron	**22000**		5.0	4.1	mg/Kg			06/28/24 11:53	1
Lead	**11**		0.50	0.11	mg/Kg			06/28/24 11:53	1
Lithium	**28**		2.5	0.15	mg/Kg			06/28/24 11:53	1
Manganese	**750**		0.75	0.052	mg/Kg			06/28/24 11:53	1
Molybdenum	**0.57**	**J**	2.0	0.082	mg/Kg			06/28/24 11:53	1
Selenium	ND		0.50	0.17	mg/Kg			06/28/24 11:53	1
Thallium	**1.0**	**J**	1.8	0.18	mg/Kg			06/28/24 11:53	1

Client Sample Results

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-35DR (15-25)

Date Collected: 05/03/24 10:00
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-1

Matrix: Solid
Percent Solids: 79.6

Method: SW846 6010B - SEP Metals (ICP) - Total

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	41000		130	20	mg/Kg	☼	06/12/24 07:00	06/25/24 16:38	10
Antimony	ND		3.8	0.18	mg/Kg	☼	06/12/24 07:00	06/25/24 17:31	1
Arsenic	6.7		0.63	0.38	mg/Kg	☼	06/12/24 07:00	06/25/24 17:31	1
Barium	420		3.1	0.058	mg/Kg	☼	06/12/24 07:00	06/25/24 17:31	1
Beryllium	1.2		0.31	0.020	mg/Kg	☼	06/12/24 07:00	06/25/24 17:31	1
Cadmium	0.19	J	0.31	0.014	mg/Kg	☼	06/12/24 07:00	06/25/24 17:31	1
Calcium	47000		3100	72	mg/Kg	☼	06/12/24 07:00	06/25/24 16:38	10
Chromium	42	B	0.63	0.088	mg/Kg	☼	06/12/24 07:00	06/25/24 17:31	1
Cobalt	9.3		6.3	0.065	mg/Kg	☼	06/12/24 07:00	06/26/24 12:35	2
Iron	22000		6.3	5.1	mg/Kg	☼	06/12/24 07:00	06/25/24 17:31	1
Lead	13		1.3	0.28	mg/Kg	☼	06/12/24 07:00	06/26/24 12:35	2
Lithium	25		3.1	0.19	mg/Kg	☼	06/12/24 07:00	06/25/24 17:31	1
Manganese	680		0.94	0.39	mg/Kg	☼	06/12/24 07:00	06/25/24 17:31	1
Molybdenum	0.62	J	2.5	0.10	mg/Kg	☼	06/12/24 07:00	06/25/24 17:31	1
Selenium	ND	L	0.63	0.21	mg/Kg	☼	06/12/24 07:00	06/25/24 17:31	1
Thallium	1.5	J	4.4	0.45	mg/Kg	☼	06/12/24 07:00	06/26/24 12:35	2

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Loss on Ignition (SPCC Loss On Ignit.)	25		0.31	0.31	%			06/23/24 09:10	1

Client Sample Results

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-195 (35-37)

Date Collected: 05/07/24 15:30
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-2

Matrix: Solid
Percent Solids: 86.7

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		46	7.4	mg/Kg	☼	06/04/24 07:00	06/20/24 14:54	4
Antimony	ND		14	1.3	mg/Kg	☼	06/04/24 07:00	06/20/24 14:54	4
Arsenic	ND		2.3	0.60	mg/Kg	☼	06/04/24 07:00	06/20/24 14:54	4
Barium	**1.5**	**J**	12	0.55	mg/Kg	☼	06/04/24 07:00	06/20/24 14:54	4
Beryllium	ND		1.2	0.36	mg/Kg	☼	06/04/24 07:00	06/20/24 14:54	4
Cadmium	ND		1.2	0.074	mg/Kg	☼	06/04/24 07:00	06/20/24 14:54	4
Calcium	**2800**		1200	8.8	mg/Kg	☼	06/04/24 07:00	06/20/24 14:54	4
Chromium	ND		2.3	0.32	mg/Kg	☼	06/04/24 07:00	06/20/24 14:54	4
Cobalt	ND		12	0.21	mg/Kg	☼	06/04/24 07:00	06/20/24 14:54	4
Iron	ND		23	13	mg/Kg	☼	06/04/24 07:00	06/20/24 14:54	4
Lead	ND		2.3	0.51	mg/Kg	☼	06/04/24 07:00	06/20/24 14:54	4
Lithium	ND		12	0.69	mg/Kg	☼	06/04/24 07:00	06/20/24 14:54	4
Manganese	**0.39**	**J**	3.5	0.14	mg/Kg	☼	06/04/24 07:00	06/20/24 14:54	4
Molybdenum	ND		9.2	0.38	mg/Kg	☼	06/04/24 07:00	06/20/24 14:54	4
Selenium	ND		2.3	0.78	mg/Kg	☼	06/04/24 07:00	06/20/24 14:54	4
Thallium	ND		8.1	0.97	mg/Kg	☼	06/04/24 07:00	06/20/24 14:54	4

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 2

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**21**	**J**	35	5.5	mg/Kg	☼	06/05/24 07:00	06/20/24 16:03	3
Antimony	ND		10	0.97	mg/Kg	☼	06/05/24 07:00	06/20/24 16:03	3
Arsenic	ND		1.7	0.45	mg/Kg	☼	06/05/24 07:00	06/20/24 16:03	3
Barium	**1.0**	**J**	8.7	0.42	mg/Kg	☼	06/05/24 07:00	06/20/24 16:03	3
Beryllium	**0.090**	**J B**	0.87	0.055	mg/Kg	☼	06/05/24 07:00	06/21/24 12:37	3
Cadmium	**0.040**	**J**	0.87	0.038	mg/Kg	☼	06/05/24 07:00	06/20/24 16:03	3
Calcium	**760**	**J**	870	7.6	mg/Kg	☼	06/05/24 07:00	06/20/24 16:03	3
Chromium	ND		1.7	0.24	mg/Kg	☼	06/05/24 07:00	06/20/24 16:03	3
Cobalt	ND		8.7	0.22	mg/Kg	☼	06/05/24 07:00	06/20/24 16:03	3
Iron	ND		17	10	mg/Kg	☼	06/05/24 07:00	06/20/24 16:03	3
Lead	ND		1.7	0.38	mg/Kg	☼	06/05/24 07:00	06/20/24 16:03	3
Lithium	ND		8.7	0.52	mg/Kg	☼	06/05/24 07:00	06/20/24 16:03	3
Manganese	**3.2**		2.6	0.97	mg/Kg	☼	06/05/24 07:00	06/20/24 16:03	3
Molybdenum	ND		6.9	0.28	mg/Kg	☼	06/05/24 07:00	06/20/24 16:03	3
Selenium	ND		1.7	0.59	mg/Kg	☼	06/05/24 07:00	06/20/24 16:03	3
Thallium	ND		6.1	0.73	mg/Kg	☼	06/05/24 07:00	06/20/24 16:03	3

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 3

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**260**		12	2.4	mg/Kg	☼	06/06/24 07:00	06/20/24 17:20	1
Antimony	ND		3.5	0.32	mg/Kg	☼	06/06/24 07:00	06/20/24 17:20	1
Arsenic	**0.71**		0.58	0.15	mg/Kg	☼	06/06/24 07:00	06/20/24 17:20	1
Barium	**7.6**		2.9	0.14	mg/Kg	☼	06/06/24 07:00	06/20/24 17:20	1
Beryllium	**0.091**	**J**	0.29	0.017	mg/Kg	☼	06/06/24 07:00	06/21/24 13:47	1
Cadmium	**0.023**	**J**	0.29	0.013	mg/Kg	☼	06/06/24 07:00	06/20/24 17:20	1
Calcium	**8.8**	**J**	290	1.7	mg/Kg	☼	06/06/24 07:00	06/20/24 17:20	1
Chromium	**0.42**	**J**	0.58	0.081	mg/Kg	☼	06/06/24 07:00	06/20/24 17:20	1
Cobalt	**4.1**		2.9	0.052	mg/Kg	☼	06/06/24 07:00	06/20/24 17:20	1
Iron	**510**		5.8	3.3	mg/Kg	☼	06/06/24 07:00	06/20/24 17:20	1
Lead	**0.88**		0.58	0.13	mg/Kg	☼	06/06/24 07:00	06/20/24 17:20	1
Lithium	ND		2.9	0.17	mg/Kg	☼	06/06/24 07:00	06/20/24 17:20	1

Client Sample ID: MW-195 (35-37)

Date Collected: 05/07/24 15:30
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-2

Matrix: Solid
Percent Solids: 86.7

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 3 (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Manganese	**310**	**B**	0.87	0.031	mg/Kg	☼	06/06/24 07:00	06/20/24 17:20	1
Molybdenum	**0.18**	**J**	2.3	0.095	mg/Kg	☼	06/06/24 07:00	06/20/24 17:20	1
Selenium	ND		0.58	0.20	mg/Kg	☼	06/06/24 07:00	06/20/24 17:20	1
Thallium	ND		2.0	0.24	mg/Kg	☼	06/06/24 07:00	06/20/24 17:20	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 4

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**2400**		12	1.8	mg/Kg	☼	06/11/24 07:00	06/24/24 11:50	1
Antimony	ND		3.5	0.52	mg/Kg	☼	06/11/24 07:00	06/24/24 11:50	1
Arsenic	**2.0**		0.58	0.25	mg/Kg	☼	06/11/24 07:00	06/24/24 11:50	1
Barium	**42**		2.9	0.14	mg/Kg	☼	06/11/24 07:00	06/24/24 11:50	1
Beryllium	**0.36**		0.29	0.018	mg/Kg	☼	06/11/24 07:00	06/24/24 11:50	1
Cadmium	ND		0.29	0.013	mg/Kg	☼	06/11/24 07:00	06/24/24 11:50	1
Calcium	**1000**		290	2.5	mg/Kg	☼	06/11/24 07:00	06/24/24 11:50	1
Chromium	**7.0**		0.58	0.081	mg/Kg	☼	06/11/24 07:00	06/24/24 11:50	1
Cobalt	**2.4**	**J**	2.9	0.061	mg/Kg	☼	06/11/24 07:00	06/24/24 11:50	1
Iron	**6200**		5.8	3.3	mg/Kg	☼	06/11/24 07:00	06/24/24 11:50	1
Lead	**6.1**		0.58	0.13	mg/Kg	☼	06/11/24 07:00	06/24/24 11:50	1
Lithium	**3.8**		2.9	0.17	mg/Kg	☼	06/11/24 07:00	06/24/24 11:50	1
Manganese	**180**		0.87	0.15	mg/Kg	☼	06/11/24 07:00	06/24/24 11:50	1
Molybdenum	**0.28**	**J**	2.3	0.095	mg/Kg	☼	06/11/24 07:00	06/24/24 11:50	1
Selenium	**0.61**		0.58	0.54	mg/Kg	☼	06/11/24 07:00	06/24/24 11:50	1
Thallium	ND		2.0	0.33	mg/Kg	☼	06/11/24 07:00	06/24/24 11:50	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 5

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**28**	**J**	170	27	mg/Kg	☼	06/13/24 07:00	06/24/24 12:59	5
Antimony	ND		52	4.8	mg/Kg	☼	06/13/24 07:00	06/24/24 12:59	5
Arsenic	ND		8.7	2.2	mg/Kg	☼	06/13/24 07:00	06/24/24 12:59	5
Barium	**34**	**J**	43	2.1	mg/Kg	☼	06/13/24 07:00	06/24/24 12:59	5
Beryllium	**1.0**	**J B**	4.3	0.36	mg/Kg	☼	06/13/24 07:00	06/24/24 12:59	5
Cadmium	ND		4.3	0.18	mg/Kg	☼	06/13/24 07:00	06/24/24 12:59	5
Calcium	**200**	**J B**	4300	13	mg/Kg	☼	06/13/24 07:00	06/24/24 12:59	5
Chromium	**3.6**	**J**	8.7	1.2	mg/Kg	☼	06/13/24 07:00	06/24/24 12:59	5
Cobalt	ND		43	0.69	mg/Kg	☼	06/13/24 07:00	06/24/24 12:59	5
Iron	ND		87	51	mg/Kg	☼	06/13/24 07:00	06/24/24 12:59	5
Lead	ND		8.7	1.9	mg/Kg	☼	06/13/24 07:00	06/24/24 12:59	5
Lithium	ND		43	2.5	mg/Kg	☼	06/13/24 07:00	06/24/24 12:59	5
Manganese	**14**		13	2.1	mg/Kg	☼	06/13/24 07:00	06/24/24 12:59	5
Molybdenum	ND		35	1.4	mg/Kg	☼	06/13/24 07:00	06/24/24 12:59	5
Selenium	ND		8.7	3.0	mg/Kg	☼	06/13/24 07:00	06/24/24 12:59	5
Thallium	ND		30	4.0	mg/Kg	☼	06/13/24 07:00	06/24/24 12:59	5

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 6

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**9000**		12	1.8	mg/Kg	☼	06/11/24 11:00	06/24/24 14:09	1
Antimony	ND		3.5	0.32	mg/Kg	☼	06/11/24 11:00	06/24/24 14:09	1
Arsenic	**2.0**		0.58	0.17	mg/Kg	☼	06/11/24 11:00	06/24/24 14:09	1
Barium	**27**		2.9	0.14	mg/Kg	☼	06/11/24 11:00	06/24/24 14:09	1
Beryllium	**0.34**	**B**	0.29	0.014	mg/Kg	☼	06/11/24 11:00	06/24/24 14:09	1

Client Sample ID: MW-195 (35-37)

Date Collected: 05/07/24 15:30
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-2

Matrix: Solid
Percent Solids: 86.7

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 6 (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.29	0.013	mg/Kg	☼	06/11/24 11:00	06/24/24 14:09	1
Calcium	**300**		290	2.4	mg/Kg	☼	06/11/24 11:00	06/24/24 14:09	1
Chromium	**12**		0.58	0.081	mg/Kg	☼	06/11/24 11:00	06/24/24 14:09	1
Cobalt	**1.9**	**J**	2.9	0.053	mg/Kg	☼	06/11/24 11:00	06/24/24 14:09	1
Iron	**11000**		5.8	3.3	mg/Kg	☼	06/11/24 11:00	06/24/24 14:09	1
Lead	**2.0**		0.58	0.13	mg/Kg	☼	06/11/24 11:00	06/24/24 14:09	1
Lithium	**6.5**		2.9	0.17	mg/Kg	☼	06/11/24 11:00	06/24/24 14:09	1
Manganese	**61**		0.87	0.29	mg/Kg	☼	06/11/24 11:00	06/24/24 14:09	1
Molybdenum	ND		2.3	0.11	mg/Kg	☼	06/11/24 11:00	06/24/24 14:09	1
Selenium	ND		0.58	0.20	mg/Kg	☼	06/11/24 11:00	06/24/24 14:09	1
Thallium	ND		2.0	0.24	mg/Kg	☼	06/11/24 11:00	06/24/24 14:09	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**30000**		120	18	mg/Kg	☼	06/12/24 07:00	06/25/24 11:31	10
Antimony	ND		3.5	0.16	mg/Kg	☼	06/12/24 07:00	06/25/24 12:25	1
Arsenic	**1.6**		1.2	0.69	mg/Kg	☼	06/12/24 07:00	06/25/24 15:16	2
Barium	**260**		2.9	0.053	mg/Kg	☼	06/12/24 07:00	06/25/24 12:25	1
Beryllium	**0.46**	**B**	0.29	0.018	mg/Kg	☼	06/12/24 07:00	06/25/24 12:25	1
Cadmium	ND		0.29	0.013	mg/Kg	☼	06/12/24 07:00	06/25/24 12:25	1
Calcium	**2000**		290	6.6	mg/Kg	☼	06/12/24 07:00	06/25/24 12:25	1
Chromium	**20**	**B**	0.58	0.081	mg/Kg	☼	06/12/24 07:00	06/25/24 12:25	1
Cobalt	**0.76**	**J**	5.8	0.060	mg/Kg	☼	06/12/24 07:00	06/25/24 15:16	2
Iron	**5300**		5.8	4.7	mg/Kg	☼	06/12/24 07:00	06/25/24 12:25	1
Lead	**2.7**		1.2	0.25	mg/Kg	☼	06/12/24 07:00	06/25/24 15:16	2
Lithium	**11**		2.9	0.17	mg/Kg	☼	06/12/24 07:00	06/25/24 12:25	1
Manganese	**54**		0.87	0.36	mg/Kg	☼	06/12/24 07:00	06/25/24 12:25	1
Molybdenum	**0.13**	**J**	2.3	0.095	mg/Kg	☼	06/12/24 07:00	06/25/24 12:25	1
Selenium	ND		1.2	0.39	mg/Kg	☼	06/12/24 07:00	06/25/24 15:16	2
Thallium	**1.0**	**J**	4.0	0.42	mg/Kg	☼	06/12/24 07:00	06/25/24 15:16	2

Method: SW846 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**42000**		10	1.6	mg/Kg			06/28/24 11:53	1
Antimony	ND		3.0	0.14	mg/Kg			06/28/24 11:53	1
Arsenic	**6.3**		0.50	0.13	mg/Kg			06/28/24 11:53	1
Barium	**370**		2.5	0.12	mg/Kg			06/28/24 11:53	1
Beryllium	**2.4**		0.25	0.0075	mg/Kg			06/28/24 11:53	1
Cadmium	**0.063**	**J**	0.25	0.011	mg/Kg			06/28/24 11:53	1
Calcium	**7100**		250	0.74	mg/Kg			06/28/24 11:53	1
Chromium	**43**		0.50	0.070	mg/Kg			06/28/24 11:53	1
Cobalt	**9.2**		2.5	0.023	mg/Kg			06/28/24 11:53	1
Iron	**23000**		5.0	4.1	mg/Kg			06/28/24 11:53	1
Lead	**12**		0.50	0.11	mg/Kg			06/28/24 11:53	1
Lithium	**21**		2.5	0.15	mg/Kg			06/28/24 11:53	1
Manganese	**620**		0.75	0.052	mg/Kg			06/28/24 11:53	1
Molybdenum	**0.59**	**J**	2.0	0.082	mg/Kg			06/28/24 11:53	1
Selenium	**0.61**		0.50	0.17	mg/Kg			06/28/24 11:53	1
Thallium	**1.0**	**J**	1.8	0.18	mg/Kg			06/28/24 11:53	1

Client Sample Results

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-195 (35-37)

Date Collected: 05/07/24 15:30
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-2

Matrix: Solid
Percent Solids: 86.7

Method: SW846 6010B - SEP Metals (ICP) - Total

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	58000		120	18	mg/Kg	☼	06/12/24 07:00	06/25/24 16:43	10
Antimony	ND		3.5	0.16	mg/Kg	☼	06/12/24 07:00	06/25/24 17:37	1
Arsenic	6.8		0.58	0.35	mg/Kg	☼	06/12/24 07:00	06/25/24 17:37	1
Barium	430		2.9	0.053	mg/Kg	☼	06/12/24 07:00	06/25/24 17:37	1
Beryllium	1.1		0.29	0.018	mg/Kg	☼	06/12/24 07:00	06/25/24 17:37	1
Cadmium	0.053	J	0.29	0.013	mg/Kg	☼	06/12/24 07:00	06/25/24 17:37	1
Calcium	8700		2900	66	mg/Kg	☼	06/12/24 07:00	06/25/24 16:43	10
Chromium	39	B	0.58	0.081	mg/Kg	☼	06/12/24 07:00	06/25/24 17:37	1
Cobalt	8.9		5.8	0.060	mg/Kg	☼	06/12/24 07:00	06/26/24 12:40	2
Iron	20000		5.8	4.7	mg/Kg	☼	06/12/24 07:00	06/25/24 17:37	1
Lead	13		1.2	0.25	mg/Kg	☼	06/12/24 07:00	06/26/24 12:40	2
Lithium	23		2.9	0.17	mg/Kg	☼	06/12/24 07:00	06/25/24 17:37	1
Manganese	520		0.87	0.36	mg/Kg	☼	06/12/24 07:00	06/25/24 17:37	1
Molybdenum	0.66	J	2.3	0.095	mg/Kg	☼	06/12/24 07:00	06/25/24 17:37	1
Selenium	ND		0.58	0.20	mg/Kg	☼	06/12/24 07:00	06/25/24 17:37	1
Thallium	0.90	J	4.0	0.42	mg/Kg	☼	06/12/24 07:00	06/26/24 12:40	2

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Loss on Ignition (SPCC Loss On Ignit.)	16		0.45	0.45	%			06/23/24 09:10	1

Client Sample Results

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-195 (44-46)

Date Collected: 05/07/24 15:40
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-3

Matrix: Solid
Percent Solids: 90.8

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		44	7.0	mg/Kg	☼	06/04/24 07:00	06/20/24 15:04	4
Antimony	ND		13	1.2	mg/Kg	☼	06/04/24 07:00	06/20/24 15:04	4
Arsenic	ND		2.2	0.57	mg/Kg	☼	06/04/24 07:00	06/20/24 15:04	4
Barium	**1.3**	**J**	11	0.53	mg/Kg	☼	06/04/24 07:00	06/20/24 15:04	4
Beryllium	ND		1.1	0.34	mg/Kg	☼	06/04/24 07:00	06/20/24 15:04	4
Cadmium	ND		1.1	0.070	mg/Kg	☼	06/04/24 07:00	06/20/24 15:04	4
Calcium	**1100**		1100	8.4	mg/Kg	☼	06/04/24 07:00	06/20/24 15:04	4
Chromium	ND		2.2	0.31	mg/Kg	☼	06/04/24 07:00	06/20/24 15:04	4
Cobalt	ND		11	0.20	mg/Kg	☼	06/04/24 07:00	06/20/24 15:04	4
Iron	ND		22	13	mg/Kg	☼	06/04/24 07:00	06/20/24 15:04	4
Lead	ND		2.2	0.48	mg/Kg	☼	06/04/24 07:00	06/20/24 15:04	4
Lithium	ND		11	0.66	mg/Kg	☼	06/04/24 07:00	06/20/24 15:04	4
Manganese	**4.8**		3.3	0.14	mg/Kg	☼	06/04/24 07:00	06/20/24 15:04	4
Molybdenum	ND		8.8	0.36	mg/Kg	☼	06/04/24 07:00	06/20/24 15:04	4
Selenium	ND		2.2	0.75	mg/Kg	☼	06/04/24 07:00	06/20/24 15:04	4
Thallium	ND		7.7	0.92	mg/Kg	☼	06/04/24 07:00	06/20/24 15:04	4

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 2

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**25**	**J**	33	5.3	mg/Kg	☼	06/05/24 07:00	06/20/24 16:13	3
Antimony	ND		9.9	0.92	mg/Kg	☼	06/05/24 07:00	06/20/24 16:13	3
Arsenic	ND		1.7	0.43	mg/Kg	☼	06/05/24 07:00	06/20/24 16:13	3
Barium	**2.3**	**J**	8.3	0.40	mg/Kg	☼	06/05/24 07:00	06/20/24 16:13	3
Beryllium	**0.054**	**J B**	0.83	0.053	mg/Kg	☼	06/05/24 07:00	06/21/24 12:47	3
Cadmium	**0.068**	**J**	0.83	0.036	mg/Kg	☼	06/05/24 07:00	06/20/24 16:13	3
Calcium	**9500**		830	7.3	mg/Kg	☼	06/05/24 07:00	06/20/24 16:13	3
Chromium	**0.61**	**J**	1.7	0.23	mg/Kg	☼	06/05/24 07:00	06/20/24 16:13	3
Cobalt	ND		8.3	0.21	mg/Kg	☼	06/05/24 07:00	06/20/24 16:13	3
Iron	**45**		17	9.6	mg/Kg	☼	06/05/24 07:00	06/20/24 16:13	3
Lead	**0.37**	**J**	1.7	0.36	mg/Kg	☼	06/05/24 07:00	06/20/24 16:13	3
Lithium	ND		8.3	0.50	mg/Kg	☼	06/05/24 07:00	06/20/24 16:13	3
Manganese	**49**		2.5	0.92	mg/Kg	☼	06/05/24 07:00	06/20/24 16:13	3
Molybdenum	ND		6.6	0.27	mg/Kg	☼	06/05/24 07:00	06/20/24 16:13	3
Selenium	ND		1.7	0.56	mg/Kg	☼	06/05/24 07:00	06/20/24 16:13	3
Thallium	ND		5.8	0.69	mg/Kg	☼	06/05/24 07:00	06/20/24 16:13	3

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 3

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**100**		11	2.3	mg/Kg	☼	06/06/24 07:00	06/20/24 17:45	1
Antimony	ND		3.3	0.31	mg/Kg	☼	06/06/24 07:00	06/20/24 17:45	1
Arsenic	**0.42**	**J**	0.55	0.14	mg/Kg	☼	06/06/24 07:00	06/20/24 17:45	1
Barium	**3.5**		2.8	0.13	mg/Kg	☼	06/06/24 07:00	06/20/24 17:45	1
Beryllium	**0.045**	**J**	0.28	0.017	mg/Kg	☼	06/06/24 07:00	06/21/24 14:12	1
Cadmium	ND		0.28	0.012	mg/Kg	☼	06/06/24 07:00	06/20/24 17:45	1
Calcium	**7.0**	**J**	280	1.7	mg/Kg	☼	06/06/24 07:00	06/20/24 17:45	1
Chromium	**1.6**		0.55	0.077	mg/Kg	☼	06/06/24 07:00	06/20/24 17:45	1
Cobalt	**2.4**	**J**	2.8	0.050	mg/Kg	☼	06/06/24 07:00	06/20/24 17:45	1
Iron	**430**		5.5	3.2	mg/Kg	☼	06/06/24 07:00	06/20/24 17:45	1
Lead	ND		0.55	0.12	mg/Kg	☼	06/06/24 07:00	06/20/24 17:45	1
Lithium	ND		2.8	0.17	mg/Kg	☼	06/06/24 07:00	06/20/24 17:45	1

Client Sample ID: MW-195 (44-46)

Date Collected: 05/07/24 15:40
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-3

Matrix: Solid
Percent Solids: 90.8

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 3 (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Manganese	**170**	**B**	0.83	0.030	mg/Kg	☼	06/06/24 07:00	06/20/24 17:45	1
Molybdenum	**0.25**	**J**	2.2	0.090	mg/Kg	☼	06/06/24 07:00	06/20/24 17:45	1
Selenium	ND		0.55	0.19	mg/Kg	☼	06/06/24 07:00	06/20/24 17:45	1
Thallium	ND		1.9	0.23	mg/Kg	☼	06/06/24 07:00	06/20/24 17:45	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 4

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**370**		11	1.8	mg/Kg	☼	06/11/24 07:00	06/24/24 11:59	1
Antimony	ND		3.3	0.50	mg/Kg	☼	06/11/24 07:00	06/24/24 11:59	1
Arsenic	**1.3**		0.55	0.24	mg/Kg	☼	06/11/24 07:00	06/24/24 11:59	1
Barium	**24**		2.8	0.13	mg/Kg	☼	06/11/24 07:00	06/24/24 11:59	1
Beryllium	**0.14**	**J**	0.28	0.018	mg/Kg	☼	06/11/24 07:00	06/24/24 11:59	1
Cadmium	**0.018**	**J**	0.28	0.012	mg/Kg	☼	06/11/24 07:00	06/24/24 11:59	1
Calcium	**9700**		280	2.4	mg/Kg	☼	06/11/24 07:00	06/24/24 11:59	1
Chromium	**1.7**		0.55	0.077	mg/Kg	☼	06/11/24 07:00	06/24/24 11:59	1
Cobalt	**1.1**	**J**	2.8	0.058	mg/Kg	☼	06/11/24 07:00	06/24/24 11:59	1
Iron	**2700**		5.5	3.2	mg/Kg	☼	06/11/24 07:00	06/24/24 11:59	1
Lead	**2.7**		0.55	0.12	mg/Kg	☼	06/11/24 07:00	06/24/24 11:59	1
Lithium	**0.96**	**J**	2.8	0.17	mg/Kg	☼	06/11/24 07:00	06/24/24 11:59	1
Manganese	**95**		0.83	0.14	mg/Kg	☼	06/11/24 07:00	06/24/24 11:59	1
Molybdenum	**0.30**	**J**	2.2	0.090	mg/Kg	☼	06/11/24 07:00	06/24/24 11:59	1
Selenium	ND		0.55	0.52	mg/Kg	☼	06/11/24 07:00	06/24/24 11:59	1
Thallium	ND		1.9	0.32	mg/Kg	☼	06/11/24 07:00	06/24/24 11:59	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 5

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**170**		170	26	mg/Kg	☼	06/13/24 07:00	06/24/24 13:10	5
Antimony	ND		50	4.6	mg/Kg	☼	06/13/24 07:00	06/24/24 13:10	5
Arsenic	ND		8.3	2.1	mg/Kg	☼	06/13/24 07:00	06/24/24 13:10	5
Barium	**6.4**	**J**	41	2.0	mg/Kg	☼	06/13/24 07:00	06/24/24 13:10	5
Beryllium	**1.0**	**J B**	4.1	0.35	mg/Kg	☼	06/13/24 07:00	06/24/24 13:10	5
Cadmium	ND		4.1	0.18	mg/Kg	☼	06/13/24 07:00	06/24/24 13:10	5
Calcium	**6200**	**B**	4100	12	mg/Kg	☼	06/13/24 07:00	06/24/24 13:10	5
Chromium	**1.9**	**J**	8.3	1.2	mg/Kg	☼	06/13/24 07:00	06/24/24 13:10	5
Cobalt	ND		41	0.66	mg/Kg	☼	06/13/24 07:00	06/24/24 13:10	5
Iron	ND		83	48	mg/Kg	☼	06/13/24 07:00	06/24/24 13:10	5
Lead	ND		8.3	1.8	mg/Kg	☼	06/13/24 07:00	06/24/24 13:10	5
Lithium	ND		41	2.4	mg/Kg	☼	06/13/24 07:00	06/24/24 13:10	5
Manganese	**5.4**	**J**	12	2.0	mg/Kg	☼	06/13/24 07:00	06/24/24 13:10	5
Molybdenum	ND		33	1.4	mg/Kg	☼	06/13/24 07:00	06/24/24 13:10	5
Selenium	ND		8.3	2.9	mg/Kg	☼	06/13/24 07:00	06/24/24 13:10	5
Thallium	ND		29	3.9	mg/Kg	☼	06/13/24 07:00	06/24/24 13:10	5

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 6

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**2900**		11	1.8	mg/Kg	☼	06/11/24 11:00	06/24/24 14:34	1
Antimony	ND		3.3	0.31	mg/Kg	☼	06/11/24 11:00	06/24/24 14:34	1
Arsenic	**1.7**		0.55	0.17	mg/Kg	☼	06/11/24 11:00	06/24/24 14:34	1
Barium	**8.6**		2.8	0.13	mg/Kg	☼	06/11/24 11:00	06/24/24 14:34	1
Beryllium	**0.15**	**J B**	0.28	0.013	mg/Kg	☼	06/11/24 11:00	06/24/24 14:34	1

Client Sample ID: MW-195 (44-46)

Date Collected: 05/07/24 15:40
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-3

Matrix: Solid
Percent Solids: 90.8

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 6 (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.28	0.012	mg/Kg	☼	06/11/24 11:00	06/24/24 14:34	1
Calcium	**3100**		280	2.3	mg/Kg	☼	06/11/24 11:00	06/24/24 14:34	1
Chromium	**4.9**		0.55	0.077	mg/Kg	☼	06/11/24 11:00	06/24/24 14:34	1
Cobalt	**1.6**	**J**	2.8	0.051	mg/Kg	☼	06/11/24 11:00	06/24/24 14:34	1
Iron	**5200**		5.5	3.2	mg/Kg	☼	06/11/24 11:00	06/24/24 14:34	1
Lead	**1.6**		0.55	0.12	mg/Kg	☼	06/11/24 11:00	06/24/24 14:34	1
Lithium	**3.6**		2.8	0.17	mg/Kg	☼	06/11/24 11:00	06/24/24 14:34	1
Manganese	**54**		0.83	0.28	mg/Kg	☼	06/11/24 11:00	06/24/24 14:34	1
Molybdenum	ND		2.2	0.11	mg/Kg	☼	06/11/24 11:00	06/24/24 14:34	1
Selenium	ND		0.55	0.19	mg/Kg	☼	06/11/24 11:00	06/24/24 14:34	1
Thallium	ND		1.9	0.23	mg/Kg	☼	06/11/24 11:00	06/24/24 14:34	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**23000**		110	18	mg/Kg	☼	06/12/24 07:00	06/25/24 11:41	10
Antimony	ND		3.3	0.15	mg/Kg	☼	06/12/24 07:00	06/25/24 12:35	1
Arsenic	**1.2**		1.1	0.66	mg/Kg	☼	06/12/24 07:00	06/25/24 15:26	2
Barium	**220**		2.8	0.051	mg/Kg	☼	06/12/24 07:00	06/25/24 12:35	1
Beryllium	**0.37**	**B**	0.28	0.018	mg/Kg	☼	06/12/24 07:00	06/25/24 12:35	1
Cadmium	ND		0.28	0.012	mg/Kg	☼	06/12/24 07:00	06/25/24 12:35	1
Calcium	**2300**		280	6.3	mg/Kg	☼	06/12/24 07:00	06/25/24 12:35	1
Chromium	**14**	**B**	0.55	0.077	mg/Kg	☼	06/12/24 07:00	06/25/24 12:35	1
Cobalt	**0.70**	**J**	5.5	0.057	mg/Kg	☼	06/12/24 07:00	06/25/24 15:26	2
Iron	**3400**		5.5	4.5	mg/Kg	☼	06/12/24 07:00	06/25/24 12:35	1
Lead	**2.0**		1.1	0.24	mg/Kg	☼	06/12/24 07:00	06/25/24 15:26	2
Lithium	**8.2**		2.8	0.17	mg/Kg	☼	06/12/24 07:00	06/25/24 12:35	1
Manganese	**35**		0.83	0.34	mg/Kg	☼	06/12/24 07:00	06/25/24 12:35	1
Molybdenum	**0.091**	**J**	2.2	0.090	mg/Kg	☼	06/12/24 07:00	06/25/24 12:35	1
Selenium	ND		1.1	0.37	mg/Kg	☼	06/12/24 07:00	06/25/24 15:26	2
Thallium	**0.85**	**J**	3.9	0.40	mg/Kg	☼	06/12/24 07:00	06/25/24 15:26	2

Method: SW846 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**27000**		10	1.6	mg/Kg			06/28/24 11:53	1
Antimony	ND		3.0	0.14	mg/Kg			06/28/24 11:53	1
Arsenic	**4.6**		0.50	0.13	mg/Kg			06/28/24 11:53	1
Barium	**260**		2.5	0.12	mg/Kg			06/28/24 11:53	1
Beryllium	**1.8**		0.25	0.0075	mg/Kg			06/28/24 11:53	1
Cadmium	**0.085**	**J**	0.25	0.011	mg/Kg			06/28/24 11:53	1
Calcium	**32000**		250	0.74	mg/Kg			06/28/24 11:53	1
Chromium	**24**		0.50	0.070	mg/Kg			06/28/24 11:53	1
Cobalt	**5.8**		2.5	0.023	mg/Kg			06/28/24 11:53	1
Iron	**12000**		5.0	4.1	mg/Kg			06/28/24 11:53	1
Lead	**6.7**		0.50	0.11	mg/Kg			06/28/24 11:53	1
Lithium	**13**		2.5	0.15	mg/Kg			06/28/24 11:53	1
Manganese	**420**		0.75	0.052	mg/Kg			06/28/24 11:53	1
Molybdenum	**0.64**	**J**	2.0	0.082	mg/Kg			06/28/24 11:53	1
Selenium	ND		0.50	0.17	mg/Kg			06/28/24 11:53	1
Thallium	**0.85**	**J**	1.8	0.18	mg/Kg			06/28/24 11:53	1

Client Sample Results

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-195 (44-46)

Date Collected: 05/07/24 15:40
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-3

Matrix: Solid
Percent Solids: 90.8

Method: SW846 6010B - SEP Metals (ICP) - Total

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	20000		110	18	mg/Kg	☼	06/12/24 07:00	06/25/24 16:52	10
Antimony	ND		3.3	0.15	mg/Kg	☼	06/12/24 07:00	06/25/24 17:48	1
Arsenic	4.2		1.1	0.66	mg/Kg	☼	06/12/24 07:00	06/26/24 12:51	2
Barium	220		2.8	0.051	mg/Kg	☼	06/12/24 07:00	06/25/24 17:48	1
Beryllium	0.43		0.28	0.018	mg/Kg	☼	06/12/24 07:00	06/25/24 17:48	1
Cadmium	0.047	J	0.28	0.012	mg/Kg	☼	06/12/24 07:00	06/25/24 17:48	1
Calcium	35000		2800	63	mg/Kg	☼	06/12/24 07:00	06/25/24 16:52	10
Chromium	17	B	0.55	0.077	mg/Kg	☼	06/12/24 07:00	06/25/24 17:48	1
Cobalt	4.7	J	5.5	0.057	mg/Kg	☼	06/12/24 07:00	06/26/24 12:51	2
Iron	9100		5.5	4.5	mg/Kg	☼	06/12/24 07:00	06/25/24 17:48	1
Lead	6.4		1.1	0.24	mg/Kg	☼	06/12/24 07:00	06/26/24 12:51	2
Lithium	8.2		2.8	0.17	mg/Kg	☼	06/12/24 07:00	06/25/24 17:48	1
Manganese	350		0.83	0.34	mg/Kg	☼	06/12/24 07:00	06/25/24 17:48	1
Molybdenum	0.67	J	2.2	0.090	mg/Kg	☼	06/12/24 07:00	06/25/24 17:48	1
Selenium	ND		1.1	0.37	mg/Kg	☼	06/12/24 07:00	06/26/24 12:51	2
Thallium	0.94	J	3.9	0.40	mg/Kg	☼	06/12/24 07:00	06/26/24 12:51	2

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Loss on Ignition (SPCC Loss On Ignit.)	17		0.39	0.39	%			06/23/24 09:10	1

Client Sample Results

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-196 (6-8)

Date Collected: 05/08/24 10:30
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-4

Matrix: Solid
Percent Solids: 81.0

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		49	7.9	mg/Kg	☼	06/04/24 07:00	06/20/24 15:09	4
Antimony	ND		15	1.4	mg/Kg	☼	06/04/24 07:00	06/20/24 15:09	4
Arsenic	ND		2.5	0.64	mg/Kg	☼	06/04/24 07:00	06/20/24 15:09	4
Barium	**1.8**	**J**	12	0.59	mg/Kg	☼	06/04/24 07:00	06/20/24 15:09	4
Beryllium	ND		1.2	0.38	mg/Kg	☼	06/04/24 07:00	06/20/24 15:09	4
Cadmium	ND		1.2	0.079	mg/Kg	☼	06/04/24 07:00	06/20/24 15:09	4
Calcium	**2100**		1200	9.4	mg/Kg	☼	06/04/24 07:00	06/20/24 15:09	4
Chromium	ND		2.5	0.35	mg/Kg	☼	06/04/24 07:00	06/20/24 15:09	4
Cobalt	ND		12	0.22	mg/Kg	☼	06/04/24 07:00	06/20/24 15:09	4
Iron	ND		25	14	mg/Kg	☼	06/04/24 07:00	06/20/24 15:09	4
Lead	**0.57**	**J**	2.5	0.54	mg/Kg	☼	06/04/24 07:00	06/20/24 15:09	4
Lithium	ND		12	0.74	mg/Kg	☼	06/04/24 07:00	06/20/24 15:09	4
Manganese	ND		3.7	0.15	mg/Kg	☼	06/04/24 07:00	06/20/24 15:09	4
Molybdenum	ND		9.9	0.41	mg/Kg	☼	06/04/24 07:00	06/20/24 15:09	4
Selenium	ND		2.5	0.84	mg/Kg	☼	06/04/24 07:00	06/20/24 15:09	4
Thallium	ND		8.6	1.0	mg/Kg	☼	06/04/24 07:00	06/20/24 15:09	4

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 2

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**11**	**J**	37	5.9	mg/Kg	☼	06/05/24 07:00	06/20/24 16:40	3
Antimony	ND		11	1.0	mg/Kg	☼	06/05/24 07:00	06/20/24 16:40	3
Arsenic	ND		1.9	0.48	mg/Kg	☼	06/05/24 07:00	06/20/24 16:40	3
Barium	**11**		9.3	0.44	mg/Kg	☼	06/05/24 07:00	06/20/24 16:40	3
Beryllium	ND		0.93	0.059	mg/Kg	☼	06/05/24 07:00	06/21/24 13:07	3
Cadmium	**0.23**	**J**	0.93	0.041	mg/Kg	☼	06/05/24 07:00	06/20/24 16:40	3
Calcium	**30000**		930	8.2	mg/Kg	☼	06/05/24 07:00	06/20/24 16:40	3
Chromium	ND		1.9	0.26	mg/Kg	☼	06/05/24 07:00	06/20/24 16:40	3
Cobalt	ND		9.3	0.23	mg/Kg	☼	06/05/24 07:00	06/20/24 16:40	3
Iron	ND		19	11	mg/Kg	☼	06/05/24 07:00	06/20/24 16:40	3
Lead	**0.94**	**J**	1.9	0.41	mg/Kg	☼	06/05/24 07:00	06/20/24 16:40	3
Lithium	**1.3**	**J**	9.3	0.56	mg/Kg	☼	06/05/24 07:00	06/20/24 16:40	3
Manganese	**17**		2.8	1.0	mg/Kg	☼	06/05/24 07:00	06/20/24 16:40	3
Molybdenum	ND		7.4	0.30	mg/Kg	☼	06/05/24 07:00	06/20/24 16:40	3
Selenium	ND		1.9	0.63	mg/Kg	☼	06/05/24 07:00	06/20/24 16:40	3
Thallium	ND		6.5	0.78	mg/Kg	☼	06/05/24 07:00	06/20/24 16:40	3

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 3

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**72**		12	2.6	mg/Kg	☼	06/06/24 07:00	06/20/24 17:50	1
Antimony	ND		3.7	0.35	mg/Kg	☼	06/06/24 07:00	06/20/24 17:50	1
Arsenic	**0.56**	**J**	0.62	0.16	mg/Kg	☼	06/06/24 07:00	06/20/24 17:50	1
Barium	**6.3**		3.1	0.15	mg/Kg	☼	06/06/24 07:00	06/20/24 17:50	1
Beryllium	**0.071**	**J**	0.31	0.019	mg/Kg	☼	06/06/24 07:00	06/21/24 14:17	1
Cadmium	ND		0.31	0.014	mg/Kg	☼	06/06/24 07:00	06/20/24 17:50	1
Calcium	**8.2**	**J**	310	1.9	mg/Kg	☼	06/06/24 07:00	06/20/24 17:50	1
Chromium	**0.33**	**J**	0.62	0.086	mg/Kg	☼	06/06/24 07:00	06/20/24 17:50	1
Cobalt	**3.9**		3.1	0.056	mg/Kg	☼	06/06/24 07:00	06/20/24 17:50	1
Iron	**170**		6.2	3.6	mg/Kg	☼	06/06/24 07:00	06/20/24 17:50	1
Lead	**0.17**	**J**	0.62	0.14	mg/Kg	☼	06/06/24 07:00	06/20/24 17:50	1
Lithium	ND		3.1	0.19	mg/Kg	☼	06/06/24 07:00	06/20/24 17:50	1

Client Sample ID: MW-196 (6-8)

Date Collected: 05/08/24 10:30
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-4

Matrix: Solid
Percent Solids: 81.0

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 3 (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Manganese	**480**	**B**	0.93	0.033	mg/Kg	☼	06/06/24 07:00	06/20/24 17:50	1
Molybdenum	**0.34**	**J**	2.5	0.10	mg/Kg	☼	06/06/24 07:00	06/20/24 17:50	1
Selenium	ND		0.62	0.21	mg/Kg	☼	06/06/24 07:00	06/20/24 17:50	1
Thallium	ND		2.2	0.26	mg/Kg	☼	06/06/24 07:00	06/20/24 17:50	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 4

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**400**		12	2.0	mg/Kg	☼	06/11/24 07:00	06/24/24 12:04	1
Antimony	ND		3.7	0.56	mg/Kg	☼	06/11/24 07:00	06/24/24 12:04	1
Arsenic	**0.70**		0.62	0.27	mg/Kg	☼	06/11/24 07:00	06/24/24 12:04	1
Barium	**30**		3.1	0.15	mg/Kg	☼	06/11/24 07:00	06/24/24 12:04	1
Beryllium	**0.27**	**J**	0.31	0.020	mg/Kg	☼	06/11/24 07:00	06/24/24 12:04	1
Cadmium	**0.12**	**J**	0.31	0.014	mg/Kg	☼	06/11/24 07:00	06/24/24 12:04	1
Calcium	**13000**		310	2.7	mg/Kg	☼	06/11/24 07:00	06/24/24 12:04	1
Chromium	**1.6**		0.62	0.086	mg/Kg	☼	06/11/24 07:00	06/24/24 12:04	1
Cobalt	**1.0**	**J**	3.1	0.065	mg/Kg	☼	06/11/24 07:00	06/24/24 12:04	1
Iron	**1300**		6.2	3.6	mg/Kg	☼	06/11/24 07:00	06/24/24 12:04	1
Lead	**3.9**		0.62	0.14	mg/Kg	☼	06/11/24 07:00	06/24/24 12:04	1
Lithium	**2.2**	**J**	3.1	0.19	mg/Kg	☼	06/11/24 07:00	06/24/24 12:04	1
Manganese	**130**		0.93	0.16	mg/Kg	☼	06/11/24 07:00	06/24/24 12:04	1
Molybdenum	ND		2.5	0.10	mg/Kg	☼	06/11/24 07:00	06/24/24 12:04	1
Selenium	ND		0.62	0.58	mg/Kg	☼	06/11/24 07:00	06/24/24 12:04	1
Thallium	ND		2.2	0.36	mg/Kg	☼	06/11/24 07:00	06/24/24 12:04	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 5

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		190	29	mg/Kg	☼	06/13/24 07:00	06/24/24 13:30	5
Antimony	ND		56	5.2	mg/Kg	☼	06/13/24 07:00	06/24/24 13:30	5
Arsenic	ND		9.3	2.3	mg/Kg	☼	06/13/24 07:00	06/24/24 13:30	5
Barium	**61**		46	2.2	mg/Kg	☼	06/13/24 07:00	06/24/24 13:30	5
Beryllium	**1.2**	**J B**	4.6	0.39	mg/Kg	☼	06/13/24 07:00	06/24/24 13:30	5
Cadmium	ND		4.6	0.20	mg/Kg	☼	06/13/24 07:00	06/24/24 13:30	5
Calcium	**12000**	**B**	4600	14	mg/Kg	☼	06/13/24 07:00	06/24/24 13:30	5
Chromium	**3.3**	**J**	9.3	1.3	mg/Kg	☼	06/13/24 07:00	06/24/24 13:30	5
Cobalt	ND		46	0.74	mg/Kg	☼	06/13/24 07:00	06/24/24 13:30	5
Iron	ND		93	54	mg/Kg	☼	06/13/24 07:00	06/24/24 13:30	5
Lead	ND		9.3	2.0	mg/Kg	☼	06/13/24 07:00	06/24/24 13:30	5
Lithium	ND		46	2.7	mg/Kg	☼	06/13/24 07:00	06/24/24 13:30	5
Manganese	**7.1**	**J**	14	2.3	mg/Kg	☼	06/13/24 07:00	06/24/24 13:30	5
Molybdenum	ND		37	1.5	mg/Kg	☼	06/13/24 07:00	06/24/24 13:30	5
Selenium	ND		9.3	3.2	mg/Kg	☼	06/13/24 07:00	06/24/24 13:30	5
Thallium	ND		32	4.3	mg/Kg	☼	06/13/24 07:00	06/24/24 13:30	5

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 6

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**6200**		12	2.0	mg/Kg	☼	06/11/24 11:00	06/24/24 14:39	1
Antimony	ND		3.7	0.35	mg/Kg	☼	06/11/24 11:00	06/24/24 14:39	1
Arsenic	**1.0**		0.62	0.19	mg/Kg	☼	06/11/24 11:00	06/24/24 14:39	1
Barium	**51**		3.1	0.15	mg/Kg	☼	06/11/24 11:00	06/24/24 14:39	1
Beryllium	**0.32**	**B**	0.31	0.015	mg/Kg	☼	06/11/24 11:00	06/24/24 14:39	1

Client Sample ID: MW-196 (6-8)

Date Collected: 05/08/24 10:30
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-4

Matrix: Solid
Percent Solids: 81.0

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 6 (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.31	0.014	mg/Kg	☼	06/11/24 11:00	06/24/24 14:39	1
Calcium	**4900**		310	2.6	mg/Kg	☼	06/11/24 11:00	06/24/24 14:39	1
Chromium	**9.5**		0.62	0.086	mg/Kg	☼	06/11/24 11:00	06/24/24 14:39	1
Cobalt	**2.0**	**J**	3.1	0.057	mg/Kg	☼	06/11/24 11:00	06/24/24 14:39	1
Iron	**7900**		6.2	3.6	mg/Kg	☼	06/11/24 11:00	06/24/24 14:39	1
Lead	**2.4**		0.62	0.14	mg/Kg	☼	06/11/24 11:00	06/24/24 14:39	1
Lithium	**6.8**		3.1	0.19	mg/Kg	☼	06/11/24 11:00	06/24/24 14:39	1
Manganese	**85**		0.93	0.31	mg/Kg	☼	06/11/24 11:00	06/24/24 14:39	1
Molybdenum	ND		2.5	0.12	mg/Kg	☼	06/11/24 11:00	06/24/24 14:39	1
Selenium	ND		0.62	0.21	mg/Kg	☼	06/11/24 11:00	06/24/24 14:39	1
Thallium	ND		2.2	0.26	mg/Kg	☼	06/11/24 11:00	06/24/24 14:39	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**29000**		120	20	mg/Kg	☼	06/12/24 07:00	06/25/24 11:46	10
Antimony	ND		3.7	0.17	mg/Kg	☼	06/12/24 07:00	06/25/24 12:41	1
Arsenic	**1.3**		1.2	0.74	mg/Kg	☼	06/12/24 07:00	06/25/24 15:31	2
Barium	**270**		3.1	0.057	mg/Kg	☼	06/12/24 07:00	06/25/24 12:41	1
Beryllium	**0.54**	**B**	0.31	0.020	mg/Kg	☼	06/12/24 07:00	06/25/24 12:41	1
Cadmium	ND		0.31	0.014	mg/Kg	☼	06/12/24 07:00	06/25/24 12:41	1
Calcium	**2600**		310	7.0	mg/Kg	☼	06/12/24 07:00	06/25/24 12:41	1
Chromium	**23**	**B**	0.62	0.086	mg/Kg	☼	06/12/24 07:00	06/25/24 12:41	1
Cobalt	**0.94**	**J**	6.2	0.064	mg/Kg	☼	06/12/24 07:00	06/25/24 15:31	2
Iron	**5900**		6.2	5.1	mg/Kg	☼	06/12/24 07:00	06/25/24 12:41	1
Lead	**2.4**		1.2	0.27	mg/Kg	☼	06/12/24 07:00	06/25/24 15:31	2
Lithium	**11**		3.1	0.19	mg/Kg	☼	06/12/24 07:00	06/25/24 12:41	1
Manganese	**54**		0.93	0.38	mg/Kg	☼	06/12/24 07:00	06/25/24 12:41	1
Molybdenum	**0.12**	**J**	2.5	0.10	mg/Kg	☼	06/12/24 07:00	06/25/24 12:41	1
Selenium	ND		1.2	0.42	mg/Kg	☼	06/12/24 07:00	06/25/24 15:31	2
Thallium	**1.2**	**J**	4.3	0.44	mg/Kg	☼	06/12/24 07:00	06/25/24 15:31	2

Method: SW846 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**36000**		10	1.6	mg/Kg			06/28/24 11:53	1
Antimony	ND		3.0	0.14	mg/Kg			06/28/24 11:53	1
Arsenic	**3.6**		0.50	0.13	mg/Kg			06/28/24 11:53	1
Barium	**430**		2.5	0.12	mg/Kg			06/28/24 11:53	1
Beryllium	**2.4**		0.25	0.0075	mg/Kg			06/28/24 11:53	1
Cadmium	**0.35**		0.25	0.011	mg/Kg			06/28/24 11:53	1
Calcium	**65000**		250	0.74	mg/Kg			06/28/24 11:53	1
Chromium	**37**		0.50	0.070	mg/Kg			06/28/24 11:53	1
Cobalt	**7.9**		2.5	0.023	mg/Kg			06/28/24 11:53	1
Iron	**15000**		5.0	4.1	mg/Kg			06/28/24 11:53	1
Lead	**10**		0.50	0.11	mg/Kg			06/28/24 11:53	1
Lithium	**21**		2.5	0.15	mg/Kg			06/28/24 11:53	1
Manganese	**770**		0.75	0.052	mg/Kg			06/28/24 11:53	1
Molybdenum	**0.46**	**J**	2.0	0.082	mg/Kg			06/28/24 11:53	1
Selenium	ND		0.50	0.17	mg/Kg			06/28/24 11:53	1
Thallium	**1.2**	**J**	1.8	0.18	mg/Kg			06/28/24 11:53	1

Client Sample Results

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-196 (6-8)

Date Collected: 05/08/24 10:30
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-4

Matrix: Solid
Percent Solids: 81.0

Method: SW846 6010B - SEP Metals (ICP) - Total

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	45000		120	20	mg/Kg	☼	06/12/24 07:00	06/25/24 16:57	10
Antimony	ND		3.7	0.17	mg/Kg	☼	06/12/24 07:00	06/25/24 17:54	1
Arsenic	3.9		0.62	0.37	mg/Kg	☼	06/12/24 07:00	06/25/24 17:54	1
Barium	430		3.1	0.057	mg/Kg	☼	06/12/24 07:00	06/25/24 17:54	1
Beryllium	0.93		0.31	0.020	mg/Kg	☼	06/12/24 07:00	06/25/24 17:54	1
Cadmium	0.55		0.31	0.014	mg/Kg	☼	06/12/24 07:00	06/25/24 17:54	1
Calcium	96000		3100	70	mg/Kg	☼	06/12/24 07:00	06/25/24 16:57	10
Chromium	36	B	0.62	0.086	mg/Kg	☼	06/12/24 07:00	06/25/24 17:54	1
Cobalt	7.3		6.2	0.064	mg/Kg	☼	06/12/24 07:00	06/26/24 12:56	2
Iron	15000		6.2	5.1	mg/Kg	☼	06/12/24 07:00	06/25/24 17:54	1
Lead	12		1.2	0.27	mg/Kg	☼	06/12/24 07:00	06/26/24 12:56	2
Lithium	22		3.1	0.19	mg/Kg	☼	06/12/24 07:00	06/25/24 17:54	1
Manganese	560		0.93	0.38	mg/Kg	☼	06/12/24 07:00	06/25/24 17:54	1
Molybdenum	0.37	J	2.5	0.10	mg/Kg	☼	06/12/24 07:00	06/25/24 17:54	1
Selenium	ND	L	0.62	0.21	mg/Kg	☼	06/12/24 07:00	06/25/24 17:54	1
Thallium	1.1	J	4.3	0.44	mg/Kg	☼	06/12/24 07:00	06/26/24 12:56	2

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Loss on Ignition (SPCC Loss On Ignit.)	29		0.31	0.31	%			06/23/24 09:10	1

Client Sample Results

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-196 (10-12)

Date Collected: 05/08/24 10:40
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-5

Matrix: Solid
Percent Solids: 76.7

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**9.2**	**J**	52	8.3	mg/Kg	☼	06/04/24 07:00	06/20/24 15:14	4
Antimony	ND		16	1.5	mg/Kg	☼	06/04/24 07:00	06/20/24 15:14	4
Arsenic	ND		2.6	0.68	mg/Kg	☼	06/04/24 07:00	06/20/24 15:14	4
Barium	**1.6**	**J**	13	0.63	mg/Kg	☼	06/04/24 07:00	06/20/24 15:14	4
Beryllium	ND		1.3	0.40	mg/Kg	☼	06/04/24 07:00	06/20/24 15:14	4
Cadmium	ND		1.3	0.083	mg/Kg	☼	06/04/24 07:00	06/20/24 15:14	4
Calcium	**1500**		1300	9.9	mg/Kg	☼	06/04/24 07:00	06/20/24 15:14	4
Chromium	ND		2.6	0.37	mg/Kg	☼	06/04/24 07:00	06/20/24 15:14	4
Cobalt	ND		13	0.23	mg/Kg	☼	06/04/24 07:00	06/20/24 15:14	4
Iron	ND		26	15	mg/Kg	☼	06/04/24 07:00	06/20/24 15:14	4
Lead	ND		2.6	0.57	mg/Kg	☼	06/04/24 07:00	06/20/24 15:14	4
Lithium	ND		13	0.78	mg/Kg	☼	06/04/24 07:00	06/20/24 15:14	4
Manganese	ND		3.9	0.16	mg/Kg	☼	06/04/24 07:00	06/20/24 15:14	4
Molybdenum	ND		10	0.43	mg/Kg	☼	06/04/24 07:00	06/20/24 15:14	4
Selenium	ND		2.6	0.89	mg/Kg	☼	06/04/24 07:00	06/20/24 15:14	4
Thallium	ND		9.1	1.1	mg/Kg	☼	06/04/24 07:00	06/20/24 15:14	4

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 2

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**18**	**J**	39	6.3	mg/Kg	☼	06/05/24 07:00	06/20/24 16:45	3
Antimony	ND		12	1.1	mg/Kg	☼	06/05/24 07:00	06/20/24 16:45	3
Arsenic	ND		2.0	0.51	mg/Kg	☼	06/05/24 07:00	06/20/24 16:45	3
Barium	**3.7**	**J**	9.8	0.47	mg/Kg	☼	06/05/24 07:00	06/20/24 16:45	3
Beryllium	**0.13**	**J B**	0.98	0.063	mg/Kg	☼	06/05/24 07:00	06/21/24 13:12	3
Cadmium	**0.065**	**J**	0.98	0.043	mg/Kg	☼	06/05/24 07:00	06/20/24 16:45	3
Calcium	**3700**		980	8.6	mg/Kg	☼	06/05/24 07:00	06/20/24 16:45	3
Chromium	ND		2.0	0.27	mg/Kg	☼	06/05/24 07:00	06/20/24 16:45	3
Cobalt	ND		9.8	0.25	mg/Kg	☼	06/05/24 07:00	06/20/24 16:45	3
Iron	ND		20	11	mg/Kg	☼	06/05/24 07:00	06/20/24 16:45	3
Lead	**0.67**	**J**	2.0	0.43	mg/Kg	☼	06/05/24 07:00	06/20/24 16:45	3
Lithium	ND		9.8	0.59	mg/Kg	☼	06/05/24 07:00	06/20/24 16:45	3
Manganese	**3.7**		2.9	1.1	mg/Kg	☼	06/05/24 07:00	06/20/24 16:45	3
Molybdenum	ND		7.8	0.32	mg/Kg	☼	06/05/24 07:00	06/20/24 16:45	3
Selenium	ND		2.0	0.67	mg/Kg	☼	06/05/24 07:00	06/20/24 16:45	3
Thallium	ND		6.8	0.82	mg/Kg	☼	06/05/24 07:00	06/20/24 16:45	3

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 3

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**230**		13	2.7	mg/Kg	☼	06/06/24 07:00	06/20/24 17:55	1
Antimony	ND		3.9	0.37	mg/Kg	☼	06/06/24 07:00	06/20/24 17:55	1
Arsenic	**1.2**		0.65	0.17	mg/Kg	☼	06/06/24 07:00	06/20/24 17:55	1
Barium	**18**		3.3	0.16	mg/Kg	☼	06/06/24 07:00	06/20/24 17:55	1
Beryllium	**0.17**	**J**	0.33	0.020	mg/Kg	☼	06/06/24 07:00	06/21/24 14:22	1
Cadmium	**0.046**	**J**	0.33	0.014	mg/Kg	☼	06/06/24 07:00	06/20/24 17:55	1
Calcium	**6.8**	**J**	330	2.0	mg/Kg	☼	06/06/24 07:00	06/20/24 17:55	1
Chromium	**0.47**	**J**	0.65	0.091	mg/Kg	☼	06/06/24 07:00	06/20/24 17:55	1
Cobalt	**5.2**		3.3	0.059	mg/Kg	☼	06/06/24 07:00	06/20/24 17:55	1
Iron	**1100**		6.5	3.8	mg/Kg	☼	06/06/24 07:00	06/20/24 17:55	1
Lead	**1.3**		0.65	0.14	mg/Kg	☼	06/06/24 07:00	06/20/24 17:55	1
Lithium	ND		3.3	0.20	mg/Kg	☼	06/06/24 07:00	06/20/24 17:55	1

Client Sample ID: MW-196 (10-12)

Date Collected: 05/08/24 10:40
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-5

Matrix: Solid
Percent Solids: 76.7

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 3 (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Manganese	**580**	**B**	0.98	0.035	mg/Kg	☼	06/06/24 07:00	06/20/24 17:55	1
Molybdenum	**0.37**	**J**	2.6	0.11	mg/Kg	☼	06/06/24 07:00	06/20/24 17:55	1
Selenium	ND		0.65	0.22	mg/Kg	☼	06/06/24 07:00	06/20/24 17:55	1
Thallium	ND		2.3	0.27	mg/Kg	☼	06/06/24 07:00	06/20/24 17:55	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 4

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**2300**		13	2.1	mg/Kg	☼	06/11/24 07:00	06/24/24 12:09	1
Antimony	ND		3.9	0.59	mg/Kg	☼	06/11/24 07:00	06/24/24 12:09	1
Arsenic	**3.9**		0.65	0.29	mg/Kg	☼	06/11/24 07:00	06/24/24 12:09	1
Barium	**90**		3.3	0.16	mg/Kg	☼	06/11/24 07:00	06/24/24 12:09	1
Beryllium	**0.44**		0.33	0.021	mg/Kg	☼	06/11/24 07:00	06/24/24 12:09	1
Cadmium	**0.20**	**J**	0.33	0.014	mg/Kg	☼	06/11/24 07:00	06/24/24 12:09	1
Calcium	**3100**		330	2.9	mg/Kg	☼	06/11/24 07:00	06/24/24 12:09	1
Chromium	**4.5**		0.65	0.091	mg/Kg	☼	06/11/24 07:00	06/24/24 12:09	1
Cobalt	**8.7**		3.3	0.069	mg/Kg	☼	06/11/24 07:00	06/24/24 12:09	1
Iron	**5800**		6.5	3.8	mg/Kg	☼	06/11/24 07:00	06/24/24 12:09	1
Lead	**16**		0.65	0.14	mg/Kg	☼	06/11/24 07:00	06/24/24 12:09	1
Lithium	**2.9**	**J**	3.3	0.20	mg/Kg	☼	06/11/24 07:00	06/24/24 12:09	1
Manganese	**1700**		2.0	0.34	mg/Kg	☼	06/11/24 07:00	06/24/24 15:00	2
Molybdenum	**0.65**	**J**	2.6	0.11	mg/Kg	☼	06/11/24 07:00	06/24/24 12:09	1
Selenium	ND		1.3	1.2	mg/Kg	☼	06/11/24 07:00	06/24/24 15:00	2
Thallium	ND		2.3	0.38	mg/Kg	☼	06/11/24 07:00	06/24/24 12:09	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 5

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**36**	**J**	200	31	mg/Kg	☼	06/13/24 07:00	06/24/24 13:35	5
Antimony	ND		59	5.5	mg/Kg	☼	06/13/24 07:00	06/24/24 13:35	5
Arsenic	ND		9.8	2.5	mg/Kg	☼	06/13/24 07:00	06/24/24 13:35	5
Barium	**100**		49	2.3	mg/Kg	☼	06/13/24 07:00	06/24/24 13:35	5
Beryllium	**1.2**	**J B**	4.9	0.41	mg/Kg	☼	06/13/24 07:00	06/24/24 13:35	5
Cadmium	ND		4.9	0.21	mg/Kg	☼	06/13/24 07:00	06/24/24 13:35	5
Calcium	**1000**	**J B**	4900	14	mg/Kg	☼	06/13/24 07:00	06/24/24 13:35	5
Chromium	**3.5**	**J**	9.8	1.4	mg/Kg	☼	06/13/24 07:00	06/24/24 13:35	5
Cobalt	ND		49	0.78	mg/Kg	☼	06/13/24 07:00	06/24/24 13:35	5
Iron	ND		98	57	mg/Kg	☼	06/13/24 07:00	06/24/24 13:35	5
Lead	ND		9.8	2.2	mg/Kg	☼	06/13/24 07:00	06/24/24 13:35	5
Lithium	ND		49	2.9	mg/Kg	☼	06/13/24 07:00	06/24/24 13:35	5
Manganese	**200**		15	2.4	mg/Kg	☼	06/13/24 07:00	06/24/24 13:35	5
Molybdenum	ND		39	1.6	mg/Kg	☼	06/13/24 07:00	06/24/24 13:35	5
Selenium	ND		9.8	3.4	mg/Kg	☼	06/13/24 07:00	06/24/24 13:35	5
Thallium	ND		34	4.6	mg/Kg	☼	06/13/24 07:00	06/24/24 13:35	5

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 6

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**6400**		13	2.1	mg/Kg	☼	06/11/24 11:00	06/24/24 14:44	1
Antimony	ND		3.9	0.37	mg/Kg	☼	06/11/24 11:00	06/24/24 14:44	1
Arsenic	**2.0**		0.65	0.20	mg/Kg	☼	06/11/24 11:00	06/24/24 14:44	1
Barium	**86**		3.3	0.16	mg/Kg	☼	06/11/24 11:00	06/24/24 14:44	1
Beryllium	**0.31**	**J B**	0.33	0.016	mg/Kg	☼	06/11/24 11:00	06/24/24 14:44	1

Client Sample ID: MW-196 (10-12)

Date Collected: 05/08/24 10:40
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-5

Matrix: Solid
Percent Solids: 76.7

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 6 (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.33	0.014	mg/Kg	☼	06/11/24 11:00	06/24/24 14:44	1
Calcium	**280**	**J**	330	2.7	mg/Kg	☼	06/11/24 11:00	06/24/24 14:44	1
Chromium	**8.0**		0.65	0.091	mg/Kg	☼	06/11/24 11:00	06/24/24 14:44	1
Cobalt	**2.0**	**J**	3.3	0.060	mg/Kg	☼	06/11/24 11:00	06/24/24 14:44	1
Iron	**8900**		6.5	3.8	mg/Kg	☼	06/11/24 11:00	06/24/24 14:44	1
Lead	**2.9**		0.65	0.14	mg/Kg	☼	06/11/24 11:00	06/24/24 14:44	1
Lithium	**4.5**		3.3	0.20	mg/Kg	☼	06/11/24 11:00	06/24/24 14:44	1
Manganese	**120**		0.98	0.33	mg/Kg	☼	06/11/24 11:00	06/24/24 14:44	1
Molybdenum	ND		2.6	0.13	mg/Kg	☼	06/11/24 11:00	06/24/24 14:44	1
Selenium	ND		0.65	0.22	mg/Kg	☼	06/11/24 11:00	06/24/24 14:44	1
Thallium	ND		2.3	0.27	mg/Kg	☼	06/11/24 11:00	06/24/24 14:44	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**31000**		130	21	mg/Kg	☼	06/12/24 07:00	06/25/24 11:50	10
Antimony	ND		3.9	0.18	mg/Kg	☼	06/12/24 07:00	06/25/24 12:46	1
Arsenic	**1.7**		1.3	0.78	mg/Kg	☼	06/12/24 07:00	06/25/24 15:36	2
Barium	**320**		3.3	0.060	mg/Kg	☼	06/12/24 07:00	06/25/24 12:46	1
Beryllium	**0.52**	**B**	0.33	0.021	mg/Kg	☼	06/12/24 07:00	06/25/24 12:46	1
Cadmium	ND		0.33	0.014	mg/Kg	☼	06/12/24 07:00	06/25/24 12:46	1
Calcium	**2000**		330	7.4	mg/Kg	☼	06/12/24 07:00	06/25/24 12:46	1
Chromium	**20**	**B**	0.65	0.091	mg/Kg	☼	06/12/24 07:00	06/25/24 12:46	1
Cobalt	**0.98**	**J**	6.5	0.068	mg/Kg	☼	06/12/24 07:00	06/25/24 15:36	2
Iron	**5400**		6.5	5.3	mg/Kg	☼	06/12/24 07:00	06/25/24 12:46	1
Lead	**3.0**		1.3	0.29	mg/Kg	☼	06/12/24 07:00	06/25/24 15:36	2
Lithium	**10**		3.3	0.20	mg/Kg	☼	06/12/24 07:00	06/25/24 12:46	1
Manganese	**69**		0.98	0.40	mg/Kg	☼	06/12/24 07:00	06/25/24 12:46	1
Molybdenum	**0.24**	**J**	2.6	0.11	mg/Kg	☼	06/12/24 07:00	06/25/24 12:46	1
Selenium	ND		1.3	0.44	mg/Kg	☼	06/12/24 07:00	06/25/24 15:36	2
Thallium	**1.1**	**J**	4.6	0.47	mg/Kg	☼	06/12/24 07:00	06/25/24 15:36	2

Method: SW846 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**40000**		10	1.6	mg/Kg			06/28/24 11:53	1
Antimony	ND		3.0	0.14	mg/Kg			06/28/24 11:53	1
Arsenic	**8.8**		0.50	0.13	mg/Kg			06/28/24 11:53	1
Barium	**620**		2.5	0.12	mg/Kg			06/28/24 11:53	1
Beryllium	**2.8**		0.25	0.0075	mg/Kg			06/28/24 11:53	1
Cadmium	**0.31**		0.25	0.011	mg/Kg			06/28/24 11:53	1
Calcium	**12000**		250	0.74	mg/Kg			06/28/24 11:53	1
Chromium	**36**		0.50	0.070	mg/Kg			06/28/24 11:53	1
Cobalt	**17**		2.5	0.023	mg/Kg			06/28/24 11:53	1
Iron	**21000**		5.0	4.1	mg/Kg			06/28/24 11:53	1
Lead	**23**		0.50	0.11	mg/Kg			06/28/24 11:53	1
Lithium	**18**		2.5	0.15	mg/Kg			06/28/24 11:53	1
Manganese	**2700**		0.75	0.052	mg/Kg			06/28/24 11:53	1
Molybdenum	**1.3**	**J**	2.0	0.082	mg/Kg			06/28/24 11:53	1
Selenium	ND		0.50	0.17	mg/Kg			06/28/24 11:53	1
Thallium	**1.1**	**J**	1.8	0.18	mg/Kg			06/28/24 11:53	1

Client Sample Results

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-196 (10-12)

Date Collected: 05/08/24 10:40
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-5

Matrix: Solid
Percent Solids: 76.7

Method: SW846 6010B - SEP Metals (ICP) - Total

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	42000		130	21	mg/Kg	☼	06/12/24 07:00	06/25/24 17:02	10
Antimony	ND		3.9	0.18	mg/Kg	☼	06/12/24 07:00	06/25/24 18:00	1
Arsenic	11		0.65	0.39	mg/Kg	☼	06/12/24 07:00	06/25/24 18:00	1
Barium	560		3.3	0.060	mg/Kg	☼	06/12/24 07:00	06/25/24 18:00	1
Beryllium	1.3		0.33	0.021	mg/Kg	☼	06/12/24 07:00	06/25/24 18:00	1
Cadmium	0.18	J	0.33	0.014	mg/Kg	☼	06/12/24 07:00	06/25/24 18:00	1
Calcium	16000		3300	74	mg/Kg	☼	06/12/24 07:00	06/25/24 17:02	10
Chromium	38	B	0.65	0.091	mg/Kg	☼	06/12/24 07:00	06/25/24 18:00	1
Cobalt	17		6.5	0.068	mg/Kg	☼	06/12/24 07:00	06/26/24 13:01	2
Iron	21000		6.5	5.3	mg/Kg	☼	06/12/24 07:00	06/25/24 18:00	1
Lead	29		1.3	0.29	mg/Kg	☼	06/12/24 07:00	06/26/24 13:01	2
Lithium	21		3.3	0.20	mg/Kg	☼	06/12/24 07:00	06/25/24 18:00	1
Manganese	2100		2.0	0.81	mg/Kg	☼	06/12/24 07:00	06/26/24 13:01	2
Molybdenum	1.4	J	2.6	0.11	mg/Kg	☼	06/12/24 07:00	06/25/24 18:00	1
Selenium	ND		1.3	0.44	mg/Kg	☼	06/12/24 07:00	06/26/24 13:01	2
Thallium	1.2	J	4.6	0.47	mg/Kg	☼	06/12/24 07:00	06/26/24 13:01	2

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Loss on Ignition (SPCC Loss On Ignit.)	31		0.46	0.46	%			06/23/24 09:10	1

Client Sample Results

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-197 (4-6)

Date Collected: 05/08/24 11:30
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-6

Matrix: Solid
Percent Solids: 85.3

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		47	7.5	mg/Kg	☼	06/04/24 07:00	06/20/24 15:33	4
Antimony	ND		14	1.3	mg/Kg	☼	06/04/24 07:00	06/20/24 15:33	4
Arsenic	ND		2.3	0.61	mg/Kg	☼	06/04/24 07:00	06/20/24 15:33	4
Barium	**0.87**	**J**	12	0.56	mg/Kg	☼	06/04/24 07:00	06/20/24 15:33	4
Beryllium	ND		1.2	0.36	mg/Kg	☼	06/04/24 07:00	06/21/24 12:07	4
Cadmium	ND		1.2	0.075	mg/Kg	☼	06/04/24 07:00	06/20/24 15:33	4
Calcium	**1800**		1200	8.9	mg/Kg	☼	06/04/24 07:00	06/20/24 15:33	4
Chromium	ND		2.3	0.33	mg/Kg	☼	06/04/24 07:00	06/20/24 15:33	4
Cobalt	ND		12	0.21	mg/Kg	☼	06/04/24 07:00	06/20/24 15:33	4
Iron	ND		23	14	mg/Kg	☼	06/04/24 07:00	06/20/24 15:33	4
Lead	ND		2.3	0.52	mg/Kg	☼	06/04/24 07:00	06/20/24 15:33	4
Lithium	ND		12	0.70	mg/Kg	☼	06/04/24 07:00	06/20/24 15:33	4
Manganese	**0.18**	**J**	3.5	0.15	mg/Kg	☼	06/04/24 07:00	06/20/24 15:33	4
Molybdenum	ND		9.4	0.38	mg/Kg	☼	06/04/24 07:00	06/20/24 15:33	4
Selenium	ND		2.3	0.80	mg/Kg	☼	06/04/24 07:00	06/20/24 15:33	4
Thallium	ND		8.2	0.98	mg/Kg	☼	06/04/24 07:00	06/20/24 15:33	4

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 2

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**15**	**J**	35	5.6	mg/Kg	☼	06/05/24 07:00	06/20/24 16:50	3
Antimony	ND		11	0.98	mg/Kg	☼	06/05/24 07:00	06/20/24 16:50	3
Arsenic	ND		1.8	0.46	mg/Kg	☼	06/05/24 07:00	06/20/24 16:50	3
Barium	**4.0**	**J**	8.8	0.42	mg/Kg	☼	06/05/24 07:00	06/20/24 16:50	3
Beryllium	**0.063**	**J B**	0.88	0.056	mg/Kg	☼	06/05/24 07:00	06/21/24 13:17	3
Cadmium	**0.079**	**J**	0.88	0.039	mg/Kg	☼	06/05/24 07:00	06/20/24 16:50	3
Calcium	**25000**		880	7.7	mg/Kg	☼	06/05/24 07:00	06/20/24 16:50	3
Chromium	ND		1.8	0.25	mg/Kg	☼	06/05/24 07:00	06/20/24 16:50	3
Cobalt	**0.22**	**J**	8.8	0.22	mg/Kg	☼	06/05/24 07:00	06/20/24 16:50	3
Iron	ND		18	10	mg/Kg	☼	06/05/24 07:00	06/20/24 16:50	3
Lead	**0.55**	**J**	1.8	0.39	mg/Kg	☼	06/05/24 07:00	06/20/24 16:50	3
Lithium	**0.94**	**J**	8.8	0.53	mg/Kg	☼	06/05/24 07:00	06/20/24 16:50	3
Manganese	**62**		2.6	0.98	mg/Kg	☼	06/05/24 07:00	06/20/24 16:50	3
Molybdenum	ND		7.0	0.29	mg/Kg	☼	06/05/24 07:00	06/20/24 16:50	3
Selenium	ND		1.8	0.60	mg/Kg	☼	06/05/24 07:00	06/20/24 16:50	3
Thallium	ND		6.2	0.74	mg/Kg	☼	06/05/24 07:00	06/20/24 16:50	3

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 3

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**95**		12	2.5	mg/Kg	☼	06/06/24 07:00	06/20/24 18:01	1
Antimony	ND		3.5	0.33	mg/Kg	☼	06/06/24 07:00	06/20/24 18:01	1
Arsenic	**0.40**	**J**	0.59	0.15	mg/Kg	☼	06/06/24 07:00	06/20/24 18:01	1
Barium	**11**		2.9	0.14	mg/Kg	☼	06/06/24 07:00	06/20/24 18:01	1
Beryllium	**0.10**	**J**	0.29	0.018	mg/Kg	☼	06/06/24 07:00	06/21/24 14:28	1
Cadmium	ND		0.29	0.013	mg/Kg	☼	06/06/24 07:00	06/20/24 18:01	1
Calcium	**5.5**	**J**	290	1.8	mg/Kg	☼	06/06/24 07:00	06/20/24 18:01	1
Chromium	**0.27**	**J**	0.59	0.082	mg/Kg	☼	06/06/24 07:00	06/20/24 18:01	1
Cobalt	**5.9**		2.9	0.053	mg/Kg	☼	06/06/24 07:00	06/20/24 18:01	1
Iron	**360**		5.9	3.4	mg/Kg	☼	06/06/24 07:00	06/20/24 18:01	1
Lead	**0.23**	**J**	0.59	0.13	mg/Kg	☼	06/06/24 07:00	06/20/24 18:01	1
Lithium	ND		2.9	0.18	mg/Kg	☼	06/06/24 07:00	06/20/24 18:01	1

Client Sample ID: MW-197 (4-6)

Date Collected: 05/08/24 11:30
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-6

Matrix: Solid
Percent Solids: 85.3

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 3 (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Manganese	**290**	**B**	0.88	0.032	mg/Kg	☼	06/06/24 07:00	06/20/24 18:01	1
Molybdenum	**0.12**	**J**	2.3	0.096	mg/Kg	☼	06/06/24 07:00	06/20/24 18:01	1
Selenium	ND		0.59	0.20	mg/Kg	☼	06/06/24 07:00	06/20/24 18:01	1
Thallium	ND		2.1	0.25	mg/Kg	☼	06/06/24 07:00	06/20/24 18:01	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 4

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**1700**		12	1.9	mg/Kg	☼	06/11/24 07:00	06/24/24 12:29	1
Antimony	ND		3.5	0.53	mg/Kg	☼	06/11/24 07:00	06/24/24 12:29	1
Arsenic	**1.4**		0.59	0.26	mg/Kg	☼	06/11/24 07:00	06/24/24 12:29	1
Barium	**21**		2.9	0.14	mg/Kg	☼	06/11/24 07:00	06/24/24 12:29	1
Beryllium	**0.45**		0.29	0.019	mg/Kg	☼	06/11/24 07:00	06/24/24 12:29	1
Cadmium	ND		0.29	0.013	mg/Kg	☼	06/11/24 07:00	06/24/24 12:29	1
Calcium	**3500**		290	2.6	mg/Kg	☼	06/11/24 07:00	06/24/24 12:29	1
Chromium	**5.5**		0.59	0.082	mg/Kg	☼	06/11/24 07:00	06/24/24 12:29	1
Cobalt	**5.4**		2.9	0.062	mg/Kg	☼	06/11/24 07:00	06/24/24 12:29	1
Iron	**9300**		5.9	3.4	mg/Kg	☼	06/11/24 07:00	06/24/24 12:29	1
Lead	**3.9**		0.59	0.13	mg/Kg	☼	06/11/24 07:00	06/24/24 12:29	1
Lithium	**3.0**		2.9	0.18	mg/Kg	☼	06/11/24 07:00	06/24/24 12:29	1
Manganese	**210**		0.88	0.15	mg/Kg	☼	06/11/24 07:00	06/24/24 12:29	1
Molybdenum	**0.30**	**J**	2.3	0.096	mg/Kg	☼	06/11/24 07:00	06/24/24 12:29	1
Selenium	ND		0.59	0.55	mg/Kg	☼	06/11/24 07:00	06/24/24 12:29	1
Thallium	ND		2.1	0.34	mg/Kg	☼	06/11/24 07:00	06/24/24 12:29	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 5

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**65**	**J**	180	28	mg/Kg	☼	06/13/24 07:00	06/24/24 13:40	5
Antimony	ND		53	4.9	mg/Kg	☼	06/13/24 07:00	06/24/24 13:40	5
Arsenic	ND		8.8	2.2	mg/Kg	☼	06/13/24 07:00	06/24/24 13:40	5
Barium	**52**		44	2.1	mg/Kg	☼	06/13/24 07:00	06/24/24 13:40	5
Beryllium	**1.0**	**J B**	4.4	0.37	mg/Kg	☼	06/13/24 07:00	06/24/24 13:40	5
Cadmium	ND		4.4	0.19	mg/Kg	☼	06/13/24 07:00	06/24/24 13:40	5
Calcium	**4600**	**B**	4400	13	mg/Kg	☼	06/13/24 07:00	06/24/24 13:40	5
Chromium	**5.9**	**J**	8.8	1.2	mg/Kg	☼	06/13/24 07:00	06/24/24 13:40	5
Cobalt	ND		44	0.70	mg/Kg	☼	06/13/24 07:00	06/24/24 13:40	5
Iron	ND		88	52	mg/Kg	☼	06/13/24 07:00	06/24/24 13:40	5
Lead	ND		8.8	1.9	mg/Kg	☼	06/13/24 07:00	06/24/24 13:40	5
Lithium	ND		44	2.6	mg/Kg	☼	06/13/24 07:00	06/24/24 13:40	5
Manganese	**8.8**	**J**	13	2.2	mg/Kg	☼	06/13/24 07:00	06/24/24 13:40	5
Molybdenum	ND		35	1.5	mg/Kg	☼	06/13/24 07:00	06/24/24 13:40	5
Selenium	ND		8.8	3.0	mg/Kg	☼	06/13/24 07:00	06/24/24 13:40	5
Thallium	ND		31	4.1	mg/Kg	☼	06/13/24 07:00	06/24/24 13:40	5

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 6

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**5200**		12	1.9	mg/Kg	☼	06/11/24 11:00	06/24/24 14:49	1
Antimony	ND		3.5	0.33	mg/Kg	☼	06/11/24 11:00	06/24/24 14:49	1
Arsenic	**3.7**		0.59	0.18	mg/Kg	☼	06/11/24 11:00	06/24/24 14:49	1
Barium	**38**		2.9	0.14	mg/Kg	☼	06/11/24 11:00	06/24/24 14:49	1
Beryllium	**0.56**	**B**	0.29	0.014	mg/Kg	☼	06/11/24 11:00	06/24/24 14:49	1

Client Sample ID: MW-197 (4-6)

Date Collected: 05/08/24 11:30
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-6

Matrix: Solid
Percent Solids: 85.3

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 6 (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.29	0.013	mg/Kg	☼	06/11/24 11:00	06/24/24 14:49	1
Calcium	**1000**		290	2.5	mg/Kg	☼	06/11/24 11:00	06/24/24 14:49	1
Chromium	**9.0**		0.59	0.082	mg/Kg	☼	06/11/24 11:00	06/24/24 14:49	1
Cobalt	**4.6**		2.9	0.054	mg/Kg	☼	06/11/24 11:00	06/24/24 14:49	1
Iron	**15000**		5.9	3.4	mg/Kg	☼	06/11/24 11:00	06/24/24 14:49	1
Lead	**3.4**		0.59	0.13	mg/Kg	☼	06/11/24 11:00	06/24/24 14:49	1
Lithium	**3.9**		2.9	0.18	mg/Kg	☼	06/11/24 11:00	06/24/24 14:49	1
Manganese	**100**		0.88	0.29	mg/Kg	☼	06/11/24 11:00	06/24/24 14:49	1
Molybdenum	**0.44**	**J**	2.3	0.12	mg/Kg	☼	06/11/24 11:00	06/24/24 14:49	1
Selenium	ND		0.59	0.20	mg/Kg	☼	06/11/24 11:00	06/24/24 14:49	1
Thallium	ND		2.1	0.25	mg/Kg	☼	06/11/24 11:00	06/24/24 14:49	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**35000**		120	19	mg/Kg	☼	06/12/24 07:00	06/25/24 12:10	10
Antimony	ND		3.5	0.16	mg/Kg	☼	06/12/24 07:00	06/25/24 12:51	1
Arsenic	**2.8**		1.2	0.70	mg/Kg	☼	06/12/24 07:00	06/25/24 15:41	2
Barium	**150**		2.9	0.054	mg/Kg	☼	06/12/24 07:00	06/25/24 12:51	1
Beryllium	**0.76**	**B**	0.29	0.019	mg/Kg	☼	06/12/24 07:00	06/25/24 12:51	1
Cadmium	ND		0.29	0.013	mg/Kg	☼	06/12/24 07:00	06/25/24 12:51	1
Calcium	**700**		290	6.7	mg/Kg	☼	06/12/24 07:00	06/25/24 12:51	1
Chromium	**33**	**B**	0.59	0.082	mg/Kg	☼	06/12/24 07:00	06/25/24 12:51	1
Cobalt	**1.9**	**J**	5.9	0.061	mg/Kg	☼	06/12/24 07:00	06/25/24 15:41	2
Iron	**9400**		5.9	4.8	mg/Kg	☼	06/12/24 07:00	06/25/24 12:51	1
Lead	**2.6**		1.2	0.26	mg/Kg	☼	06/12/24 07:00	06/25/24 15:41	2
Lithium	**14**		2.9	0.18	mg/Kg	☼	06/12/24 07:00	06/25/24 12:51	1
Manganese	**40**		0.88	0.36	mg/Kg	☼	06/12/24 07:00	06/25/24 12:51	1
Molybdenum	**0.22**	**J**	2.3	0.096	mg/Kg	☼	06/12/24 07:00	06/25/24 12:51	1
Selenium	ND		1.2	0.40	mg/Kg	☼	06/12/24 07:00	06/25/24 15:41	2
Thallium	**1.3**	**J**	4.1	0.42	mg/Kg	☼	06/12/24 07:00	06/25/24 15:41	2

Method: SW846 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**42000**		10	1.6	mg/Kg			06/28/24 11:53	1
Antimony	ND		3.0	0.14	mg/Kg			06/28/24 11:53	1
Arsenic	**8.3**		0.50	0.13	mg/Kg			06/28/24 11:53	1
Barium	**280**		2.5	0.12	mg/Kg			06/28/24 11:53	1
Beryllium	**3.0**		0.25	0.0075	mg/Kg			06/28/24 11:53	1
Cadmium	**0.079**	**J**	0.25	0.011	mg/Kg			06/28/24 11:53	1
Calcium	**37000**		250	0.74	mg/Kg			06/28/24 11:53	1
Chromium	**53**		0.50	0.070	mg/Kg			06/28/24 11:53	1
Cobalt	**18**		2.5	0.023	mg/Kg			06/28/24 11:53	1
Iron	**34000**		5.0	4.1	mg/Kg			06/28/24 11:53	1
Lead	**11**		0.50	0.11	mg/Kg			06/28/24 11:53	1
Lithium	**22**		2.5	0.15	mg/Kg			06/28/24 11:53	1
Manganese	**710**		0.75	0.052	mg/Kg			06/28/24 11:53	1
Molybdenum	**1.1**	**J**	2.0	0.082	mg/Kg			06/28/24 11:53	1
Selenium	ND		0.50	0.17	mg/Kg			06/28/24 11:53	1
Thallium	**1.3**	**J**	1.8	0.18	mg/Kg			06/28/24 11:53	1

Client Sample Results

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-197 (4-6)

Date Collected: 05/08/24 11:30
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-6

Matrix: Solid
Percent Solids: 85.3

Method: SW846 6010B - SEP Metals (ICP) - Total

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	27000		120	19	mg/Kg	☼	06/12/24 07:00	06/25/24 17:22	10
Antimony	ND		3.5	0.16	mg/Kg	☼	06/12/24 07:00	06/25/24 18:05	1
Arsenic	12		1.2	0.70	mg/Kg	☼	06/12/24 07:00	06/26/24 13:07	2
Barium	260		2.9	0.054	mg/Kg	☼	06/12/24 07:00	06/25/24 18:05	1
Beryllium	1.6		0.29	0.019	mg/Kg	☼	06/12/24 07:00	06/25/24 18:05	1
Cadmium	ND		0.59	0.026	mg/Kg	☼	06/12/24 07:00	06/26/24 13:07	2
Calcium	78000		2900	67	mg/Kg	☼	06/12/24 07:00	06/25/24 17:22	10
Chromium	48	B	0.59	0.082	mg/Kg	☼	06/12/24 07:00	06/25/24 18:05	1
Cobalt	13		2.9	0.030	mg/Kg	☼	06/12/24 07:00	06/25/24 18:05	1
Iron	31000		12	9.6	mg/Kg	☼	06/12/24 07:00	06/26/24 13:07	2
Lead	10		1.2	0.26	mg/Kg	☼	06/12/24 07:00	06/26/24 13:07	2
Lithium	30		2.9	0.18	mg/Kg	☼	06/12/24 07:00	06/25/24 18:05	1
Manganese	780		0.88	0.36	mg/Kg	☼	06/12/24 07:00	06/25/24 18:05	1
Molybdenum	0.73	J	2.3	0.096	mg/Kg	☼	06/12/24 07:00	06/25/24 18:05	1
Selenium	ND		1.2	0.40	mg/Kg	☼	06/12/24 07:00	06/26/24 13:07	2
Thallium	0.68	J	2.1	0.21	mg/Kg	☼	06/12/24 07:00	06/25/24 18:05	1

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Loss on Ignition (SPCC Loss On Ignit.)	21		0.45	0.45	%			06/23/24 09:10	1

Client Sample Results

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-197 (10-12)

Date Collected: 05/08/24 11:40
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-7

Matrix: Solid
Percent Solids: 83.7

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 1

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		48	7.6	mg/Kg	☼	06/04/24 07:00	06/20/24 15:38	4
Antimony	ND		14	1.3	mg/Kg	☼	06/04/24 07:00	06/20/24 15:38	4
Arsenic	ND		2.4	0.62	mg/Kg	☼	06/04/24 07:00	06/20/24 15:38	4
Barium	**1.1**	**J**	12	0.57	mg/Kg	☼	06/04/24 07:00	06/20/24 15:38	4
Beryllium	ND		1.2	0.37	mg/Kg	☼	06/04/24 07:00	06/21/24 12:12	4
Cadmium	ND		1.2	0.076	mg/Kg	☼	06/04/24 07:00	06/20/24 15:38	4
Calcium	**1400**		1200	9.1	mg/Kg	☼	06/04/24 07:00	06/20/24 15:38	4
Chromium	ND		2.4	0.33	mg/Kg	☼	06/04/24 07:00	06/20/24 15:38	4
Cobalt	ND		12	0.22	mg/Kg	☼	06/04/24 07:00	06/20/24 15:38	4
Iron	ND		24	14	mg/Kg	☼	06/04/24 07:00	06/20/24 15:38	4
Lead	ND		2.4	0.53	mg/Kg	☼	06/04/24 07:00	06/20/24 15:38	4
Lithium	ND		12	0.72	mg/Kg	☼	06/04/24 07:00	06/20/24 15:38	4
Manganese	ND		3.6	0.15	mg/Kg	☼	06/04/24 07:00	06/20/24 15:38	4
Molybdenum	ND		9.6	0.39	mg/Kg	☼	06/04/24 07:00	06/20/24 15:38	4
Selenium	ND		2.4	0.81	mg/Kg	☼	06/04/24 07:00	06/20/24 15:38	4
Thallium	ND		8.4	1.0	mg/Kg	☼	06/04/24 07:00	06/20/24 15:38	4

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 2

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**11**	**J**	36	5.7	mg/Kg	☼	06/05/24 07:00	06/20/24 16:56	3
Antimony	ND		11	1.0	mg/Kg	☼	06/05/24 07:00	06/20/24 16:56	3
Arsenic	ND		1.8	0.47	mg/Kg	☼	06/05/24 07:00	06/20/24 16:56	3
Barium	**2.7**	**J**	9.0	0.43	mg/Kg	☼	06/05/24 07:00	06/20/24 16:56	3
Beryllium	**0.079**	**J B**	0.90	0.057	mg/Kg	☼	06/05/24 07:00	06/21/24 13:23	3
Cadmium	**0.099**	**J**	0.90	0.039	mg/Kg	☼	06/05/24 07:00	06/20/24 16:56	3
Calcium	**16000**		900	7.9	mg/Kg	☼	06/05/24 07:00	06/20/24 16:56	3
Chromium	ND		1.8	0.25	mg/Kg	☼	06/05/24 07:00	06/20/24 16:56	3
Cobalt	ND		9.0	0.23	mg/Kg	☼	06/05/24 07:00	06/20/24 16:56	3
Iron	**13**	**J**	18	10	mg/Kg	☼	06/05/24 07:00	06/20/24 16:56	3
Lead	**0.53**	**J**	1.8	0.39	mg/Kg	☼	06/05/24 07:00	06/20/24 16:56	3
Lithium	**0.65**	**J**	9.0	0.54	mg/Kg	☼	06/05/24 07:00	06/20/24 16:56	3
Manganese	**65**		2.7	1.0	mg/Kg	☼	06/05/24 07:00	06/20/24 16:56	3
Molybdenum	ND		7.2	0.29	mg/Kg	☼	06/05/24 07:00	06/20/24 16:56	3
Selenium	ND		1.8	0.61	mg/Kg	☼	06/05/24 07:00	06/20/24 16:56	3
Thallium	ND		6.3	0.75	mg/Kg	☼	06/05/24 07:00	06/20/24 16:56	3

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 3

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**81**		12	2.5	mg/Kg	☼	06/06/24 07:00	06/20/24 18:06	1
Antimony	ND		3.6	0.33	mg/Kg	☼	06/06/24 07:00	06/20/24 18:06	1
Arsenic	**0.54**	**J**	0.60	0.16	mg/Kg	☼	06/06/24 07:00	06/20/24 18:06	1
Barium	**4.9**		3.0	0.14	mg/Kg	☼	06/06/24 07:00	06/20/24 18:06	1
Beryllium	**0.092**	**J**	0.30	0.018	mg/Kg	☼	06/06/24 07:00	06/21/24 14:33	1
Cadmium	ND		0.30	0.013	mg/Kg	☼	06/06/24 07:00	06/20/24 18:06	1
Calcium	**8.3**	**J**	300	1.8	mg/Kg	☼	06/06/24 07:00	06/20/24 18:06	1
Chromium	**0.27**	**J**	0.60	0.084	mg/Kg	☼	06/06/24 07:00	06/20/24 18:06	1
Cobalt	**1.8**	**J**	3.0	0.054	mg/Kg	☼	06/06/24 07:00	06/20/24 18:06	1
Iron	**500**		6.0	3.5	mg/Kg	☼	06/06/24 07:00	06/20/24 18:06	1
Lead	ND		0.60	0.13	mg/Kg	☼	06/06/24 07:00	06/20/24 18:06	1
Lithium	ND		3.0	0.18	mg/Kg	☼	06/06/24 07:00	06/20/24 18:06	1

Client Sample ID: MW-197 (10-12)

Date Collected: 05/08/24 11:40
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-7

Matrix: Solid
Percent Solids: 83.7

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 3 (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Manganese	190	B	0.90	0.032	mg/Kg	☼	06/06/24 07:00	06/20/24 18:06	1
Molybdenum	0.13	J	2.4	0.098	mg/Kg	☼	06/06/24 07:00	06/20/24 18:06	1
Selenium	ND		0.60	0.20	mg/Kg	☼	06/06/24 07:00	06/20/24 18:06	1
Thallium	ND		2.1	0.25	mg/Kg	☼	06/06/24 07:00	06/20/24 18:06	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 4

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	800		12	1.9	mg/Kg	☼	06/11/24 07:00	06/24/24 12:34	1
Antimony	ND		3.6	0.54	mg/Kg	☼	06/11/24 07:00	06/24/24 12:34	1
Arsenic	1.3		0.60	0.26	mg/Kg	☼	06/11/24 07:00	06/24/24 12:34	1
Barium	54		3.0	0.14	mg/Kg	☼	06/11/24 07:00	06/24/24 12:34	1
Beryllium	0.28	J	0.30	0.019	mg/Kg	☼	06/11/24 07:00	06/24/24 12:34	1
Cadmium	ND		0.30	0.013	mg/Kg	☼	06/11/24 07:00	06/24/24 12:34	1
Calcium	8300		300	2.6	mg/Kg	☼	06/11/24 07:00	06/24/24 12:34	1
Chromium	2.7		0.60	0.084	mg/Kg	☼	06/11/24 07:00	06/24/24 12:34	1
Cobalt	2.9	J	3.0	0.063	mg/Kg	☼	06/11/24 07:00	06/24/24 12:34	1
Iron	7400		6.0	3.5	mg/Kg	☼	06/11/24 07:00	06/24/24 12:34	1
Lead	5.3		0.60	0.13	mg/Kg	☼	06/11/24 07:00	06/24/24 12:34	1
Lithium	1.6	J	3.0	0.18	mg/Kg	☼	06/11/24 07:00	06/24/24 12:34	1
Manganese	400		0.90	0.16	mg/Kg	☼	06/11/24 07:00	06/24/24 12:34	1
Molybdenum	0.31	J	2.4	0.098	mg/Kg	☼	06/11/24 07:00	06/24/24 12:34	1
Selenium	ND		0.60	0.56	mg/Kg	☼	06/11/24 07:00	06/24/24 12:34	1
Thallium	ND		2.1	0.35	mg/Kg	☼	06/11/24 07:00	06/24/24 12:34	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 5

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	160	J	180	28	mg/Kg	☼	06/13/24 07:00	06/24/24 13:45	5
Antimony	ND		54	5.0	mg/Kg	☼	06/13/24 07:00	06/24/24 13:45	5
Arsenic	ND		9.0	2.3	mg/Kg	☼	06/13/24 07:00	06/24/24 13:45	5
Barium	16	J	45	2.2	mg/Kg	☼	06/13/24 07:00	06/24/24 13:45	5
Beryllium	0.97	J B	4.5	0.38	mg/Kg	☼	06/13/24 07:00	06/24/24 13:45	5
Cadmium	ND		4.5	0.19	mg/Kg	☼	06/13/24 07:00	06/24/24 13:45	5
Calcium	7100	B	4500	13	mg/Kg	☼	06/13/24 07:00	06/24/24 13:45	5
Chromium	2.7	J	9.0	1.3	mg/Kg	☼	06/13/24 07:00	06/24/24 13:45	5
Cobalt	ND		45	0.72	mg/Kg	☼	06/13/24 07:00	06/24/24 13:45	5
Iron	ND		90	53	mg/Kg	☼	06/13/24 07:00	06/24/24 13:45	5
Lead	ND		9.0	2.0	mg/Kg	☼	06/13/24 07:00	06/24/24 13:45	5
Lithium	ND		45	2.6	mg/Kg	☼	06/13/24 07:00	06/24/24 13:45	5
Manganese	6.1	J	13	2.2	mg/Kg	☼	06/13/24 07:00	06/24/24 13:45	5
Molybdenum	ND		36	1.5	mg/Kg	☼	06/13/24 07:00	06/24/24 13:45	5
Selenium	ND		9.0	3.1	mg/Kg	☼	06/13/24 07:00	06/24/24 13:45	5
Thallium	ND		31	4.2	mg/Kg	☼	06/13/24 07:00	06/24/24 13:45	5

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 6

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	3900		12	1.9	mg/Kg	☼	06/11/24 11:00	06/24/24 14:55	1
Antimony	ND		3.6	0.33	mg/Kg	☼	06/11/24 11:00	06/24/24 14:55	1
Arsenic	2.7		0.60	0.18	mg/Kg	☼	06/11/24 11:00	06/24/24 14:55	1
Barium	15		3.0	0.14	mg/Kg	☼	06/11/24 11:00	06/24/24 14:55	1
Beryllium	0.23	J B	0.30	0.014	mg/Kg	☼	06/11/24 11:00	06/24/24 14:55	1

Client Sample ID: MW-197 (10-12)

Date Collected: 05/08/24 11:40
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-7

Matrix: Solid
Percent Solids: 83.7

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 6 (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.30	0.013	mg/Kg	☼	06/11/24 11:00	06/24/24 14:55	1
Calcium	**2700**		300	2.5	mg/Kg	☼	06/11/24 11:00	06/24/24 14:55	1
Chromium	**6.4**		0.60	0.084	mg/Kg	☼	06/11/24 11:00	06/24/24 14:55	1
Cobalt	**2.5**	**J**	3.0	0.055	mg/Kg	☼	06/11/24 11:00	06/24/24 14:55	1
Iron	**8800**		6.0	3.5	mg/Kg	☼	06/11/24 11:00	06/24/24 14:55	1
Lead	**2.6**		0.60	0.13	mg/Kg	☼	06/11/24 11:00	06/24/24 14:55	1
Lithium	**4.7**		3.0	0.18	mg/Kg	☼	06/11/24 11:00	06/24/24 14:55	1
Manganese	**120**		0.90	0.30	mg/Kg	☼	06/11/24 11:00	06/24/24 14:55	1
Molybdenum	**0.16**	**J**	2.4	0.12	mg/Kg	☼	06/11/24 11:00	06/24/24 14:55	1
Selenium	ND		0.60	0.20	mg/Kg	☼	06/11/24 11:00	06/24/24 14:55	1
Thallium	ND		2.1	0.25	mg/Kg	☼	06/11/24 11:00	06/24/24 14:55	1

Method: SW846 6010B SEP - SEP Metals (ICP) - Step 7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**32000**		120	19	mg/Kg	☼	06/12/24 07:00	06/25/24 12:15	10
Antimony	ND		3.6	0.17	mg/Kg	☼	06/12/24 07:00	06/25/24 13:21	1
Arsenic	**1.9**		1.2	0.72	mg/Kg	☼	06/12/24 07:00	06/25/24 15:46	2
Barium	**250**		3.0	0.055	mg/Kg	☼	06/12/24 07:00	06/25/24 13:21	1
Beryllium	**0.44**	**B**	0.30	0.019	mg/Kg	☼	06/12/24 07:00	06/25/24 15:05	1
Cadmium	ND		0.30	0.013	mg/Kg	☼	06/12/24 07:00	06/25/24 13:21	1
Calcium	**1900**		300	6.8	mg/Kg	☼	06/12/24 07:00	06/25/24 13:21	1
Chromium	**16**	**B**	0.60	0.084	mg/Kg	☼	06/12/24 07:00	06/25/24 13:21	1
Cobalt	**0.83**	**J**	6.0	0.062	mg/Kg	☼	06/12/24 07:00	06/25/24 15:46	2
Iron	**4200**		6.0	4.9	mg/Kg	☼	06/12/24 07:00	06/25/24 13:21	1
Lead	**3.3**		1.2	0.26	mg/Kg	☼	06/12/24 07:00	06/25/24 15:46	2
Lithium	**8.9**		3.0	0.18	mg/Kg	☼	06/12/24 07:00	06/25/24 13:21	1
Manganese	**45**		0.90	0.37	mg/Kg	☼	06/12/24 07:00	06/25/24 13:21	1
Molybdenum	**0.10**	**J**	2.4	0.098	mg/Kg	☼	06/12/24 07:00	06/25/24 13:21	1
Selenium	ND		1.2	0.41	mg/Kg	☼	06/12/24 07:00	06/25/24 15:46	2
Thallium	**1.0**	**J**	4.2	0.43	mg/Kg	☼	06/12/24 07:00	06/25/24 15:46	2

Method: SW846 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	**37000**		10	1.6	mg/Kg			06/28/24 11:53	1
Antimony	ND		3.0	0.14	mg/Kg			06/28/24 11:53	1
Arsenic	**6.5**		0.50	0.13	mg/Kg			06/28/24 11:53	1
Barium	**350**		2.5	0.12	mg/Kg			06/28/24 11:53	1
Beryllium	**2.1**		0.25	0.0075	mg/Kg			06/28/24 11:53	1
Cadmium	**0.099**	**J**	0.25	0.011	mg/Kg			06/28/24 11:53	1
Calcium	**37000**		250	0.74	mg/Kg			06/28/24 11:53	1
Chromium	**28**		0.50	0.070	mg/Kg			06/28/24 11:53	1
Cobalt	**8.1**		2.5	0.023	mg/Kg			06/28/24 11:53	1
Iron	**21000**		5.0	4.1	mg/Kg			06/28/24 11:53	1
Lead	**12**		0.50	0.11	mg/Kg			06/28/24 11:53	1
Lithium	**16**		2.5	0.15	mg/Kg			06/28/24 11:53	1
Manganese	**820**		0.75	0.052	mg/Kg			06/28/24 11:53	1
Molybdenum	**0.71**	**J**	2.0	0.082	mg/Kg			06/28/24 11:53	1
Selenium	ND		0.50	0.17	mg/Kg			06/28/24 11:53	1
Thallium	**1.0**	**J**	1.8	0.18	mg/Kg			06/28/24 11:53	1

Client Sample Results

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-197 (10-12)

Date Collected: 05/08/24 11:40
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-7

Matrix: Solid
Percent Solids: 83.7

Method: SW846 6010B - SEP Metals (ICP) - Total

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	49000		120	19	mg/Kg	☼	06/12/24 07:00	06/25/24 17:27	10
Antimony	ND		3.6	0.17	mg/Kg	☼	06/12/24 07:00	06/25/24 18:25	1
Arsenic	6.8		0.60	0.36	mg/Kg	☼	06/12/24 07:00	06/25/24 18:25	1
Barium	320		3.0	0.055	mg/Kg	☼	06/12/24 07:00	06/25/24 18:25	1
Beryllium	1.1		0.30	0.019	mg/Kg	☼	06/12/24 07:00	06/25/24 18:25	1
Cadmium	ND		0.30	0.013	mg/Kg	☼	06/12/24 07:00	06/25/24 18:25	1
Calcium	34000		3000	68	mg/Kg	☼	06/12/24 07:00	06/25/24 17:27	10
Chromium	33	B	0.60	0.084	mg/Kg	☼	06/12/24 07:00	06/25/24 18:25	1
Cobalt	6.5		6.0	0.062	mg/Kg	☼	06/12/24 07:00	06/26/24 13:12	2
Iron	23000		6.0	4.9	mg/Kg	☼	06/12/24 07:00	06/25/24 18:25	1
Lead	11		1.2	0.26	mg/Kg	☼	06/12/24 07:00	06/26/24 13:12	2
Lithium	25		3.0	0.18	mg/Kg	☼	06/12/24 07:00	06/25/24 18:25	1
Manganese	330		0.90	0.37	mg/Kg	☼	06/12/24 07:00	06/25/24 18:25	1
Molybdenum	0.62	J	2.4	0.098	mg/Kg	☼	06/12/24 07:00	06/25/24 18:25	1
Selenium	ND	L	0.60	0.20	mg/Kg	☼	06/12/24 07:00	06/25/24 18:25	1
Thallium	1.2	J	4.2	0.43	mg/Kg	☼	06/12/24 07:00	06/26/24 13:12	2

General Chemistry

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Loss on Ignition (SPCC Loss On Ignit.)	23		0.42	0.42	%			06/23/24 09:10	1

Default Detection Limits

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Method: 6010B SEP - SEP Metals (ICP) - Step 1

Prep: 3010A

SEP: Exchangeable

Analyte	RL	MDL	Units
Aluminum	10	1.6	mg/Kg
Antimony	3.0	0.28	mg/Kg
Arsenic	0.50	0.13	mg/Kg
Barium	2.5	0.12	mg/Kg
Beryllium	0.25	0.077	mg/Kg
Cadmium	0.25	0.016	mg/Kg
Calcium	250	1.9	mg/Kg
Chromium	0.50	0.070	mg/Kg
Cobalt	2.5	0.045	mg/Kg
Iron	5.0	2.9	mg/Kg
Lead	0.50	0.11	mg/Kg
Lithium	2.5	0.15	mg/Kg
Manganese	0.75	0.031	mg/Kg
Molybdenum	2.0	0.082	mg/Kg
Selenium	0.50	0.17	mg/Kg
Thallium	1.8	0.21	mg/Kg

Method: 6010B SEP - SEP Metals (ICP) - Step 2

Prep: 3010A

SEP: Carbonate

Analyte	RL	MDL	Units
Aluminum	10	1.6	mg/Kg
Antimony	3.0	0.28	mg/Kg
Arsenic	0.50	0.13	mg/Kg
Barium	2.5	0.12	mg/Kg
Beryllium	0.25	0.016	mg/Kg
Cadmium	0.25	0.011	mg/Kg
Calcium	250	2.2	mg/Kg
Chromium	0.50	0.070	mg/Kg
Cobalt	2.5	0.063	mg/Kg
Iron	5.0	2.9	mg/Kg
Lead	0.50	0.11	mg/Kg
Lithium	2.5	0.15	mg/Kg
Manganese	0.75	0.28	mg/Kg
Molybdenum	2.0	0.082	mg/Kg
Selenium	0.50	0.17	mg/Kg
Thallium	1.8	0.21	mg/Kg

Method: 6010B SEP - SEP Metals (ICP) - Step 3

Prep: 3010A

SEP: Non-Crystalline

Analyte	RL	MDL	Units
Aluminum	10	2.1	mg/Kg
Antimony	3.0	0.28	mg/Kg
Arsenic	0.50	0.13	mg/Kg
Barium	2.5	0.12	mg/Kg
Beryllium	0.25	0.015	mg/Kg
Cadmium	0.25	0.011	mg/Kg
Calcium	250	1.5	mg/Kg
Chromium	0.50	0.070	mg/Kg

Method: 6010B SEP - SEP Metals (ICP) - Step 3 (Continued)
Prep: 3010A
SEP: Non-Crystalline

Analyte	RL	MDL	Units
Cobalt	2.5	0.045	mg/Kg
Iron	5.0	2.9	mg/Kg
Lead	0.50	0.11	mg/Kg
Lithium	2.5	0.15	mg/Kg
Manganese	0.75	0.027	mg/Kg
Molybdenum	2.0	0.082	mg/Kg
Selenium	0.50	0.17	mg/Kg
Thallium	1.8	0.21	mg/Kg

Method: 6010B SEP - SEP Metals (ICP) - Step 4
Prep: 3010A
SEP: Metal Hydroxide

Analyte	RL	MDL	Units
Aluminum	10	1.6	mg/Kg
Antimony	3.0	0.45	mg/Kg
Arsenic	0.50	0.22	mg/Kg
Barium	2.5	0.12	mg/Kg
Beryllium	0.25	0.016	mg/Kg
Cadmium	0.25	0.011	mg/Kg
Calcium	250	2.2	mg/Kg
Chromium	0.50	0.070	mg/Kg
Cobalt	2.5	0.053	mg/Kg
Iron	5.0	2.9	mg/Kg
Lead	0.50	0.11	mg/Kg
Lithium	2.5	0.15	mg/Kg
Manganese	0.75	0.13	mg/Kg
Molybdenum	2.0	0.082	mg/Kg
Selenium	0.50	0.47	mg/Kg
Thallium	1.8	0.29	mg/Kg

Method: 6010B SEP - SEP Metals (ICP) - Step 5
Prep: 3010A
SEP: Organic-Bound

Analyte	RL	MDL	Units
Aluminum	30	4.7	mg/Kg
Antimony	9.0	0.84	mg/Kg
Arsenic	1.5	0.38	mg/Kg
Barium	7.5	0.36	mg/Kg
Beryllium	0.75	0.063	mg/Kg
Cadmium	0.75	0.032	mg/Kg
Calcium	750	2.2	mg/Kg
Chromium	1.5	0.21	mg/Kg
Cobalt	7.5	0.12	mg/Kg
Iron	15	8.8	mg/Kg
Lead	1.5	0.33	mg/Kg
Lithium	7.5	0.44	mg/Kg
Manganese	2.3	0.37	mg/Kg
Molybdenum	6.0	0.25	mg/Kg
Selenium	1.5	0.52	mg/Kg
Thallium	5.3	0.70	mg/Kg

Default Detection Limits

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Method: 6010B SEP - SEP Metals (ICP) - Step 6

SEP: Acid/Sulfide

Analyte	RL	MDL	Units
Aluminum	10	1.6	mg/Kg
Antimony	3.0	0.28	mg/Kg
Arsenic	0.50	0.15	mg/Kg
Barium	2.5	0.12	mg/Kg
Beryllium	0.25	0.012	mg/Kg
Cadmium	0.25	0.011	mg/Kg
Calcium	250	2.1	mg/Kg
Chromium	0.50	0.070	mg/Kg
Cobalt	2.5	0.046	mg/Kg
Iron	5.0	2.9	mg/Kg
Lead	0.50	0.11	mg/Kg
Lithium	2.5	0.15	mg/Kg
Manganese	0.75	0.25	mg/Kg
Molybdenum	2.0	0.099	mg/Kg
Selenium	0.50	0.17	mg/Kg
Thallium	1.8	0.21	mg/Kg

Method: 6010B SEP - SEP Metals (ICP) - Step 7

Prep: Residual

Analyte	RL	MDL	Units
Aluminum	10	1.6	mg/Kg
Antimony	3.0	0.14	mg/Kg
Arsenic	0.50	0.30	mg/Kg
Barium	2.5	0.046	mg/Kg
Beryllium	0.25	0.016	mg/Kg
Cadmium	0.25	0.011	mg/Kg
Calcium	250	5.7	mg/Kg
Chromium	0.50	0.070	mg/Kg
Cobalt	2.5	0.026	mg/Kg
Iron	5.0	4.1	mg/Kg
Lead	0.50	0.11	mg/Kg
Lithium	2.5	0.15	mg/Kg
Manganese	0.75	0.31	mg/Kg
Molybdenum	2.0	0.082	mg/Kg
Selenium	0.50	0.17	mg/Kg
Thallium	1.8	0.18	mg/Kg

Method: 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7

Analyte	RL	MDL	Units
Aluminum	10	1.6	mg/Kg
Antimony	3.0	0.14	mg/Kg
Arsenic	0.50	0.13	mg/Kg
Barium	2.5	0.12	mg/Kg
Beryllium	0.25	0.0075	mg/Kg
Cadmium	0.25	0.011	mg/Kg
Calcium	250	0.74	mg/Kg
Chromium	0.50	0.070	mg/Kg
Cobalt	2.5	0.023	mg/Kg
Iron	5.0	4.1	mg/Kg
Lead	0.50	0.11	mg/Kg
Lithium	2.5	0.15	mg/Kg

Default Detection Limits

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Method: 6010B SEP - SEP Metals (ICP) - Sum of Steps 1-7 (Continued)

Analyte	RL	MDL	Units
Manganese	0.75	0.052	mg/Kg
Molybdenum	2.0	0.082	mg/Kg
Selenium	0.50	0.17	mg/Kg
Thallium	1.8	0.18	mg/Kg

Method: 6010B - SEP Metals (ICP) - Total

Prep: Total

Analyte	RL	MDL	Units
Aluminum	10	1.6	mg/Kg
Antimony	3.0	0.14	mg/Kg
Arsenic	0.50	0.30	mg/Kg
Barium	2.5	0.046	mg/Kg
Beryllium	0.25	0.016	mg/Kg
Cadmium	0.25	0.011	mg/Kg
Calcium	250	5.7	mg/Kg
Chromium	0.50	0.070	mg/Kg
Cobalt	2.5	0.026	mg/Kg
Iron	5.0	4.1	mg/Kg
Lead	0.50	0.11	mg/Kg
Lithium	2.5	0.15	mg/Kg
Manganese	0.75	0.31	mg/Kg
Molybdenum	2.0	0.082	mg/Kg
Selenium	0.50	0.17	mg/Kg
Thallium	1.8	0.18	mg/Kg

General Chemistry

Analyte	RL	RL	Units
Loss on Ignition	0.50	0.50	%

Method: 6010B - SEP Metals (ICP) - Total

Lab Sample ID: MB 140-87191/9-A
Matrix: Solid
Analysis Batch: 88099

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 87191

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		10	1.6	mg/Kg		06/12/24 07:00	06/25/24 16:23	1
Antimony	ND		3.0	0.14	mg/Kg		06/12/24 07:00	06/25/24 16:23	1
Arsenic	ND		0.50	0.30	mg/Kg		06/12/24 07:00	06/25/24 16:23	1
Barium	ND		2.5	0.046	mg/Kg		06/12/24 07:00	06/25/24 16:23	1
Beryllium	ND		0.25	0.016	mg/Kg		06/12/24 07:00	06/25/24 16:23	1
Cadmium	ND		0.25	0.011	mg/Kg		06/12/24 07:00	06/25/24 16:23	1
Calcium	ND		250	5.7	mg/Kg		06/12/24 07:00	06/25/24 16:23	1
Chromium	0.0895	J	0.50	0.070	mg/Kg		06/12/24 07:00	06/25/24 16:23	1
Cobalt	ND		2.5	0.026	mg/Kg		06/12/24 07:00	06/25/24 16:23	1
Iron	ND		5.0	4.1	mg/Kg		06/12/24 07:00	06/25/24 16:23	1
Lead	ND		0.50	0.11	mg/Kg		06/12/24 07:00	06/25/24 16:23	1
Lithium	ND		2.5	0.15	mg/Kg		06/12/24 07:00	06/25/24 16:23	1
Manganese	ND		0.75	0.31	mg/Kg		06/12/24 07:00	06/25/24 16:23	1
Molybdenum	ND		2.0	0.082	mg/Kg		06/12/24 07:00	06/25/24 16:23	1
Selenium	ND		0.50	0.17	mg/Kg		06/12/24 07:00	06/25/24 16:23	1
Thallium	ND		1.8	0.18	mg/Kg		06/12/24 07:00	06/25/24 16:23	1

Lab Sample ID: LCS 140-87191/10-A
Matrix: Solid
Analysis Batch: 88099

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 87191

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Aluminum	100	100		mg/Kg		100	80 - 120
Antimony	25.0	25.3		mg/Kg		101	80 - 125
Arsenic	5.00	5.12		mg/Kg		102	80 - 120
Barium	5.00	5.16		mg/Kg		103	80 - 120
Beryllium	2.50	2.56		mg/Kg		103	80 - 120
Cadmium	2.50	2.61		mg/Kg		104	80 - 125
Calcium	2500	2570		mg/Kg		103	80 - 120
Chromium	10.0	10.8		mg/Kg		108	80 - 120
Cobalt	5.00	5.21		mg/Kg		104	80 - 125
Iron	50.0	53.8		mg/Kg		108	80 - 120
Lead	5.00	5.02		mg/Kg		100	80 - 120
Lithium	5.00	5.14		mg/Kg		103	80 - 120
Manganese	5.00	5.52		mg/Kg		110	80 - 120
Molybdenum	25.0	25.7		mg/Kg		103	80 - 125
Selenium	7.50	7.37		mg/Kg		98	80 - 120
Thallium	20.0	20.9		mg/Kg		104	80 - 120

Lab Sample ID: LCSD 140-87191/11-A
Matrix: Solid
Analysis Batch: 88099

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 87191

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Aluminum	100	101		mg/Kg		101	80 - 120	1	30
Antimony	25.0	25.6		mg/Kg		102	80 - 125	1	30
Arsenic	5.00	5.13		mg/Kg		103	80 - 120	0	30
Barium	5.00	5.19		mg/Kg		104	80 - 120	1	30
Beryllium	2.50	2.55		mg/Kg		102	80 - 120	1	30

Method: 6010B - SEP Metals (ICP) - Total (Continued)

Lab Sample ID: LCSD 140-87191/11-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 88099 — **Prep Batch: 87191**

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Cadmium			2.50	2.62		mg/Kg		105	80 - 125	0	30
Calcium			2500	2570		mg/Kg		103	80 - 120	0	30
Chromium			10.0	10.8		mg/Kg		108	80 - 120	0	30
Cobalt			5.00	5.23		mg/Kg		105	80 - 125	0	30
Iron			50.0	53.8		mg/Kg		108	80 - 120	0	30
Lead			5.00	5.06		mg/Kg		101	80 - 120	1	30
Lithium			5.00	5.23		mg/Kg		105	80 - 120	2	30
Manganese			5.00	5.62		mg/Kg		112	80 - 120	2	30
Molybdenum			25.0	25.8		mg/Kg		103	80 - 125	0	30
Selenium			7.50	7.45		mg/Kg		99	80 - 120	1	30
Thallium			20.0	20.9		mg/Kg		105	80 - 120	0	30

Lab Sample ID: 140-36896-2 DU — **Client Sample ID: MW-195 (35-37)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 88099 — **Prep Batch: 87191**

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Aluminum	58000			55000		mg/Kg	☼			5	30
Calcium	8700			8920		mg/Kg	☼			3	30

Lab Sample ID: 140-36896-2 DU — **Client Sample ID: MW-195 (35-37)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 88099 — **Prep Batch: 87191**

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Antimony	ND			ND		mg/Kg	☼			NC	30
Arsenic	6.8			7.33		mg/Kg	☼			8	30
Barium	430			433		mg/Kg	☼			0.2	30
Beryllium	1.1			1.20		mg/Kg	☼			10	30
Cadmium	0.053	J		ND		mg/Kg	☼			NC	30
Chromium	39	B		42.6		mg/Kg	☼			8	30
Iron	20000			22000		mg/Kg	☼			8	30
Lithium	23			23.0		mg/Kg	☼			0.2	30
Manganese	520			507		mg/Kg	☼			3	30
Molybdenum	0.66	J		0.637	J	mg/Kg	☼			3	30
Selenium	ND			ND		mg/Kg	☼			NC	30

Lab Sample ID: 140-36896-2 DU — **Client Sample ID: MW-195 (35-37)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 88142 — **Prep Batch: 87191**

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Cobalt	8.9			8.35		mg/Kg	☼			6	30
Lead	13			13.0		mg/Kg	☼			0.5	30
Thallium	0.90	J		1.47	J F5	mg/Kg	☼			48	30

Method: 6010B SEP - SEP Metals (ICP)

Lab Sample ID: MB 140-87192/9-B ^4
Matrix: Solid
Analysis Batch: 87914

Client Sample ID: Method Blank
Prep Type: Step 1
Prep Batch: 87264

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		40	6.4	mg/Kg		06/04/24 07:00	06/20/24 14:34	4
Antimony	ND		12	1.1	mg/Kg		06/04/24 07:00	06/20/24 14:34	4
Arsenic	ND		2.0	0.52	mg/Kg		06/04/24 07:00	06/20/24 14:34	4
Barium	ND		10	0.48	mg/Kg		06/04/24 07:00	06/20/24 14:34	4
Beryllium	ND		1.0	0.31	mg/Kg		06/04/24 07:00	06/20/24 14:34	4
Cadmium	ND		1.0	0.064	mg/Kg		06/04/24 07:00	06/20/24 14:34	4
Calcium	ND		1000	7.6	mg/Kg		06/04/24 07:00	06/20/24 14:34	4
Chromium	ND		2.0	0.28	mg/Kg		06/04/24 07:00	06/20/24 14:34	4
Cobalt	ND		10	0.18	mg/Kg		06/04/24 07:00	06/20/24 14:34	4
Iron	ND		20	12	mg/Kg		06/04/24 07:00	06/20/24 14:34	4
Lead	ND		2.0	0.44	mg/Kg		06/04/24 07:00	06/20/24 14:34	4
Lithium	ND		10	0.60	mg/Kg		06/04/24 07:00	06/20/24 14:34	4
Manganese	ND		3.0	0.12	mg/Kg		06/04/24 07:00	06/20/24 14:34	4
Molybdenum	ND		8.0	0.33	mg/Kg		06/04/24 07:00	06/20/24 14:34	4
Selenium	ND		2.0	0.68	mg/Kg		06/04/24 07:00	06/20/24 14:34	4
Thallium	ND		7.0	0.84	mg/Kg		06/04/24 07:00	06/20/24 14:34	4

Lab Sample ID: LCS 140-87192/10-B ^5
Matrix: Solid
Analysis Batch: 87914

Client Sample ID: Lab Control Sample
Prep Type: Step 1
Prep Batch: 87264

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Aluminum	100	97.0		mg/Kg		97	80 - 120
Antimony	25.0	23.2		mg/Kg		93	80 - 120
Arsenic	5.00	4.55		mg/Kg		91	80 - 120
Barium	5.00	4.67	J	mg/Kg		93	80 - 120
Beryllium	2.50	2.37		mg/Kg		95	80 - 120
Cadmium	2.50	2.29		mg/Kg		91	80 - 120
Calcium	2500	2230		mg/Kg		89	80 - 120
Chromium	10.0	9.24		mg/Kg		92	80 - 120
Cobalt	5.00	4.55	J	mg/Kg		91	80 - 120
Iron	50.0	46.3		mg/Kg		93	80 - 120
Lead	5.00	4.81		mg/Kg		96	80 - 120
Lithium	5.00	4.75	J	mg/Kg		95	80 - 120
Manganese	5.00	4.72		mg/Kg		94	80 - 120
Molybdenum	25.0	22.6		mg/Kg		90	80 - 120
Selenium	7.50	6.90		mg/Kg		92	80 - 120
Thallium	20.0	18.3		mg/Kg		92	80 - 120

Lab Sample ID: LCSD 140-87192/11-B ^5
Matrix: Solid
Analysis Batch: 87914

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 1
Prep Batch: 87264

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Aluminum	100	97.5		mg/Kg		97	80 - 120	1	30
Antimony	25.0	23.3		mg/Kg		93	80 - 120	0	30
Arsenic	5.00	4.64		mg/Kg		93	80 - 120	2	30
Barium	5.00	4.75	J	mg/Kg		95	80 - 120	2	30
Beryllium	2.50	2.51		mg/Kg		100	80 - 120	6	30

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: LCSD 140-87192/11-B ^5
Matrix: Solid
Analysis Batch: 87914

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 1
Prep Batch: 87264

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Cadmium	2.50	2.36		mg/Kg		94	80 - 120	3	30
Calcium	2500	2310		mg/Kg		92	80 - 120	3	30
Chromium	10.0	9.63		mg/Kg		96	80 - 120	4	30
Cobalt	5.00	4.66	J	mg/Kg		93	80 - 120	2	30
Iron	50.0	46.7		mg/Kg		93	80 - 120	1	30
Lead	5.00	4.96		mg/Kg		99	80 - 120	3	30
Lithium	5.00	4.69	J	mg/Kg		94	80 - 120	1	30
Manganese	5.00	4.86		mg/Kg		97	80 - 120	3	30
Molybdenum	25.0	23.0		mg/Kg		92	80 - 120	2	30
Selenium	7.50	6.99		mg/Kg		93	80 - 120	1	30
Thallium	20.0	18.6		mg/Kg		93	80 - 120	2	30

Lab Sample ID: 140-36896-2 DU
Matrix: Solid
Analysis Batch: 87914

Client Sample ID: MW-195 (35-37)
Prep Type: Step 1
Prep Batch: 87264

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Aluminum	ND		13.2	J	mg/Kg	☼	NC	30
Antimony	ND		ND		mg/Kg	☼	NC	30
Arsenic	ND		ND		mg/Kg	☼	NC	30
Barium	1.5	J	1.79	J	mg/Kg	☼	19	30
Beryllium	ND		ND		mg/Kg	☼	NC	30
Cadmium	ND		ND		mg/Kg	☼	NC	30
Calcium	2800		2580		mg/Kg	☼	7	30
Chromium	ND		ND		mg/Kg	☼	NC	30
Cobalt	ND		ND		mg/Kg	☼	NC	30
Iron	ND		ND		mg/Kg	☼	NC	30
Lead	ND		ND		mg/Kg	☼	NC	30
Lithium	ND		ND		mg/Kg	☼	NC	30
Manganese	0.39	J	0.404	J	mg/Kg	☼	3	30
Molybdenum	ND		ND		mg/Kg	☼	NC	30
Selenium	ND		ND		mg/Kg	☼	NC	30
Thallium	ND		ND		mg/Kg	☼	NC	30

Lab Sample ID: MB 140-87265/9-B ^3
Matrix: Solid
Analysis Batch: 87914

Client Sample ID: Method Blank
Prep Type: Step 2
Prep Batch: 87312

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		30	4.8	mg/Kg		06/05/24 07:00	06/20/24 15:43	3
Antimony	ND		9.0	0.84	mg/Kg		06/05/24 07:00	06/20/24 15:43	3
Arsenic	ND		1.5	0.39	mg/Kg		06/05/24 07:00	06/20/24 15:43	3
Barium	ND		7.5	0.36	mg/Kg		06/05/24 07:00	06/20/24 15:43	3
Cadmium	ND		0.75	0.033	mg/Kg		06/05/24 07:00	06/20/24 15:43	3
Calcium	ND		750	6.6	mg/Kg		06/05/24 07:00	06/20/24 15:43	3
Chromium	ND		1.5	0.21	mg/Kg		06/05/24 07:00	06/20/24 15:43	3
Cobalt	ND		7.5	0.19	mg/Kg		06/05/24 07:00	06/20/24 15:43	3
Iron	ND		15	8.7	mg/Kg		06/05/24 07:00	06/20/24 15:43	3
Lead	ND		1.5	0.33	mg/Kg		06/05/24 07:00	06/20/24 15:43	3

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: MB 140-87265/9-B ^3
Matrix: Solid
Analysis Batch: 87914

Client Sample ID: Method Blank
Prep Type: Step 2
Prep Batch: 87312

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lithium	ND		7.5	0.45	mg/Kg		06/05/24 07:00	06/20/24 15:43	3
Manganese	ND		2.3	0.84	mg/Kg		06/05/24 07:00	06/20/24 15:43	3
Molybdenum	ND		6.0	0.25	mg/Kg		06/05/24 07:00	06/20/24 15:43	3
Selenium	ND		1.5	0.51	mg/Kg		06/05/24 07:00	06/20/24 15:43	3
Thallium	ND		5.3	0.63	mg/Kg		06/05/24 07:00	06/20/24 15:43	3

Lab Sample ID: MB 140-87265/9-B ^3
Matrix: Solid
Analysis Batch: 87973

Client Sample ID: Method Blank
Prep Type: Step 2
Prep Batch: 87312

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		30	4.8	mg/Kg		06/05/24 07:00	06/21/24 12:17	3
Antimony	ND		9.0	0.84	mg/Kg		06/05/24 07:00	06/21/24 12:17	3
Arsenic	ND		1.5	0.39	mg/Kg		06/05/24 07:00	06/21/24 12:17	3
Barium	ND		7.5	0.36	mg/Kg		06/05/24 07:00	06/21/24 12:17	3
Beryllium	0.0615	J	0.75	0.048	mg/Kg		06/05/24 07:00	06/21/24 12:17	3
Cadmium	ND		0.75	0.033	mg/Kg		06/05/24 07:00	06/21/24 12:17	3
Calcium	ND		750	6.6	mg/Kg		06/05/24 07:00	06/21/24 12:17	3
Chromium	ND		1.5	0.21	mg/Kg		06/05/24 07:00	06/21/24 12:17	3
Cobalt	ND		7.5	0.19	mg/Kg		06/05/24 07:00	06/21/24 12:17	3
Iron	ND		15	8.7	mg/Kg		06/05/24 07:00	06/21/24 12:17	3
Lead	ND		1.5	0.33	mg/Kg		06/05/24 07:00	06/21/24 12:17	3
Lithium	ND		7.5	0.45	mg/Kg		06/05/24 07:00	06/21/24 12:17	3
Manganese	ND		2.3	0.84	mg/Kg		06/05/24 07:00	06/21/24 12:17	3
Molybdenum	ND		6.0	0.25	mg/Kg		06/05/24 07:00	06/21/24 12:17	3
Selenium	0.518	J	1.5	0.51	mg/Kg		06/05/24 07:00	06/21/24 12:17	3
Thallium	ND		5.3	0.63	mg/Kg		06/05/24 07:00	06/21/24 12:17	3

Lab Sample ID: LCS 140-87265/10-B ^5
Matrix: Solid
Analysis Batch: 87914

Client Sample ID: Lab Control Sample
Prep Type: Step 2
Prep Batch: 87312

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Aluminum	100	ND		mg/Kg		3	
Antimony	25.0	19.9		mg/Kg		79	70 - 120
Arsenic	5.00	3.82		mg/Kg		76	60 - 120
Barium	5.00	2.28	J	mg/Kg		46	30 - 60
Cadmium	2.50	2.41		mg/Kg		96	80 - 120
Calcium	2500	706	J	mg/Kg		28	10 - 40
Chromium	10.0	8.62		mg/Kg		86	60 - 120
Cobalt	5.00	4.61	J	mg/Kg		92	80 - 120
Iron	50.0	ND		mg/Kg		3	
Lead	5.00	4.63		mg/Kg		93	70 - 120
Lithium	5.00	4.48	J	mg/Kg		90	80 - 120
Manganese	5.00	4.99		mg/Kg		100	80 - 120
Molybdenum	25.0	19.5		mg/Kg		78	70 - 120
Selenium	7.50	6.09		mg/Kg		81	70 - 120
Thallium	20.0	18.9		mg/Kg		94	80 - 120

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: LCS 140-87265/10-B ^5
Matrix: Solid
Analysis Batch: 87973

Client Sample ID: Lab Control Sample
Prep Type: Step 2
Prep Batch: 87312

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Aluminum	100	ND		mg/Kg		-3	
Antimony	25.0	20.3		mg/Kg		81	70 - 120
Arsenic	5.00	3.70		mg/Kg		74	60 - 120
Barium	5.00	2.21	J	mg/Kg		44	30 - 60
Beryllium	2.50	1.39		mg/Kg		56	40 - 70
Cadmium	2.50	2.40		mg/Kg		96	80 - 120
Calcium	2500	696	J	mg/Kg		28	10 - 40
Chromium	10.0	8.38		mg/Kg		84	60 - 120
Cobalt	5.00	4.69	J	mg/Kg		94	80 - 120
Iron	50.0	ND		mg/Kg		3	
Lead	5.00	4.62		mg/Kg		92	70 - 120
Lithium	5.00	4.30	J	mg/Kg		86	80 - 120
Manganese	5.00	4.92		mg/Kg		98	80 - 120
Molybdenum	25.0	19.9		mg/Kg		80	70 - 120
Selenium	7.50	6.66		mg/Kg		89	70 - 120
Thallium	20.0	18.9		mg/Kg		95	80 - 120

Lab Sample ID: LCSD 140-87265/11-B ^5
Matrix: Solid
Analysis Batch: 87914

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 2
Prep Batch: 87312

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Aluminum	100	ND		mg/Kg		5		50	
Antimony	25.0	18.6		mg/Kg		74	70 - 120	7	30
Arsenic	5.00	3.72		mg/Kg		74	60 - 120	3	30
Barium	5.00	2.31	J	mg/Kg		46	30 - 60	1	30
Cadmium	2.50	2.36		mg/Kg		94	80 - 120	2	30
Calcium	2500	712	J	mg/Kg		28	10 - 40	1	30
Chromium	10.0	8.70		mg/Kg		87	60 - 120	1	30
Cobalt	5.00	4.57	J	mg/Kg		91	80 - 120	1	30
Iron	50.0	ND		mg/Kg		3		1	
Lead	5.00	4.52		mg/Kg		90	70 - 120	2	30
Lithium	5.00	4.01	J	mg/Kg		80	80 - 120	11	30
Manganese	5.00	4.94		mg/Kg		99	80 - 120	1	30
Molybdenum	25.0	19.0		mg/Kg		76	70 - 120	3	30
Selenium	7.50	6.09		mg/Kg		81	70 - 120	0	30
Thallium	20.0	18.1		mg/Kg		90	80 - 120	4	30

Lab Sample ID: LCSD 140-87265/11-B ^5
Matrix: Solid
Analysis Batch: 87973

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 2
Prep Batch: 87312

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Aluminum	100	ND		mg/Kg		2		1400	
Antimony	25.0	20.1		mg/Kg		80	70 - 120	1	30
Arsenic	5.00	3.39		mg/Kg		68	60 - 120	9	30
Barium	5.00	2.24	J	mg/Kg		45	30 - 60	1	30
Beryllium	2.50	1.36		mg/Kg		54	40 - 70	3	30
Cadmium	2.50	2.35		mg/Kg		94	80 - 120	2	30

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: LCSD 140-87265/11-B ^5 — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Step 2**
Analysis Batch: 87973 — **Prep Batch: 87312**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Calcium	2500	685	J	mg/Kg		27	10 - 40	2	30
Chromium	10.0	8.29		mg/Kg		83	60 - 120	1	30
Cobalt	5.00	4.59	J	mg/Kg		92	80 - 120	2	30
Iron	50.0	ND		mg/Kg		2		14	
Lead	5.00	4.49		mg/Kg		90	70 - 120	3	30
Lithium	5.00	4.25	J	mg/Kg		85	80 - 120	1	30
Manganese	5.00	4.83		mg/Kg		97	80 - 120	2	30
Molybdenum	25.0	19.6		mg/Kg		79	70 - 120	1	30
Selenium	7.50	6.48		mg/Kg		86	70 - 120	3	30
Thallium	20.0	18.4		mg/Kg		92	80 - 120	3	30

Lab Sample ID: 140-36896-2 DU — **Client Sample ID: MW-195 (35-37)**
Matrix: Solid — **Prep Type: Step 2**
Analysis Batch: 87914 — **Prep Batch: 87312**

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Aluminum	21	J	13.5	J	mg/Kg	☼	41	
Antimony	ND		ND		mg/Kg	☼	NC	30
Arsenic	ND		ND		mg/Kg	☼	NC	30
Barium	1.0	J	1.31	J	mg/Kg	☼	24	30
Cadmium	0.040	J	ND		mg/Kg	☼	NC	30
Calcium	760	J	452	J F5	mg/Kg	☼	50	30
Chromium	ND		ND		mg/Kg	☼	NC	30
Cobalt	ND		ND		mg/Kg	☼	NC	30
Iron	ND		ND		mg/Kg	☼	NC	
Lead	ND		ND		mg/Kg	☼	NC	30
Lithium	ND		ND		mg/Kg	☼	NC	30
Manganese	3.2		2.28	J F5	mg/Kg	☼	34	30
Molybdenum	ND		ND		mg/Kg	☼	NC	30
Selenium	ND		ND		mg/Kg	☼	NC	30
Thallium	ND		ND		mg/Kg	☼	NC	30

Lab Sample ID: 140-36896-2 DU — **Client Sample ID: MW-195 (35-37)**
Matrix: Solid — **Prep Type: Step 2**
Analysis Batch: 87973 — **Prep Batch: 87312**

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Beryllium	0.090	J B	0.0813	J	mg/Kg	☼	10	30

Lab Sample ID: MB 140-87328/9-B — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Step 3**
Analysis Batch: 87914 — **Prep Batch: 87354**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		10	2.1	mg/Kg		06/06/24 07:00	06/20/24 17:01	1
Antimony	ND		3.0	0.28	mg/Kg		06/06/24 07:00	06/20/24 17:01	1
Arsenic	ND		0.50	0.13	mg/Kg		06/06/24 07:00	06/20/24 17:01	1
Barium	ND		2.5	0.12	mg/Kg		06/06/24 07:00	06/20/24 17:01	1
Cadmium	ND		0.25	0.011	mg/Kg		06/06/24 07:00	06/20/24 17:01	1

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: MB 140-87328/9-B
Matrix: Solid
Analysis Batch: 87914

Client Sample ID: Method Blank
Prep Type: Step 3
Prep Batch: 87354

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Calcium	ND		250	1.5	mg/Kg		06/06/24 07:00	06/20/24 17:01	1
Chromium	ND		0.50	0.070	mg/Kg		06/06/24 07:00	06/20/24 17:01	1
Cobalt	ND		2.5	0.045	mg/Kg		06/06/24 07:00	06/20/24 17:01	1
Iron	ND		5.0	2.9	mg/Kg		06/06/24 07:00	06/20/24 17:01	1
Lead	ND		0.50	0.11	mg/Kg		06/06/24 07:00	06/20/24 17:01	1
Lithium	ND		2.5	0.15	mg/Kg		06/06/24 07:00	06/20/24 17:01	1
Manganese	0.0865	J	0.75	0.027	mg/Kg		06/06/24 07:00	06/20/24 17:01	1
Molybdenum	ND		2.0	0.082	mg/Kg		06/06/24 07:00	06/20/24 17:01	1
Selenium	ND		0.50	0.17	mg/Kg		06/06/24 07:00	06/20/24 17:01	1
Thallium	ND		1.8	0.21	mg/Kg		06/06/24 07:00	06/20/24 17:01	1

Lab Sample ID: MB 140-87328/9-B
Matrix: Solid
Analysis Batch: 87973

Client Sample ID: Method Blank
Prep Type: Step 3
Prep Batch: 87354

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		10	2.1	mg/Kg		06/06/24 07:00	06/21/24 13:28	1
Antimony	ND		3.0	0.28	mg/Kg		06/06/24 07:00	06/21/24 13:28	1
Arsenic	ND		0.50	0.13	mg/Kg		06/06/24 07:00	06/21/24 13:28	1
Barium	ND		2.5	0.12	mg/Kg		06/06/24 07:00	06/21/24 13:28	1
Beryllium	ND		0.25	0.015	mg/Kg		06/06/24 07:00	06/21/24 13:28	1
Cadmium	ND		0.25	0.011	mg/Kg		06/06/24 07:00	06/21/24 13:28	1
Calcium	ND		250	1.5	mg/Kg		06/06/24 07:00	06/21/24 13:28	1
Chromium	ND		0.50	0.070	mg/Kg		06/06/24 07:00	06/21/24 13:28	1
Cobalt	ND		2.5	0.045	mg/Kg		06/06/24 07:00	06/21/24 13:28	1
Iron	ND		5.0	2.9	mg/Kg		06/06/24 07:00	06/21/24 13:28	1
Lead	ND		0.50	0.11	mg/Kg		06/06/24 07:00	06/21/24 13:28	1
Lithium	ND		2.5	0.15	mg/Kg		06/06/24 07:00	06/21/24 13:28	1
Manganese	0.0895	J	0.75	0.027	mg/Kg		06/06/24 07:00	06/21/24 13:28	1
Molybdenum	ND		2.0	0.082	mg/Kg		06/06/24 07:00	06/21/24 13:28	1
Selenium	ND		0.50	0.17	mg/Kg		06/06/24 07:00	06/21/24 13:28	1
Thallium	ND		1.8	0.21	mg/Kg		06/06/24 07:00	06/21/24 13:28	1

Lab Sample ID: LCS 140-87328/10-B
Matrix: Solid
Analysis Batch: 87914

Client Sample ID: Lab Control Sample
Prep Type: Step 3
Prep Batch: 87354

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Aluminum	100	94.6		mg/Kg		95	80 - 120
Antimony	25.0	23.2		mg/Kg		93	80 - 120
Arsenic	5.00	4.62		mg/Kg		92	80 - 120
Barium	5.00	4.79		mg/Kg		96	70 - 120
Cadmium	2.50	1.36		mg/Kg		54	10 - 120
Calcium	2500	40.6	J	mg/Kg		2	
Chromium	10.0	9.98		mg/Kg		100	80 - 120
Cobalt	5.00	4.83		mg/Kg		97	80 - 120
Iron	50.0	49.0		mg/Kg		98	80 - 120
Lead	5.00	0.174	J	mg/Kg		3	
Lithium	5.00	4.66		mg/Kg		93	80 - 120

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: LCS 140-87328/10-B
Matrix: Solid
Analysis Batch: 87914

Client Sample ID: Lab Control Sample
Prep Type: Step 3
Prep Batch: 87354

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Manganese	5.00	5.00		mg/Kg		100	80 - 120
Molybdenum	25.0	23.2		mg/Kg		93	80 - 120
Selenium	7.50	7.14		mg/Kg		95	80 - 120
Thallium	20.0	19.6		mg/Kg		98	80 - 120

Lab Sample ID: LCS 140-87328/10-B
Matrix: Solid
Analysis Batch: 87973

Client Sample ID: Lab Control Sample
Prep Type: Step 3
Prep Batch: 87354

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Aluminum	100	93.7		mg/Kg		94	80 - 120
Antimony	25.0	23.3		mg/Kg		93	80 - 120
Arsenic	5.00	4.66		mg/Kg		93	80 - 120
Barium	5.00	4.72		mg/Kg		94	70 - 120
Beryllium	2.50	2.51		mg/Kg		100	80 - 120
Cadmium	2.50	1.37		mg/Kg		55	10 - 120
Calcium	2500	41.2	J	mg/Kg		2	
Chromium	10.0	10.1		mg/Kg		101	80 - 120
Cobalt	5.00	4.88		mg/Kg		98	80 - 120
Iron	50.0	49.2		mg/Kg		98	80 - 120
Lead	5.00	0.176	J	mg/Kg		4	
Lithium	5.00	4.56		mg/Kg		91	80 - 120
Manganese	5.00	5.06		mg/Kg		101	80 - 120
Molybdenum	25.0	23.3		mg/Kg		93	80 - 120
Selenium	7.50	7.19		mg/Kg		96	80 - 120
Thallium	20.0	19.9		mg/Kg		99	80 - 120

Lab Sample ID: LCSD 140-87328/11-B
Matrix: Solid
Analysis Batch: 87914

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 3
Prep Batch: 87354

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Aluminum	100	93.8		mg/Kg		94	80 - 120	1	30
Antimony	25.0	23.1		mg/Kg		93	80 - 120	0	30
Arsenic	5.00	4.59		mg/Kg		92	80 - 120	1	30
Barium	5.00	4.76		mg/Kg		95	70 - 120	1	30
Cadmium	2.50	1.36		mg/Kg		54	10 - 120	0	30
Calcium	2500	40.1	J	mg/Kg		2		1	
Chromium	10.0	9.82		mg/Kg		98	80 - 120	2	30
Cobalt	5.00	4.81		mg/Kg		96	80 - 120	1	30
Iron	50.0	48.4		mg/Kg		97	80 - 120	1	30
Lead	5.00	0.123	J	mg/Kg		2		34	
Lithium	5.00	4.67		mg/Kg		93	80 - 120	0	30
Manganese	5.00	4.98		mg/Kg		100	80 - 120	0	30
Molybdenum	25.0	23.0		mg/Kg		92	80 - 120	1	30
Selenium	7.50	7.01		mg/Kg		93	80 - 120	2	30
Thallium	20.0	19.5		mg/Kg		98	80 - 120	0	30

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: LCSD 140-87328/11-B
Matrix: Solid
Analysis Batch: 87973

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 3
Prep Batch: 87354

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Aluminum			100	96.0		mg/Kg		96	80 - 120	2	30
Antimony			25.0	22.8		mg/Kg		91	80 - 120	2	30
Arsenic			5.00	4.59		mg/Kg		92	80 - 120	1	30
Barium			5.00	4.71		mg/Kg		94	70 - 120	0	30
Beryllium			2.50	2.65		mg/Kg		106	80 - 120	5	30
Cadmium			2.50	1.41		mg/Kg		56	10 - 120	3	30
Calcium			2500	42.8	J	mg/Kg		2		4	
Chromium			10.0	10.5		mg/Kg		105	80 - 120	5	30
Cobalt			5.00	4.93		mg/Kg		99	80 - 120	1	30
Iron			50.0	50.5		mg/Kg		101	80 - 120	2	30
Lead			5.00	0.179	J	mg/Kg		4		1	
Lithium			5.00	4.46		mg/Kg		89	80 - 120	2	30
Manganese			5.00	5.29		mg/Kg		106	80 - 120	4	30
Molybdenum			25.0	23.2		mg/Kg		93	80 - 120	1	30
Selenium			7.50	6.91		mg/Kg		92	80 - 120	4	30
Thallium			20.0	20.0		mg/Kg		100	80 - 120	1	30

Lab Sample ID: 140-36896-2 DU
Matrix: Solid
Analysis Batch: 87914

Client Sample ID: MW-195 (35-37)
Prep Type: Step 3
Prep Batch: 87354

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Aluminum	260			249		mg/Kg	☼			4	30
Antimony	ND			ND		mg/Kg	☼			NC	30
Arsenic	0.71			0.619		mg/Kg	☼			14	30
Barium	7.6			6.28		mg/Kg	☼			19	30
Cadmium	0.023	J		0.0156	J F5	mg/Kg	☼			39	30
Calcium	8.8	J		9.84	J	mg/Kg	☼			11	
Chromium	0.42	J		0.337	J	mg/Kg	☼			22	30
Cobalt	4.1			3.31		mg/Kg	☼			22	30
Iron	510			490		mg/Kg	☼			4	30
Lead	0.88			0.842		mg/Kg	☼			4	
Lithium	ND			0.187	J	mg/Kg	☼			NC	30
Manganese	310	B		193	F3	mg/Kg	☼			46	30
Molybdenum	0.18	J		0.123	J F5	mg/Kg	☼			38	30
Selenium	ND			ND		mg/Kg	☼			NC	30
Thallium	ND			ND		mg/Kg	☼			NC	30

Lab Sample ID: 140-36896-2 DU
Matrix: Solid
Analysis Batch: 87973

Client Sample ID: MW-195 (35-37)
Prep Type: Step 3
Prep Batch: 87354

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Beryllium	0.091	J		0.0836	J	mg/Kg	☼			8	30

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: MB 140-87365/9-B — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Step 4**
Analysis Batch: 88045 — **Prep Batch: 87482**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		10	1.6	mg/Kg		06/11/24 07:00	06/24/24 11:30	1
Antimony	ND		3.0	0.45	mg/Kg		06/11/24 07:00	06/24/24 11:30	1
Arsenic	ND		0.50	0.22	mg/Kg		06/11/24 07:00	06/24/24 11:30	1
Barium	ND		2.5	0.12	mg/Kg		06/11/24 07:00	06/24/24 11:30	1
Beryllium	ND		0.25	0.016	mg/Kg		06/11/24 07:00	06/24/24 11:30	1
Cadmium	ND		0.25	0.011	mg/Kg		06/11/24 07:00	06/24/24 11:30	1
Calcium	ND		250	2.2	mg/Kg		06/11/24 07:00	06/24/24 11:30	1
Chromium	ND		0.50	0.070	mg/Kg		06/11/24 07:00	06/24/24 11:30	1
Cobalt	ND		2.5	0.053	mg/Kg		06/11/24 07:00	06/24/24 11:30	1
Iron	ND		5.0	2.9	mg/Kg		06/11/24 07:00	06/24/24 11:30	1
Lead	ND		0.50	0.11	mg/Kg		06/11/24 07:00	06/24/24 11:30	1
Lithium	ND		2.5	0.15	mg/Kg		06/11/24 07:00	06/24/24 11:30	1
Manganese	ND		0.75	0.13	mg/Kg		06/11/24 07:00	06/24/24 11:30	1
Molybdenum	ND		2.0	0.082	mg/Kg		06/11/24 07:00	06/24/24 11:30	1
Selenium	ND		0.50	0.47	mg/Kg		06/11/24 07:00	06/24/24 11:30	1
Thallium	ND		1.8	0.29	mg/Kg		06/11/24 07:00	06/24/24 11:30	1

Lab Sample ID: LCS 140-87365/10-B — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Step 4**
Analysis Batch: 88045 — **Prep Batch: 87482**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Aluminum	100	93.7		mg/Kg		94	80 - 120
Antimony	25.0	23.6		mg/Kg		95	80 - 130
Arsenic	5.00	4.81		mg/Kg		96	80 - 130
Barium	5.00	4.80		mg/Kg		96	80 - 120
Beryllium	2.50	2.53		mg/Kg		101	80 - 120
Cadmium	2.50	2.43		mg/Kg		97	80 - 120
Calcium	2500	2400		mg/Kg		96	80 - 120
Chromium	10.0	9.86		mg/Kg		99	80 - 120
Cobalt	5.00	4.85		mg/Kg		97	80 - 120
Iron	50.0	48.3		mg/Kg		97	80 - 120
Lead	5.00	4.77		mg/Kg		95	80 - 120
Lithium	5.00	4.79		mg/Kg		96	80 - 120
Manganese	5.00	4.99		mg/Kg		100	80 - 120
Molybdenum	25.0	24.4		mg/Kg		97	80 - 120
Selenium	7.50	0.484	J	mg/Kg		6	
Thallium	20.0	18.0		mg/Kg		90	80 - 120

Lab Sample ID: LCSD 140-87365/11-B — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Step 4**
Analysis Batch: 88045 — **Prep Batch: 87482**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Aluminum	100	95.6		mg/Kg		96	80 - 120	2	30
Antimony	25.0	24.1		mg/Kg		97	80 - 130	2	30
Arsenic	5.00	4.91		mg/Kg		98	80 - 130	2	30
Barium	5.00	4.87		mg/Kg		97	80 - 120	2	30
Beryllium	2.50	2.56		mg/Kg		102	80 - 120	1	30

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: LCSD 140-87365/11-B
Matrix: Solid
Analysis Batch: 88045

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 4
Prep Batch: 87482

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Cadmium	2.50	2.46		mg/Kg		99	80 - 120	1	30
Calcium	2500	2430		mg/Kg		97	80 - 120	1	30
Chromium	10.0	10.0		mg/Kg		100	80 - 120	2	30
Cobalt	5.00	4.91		mg/Kg		98	80 - 120	1	30
Iron	50.0	49.0		mg/Kg		98	80 - 120	1	30
Lead	5.00	4.82		mg/Kg		96	80 - 120	1	30
Lithium	5.00	4.87		mg/Kg		97	80 - 120	2	30
Manganese	5.00	5.03		mg/Kg		101	80 - 120	1	30
Molybdenum	25.0	24.9		mg/Kg		100	80 - 120	2	30
Selenium	7.50	0.550		mg/Kg		7		13	
Thallium	20.0	18.4		mg/Kg		92	80 - 120	2	30

Lab Sample ID: 140-36896-2 DU
Matrix: Solid
Analysis Batch: 88045

Client Sample ID: MW-195 (35-37)
Prep Type: Step 4
Prep Batch: 87482

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Aluminum	2400		2440		mg/Kg	☼	3	30
Antimony	ND		ND		mg/Kg	☼	NC	30
Arsenic	2.0		1.85		mg/Kg	☼	7	30
Barium	42		44.7		mg/Kg	☼	6	30
Beryllium	0.36		0.367		mg/Kg	☼	0.9	30
Cadmium	ND		ND		mg/Kg	☼	NC	30
Calcium	1000		672	F3	mg/Kg	☼	43	30
Chromium	7.0		6.41		mg/Kg	☼	9	30
Cobalt	2.4	J	2.47	J	mg/Kg	☼	1	30
Iron	6200		6140		mg/Kg	☼	0.7	30
Lead	6.1		5.62		mg/Kg	☼	9	30
Lithium	3.8		4.22		mg/Kg	☼	9	30
Manganese	180		164		mg/Kg	☼	9	30
Molybdenum	0.28	J	0.266	J	mg/Kg	☼	6	30
Selenium	0.61		ND		mg/Kg	☼	NC	
Thallium	ND		ND		mg/Kg	☼	NC	30

Lab Sample ID: MB 140-87438/9-B ^5
Matrix: Solid
Analysis Batch: 88045

Client Sample ID: Method Blank
Prep Type: Step 5
Prep Batch: 87584

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		150	24	mg/Kg		06/13/24 07:00	06/24/24 12:39	5
Antimony	ND		45	4.2	mg/Kg		06/13/24 07:00	06/24/24 12:39	5
Arsenic	ND		7.5	1.9	mg/Kg		06/13/24 07:00	06/24/24 12:39	5
Barium	ND		38	1.8	mg/Kg		06/13/24 07:00	06/24/24 12:39	5
Beryllium	0.998	J	3.8	0.32	mg/Kg		06/13/24 07:00	06/24/24 12:39	5
Cadmium	ND		3.8	0.16	mg/Kg		06/13/24 07:00	06/24/24 12:39	5
Calcium	13.8	J	3800	11	mg/Kg		06/13/24 07:00	06/24/24 12:39	5
Chromium	ND		7.5	1.1	mg/Kg		06/13/24 07:00	06/24/24 12:39	5
Cobalt	ND		38	0.60	mg/Kg		06/13/24 07:00	06/24/24 12:39	5
Iron	ND		75	44	mg/Kg		06/13/24 07:00	06/24/24 12:39	5

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: MB 140-87438/9-B ^5
Matrix: Solid
Analysis Batch: 88045

Client Sample ID: Method Blank
Prep Type: Step 5
Prep Batch: 87584

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lead	ND		7.5	1.7	mg/Kg		06/13/24 07:00	06/24/24 12:39	5
Lithium	ND		38	2.2	mg/Kg		06/13/24 07:00	06/24/24 12:39	5
Manganese	ND		11	1.9	mg/Kg		06/13/24 07:00	06/24/24 12:39	5
Molybdenum	ND		30	1.3	mg/Kg		06/13/24 07:00	06/24/24 12:39	5
Selenium	ND		7.5	2.6	mg/Kg		06/13/24 07:00	06/24/24 12:39	5
Thallium	ND		26	3.5	mg/Kg		06/13/24 07:00	06/24/24 12:39	5

Lab Sample ID: LCS 140-87438/10-B ^5
Matrix: Solid
Analysis Batch: 88045

Client Sample ID: Lab Control Sample
Prep Type: Step 5
Prep Batch: 87584

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Aluminum	300	ND		mg/Kg		7	
Antimony	75.0	71.0		mg/Kg		95	80 - 120
Arsenic	15.0	10.2		mg/Kg		68	60 - 100
Barium	15.0	8.47	J	mg/Kg		56	40 - 70
Beryllium	7.50	4.23		mg/Kg		56	40 - 70
Cadmium	7.50	7.45		mg/Kg		99	80 - 130
Calcium	7500	2100	J	mg/Kg		28	20 - 50
Chromium	30.0	30.7		mg/Kg		102	80 - 130
Cobalt	15.0	3.94	J	mg/Kg		26	1 - 60
Iron	150	ND		mg/Kg		3	
Lead	15.0	10.3		mg/Kg		69	40 - 80
Lithium	15.0	16.4	J	mg/Kg		109	80 - 150
Manganese	15.0	3.72	J	mg/Kg		25	1 - 60
Molybdenum	75.0	51.8		mg/Kg		69	60 - 100
Selenium	22.5	23.9		mg/Kg		106	80 - 140
Thallium	60.0	12.4	J	mg/Kg		21	

Lab Sample ID: LCSD 140-87438/11-B ^5
Matrix: Solid
Analysis Batch: 88045

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 5
Prep Batch: 87584

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Aluminum	300	ND		mg/Kg		6		20	
Antimony	75.0	71.6		mg/Kg		95	80 - 120	1	30
Arsenic	15.0	9.96		mg/Kg		66	60 - 100	2	30
Barium	15.0	8.42	J	mg/Kg		56	40 - 70	1	30
Beryllium	7.50	4.22		mg/Kg		56	40 - 70	0	30
Cadmium	7.50	7.43		mg/Kg		99	80 - 130	0	30
Calcium	7500	2130	J	mg/Kg		28	20 - 50	1	30
Chromium	30.0	30.8		mg/Kg		103	80 - 130	0	30
Cobalt	15.0	3.99	J	mg/Kg		27	1 - 60	1	30
Iron	150	ND		mg/Kg		3		24	
Lead	15.0	10.3		mg/Kg		69	40 - 80	0	30
Lithium	15.0	15.3	J	mg/Kg		102	80 - 150	7	30
Manganese	15.0	4.85	J	mg/Kg		32	1 - 60	26	30
Molybdenum	75.0	52.7		mg/Kg		70	60 - 100	2	30
Selenium	22.5	22.5		mg/Kg		100	80 - 140	6	30

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: LCSD 140-87438/11-B ^5
Matrix: Solid
Analysis Batch: 88045

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 5
Prep Batch: 87584

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Thallium			60.0	13.4	J	mg/Kg		22		8	

Lab Sample ID: 140-36896-2 DU
Matrix: Solid
Analysis Batch: 88045

Client Sample ID: MW-195 (35-37)
Prep Type: Step 5
Prep Batch: 87584

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Aluminum	28	J		39.0	J	mg/Kg	☼			34	
Antimony	ND			ND		mg/Kg	☼			NC	30
Arsenic	ND			ND		mg/Kg	☼			NC	30
Barium	34	J		33.7	J	mg/Kg	☼			2	30
Beryllium	1.0	J B		1.38	J	mg/Kg	☼			29	30
Cadmium	ND			ND		mg/Kg	☼			NC	30
Calcium	200	J B		147	J F5	mg/Kg	☼			32	30
Chromium	3.6	J		3.93	J	mg/Kg	☼			8	30
Cobalt	ND			ND		mg/Kg	☼			NC	30
Iron	ND			ND		mg/Kg	☼			NC	
Lead	ND			ND		mg/Kg	☼			NC	30
Lithium	ND			ND		mg/Kg	☼			NC	30
Manganese	14			14.4		mg/Kg	☼			4	30
Molybdenum	ND			ND		mg/Kg	☼			NC	30
Selenium	ND			ND		mg/Kg	☼			NC	30
Thallium	ND			ND		mg/Kg	☼			NC	

Lab Sample ID: MB 140-87516/9-A
Matrix: Solid
Analysis Batch: 88045

Client Sample ID: Method Blank
Prep Type: Step 6
Prep Batch: 87516

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		10	1.6	mg/Kg		06/11/24 11:00	06/24/24 13:50	1
Antimony	ND		3.0	0.28	mg/Kg		06/11/24 11:00	06/24/24 13:50	1
Arsenic	ND		0.50	0.15	mg/Kg		06/11/24 11:00	06/24/24 13:50	1
Barium	ND		2.5	0.12	mg/Kg		06/11/24 11:00	06/24/24 13:50	1
Beryllium	0.0445	J	0.25	0.012	mg/Kg		06/11/24 11:00	06/24/24 13:50	1
Cadmium	ND		0.25	0.011	mg/Kg		06/11/24 11:00	06/24/24 13:50	1
Calcium	ND		250	2.1	mg/Kg		06/11/24 11:00	06/24/24 13:50	1
Chromium	ND		0.50	0.070	mg/Kg		06/11/24 11:00	06/24/24 13:50	1
Cobalt	ND		2.5	0.046	mg/Kg		06/11/24 11:00	06/24/24 13:50	1
Iron	ND		5.0	2.9	mg/Kg		06/11/24 11:00	06/24/24 13:50	1
Lead	ND		0.50	0.11	mg/Kg		06/11/24 11:00	06/24/24 13:50	1
Lithium	ND		2.5	0.15	mg/Kg		06/11/24 11:00	06/24/24 13:50	1
Manganese	ND		0.75	0.25	mg/Kg		06/11/24 11:00	06/24/24 13:50	1
Molybdenum	ND		2.0	0.099	mg/Kg		06/11/24 11:00	06/24/24 13:50	1
Selenium	ND		0.50	0.17	mg/Kg		06/11/24 11:00	06/24/24 13:50	1
Thallium	ND		1.8	0.21	mg/Kg		06/11/24 11:00	06/24/24 13:50	1

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: LCS 140-87516/10-A
Matrix: Solid
Analysis Batch: 88045

Client Sample ID: Lab Control Sample
Prep Type: Step 6
Prep Batch: 87516

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Aluminum	100	99.3		mg/Kg		99	80 - 120
Antimony	25.0	25.7		mg/Kg		103	80 - 120
Arsenic	5.00	5.06		mg/Kg		101	80 - 120
Barium	5.00	5.04		mg/Kg		101	80 - 120
Beryllium	2.50	2.70		mg/Kg		108	80 - 120
Cadmium	2.50	2.58		mg/Kg		103	80 - 120
Calcium	2500	2500		mg/Kg		100	80 - 120
Chromium	10.0	10.3		mg/Kg		103	80 - 120
Cobalt	5.00	5.08		mg/Kg		102	80 - 120
Iron	50.0	50.0		mg/Kg		100	80 - 120
Lead	5.00	5.10		mg/Kg		102	80 - 120
Lithium	5.00	4.99		mg/Kg		100	80 - 120
Manganese	5.00	5.19		mg/Kg		104	80 - 120
Molybdenum	25.0	25.2		mg/Kg		101	80 - 120
Selenium	7.50	7.92		mg/Kg		106	80 - 120
Thallium	20.0	21.1		mg/Kg		106	80 - 120

Lab Sample ID: LCSD 140-87516/11-A
Matrix: Solid
Analysis Batch: 88045

Client Sample ID: Lab Control Sample Dup
Prep Type: Step 6
Prep Batch: 87516

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Aluminum	100	98.9		mg/Kg		99	80 - 120	0	30
Antimony	25.0	25.8		mg/Kg		103	80 - 120	0	30
Arsenic	5.00	5.14		mg/Kg		103	80 - 120	2	30
Barium	5.00	4.99		mg/Kg		100	80 - 120	1	30
Beryllium	2.50	2.68		mg/Kg		107	80 - 120	1	30
Cadmium	2.50	2.57		mg/Kg		103	80 - 120	1	30
Calcium	2500	2480		mg/Kg		99	80 - 120	1	30
Chromium	10.0	10.2		mg/Kg		102	80 - 120	1	30
Cobalt	5.00	5.07		mg/Kg		101	80 - 120	0	30
Iron	50.0	52.6		mg/Kg		105	80 - 120	5	30
Lead	5.00	5.10		mg/Kg		102	80 - 120	0	30
Lithium	5.00	4.94		mg/Kg		99	80 - 120	1	30
Manganese	5.00	5.14		mg/Kg		103	80 - 120	1	30
Molybdenum	25.0	25.2		mg/Kg		101	80 - 120	0	30
Selenium	7.50	7.81		mg/Kg		104	80 - 120	1	30
Thallium	20.0	21.0		mg/Kg		105	80 - 120	1	30

Lab Sample ID: 140-36896-2 DU
Matrix: Solid
Analysis Batch: 88045

Client Sample ID: MW-195 (35-37)
Prep Type: Step 6
Prep Batch: 87516

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Aluminum	9000		7750		mg/Kg	☼	14	30
Antimony	ND		ND		mg/Kg	☼	NC	30
Arsenic	2.0		1.82		mg/Kg	☼	8	30
Barium	27		23.7		mg/Kg	☼	11	30
Beryllium	0.34	B	0.314		mg/Kg	☼	9	30

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: 140-36896-2 DU
Matrix: Solid
Analysis Batch: 88045

Client Sample ID: MW-195 (35-37)
Prep Type: Step 6
Prep Batch: 87516

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Cadmium	ND		ND		mg/Kg	☼	NC	30
Calcium	300		330		mg/Kg	☼	8	30
Chromium	12		11.2		mg/Kg	☼	8	30
Cobalt	1.9	J	1.96	J	mg/Kg	☼	4	30
Iron	11000		10300		mg/Kg	☼	6	30
Lead	2.0		1.99		mg/Kg	☼	0.2	30
Lithium	6.5		6.32		mg/Kg	☼	2	30
Manganese	61		62.6		mg/Kg	☼	3	30
Molybdenum	ND		ND		mg/Kg	☼	NC	30
Selenium	ND		ND		mg/Kg	☼	NC	30
Thallium	ND		0.295	J	mg/Kg	☼	NC	30

Lab Sample ID: MB 140-87527/9-A
Matrix: Solid
Analysis Batch: 88099

Client Sample ID: Method Blank
Prep Type: Step 7
Prep Batch: 87527

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	ND		10	1.6	mg/Kg		06/12/24 07:00	06/25/24 11:11	1
Antimony	ND		3.0	0.14	mg/Kg		06/12/24 07:00	06/25/24 11:11	1
Arsenic	ND		0.50	0.30	mg/Kg		06/12/24 07:00	06/25/24 11:11	1
Barium	ND		2.5	0.046	mg/Kg		06/12/24 07:00	06/25/24 11:11	1
Beryllium	0.0190	J	0.25	0.016	mg/Kg		06/12/24 07:00	06/25/24 11:11	1
Cadmium	ND		0.25	0.011	mg/Kg		06/12/24 07:00	06/25/24 11:11	1
Calcium	ND		250	5.7	mg/Kg		06/12/24 07:00	06/25/24 11:11	1
Chromium	0.0900	J	0.50	0.070	mg/Kg		06/12/24 07:00	06/25/24 11:11	1
Cobalt	ND		2.5	0.026	mg/Kg		06/12/24 07:00	06/25/24 11:11	1
Iron	ND		5.0	4.1	mg/Kg		06/12/24 07:00	06/25/24 11:11	1
Lead	ND		0.50	0.11	mg/Kg		06/12/24 07:00	06/25/24 11:11	1
Lithium	ND		2.5	0.15	mg/Kg		06/12/24 07:00	06/25/24 11:11	1
Manganese	ND		0.75	0.31	mg/Kg		06/12/24 07:00	06/25/24 11:11	1
Molybdenum	ND		2.0	0.082	mg/Kg		06/12/24 07:00	06/25/24 11:11	1
Selenium	ND		0.50	0.17	mg/Kg		06/12/24 07:00	06/25/24 11:11	1
Thallium	ND		1.8	0.18	mg/Kg		06/12/24 07:00	06/25/24 11:11	1

Lab Sample ID: LCS 140-87527/10-A
Matrix: Solid
Analysis Batch: 88099

Client Sample ID: Lab Control Sample
Prep Type: Step 7
Prep Batch: 87527

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Aluminum	100	103		mg/Kg		103	80 - 120
Antimony	25.0	25.7		mg/Kg		103	80 - 125
Arsenic	5.00	5.15		mg/Kg		103	80 - 120
Barium	5.00	5.28		mg/Kg		106	80 - 120
Beryllium	2.50	2.70		mg/Kg		108	80 - 120
Cadmium	2.50	2.70		mg/Kg		108	80 - 125
Calcium	2500	2690		mg/Kg		107	80 - 120
Chromium	10.0	11.3		mg/Kg		113	80 - 120
Cobalt	5.00	5.34		mg/Kg		107	80 - 125
Iron	50.0	55.0		mg/Kg		110	80 - 120

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: LCS 140-87527/10-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Step 7**
Analysis Batch: 88099 — **Prep Batch: 87527**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Lead	5.00	5.26		mg/Kg		105	80 - 120
Lithium	5.00	5.05		mg/Kg		101	80 - 120
Manganese	5.00	5.86		mg/Kg		117	80 - 120
Molybdenum	25.0	26.2		mg/Kg		105	80 - 125
Selenium	7.50	7.42		mg/Kg		99	80 - 120
Thallium	20.0	21.4		mg/Kg		107	80 - 120

Lab Sample ID: LCSD 140-87527/11-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Step 7**
Analysis Batch: 88099 — **Prep Batch: 87527**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Aluminum	100	102		mg/Kg		102	80 - 120	0	30
Antimony	25.0	26.1		mg/Kg		104	80 - 125	1	30
Arsenic	5.00	5.19		mg/Kg		104	80 - 120	1	30
Barium	5.00	5.32		mg/Kg		106	80 - 120	1	30
Beryllium	2.50	2.67		mg/Kg		107	80 - 120	1	30
Cadmium	2.50	2.68		mg/Kg		107	80 - 125	1	30
Calcium	2500	2680		mg/Kg		107	80 - 120	0	30
Chromium	10.0	11.2		mg/Kg		112	80 - 120	1	30
Cobalt	5.00	5.33		mg/Kg		107	80 - 125	0	30
Iron	50.0	55.8		mg/Kg		112	80 - 120	2	30
Lead	5.00	5.20		mg/Kg		104	80 - 120	1	30
Lithium	5.00	5.09		mg/Kg		102	80 - 120	1	30
Manganese	5.00	5.79		mg/Kg		116	80 - 120	1	30
Molybdenum	25.0	26.6		mg/Kg		106	80 - 125	1	30
Selenium	7.50	7.45		mg/Kg		99	80 - 120	0	30
Thallium	20.0	21.2		mg/Kg		106	80 - 120	1	30

Lab Sample ID: 140-36896-2 DU — **Client Sample ID: MW-195 (35-37)**
Matrix: Solid — **Prep Type: Step 7**
Analysis Batch: 88099 — **Prep Batch: 87527**

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Aluminum	30000		33500		mg/Kg	☼	10	30

Lab Sample ID: 140-36896-2 DU — **Client Sample ID: MW-195 (35-37)**
Matrix: Solid — **Prep Type: Step 7**
Analysis Batch: 88099 — **Prep Batch: 87527**

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Antimony	ND		ND		mg/Kg	☼	NC	30
Barium	260		265		mg/Kg	☼	2	30
Beryllium	0.46	B	0.456		mg/Kg	☼	0.1	30
Cadmium	ND		ND		mg/Kg	☼	NC	30
Calcium	2000		2310		mg/Kg	☼	13	30
Chromium	20	B	19.2		mg/Kg	☼	2	30
Iron	5300		5360		mg/Kg	☼	1	30
Lithium	11		11.3		mg/Kg	☼	2	30

Method: 6010B SEP - SEP Metals (ICP) (Continued)

Lab Sample ID: 140-36896-2 DU — **Client Sample ID: MW-195 (35-37)**
Matrix: Solid — **Prep Type: Step 7**
Analysis Batch: 88099 — **Prep Batch: 87527**

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Manganese	54			58.6		mg/Kg	☼			8	30
Molybdenum	0.13	J		0.121	J	mg/Kg	☼			8	30

Lab Sample ID: 140-36896-2 DU — **Client Sample ID: MW-195 (35-37)**
Matrix: Solid — **Prep Type: Step 7**
Analysis Batch: 88099 — **Prep Batch: 87527**

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Arsenic	1.6			1.58		mg/Kg	☼			0.07	30
Cobalt	0.76	J		0.858	J	mg/Kg	☼			12	30
Lead	2.7			2.96		mg/Kg	☼			10	30
Selenium	ND			ND		mg/Kg	☼			NC	30
Thallium	1.0	J		1.03	J	mg/Kg	☼			1	30

Method: Loss On Ignit. - Loss On Ignition

Lab Sample ID: MB 140-87996/1 — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 87996

Analyte	MB Result	MB Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Loss on Ignition	ND		0.50	0.50	%			06/23/24 09:10	1

Lab Sample ID: 140-36896-5 DU — **Client Sample ID: MW-196 (10-12)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 87996

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Loss on Ignition	31			27.8		%				10	10

Metals

Prep Batch: 87191

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-1	MW-35DR (15-25)	Total/NA	Solid	Total	
140-36896-2	MW-195 (35-37)	Total/NA	Solid	Total	
140-36896-3	MW-195 (44-46)	Total/NA	Solid	Total	
140-36896-4	MW-196 (6-8)	Total/NA	Solid	Total	
140-36896-5	MW-196 (10-12)	Total/NA	Solid	Total	
140-36896-6	MW-197 (4-6)	Total/NA	Solid	Total	
140-36896-7	MW-197 (10-12)	Total/NA	Solid	Total	
MB 140-87191/9-A	Method Blank	Total/NA	Solid	Total	
LCS 140-87191/10-A	Lab Control Sample	Total/NA	Solid	Total	
LCSD 140-87191/11-A	Lab Control Sample Dup	Total/NA	Solid	Total	
140-36896-2 DU	MW-195 (35-37)	Total/NA	Solid	Total	

SEP Batch: 87192

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-1	MW-35DR (15-25)	Step 1	Solid	Exchangeable	
140-36896-2	MW-195 (35-37)	Step 1	Solid	Exchangeable	
140-36896-3	MW-195 (44-46)	Step 1	Solid	Exchangeable	
140-36896-4	MW-196 (6-8)	Step 1	Solid	Exchangeable	
140-36896-5	MW-196 (10-12)	Step 1	Solid	Exchangeable	
140-36896-6	MW-197 (4-6)	Step 1	Solid	Exchangeable	
140-36896-7	MW-197 (10-12)	Step 1	Solid	Exchangeable	
MB 140-87192/9-B ^4	Method Blank	Step 1	Solid	Exchangeable	
LCS 140-87192/10-B ^5	Lab Control Sample	Step 1	Solid	Exchangeable	
LCSD 140-87192/11-B ^5	Lab Control Sample Dup	Step 1	Solid	Exchangeable	
140-36896-2 DU	MW-195 (35-37)	Step 1	Solid	Exchangeable	

Prep Batch: 87264

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-1	MW-35DR (15-25)	Step 1	Solid	3010A	87192
140-36896-2	MW-195 (35-37)	Step 1	Solid	3010A	87192
140-36896-3	MW-195 (44-46)	Step 1	Solid	3010A	87192
140-36896-4	MW-196 (6-8)	Step 1	Solid	3010A	87192
140-36896-5	MW-196 (10-12)	Step 1	Solid	3010A	87192
140-36896-6	MW-197 (4-6)	Step 1	Solid	3010A	87192
140-36896-7	MW-197 (10-12)	Step 1	Solid	3010A	87192
MB 140-87192/9-B ^4	Method Blank	Step 1	Solid	3010A	87192
LCS 140-87192/10-B ^5	Lab Control Sample	Step 1	Solid	3010A	87192
LCSD 140-87192/11-B ^5	Lab Control Sample Dup	Step 1	Solid	3010A	87192
140-36896-2 DU	MW-195 (35-37)	Step 1	Solid	3010A	87192

SEP Batch: 87265

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-1	MW-35DR (15-25)	Step 2	Solid	Carbonate	
140-36896-2	MW-195 (35-37)	Step 2	Solid	Carbonate	
140-36896-3	MW-195 (44-46)	Step 2	Solid	Carbonate	
140-36896-4	MW-196 (6-8)	Step 2	Solid	Carbonate	
140-36896-5	MW-196 (10-12)	Step 2	Solid	Carbonate	
140-36896-6	MW-197 (4-6)	Step 2	Solid	Carbonate	
140-36896-7	MW-197 (10-12)	Step 2	Solid	Carbonate	
MB 140-87265/9-B ^3	Method Blank	Step 2	Solid	Carbonate	
LCS 140-87265/10-B ^5	Lab Control Sample	Step 2	Solid	Carbonate	

Metals (Continued)

SEP Batch: 87265 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCSD 140-87265/11-B ^5	Lab Control Sample Dup	Step 2	Solid	Carbonate	
140-36896-2 DU	MW-195 (35-37)	Step 2	Solid	Carbonate	

Prep Batch: 87312

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-1	MW-35DR (15-25)	Step 2	Solid	3010A	87265
140-36896-2	MW-195 (35-37)	Step 2	Solid	3010A	87265
140-36896-3	MW-195 (44-46)	Step 2	Solid	3010A	87265
140-36896-4	MW-196 (6-8)	Step 2	Solid	3010A	87265
140-36896-5	MW-196 (10-12)	Step 2	Solid	3010A	87265
140-36896-6	MW-197 (4-6)	Step 2	Solid	3010A	87265
140-36896-7	MW-197 (10-12)	Step 2	Solid	3010A	87265
MB 140-87265/9-B ^3	Method Blank	Step 2	Solid	3010A	87265
LCS 140-87265/10-B ^5	Lab Control Sample	Step 2	Solid	3010A	87265
LCSD 140-87265/11-B ^5	Lab Control Sample Dup	Step 2	Solid	3010A	87265
140-36896-2 DU	MW-195 (35-37)	Step 2	Solid	3010A	87265

SEP Batch: 87328

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-1	MW-35DR (15-25)	Step 3	Solid	Non-Crystalline	
140-36896-2	MW-195 (35-37)	Step 3	Solid	Non-Crystalline	
140-36896-3	MW-195 (44-46)	Step 3	Solid	Non-Crystalline	
140-36896-4	MW-196 (6-8)	Step 3	Solid	Non-Crystalline	
140-36896-5	MW-196 (10-12)	Step 3	Solid	Non-Crystalline	
140-36896-6	MW-197 (4-6)	Step 3	Solid	Non-Crystalline	
140-36896-7	MW-197 (10-12)	Step 3	Solid	Non-Crystalline	
MB 140-87328/9-B	Method Blank	Step 3	Solid	Non-Crystalline	
LCS 140-87328/10-B	Lab Control Sample	Step 3	Solid	Non-Crystalline	
LCSD 140-87328/11-B	Lab Control Sample Dup	Step 3	Solid	Non-Crystalline	
140-36896-2 DU	MW-195 (35-37)	Step 3	Solid	Non-Crystalline	

Prep Batch: 87354

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-1	MW-35DR (15-25)	Step 3	Solid	3010A	87328
140-36896-2	MW-195 (35-37)	Step 3	Solid	3010A	87328
140-36896-3	MW-195 (44-46)	Step 3	Solid	3010A	87328
140-36896-4	MW-196 (6-8)	Step 3	Solid	3010A	87328
140-36896-5	MW-196 (10-12)	Step 3	Solid	3010A	87328
140-36896-6	MW-197 (4-6)	Step 3	Solid	3010A	87328
140-36896-7	MW-197 (10-12)	Step 3	Solid	3010A	87328
MB 140-87328/9-B	Method Blank	Step 3	Solid	3010A	87328
LCS 140-87328/10-B	Lab Control Sample	Step 3	Solid	3010A	87328
LCSD 140-87328/11-B	Lab Control Sample Dup	Step 3	Solid	3010A	87328
140-36896-2 DU	MW-195 (35-37)	Step 3	Solid	3010A	87328

SEP Batch: 87365

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-1	MW-35DR (15-25)	Step 4	Solid	Metal Hydroxide	
140-36896-2	MW-195 (35-37)	Step 4	Solid	Metal Hydroxide	
140-36896-3	MW-195 (44-46)	Step 4	Solid	Metal Hydroxide	
140-36896-4	MW-196 (6-8)	Step 4	Solid	Metal Hydroxide	

Metals (Continued)

SEP Batch: 87365 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-5	MW-196 (10-12)	Step 4	Solid	Metal Hydroxide	
140-36896-6	MW-197 (4-6)	Step 4	Solid	Metal Hydroxide	
140-36896-7	MW-197 (10-12)	Step 4	Solid	Metal Hydroxide	
MB 140-87365/9-B	Method Blank	Step 4	Solid	Metal Hydroxide	
LCS 140-87365/10-B	Lab Control Sample	Step 4	Solid	Metal Hydroxide	
LCSD 140-87365/11-B	Lab Control Sample Dup	Step 4	Solid	Metal Hydroxide	
140-36896-2 DU	MW-195 (35-37)	Step 4	Solid	Metal Hydroxide	

SEP Batch: 87438

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-1	MW-35DR (15-25)	Step 5	Solid	Organic-Bound	
140-36896-2	MW-195 (35-37)	Step 5	Solid	Organic-Bound	
140-36896-3	MW-195 (44-46)	Step 5	Solid	Organic-Bound	
140-36896-4	MW-196 (6-8)	Step 5	Solid	Organic-Bound	
140-36896-5	MW-196 (10-12)	Step 5	Solid	Organic-Bound	
140-36896-6	MW-197 (4-6)	Step 5	Solid	Organic-Bound	
140-36896-7	MW-197 (10-12)	Step 5	Solid	Organic-Bound	
MB 140-87438/9-B ^5	Method Blank	Step 5	Solid	Organic-Bound	
LCS 140-87438/10-B ^5	Lab Control Sample	Step 5	Solid	Organic-Bound	
LCSD 140-87438/11-B ^5	Lab Control Sample Dup	Step 5	Solid	Organic-Bound	
140-36896-2 DU	MW-195 (35-37)	Step 5	Solid	Organic-Bound	

Prep Batch: 87482

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-1	MW-35DR (15-25)	Step 4	Solid	3010A	87365
140-36896-2	MW-195 (35-37)	Step 4	Solid	3010A	87365
140-36896-3	MW-195 (44-46)	Step 4	Solid	3010A	87365
140-36896-4	MW-196 (6-8)	Step 4	Solid	3010A	87365
140-36896-5	MW-196 (10-12)	Step 4	Solid	3010A	87365
140-36896-6	MW-197 (4-6)	Step 4	Solid	3010A	87365
140-36896-7	MW-197 (10-12)	Step 4	Solid	3010A	87365
MB 140-87365/9-B	Method Blank	Step 4	Solid	3010A	87365
LCS 140-87365/10-B	Lab Control Sample	Step 4	Solid	3010A	87365
LCSD 140-87365/11-B	Lab Control Sample Dup	Step 4	Solid	3010A	87365
140-36896-2 DU	MW-195 (35-37)	Step 4	Solid	3010A	87365

SEP Batch: 87516

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-1	MW-35DR (15-25)	Step 6	Solid	Acid/Sulfide	
140-36896-2	MW-195 (35-37)	Step 6	Solid	Acid/Sulfide	
140-36896-3	MW-195 (44-46)	Step 6	Solid	Acid/Sulfide	
140-36896-4	MW-196 (6-8)	Step 6	Solid	Acid/Sulfide	
140-36896-5	MW-196 (10-12)	Step 6	Solid	Acid/Sulfide	
140-36896-6	MW-197 (4-6)	Step 6	Solid	Acid/Sulfide	
140-36896-7	MW-197 (10-12)	Step 6	Solid	Acid/Sulfide	
MB 140-87516/9-A	Method Blank	Step 6	Solid	Acid/Sulfide	
LCS 140-87516/10-A	Lab Control Sample	Step 6	Solid	Acid/Sulfide	
LCSD 140-87516/11-A	Lab Control Sample Dup	Step 6	Solid	Acid/Sulfide	
140-36896-2 DU	MW-195 (35-37)	Step 6	Solid	Acid/Sulfide	

Metals

Prep Batch: 87527

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-1	MW-35DR (15-25)	Step 7	Solid	Residual	
140-36896-2	MW-195 (35-37)	Step 7	Solid	Residual	
140-36896-3	MW-195 (44-46)	Step 7	Solid	Residual	
140-36896-4	MW-196 (6-8)	Step 7	Solid	Residual	
140-36896-5	MW-196 (10-12)	Step 7	Solid	Residual	
140-36896-6	MW-197 (4-6)	Step 7	Solid	Residual	
140-36896-7	MW-197 (10-12)	Step 7	Solid	Residual	
MB 140-87527/9-A	Method Blank	Step 7	Solid	Residual	
LCS 140-87527/10-A	Lab Control Sample	Step 7	Solid	Residual	
LCSD 140-87527/11-A	Lab Control Sample Dup	Step 7	Solid	Residual	
140-36896-2 DU	MW-195 (35-37)	Step 7	Solid	Residual	

Prep Batch: 87584

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-1	MW-35DR (15-25)	Step 5	Solid	3010A	87438
140-36896-2	MW-195 (35-37)	Step 5	Solid	3010A	87438
140-36896-3	MW-195 (44-46)	Step 5	Solid	3010A	87438
140-36896-4	MW-196 (6-8)	Step 5	Solid	3010A	87438
140-36896-5	MW-196 (10-12)	Step 5	Solid	3010A	87438
140-36896-6	MW-197 (4-6)	Step 5	Solid	3010A	87438
140-36896-7	MW-197 (10-12)	Step 5	Solid	3010A	87438
MB 140-87438/9-B ^5	Method Blank	Step 5	Solid	3010A	87438
LCS 140-87438/10-B ^5	Lab Control Sample	Step 5	Solid	3010A	87438
LCSD 140-87438/11-B ^5	Lab Control Sample Dup	Step 5	Solid	3010A	87438
140-36896-2 DU	MW-195 (35-37)	Step 5	Solid	3010A	87438

Analysis Batch: 87914

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-1	MW-35DR (15-25)	Step 1	Solid	6010B SEP	87264
140-36896-1	MW-35DR (15-25)	Step 2	Solid	6010B SEP	87312
140-36896-1	MW-35DR (15-25)	Step 3	Solid	6010B SEP	87354
140-36896-2	MW-195 (35-37)	Step 1	Solid	6010B SEP	87264
140-36896-2	MW-195 (35-37)	Step 2	Solid	6010B SEP	87312
140-36896-2	MW-195 (35-37)	Step 3	Solid	6010B SEP	87354
140-36896-3	MW-195 (44-46)	Step 1	Solid	6010B SEP	87264
140-36896-3	MW-195 (44-46)	Step 2	Solid	6010B SEP	87312
140-36896-3	MW-195 (44-46)	Step 3	Solid	6010B SEP	87354
140-36896-4	MW-196 (6-8)	Step 1	Solid	6010B SEP	87264
140-36896-4	MW-196 (6-8)	Step 2	Solid	6010B SEP	87312
140-36896-4	MW-196 (6-8)	Step 3	Solid	6010B SEP	87354
140-36896-5	MW-196 (10-12)	Step 1	Solid	6010B SEP	87264
140-36896-5	MW-196 (10-12)	Step 2	Solid	6010B SEP	87312
140-36896-5	MW-196 (10-12)	Step 3	Solid	6010B SEP	87354
140-36896-6	MW-197 (4-6)	Step 1	Solid	6010B SEP	87264
140-36896-6	MW-197 (4-6)	Step 2	Solid	6010B SEP	87312
140-36896-6	MW-197 (4-6)	Step 3	Solid	6010B SEP	87354
140-36896-7	MW-197 (10-12)	Step 1	Solid	6010B SEP	87264
140-36896-7	MW-197 (10-12)	Step 2	Solid	6010B SEP	87312
140-36896-7	MW-197 (10-12)	Step 3	Solid	6010B SEP	87354
MB 140-87192/9-B ^4	Method Blank	Step 1	Solid	6010B SEP	87264
MB 140-87265/9-B ^3	Method Blank	Step 2	Solid	6010B SEP	87312

Metals (Continued)

Analysis Batch: 87914 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 140-87328/9-B	Method Blank	Step 3	Solid	6010B SEP	87354
LCS 140-87192/10-B ^5	Lab Control Sample	Step 1	Solid	6010B SEP	87264
LCS 140-87265/10-B ^5	Lab Control Sample	Step 2	Solid	6010B SEP	87312
LCS 140-87328/10-B	Lab Control Sample	Step 3	Solid	6010B SEP	87354
LCSD 140-87192/11-B ^5	Lab Control Sample Dup	Step 1	Solid	6010B SEP	87264
LCSD 140-87265/11-B ^5	Lab Control Sample Dup	Step 2	Solid	6010B SEP	87312
LCSD 140-87328/11-B	Lab Control Sample Dup	Step 3	Solid	6010B SEP	87354
140-36896-2 DU	MW-195 (35-37)	Step 1	Solid	6010B SEP	87264
140-36896-2 DU	MW-195 (35-37)	Step 2	Solid	6010B SEP	87312
140-36896-2 DU	MW-195 (35-37)	Step 3	Solid	6010B SEP	87354

Analysis Batch: 87973

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-1	MW-35DR (15-25)	Step 2	Solid	6010B SEP	87312
140-36896-1	MW-35DR (15-25)	Step 3	Solid	6010B SEP	87354
140-36896-2	MW-195 (35-37)	Step 2	Solid	6010B SEP	87312
140-36896-2	MW-195 (35-37)	Step 3	Solid	6010B SEP	87354
140-36896-3	MW-195 (44-46)	Step 2	Solid	6010B SEP	87312
140-36896-3	MW-195 (44-46)	Step 3	Solid	6010B SEP	87354
140-36896-4	MW-196 (6-8)	Step 2	Solid	6010B SEP	87312
140-36896-4	MW-196 (6-8)	Step 3	Solid	6010B SEP	87354
140-36896-5	MW-196 (10-12)	Step 2	Solid	6010B SEP	87312
140-36896-5	MW-196 (10-12)	Step 3	Solid	6010B SEP	87354
140-36896-6	MW-197 (4-6)	Step 1	Solid	6010B SEP	87264
140-36896-6	MW-197 (4-6)	Step 2	Solid	6010B SEP	87312
140-36896-6	MW-197 (4-6)	Step 3	Solid	6010B SEP	87354
140-36896-7	MW-197 (10-12)	Step 1	Solid	6010B SEP	87264
140-36896-7	MW-197 (10-12)	Step 2	Solid	6010B SEP	87312
140-36896-7	MW-197 (10-12)	Step 3	Solid	6010B SEP	87354
MB 140-87265/9-B ^3	Method Blank	Step 2	Solid	6010B SEP	87312
MB 140-87328/9-B	Method Blank	Step 3	Solid	6010B SEP	87354
LCS 140-87265/10-B ^5	Lab Control Sample	Step 2	Solid	6010B SEP	87312
LCS 140-87328/10-B	Lab Control Sample	Step 3	Solid	6010B SEP	87354
LCSD 140-87265/11-B ^5	Lab Control Sample Dup	Step 2	Solid	6010B SEP	87312
LCSD 140-87328/11-B	Lab Control Sample Dup	Step 3	Solid	6010B SEP	87354
140-36896-2 DU	MW-195 (35-37)	Step 2	Solid	6010B SEP	87312
140-36896-2 DU	MW-195 (35-37)	Step 3	Solid	6010B SEP	87354

Analysis Batch: 88045

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-1	MW-35DR (15-25)	Step 4	Solid	6010B SEP	87482
140-36896-1	MW-35DR (15-25)	Step 5	Solid	6010B SEP	87584
140-36896-1	MW-35DR (15-25)	Step 6	Solid	6010B SEP	87516
140-36896-2	MW-195 (35-37)	Step 4	Solid	6010B SEP	87482
140-36896-2	MW-195 (35-37)	Step 5	Solid	6010B SEP	87584
140-36896-2	MW-195 (35-37)	Step 6	Solid	6010B SEP	87516
140-36896-3	MW-195 (44-46)	Step 4	Solid	6010B SEP	87482
140-36896-3	MW-195 (44-46)	Step 5	Solid	6010B SEP	87584
140-36896-3	MW-195 (44-46)	Step 6	Solid	6010B SEP	87516
140-36896-4	MW-196 (6-8)	Step 4	Solid	6010B SEP	87482
140-36896-4	MW-196 (6-8)	Step 5	Solid	6010B SEP	87584

Metals (Continued)

Analysis Batch: 88045 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-4	MW-196 (6-8)	Step 6	Solid	6010B SEP	87516
140-36896-5	MW-196 (10-12)	Step 4	Solid	6010B SEP	87482
140-36896-5	MW-196 (10-12)	Step 4	Solid	6010B SEP	87482
140-36896-5	MW-196 (10-12)	Step 5	Solid	6010B SEP	87584
140-36896-5	MW-196 (10-12)	Step 6	Solid	6010B SEP	87516
140-36896-6	MW-197 (4-6)	Step 4	Solid	6010B SEP	87482
140-36896-6	MW-197 (4-6)	Step 5	Solid	6010B SEP	87584
140-36896-6	MW-197 (4-6)	Step 6	Solid	6010B SEP	87516
140-36896-7	MW-197 (10-12)	Step 4	Solid	6010B SEP	87482
140-36896-7	MW-197 (10-12)	Step 5	Solid	6010B SEP	87584
140-36896-7	MW-197 (10-12)	Step 6	Solid	6010B SEP	87516
MB 140-87365/9-B	Method Blank	Step 4	Solid	6010B SEP	87482
MB 140-87438/9-B ^5	Method Blank	Step 5	Solid	6010B SEP	87584
MB 140-87516/9-A	Method Blank	Step 6	Solid	6010B SEP	87516
LCS 140-87365/10-B	Lab Control Sample	Step 4	Solid	6010B SEP	87482
LCS 140-87438/10-B ^5	Lab Control Sample	Step 5	Solid	6010B SEP	87584
LCS 140-87516/10-A	Lab Control Sample	Step 6	Solid	6010B SEP	87516
LCSD 140-87365/11-B	Lab Control Sample Dup	Step 4	Solid	6010B SEP	87482
LCSD 140-87438/11-B ^5	Lab Control Sample Dup	Step 5	Solid	6010B SEP	87584
LCSD 140-87516/11-A	Lab Control Sample Dup	Step 6	Solid	6010B SEP	87516
140-36896-2 DU	MW-195 (35-37)	Step 4	Solid	6010B SEP	87482
140-36896-2 DU	MW-195 (35-37)	Step 5	Solid	6010B SEP	87584
140-36896-2 DU	MW-195 (35-37)	Step 6	Solid	6010B SEP	87516

Analysis Batch: 88099

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-1	MW-35DR (15-25)	Step 7	Solid	6010B SEP	87527
140-36896-1	MW-35DR (15-25)	Step 7	Solid	6010B SEP	87527
140-36896-1	MW-35DR (15-25)	Step 7	Solid	6010B SEP	87527
140-36896-1	MW-35DR (15-25)	Total/NA	Solid	6010B	87191
140-36896-1	MW-35DR (15-25)	Total/NA	Solid	6010B	87191
140-36896-2	MW-195 (35-37)	Step 7	Solid	6010B SEP	87527
140-36896-2	MW-195 (35-37)	Step 7	Solid	6010B SEP	87527
140-36896-2	MW-195 (35-37)	Step 7	Solid	6010B SEP	87527
140-36896-2	MW-195 (35-37)	Total/NA	Solid	6010B	87191
140-36896-2	MW-195 (35-37)	Total/NA	Solid	6010B	87191
140-36896-3	MW-195 (44-46)	Step 7	Solid	6010B SEP	87527
140-36896-3	MW-195 (44-46)	Step 7	Solid	6010B SEP	87527
140-36896-3	MW-195 (44-46)	Step 7	Solid	6010B SEP	87527
140-36896-3	MW-195 (44-46)	Total/NA	Solid	6010B	87191
140-36896-3	MW-195 (44-46)	Total/NA	Solid	6010B	87191
140-36896-4	MW-196 (6-8)	Step 7	Solid	6010B SEP	87527
140-36896-4	MW-196 (6-8)	Step 7	Solid	6010B SEP	87527
140-36896-4	MW-196 (6-8)	Step 7	Solid	6010B SEP	87527
140-36896-4	MW-196 (6-8)	Total/NA	Solid	6010B	87191
140-36896-4	MW-196 (6-8)	Total/NA	Solid	6010B	87191
140-36896-5	MW-196 (10-12)	Step 7	Solid	6010B SEP	87527
140-36896-5	MW-196 (10-12)	Step 7	Solid	6010B SEP	87527
140-36896-5	MW-196 (10-12)	Step 7	Solid	6010B SEP	87527
140-36896-5	MW-196 (10-12)	Total/NA	Solid	6010B	87191
140-36896-5	MW-196 (10-12)	Total/NA	Solid	6010B	87191

Metals (Continued)

Analysis Batch: 88099 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-6	MW-197 (4-6)	Step 7	Solid	6010B SEP	87527
140-36896-6	MW-197 (4-6)	Step 7	Solid	6010B SEP	87527
140-36896-6	MW-197 (4-6)	Step 7	Solid	6010B SEP	87527
140-36896-6	MW-197 (4-6)	Total/NA	Solid	6010B	87191
140-36896-6	MW-197 (4-6)	Total/NA	Solid	6010B	87191
140-36896-7	MW-197 (10-12)	Step 7	Solid	6010B SEP	87527
140-36896-7	MW-197 (10-12)	Step 7	Solid	6010B SEP	87527
140-36896-7	MW-197 (10-12)	Step 7	Solid	6010B SEP	87527
140-36896-7	MW-197 (10-12)	Step 7	Solid	6010B SEP	87527
140-36896-7	MW-197 (10-12)	Total/NA	Solid	6010B	87191
140-36896-7	MW-197 (10-12)	Total/NA	Solid	6010B	87191
MB 140-87191/9-A	Method Blank	Total/NA	Solid	6010B	87191
MB 140-87527/9-A	Method Blank	Step 7	Solid	6010B SEP	87527
LCS 140-87191/10-A	Lab Control Sample	Total/NA	Solid	6010B	87191
LCS 140-87527/10-A	Lab Control Sample	Step 7	Solid	6010B SEP	87527
LCSD 140-87191/11-A	Lab Control Sample Dup	Total/NA	Solid	6010B	87191
LCSD 140-87527/11-A	Lab Control Sample Dup	Step 7	Solid	6010B SEP	87527
140-36896-2 DU	MW-195 (35-37)	Step 7	Solid	6010B SEP	87527
140-36896-2 DU	MW-195 (35-37)	Step 7	Solid	6010B SEP	87527
140-36896-2 DU	MW-195 (35-37)	Step 7	Solid	6010B SEP	87527
140-36896-2 DU	MW-195 (35-37)	Total/NA	Solid	6010B	87191
140-36896-2 DU	MW-195 (35-37)	Total/NA	Solid	6010B	87191

Analysis Batch: 88142

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-1	MW-35DR (15-25)	Total/NA	Solid	6010B	87191
140-36896-2	MW-195 (35-37)	Total/NA	Solid	6010B	87191
140-36896-3	MW-195 (44-46)	Total/NA	Solid	6010B	87191
140-36896-4	MW-196 (6-8)	Total/NA	Solid	6010B	87191
140-36896-5	MW-196 (10-12)	Total/NA	Solid	6010B	87191
140-36896-6	MW-197 (4-6)	Total/NA	Solid	6010B	87191
140-36896-7	MW-197 (10-12)	Total/NA	Solid	6010B	87191
140-36896-2 DU	MW-195 (35-37)	Total/NA	Solid	6010B	87191

Analysis Batch: 88228

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-1	MW-35DR (15-25)	Sum of Steps 1-7	Solid	6010B SEP	
140-36896-2	MW-195 (35-37)	Sum of Steps 1-7	Solid	6010B SEP	
140-36896-3	MW-195 (44-46)	Sum of Steps 1-7	Solid	6010B SEP	
140-36896-4	MW-196 (6-8)	Sum of Steps 1-7	Solid	6010B SEP	
140-36896-5	MW-196 (10-12)	Sum of Steps 1-7	Solid	6010B SEP	
140-36896-6	MW-197 (4-6)	Sum of Steps 1-7	Solid	6010B SEP	
140-36896-7	MW-197 (10-12)	Sum of Steps 1-7	Solid	6010B SEP	

General Chemistry

Analysis Batch: 87524

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-1	MW-35DR (15-25)	Total/NA	Solid	Moisture	
140-36896-2	MW-195 (35-37)	Total/NA	Solid	Moisture	
140-36896-3	MW-195 (44-46)	Total/NA	Solid	Moisture	

General Chemistry (Continued)

Analysis Batch: 87524 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-4	MW-196 (6-8)	Total/NA	Solid	Moisture	
140-36896-5	MW-196 (10-12)	Total/NA	Solid	Moisture	
140-36896-6	MW-197 (4-6)	Total/NA	Solid	Moisture	
140-36896-7	MW-197 (10-12)	Total/NA	Solid	Moisture	

Analysis Batch: 87996

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
140-36896-1	MW-35DR (15-25)	Total/NA	Solid	Loss On Ignit.	
140-36896-2	MW-195 (35-37)	Total/NA	Solid	Loss On Ignit.	
140-36896-3	MW-195 (44-46)	Total/NA	Solid	Loss On Ignit.	
140-36896-4	MW-196 (6-8)	Total/NA	Solid	Loss On Ignit.	
140-36896-5	MW-196 (10-12)	Total/NA	Solid	Loss On Ignit.	
140-36896-6	MW-197 (4-6)	Total/NA	Solid	Loss On Ignit.	
140-36896-7	MW-197 (10-12)	Total/NA	Solid	Loss On Ignit.	
MB 140-87996/1	Method Blank	Total/NA	Solid	Loss On Ignit.	
LCS 140-87996/2	Lab Control Sample	Total/NA	Solid	Loss On Ignit.	
LCSD 140-87996/3	Lab Control Sample Dup	Total/NA	Solid	Loss On Ignit.	
140-36896-5 DU	MW-196 (10-12)	Total/NA	Solid	Loss On Ignit.	

Lab Chronicle

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-35DR (15-25)

Lab Sample ID: 140-36896-1
Date Collected: 05/03/24 10:00
Matrix: Solid
Date Received: 05/24/24 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Sum of Steps 1-7	Analysis	6010B SEP		1			88228	06/28/24 11:53	KNC	EET KNX
	Instrument ID:	NOEQUIP								
Total/NA	Analysis	Loss On Ignit.		1	1.6344 g	1 g	87996	06/23/24 09:10	SJF	EET KNX
	Instrument ID:	NOEQUIP								
Total/NA	Analysis	Moisture		1			87524	06/11/24 14:31	JXP	EET KNX
	Instrument ID:	NOEQUIP								

Client Sample ID: MW-35DR (15-25)

Lab Sample ID: 140-36896-1
Date Collected: 05/03/24 10:00
Matrix: Solid
Date Received: 05/24/24 09:30
Percent Solids: 79.6

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		10			88099	06/25/24 16:38	KNC	EET KNX
	Instrument ID:	DUO								
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		1			88099	06/25/24 17:31	KNC	EET KNX
	Instrument ID:	DUO								
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		2			88142	06/26/24 12:35	KNC	EET KNX
	Instrument ID:	DUO								
Step 1	SEP	Exchangeable			5.000 g	25 mL	87192	06/03/24 08:00	JDM	EET KNX
Step 1	Prep	3010A			5 mL	50 mL	87264	06/04/24 07:00	JDM	EET KNX
Step 1	Analysis	6010B SEP		4			87914	06/20/24 14:49	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	87265	06/04/24 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	87312	06/05/24 07:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			87914	06/20/24 15:58	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	87265	06/04/24 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	87312	06/05/24 07:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			87973	06/21/24 12:32	KNC	EET KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	87328	06/05/24 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	87354	06/06/24 07:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			87914	06/20/24 17:15	KNC	EET KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	87328	06/05/24 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	87354	06/06/24 07:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			87973	06/21/24 13:42	KNC	EET KNX
	Instrument ID:	DUO								
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	87365	06/06/24 07:30	JDM	EET KNX
Step 4	Prep	3010A			5 mL	50 mL	87482	06/11/24 07:00	JDM	EET KNX
Step 4	Analysis	6010B SEP		1			88045	06/24/24 11:45	KNC	EET KNX
	Instrument ID:	DUO								

Lab Chronicle

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-35DR (15-25)

Lab Sample ID: 140-36896-1
Date Collected: 05/03/24 10:00
Matrix: Solid
Date Received: 05/24/24 09:30
Percent Solids: 79.6

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 5	SEP	Organic-Bound			5.000 g	75 mL	87438	06/10/24 07:00	JDM	EET KNX
Step 5	Prep	3010A			5 mL	50 mL	87584	06/13/24 07:00	JDM	EET KNX
Step 5	Analysis	6010B SEP		5			88045	06/24/24 12:54	KNC	EET KNX
	Instrument ID:	DUO								
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	87516	06/11/24 11:00	JDM	EET KNX
Step 6	Analysis	6010B SEP		1			88045	06/24/24 14:04	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		10			88099	06/25/24 11:26	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		1			88099	06/25/24 12:20	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		2			88099	06/25/24 15:11	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: MW-195 (35-37)

Lab Sample ID: 140-36896-2
Date Collected: 05/07/24 15:30
Matrix: Solid
Date Received: 05/24/24 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Sum of Steps 1-7	Analysis	6010B SEP		1			88228	06/28/24 11:53	KNC	EET KNX
	Instrument ID:	NOEQUIP								
Total/NA	Analysis	Loss On Ignit.		1	1.1142 g	1 g	87996	06/23/24 09:10	SJF	EET KNX
	Instrument ID:	NOEQUIP								
Total/NA	Analysis	Moisture		1			87524	06/11/24 14:31	JXP	EET KNX
	Instrument ID:	NOEQUIP								

Client Sample ID: MW-195 (35-37)

Lab Sample ID: 140-36896-2
Date Collected: 05/07/24 15:30
Matrix: Solid
Date Received: 05/24/24 09:30
Percent Solids: 86.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		10			88099	06/25/24 16:43	KNC	EET KNX
	Instrument ID:	DUO								
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		1			88099	06/25/24 17:37	KNC	EET KNX
	Instrument ID:	DUO								
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		2			88142	06/26/24 12:40	KNC	EET KNX
	Instrument ID:	DUO								

Lab Chronicle

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-195 (35-37)

Date Collected: 05/07/24 15:30
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-2

Matrix: Solid
Percent Solids: 86.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 1	SEP	Exchangeable			5.000 g	25 mL	87192	06/03/24 08:00	JDM	EET KNX
Step 1	Prep	3010A			5 mL	50 mL	87264	06/04/24 07:00	JDM	EET KNX
Step 1	Analysis	6010B SEP		4			87914	06/20/24 14:54	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	87265	06/04/24 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	87312	06/05/24 07:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			87914	06/20/24 16:03	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	87265	06/04/24 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	87312	06/05/24 07:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			87973	06/21/24 12:37	KNC	EET KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	87328	06/05/24 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	87354	06/06/24 07:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			87914	06/20/24 17:20	KNC	EET KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	87328	06/05/24 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	87354	06/06/24 07:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			87973	06/21/24 13:47	KNC	EET KNX
	Instrument ID:	DUO								
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	87365	06/06/24 07:30	JDM	EET KNX
Step 4	Prep	3010A			5 mL	50 mL	87482	06/11/24 07:00	JDM	EET KNX
Step 4	Analysis	6010B SEP		1			88045	06/24/24 11:50	KNC	EET KNX
	Instrument ID:	DUO								
Step 5	SEP	Organic-Bound			5.000 g	75 mL	87438	06/10/24 07:00	JDM	EET KNX
Step 5	Prep	3010A			5 mL	50 mL	87584	06/13/24 07:00	JDM	EET KNX
Step 5	Analysis	6010B SEP		5			88045	06/24/24 12:59	KNC	EET KNX
	Instrument ID:	DUO								
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	87516	06/11/24 11:00	JDM	EET KNX
Step 6	Analysis	6010B SEP		1			88045	06/24/24 14:09	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		10			88099	06/25/24 11:31	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		1			88099	06/25/24 12:25	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		2			88099	06/25/24 15:16	KNC	EET KNX
	Instrument ID:	DUO								

Lab Chronicle

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-195 (44-46)

Lab Sample ID: 140-36896-3
Date Collected: 05/07/24 15:40
Matrix: Solid
Date Received: 05/24/24 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Sum of Steps 1-7	Analysis	6010B SEP		1			88228	06/28/24 11:53	KNC	EET KNX
	Instrument ID:	NOEQUIP								
Total/NA	Analysis	Loss On Ignit.		1	1.2813 g	1 g	87996	06/23/24 09:10	SJF	EET KNX
	Instrument ID:	NOEQUIP								
Total/NA	Analysis	Moisture		1			87524	06/11/24 14:31	JXP	EET KNX
	Instrument ID:	NOEQUIP								

Client Sample ID: MW-195 (44-46)

Lab Sample ID: 140-36896-3
Date Collected: 05/07/24 15:40
Matrix: Solid
Date Received: 05/24/24 09:30
Percent Solids: 90.8

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		10			88099	06/25/24 16:52	KNC	EET KNX
	Instrument ID:	DUO								
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		1			88099	06/25/24 17:48	KNC	EET KNX
	Instrument ID:	DUO								
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		2			88142	06/26/24 12:51	KNC	EET KNX
	Instrument ID:	DUO								
Step 1	SEP	Exchangeable			5.000 g	25 mL	87192	06/03/24 08:00	JDM	EET KNX
Step 1	Prep	3010A			5 mL	50 mL	87264	06/04/24 07:00	JDM	EET KNX
Step 1	Analysis	6010B SEP		4			87914	06/20/24 15:04	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	87265	06/04/24 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	87312	06/05/24 07:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			87914	06/20/24 16:13	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	87265	06/04/24 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	87312	06/05/24 07:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			87973	06/21/24 12:47	KNC	EET KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	87328	06/05/24 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	87354	06/06/24 07:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			87914	06/20/24 17:45	KNC	EET KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	87328	06/05/24 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	87354	06/06/24 07:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			87973	06/21/24 14:12	KNC	EET KNX
	Instrument ID:	DUO								
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	87365	06/06/24 07:30	JDM	EET KNX
Step 4	Prep	3010A			5 mL	50 mL	87482	06/11/24 07:00	JDM	EET KNX
Step 4	Analysis	6010B SEP		1			88045	06/24/24 11:59	KNC	EET KNX
	Instrument ID:	DUO								

Lab Chronicle

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-195 (44-46)

Lab Sample ID: 140-36896-3
Date Collected: 05/07/24 15:40
Matrix: Solid
Date Received: 05/24/24 09:30
Percent Solids: 90.8

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 5	SEP	Organic-Bound			5.000 g	75 mL	87438	06/10/24 07:00	JDM	EET KNX
Step 5	Prep	3010A			5 mL	50 mL	87584	06/13/24 07:00	JDM	EET KNX
Step 5	Analysis	6010B SEP		5			88045	06/24/24 13:10	KNC	EET KNX
	Instrument ID:	DUO								
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	87516	06/11/24 11:00	JDM	EET KNX
Step 6	Analysis	6010B SEP		1			88045	06/24/24 14:34	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		10			88099	06/25/24 11:41	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		1			88099	06/25/24 12:35	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		2			88099	06/25/24 15:26	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: MW-196 (6-8)

Lab Sample ID: 140-36896-4
Date Collected: 05/08/24 10:30
Matrix: Solid
Date Received: 05/24/24 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Sum of Steps 1-7	Analysis	6010B SEP		1			88228	06/28/24 11:53	KNC	EET KNX
	Instrument ID:	NOEQUIP								
Total/NA	Analysis	Loss On Ignit.		1	1.6288 g	1 g	87996	06/23/24 09:10	SJF	EET KNX
	Instrument ID:	NOEQUIP								
Total/NA	Analysis	Moisture		1			87524	06/11/24 14:31	JXP	EET KNX
	Instrument ID:	NOEQUIP								

Client Sample ID: MW-196 (6-8)

Lab Sample ID: 140-36896-4
Date Collected: 05/08/24 10:30
Matrix: Solid
Date Received: 05/24/24 09:30
Percent Solids: 81.0

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		10			88099	06/25/24 16:57	KNC	EET KNX
	Instrument ID:	DUO								
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		1			88099	06/25/24 17:54	KNC	EET KNX
	Instrument ID:	DUO								
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		2			88142	06/26/24 12:56	KNC	EET KNX
	Instrument ID:	DUO								

Lab Chronicle

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-196 (6-8)

Date Collected: 05/08/24 10:30
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-4

Matrix: Solid
Percent Solids: 81.0

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 1	SEP	Exchangeable			5.000 g	25 mL	87192	06/03/24 08:00	JDM	EET KNX
Step 1	Prep	3010A			5 mL	50 mL	87264	06/04/24 07:00	JDM	EET KNX
Step 1	Analysis	6010B SEP		4			87914	06/20/24 15:09	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	87265	06/04/24 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	87312	06/05/24 07:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			87914	06/20/24 16:40	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	87265	06/04/24 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	87312	06/05/24 07:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			87973	06/21/24 13:07	KNC	EET KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	87328	06/05/24 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	87354	06/06/24 07:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			87914	06/20/24 17:50	KNC	EET KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	87328	06/05/24 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	87354	06/06/24 07:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			87973	06/21/24 14:17	KNC	EET KNX
	Instrument ID:	DUO								
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	87365	06/06/24 07:30	JDM	EET KNX
Step 4	Prep	3010A			5 mL	50 mL	87482	06/11/24 07:00	JDM	EET KNX
Step 4	Analysis	6010B SEP		1			88045	06/24/24 12:04	KNC	EET KNX
	Instrument ID:	DUO								
Step 5	SEP	Organic-Bound			5.000 g	75 mL	87438	06/10/24 07:00	JDM	EET KNX
Step 5	Prep	3010A			5 mL	50 mL	87584	06/13/24 07:00	JDM	EET KNX
Step 5	Analysis	6010B SEP		5			88045	06/24/24 13:30	KNC	EET KNX
	Instrument ID:	DUO								
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	87516	06/11/24 11:00	JDM	EET KNX
Step 6	Analysis	6010B SEP		1			88045	06/24/24 14:39	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		10			88099	06/25/24 11:46	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		1			88099	06/25/24 12:41	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		2			88099	06/25/24 15:31	KNC	EET KNX
	Instrument ID:	DUO								

Lab Chronicle

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-196 (10-12)

Lab Sample ID: 140-36896-5
Matrix: Solid
Date Collected: 05/08/24 10:40
Date Received: 05/24/24 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Sum of Steps 1-7	Analysis	6010B SEP		1			88228	06/28/24 11:53	KNC	EET KNX
	Instrument ID:	NOEQUIP								
Total/NA	Analysis	Loss On Ignit.		1	1.0779 g	1 g	87996	06/23/24 09:10	SJF	EET KNX
	Instrument ID:	NOEQUIP								
Total/NA	Analysis	Moisture		1			87524	06/11/24 14:31	JXP	EET KNX
	Instrument ID:	NOEQUIP								

Client Sample ID: MW-196 (10-12)

Lab Sample ID: 140-36896-5
Matrix: Solid
Date Collected: 05/08/24 10:40
Date Received: 05/24/24 09:30
Percent Solids: 76.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		10			88099	06/25/24 17:02	KNC	EET KNX
	Instrument ID:	DUO								
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		1			88099	06/25/24 18:00	KNC	EET KNX
	Instrument ID:	DUO								
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		2			88142	06/26/24 13:01	KNC	EET KNX
	Instrument ID:	DUO								
Step 1	SEP	Exchangeable			5.000 g	25 mL	87192	06/03/24 08:00	JDM	EET KNX
Step 1	Prep	3010A			5 mL	50 mL	87264	06/04/24 07:00	JDM	EET KNX
Step 1	Analysis	6010B SEP		4			87914	06/20/24 15:14	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	87265	06/04/24 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	87312	06/05/24 07:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			87914	06/20/24 16:45	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	87265	06/04/24 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	87312	06/05/24 07:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			87973	06/21/24 13:12	KNC	EET KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	87328	06/05/24 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	87354	06/06/24 07:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			87914	06/20/24 17:55	KNC	EET KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	87328	06/05/24 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	87354	06/06/24 07:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			87973	06/21/24 14:22	KNC	EET KNX
	Instrument ID:	DUO								
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	87365	06/06/24 07:30	JDM	EET KNX
Step 4	Prep	3010A			5 mL	50 mL	87482	06/11/24 07:00	JDM	EET KNX
Step 4	Analysis	6010B SEP		1			88045	06/24/24 12:09	KNC	EET KNX
	Instrument ID:	DUO								

Lab Chronicle

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-196 (10-12)

Lab Sample ID: 140-36896-5
Date Collected: 05/08/24 10:40
Matrix: Solid
Date Received: 05/24/24 09:30
Percent Solids: 76.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	87365	06/06/24 07:30	JDM	EET KNX
Step 4	Prep	3010A			5 mL	50 mL	87482	06/11/24 07:00	JDM	EET KNX
Step 4	Analysis	6010B SEP		2			88045	06/24/24 15:00	KNC	EET KNX
	Instrument ID:	DUO								
Step 5	SEP	Organic-Bound			5.000 g	75 mL	87438	06/10/24 07:00	JDM	EET KNX
Step 5	Prep	3010A			5 mL	50 mL	87584	06/13/24 07:00	JDM	EET KNX
Step 5	Analysis	6010B SEP		5			88045	06/24/24 13:35	KNC	EET KNX
	Instrument ID:	DUO								
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	87516	06/11/24 11:00	JDM	EET KNX
Step 6	Analysis	6010B SEP		1			88045	06/24/24 14:44	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		10			88099	06/25/24 11:50	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		1			88099	06/25/24 12:46	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		2			88099	06/25/24 15:36	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: MW-197 (4-6)

Lab Sample ID: 140-36896-6
Date Collected: 05/08/24 11:30
Matrix: Solid
Date Received: 05/24/24 09:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Sum of Steps 1-7	Analysis	6010B SEP		1			88228	06/28/24 11:53	KNC	EET KNX
	Instrument ID:	NOEQUIP								
Total/NA	Analysis	Loss On Ignit.		1	1.1127 g	1 g	87996	06/23/24 09:10	SJF	EET KNX
	Instrument ID:	NOEQUIP								
Total/NA	Analysis	Moisture		1			87524	06/11/24 14:31	JXP	EET KNX
	Instrument ID:	NOEQUIP								

Client Sample ID: MW-197 (4-6)

Lab Sample ID: 140-36896-6
Date Collected: 05/08/24 11:30
Matrix: Solid
Date Received: 05/24/24 09:30
Percent Solids: 85.3

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		10			88099	06/25/24 17:22	KNC	EET KNX
	Instrument ID:	DUO								
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		1			88099	06/25/24 18:05	KNC	EET KNX
	Instrument ID:	DUO								

Lab Chronicle

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-197 (4-6)

Date Collected: 05/08/24 11:30
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-6

Matrix: Solid
Percent Solids: 85.3

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		2			88142	06/26/24 13:07	KNC	EET KNX
	Instrument ID:	DUO								
Step 1	SEP	Exchangeable			5.000 g	25 mL	87192	06/03/24 08:00	JDM	EET KNX
Step 1	Prep	3010A			5 mL	50 mL	87264	06/04/24 07:00	JDM	EET KNX
Step 1	Analysis	6010B SEP		4			87914	06/20/24 15:33	KNC	EET KNX
	Instrument ID:	DUO								
Step 1	SEP	Exchangeable			5.000 g	25 mL	87192	06/03/24 08:00	JDM	EET KNX
Step 1	Prep	3010A			5 mL	50 mL	87264	06/04/24 07:00	JDM	EET KNX
Step 1	Analysis	6010B SEP		4			87973	06/21/24 12:07	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	87265	06/04/24 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	87312	06/05/24 07:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			87914	06/20/24 16:50	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	87265	06/04/24 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	87312	06/05/24 07:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			87973	06/21/24 13:17	KNC	EET KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	87328	06/05/24 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	87354	06/06/24 07:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			87914	06/20/24 18:01	KNC	EET KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	87328	06/05/24 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	87354	06/06/24 07:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			87973	06/21/24 14:28	KNC	EET KNX
	Instrument ID:	DUO								
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	87365	06/06/24 07:30	JDM	EET KNX
Step 4	Prep	3010A			5 mL	50 mL	87482	06/11/24 07:00	JDM	EET KNX
Step 4	Analysis	6010B SEP		1			88045	06/24/24 12:29	KNC	EET KNX
	Instrument ID:	DUO								
Step 5	SEP	Organic-Bound			5.000 g	75 mL	87438	06/10/24 07:00	JDM	EET KNX
Step 5	Prep	3010A			5 mL	50 mL	87584	06/13/24 07:00	JDM	EET KNX
Step 5	Analysis	6010B SEP		5			88045	06/24/24 13:40	KNC	EET KNX
	Instrument ID:	DUO								
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	87516	06/11/24 11:00	JDM	EET KNX
Step 6	Analysis	6010B SEP		1			88045	06/24/24 14:49	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		10			88099	06/25/24 12:10	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		1			88099	06/25/24 12:51	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: MW-197 (4-6)
Date Collected: 05/08/24 11:30
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-6
Matrix: Solid
Percent Solids: 85.3

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		2			88099	06/25/24 15:41	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: MW-197 (10-12)
Date Collected: 05/08/24 11:40
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-7
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Sum of Steps 1-7	Analysis	6010B SEP		1			88228	06/28/24 11:53	KNC	EET KNX
	Instrument ID:	NOEQUIP								
Total/NA	Analysis	Loss On Ignit.		1	1.1887 g	1 g	87996	06/23/24 09:10	SJF	EET KNX
	Instrument ID:	NOEQUIP								
Total/NA	Analysis	Moisture		1			87524	06/11/24 14:31	JXP	EET KNX
	Instrument ID:	NOEQUIP								

Client Sample ID: MW-197 (10-12)
Date Collected: 05/08/24 11:40
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-7
Matrix: Solid
Percent Solids: 83.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		10			88099	06/25/24 17:27	KNC	EET KNX
	Instrument ID:	DUO								
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		1			88099	06/25/24 18:25	KNC	EET KNX
	Instrument ID:	DUO								
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		2			88142	06/26/24 13:12	KNC	EET KNX
	Instrument ID:	DUO								
Step 1	SEP	Exchangeable			5.000 g	25 mL	87192	06/03/24 08:00	JDM	EET KNX
Step 1	Prep	3010A			5 mL	50 mL	87264	06/04/24 07:00	JDM	EET KNX
Step 1	Analysis	6010B SEP		4			87914	06/20/24 15:38	KNC	EET KNX
	Instrument ID:	DUO								
Step 1	SEP	Exchangeable			5.000 g	25 mL	87192	06/03/24 08:00	JDM	EET KNX
Step 1	Prep	3010A			5 mL	50 mL	87264	06/04/24 07:00	JDM	EET KNX
Step 1	Analysis	6010B SEP		4			87973	06/21/24 12:12	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	87265	06/04/24 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	87312	06/05/24 07:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			87914	06/20/24 16:56	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	87265	06/04/24 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	87312	06/05/24 07:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			87973	06/21/24 13:23	KNC	EET KNX
	Instrument ID:	DUO								

Lab Chronicle

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-197 (10-12)

Lab Sample ID: 140-36896-7

Date Collected: 05/08/24 11:40
Matrix: Solid
Date Received: 05/24/24 09:30
Percent Solids: 83.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	87328	06/05/24 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	87354	06/06/24 07:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			87914	06/20/24 18:06	KNC	EET KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	87328	06/05/24 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	87354	06/06/24 07:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			87973	06/21/24 14:33	KNC	EET KNX
	Instrument ID:	DUO								
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	87365	06/06/24 07:30	JDM	EET KNX
Step 4	Prep	3010A			5 mL	50 mL	87482	06/11/24 07:00	JDM	EET KNX
Step 4	Analysis	6010B SEP		1			88045	06/24/24 12:34	KNC	EET KNX
	Instrument ID:	DUO								
Step 5	SEP	Organic-Bound			5.000 g	75 mL	87438	06/10/24 07:00	JDM	EET KNX
Step 5	Prep	3010A			5 mL	50 mL	87584	06/13/24 07:00	JDM	EET KNX
Step 5	Analysis	6010B SEP		5			88045	06/24/24 13:45	KNC	EET KNX
	Instrument ID:	DUO								
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	87516	06/11/24 11:00	JDM	EET KNX
Step 6	Analysis	6010B SEP		1			88045	06/24/24 14:55	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		10			88099	06/25/24 12:15	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		1			88099	06/25/24 13:21	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		1			88099	06/25/24 15:05	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		2			88099	06/25/24 15:46	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Method Blank

Lab Sample ID: MB 140-87191/9-A

Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		1			88099	06/25/24 16:23	KNC	EET KNX
	Instrument ID:	DUO								

Lab Chronicle

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: Method Blank — Lab Sample ID: MB 140-87192/9-B ^4

Date Collected: N/A — **Matrix: Solid**
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 1	SEP	Exchangeable			5.000 g	25 mL	87192	06/03/24 08:00	JDM	EET KNX
Step 1	Prep	3010A			5 mL	50 mL	87264	06/04/24 07:00	JDM	EET KNX
Step 1	Analysis	6010B SEP		4			87914	06/20/24 14:34	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Method Blank — Lab Sample ID: MB 140-87265/9-B ^3

Date Collected: N/A — **Matrix: Solid**
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 2	SEP	Carbonate			5.000 g	25 mL	87265	06/04/24 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	87312	06/05/24 07:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			87914	06/20/24 15:43	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	87265	06/04/24 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	87312	06/05/24 07:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			87973	06/21/24 12:17	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Method Blank — Lab Sample ID: MB 140-87328/9-B

Date Collected: N/A — **Matrix: Solid**
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	87328	06/05/24 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	87354	06/06/24 07:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			87914	06/20/24 17:01	KNC	EET KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	87328	06/05/24 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	87354	06/06/24 07:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			87973	06/21/24 13:28	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Method Blank — Lab Sample ID: MB 140-87365/9-B

Date Collected: N/A — **Matrix: Solid**
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	87365	06/06/24 07:30	JDM	EET KNX
Step 4	Prep	3010A			5 mL	50 mL	87482	06/11/24 07:00	JDM	EET KNX
Step 4	Analysis	6010B SEP		1			88045	06/24/24 11:30	KNC	EET KNX
	Instrument ID:	DUO								

Lab Chronicle

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: Method Blank
Lab Sample ID: MB 140-87438/9-B ^5
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 5	SEP	Organic-Bound			5.000 g	75 mL	87438	06/10/24 07:00	JDM	EET KNX
Step 5	Prep	3010A			5 mL	50 mL	87584	06/13/24 07:00	JDM	EET KNX
Step 5	Analysis	6010B SEP		5			88045	06/24/24 12:39	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Method Blank
Lab Sample ID: MB 140-87516/9-A
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	87516	06/11/24 11:00	JDM	EET KNX
Step 6	Analysis	6010B SEP		1			88045	06/24/24 13:50	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Method Blank
Lab Sample ID: MB 140-87527/9-A
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		1			88099	06/25/24 11:11	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Method Blank
Lab Sample ID: MB 140-87996/1
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Loss On Ignit.		1	1.0029 g	1 g	87996	06/23/24 09:10	SJF	EET KNX
	Instrument ID:	NOEQUIP								

Client Sample ID: Lab Control Sample
Lab Sample ID: LCS 140-87191/10-A
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		1			88099	06/25/24 16:28	KNC	EET KNX
	Instrument ID:	DUO								

Lab Chronicle

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-87192/10-B ^5

Date Collected: N/A — **Matrix: Solid**
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 1	SEP	Exchangeable			5.000 g	25 mL	87192	06/03/24 08:00	JDM	EET KNX
Step 1	Prep	3010A			5 mL	50 mL	87264	06/04/24 07:00	JDM	EET KNX
Step 1	Analysis	6010B SEP		5			87914	06/20/24 14:39	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-87265/10-B ^5

Date Collected: N/A — **Matrix: Solid**
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 2	SEP	Carbonate			5.000 g	25 mL	87265	06/04/24 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	87312	06/05/24 07:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		5			87914	06/20/24 15:48	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	87265	06/04/24 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	87312	06/05/24 07:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		5			87973	06/21/24 12:22	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-87328/10-B

Date Collected: N/A — **Matrix: Solid**
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	87328	06/05/24 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	87354	06/06/24 07:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			87914	06/20/24 17:06	KNC	EET KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	87328	06/05/24 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	87354	06/06/24 07:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			87973	06/21/24 13:33	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-87365/10-B

Date Collected: N/A — **Matrix: Solid**
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	87365	06/06/24 07:30	JDM	EET KNX
Step 4	Prep	3010A			5 mL	50 mL	87482	06/11/24 07:00	JDM	EET KNX
Step 4	Analysis	6010B SEP		1			88045	06/24/24 11:35	KNC	EET KNX
	Instrument ID:	DUO								

Lab Chronicle

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-87438/10-B ^5

Date Collected: N/A
Date Received: N/A
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 5	SEP	Organic-Bound			5.000 g	75 mL	87438	06/10/24 07:00	JDM	EET KNX
Step 5	Prep	3010A			5 mL	50 mL	87584	06/13/24 07:00	JDM	EET KNX
Step 5	Analysis	6010B SEP		5			88045	06/24/24 12:44	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-87516/10-A

Date Collected: N/A
Date Received: N/A
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	87516	06/11/24 11:00	JDM	EET KNX
Step 6	Analysis	6010B SEP		1			88045	06/24/24 13:55	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-87527/10-A

Date Collected: N/A
Date Received: N/A
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		1			88099	06/25/24 11:17	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Lab Control Sample — Lab Sample ID: LCS 140-87996/2

Date Collected: N/A
Date Received: N/A
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Loss On Ignit.		1	1.0462 g	1 g	87996	06/23/24 09:10	SJF	EET KNX
	Instrument ID:	NOEQUIP								

Client Sample ID: Lab Control Sample Dup — Lab Sample ID: LCSD 140-87191/11-A

Date Collected: N/A
Date Received: N/A
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		1			88099	06/25/24 16:33	KNC	EET KNX
	Instrument ID:	DUO								

Lab Chronicle

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: Lab Control Sample Dup
Lab Sample ID: LCSD 140-87192/11-B ^5

Date Collected: N/A
Date Received: N/A
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 1	SEP	Exchangeable			5.000 g	25 mL	87192	06/03/24 08:00	JDM	EET KNX
Step 1	Prep	3010A			5 mL	50 mL	87264	06/04/24 07:00	JDM	EET KNX
Step 1	Analysis	6010B SEP		5			87914	06/20/24 14:44	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Lab Control Sample Dup
Lab Sample ID: LCSD 140-87265/11-B ^5

Date Collected: N/A
Date Received: N/A
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 2	SEP	Carbonate			5.000 g	25 mL	87265	06/04/24 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	87312	06/05/24 07:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		5			87914	06/20/24 15:53	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	87265	06/04/24 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	87312	06/05/24 07:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		5			87973	06/21/24 12:27	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Lab Control Sample Dup
Lab Sample ID: LCSD 140-87328/11-B

Date Collected: N/A
Date Received: N/A
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	87328	06/05/24 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	87354	06/06/24 07:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			87914	06/20/24 17:10	KNC	EET KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	87328	06/05/24 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	87354	06/06/24 07:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			87973	06/21/24 13:37	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Lab Control Sample Dup
Lab Sample ID: LCSD 140-87365/11-B

Date Collected: N/A
Date Received: N/A
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	87365	06/06/24 07:30	JDM	EET KNX
Step 4	Prep	3010A			5 mL	50 mL	87482	06/11/24 07:00	JDM	EET KNX
Step 4	Analysis	6010B SEP		1			88045	06/24/24 11:40	KNC	EET KNX
	Instrument ID:	DUO								

Lab Chronicle

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: Lab Control Sample Dup
Lab Sample ID: LCSD 140-87438/11-B ^5
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 5	SEP	Organic-Bound			5.000 g	75 mL	87438	06/10/24 07:00	JDM	EET KNX
Step 5	Prep	3010A			5 mL	50 mL	87584	06/13/24 07:00	JDM	EET KNX
Step 5	Analysis	6010B SEP		5			88045	06/24/24 12:49	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Lab Control Sample Dup
Lab Sample ID: LCSD 140-87516/11-A
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	87516	06/11/24 11:00	JDM	EET KNX
Step 6	Analysis	6010B SEP		1			88045	06/24/24 14:00	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Lab Control Sample Dup
Lab Sample ID: LCSD 140-87527/11-A
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		1			88099	06/25/24 11:21	KNC	EET KNX
	Instrument ID:	DUO								

Client Sample ID: Lab Control Sample Dup
Lab Sample ID: LCSD 140-87996/3
Date Collected: N/A
Matrix: Solid
Date Received: N/A

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Loss On Ignit.		1	1.0304 g	1 g	87996	06/23/24 09:10	SJF	EET KNX
	Instrument ID:	NOEQUIP								

Client Sample ID: MW-195 (35-37)
Lab Sample ID: 140-36896-2 DU
Date Collected: 05/07/24 15:30
Matrix: Solid
Date Received: 05/24/24 09:30
Percent Solids: 86.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		10			88099	06/25/24 16:48	KNC	EET KNX
	Instrument ID:	DUO								
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		1			88099	06/25/24 17:43	KNC	EET KNX
	Instrument ID:	DUO								
Total/NA	Prep	Total			1.000 g	50 mL	87191	06/12/24 07:00	JDM	EET KNX
Total/NA	Analysis	6010B		2			88142	06/26/24 12:46	KNC	EET KNX
	Instrument ID:	DUO								

Lab Chronicle

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-195 (35-37)

Date Collected: 05/07/24 15:30
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-2 DU

Matrix: Solid
Percent Solids: 86.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Step 1	SEP	Exchangeable			5.000 g	25 mL	87192	06/03/24 08:00	JDM	EET KNX
Step 1	Prep	3010A			5 mL	50 mL	87264	06/04/24 07:00	JDM	EET KNX
Step 1	Analysis	6010B SEP		4			87914	06/20/24 14:59	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	87265	06/04/24 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	87312	06/05/24 07:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			87914	06/20/24 16:08	KNC	EET KNX
	Instrument ID:	DUO								
Step 2	SEP	Carbonate			5.000 g	25 mL	87265	06/04/24 08:00	JDM	EET KNX
Step 2	Prep	3010A			5 mL	50 mL	87312	06/05/24 07:00	JDM	EET KNX
Step 2	Analysis	6010B SEP		3			87973	06/21/24 12:42	KNC	EET KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	87328	06/05/24 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	87354	06/06/24 07:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			87914	06/20/24 17:40	KNC	EET KNX
	Instrument ID:	DUO								
Step 3	SEP	Non-Crystalline			5.000 g	25 mL	87328	06/05/24 08:00	JDM	EET KNX
Step 3	Prep	3010A			5 mL	50 mL	87354	06/06/24 07:00	JDM	EET KNX
Step 3	Analysis	6010B SEP		1			87973	06/21/24 14:07	KNC	EET KNX
	Instrument ID:	DUO								
Step 4	SEP	Metal Hydroxide			5.000 g	25 mL	87365	06/06/24 07:30	JDM	EET KNX
Step 4	Prep	3010A			5 mL	50 mL	87482	06/11/24 07:00	JDM	EET KNX
Step 4	Analysis	6010B SEP		1			88045	06/24/24 11:55	KNC	EET KNX
	Instrument ID:	DUO								
Step 5	SEP	Organic-Bound			5.000 g	75 mL	87438	06/10/24 07:00	JDM	EET KNX
Step 5	Prep	3010A			5 mL	50 mL	87584	06/13/24 07:00	JDM	EET KNX
Step 5	Analysis	6010B SEP		5			88045	06/24/24 13:04	KNC	EET KNX
	Instrument ID:	DUO								
Step 6	SEP	Acid/Sulfide			5.000 g	250 mL	87516	06/11/24 11:00	JDM	EET KNX
Step 6	Analysis	6010B SEP		1			88045	06/24/24 14:29	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		10			88099	06/25/24 11:36	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		1			88099	06/25/24 12:30	KNC	EET KNX
	Instrument ID:	DUO								
Step 7	Prep	Residual			1.000 g	50 mL	87527	06/12/24 07:00	JDM	EET KNX
Step 7	Analysis	6010B SEP		2			88099	06/25/24 15:21	KNC	EET KNX
	Instrument ID:	DUO								

Lab Chronicle

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Client Sample ID: MW-196 (10-12)

Date Collected: 05/08/24 10:40
Date Received: 05/24/24 09:30

Lab Sample ID: 140-36896-5 DU

Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Loss On Ignit.		1	1.0943 g	1 g	87996	06/23/24 09:10	SJF	EET KNX
	Instrument ID:	NOEQUIP								

Laboratory References:

EET KNX = Eurofins Knoxville, 5815 Middlebrook Pike, Knoxville, TN 37921, TEL (865)291-3000

Accreditation/Certification Summary

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Laboratory: Eurofins Knoxville

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
	AFCEE	N/A	
ANAB	Dept. of Defense ELAP	L2311	02-13-25
ANAB	Dept. of Energy	L2311.01	02-13-25
ANAB	ISO/IEC 17025	L2311	02-13-25
Arkansas DEQ	State	88-0688	06-17-25
Colorado	State	TN00009	02-28-25
Connecticut	State	PH-0223	10-01-26
Florida	NELAP	E87177	06-30-24
Georgia (DW)	State	906	07-27-25
Hawaii	State	NA	07-27-24
Kansas	NELAP	E-10349	10-31-24
Kentucky (DW)	State	90101	12-31-24
Louisiana (All)	NELAP	83979	06-30-24
Louisiana (DW)	State	LA019	12-31-24
Maryland	State	277	03-31-25
Michigan	State	9933	07-27-25
Nevada	State	TN00009	07-31-24
New Hampshire	NELAP	2999	01-17-25
New Jersey	NELAP	TN001	06-30-25
New York	NELAP	10781	03-31-25
North Carolina (DW)	State	21705	07-31-24
North Carolina (WW/SW)	State	64	12-31-24
Oklahoma	State	9415	08-31-24
Oregon	NELAP	TNI0189	01-01-25
Pennsylvania	NELAP	68-00576	12-31-24
Tennessee	State	02014	07-27-25
Texas	NELAP	T104704380-23-18	08-31-24
US Fish & Wildlife	US Federal Programs	058448	07-31-24
USDA	US Federal Programs	525-22-279-18762	10-06-25
Utah	NELAP	TN00009	07-31-24
Virginia	NELAP	460176	09-14-24
Washington	State	C593	01-19-25
West Virginia (DW)	State	9955C	12-31-24
West Virginia DEP	State	345	04-30-25
Wisconsin	State	998044300	08-31-24

Method Summary

Client: Ramboll Americas Engineering Solutions
Project/Site: Baldwin Nature & Extent SEP

Job ID: 140-36896-1

Method	Method Description	Protocol	Laboratory
6010B	SEP Metals (ICP) - Total	SW846	EET KNX
6010B SEP	SEP Metals (ICP)	SW846	EET KNX
Loss On Ignit.	Loss On Ignition	SPCC	EET KNX
Moisture	Percent Moisture	EPA	EET KNX
3010A	Preparation, Total Metals	SW846	EET KNX
Acid/Sulfide	Sequential Extraction Procedure, Acid/Sulfide Fraction	TAL-KNOX	EET KNX
Carbonate	Sequential Extraction Procedure, Carbonate Fraction	TAL-KNOX	EET KNX
Exchangeable	Sequential Extraction Procedure, Exchangeable Fraction	TAL-KNOX	EET KNX
Metal Hydroxide	Sequential Extraction Procedure, Metal Hydroxide Fraction	TAL-KNOX	EET KNX
Non-Crystalline	Sequential Extraction Procedure, Non-crystalline Materials	TAL-KNOX	EET KNX
Organic-Bound	Sequential Extraction Procedure, Organic Bound Fraction	TAL-KNOX	EET KNX
Residual	Sequential Extraction Procedure, Residual Fraction	TAL-KNOX	EET KNX
Total	Preparation, Total Material	TAL-KNOX	EET KNX

Protocol References:

EPA = US Environmental Protection Agency
SPCC = Society for Protective Coatings
SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.
TAL-KNOX = TestAmerica Laboratories, Knoxville, Facility Standard Operating Procedure.

Laboratory References:

EET KNX = Eurofins Knoxville, 5815 Middlebrook Pike, Knoxville, TN 37921, TEL (865)291-3000

Chain of Custody Record 727611

eurofins | Environment Testing America

AL-8210

Address: 5815 Middlebrook Pike, Knoxville, TN 37921

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager: Evvan Plank	Site Contact:	Date: 5/22/24	COC No: 1940108204-002
Company Name: RAMBOLL	Tel/Email: evvan.plank@ramboll.com	Lab Contact: Ryan Henry	Carrier:	1 of 1 COCs
Address: 234 W Florida St	Analysis Turnaround Time			Sampler: Evvan Plank
City/State/Zip: Milwaukee/WI/53214	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
Phone: 414-531-0172	TAT if different from Below			Walk-in Client:
Fax:	☐ 2 weeks			Lab Sampling:
Project Name: Baldwin	☐ 1 week			
Site:	☐ 2 days			Job / SDG No.:
P.O.#	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	7-Step SEP	Loss On Ignition	Sample Specific Notes:
MW-35DR (15-25)	5/3/24	10:00	G	Soil	1	N	N	X	X	
MW-195 (35-37)	5/7/24	15:30	G	Soil	1	N	N	X	X	
MW-195 (44-46)	5/7/24	15:40	G	Soil	1	N	N	X	X	CUSTODY SEALS INTACT
MW-196 (6-8)	5/8/24	10:30	G	Soil	1	N	N	X	X	RECEIVED AMBIENT
MW-196 (10-12)	5/8/24	10:40	G	Soil	1	N	N	X	X	AT 20.0 / CT 20.1°C
MW-197 (4-6)	5/8/24	11:30	G	Soil	1	N	N	X	X	AKA 5-24-24
MW-197 (10-12)	5/8/24	11:40	G	Soil	1	N	N	X	X	100x FEDX#
										741402910708 PD

140-36896 Chain of Custody

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☒ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☒ Disposal by Lab ☐ Archive for _____ Months

Special Instructions/QC Requirements & Comments:

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd: _____ Corr'd: _____ | Therm ID No.: _____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Evvan Plank	Ramboll	5/22/24	[signature]	Eurofins	5/23/24 0800
[signature]	Eurofins 5/23/24	1630	[signature]	ETI-KNX	5-24-24 09:30

Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Loc: 140
36896

6/28/2024

EUROFINS KNOXVILLE SAMPLE RECEIPT/CONDITION UPON RECEIPT ANOMALY CHECKLIST **Log In Number:**

Review Items	Yes	No	NA	If No, what was the problem?
1. Are the shipping containers intact?	✓			☐ **Containers, Broken**
2. Were ambient air containers received intact?			✓	☐ Checked in lab
3. The coolers/containers custody seal if present, is it intact?	✓			☐ Yes ☐ NA
4. Is the cooler temperature within limits? (> freezing temp. of water to 6 °C, VOST: 10°C) Thermometer ID : 5076 Correction factor: +0.1°C	✓		✓	☐ **Cooler Out of Temp, Client Contacted, Proceed/Cancel** ☐ **Cooler Out of Temp, Same Day Receipt**
5. Were all of the sample containers received intact?	✓	✓		☐ **Containers, Broken**
6. Were samples received in appropriate containers?	✓			☐ **Containers, Improper; Client Contacted; Proceed/Cancel**
7. Do sample container labels match COC? (IDs, Dates, Times)	✓			☐ **COC & Samples Do Not Match** ☐ **COC Incorrect/Incomplete** ☐ **COC Not Received**
8. Were all of the samples listed on the COC received?	✓			☐ **Sample Received, Not on COC** ☐ **Sample on COC, Not Received**
9. Is the date/time of sample collection noted?	✓			☐ **COC; No Date/Time; Client Contacted**
10. Was the sampler identified on the COC?	✓			☐ **Sampler Not Listed on COC**
11. Is the client and project name/# identified?	✓			☐ **COC Incorrect/Incomplete**
12. Are tests/parameters listed for each sample?	✓			☐ **COC No tests on COC**
13. Is the matrix of the samples noted?	✓			☐ **COC Incorrect/Incomplete**
14. Was COC relinquished? (Signed/Dated/Timed)	✓			☐ **COC Incorrect/Incomplete**
15. Were samples received within holding time?	✓			☐ **Holding Time - Receipt**
16. Were samples received with correct chemical preservative (excluding Encore)?			✓	☐ **pH Adjusted, pH Included (See box 16A)** ☐ **Incorrect Preservative**
17. Were VOA samples received without headspace?			✓	☐ **Headspace (VOA only)**
18. Did you check for residual chlorine, if necessary? (e.g. 1613B, 1668) Chlorine test strip lot number:			✓	☐ **Residual Chlorine**
19. For 1613B water samples is pH<9?			✓	☐ If no, notify lab to adjust
20. For rad samples was sample activity info. Provided?			✓	☐ Project missing info

Comments/Actions Taken

Labeling Verified by: **Date:**

pH test strip lot number:

	Box 16A: pH Preservation	Box 18A: Residual Chlorine
Preservative:		
Lot Number:		
Exp Date:		
Analyst:		
Date:		
Time:		

Project #: 140074524 PM Instructions:

Sample Receiving Associate: [signature] Date: 5·24·24

QA026R33.doc, 11/10/23

Attachment E

eurofins | Built Environment Testing

For:
Evvan Plank
Ramboll
234 W. Florida Street
Milwaukee, WI 53204

RE:
Eurofins Built Environment Testing – Pasadena, Texas
XRD Mineral Characterization of Drill Cores by Full Mineral Scan
Project ID: Baldwin
Project #: COC 1940108209-001
EMLab ID: 3656785

Approved By:

Scott M. Ward, Ph.D.

Analyst: Carlos Duane Salinas

Eurofins Built Environment Testing (EBET) is an analytical laboratory accredited for the analysis of asbestos in air and bulk samples by X-Ray Powder Diffraction (XRD), Analytical Transmission Electron Microscopy (ATEM), and Polarized Light Microscopy (PLM) by the National Voluntary Laboratory Accreditation Program (NVLAP) {Lab Code 200525 (Houston) and Lab Code 600120 (Pasadena)}, and the American Industrial Hygiene Association Lab Code 157714 (Pasadena)}.

All samples were received in acceptable condition unless noted in the Report Comments portion in the body of the report. The results relate only to the samples as received and tested. The results include an inherent uncertainty of measurement associated with estimating percentages by the analytical method utilized.

Eurofins Built Environement Testing located in Pasadena, TX, a member of the Eurofins Built Environment Testing group of companies, shall have no liability to the client or the client's customer with respect to decisions or recommendations made, actions taken or courses of conduct implemented by either the client or the client's customer as a result of or based upon the Test Results. In no event shall the Company be liable to the client with respect to the Test Results except for the Company's own willful misconduct or gross negligence nor

eurofins | Built Environment Testing

Report: 3656785

Mineralogy of Drill Core Samples
XRD (Full Mineral) Analysis
Project Name: Baldwin
Project #: COC 194108209-001

For:

Evvan Plank
Ramboll
234 W. Florida Street
Milwaukee, WI 53204

By:

Carlos Duane Salinas
Technical Expert
Eurofins Built Environmental Testing
3113 Red Bluff Road
Pasadena, Texas 77503

June 24, 2024

eurofins | Built Environment Testing

June 24, 2024

Evvan Plank
Ramboll
234 W. Florida Street
Milwaukee, WI 53204

Dear Evan,

Eurofins Built Environmental Testing (EBET) is an analytical laboratory accredited for the analysis of asbestos in air and bulk samples by X-Ray Powder Diffraction (XRD), Analytical Transmission Electron Microscopy (ATEM), and Polarized Light Microscopy (PLM) by the National Voluntary Laboratory Accreditation Program (NVLAP) {Lab Code 200525 (Houston) and Lab Code 600120 (Pasadena)}, and the American Industrial Hygiene Association Laboratory Accreditation Program (AIHA-LAP,LLC) {Lab Code 157714 (Pasadena)}.

EBET received seven (7) samples on May 24, 2024, to determine their mineralogy by X-Ray Powder Diffraction (XRD). The samples were drill cores consisting mostly of silty soil with some pebbles, contained in individually labeled 8 oz wide mouth glass jars. The chain of custody matched the labeled sample ID's as follows:

Client Sample Number	**EBET ID Number**
MW-350R (15-25)	3656785-1FM
MW-195 (35-37)	3656785-2FM
MW-195 (44-46)	3656785-3FM
MW-196 (6-8)	3656785-4FM
MW-196 (10-12)	3656785-5FM
MW-197 (4-6)	3656785-6FM
MW-197 (10-12)	3656785-7FM

EBET prepped and analyzed these samples using X-Ray Powder Diffraction.

3656785 is the job number assigned to this study. This report is considered highly confidential and the sole property of the customer. EBET will not discuss any part of this study with personnel other than those authorized by the client. The results described in this report only apply to the samples analyzed. This report shall not be reproduced except in full, without written approval from EBET. The samples will be kept in our secure storage facility for a minimum of three (3) months from the report date.

Sample Preparation

A representative grab sample from each sample jar was dried overnight at 110 degrees Fahrenheit in our drying oven. The dried samples were then crushed using a large mortar and pestle. The crushed samples were coned and quartered to acquire a representative sample to be further prepared. These samples were ground and homogenized by hand using a mortar and pestle, and then passed through a No.400 (38um) sieve. The sieved samples were then milled with DI water in a McCrone XRD Micro Mill for 15 minutes, utilizing agate grinding elements, to produce powders that were prepped and scanned in our Cubix3/Panalytical XRD using a mineral scan program.

The results of this study can be found in the attached document. If you should have any questions about this report, please feel free to call us at 713-290-0223.

Sincerely,

Carlos Duane Salinas
Technical Expert
EBET – Pasadena, Texas

Mineralogy Report – June 2024.

This report was prepared at the request of Carlos Salinas, Technical Expert at Eurofins Built Environment Testing

I. Quantitative XRD analysis of powder samples

Table 1 - Scans of the following samples were evaluated.

Sample ID	
6785-1FM~1	Drill core samples
6785-2FM~1	Drill core samples
6785-3FM~1	Drill core samples
6785-4FM~1	Drill core samples
6785-5FM~1	Drill core samples
6785-6FM~1	Drill core samples
6785-7FM~1	Drill core samples

For QXRD analysis the software High score plus version 2.0.1 available from Malvern Panalytical was used.

II. Instrument and measurement conditions

Cubix3/PANalytical

Instrument settings:
Tube: Ceramic Cu long fine focus
Radiation: Copper (Cu)
Diffractometer radius: 200mm
Sample stage: Sample spinner stage

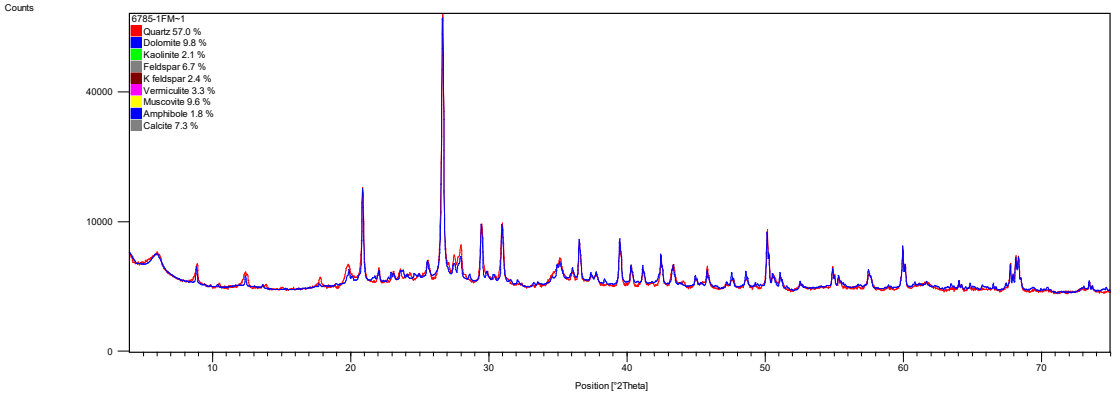
Incident optics:
BBHD
Divergence slit: Fixed 1/2 °
Soller slit: 0.04 radians
Mask: 10mm
Anti scatter slit: Fixed 2°

Diffracted optics:
Soller slit: 0.04 radians
Filter: Not present
Anti scatter slit: Fixed 5.5°
Detector: X'Celerator

Measurement conditions:
Applied power: 45KV, 40mA
Scan range: 4-75º 2Theta
Step size 0,016 º 2Theta
Time per step: 4.82sec
Scan type: continuous

III. QXRD analysis of Drill core samples:

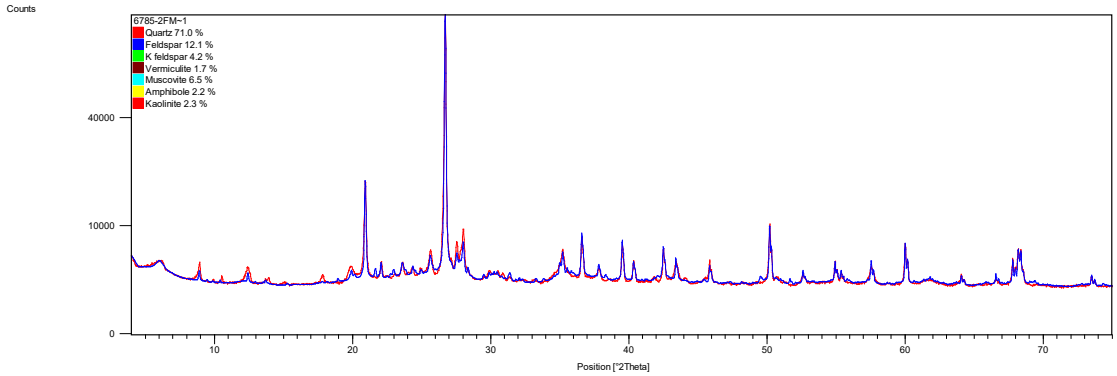
1) Sample 6785-1FM~1



Phase	Formula	%
Quartz	SiO2	57.0
Feldspar	(Na,Ca)(Si,Al)4O8	6.7
K-feldspar	KAlSi3O8	2.4
Mica	KAl2(Si3Al)O10(OH,F)2	9.6
Chlorite/Vermiculite	(Mg,Fe)5Al(Si3Al)O10(OH)8	3.3
Calcite	CaCO3	7.3
Dolomite	CaMg(CO3)2	9.8
Kaolinite	Al2Si2O5(OH)4	2.1
Amphibole	Ca2Mg5Si8O22(OH)2	1.8

Figure 1 – Results of X-ray diffraction - 6785-1FM~1

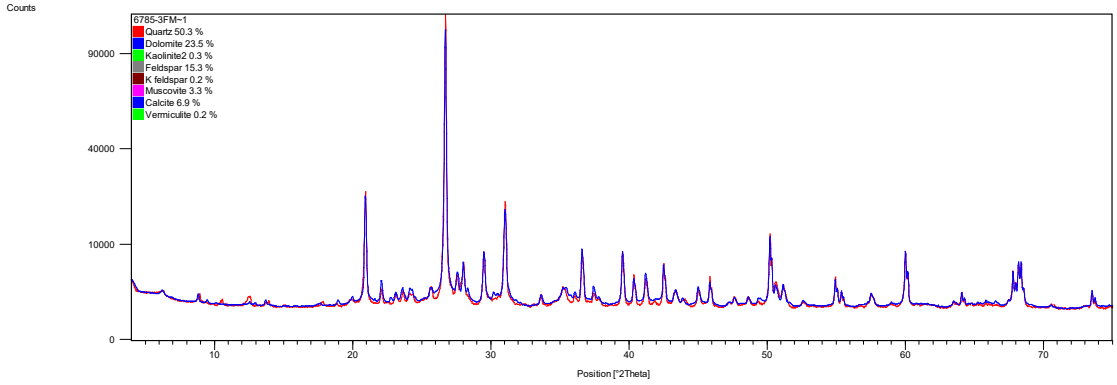
2) Sample 6785-2FM~1



Phase	Formula	%
Quartz	SiO2	71.0
Feldspar	(Na,Ca)(Si,Al)4O8	12.1
K-feldspar	KAlSi3O8	4.2
Mica	KAl2(Si3Al)O10(OH,F)2	6.5
Chlorite/Vermiculite	(Mg,Fe)5Al(Si3Al)O10(OH)8	1.7
Amphibole	Ca2Mg5Si8O22(OH)2	2.2
Kaolinite	Al2Si2O5(OH)4	2.3

Figure 2 – Results of X-ray diffraction - 6785-2FM~1

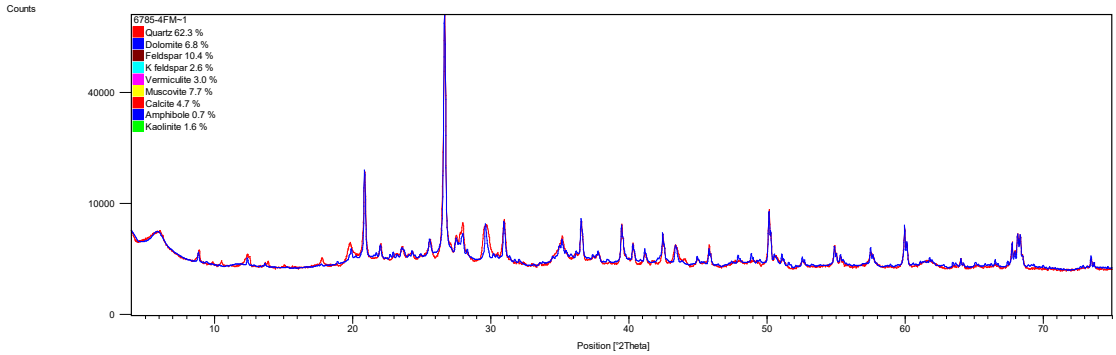
3) Sample 6785-3FM~1



Phase	Formula	%
Quartz	SiO2	50.3
Feldspar	(Na,Ca)(Si,Al)4O8	15.3
K-feldspar	KAlSi3O8	0.2
Mica	KAl2(Si3Al)O10(OH,F)2	3.3
Chlorite/Vermiculite	(Mg,Fe)5Al(Si3Al)O10(OH)8	0.2
Calcite	CaCO3	6.9
Dolomite	CaMg(CO3)2	23.5
Kaolinite	Al2Si2O5(OH)4	0.3

Figure 3 – Results of X-ray diffraction - 6785-3FM~1

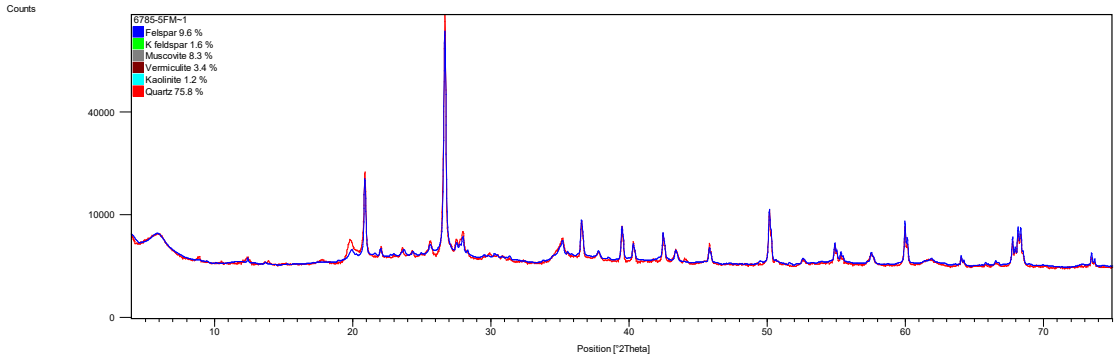
4) Sample 6785-4FM~1



Phase	Formula	%
Quartz	SiO2	62.3
Feldspar	(Na,Ca)(Si,Al)4O8	10.4
K-feldspar	KAlSi3O8	2.6
Mica	KAl2(Si3Al)O10(OH,F)2	7.7
Chlorite/Vermiculite	(Mg,Fe)5Al(Si3Al)O10(OH)8	3.0
Calcite	CaCO3	4.7
Dolomite	CaMg(CO3)2	6.8
Amphibole	Ca2Mg5Si8O22(OH)2	0.7
Kaolinite	Al2Si2O5(OH)4	1.6

Figure 4 – Results of X-ray diffraction - 6785-4FM~1

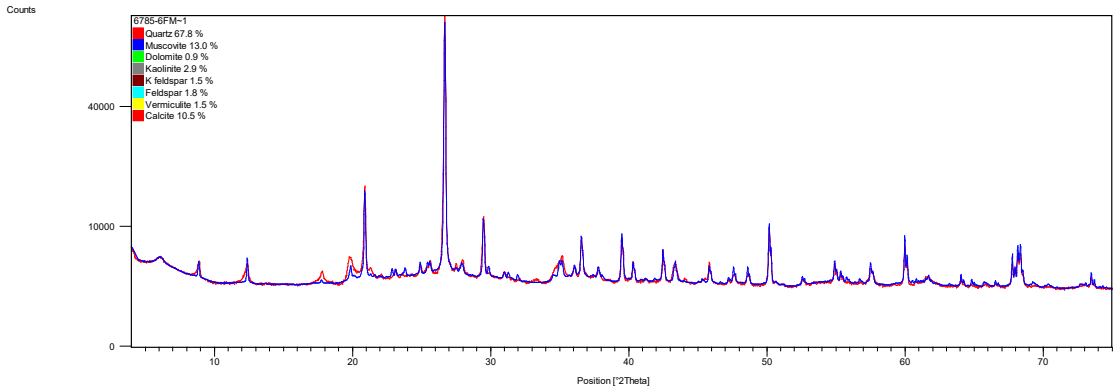
5) Sample 6785-5FM~1



Phase	Formula	%
Quartz	SiO2	75.8
Feldspar	(Na,Ca)(Si,Al)4O8	9.6
K-feldspar	KAlSi3O8	1.6
Mica	KAl2(Si3Al)O10(OH,F)2	8.3
Chlorite/Vermiculite	(Mg,Fe)5Al(Si3Al)O10(OH)8	3.4
Kaolinite	Al2Si2O5(OH)4	1.2

Figure 5 – Results of X-ray diffraction - 6785-5FM~1

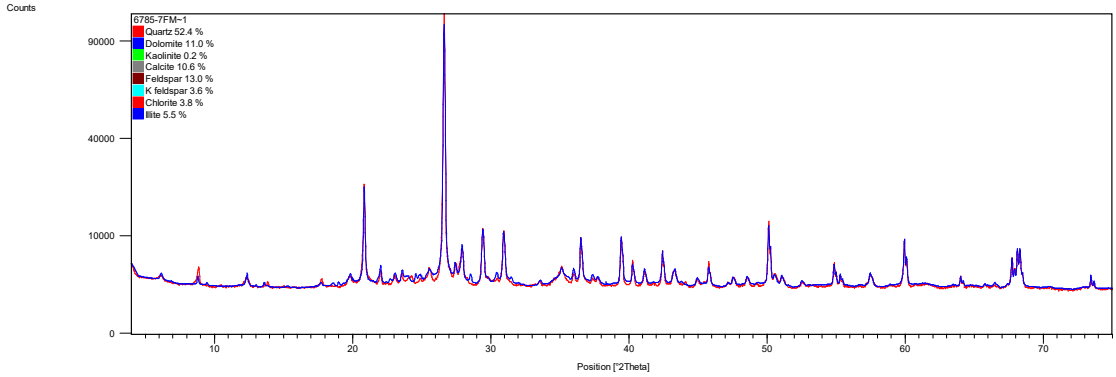
6) Sample 6785-6FM~1



Phase	Formula	%
Quartz	SiO2	67.8
Feldspar	(Na,Ca)(Si,Al)4O8	1.8
K-feldspar	KAlSi3O8	1.5
Mica	KAl2(Si3Al)O10(OH,F)2	13.0
Chlorite/Vermiculite	(Mg,Fe)5Al(Si3Al)O10(OH)8	1.5
Calcite	CaCO3	10.5
Dolomite	CaMg(CO3)2	0.9
Kaolinite	Al2Si2O5(OH)4	2.9

Figure 6 – Results of X-ray diffraction - 6785-6FM~1

7) Sample 6785-7FM~1



Phase	Formula	%
Quartz	SiO2	52.4
Feldspar	(Na,Ca)(Si,Al)4O8	13.0
K-feldspar	KAlSi3O8	3.6
Mica	KAl2(Si3Al)O10(OH,F)2	5.5
Chlorite/Vermiculite	(Mg,Fe)5Al(Si3Al)O10(OH)8	3.8
Calcite	CaCO3	10.6
Dolomite	CaMg(CO3)2	11.0
Kaolinite	Al2Si2O5(OH)4	0.2

Figure 7 – Results of X-ray diffraction - 6785-7FM~1

8) All samples comparison

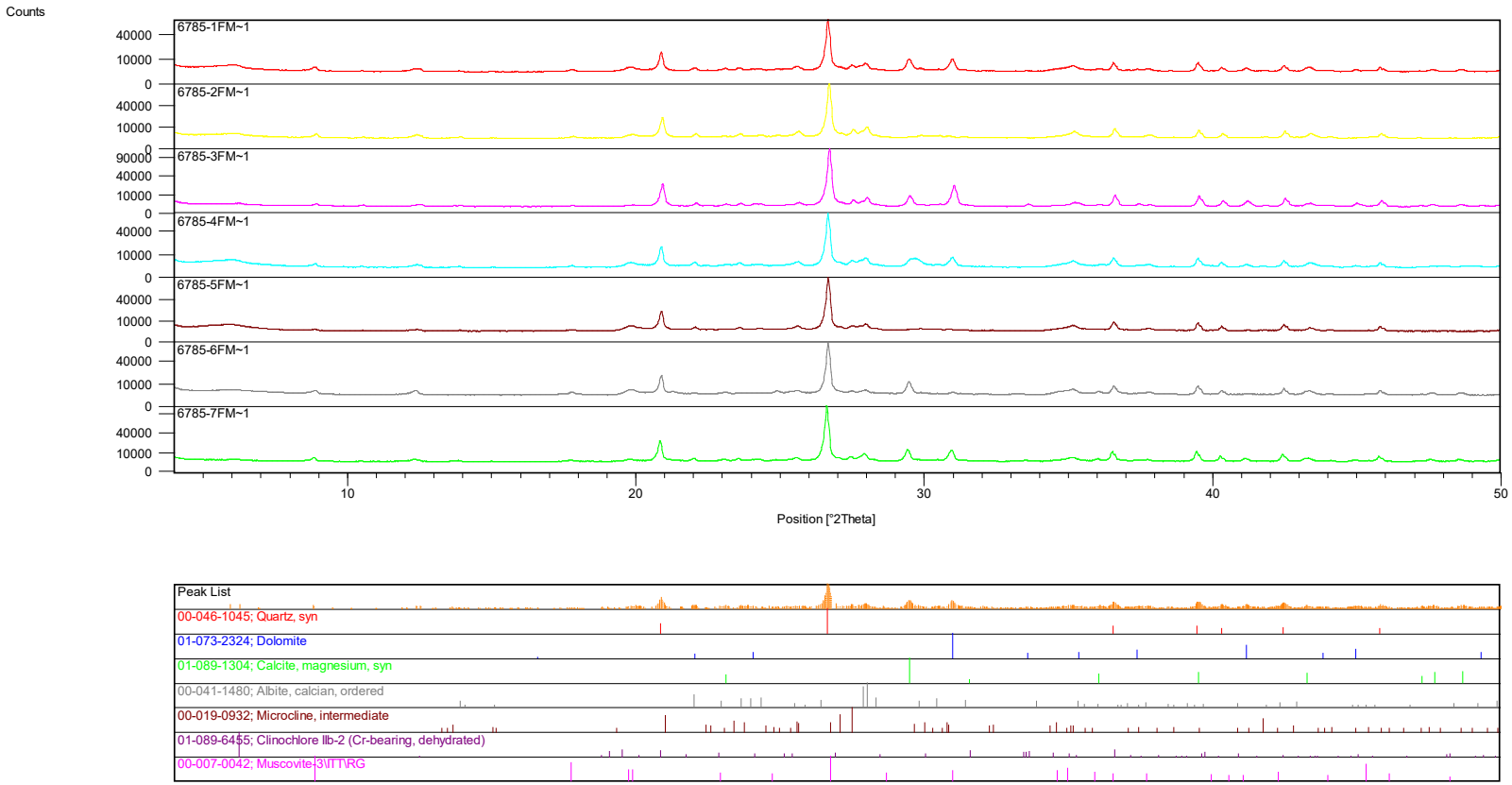


Figure 8 - The comparison of the x-ray diffraction (XRD) results

Sample	%								
	Quartz	Feldspar	K-feldspar	Mica	Chlorite/Vermiculite	Calcite	Dolomite	Amphibole	Kaolinite
6785-1FM~1	57.0	6.7	2.4	9.6	3.3	7.3	9.8	1.8	2.1
6785-2FM~1	71.0	12.1	4.2	6.5	1.7			2.2	2.3
6785-3FM~1	50.3	15.3	0.2	3.3	0.2	6.9	23.5		0.3
6785-4FM~1	62.3	10.4	2.6	7.7	3.0	4.7	6.8	0.7	1.6
6785-5FM~1	75.8	9.6	1.6	8.3	3.4				1.2
6785-6FM~1	67.8	1.8	1.5	13.0	1.5	10.5	0.9		2.9
6785-7FM~1	52.4	13.0	3.6	5.5	3.8	10.6	11.0		0.2

IV. Comments

The samples have similar mineralogy, with differences in their proportions, composed mainly of quartz, feldspar, mica, kaolinite, chlorite, vermiculite, dolomite and calcite. In some it was also possible to identify amphibole.
The samples 2 and 5 stand out for not containing carbonates in their composition.
It is necessary to validate the quantification by XRD with other techniques, preferably chemical analysis. The orientation of clay mineral particles affects the XRD intensities of powdered samples. The most clay mineral particles exhibit platy characteristics, and some preparation methods can often produce preferred orientation of clay minerals.

Elaborated by:
Angela Nair Avelar
PhD, Geologist - Applied Mineralogy and Development Process

Márcia Mika Saito
MSC, Geologist – Geometallurgical and Applied Mineralogy

eurofins | Built Environment Testing

For:
Evvan Plank
Ramboll
234 W. Florida Street
Milwaukee, WI 53204

RE:
Eurofins Built Environment Testing – Pasadena, Texas
XRD Mineral Characterization of Drill Cores by Clay Mineral Scan
Project ID: Baldwin
Project #: COC 1940108209-001
EMLab ID: 3656785

Approved By:

Scott M. Ward, Ph.D.

Analyst: Carlos Duane Salinas

Eurofins Built Environment Testing (EBET) is an analytical laboratory accredited for the analysis of asbestos in air and bulk samples by X-Ray Powder Diffraction (XRD), Analytical Transmission Electron Microscopy (ATEM), and Polarized Light Microscopy (PLM) by the National Voluntary Laboratory Accreditation Program (NVLAP) {Lab Code 200525 (Houston) and Lab Code 600120 (Pasadena)}, and the American Industrial Hygiene Association Lab Code 157714 (Pasadena)}.

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eurofins | Built Environment Testing

Report: 3656785

Mineralogy of Drill Core Samples
XRD (Clay Mineral) Analysis
Project Name: Baldwin
Project #: COC 194108209-001

For:

Evvan Plank
Ramboll
234 W. Florida Street
Milwaukee, WI 53204

By:

Carlos Duane Salinas
Technical Expert
Eurofins Built Environmental Testing
3113 Red Bluff Road
Pasadena, Texas 77503

June 24, 2024

eurofins | Built Environment Testing

June 24, 2024

Evvan Plank
Ramboll
234 W. Florida Street
Milwaukee, WI 53204

Dear Evan,

Eurofins Built Environmental Testing (EBET) is an analytical laboratory accredited for the analysis of asbestos in air and bulk samples by X-Ray Powder Diffraction (XRD), Analytical Transmission Electron Microscopy (ATEM), and Polarized Light Microscopy (PLM) by the National Voluntary Laboratory Accreditation Program (NVLAP) {Lab Code 200525 (Houston) and Lab Code 600120 (Pasadena)}, and the American Industrial Hygiene Association Laboratory Accreditation Program (AIHA-LAP,LLC) {Lab Code 157714 (Pasadena)}.

EBET received seven (7) samples on May 24, 2024, to determine their mineralogy by X-Ray Powder Diffraction (XRD). The samples were drill cores consisting mostly of silty soil with some pebbles, contained in individually labeled 8 oz wide mouth glass jars. The chain of custody matched the labeled sample ID's as follows:

Client Sample Number	**EBET ID Number**
MW-350R (15-25)	3656785-1CM
MW-195 (35-37)	3656785-2CM
MW-195 (44-46)	3656785-3CM
MW-196 (6-8)	3656785-4CM
MW-196 (10-12)	3656785-5CM
MW-197 (4-6)	3656785-6CM
MW-197 (10-12)	3656785-7CM

EBET prepped and analyzed these samples using X-Ray Powder Diffraction.

3656785 is the job number assigned to this study. This report is considered highly confidential and the sole property of the customer. EBET will not discuss any part of this study with personnel other than those authorized by the client. The results described in this report only apply to the samples analyzed. This report shall not be reproduced except in full, without written approval from EBET. The samples will be kept in our secure storage facility for a minimum of three (3) months from the report date.

Sample Preparation

A representative grab sample from each sample jar was collected and placed into a 100 ml plastic screw cap container filled with DI water and then shaken and wet sieved through a 400 Tyler Mesh (38 um) sieve. This process was repeated on the grab sample until all the material <38 um in size passed through the sieve. The <38 um material was collected in a 150 ml Pyrex beaker and placed into our drying oven overnight at a temperature of 110 degrees Celsius. The dried samples were then milled in a McCrone XRD Micro Mill for 15 minutes, utilizing agate grinding elements, to produce powders that were then prepped and scanned in our Cubix3/Panalytical XRD using a mineral scan program.

The results of this study can be found in the attached documents. If you should have any questions about this report, please feel free to call us at 713-290-0223.

Sincerely,

Carlos Duane Salinas
Technical Expert
EBET – Pasadena, Texas

Mineralogy Report – June 2024.

This report was prepared at the request of Carlos Salinas, Technical Expert at Eurofins Built Environment Testing

I. Quantitative XRD analysis of powder samples

Table 1 - Scans of the following samples were evaluated.

Sample ID	
6785-1CM~1	Drill core samples
6785-2CM~1	Drill core samples
6785-3CM~1	Drill core samples
6785-4CM~1	Drill core samples
6785-5CM~1	Drill core samples
6785-6CM~1	Drill core samples
6785-7CM~1	Drill core samples

For QXRD analysis the software High score plus version 2.0.1 available from Malvern Panalytical was used.

II. Instrument and measurement conditions

Cubix3/PANalytical

Instrument settings:
Tube: Ceramic Cu long fine focus
Radiation: Copper (Cu)
Diffractometer radius: 200mm
Sample stage: Sample spinner stage

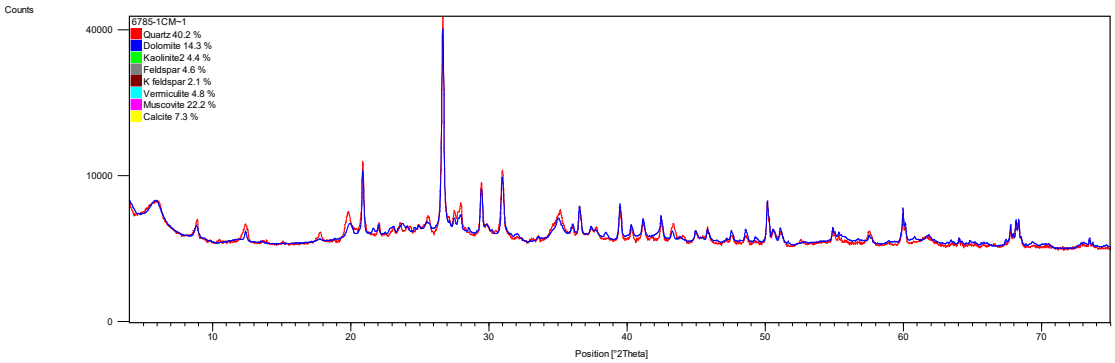
Incident optics:
BBHD
Divergence slit: Fixed 1/2 °
Soller slit: 0.04 radians
Mask: 10mm
Anti scatter slit: Fixed 2°

Diffracted optics:
Soller slit: 0.04 radians
Filter: Not present
Anti scatter slit: Fixed 5.5°
Detector: X'Celerator

Measurement conditions:
Applied power: 45KV, 40mA
Scan range: 4-75º 2Theta
Step size 0,016 º 2Theta
Time per step: 4.82sec
Scan type: continuous

III. QXRD analysis of Drill core samples:

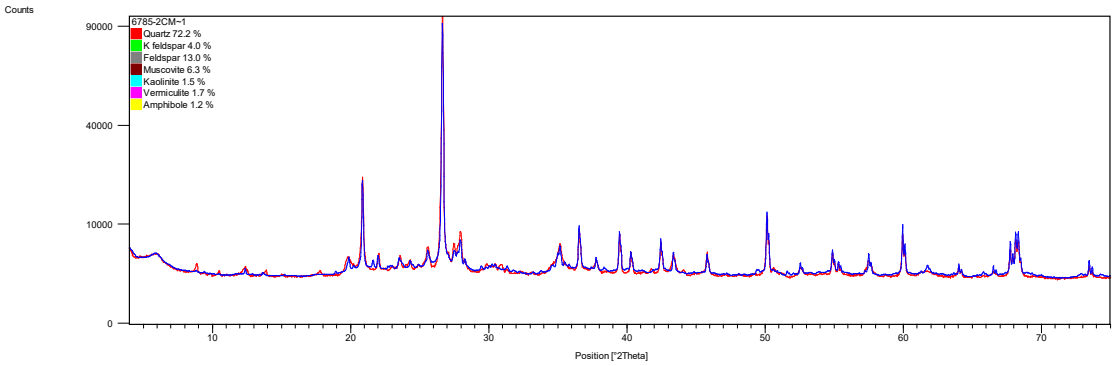
1) Sample 6785-1CM~1



Phase	Formula	%
Quartz	SiO2	40.2
Feldspar	(Na,Ca)(Si,Al)4O8	4.6
K-feldspar	KAlSi3O8	2.1
Mica	KAl2(Si3Al)O10(OH,F)2	22.2
Chlorite/Vermiculite	(Mg,Fe)5Al(Si3Al)O10(OH)8	4.8
Calcite	CaCO3	7.3
Dolomite	CaMg(CO3)2	14.2
Kaolinite	Al2Si2O5(OH)4	4.4

Figure 1 – Results of X-ray diffraction - 6785-1CM~1

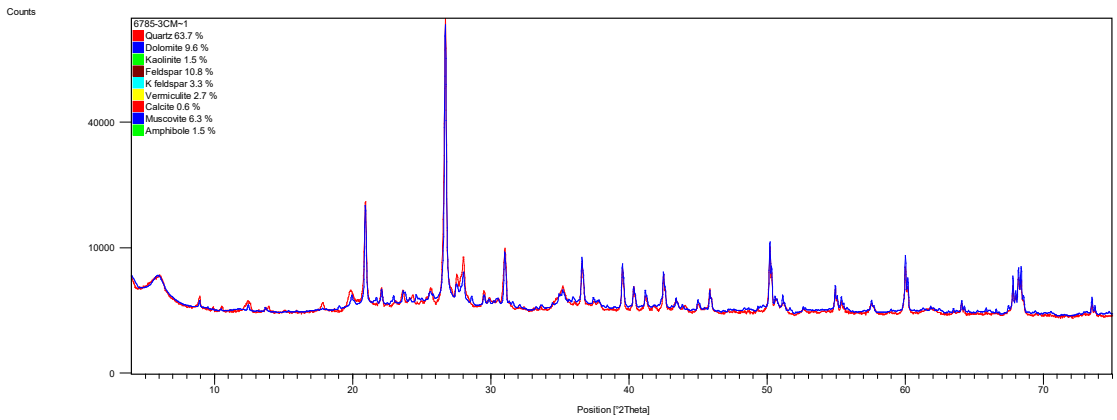
2) Sample 6785-2CM~1



Phase	Formula	%
Quartz	SiO2	72.2
Feldspar	(Na,Ca)(Si,Al)4O8	13.0
K-feldspar	KAlSi3O8	4.0
Mica	KAl2(Si3Al)O10(OH,F)2	6.3
Chlorite/Vermiculite	(Mg,Fe)5Al(Si3Al)O10(OH)8	1.7
Amphibole		1.2
Kaolinite	Al2Si2O5(OH)4	1.5

Figure 2 – Results of X-ray diffraction - 6785-2CM~1

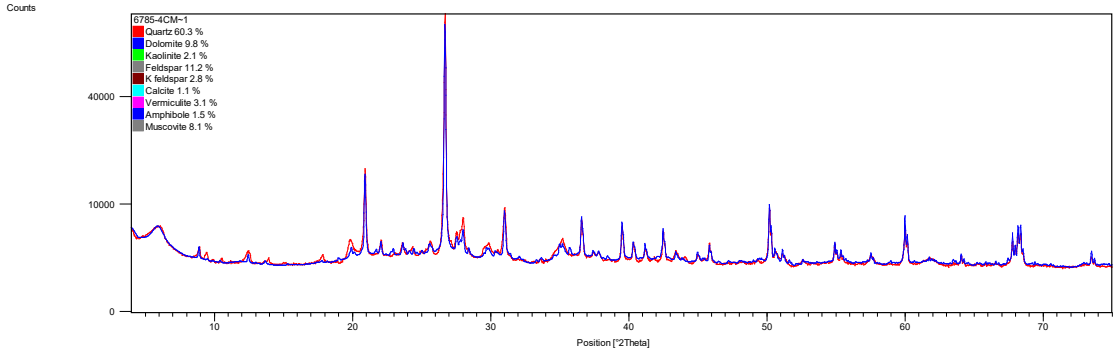
3) Sample 6785-3CM~1



Phase	Formula	%
Quartz	SiO2	63.7
Feldspar	(Na,Ca)(Si,Al)4O8	10.8
K-feldspar	KAlSi3O8	3.3
Mica	KAl2(Si3Al)O10(OH,F)2	6.3
Chlorite/Vermiculite	(Mg,Fe)5Al(Si3Al)O10(OH)8	2.7
Calcite	CaCO3	0.6
Dolomite	CaMg(CO3)2	9.6
Amphibole		1.5
Kaolinite	Al2Si2O5(OH)4	2.1

Figure 3 – Results of X-ray diffraction - 6785-3CM~1

4) Sample 6785-4CM~1

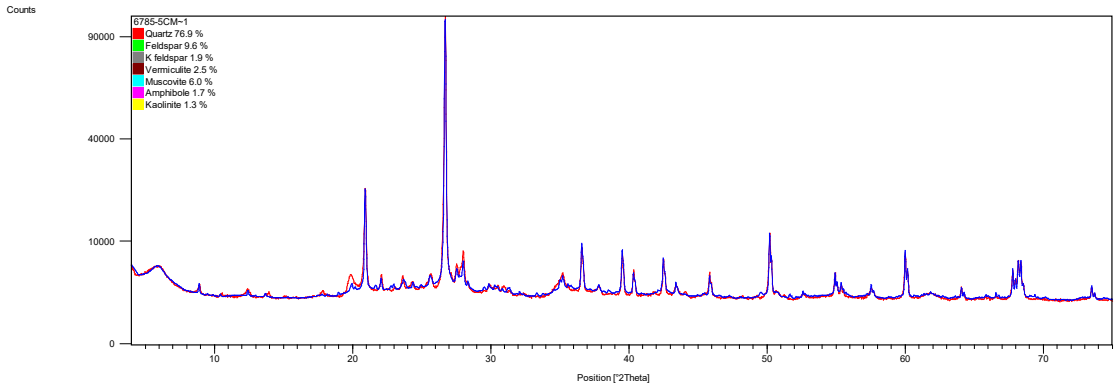


Phase	Formula	%
Quartz	SiO2	60.3
Feldspar	(Na,Ca)(Si,Al)4O8	11.2
K-feldspar	KAlSi3O8	2.8
Mica	KAl2(Si3Al)O10(OH,F)2	8.1
Chlorite/Vermiculite	(Mg,Fe)5Al(Si3Al)O10(OH)8	3.1
Calcite	CaCO3	1.1
Dolomite	CaMg(CO3)2	9.8
Amphibole		1.5
Kaolinite	Al2Si2O5(OH)4	2.1
Talc		p.p.

*p.p. – possible presence

Figure 4 – Results of X-ray diffraction - 6785-4CM~1

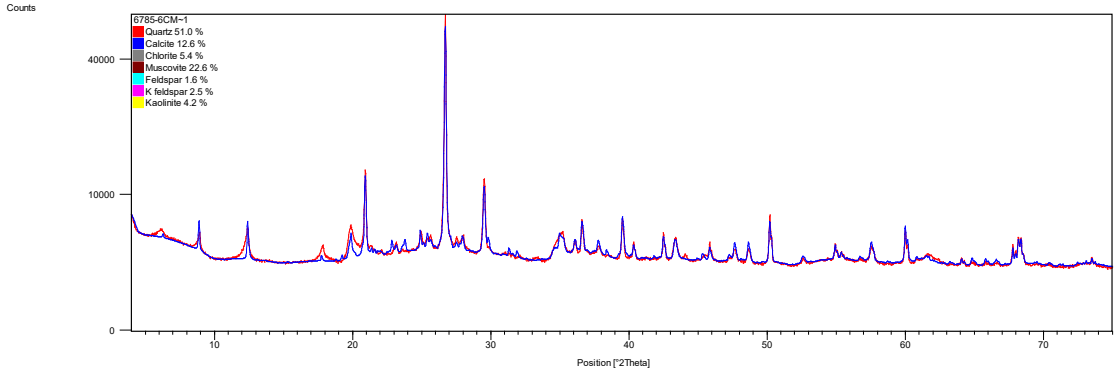
5) Sample 6785-5CM~1



Phase	Formula	%
Quartz	SiO2	76.9
Feldspar	(Na,Ca)(Si,Al)4O8	9.6
K-feldspar	KAlSi3O8	1.9
Mica	KAl2(Si3Al)O10(OH,F)2	6.0
Chlorite/Vermiculite	(Mg,Fe)5Al(Si3Al)O10(OH)8	2.5
Amphibole		1.7
Kaolinite	Al2Si2O5(OH)4	1.3

Figure 5 – Results of X-ray diffraction - 6785-5CM~1

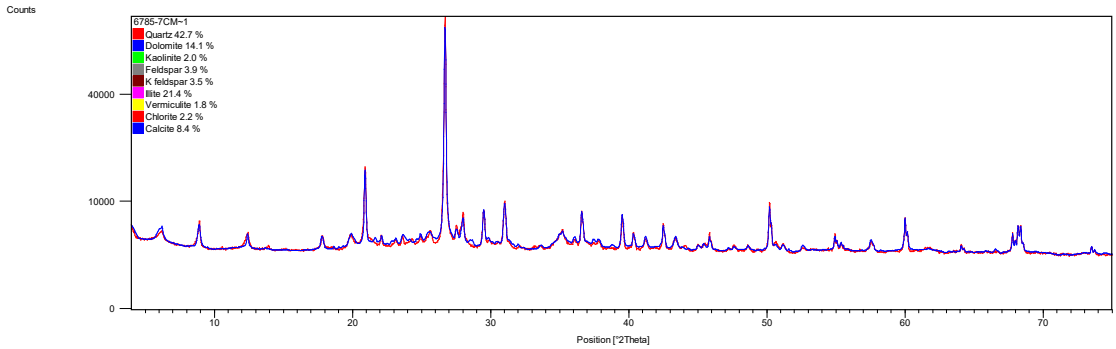
6) Sample 6785-6CM~1



Phase	Formula	%
Quartz	SiO2	51.0
Feldspar	(Na,Ca)(Si,Al)4O8	1.6
K-feldspar	KAlSi3O8	2.5
Mica	KAl2(Si3Al)O10(OH,F)2	22.6
Chlorite/Vermiculite	(Mg,Fe)5Al(Si3Al)O10(OH)8	5.4
Calcite	CaCO3	12.6
Kaolinite	Al2Si2O5(OH)4	4.2

Figure 6 – Results of X-ray diffraction - 6785-6CM~1

7) Sample 6785-7CM~1



Phase	Formula	%
Quartz	SiO2	42.7
Feldspar	(Na,Ca)(Si,Al)4O8	3.9
K-feldspar	KAlSi3O8	3.5
Mica	KAl2(Si3Al)O10(OH,F)2	21.4
Chlorite/Vermiculite	(Mg,Fe)5Al(Si3Al)O10(OH)8	4.0
Calcite	CaCO3	8.4
Dolomite	CaMg(CO3)2	14.1
Kaolinite	Al2Si2O5(OH)4	2.0

Figure 7 – Results of X-ray diffraction - 6785-7CM~1

8) All samples comparison

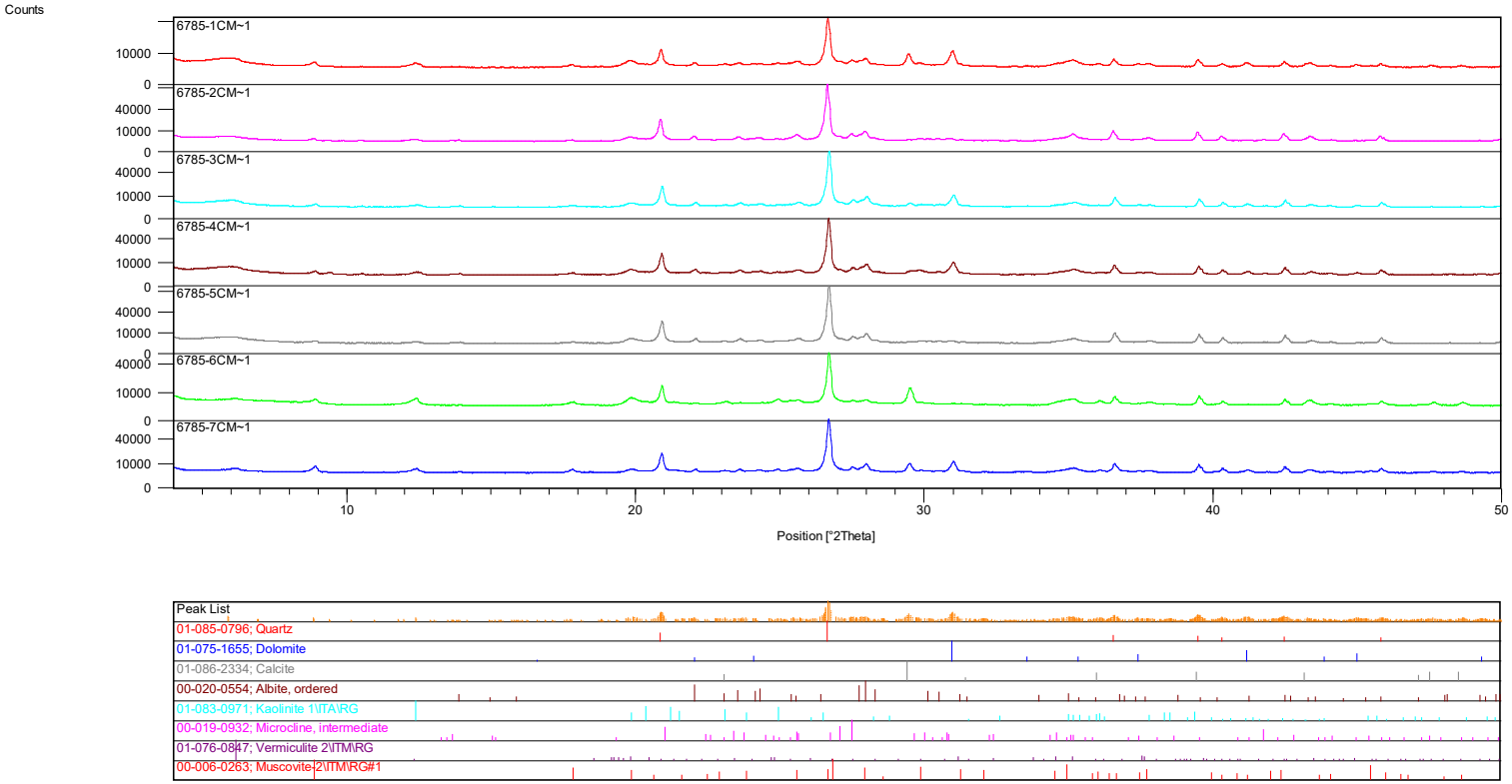


Figure 8 - The comparison of the x-ray diffraction (XRD) results

	%								
	Quartz	Feldspar	K-feldspar	Mica	Chlorite/Vermiculite	Calcite	Dolomite	Amphibole	Kaolinite
Sample									
6785-1CM~1	40.2	4.6	2.1	22.2	4.8	7.3	14.2		4.4
6785-2CM~1	72.2	13.0	4.0	6.3	1.7			1.2	1.5
6785-3CM~1	63.7	10.8	3.3	6.3	2.7	0.6	9.6	1.5	1.5
6785-4CM~1	60.3	11.2	2.8	8.1	3.1	1.1	9.8	1.5	2.1
6785-5CM~1	76.9	9.6	1.9	6.0	2.5			1.7	1.3
6785-6CM~1	51.0	1.6	2.5	22.6	5.4	12.6			4.2
6785-7CM~1	42.7	3.9	3.5	21.4	4.0	8.4	14.1		2.0

IV. Comments

The samples have similar mineralogy, with differences in their proportions, composed mainly of quartz, feldspar, mica, kaolinite, chlorite, vermiculite, dolomite and calcite. In some it was also possible to identify amphibole.
It is necessary to validate the quantification by XRD with other techniques, preferably chemical analysis. The orientation of clay mineral particles affects the XRD intensities of powdered samples. The most clay mineral particles exhibit platy characteristics, and some preparation methods can often produce preferred orientation of clay minerals.

Elaborated by:
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Appendix E

Groundwater Polishing Evaluation Report

Geosyntec consultants

engineers | scientists | innovators

Groundwater Polishing Evaluation Report

Baldwin Power Plant – Fly Ash Pond System

(IEPA ID No. W1578510001-01/02/03)

Prepared for

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Project Number: GLP8068

April 22, 2025

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LIST OF ATTACHMENTS

Attachment A	Potentiometric Surface Maps - August 2-3, 2023
Attachment B	PHREEQC Input File and Thermodynamic Database
Attachment C	Details of Geochemical Model Parameterization
Attachment D	Complete Geochemical Modeling Outputs

ACRONYMS AND ABBREVIATIONS

35 I.A.C.	Title 35 of the Illinois Administrative Code
CAAA	Corrective Actions Alternative Analysis
CCR	Coal combustion residuals
COC	Constituent of concern
FAPS	Fly Ash Pond System
GCSM	Geochemical conceptual site model
GWPS	Groundwater protection standard
IEPA	Illinois Environmental Protection Agency
mg/kg	milligrams per kilogram
PMP	Potential migration pathway
redox	oxidation-reduction
SEP	Sequential extraction procedure
UA	Uppermost aquifer
USEPA	United States Environmental Protection Agency
UU	Upper unit
wt %	percent by weight
XRD	X-ray diffraction

EXECUTIVE SUMMARY

This document has been prepared as an attachment to the Corrective Actions Alternative Analysis (CAAA) prepared by Gradient for the Baldwin Power Plant Fly Ash Pond System (FAPS). The constituents of concern (COCs) addressed in this document are boron and sulfate, which have been identified as having exceedances[1] of the site-specific groundwater protection standards (GWPS) at the time of this analysis. Natural geochemical processes may be appropriate as a "polishing step" for residual plume management after effective source control implementation if there are no risks to receptors and/or the contaminant plume is not expanding (United States Environmental Protection Agency [USEPA] 1999; USEPA 2015). Source control is a major component of every corrective action considered in the CAAA, and there are no risks to human health or the environment at Baldwin FAPS.

Natural groundwater polishing processes, which include both physical and chemical mechanisms, reduce the concentration of COCs in the groundwater. After source control is implemented, a geochemical trailing gradient may form in the subsurface as conditions undergo a return to background water quality which could affect chemical groundwater polishing mechanisms (Savannah River National Laboratory, 2011). This report supports groundwater polishing as a component of the proposed corrective action by evaluating the contribution of chemical mechanisms to groundwater polishing under current conditions and after source control implementation. The groundwater flow and transport model estimated the time to reach the GWPS based on hydraulic properties of the aquifer. The results of this groundwater polishing evaluation contextualize these estimates by evaluating the potential for attenuation of COCs and for previously attenuated COCs to be mobilized to groundwater as groundwater quality returns to background conditions.

Groundwater polishing mechanisms were assessed using speciation and reaction geochemical models: speciation models assess the distribution of constituents between solid and aqueous phases, and reaction models evaluate how that distribution may change with changing site conditions (USEPA 2015). Inputs to the model include geochemically reactive solid mineral phases, compliance well groundwater composition, and background groundwater composition based on site-specific data.

The results of the groundwater polishing evaluation indicate that chemical attenuation of boron and sulfate is feasible under current conditions through sorption to iron and aluminum oxide solids. Barite precipitation is also predicted to contribute to the chemical attenuation of sulfate. Though a small amount of desorption of boron and sulfate is predicted with background groundwater interaction, the impact of the desorption to aqueous boron and sulfate concentrations is negated by interaction with background groundwater that contains lower concentrations of both parameters.

[1] Throughout this document, "exceedance" or "exceedances" is intended to refer only to potential exceedances of proposed applicable background statistics or groundwater protection standards (GWPSs) as described in the proposed groundwater monitoring program which was submitted to the IEPA on October 25, 2021 as part of Dynegy Midwest Generation, LLC's operating permit application for the FAPS. That operating permit application, including the proposed groundwater monitoring program, remains under review by the IEPA and therefore Dynegy Midwest Generation, LLC has not identified any actual exceedances.

Aqueous boron and sulfate concentrations are expected to decrease below the GWPS at all wells in the compliance network post-source control and corrective action. Based on modeling results, remobilization of attenuated boron and sulfate is unlikely to affect the time to reach the GWPS. These results will inform corrective action groundwater monitoring and adaptive site management, critical components every corrective action considered in the CAAA.

1. INTRODUCTION

This document has been prepared as an attachment to the Corrective Actions Alternatives Analysis (CAAA) prepared by Gradient for the Baldwin Power Plant Fly Ash Pond System (FAPS). The purpose of the CAAA is to holistically evaluate potentially viable corrective actions to remediate groundwater and achieve compliance with GWPS for all monitored parameters under Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845.600. The constituents of concern (COCs) addressed in this document are boron and sulfate, which have been identified as having exceedances of the site-specific groundwater protection standards (GWPS) at the time of this analysis. In the CAAA, all corrective actions considered consist of source control and residual plume management. Natural geochemical processes may be appropriate as a "polishing step" for residual plume management after effective source control implementation, if there are no risks to receptors and/or the contaminant plume is not expanding (United States Environmental Protection Agency [USEPA] 1999; USEPA 2015). Source control is a major component of every corrective action considered in the CAAA, and there are no risks to human health or the environment at Baldwin FAPS.[2]

Groundwater polishing processes include both physical and chemical mechanisms within the subsurface which reduce the concentration of COCs in the groundwater. Physical components of groundwater polishing, including advection, dilution, and dispersion, are assessed by groundwater flow and transport modeling (Groundwater Modeling Technical Memorandum[3]). Chemical mechanisms of groundwater polishing include sorption and mineral precipitation. After source control is implemented, a geochemical trailing gradient may form in the subsurface as conditions undergo a return to background water quality which could affect chemical groundwater polishing mechanisms (Savannah River National Laboratory [SRNL], 2011). The chemical mechanisms of groundwater polishing at Baldwin FAPS are evaluated herein using a geochemical modeling-based approach informed by site-specific data. This report uses geochemical modeling to evaluate the influence of chemical mechanisms to groundwater polishing under current conditions and after source control implementation.

The groundwater flow and transport model (Groundwater Modeling Technical Memorandum[4]) estimated the time for boron (as a conservative surrogate) to reach the GWPSs under different potential corrective actions based on physical components of groundwater polishing and did not incorporate any potential chemical controls on chemical distribution. This geochemical modeling effort supports the assessment of groundwater polishing as a component of the proposed corrective action by evaluating the potential for chemical attenuation of COCs before and after source control as a means of contextualizing the times estimated in the flow and transport model. This analysis

[2] The Human Health and Ecological Risk Assessment serves as Appendix A of the CAAA to which this report is attached.
[3] The Groundwater Modeling Technical Memorandum serves as Appendix B of the CAAA Supporting Information Report; the CAAA Supporting Information Report serves as Appendix B of the CAAA to which this report is attached.
[4] Ibid.

also provides an initial foundation for understanding groundwater chemistry to inform adaptive site management as a key component of the Corrective Action Groundwater Monitoring Plan[5].

[5] The Corrective Action Groundwater Monitoring Plan serves as Appendix B.1 to the Construction Permit Application.

2. SITE BACKGROUND

2.1 Site Overview

A thorough overview of general site characteristics is presented in Section 1 of the CAAA to which this document is attached and summarized here. The Baldwin Power Plant is owned by Dynegy Midwest Generation, LLC. The facility is bordered by the village of Baldwin, Illinois to the southeast; Baldwin Road, farmland, and strip-mining areas to the east; Illinois Central Gulf railroad tracks, State Road 154, and scattered residences to the south; the Kaskaskia River to the west; and farmland to the north. The Baldwin FAPS impoundment is located to the south of the Bottom Ash Pond coal combustion residuals (CCR) unit. The FAPS comprised the West Fly Ash Pond, East Fly Ash Pond, and Old East Fly Ash Pond and has been closed in-place since 2020.

A groundwater monitoring network was proposed in the Operating Permit Application (Burns and McDonnell, 2021)[6] in accordance with 35 I.A.C. § 845.630 to monitor groundwater quality which passes the waste boundary as part of the Operating Permit Application to Illinois Environmental Protection Agency (IEPA) for the FAPS unit. The proposed groundwater monitoring network is shown in **Attachment A**. The monitoring network consists of 15 compliance monitoring wells (MW-150, MW-151, MW-152, MW-153, MW-252, MW-253R, MW-350R, MW-352, MW-366, MW-375, MW-377, MW-383, MW-384, MW-390, and MW-391R) and two background wells (MW-304 and MW-358R).

The geology underlying the Site in the vicinity of the FAPS consists of two distinct hydrostratigraphic units (Natural Resource Technology, Inc., 2016):

- **Upper Unit (UU):** The UU underlies the FAPS and consists predominately of clay with silt and minor sand, silt layers, and occasional sand lenses. The UU includes lithologies identified as the Cahokia Formation, Peoria Loess, Equality Formation, and Vandalia Till. Thin sand seams present at the contact between the UU and the Bedrock Unit have been identified as a potential migration pathways (PMP). Due to the presence of clay and only thin and intermittent sand lenses in the UU, this unit is not considered a continuous aquifer unit.
- **Bedrock Unit (UA):** The bedrock unit underlies the UU and is comprised of Pennsylvanian and Mississippian-aged interbedded shale and limestone bedrock. The bedrock unit is considered the uppermost aquifer (UA).

Groundwater in the UU generally flows west and southwest towards the Kaskaskia River. Groundwater within the UA flows southwest to northwest in the eastern section of the FAPS until it reaches a bedrock valley feature to the west of the FAPS at which point the flow direction becomes southwest and follows the bedrock surface. Vertical groundwater migration between the

[6] Illinois Environmental Protection Agency approved the following changes to the proposed network due to evidence of bentonite grout contamination: abandonment of background well MW-306 and replacement of compliance wells MW-253 and MW-350. IEPA was notified on August 16 and September 16, 2024, that MW-391 and MW-358 (respectively) no longer provided representative samples of the uppermost aquifer and would be replaced.

UU PMP and UA varies seasonally and spatially across the site. Vertical migration is generally downward from the UU PMP to the UA, though upward migration has been observed during winter sampling events. A map showing representative UA groundwater flow direction at the site is shown in **Attachment A**.

2.2 Identified Exceedances of the GWPS

The following GWPS exceedances at compliance groundwater monitoring wells likely attributable to the Baldwin FAPS were observed from 2023 Q2 through Q1 2024 (Ramboll 2024):

- Boron – Observed at monitoring wells MW-150 and MW-152.
- Sulfate – Observed at monitoring wells MW-150, MW-152, and MW-366.

The data set for geochemical modeling was finalized after the 2024 Q1 sampling event. Groundwater at these compliance wells is representative of groundwater conditions downgradient of the unit, and samples may be referred to as downgradient groundwater.

GWPS exceedances in the FAPS network occur within the UU PMP (MW-150, MW-152, and MW-252) and UA (MW-366). All wells containing boron or sulfate exceedances are located generally south-southwest of the FAPS unit. Boron and sulfate concentrations at MW-152 exhibit a strong seasonal pattern, with concentrations of both analytes increasing in the fall and decreasing in the spring.

Modeling parameters with observed exceedances is appropriate to the scope of the CAAA. Additionally, the selected remedy will meet the performance standards of 35 I.A.C. § 845.670(d) and the Corrective Action Plan will be submitted to the Agency on or before April 24, 2025. Once implemented and completed, the selected remedy will prevent further releases and minimize the footprint of impacted groundwater until the GWPS are achieved.

2.3 Geochemical Conceptual Site Model

A Geochemical Conceptual Site Model (GCSM)[7] was developed for Baldwin FAPS to describe the geochemical processes that contribute to mobilization and attenuation of constituents in the environment under current conditions, including evaluating whether chemical interactions of COCs with aquifer solids contribute to attenuation of aqueous concentrations at compliance monitoring wells (Geosyntec 2024). This discussion relies on lab reports and raw data previously presented in the Nature and Extent Report submitted to IEPA on April 24, 2024 (Ramboll 2024) in accordance with 35 I.A.C. § 845.650(d)(1) and provided again in as Appendix D of the CAAA to which this report is attached.

The primary source of boron and sulfate to groundwater in the UU PMP and UA within the monitoring network is the FAPS CCR porewater. This finding is based on COC concentrations

[7] The GCSM is a component of the Nature and Extent Report previously submitted to IEPA (Ramboll 2024) and provided with relevant updates as Appendix D of the CAAA to which this report is attached.

within the source and relationships to hydrogeological patterns at the site. Limited variability in pH or redox conditions is observed between upgradient background and downgradient locations.

The observation of pyrite within shaley portions of the UA could provide an additional source of geogenic sulfate to groundwater via pyrite oxidation. Pyrite is not expected to be a stable mineral phase under observed groundwater oxidation-reduction (redox) conditions and sulfate concentrations at background wells are indicative of a potential additional natural source.

Boron and sulfate in the groundwater system may be attenuated via surface complexation reactions with iron and aluminum oxides within portions of the UU PMP and the UA. Conditions within groundwater from both the UU PMP and UA are typically predicted to favor amorphous iron oxide stability at most locations, and the presence of iron-bearing minerals in some site solids supports the occurrence of this mechanism. Crystalline iron oxides (magnetite and hematite) were observed in low abundance (0.2 to 1.4 percent by weight [wt %]) in the UU PMP and UA in X-ray diffraction (XRD) analyses, though given the abundance of iron observed in X-ray fluorescence analysis (0.7 to 7.7 wt %), the majority of iron minerals are expected to exist in non-crystalline or amorphous phases.

Boron may be further attenuated via interactions with clay minerals (e.g., kaolinite), which were observed at notable abundances (1.6 to 41.2 wt %) in solids across both the UU and UA. The observation of gypsum, although limited to the shale bedrock portions of the UA, indicates that precipitation of gypsum may be another potential attenuation mechanism for sulfate at locations near the FAPS and may also act as a geogenic source of sulfate in the event of gypsum dissolution.

The GCSM findings suggest the potential for chemical attenuation of boron and sulfate based on detected abundances of iron oxides, clay minerals, and gypsum, and groundwater redox conditions which are favorable for the stability of these potential sorbing surfaces.

3. GROUNDWATER POLISHING REMEDY EVALUATION

This groundwater polishing evaluation uses geochemical modeling to evaluate chemical attenuation of COCs under current conditions and to predict changes in attenuation at exceedance locations following source control and corrective action to further assess if chemical mechanisms of groundwater polishing will contribute to the remedy achieving the GWPS in a reasonable amount of time. Speciation and reaction models are geochemical models that can be used to evaluate the potential for chemical attenuation in groundwater. Speciation models assess the distribution of constituents between solid and aqueous phases, and reaction models evaluate how that distribution may change with changing site conditions (USEPA 2015). The results of geochemical modeling provide insight into groundwater polishing mechanisms and additional context for the time estimated to reach the GWPS determined by the groundwater flow and transport model[8], which is based on hydraulic properties of the aquifer and does not take into account chemical interactions of boron within the hydrologic unit.

3.1 Methods

Geochemical modeling was done in PHREEQC Version 3 (USGS 2021) using a modified MINETQ v4 thermodynamic database (as described in relevant sections below). The geochemical modeling of groundwater polishing under current conditions and conditions after source control is completed includes speciation and reaction modeling (USEPA 2015):

1. Speciation: To understand groundwater polishing mechanisms under current conditions, a solid phase representative of site conditions is equilibrated with current downgradient groundwater. The results of speciation modeling represent the association of COCs with the solid phase under current conditions through mechanisms such as sorption or precipitation.
2. Reaction: In the reaction modeling, the solid phase generated during the speciation modeling phase is reacted iteratively with background groundwater. These results represent the geochemical conditions expected after the source is controlled during which a trailing geochemical gradient may be created (SRNL 2011). The reactions with background groundwater assess the potential for a trailing geochemical gradient to drive changes in groundwater chemistry. Persistence of elevated groundwater COC concentrations over several reaction iterations suggests a trailing geochemical gradient may affect the time to reach the GWPS.

The equilibrium thermodynamic modeling approach used herein allows that the solid and aqueous phases reach equilibrium during each step. The primary goal of this model is to inform the assessment of groundwater polishing as an appropriate remedy for the site by evaluating dominant geochemical reactions that may occur at time scales relevant to groundwater flow, including adsorption and certain mineral dissolution/precipitation (i.e., iron and aluminum (hydr)oxides,

[8] The Groundwater Modeling Technical Memorandum serves as Appendix B of the CAAA Supporting Information Report; the CAAA Supporting Information Report serves as Appendix B of the CAAA to which this report is attached.

carbonates, and some sulfates) as identified in the GCSM[9]. The model therefore includes those parameters that are expected to contribute to those reactions (as discussed below) and does not include every constituent of the solid phase and groundwater in order to capture "the salient aspects of the system's behavior without introducing unnecessary complexity" (USEPA 2015). This model is therefore a semi-quantitative estimation of chemical behavior in the subsurface rather than a prediction of groundwater quality, consistent with USEPA guidance that geochemical modeling "is often most helpful for identifying relative changes in contaminant speciation and distribution" (USEPA 2015).

3.1.1 Model Set-Up

Inputs to the model include solid phase composition, downgradient groundwater composition for wells with exceedances of boron or sulfate, and background groundwater composition. The PHREEQC input file and modified MINTEQ v4 database are provided in **Attachment B**. The data included for model parameterization is summarized in **Table 1** and discussed in greater detail in **Attachment C**. All data used in the model and discussed below are provided in the Nature and Extent Report[10].

3.1.2 Solid Phase Inputs

Iron hydroxide (ferrihydrite [$Fe(OH)_3$]) and aluminum hydroxide (gibbsite [$Al(OH)_3$]) are wide-spread in the environment and known to act as sorbing phases for many groundwater constituents, including boron and sulfate (Dzombak and Morel 1990; Karamalidis and Dzombak 2010). Model input concentrations for ferrihydrite and gibbsite are ideally derived from sequential extraction procedure (SEP) analyses of iron and aluminum, respectively. Because SEP analyses for aluminum were not completed for Baldwin FAPS samples, and SEP analyses for iron did not include evaluation of the critical amorphous component for Baldwin FAPS samples, model input concentrations for ferrihydrite for Baldwin FAPS were derived using site-specific total metals and an SEP dataset compiled from analogous geological systems as described in greater detail in **Attachment C**. Gibbsite input concentrations for Baldwin FAPS were taken directly from the analogous compiled SEP dataset.

Metal oxide concentrations representing the 25th percentile, median, and 75th percentile of the observed data were used to test the sensitivity of the model to the amount of sorbing phases present. Both ferrihydrite and gibbsite were allowed to dissolve or precipitate in the reaction phase of the model.

Calcite and dolomite were included as mineral phases in the model because carbonate mineral formation and dissolution are often major controls on groundwater pH (Stumm and Morgan 1996; Stackelberg et al. 2020). Calcite and dolomite are present in site aquifer solids, and model input

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[9] The GCSM is a component of the Nature and Extent Report previously submitted to IEPA (Ramboll 2024) and is provided with relevant updates as Appendix D of the CAAA to which this report is attached.

[10] The Nature and Extent Report was previously submitted to IEPA (Ramboll 2024) and is provided with relevant updates as Appendix D of the CAAA to which this report is attached. The Nature and Extent report contains laboratory reports and tabulated results from solid phase analysis and tabulated results from groundwater analyses. Laboratory reports for groundwater data are provided quarterly to IEPA and posted to the facility's operating record in accordance with 35 I.A.C. § 845.800(d)(15).

concentration were based on site-specific XRD results. Both calcite and dolomite were allowed to dissolve or precipitate in the reaction phase of the model.

Barite ($BaSO_4$) and gypsum ($CaSO_4$) are minerals that contain sulfate and have the potential to form under ambient environmental conditions in a timeframe consistent with the remedial effort. These minerals therefore may affect sulfate attenuation. Neither mineral phase was observed in mineralogical results for wells containing GWPS exceedances of COCs; therefore, both were made available to precipitate from the aqueous solution but did not have initial concentrations provided.

3.1.3 Aqueous Phase Inputs

In addition to the COCs, the following parameters are included to capture the expected attenuation and mobilization mechanisms (see **Section 2.3**):

- Temperature, pH and pe[11].
- Major ions: Alkalinity, chloride, fluoride, calcium, magnesium, potassium, and sodium.
- Oxyanions: Silicon and phosphate.
- Redox-active metals: Aluminum, iron, and manganese.
- Remaining constituents regulated under 35 I.A.C. § 845.600[12].

This full suite of geochemical parameters for this model was measured in Quarter 2 and Quarter 3, 2023, and Quarter 4, 2024 for wells MW-304, MW-150 and MW-152; Quarter 1 and Quarter 4, 2024 for wells MW-252 and MW-366; and Quarter 4, 2024, for well MW-358R. For wells with more than one data point available, the medians of the results at each well were used in the model to represent average groundwater interacting with the solid phase. For downgradient wells with exceedances of the COCs (**Section 2.2**), the median for each parameter was calculated for each location individually. For background wells, a single median for each parameter was calculated using data from all both background locations (see **Section 2.1**).

3.2 Results and Discussion

3.2.1 Model Results

Geochemical modeling results are shown on **Figures 1 through 5** below. Current geochemical conditions are represented in model output figures as 'Speciation Model' and subsequent reaction calculation results are represented with 'First Reaction' and 'Second Reaction'. Full modeling results are provided in **Attachment D**.

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[11] See **Attachment C** for details.

[12] Mercury, thallium, total dissolved solids, and radium were not included in the model. Mercury reactions within the environment are highly complex and would require a separate modeling effort, and the high frequency of non-detect concentrations in the groundwater indicate it would not contribute to model outcomes. Thallium forms a non-reactive monovalent cation and is rarely detected in the groundwater and is therefore not expected to contribute to model outcomes. Total dissolved solids are not a chemical parameter, but rather the result of other chemical abundances taken together. Radium is not included in most thermodynamic databases.

Figure 1: Percentage of Sorbed Boron

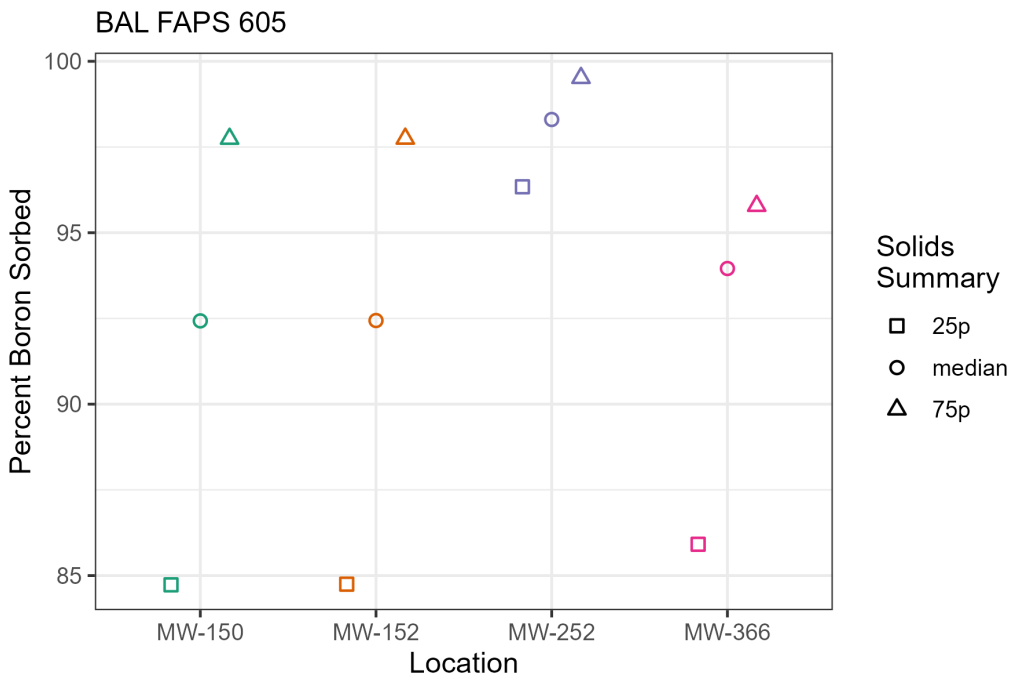


Figure 2: Modeled Boron Behavior

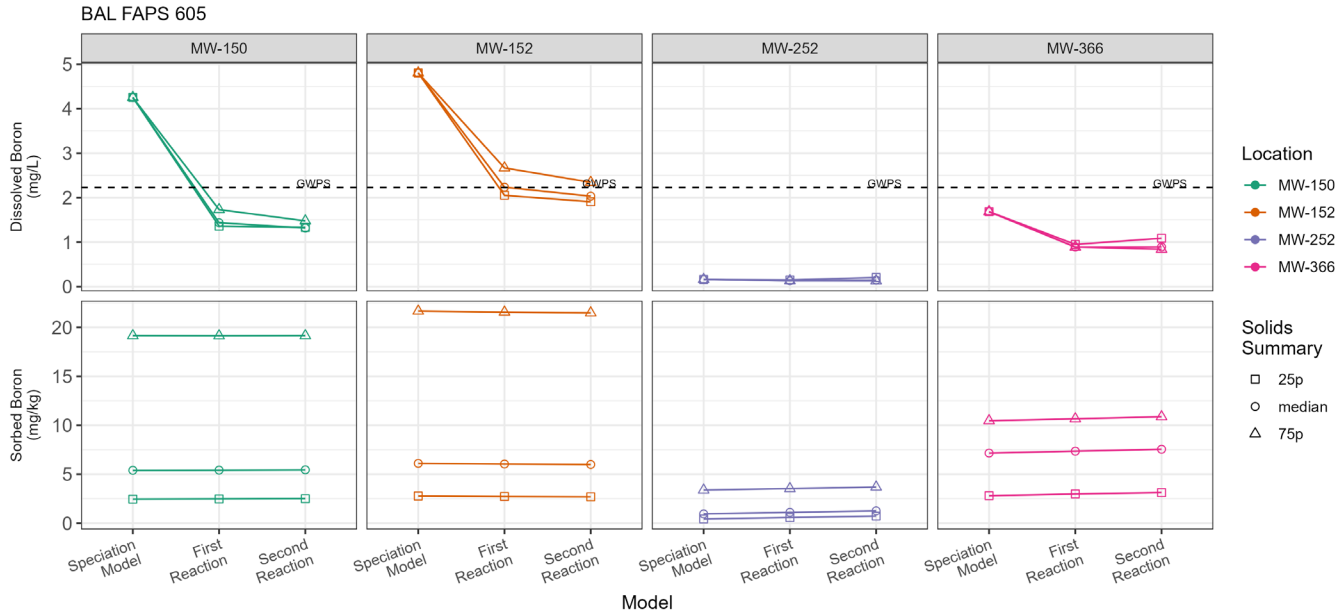


Figure 3: Percentage of Sorbed Sulfate

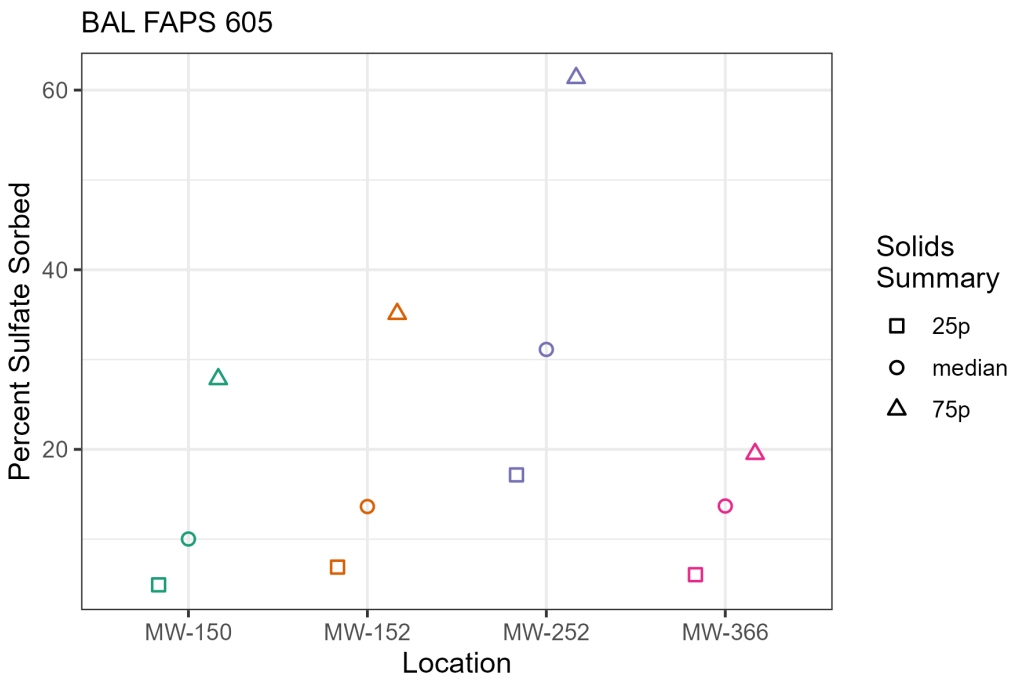


Figure 4: Modeled Sulfate Behavior

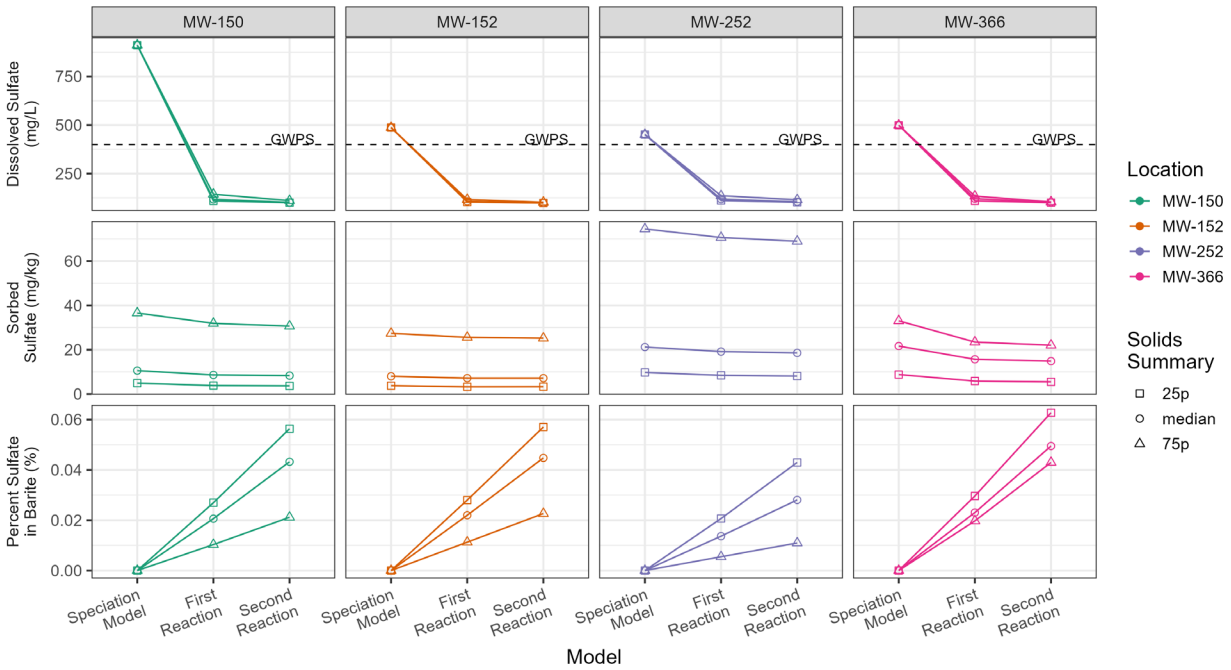
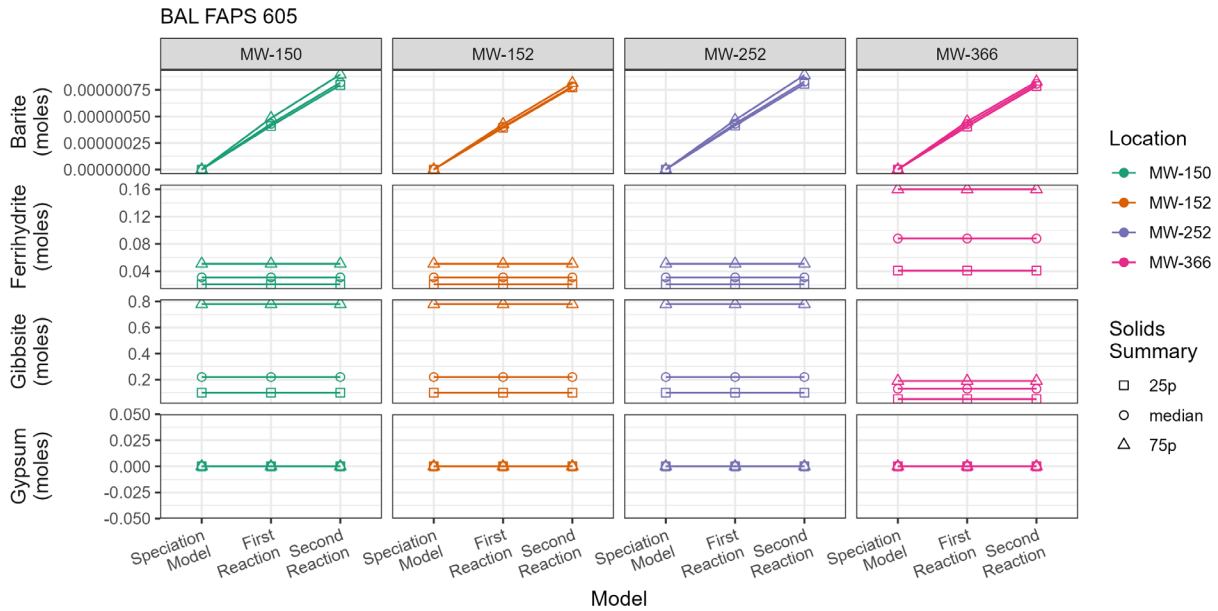


Figure 5: Modeled Sorbing Phase Behavior



3.2.2 Speciation Modeling

Results of the speciation modeling support the determination of the GCSM that chemical attenuation of boron and sulfate is likely. Speciation calculations indicate that at wells with boron exceedances (i.e., MW-150 and MW-152) between 84 and 96% of boron present in (modeled) downgradient compliance well groundwater will sorb to mineral surfaces (**Figure 1**), with most of the predicted sorption associated with the aluminum oxide (gibbsite) phase (**Attachment D**). Sensitivity assessments demonstrate the influence of variable sorbing mineral mass inputs on boron sorption, with the 25th percentile and 75th percentile values for mineral mass accounting for differences of up to 12% of aqueous boron sorbed under current conditions. These predicted percentages of aqueous boron sorbed correspond to sorbed boron masses ranging from approximately 2.5 to 22 milligrams of boron per kilogram of solid (mg/kg) (**Figure 2**). Model results using the median solid-phase inputs yield total sorbed boron masses of approximately 6 mg/kg for all wells with boron exceedances. These results suggest that boron sorption under current geochemical conditions is thermodynamically favorable, although the absolute amount of sorbed boron is somewhat sensitive to the amount of sorbent.

Speciation calculations for sulfate indicate that at wells with sulfate exceedances (i.e., MW-150, MW-152, and MW-366) between 5 and 35% of sulfate present in (modeled) downgradient compliance well groundwater will sorb to mineral surfaces (**Figure 3**). These predicted percentages of aqueous sulfate sorbed correspond to sorbed sulfate masses ranging from approximately 4 to 38 mg/kg (**Figure 4**). Sensitivity assessments demonstrate the influence of variable sorbing mineral mass inputs on sulfate sorption, with the 25th percentile and 75th percentile values for mineral mass accounting for differences of up to 36% of aqueous sulfate sorbed under current conditions. Model results using the median solid-phase inputs yield total sorbed sulfate masses of approximately 10 to 21 mg/kg. Similar results are observed at MW-252, which does not

currently have a sulfate exceedance. These results suggest that sulfate sorption is likely under current geochemical conditions, although the absolute amount of sorbed sulfate is sensitive to the amount of sorbent.

3.2.3 Reaction Modeling

Results of reaction modeling conducted to simulate conditions following source control demonstrate that aqueous boron and sulfate concentrations decrease with background groundwater interaction (**Figure 2, Figure 4**). Little boron desorption is predicted at wells with boron exceedances (MW-150 and MW-152) through two reaction cycles. The impact of this minor desorption on aqueous boron concentrations is negated by the background groundwater which contains less aqueous boron. Well MW-150 is predicted to achieve the boron GWPS after the first reaction and well MW-152 is predicted to achieve the boron GWPS after the second reaction for the median and 25th percentile model scenarios. The decreasing trend of aqueous boron concentrations with iterative reactions at MW-152 indicates that aqueous boron at this location will decrease below the GWPS even at the 75% of sorbent solid mass input given additional reaction time.

Aqueous sulfate concentrations are predicted to decrease at all wells with each iterative reaction (**Figure 4**). Some degree (< 10 mg/kg) of sulfate desorption is predicted with background groundwater interaction, depending on the model scenario. However, the impact of this desorption on aqueous sulfate concentrations is negated because the background groundwater contains less aqueous sulfate. Barite precipitation is predicted in all post-source control scenarios, which provides an additional attenuation mechanism for aqueous sulfate. All modeled wells are predicted to achieve the sulfate GWPS following the first reaction.

Boron and sulfate are predicted to sorb to ferrihydrite and gibbsite. Both minerals are predicted to be stable and exhibit minor (less than 0.01%, **Table 2**) predicted dissolution under post-source control conditions (**Figure 5**). Barite is predicted to precipitate under post-source control conditions in all model scenarios. The predicted stability of sorbing mineral phases and precipitation of barite under post-source control conditions demonstrates the continued feasibility of boron and sulfate chemical attenuation mechanisms in the FAPS.

These results suggest that chemical attenuation of boron and sulfate should remain sustainable following source control efforts. The primary chemical attenuation mechanism for boron is anticipated to be sorption to iron and aluminum oxide mineral phases which are predicted to be stable in post-source control conditions. Chemical attenuation mechanisms for sulfate are expected to include sorption to iron and aluminum oxide minerals and precipitation of barite. Results suggest that the flow and transport model conclusions are approximately correct for boron and sulfate, and that the time to reach the respective GWPS is not anticipated to be affected by desorption of COCs from the solid phase.

4. CONCLUSIONS

This report evaluated the contribution of chemical mechanisms to groundwater polishing via geochemical modeling. The results of the groundwater polishing evaluation also contextualize estimates of the modeled time to reach the GWPS by evaluating potential changes in COC attenuation as groundwater quality returns to background conditions.

Geochemical modeling of current FAPS chemical conditions demonstrates chemical attenuation of boron and sulfate via sorption to aquifer solids, particularly iron and aluminum oxides and (applicable to sulfate only) precipitation of barite. Modeling of anticipated post-source control conditions predicts some desorption of boron and sulfate from solids. However, desorption will be offset by interaction with background groundwater containing low aqueous COC concentrations, resulting in net aqueous boron and sulfate concentration decreases at wells with exceedances. Barite precipitation is predicted under post-source control conditions which will provide an additional attenuation mechanism for sulfate. Modeling also predicts that iron and aluminum oxide sorbing minerals phases will remain stable in post-source control conditions, and as a result this chemical attenuation mechanism will remain viable.

Results of the geochemical modeling suggest that the time to reach the boron and sulfate GWPS determined by the groundwater flow and transport model is not anticipated to be impacted by desorption from aquifer solids under post-source control conditions. The results will inform corrective action groundwater monitoring and adaptive site management, critical components of every corrective action considered in the CAAA.

5. REFERENCES

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TABLES

Table 1. Summary of Geochemical Model Inputs
Groundwater Polishing Evaluation Report
Baldwin Power Plant - Fly Ash Pond System

Model Component	Parameters	Data source(s)
Solid Phase	Iron (hydr)oxides, aluminum (hydr)oxides	Site-specific total metals and X-ray diffraction results from solid samples which were refined using representative results from sequential extraction data
	Calcite and dolomite	X-ray diffraction results
Downgradient groundwater (COC exceedance locations)	Boron, sulfate, iron, manganese, major ions[1], 845 constituents[1]	Median concentrations per well from data collected in Q2 and Q3 2023
Background groundwater		Median concentrations from all network background wells using data collected in Q2 and Q3 2023

[1]See Section 3.1.1.2 for details.

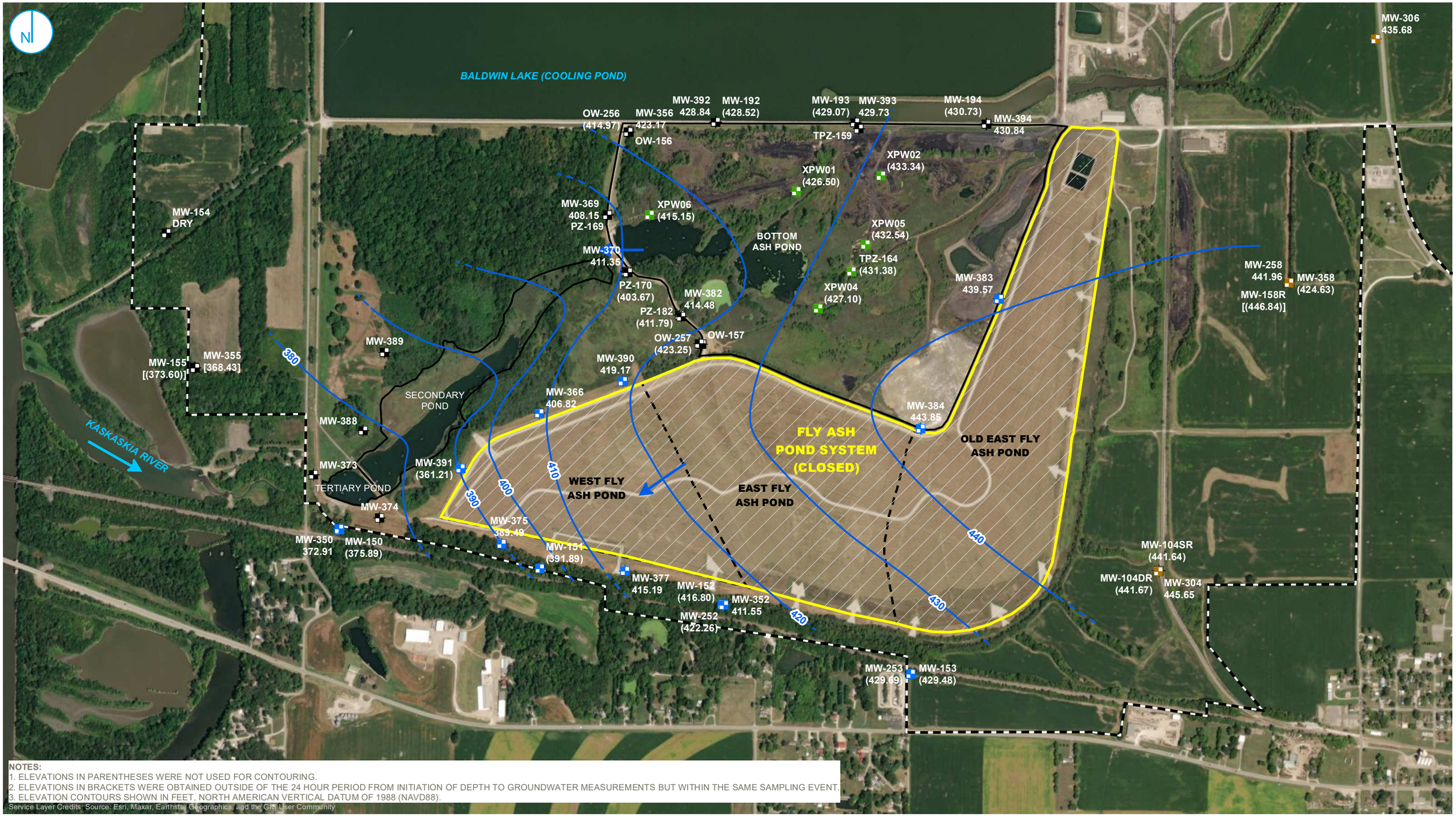
Table 2. Geochemical Modeling Response of Sorbing Phases
Groundwater Polishing Evaluation Report
Baldwin Power Plant - Fly Ash Pond System

Parameter	Hydrostratigraphic Unit	Location	Summary Type	First Reaction Change		Second Reaction Change	
				mg/kg	%	mg/kg	%
Ferrihydrite	PMP	MW-150	25p	0.022	<0.01	0.022	<0.01
			median	0.022	<0.01	0.022	<0.01
			75p	0.022	<0.01	0.022	<0.01
		MW-152	25p	0.022	<0.01	0.022	<0.01
			median	0.022	<0.01	0.022	<0.01
			75p	0.022	<0.01	0.022	<0.01
		MW-252	25p	0.022	<0.01	0.022	<0.01
			median	0.022	<0.01	0.022	<0.01
			75p	0.022	<0.01	0.022	<0.01
	UA	MW-366	25p	0.058	<0.01	0.058	<0.01
			median	0.058	<0.01	0.058	<0.01
			75p	0.058	<0.01	0.058	<0.01
Gibbsite	PMP	MW-150	25p	0.007	<0.01	0.007	<0.01
			median	0.007	<0.01	0.007	<0.01
			75p	0.007	<0.01	0.007	<0.01
		MW-152	25p	0.007	<0.01	0.007	<0.01
			median	0.007	<0.01	0.007	<0.01
			75p	0.007	<0.01	0.007	<0.01
		MW-252	25p	0.007	<0.01	0.007	<0.01
			median	0.007	<0.01	0.007	<0.01
			75p	0.007	<0.01	0.007	<0.01
	UA	MW-366	25p	0.019	<0.01	0.019	<0.01
			median	0.020	<0.01	0.019	<0.01
			75p	0.020	<0.01	0.019	<0.01
Barite	PMP	MW-150	25p	0.010	NA	0.009	93.97
			median	0.010	NA	0.009	90.10
			75p	0.012	NA	0.010	84.69
		MW-152	25p	0.010	NA	0.009	96.53
			median	0.010	NA	0.009	94.33
			75p	0.010	NA	0.009	91.09
		MW-252	25p	0.010	NA	0.010	94.57
			median	0.010	NA	0.010	92.09
			75p	0.011	NA	0.010	90.77
	UA	MW-366	25p	0.026	NA	0.024	94.32
			median	0.027	NA	0.024	88.48
			75p	0.029	NA	0.024	82.94

Notes:
% = percent
25p = 25th percentile
75p = 75th percentile
mg/kg = milligram/kilogram
UA = Uppermost Aquifer
PMP = Potential migration pathways
NA = not applicable

ATTACHMENT A

Potentiometric Surface Maps – August 2-3, 2023



NOTES:
1. ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
2. ELEVATIONS IN BRACKETS WERE OBTAINED OUTSIDE OF THE 24 HOUR PERIOD FROM INITIATION OF DEPTH TO GROUNDWATER MEASUREMENTS BUT WITHIN THE SAME SAMPLING EVENT.
3. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Y:\Mapping\Projects\2222285\MXD\GW_Contours\Round_2023\Baldwin\FAPS_605\BAL 605 FAPS Pot Surface 20230802.mxd

PROJECT: 169000XXXX | DATED: 12/19/2023 | DESIGNER: GALARNMC

- COMPLIANCE MONITORING WELL
- BACKGROUND MONITORING WELL
- PORE WATER WELL
- MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (10-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- CAPPED
- PROPERTY BOUNDARY

0 400 800 Feet

POTENTIOMETRIC SURFACE MAP
AUGUST 2-3, 2023

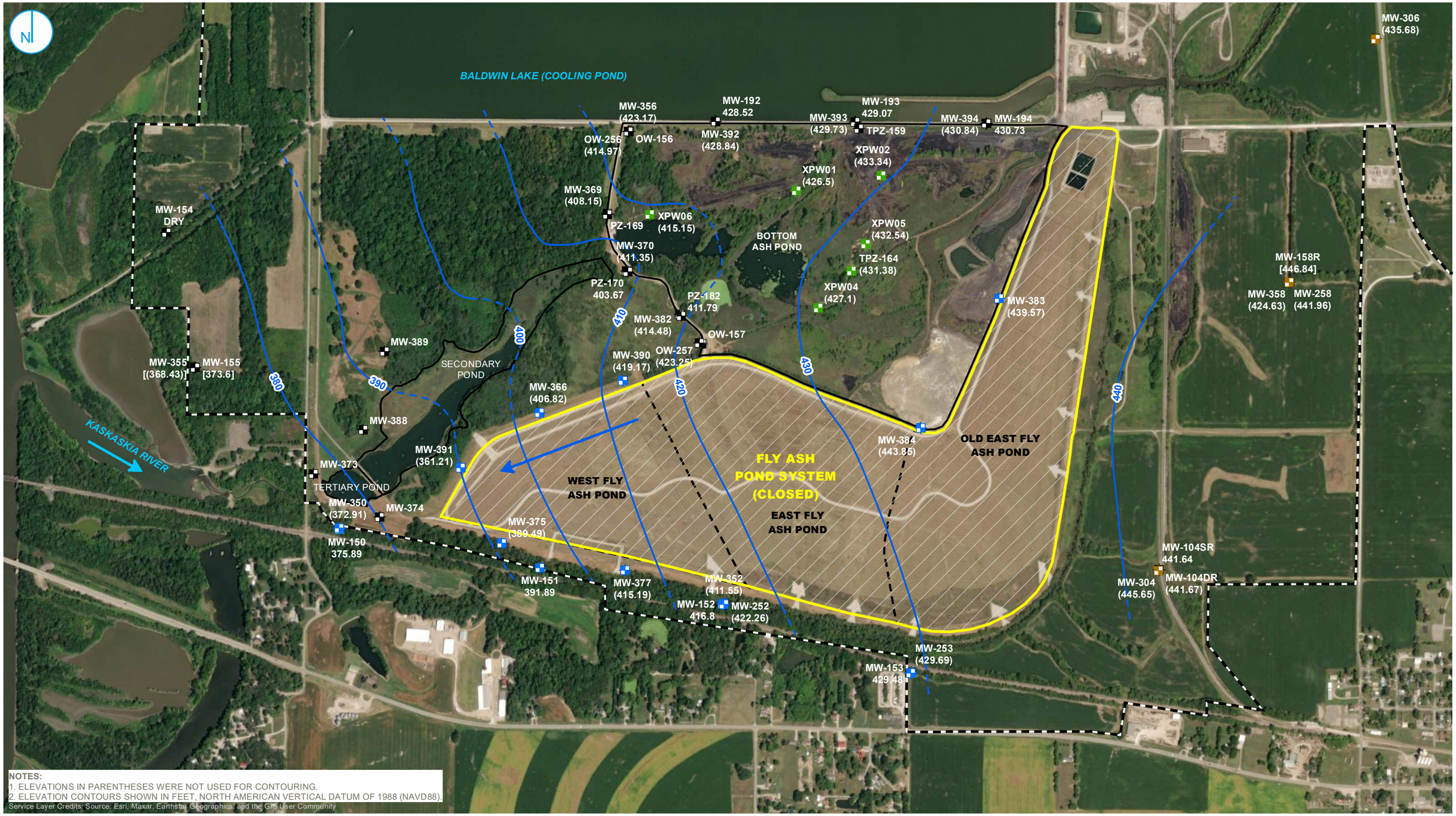
2023 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

Y:\Mapping\Projects\22\2285\MXD\GW_Contours\Round_2023\Baldwin\FAPS_605\BAL 605 FAPS Unlith Pot Surface 20230802.mxd

PROJECT: 169000XXXX | DATED: 12/21/2023 | DESIGNER: GALARNMC



NOTES:
1. ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
2. ELEVATION CONTOURS SHOWN IN FEET, NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
Service Layer Credits: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

- COMPLIANCE MONITORING WELL
- BACKGROUND MONITORING WELL
- MONITORING WELL
- PORE WATER WELL
- GROUNDWATER ELEVATION CONTOUR (10-FT CONTOUR INTERVAL, NAVD88)
- INFERRED GROUNDWATER ELEVATION CONTOUR
- GROUNDWATER FLOW DIRECTION
- REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- CAPPED
- PROPERTY BOUNDARY

0 400 800 Feet

SHALLOW UNLITHIFIED POTENTIOMETRIC SURFACE MAP
AUGUST 2-3, 2023

2023 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT
FLY ASH POND SYSTEM
BALDWIN POWER PLANT
BALDWIN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

ATTACHMENT B

PHREEQC Input Files and Thermodynamic Database

25th Percentile Metal Oxides/No Charge Balance

```
SELECTED_OUTPUT 1
-file BAL_845_605_25p_cb-false_out.csv
-charge_balance true
-percent_error true
-totals S(6) B Li As C(4) Cl F Ca Mg Na K Ba Si P Mn Fe Al Sb Be Cd Cr Co Pb Mo Se Hfo_s
Hfo_w Hao_
-molalities Hfo_wOH Hfo_wOH2+ Hfo_wOHSO4-2 Hfo_wSO4- Hfo_wOSi(OH)3
Hfo_wOSiO(OH)2- Hfo_wHCO3 Hfo_wCO3- Hfo_wPO4-2
Hfo_wHPO4- Hfo_wH2PO4 Hfo_sCO3- Hfo_sHCO3
Hfo_sHPO4- Hfo_sH2BO3 Hfo_sH2PO4 Hfo_sOSi(OH)3
Hfo_sOSiO(OH)2- Hfo_sOHSO4-2 Hfo_sSO4-
Hao_SO4- Hao_OHSO4-2 Hao_H2BO3 Hao_H3BO4-
-equilibrium_phases Ferrihydrite Gibbsite Barite Calcite Dolomite(ordered) Gypsum
-saturation_indices Ferrihydrite Gibbsite Barite Calcite Dolomite(ordered) Gypsum

SOLUTION 1 #MW-150 (C - PMP)
redox pe
units mg/l
density 1
pH 7.055
pe 3.36
temp 13.8
S(6) 911 as SO4
B 4.25
Li 0.0504
As 0.002425
C(4) 194.5 as CO3
Cl 54.5
F 0.725
Ca 204.5
Mg 159
Na 107.9
K 0.8785
Ba 0.0182
Si 9.875
P 0.0275
Mn 0.00315
Fe 0.0383
Al 0.017625
Sb 0.0002
Be 0.0001
Cd 0.000175
Cr 0.00105
Co 0.00005
Pb 0.00115
Mo 0.001675
Se 0.0011
end

SOLUTION 2 #MW-152 (C - PMP)
redox pe
units mg/l
density 1
```

```
pH 6.93
pe 5.81
temp 13.9
S(6) 487 as SO4
B 4.8025
Li 0.006325
As 0.002675
C(4) 236.5 as CO3
Cl 22.5
F 0.35
Ca 162.5
Mg 76.75
Na 117.95
K 1.0285
Ba 0.02485
Si 9.17
P 0.009
Mn 0.01245
Fe 0.008
Al 0.010175
Sb 0.0002
Be 0.00025
Cd 0.000175
Cr 0.00255
Co 0.00095
Pb 0.002
Mo 0.001325
Se 0.00045
end
```

```
SOLUTION 3 #MW-252 (C - PMP)
redox pe
units mg/l
density 1
pH 6.715
pe 3.79
temp 16.6
S(6) 451 as SO4
B 0.1585
Li 0.01265
As 0.002725
C(4) 289 as CO3
Cl 37.5
F 0.23
Ca 217
Mg 85.05
Na 99.45
K 1.785
Ba 0.0368
Si 6.885
P 0.0465
Mn 0.3445
Fe 0.30595
Al 0.0063
```

```
Sb 0.0024
Be 0.0001
Cd 0.000175
Cr 0.00315
Co 0.00205
Pb 0.0019
Mo 0.001325
Se 0.0003
end

SOLUTION 4 #MW-366 (C - UA)
redox pe
units mg/l
density 1
pH 6.865
pe 5.365
temp 14.95
S(6) 499 as SO4
B 1.685
Li 0.006225
As 0.002375
C(4) 187 as CO3
Cl 47.5
F 0.375
Ca 185.5
Mg 80.25
Na 59.25
K 4.05
Ba 0.03265
Si 8.305
P 0.008
Mn 0.0225
Fe 0.008
Al 0.0063
Sb 0.0004
Be 0.0001
Cd 0.000175
Cr 0.000875
Co 0.0017
Pb 0.00115
Mo 0.00305
Se 0.0003
end

EQUILIBRIUM_PHASES 1 #MW-150 (C - PMP) - 25p
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.1
Ferrihydrite 0 0.021
Calcite 0 0.1
Dolomite(ordered) 0 0

SURFACE 1
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
```

```
-equil 1
save surface 1
end

EQUILIBRIUM_PHASES 2 #MW-152 (C - PMP) - 25p
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.1
Ferrihydrite 0 0.021
Calcite 0 0.1
Dolomite(ordered) 0 0

SURFACE 2
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
-equil 2
save surface 2
end

EQUILIBRIUM_PHASES 3 #MW-252 (C - PMP) - 25p
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.1
Ferrihydrite 0 0.021
Calcite 0 0.1
Dolomite(ordered) 0 0

SURFACE 3
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
-equil 3
save surface 3
end

EQUILIBRIUM_PHASES 4 #MW-366 (C - UA) - 25p
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.051
Ferrihydrite 0 0.041
Calcite 0 10
Dolomite(ordered) 0 0

SURFACE 4
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
-equil 4
save surface 4
end

SOLUTION 5 #average background
redox pe
units mg/l
density 1
pH 7.77
pe 4.015
```

```
temp 16.15
S(6) 98.5
B 1.605
Li 0.07785
As 0.004075
C(4) 501.5
Cl 726 charge
F 2.515
Ca 10.635
Mg 4.91
Na 938.5
K 3.305
Ba 0.10605
Si 3.555
P 0.0495
Mn 0.0807
Fe 0.1155
Al 0.0268
Sb 0.0002
Be 0.0001
Cd 0.000175
Cr 0.0012
Co 0.00005
Pb 0.00115
Mo 0.007875
Se 0.0003

SAVE solution 5

end

#FIRST REACTION

#MW-150 (C - PMP) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 1
USE SURFACE 1
SAVE equilibrium_phases 1
SAVE surface 1
end

#MW-150 (C - PMP) - Second Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 1
USE SURFACE 1
SAVE equilibrium_phases 1
SAVE surface 1
end

#MW-152 (C - PMP) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 2
USE SURFACE 2
SAVE equilibrium_phases 2
SAVE surface 2
end

#MW-152 (C - PMP) - Second Reaction
```

```
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 2
USE SURFACE 2
SAVE equilibrium_phases 2
SAVE surface 2
end

#MW-252 (C - PMP) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 3
USE SURFACE 3
SAVE equilibrium_phases 3
SAVE surface 3
end

#MW-252 (C - PMP) - Second Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 3
USE SURFACE 3
SAVE equilibrium_phases 3
SAVE surface 3
end

#MW-366 (C - UA) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 4
USE SURFACE 4
SAVE equilibrium_phases 4
SAVE surface 4
end

#MW-366 (C - UA) - Second Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 4
USE SURFACE 4
SAVE equilibrium_phases 4
SAVE surface 4
end
```

25th Percentile Metal Oxides/Charge Balance on Chloride

```
SELECTED_OUTPUT 1
-file BAL_845_605_25p_cb-true_out.csv
-charge_balance true
-percent_error true
-totals S(6) B Li As C(4) Cl F Ca Mg Na K Ba Si P Mn Fe Al Sb Be Cd Cr Co Pb Mo Se Hfo_s
Hfo_w Hao_
-molalities Hfo_wOH Hfo_wOH2+ Hfo_wOHSO4-2 Hfo_wSO4- Hfo_wOSi(OH)3
Hfo_wOSiO(OH)2- Hfo_wHCO3 Hfo_wCO3- Hfo_wPO4-2
Hfo_wHPO4- Hfo_wH2PO4 Hfo_sCO3- Hfo_sHCO3
Hfo_sHPO4- Hfo_sH2BO3 Hfo_sH2PO4 Hfo_sOSi(OH)3
Hfo_sOSiO(OH)2- Hfo_sOHSO4-2 Hfo_sSO4-
Hao_SO4- Hao_OHSO4-2 Hao_H2BO3 Hao_H3BO4-
-equilibrium_phases Ferrihydrite Gibbsite Barite Calcite Dolomite(ordered) Gypsum
-saturation_indices Ferrihydrite Gibbsite Barite Calcite Dolomite(ordered) Gypsum

SOLUTION 1 #MW-150 (C - PMP)
redox pe
units mg/l
density 1
pH 7.055
pe 3.36
temp 13.8
S(6) 911 as SO4
B 4.25
Li 0.0504
As 0.002425
C(4) 194.5 as CO3
Cl 54.5 charge
F 0.725
Ca 204.5
Mg 159
Na 107.9
K 0.8785
Ba 0.0182
Si 9.875
P 0.0275
Mn 0.00315
Fe 0.0383
Al 0.017625
Sb 0.0002
Be 0.0001
Cd 0.000175
Cr 0.00105
Co 0.00005
Pb 0.00115
Mo 0.001675
Se 0.0011
end

SOLUTION 2 #MW-152 (C - PMP)
redox pe
units mg/l
density 1
```

```
pH 6.93
pe 5.81
temp 13.9
S(6) 487 as SO4
B 4.8025
Li 0.006325
As 0.002675
C(4) 236.5 as CO3
Cl 22.5 charge
F 0.35
Ca 162.5
Mg 76.75
Na 117.95
K 1.0285
Ba 0.02485
Si 9.17
P 0.009
Mn 0.01245
Fe 0.008
Al 0.010175
Sb 0.0002
Be 0.00025
Cd 0.000175
Cr 0.00255
Co 0.00095
Pb 0.002
Mo 0.001325
Se 0.00045
end
SOLUTION 3 #MW-252 (C - PMP)
redox pe
units mg/l
density 1
pH 6.715
pe 3.79
temp 16.6
S(6) 451 as SO4
B 0.1585
Li 0.01265
As 0.002725
C(4) 289 as CO3
Cl 37.5 charge
F 0.23
Ca 217
Mg 85.05
Na 99.45
K 1.785
Ba 0.0368
Si 6.885
P 0.0465
Mn 0.3445
Fe 0.30595
Al 0.0063
```

```
Sb 0.0024
Be 0.0001
Cd 0.000175
Cr 0.00315
Co 0.00205
Pb 0.0019
Mo 0.001325
Se 0.0003
end

SOLUTION 4 #MW-366 (C - UA)
redox pe
units mg/l
density 1
pH 6.865
pe 5.365
temp 14.95
S(6) 499 as SO4
B 1.685
Li 0.006225
As 0.002375
C(4) 187 as CO3
Cl 47.5 charge
F 0.375
Ca 185.5
Mg 80.25
Na 59.25
K 4.05
Ba 0.03265
Si 8.305
P 0.008
Mn 0.0225
Fe 0.008
Al 0.0063
Sb 0.0004
Be 0.0001
Cd 0.000175
Cr 0.000875
Co 0.0017
Pb 0.00115
Mo 0.00305
Se 0.0003
end

EQUILIBRIUM_PHASES 1 #MW-150 (C - PMP) - 25p
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.1
Ferrihydrite 0 0.021
Calcite 0 0.1
Dolomite(ordered) 0 0

SURFACE 1
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
```

```
-equil 1
save surface 1
end

EQUILIBRIUM_PHASES 2 #MW-152 (C - PMP) - 25p
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.1
Ferrihydrite 0 0.021
Calcite 0 0.1
Dolomite(ordered) 0 0

SURFACE 2
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
-equil 2
save surface 2
end

EQUILIBRIUM_PHASES 3 #MW-252 (C - PMP) - 25p
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.1
Ferrihydrite 0 0.021
Calcite 0 0.1
Dolomite(ordered) 0 0

SURFACE 3
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
-equil 3
save surface 3
end

EQUILIBRIUM_PHASES 4 #MW-366 (C - UA) - 25p
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.051
Ferrihydrite 0 0.041
Calcite 0 10
Dolomite(ordered) 0 0

SURFACE 4
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
-equil 4
save surface 4
end

SOLUTION 5 #average background
redox pe
units mg/l
density 1
pH 7.77
pe 4.015
```

```
temp 16.15
S(6) 98.5
B 1.605
Li 0.07785
As 0.004075
C(4) 501.5
Cl 726 charge
F 2.515
Ca 10.635
Mg 4.91
Na 938.5
K 3.305
Ba 0.10605
Si 3.555
P 0.0495
Mn 0.0807
Fe 0.1155
Al 0.0268
Sb 0.0002
Be 0.0001
Cd 0.000175
Cr 0.0012
Co 0.00005
Pb 0.00115
Mo 0.007875
Se 0.0003

SAVE solution 5

end

#FIRST REACTION

#MW-150 (C - PMP) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 1
USE SURFACE 1
SAVE equilibrium_phases 1
SAVE surface 1
end

#MW-150 (C - PMP) - Second Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 1
USE SURFACE 1
SAVE equilibrium_phases 1
SAVE surface 1
end

#MW-152 (C - PMP) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 2
USE SURFACE 2
SAVE equilibrium_phases 2
SAVE surface 2
end

#MW-152 (C - PMP) - Second Reaction
```

```
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 2
USE SURFACE 2
SAVE equilibrium_phases 2
SAVE surface 2
end

#MW-252 (C - PMP) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 3
USE SURFACE 3
SAVE equilibrium_phases 3
SAVE surface 3
end

#MW-252 (C - PMP) - Second Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 3
USE SURFACE 3
SAVE equilibrium_phases 3
SAVE surface 3
end

#MW-366 (C - UA) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 4
USE SURFACE 4
SAVE equilibrium_phases 4
SAVE surface 4
end

#MW-366 (C - UA) - Second Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 4
USE SURFACE 4
SAVE equilibrium_phases 4
SAVE surface 4
end
```

75th Percentile Metal Oxides/No Charge Balance

```
SELECTED_OUTPUT 1
-file BAL_845_605_75p_cb-false_out.csv
-charge_balance true
-percent_error true
-totals S(6) B Li As C(4) Cl F Ca Mg Na K Ba Si P Mn Fe Al Sb Be Cd Cr Co Pb Mo Se Hfo_s
Hfo_w Hao_
-molalities Hfo_wOH Hfo_wOH2+ Hfo_wOHSO4-2 Hfo_wSO4- Hfo_wOSi(OH)3
Hfo_wOSiO(OH)2- Hfo_wHCO3 Hfo_wCO3- Hfo_wPO4-2
Hfo_wHPO4- Hfo_wH2PO4 Hfo_sCO3- Hfo_sHCO3
Hfo_sHPO4- Hfo_sH2BO3 Hfo_sH2PO4 Hfo_sOSi(OH)3
Hfo_sOSiO(OH)2- Hfo_sOHSO4-2 Hfo_sSO4-
Hao_SO4- Hao_OHSO4-2 Hao_H2BO3 Hao_H3BO4-
-equilibrium_phases Ferrihydrite Gibbsite Barite Calcite Dolomite(ordered) Gypsum
-saturation_indices Ferrihydrite Gibbsite Barite Calcite Dolomite(ordered) Gypsum

SOLUTION 1 #MW-150 (C - PMP)
redox pe
units mg/l
density 1
pH 7.055
pe 3.36
temp 13.8
S(6) 911 as SO4
B 4.25
Li 0.0504
As 0.002425
C(4) 194.5 as CO3
Cl 54.5
F 0.725
Ca 204.5
Mg 159
Na 107.9
K 0.8785
Ba 0.0182
Si 9.875
P 0.0275
Mn 0.00315
Fe 0.0383
Al 0.017625
Sb 0.0002
Be 0.0001
Cd 0.000175
Cr 0.00105
Co 0.00005
Pb 0.00115
Mo 0.001675
Se 0.0011
end

SOLUTION 2 #MW-152 (C - PMP)
redox pe
units mg/l
density 1
```

```
pH 6.93
pe 5.81
temp 13.9
S(6) 487 as SO4
B 4.8025
Li 0.006325
As 0.002675
C(4) 236.5 as CO3
Cl 22.5
F 0.35
Ca 162.5
Mg 76.75
Na 117.95
K 1.0285
Ba 0.02485
Si 9.17
P 0.009
Mn 0.01245
Fe 0.008
Al 0.010175
Sb 0.0002
Be 0.00025
Cd 0.000175
Cr 0.00255
Co 0.00095
Pb 0.002
Mo 0.001325
Se 0.00045
end
```

```
SOLUTION 3 #MW-252 (C - PMP)
redox pe
units mg/l
density 1
pH 6.715
pe 3.79
temp 16.6
S(6) 451 as SO4
B 0.1585
Li 0.01265
As 0.002725
C(4) 289 as CO3
Cl 37.5
F 0.23
Ca 217
Mg 85.05
Na 99.45
K 1.785
Ba 0.0368
Si 6.885
P 0.0465
Mn 0.3445
Fe 0.30595
Al 0.0063
```

```
Sb 0.0024
Be 0.0001
Cd 0.000175
Cr 0.00315
Co 0.00205
Pb 0.0019
Mo 0.001325
Se 0.0003
end

SOLUTION 4 #MW-366 (C - UA)
redox pe
units mg/l
density 1
pH 6.865
pe 5.365
temp 14.95
S(6) 499 as SO4
B 1.685
Li 0.006225
As 0.002375
C(4) 187 as CO3
Cl 47.5
F 0.375
Ca 185.5
Mg 80.25
Na 59.25
K 4.05
Ba 0.03265
Si 8.305
P 0.008
Mn 0.0225
Fe 0.008
Al 0.0063
Sb 0.0004
Be 0.0001
Cd 0.000175
Cr 0.000875
Co 0.0017
Pb 0.00115
Mo 0.00305
Se 0.0003
end

EQUILIBRIUM_PHASES 1 #MW-150 (C - PMP) - 75p
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.78
Ferrihydrite 0 0.051
Calcite 0 0.1
Dolomite(ordered) 0 0

SURFACE 1
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
```

```
-equil 1
save surface 1
end

EQUILIBRIUM_PHASES 2 #MW-152 (C - PMP) - 75p
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.78
Ferrihydrite 0 0.051
Calcite 0 0.1
Dolomite(ordered) 0 0

SURFACE 2
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
-equil 2
save surface 2
end

EQUILIBRIUM_PHASES 3 #MW-252 (C - PMP) - 75p
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.78
Ferrihydrite 0 0.051
Calcite 0 0.1
Dolomite(ordered) 0 0

SURFACE 3
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
-equil 3
save surface 3
end

EQUILIBRIUM_PHASES 4 #MW-366 (C - UA) - 75p
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.19
Ferrihydrite 0 0.16
Calcite 0 10
Dolomite(ordered) 0 0

SURFACE 4
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
-equil 4
save surface 4
end

SOLUTION 5 #average background
redox pe
units mg/l
density 1
pH 7.77
pe 4.015
```

```
temp 16.15
S(6) 98.5
B 1.605
Li 0.07785
As 0.004075
C(4) 501.5
Cl 726 charge
F 2.515
Ca 10.635
Mg 4.91
Na 938.5
K 3.305
Ba 0.10605
Si 3.555
P 0.0495
Mn 0.0807
Fe 0.1155
Al 0.0268
Sb 0.0002
Be 0.0001
Cd 0.000175
Cr 0.0012
Co 0.00005
Pb 0.00115
Mo 0.007875
Se 0.0003

SAVE solution 5

end

#FIRST REACTION

#MW-150 (C - PMP) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 1
USE SURFACE 1
SAVE equilibrium_phases 1
SAVE surface 1
end

#MW-150 (C - PMP) - Second Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 1
USE SURFACE 1
SAVE equilibrium_phases 1
SAVE surface 1
end

#MW-152 (C - PMP) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 2
USE SURFACE 2
SAVE equilibrium_phases 2
SAVE surface 2
end

#MW-152 (C - PMP) - Second Reaction
```

```
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 2
USE SURFACE 2
SAVE equilibrium_phases 2
SAVE surface 2
end

#MW-252 (C - PMP) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 3
USE SURFACE 3
SAVE equilibrium_phases 3
SAVE surface 3
end

#MW-252 (C - PMP) - Second Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 3
USE SURFACE 3
SAVE equilibrium_phases 3
SAVE surface 3
end

#MW-366 (C - UA) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 4
USE SURFACE 4
SAVE equilibrium_phases 4
SAVE surface 4
end

#MW-366 (C - UA) - Second Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 4
USE SURFACE 4
SAVE equilibrium_phases 4
SAVE surface 4
end
```

75th Percentile Metal Oxides/Charge Balance on Chloride

```
SELECTED_OUTPUT 1
-file BAL_845_605_75p_cb-true_out.csv
-charge_balance true
-percent_error true
-totals S(6) B Li As C(4) Cl F Ca Mg Na K Ba Si P Mn Fe Al Sb Be Cd Cr Co Pb Mo Se Hfo_s
Hfo_w Hao_
-molalities Hfo_wOH Hfo_wOH2+ Hfo_wOHSO4-2 Hfo_wSO4- Hfo_wOSi(OH)3
Hfo_wOSiO(OH)2- Hfo_wHCO3 Hfo_wCO3- Hfo_wPO4-2
Hfo_wHPO4- Hfo_wH2PO4 Hfo_sCO3- Hfo_sHCO3
Hfo_sHPO4- Hfo_sH2BO3 Hfo_sH2PO4 Hfo_sOSi(OH)3
Hfo_sOSiO(OH)2- Hfo_sOHSO4-2 Hfo_sSO4-
Hao_SO4- Hao_OHSO4-2 Hao_H2BO3 Hao_H3BO4-
-equilibrium_phases Ferrihydrite Gibbsite Barite Calcite Dolomite(ordered) Gypsum
-saturation_indices Ferrihydrite Gibbsite Barite Calcite Dolomite(ordered) Gypsum

SOLUTION 1 #MW-150 (C - PMP)
redox pe
units mg/l
density 1
pH 7.055
pe 3.36
temp 13.8
S(6) 911 as SO4
B 4.25
Li 0.0504
As 0.002425
C(4) 194.5 as CO3
Cl 54.5 charge
F 0.725
Ca 204.5
Mg 159
Na 107.9
K 0.8785
Ba 0.0182
Si 9.875
P 0.0275
Mn 0.00315
Fe 0.0383
Al 0.017625
Sb 0.0002
Be 0.0001
Cd 0.000175
Cr 0.00105
Co 0.00005
Pb 0.00115
Mo 0.001675
Se 0.0011
end

SOLUTION 2 #MW-152 (C - PMP)
redox pe
units mg/l
density 1
```

```
pH 6.93
pe 5.81
temp 13.9
S(6) 487 as SO4
B 4.8025
Li 0.006325
As 0.002675
C(4) 236.5 as CO3
Cl 22.5 charge
F 0.35
Ca 162.5
Mg 76.75
Na 117.95
K 1.0285
Ba 0.02485
Si 9.17
P 0.009
Mn 0.01245
Fe 0.008
Al 0.010175
Sb 0.0002
Be 0.00025
Cd 0.000175
Cr 0.00255
Co 0.00095
Pb 0.002
Mo 0.001325
Se 0.00045
end
SOLUTION 3 #MW-252 (C - PMP)
redox pe
units mg/l
density 1
pH 6.715
pe 3.79
temp 16.6
S(6) 451 as SO4
B 0.1585
Li 0.01265
As 0.002725
C(4) 289 as CO3
Cl 37.5 charge
F 0.23
Ca 217
Mg 85.05
Na 99.45
K 1.785
Ba 0.0368
Si 6.885
P 0.0465
Mn 0.3445
Fe 0.30595
Al 0.0063
```

```
Sb 0.0024
Be 0.0001
Cd 0.000175
Cr 0.00315
Co 0.00205
Pb 0.0019
Mo 0.001325
Se 0.0003
end

SOLUTION 4 #MW-366 (C - UA)
redox pe
units mg/l
density 1
pH 6.865
pe 5.365
temp 14.95
S(6) 499 as SO4
B 1.685
Li 0.006225
As 0.002375
C(4) 187 as CO3
Cl 47.5 charge
F 0.375
Ca 185.5
Mg 80.25
Na 59.25
K 4.05
Ba 0.03265
Si 8.305
P 0.008
Mn 0.0225
Fe 0.008
Al 0.0063
Sb 0.0004
Be 0.0001
Cd 0.000175
Cr 0.000875
Co 0.0017
Pb 0.00115
Mo 0.00305
Se 0.0003
end

EQUILIBRIUM_PHASES 1 #MW-150 (C - PMP) - 75p
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.78
Ferrihydrite 0 0.051
Calcite 0 0.1
Dolomite(ordered) 0 0

SURFACE 1
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
```

```
-equil 1
save surface 1
end

EQUILIBRIUM_PHASES 2 #MW-152 (C - PMP) - 75p
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.78
Ferrihydrite 0 0.051
Calcite 0 0.1
Dolomite(ordered) 0 0

SURFACE 2
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
-equil 2
save surface 2
end

EQUILIBRIUM_PHASES 3 #MW-252 (C - PMP) - 75p
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.78
Ferrihydrite 0 0.051
Calcite 0 0.1
Dolomite(ordered) 0 0

SURFACE 3
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
-equil 3
save surface 3
end

EQUILIBRIUM_PHASES 4 #MW-366 (C - UA) - 75p
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.19
Ferrihydrite 0 0.16
Calcite 0 10
Dolomite(ordered) 0 0

SURFACE 4
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
-equil 4
save surface 4
end

SOLUTION 5 #average background
redox pe
units mg/l
density 1
pH 7.77
pe 4.015
```

```
temp 16.15
S(6) 98.5
B 1.605
Li 0.07785
As 0.004075
C(4) 501.5
Cl 726 charge
F 2.515
Ca 10.635
Mg 4.91
Na 938.5
K 3.305
Ba 0.10605
Si 3.555
P 0.0495
Mn 0.0807
Fe 0.1155
Al 0.0268
Sb 0.0002
Be 0.0001
Cd 0.000175
Cr 0.0012
Co 0.00005
Pb 0.00115
Mo 0.007875
Se 0.0003

SAVE solution 5

end

#FIRST REACTION

#MW-150 (C - PMP) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 1
USE SURFACE 1
SAVE equilibrium_phases 1
SAVE surface 1
end

#MW-150 (C - PMP) - Second Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 1
USE SURFACE 1
SAVE equilibrium_phases 1
SAVE surface 1
end

#MW-152 (C - PMP) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 2
USE SURFACE 2
SAVE equilibrium_phases 2
SAVE surface 2
end

#MW-152 (C - PMP) - Second Reaction
```

```
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 2
USE SURFACE 2
SAVE equilibrium_phases 2
SAVE surface 2
end

#MW-252 (C - PMP) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 3
USE SURFACE 3
SAVE equilibrium_phases 3
SAVE surface 3
end

#MW-252 (C - PMP) - Second Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 3
USE SURFACE 3
SAVE equilibrium_phases 3
SAVE surface 3
end

#MW-366 (C - UA) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 4
USE SURFACE 4
SAVE equilibrium_phases 4
SAVE surface 4
end

#MW-366 (C - UA) - Second Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 4
USE SURFACE 4
SAVE equilibrium_phases 4
SAVE surface 4
end
```

Median Metal Oxides/No Charge Balance

```
SELECTED_OUTPUT 1
-file BAL_845_605_median_cb-false_out.csv
-charge_balance true
-percent_error true
-totals S(6) B Li As C(4) Cl F Ca Mg Na K Ba Si P Mn Fe Al Sb Be Cd Cr Co Pb Mo Se Hfo_s
Hfo_w Hao_
-molalities Hfo_wOH Hfo_wOH2+ Hfo_wOHSO4-2 Hfo_wSO4- Hfo_wOSi(OH)3
Hfo_wOSiO(OH)2- Hfo_wHCO3 Hfo_wCO3- Hfo_wPO4-2
Hfo_wHPO4- Hfo_wH2PO4 Hfo_sCO3- Hfo_sHCO3
Hfo_sHPO4- Hfo_sH2BO3 Hfo_sH2PO4 Hfo_sOSi(OH)3
Hfo_sOSiO(OH)2- Hfo_sOHSO4-2 Hfo_sSO4-
Hao_SO4- Hao_OHSO4-2 Hao_H2BO3 Hao_H3BO4-
-equilibrium_phases Ferrihydrite Gibbsite Barite Calcite Dolomite(ordered) Gypsum
-saturation_indices Ferrihydrite Gibbsite Barite Calcite Dolomite(ordered) Gypsum

SOLUTION 1 #MW-150 (C - PMP)
redox pe
units mg/l
density 1
pH 7.055
pe 3.36
temp 13.8
S(6) 911 as SO4
B 4.25
Li 0.0504
As 0.002425
C(4) 194.5 as CO3
Cl 54.5
F 0.725
Ca 204.5
Mg 159
Na 107.9
K 0.8785
Ba 0.0182
Si 9.875
P 0.0275
Mn 0.00315
Fe 0.0383
Al 0.017625
Sb 0.0002
Be 0.0001
Cd 0.000175
Cr 0.00105
Co 0.00005
Pb 0.00115
Mo 0.001675
Se 0.0011
end

SOLUTION 2 #MW-152 (C - PMP)
redox pe
units mg/l
density 1
```

```
pH 6.93
pe 5.81
temp 13.9
S(6) 487 as SO4
B 4.8025
Li 0.006325
As 0.002675
C(4) 236.5 as CO3
Cl 22.5
F 0.35
Ca 162.5
Mg 76.75
Na 117.95
K 1.0285
Ba 0.02485
Si 9.17
P 0.009
Mn 0.01245
Fe 0.008
Al 0.010175
Sb 0.0002
Be 0.00025
Cd 0.000175
Cr 0.00255
Co 0.00095
Pb 0.002
Mo 0.001325
Se 0.00045
end
SOLUTION 3 #MW-252 (C - PMP)
redox pe
units mg/l
density 1
pH 6.715
pe 3.79
temp 16.6
S(6) 451 as SO4
B 0.1585
Li 0.01265
As 0.002725
C(4) 289 as CO3
Cl 37.5
F 0.23
Ca 217
Mg 85.05
Na 99.45
K 1.785
Ba 0.0368
Si 6.885
P 0.0465
Mn 0.3445
Fe 0.30595
Al 0.0063
```

```
Sb 0.0024
Be 0.0001
Cd 0.000175
Cr 0.00315
Co 0.00205
Pb 0.0019
Mo 0.001325
Se 0.0003
end

SOLUTION 4 #MW-366 (C - UA)
redox pe
units mg/l
density 1
pH 6.865
pe 5.365
temp 14.95
S(6) 499 as SO4
B 1.685
Li 0.006225
As 0.002375
C(4) 187 as CO3
Cl 47.5
F 0.375
Ca 185.5
Mg 80.25
Na 59.25
K 4.05
Ba 0.03265
Si 8.305
P 0.008
Mn 0.0225
Fe 0.008
Al 0.0063
Sb 0.0004
Be 0.0001
Cd 0.000175
Cr 0.000875
Co 0.0017
Pb 0.00115
Mo 0.00305
Se 0.0003
end

EQUILIBRIUM_PHASES 1 #MW-150 (C - PMP) - median
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.22
Ferrihydrite 0 0.031
Calcite 0 0.1
Dolomite(ordered) 0 0

SURFACE 1
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
```

```
-equil 1
save surface 1
end

EQUILIBRIUM_PHASES 2 #MW-152 (C - PMP) - median
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.22
Ferrihydrite 0 0.031
Calcite 0 0.1
Dolomite(ordered) 0 0

SURFACE 2
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
-equil 2
save surface 2
end

EQUILIBRIUM_PHASES 3 #MW-252 (C - PMP) - median
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.22
Ferrihydrite 0 0.031
Calcite 0 0.1
Dolomite(ordered) 0 0

SURFACE 3
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
-equil 3
save surface 3
end

EQUILIBRIUM_PHASES 4 #MW-366 (C - UA) - median
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.13
Ferrihydrite 0 0.088
Calcite 0 10
Dolomite(ordered) 0 0

SURFACE 4
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
-equil 4
save surface 4
end

SOLUTION 5 #average background
redox pe
units mg/l
density 1
pH 7.77
pe 4.015
```

```
temp 16.15
S(6) 98.5
B 1.605
Li 0.07785
As 0.004075
C(4) 501.5
Cl 726 charge
F 2.515
Ca 10.635
Mg 4.91
Na 938.5
K 3.305
Ba 0.10605
Si 3.555
P 0.0495
Mn 0.0807
Fe 0.1155
Al 0.0268
Sb 0.0002
Be 0.0001
Cd 0.000175
Cr 0.0012
Co 0.00005
Pb 0.00115
Mo 0.007875
Se 0.0003

SAVE solution 5

end

#FIRST REACTION

#MW-150 (C - PMP) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 1
USE SURFACE 1
SAVE equilibrium_phases 1
SAVE surface 1
end

#MW-150 (C - PMP) - Second Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 1
USE SURFACE 1
SAVE equilibrium_phases 1
SAVE surface 1
end

#MW-152 (C - PMP) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 2
USE SURFACE 2
SAVE equilibrium_phases 2
SAVE surface 2
end

#MW-152 (C - PMP) - Second Reaction
```

```
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 2
USE SURFACE 2
SAVE equilibrium_phases 2
SAVE surface 2
end

#MW-252 (C - PMP) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 3
USE SURFACE 3
SAVE equilibrium_phases 3
SAVE surface 3
end

#MW-252 (C - PMP) - Second Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 3
USE SURFACE 3
SAVE equilibrium_phases 3
SAVE surface 3
end

#MW-366 (C - UA) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 4
USE SURFACE 4
SAVE equilibrium_phases 4
SAVE surface 4
end

#MW-366 (C - UA) - Second Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 4
USE SURFACE 4
SAVE equilibrium_phases 4
SAVE surface 4
end
```

Median Metal Oxides/Charge Balance on Chloride

```
SELECTED_OUTPUT 1
-file BAL_845_605_median_cb-true_out.csv
-charge_balance true
-percent_error true
-totals S(6) B Li As C(4) Cl F Ca Mg Na K Ba Si P Mn Fe Al Sb Be Cd Cr Co Pb Mo Se Hfo_s
Hfo_w Hao_
-molalities Hfo_wOH Hfo_wOH2+ Hfo_wOHSO4-2 Hfo_wSO4- Hfo_wOSi(OH)3
Hfo_wOSiO(OH)2- Hfo_wHCO3 Hfo_wCO3- Hfo_wPO4-2
Hfo_wHPO4- Hfo_wH2PO4 Hfo_sCO3- Hfo_sHCO3
Hfo_sHPO4- Hfo_sH2BO3 Hfo_sH2PO4 Hfo_sOSi(OH)3
Hfo_sOSiO(OH)2- Hfo_sOHSO4-2 Hfo_sSO4-
Hao_SO4- Hao_OHSO4-2 Hao_H2BO3 Hao_H3BO4-
-equilibrium_phases Ferrihydrite Gibbsite Barite Calcite Dolomite(ordered) Gypsum
-saturation_indices Ferrihydrite Gibbsite Barite Calcite Dolomite(ordered) Gypsum

SOLUTION 1 #MW-150 (C - PMP)
redox pe
units mg/l
density 1
pH 7.055
pe 3.36
temp 13.8
S(6) 911 as SO4
B 4.25
Li 0.0504
As 0.002425
C(4) 194.5 as CO3
Cl 54.5 charge
F 0.725
Ca 204.5
Mg 159
Na 107.9
K 0.8785
Ba 0.0182
Si 9.875
P 0.0275
Mn 0.00315
Fe 0.0383
Al 0.017625
Sb 0.0002
Be 0.0001
Cd 0.000175
Cr 0.00105
Co 0.00005
Pb 0.00115
Mo 0.001675
Se 0.0011
end

SOLUTION 2 #MW-152 (C - PMP)
redox pe
units mg/l
density 1
```

```
pH 6.93
pe 5.81
temp 13.9
S(6) 487 as SO4
B 4.8025
Li 0.006325
As 0.002675
C(4) 236.5 as CO3
Cl 22.5 charge
F 0.35
Ca 162.5
Mg 76.75
Na 117.95
K 1.0285
Ba 0.02485
Si 9.17
P 0.009
Mn 0.01245
Fe 0.008
Al 0.010175
Sb 0.0002
Be 0.00025
Cd 0.000175
Cr 0.00255
Co 0.00095
Pb 0.002
Mo 0.001325
Se 0.00045
end
SOLUTION 3 #MW-252 (C - PMP)
redox pe
units mg/l
density 1
pH 6.715
pe 3.79
temp 16.6
S(6) 451 as SO4
B 0.1585
Li 0.01265
As 0.002725
C(4) 289 as CO3
Cl 37.5 charge
F 0.23
Ca 217
Mg 85.05
Na 99.45
K 1.785
Ba 0.0368
Si 6.885
P 0.0465
Mn 0.3445
Fe 0.30595
Al 0.0063
```

```
Sb 0.0024
Be 0.0001
Cd 0.000175
Cr 0.00315
Co 0.00205
Pb 0.0019
Mo 0.001325
Se 0.0003
end

SOLUTION 4 #MW-366 (C - UA)
redox pe
units mg/l
density 1
pH 6.865
pe 5.365
temp 14.95
S(6) 499 as SO4
B 1.685
Li 0.006225
As 0.002375
C(4) 187 as CO3
Cl 47.5 charge
F 0.375
Ca 185.5
Mg 80.25
Na 59.25
K 4.05
Ba 0.03265
Si 8.305
P 0.008
Mn 0.0225
Fe 0.008
Al 0.0063
Sb 0.0004
Be 0.0001
Cd 0.000175
Cr 0.000875
Co 0.0017
Pb 0.00115
Mo 0.00305
Se 0.0003
end

EQUILIBRIUM_PHASES 1 #MW-150 (C - PMP) - median
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.22
Ferrihydrite 0 0.031
Calcite 0 0.1
Dolomite(ordered) 0 0

SURFACE 1
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
```

```
-equil 1
save surface 1
end

EQUILIBRIUM_PHASES 2 #MW-152 (C - PMP) - median
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.22
Ferrihydrite 0 0.031
Calcite 0 0.1
Dolomite(ordered) 0 0

SURFACE 2
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
-equil 2
save surface 2
end

EQUILIBRIUM_PHASES 3 #MW-252 (C - PMP) - median
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.22
Ferrihydrite 0 0.031
Calcite 0 0.1
Dolomite(ordered) 0 0

SURFACE 3
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
-equil 3
save surface 3
end

EQUILIBRIUM_PHASES 4 #MW-366 (C - UA) - median
Barite 0 0
Gypsum 0 0
Gibbsite 0 0.13
Ferrihydrite 0 0.088
Calcite 0 10
Dolomite(ordered) 0 0

SURFACE 4
Hfo_wOH Ferrihydrite equilibrium_phase 0.2 53400
Hfo_sOH Ferrihydrite equilibrium_phase 0.005 53400
Hao_OH Gibbsite equilibrium_phase 0.033 2496
-equil 4
save surface 4
end

SOLUTION 5 #average background
redox pe
units mg/l
density 1
pH 7.77
pe 4.015
```

```
temp 16.15
S(6) 98.5
B 1.605
Li 0.07785
As 0.004075
C(4) 501.5
Cl 726 charge
F 2.515
Ca 10.635
Mg 4.91
Na 938.5
K 3.305
Ba 0.10605
Si 3.555
P 0.0495
Mn 0.0807
Fe 0.1155
Al 0.0268
Sb 0.0002
Be 0.0001
Cd 0.000175
Cr 0.0012
Co 0.00005
Pb 0.00115
Mo 0.007875
Se 0.0003

SAVE solution 5

end

#FIRST REACTION

#MW-150 (C - PMP) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 1
USE SURFACE 1
SAVE equilibrium_phases 1
SAVE surface 1
end

#MW-150 (C - PMP) - Second Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 1
USE SURFACE 1
SAVE equilibrium_phases 1
SAVE surface 1
end

#MW-152 (C - PMP) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 2
USE SURFACE 2
SAVE equilibrium_phases 2
SAVE surface 2
end

#MW-152 (C - PMP) - Second Reaction
```

```
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 2
USE SURFACE 2
SAVE equilibrium_phases 2
SAVE surface 2
end

#MW-252 (C - PMP) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 3
USE SURFACE 3
SAVE equilibrium_phases 3
SAVE surface 3
end

#MW-252 (C - PMP) - Second Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 3
USE SURFACE 3
SAVE equilibrium_phases 3
SAVE surface 3
end

#MW-366 (C - UA) - First Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 4
USE SURFACE 4
SAVE equilibrium_phases 4
SAVE surface 4
end

#MW-366 (C - UA) - Second Reaction
USE SOLUTION 5
USE EQUILIBRIUM_PHASES 4
USE SURFACE 4
SAVE equilibrium_phases 4
SAVE surface 4
end
```

Database

```
#$Id: minteq.v4.dat 12387 2017-02-09 16:41:47Z dlpark $
SOLUTION_MASTER_SPECIES
Alkalinity CO3-2 2.0 HCO3 61.0173
E e- 0 0 0
O H2O 0 O 16.00
O(-2) H2O 0 O
O(0) O2 0 O
Ag Ag+ 0.0 Ag 107.868
Al Al+3 0.0 Al 26.9815
As H3AsO4 -1.0 As 74.9216
As(3) H3AsO3 0.0 As
As(5) H3AsO4 -1.0 As
B H3BO3 0.0 B 10.81
Ba Ba+2 0.0 Ba 137.33
Be Be+2 0.0 Be 9.0122
Br Br- 0.0 Br 79.904
C CO3-2 2.0 CO3 12.0111
C(4) CO3-2 2.0 CO3 12.0111
Cyanide Cyanide- 1.0 Cyanide 26.0177
Dom_a Dom_a 0.0 C 12.0111
Dom_b Dom_b 0.0 C 12.0111
Dom_c Dom_c 0.0 C 12.0111
Ca Ca+2 0.0 Ca 40.078
Cd Cd+2 0.0 Cd 112.41
Cl Cl- 0.0 Cl 35.453
Co Co+3 -1.0 Co 58.9332
Co(2) Co+2 0.0 Co
Co(3) Co+3 -1.0 Co
Cr CrO4-2 1.0 Cr 51.996
Cr(2) Cr+2 0.0 Cr
Cr(3) Cr(OH)2+ 0.0 Cr
Cr(6) CrO4-2 1.0 Cr
Cu Cu+2 0.0 Cu 63.546
Cu(1) Cu+ 0.0 Cu
Cu(2) Cu+2 0.0 Cu
F F- 0.0 F 18.9984
Fe Fe+3 -2.0 Fe 55.847
Fe(2) Fe+2 0.0 Fe
Fe(3) Fe+3 -2.0 Fe
H H+ -1.0 H 1.0079
H(0) H2 0 H
H(1) H+ -1.0 H
Hg Hg(OH)2 0.0 Hg 200.59
Hg(0) Hg 0.0 Hg
Hg(1) Hg2+2 0.0 Hg
Hg(2) Hg(OH)2 0.0 Hg
I I- 0.0 I 126.904
K K+ 0.0 K 39.0983
Li Li+ 0.0 Li 6.941
Mg Mg+2 0.0 Mg 24.305
Mn Mn+3 0.0 Mn 54.938
```

Mn(2) Mn+2 0.0 Mn
Mn(3) Mn+3 0.0 Mn
Mn(6) MnO4-2 0.0 Mn
Mn(7) MnO4- 0.0 Mn
Mo MoO4-2 0.0 Mo 95.94
N NO3- 0.0 N 14.0067
N(-3) NH4+ 0.0 N
N(3) NO2- 0.0 N
N(5) NO3- 0.0 N
Na Na+ 0.0 Na 22.9898
Ni Ni+2 0.0 Ni 58.69
P PO4-3 2.0 P 30.9738
Pb Pb+2 0.0 Pb 207.2
S SO4-2 0.0 SO4 32.066
S(-2) HS- 1.0 S
#S(0) S 0.0 S
S(6) SO4-2 0.0 SO4
Sb Sb(OH)6- 0.0 Sb 121.75
Sb(3) Sb(OH)3 0.0 Sb
Sb(5) Sb(OH)6- 0.0 Sb
Se SeO4-2 0.0 Se 78.96
Se(-2) HSe- 0.0 Se
Se(4) HSeO3- 0.0 Se
Se(6) SeO4-2 0.0 Se
Si H4SiO4 0.0 SiO2 28.0843
Sn Sn(OH)6-2 0.0 Sn 118.71
Sn(2) Sn(OH)2 0.0 Sn
Sn(4) Sn(OH)6-2 0.0 Sn
Sr Sr+2 0.0 Sr 87.62
Tl Tl(OH)3 0.0 Tl 204.383
Tl(1) Tl+ 0.0 Tl
Tl(3) Tl(OH)3 0.0 Tl
U UO2+2 0.0 U 238.029
U(3) U+3 0.0 U
U(4) U+4 -4.0 U
U(5) UO2+ 0.0 U
U(6) UO2+2 0.0 U
V VO2+ -2.0 V 50.94
V(2) V+2 0.0 V
V(3) V+3 -3.0 V
V(4) VO+2 0.0 V
V(5) VO2+ -2.0 V
Zn Zn+2 0.0 Zn 65.39
Benzoate Benzoate- 0.0 121.116 121.116
Phenylacetate Phenylacetate- 0.0 135.142 135.142
Isophthalate Isophthalate-2 0.0 164.117 164.117
Diethylamine Diethylamine 1.0 73.138 73.138
Butylamine Butylamine 1.0 73.138 73.138
Methylamine Methylamine 1.0 31.057 31.057
Dimethylamine Dimethylamine 1.0 45.084 45.084
Hexylamine Hexylamine 1.0 101.192 101.192
Ethylenediamine Ethylenediamine 2.0 60.099 60.099
Propylamine Propylamine 1.0 59.111 59.111
Isopropylamine Isopropylamine 1.0 59.111 59.111

```
Trimethylamine Trimethylamine 1.0 59.111 59.111
Citrate Citrate-3 2.0 189.102 189.102
Nta Nta-3 1.0 188.117 188.117
Edta Edta-4 2.0 288.214 288.214
Propionate Propionate- 1.0 73.072 73.072
Butyrate Butyrate- 1.0 87.098 87.098
Isobutyrate Isobutyrate- 1.0 87.098 87.098
Two_picoline Two_picoline 1.0 93.128 93.128
Three_picoline Three_picoline 1.0 93.128 93.128
Four_picoline Four_picoline 1.0 93.128 93.128
Formate Formate- 0.0 45.018 45.018
Isovalerate Isovalerate- 1.0 101.125 101.125
Valerate Valerate- 1.0 101.125 101.125
Acetate Acetate- 1.0 59.045 59.045
Tartarate Tartarate-2 0.0 148.072 148.072
Glycine Glycine- 1.0 74.059 74.059
Salicylate Salicylate-2 1.0 136.107 136.107
Glutamate Glutamate-2 1.0 145.115 145.115
Phthalate Phthalate-2 1.0 164.117 164.117
SOLUTION_SPECIES
e- = e-
log_k 0
H2O = H2O
log_k 0
Ag+ = Ag+
log_k 0
Al+3 = Al+3
log_k 0
H3AsO4 = H3AsO4
log_k 0
H3BO3 = H3BO3
log_k 0
Ba+2 = Ba+2
log_k 0
Be+2 = Be+2
log_k 0
Br- = Br-
log_k 0
CO3-2 = CO3-2
log_k 0
Cyanide- = Cyanide-
log_k 0
Dom_a = Dom_a
log_k 0
Dom_b = Dom_b
log_k 0
Dom_c = Dom_c
log_k 0
Ca+2 = Ca+2
log_k 0
Cd+2 = Cd+2
log_k 0
Cl- = Cl-
log_k 0
```

Co+3 = Co+3
log_k 0
CrO4-2 = CrO4-2
log_k 0
Cu+2 = Cu+2
log_k 0
F- = F-
log_k 0
Fe+3 = Fe+3
log_k 0
H+ = H+
log_k 0
Hg(OH)2 = Hg(OH)2
log_k 0
I- = I-
log_k 0
K+ = K+
log_k 0
Li+ = Li+
log_k 0
Mg+2 = Mg+2
log_k 0
Mn+3 = Mn+3
log_k 0
MoO4-2 = MoO4-2
log_k 0
NO3- = NO3-
log_k 0
Na+ = Na+
log_k 0
Ni+2 = Ni+2
log_k 0
PO4-3 = PO4-3
log_k 0
Pb+2 = Pb+2
log_k 0
SO4-2 = SO4-2
log_k 0
Sb(OH)6- = Sb(OH)6-
log_k 0
SeO4-2 = SeO4-2
log_k 0
H4SiO4 = H4SiO4
log_k 0
Sn(OH)6-2 = Sn(OH)6-2
log_k 0
Sr+2 = Sr+2
log_k 0
Tl(OH)3 = Tl(OH)3
log_k 0
UO2+2 = UO2+2
log_k 0
VO2+ = VO2+
log_k 0

Benzoate- = Benzoate-
log_k 0
Phenylacetate- = Phenylacetate-
log_k 0
Isophthalate-2 = Isophthalate-2
log_k 0
Zn+2 = Zn+2
log_k 0
Diethylamine = Diethylamine
log_k 0
Butylamine = Butylamine
log_k 0
Methylamine = Methylamine
log_k 0
Dimethylamine = Dimethylamine
log_k 0
Hexylamine = Hexylamine
log_k 0
Ethylenediamine = Ethylenediamine
log_k 0
Propylamine = Propylamine
log_k 0
Isopropylamine = Isopropylamine
log_k 0
Trimethylamine = Trimethylamine
log_k 0
Citrate-3 = Citrate-3
log_k 0
Nta-3 = Nta-3
log_k 0
Edta-4 = Edta-4
log_k 0
Propionate- = Propionate-
log_k 0
Butyrate- = Butyrate-
log_k 0
Isobutyrate- = Isobutyrate-
log_k 0
Two_picoline = Two_picoline
log_k 0
Three_picoline = Three_picoline
log_k 0
Four_picoline = Four_picoline
log_k 0
Formate- = Formate-
log_k 0
Isovalerate- = Isovalerate-
log_k 0
Valerate- = Valerate-
log_k 0
Acetate- = Acetate-
log_k 0
Tartarate-2 = Tartarate-2
log_k 0

```
Glycine- = Glycine-
log_k 0
Salicylate-2 = Salicylate-2
log_k 0
Glutamate-2 = Glutamate-2
log_k 0
Phthalate-2 = Phthalate-2
log_k 0
SOLUTION_SPECIES
Fe+3 + e- = Fe+2
log_k 13.032
delta_h -42.7 kJ
-gamma 0 0
# Id: 2802810
# log K source: Bard85
# Delta H source: Bard85
#T and ionic strength:
H3AsO4 + 2e- + 2H+ = H3AsO3 + H2O
log_k 18.898
delta_h -125.6 kJ
-gamma 0 0
# Id: 600610
# log K source: Bard85
# Delta H source: MTQ3.11
#T and ionic strength:
Sb(OH)6- + 2e- + 3H+ = Sb(OH)3 + 3H2O
log_k 24.31
delta_h 0 kJ
-gamma 0 0
# Id: 7407410
# log K source: Bard85
# Delta H source: MTQ3.11
#T and ionic strength:
UO2+2 + 3e- + 4H+ = U+3 + 2H2O
log_k 0.42
delta_h -42 kJ
-gamma 0 0
# Id: 8908930
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
UO2+2 + 2e- + 4H+ = U+4 + 2H2O
log_k 9.216
delta_h -144.1 kJ
-gamma 0 0
# Id: 8918930
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
UO2+2 + e- = UO2+
log_k 2.785
delta_h -13.8 kJ
-gamma 0 0
# Id: 8928930
```

```
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
e- + Mn+3 = Mn+2
log_k 25.35
delta_h -107.8 kJ
-gamma 0 0
# Id: 4704710
# log K source: Bard85
# Delta H source: MTQ3.11
#T and ionic strength:
Co+3 + e- = Co+2
log_k 32.4
delta_h 0 kJ
-gamma 0 0
# Id: 2002010
# log K source: Bard85
# Delta H source: MTQ3.11
#T and ionic strength:
Cu+2 + e- = Cu+
log_k 2.69
delta_h 6.9 kJ
-gamma 0 0
# Id: 2302310
# log K source: Bard85
# Delta H source: MTQ3.11
#T and ionic strength:
V+3 + e- = V+2
log_k -4.31
delta_h 0 kJ
-gamma 0 0
# Id: 9009010
# log K source: Bard85
# Delta H source: MTQ3.11
#T and ionic strength:
VO+2 + e- + 2H+ = V+3 + H2O
log_k 5.696
delta_h 0 kJ
-gamma 0 0
# Id: 9019020
# log K source: Bard85
# Delta H source: MTQ3.11
#T and ionic strength:
VO2+ + e- + 2H+ = VO+2 + H2O
log_k 16.903
delta_h -122.7 kJ
-gamma 0 0
# Id: 9029030
# log K source: Bard85
# Delta H source: MTQ3.11
#T and ionic strength:
SO4-2 + 9H+ + 8e- = HS- + 4H2O
log_k 33.66
delta_h -60.14 kJ
```

```
-gamma 0 0
# Id: 7307320
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Sn(OH)6-2 + 2e- + 4H+ = Sn(OH)2 + 4H2O
log_k 19.2
delta_h 0 kJ
-gamma 0 0
# Id: 7907910
# log K source: Bard85
# Delta H source: MTQ3.11
#T and ionic strength:
Tl(OH)3 + 2e- + 3H+ = Tl+ + 3H2O
log_k 45.55
delta_h 0 kJ
-gamma 0 0
# Id: 8708710
# log K source: Bard85
# Delta H source: MTQ3.11
#T and ionic strength:
HSeO3- + 6e- + 6H+ = HSe- + 3H2O
log_k 44.86
delta_h 0 kJ
-gamma 0 0
# Id: 7607610
# log K source: Bard85
# Delta H source: MTQ3.11
#T and ionic strength:
SeO4-2 + 2e- + 3H+ = HSeO3- + H2O
log_k 36.308
delta_h -201.2 kJ
-gamma 0 0
# Id: 7617620
# log K source: Bard85
# Delta H source: MTQ3.11
#T and ionic strength:
0.5Hg2+2 + e- = Hg
log_k 6.5667
delta_h -45.735 kJ
-gamma 0 0
# Id: 3600000
# log K source: NIST2.1.1
# Delta H source: NIST2.1.1
#T and ionic strength:

2Hg(OH)2 + 4H+ + 2e- = Hg2+2 + 4H2O
log_k 43.185
delta_h -63.59 kJ
-gamma 0 0
# Id: 3603610
# log K source: Bard85
# Delta H source: MTQ3.11
#T and ionic strength:
```

```
Cr(OH)2+ + 2H+ + e- = Cr+2 + 2H2O
log_k 2.947
delta_h 6.36 kJ
-gamma 0 0
# Id: 2102110
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
CrO4-2 + 6H+ + 3e- = Cr(OH)2+ + 2H2O
log_k 67.376
delta_h -103 kJ
-gamma 0 0
# Id: 2112120
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:

2H2O = O2 + 4H+ + 4e-
# Adjusted for equation to aqueous species
log_k -85.9951
-analytic 38.0229 7.99407E-03 -2.7655e+004 -1.4506e+001 199838.45

2 H+ + 2 e- = H2
log_k -3.15
delta_h -1.759 kcal

NO3- + 2 H+ + 2 e- = NO2- + H2O
log_k 28.570
delta_h -43.760 kcal
-gamma 3.0000 0.0000

NO3- + 10 H+ + 8 e- = NH4+ + 3 H2O
log_k 119.077
delta_h -187.055 kcal
-gamma 2.5000 0.0000

Mn+2 + 4H2O = MnO4- + 8H+ + 5e-
log_k -127.794
delta_h 822.67 kJ
-gamma 3 0
# Id: 4700020
# log K source: NIST2.1.1
# Delta H source: NIST2.1.1
#T and ionic strength:
Mn+2 + 4H2O = MnO4-2 + 8H+ + 4e-
log_k -118.422
delta_h 711.07 kJ
-gamma 5 0
# Id: 4700021
# log K source: NIST2.1.1
# Delta H source: NIST2.1.1
#T and ionic strength:
HS- = S-2 + H+
log_k -17.3
delta_h 49.4 kJ
-gamma 5 0
# Id: 3307301
```

```
# log K source: LMa1987
# Delta H source: NIST2.1.1
#T and ionic strength: 0.00 25.0
HSe- = Se-2 + H+
log_k -15
delta_h 48.116 kJ
-gamma 0 0
# Id: 3307601
# log K source: SCD3.02 (1968 DKa)
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Tl(OH)3 + 3H+ = Tl+3 + 3H2O
log_k 3.291
delta_h 0 kJ
-gamma 0 0
# Id: 8713300
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
0.5Hg2+2 + e- = Hg
log_k 6.5667
delta_h -45.735 kJ
-gamma 0 0
# Id: 3600000
# log K source: NIST2.1.1
# Delta H source: NIST2.1.1
#T and ionic strength:
Hg(OH)2 + 2H+ = Hg+2 + 2H2O
log_k 6.194
delta_h -39.72 kJ
-gamma 0 0
# Id: 3613300
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Cr(OH)2+ + 2H+ = Cr+3 + 2H2O
log_k 9.5688
delta_h -129.62 kJ
-gamma 0 0
# Id: 2113300
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.10 20.0
H2O = OH- + H+
log_k -13.997
delta_h 55.81 kJ
-gamma 3.5 0
# Id: 3300020
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Sn(OH)2 + 2H+ = Sn+2 + 2H2O
log_k 7.094
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 7903301
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Sn(OH)2 + H+ = SnOH+ + H2O
log_k 3.697
delta_h 0 kJ
-gamma 0 0
# Id: 7903302
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Sn(OH)2 + H2O = Sn(OH)3- + H+
log_k -9.497
delta_h 0 kJ
-gamma 0 0
# Id: 7903303
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
2Sn(OH)2 + 2H+ = Sn2(OH)2+2 + 2H2O
log_k 9.394
delta_h 0 kJ
-gamma 0 0
# Id: 7903304
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
3Sn(OH)2 + 2H+ = Sn3(OH)4+2 + 2H2O
log_k 14.394
delta_h 0 kJ
-gamma 0 0
# Id: 7903305
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Sn(OH)2 = HSnO2- + H+
log_k -8.9347
delta_h 0 kJ
-gamma 0 0
# Id: 7903306
# log K source: Bard85
# Delta H source: MTQ3.11
#T and ionic strength:
Sn(OH)6-2 + 6H+ = Sn+4 + 6H2O
log_k 21.2194
delta_h 0 kJ
-gamma 0 0
# Id: 7913301
# log K source: Bard85
# Delta H source: MTQ3.11
#T and ionic strength:
Sn(OH)6-2 = SnO3-2 + 3H2O
```

```
log_k -2.2099
delta_h 0 kJ
-gamma 0 0
# Id: 7913302
# log K source: Bard85
# Delta H source: MTQ3.11
#T and ionic strength:
Pb+2 + H2O = PbOH+ + H+
log_k -7.597
delta_h 0 kJ
-gamma 0 0
# Id: 6003300
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Pb+2 + 2H2O = Pb(OH)2 + 2H+
log_k -17.094
delta_h 0 kJ
-gamma 0 0
# Id: 6003301
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Pb+2 + 3H2O = Pb(OH)3- + 3H+
log_k -28.091
delta_h 0 kJ
-gamma 0 0
# Id: 6003302
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
2Pb+2 + H2O = Pb2OH+3 + H+
log_k -6.397
delta_h 0 kJ
-gamma 0 0
# Id: 6003303
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
3Pb+2 + 4H2O = Pb3(OH)4+2 + 4H+
log_k -23.888
delta_h 115.24 kJ
-gamma 0 0
# Id: 6003304
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Pb+2 + 4H2O = Pb(OH)4-2 + 4H+
log_k -39.699
delta_h 0 kJ
-gamma 0 0
# Id: 6003305
# log K source: MTQ3.11
# Delta H source: MTQ3.11
```

```
#T and ionic strength:
4Pb+2 + 4H2O = Pb4(OH)4+4 + 4H+
log_k -19.988
delta_h 88.24 kJ
-gamma 0 0
# Id: 6003306
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
H3BO3 + F- = BF(OH)3-
log_k -0.399
delta_h 7.7404 kJ
-gamma 2.5 0
# Id: 902700
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
H3BO3 + 2F- + H+ = BF2(OH)2- + H2O
log_k 7.63
delta_h 6.8408 kJ
-gamma 2.5 0
# Id: 902701
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
H3BO3 + 3F- + 2H+ = BF3OH- + 2H2O
log_k 13.22
delta_h -20.4897 kJ
-gamma 2.5 0
# Id: 902702
# log K source: NIST2.1.1
# Delta H source: NIST2.1.1
#T and ionic strength:
Al+3 + H2O = AlOH+2 + H+
log_k -4.997
delta_h 47.81 kJ
-gamma 5.4 0
# Id: 303300
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Al+3 + 2H2O = Al(OH)2+ + 2H+
log_k -10.094
delta_h 0 kJ
-gamma 5.4 0
# Id: 303301
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Al+3 + 3H2O = Al(OH)3 + 3H+
log_k -16.791
delta_h 0 kJ
-gamma 0 0
# Id: 303303
```

```
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Al+3 + 4H2O = Al(OH)4- + 4H+
log_k -22.688
delta_h 173.24 kJ
-gamma 4.5 0
# Id: 303302
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Tl+ + H2O = TlOH + H+
log_k -13.207
delta_h 56.81 kJ
-gamma 0 0
# Id: 8703300
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Tl(OH)3 + 2H+ = TlOH+2 + 2H2O
log_k 2.694
delta_h 0 kJ
-gamma 0 0
# Id: 8713301
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Tl(OH)3 + H+ = Tl(OH)2+ + H2O
log_k 1.897
delta_h 0 kJ
-gamma 0 0
# Id: 8713302
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Tl(OH)3 + H2O = Tl(OH)4- + H+
log_k -11.697
delta_h 0 kJ
-gamma 0 0
# Id: 8713303
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Zn+2 + H2O = ZnOH+ + H+
log_k -8.997
delta_h 55.81 kJ
-gamma 0 0
# Id: 9503300
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Zn+2 + 2H2O = Zn(OH)2 + 2H+
log_k -17.794
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 9503301
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Zn+2 + 3H2O = Zn(OH)3- + 3H+
log_k -28.091
delta_h 0 kJ
-gamma 0 0
# Id: 9503302
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Zn+2 + 4H2O = Zn(OH)4-2 + 4H+
log_k -40.488
delta_h 0 kJ
-gamma 0 0
# Id: 9503303
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Cd+2 + H2O = CdOH+ + H+
log_k -10.097
delta_h 54.81 kJ
-gamma 0 0
# Id: 1603300
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Cd+2 + 2H2O = Cd(OH)2 + 2H+
log_k -20.294
delta_h 0 kJ
-gamma 0 0
# Id: 1603301
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Cd+2 + 3H2O = Cd(OH)3- + 3H+
log_k -32.505
delta_h 0 kJ
-gamma 0 0
# Id: 1603302
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 3.00 25.0
Cd+2 + 4H2O = Cd(OH)4-2 + 4H+
log_k -47.288
delta_h 0 kJ
-gamma 0 0
# Id: 1603303
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
2Cd+2 + H2O = Cd2OH+3 + H+
```

```
log_k -9.397
delta_h 45.81 kJ
-gamma 0 0
# Id: 1603304
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Hg(OH)2 + H+ = HgOH+ + H2O
log_k 2.797
delta_h -18.91 kJ
-gamma 0 0
# Id: 3613302
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Hg(OH)2 + H2O = Hg(OH)3- + H+
log_k -14.897
delta_h 0 kJ
-gamma 0 0
# Id: 3613303
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Cu+2 + H2O = CuOH+ + H+
log_k -7.497
delta_h 35.81 kJ
-gamma 4 0
# Id: 2313300
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Cu+2 + 2H2O = Cu(OH)2 + 2H+
log_k -16.194
delta_h 0 kJ
-gamma 0 0
# Id: 2313301
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Cu+2 + 3H2O = Cu(OH)3- + 3H+
log_k -26.879
delta_h 0 kJ
-gamma 0 0
# Id: 2313302
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
Cu+2 + 4H2O = Cu(OH)4-2 + 4H+
log_k -39.98
delta_h 0 kJ
-gamma 0 0
# Id: 2313303
# log K source: NIST46.3
# Delta H source: MTQ3.11
```

```
#T and ionic strength:  1.00 25.0
2Cu+2 + 2H2O = Cu2(OH)2+2 + 2H+
log_k -10.594
delta_h 76.62 kJ
-gamma 0 0
# Id:  2313304
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  0.00 25.0
Ag+ + H2O = AgOH + H+
log_k -11.997
delta_h 0 kJ
-gamma 0 0
# Id:  203300
# log K source:  NIST46.3
# Delta H source:  MTQ3.11
#T and ionic strength:  0.00 25.0
Ag+ + 2H2O = Ag(OH)2- + 2H+
log_k -24.004
delta_h 0 kJ
-gamma 0 0
# Id:  203301
# log K source:  NIST46.3
# Delta H source:  MTQ3.11
#T and ionic strength:  0.00 25.0
Ni+2 + H2O = NiOH+ + H+
log_k -9.897
delta_h 51.81 kJ
-gamma 0 0
# Id:  5403300
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  0.00 25.0
Ni+2 + 2H2O = Ni(OH)2 + 2H+
log_k -18.994
delta_h 0 kJ
-gamma 0 0
# Id:  5403301
# log K source:  NIST46.3
# Delta H source:  MTQ3.11
#T and ionic strength:  0.00 25.0
Ni+2 + 3H2O = Ni(OH)3- + 3H+
log_k -29.991
delta_h 0 kJ
-gamma 0 0
# Id:  5403302
# log K source:  NIST46.3
# Delta H source:  MTQ3.11
#T and ionic strength:  0.00 25.0
Co+2 + H2O = CoOH+ + H+
log_k -9.697
delta_h 0 kJ
-gamma 0 0
# Id:  2003300
```

```
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Co+2 + 2H2O = Co(OH)2 + 2H+
log_k -18.794
delta_h 0 kJ
-gamma 0 0
# Id: 2003301
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Co+2 + 3H2O = Co(OH)3- + 3H+
log_k -31.491
delta_h 0 kJ
-gamma 0 0
# Id: 2003302
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Co+2 + 4H2O = Co(OH)4-2 + 4H+
log_k -46.288
delta_h 0 kJ
-gamma 0 0
# Id: 2003303
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
2Co+2 + H2O = Co2OH+3 + H+
log_k -10.997
delta_h 0 kJ
-gamma 0 0
# Id: 2003304
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
4Co+2 + 4H2O = Co4(OH)4+4 + 4H+
log_k -30.488
delta_h 0 kJ
-gamma 0 0
# Id: 2003306
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Co+2 + 2H2O = CoOOH- + 3H+
log_k -32.0915
delta_h 260.454 kJ
-gamma 0 0
# Id: 2003305
# log K source: NIST2.1.1
# Delta H source: MTQ3.11
#T and ionic strength:
Co+3 + H2O = CoOH+2 + H+
log_k -1.291
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 2013300
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 3.00 25.0
Fe+2 + H2O = FeOH+ + H+
log_k -9.397
delta_h 55.81 kJ
-gamma 5 0
# Id: 2803300
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Fe+2 + 2H2O = Fe(OH)2 + 2H+
log_k -20.494
delta_h 119.62 kJ
-gamma 0 0
# Id: 2803302
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Fe+2 + 3H2O = Fe(OH)3- + 3H+
log_k -28.991
delta_h 126.43 kJ
-gamma 5 0
# Id: 2803301
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Fe+3 + H2O = FeOH+2 + H+
log_k -2.187
delta_h 41.81 kJ
-gamma 5 0
# Id: 2813300
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Fe+3 + 2H2O = Fe(OH)2+ + 2H+
log_k -4.594
delta_h 0 kJ
-gamma 5.4 0
# Id: 2813301
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Fe+3 + 3H2O = Fe(OH)3 + 3H+
log_k -12.56
delta_h 103.8 kJ
-gamma 0 0
# Id: 2813302
# log K source: Nord90
# Delta H source: Nord90
#T and ionic strength: 0.00 25.0
Fe+3 + 4H2O = Fe(OH)4- + 4H+
```

```
log_k -21.588
delta_h 0 kJ
-gamma 5.4 0
# Id: 2813303
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
2Fe+3 + 2H2O = Fe2(OH)2+4 + 2H+
log_k -2.854
delta_h 57.62 kJ
-gamma 0 0
# Id: 2813304
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
3Fe+3 + 4H2O = Fe3(OH)4+5 + 4H+
log_k -6.288
delta_h 65.24 kJ
-gamma 0 0
# Id: 2813305
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Mn+2 + H2O = MnOH+ + H+
log_k -10.597
delta_h 55.81 kJ
-gamma 5 0
# Id: 4703300
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Mn+2 + 3H2O = Mn(OH)3- + 3H+
log_k -34.8
delta_h 0 kJ
-gamma 5 0
# Id: 4703301
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Mn+2 + 4H2O = Mn(OH)4-2 + 4H+
log_k -48.288
delta_h 0 kJ
-gamma 5 0
# Id: 4703302
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Mn+2 + 4H2O = MnO4- + 8H+ + 5e-
log_k -127.794
delta_h 822.67 kJ
-gamma 3 0
# Id: 4700020
# log K source: NIST2.1.1
# Delta H source: NIST2.1.1
```

```
#T and ionic strength:
Mn+2 + 4H2O = MnO4-2 + 8H+ + 4e-
log_k -118.422
delta_h 711.07 kJ
-gamma 5 0
# Id: 4700021
# log K source: NIST2.1.1
# Delta H source: NIST2.1.1
#T and ionic strength:
Cr(OH)2+ + H+ = Cr(OH)+2 + H2O
log_k 5.9118
delta_h -77.91 kJ
-gamma 0 0
# Id: 2113301
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Cr(OH)2+ + H2O = Cr(OH)3 + H+
log_k -8.4222
delta_h 0 kJ
-gamma 0 0
# Id: 2113302
# log K source: SCD3.02 (1983 RCa)
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Cr(OH)2+ + 2H2O = Cr(OH)4- + 2H+
log_k -17.8192
delta_h 0 kJ
-gamma 0 0
# Id: 2113303
# log K source: SCD3.02 (1983 RCa)
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Cr(OH)2+ = CrO2- + 2H+
log_k -17.7456
delta_h 0 kJ
-gamma 0 0
# Id: 2113304
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
V+2 + H2O = VOH+ + H+
log_k -6.487
delta_h 59.81 kJ
-gamma 0 0
# Id: 9003300
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
V+3 + H2O = VOH+2 + H+
log_k -2.297
delta_h 43.81 kJ
-gamma 0 0
# Id: 9013300
```

```
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
V+3 + 2H2O = V(OH)2+ + 2H+
log_k -6.274
delta_h 0 kJ
-gamma 0 0
# Id: 9013301
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 20.0
V+3 + 3H2O = V(OH)3 + 3H+
log_k -3.0843
delta_h 0 kJ
-gamma 0 0
# Id: 9013302
# log K source: SCD3.02 (1978 TKa)
# Delta H source: MTQ3.11
#T and ionic strength: 0.10 20.0
2V+3 + 2H2O = V2(OH)2+4 + 2H+
log_k -3.794
delta_h 0 kJ
-gamma 0 0
# Id: 9013304
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
2V+3 + 3H2O = V2(OH)3+3 + 3H+
log_k -10.1191
delta_h 0 kJ
-gamma 0 0
# Id: 9013303
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 3.00 25.0
VO+2 + 2H2O = V(OH)3+ + H+
log_k -5.697
delta_h 0 kJ
-gamma 0 0
# Id: 9023300
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
2VO+2 + 2H2O = H2V2O4+2 + 2H+
log_k -6.694
delta_h 53.62 kJ
-gamma 0 0
# Id: 9023301
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
U+4 + H2O = UOH+3 + H+
log_k -0.597
delta_h 47.81 kJ
```

```
-gamma 0 0
# Id: 8913300
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
U+4 + 2H2O = U(OH)2+2 + 2H+
log_k -2.27
delta_h 74.1823 kJ
-gamma 0 0
# Id: 8913301
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
U+4 + 3H2O = U(OH)3+ + 3H+
log_k -4.935
delta_h 94.7467 kJ
-gamma 0 0
# Id: 8913302
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
U+4 + 4H2O = U(OH)4 + 4H+
log_k -8.498
delta_h 103.596 kJ
-gamma 0 0
# Id: 8913303
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
U+4 + 5H2O = U(OH)5- + 5H+
log_k -13.12
delta_h 115.374 kJ
-gamma 0 0
# Id: 8913304
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
6U+4 + 15H2O = U6(OH)15+9 + 15H+
log_k -17.155
delta_h 0 kJ
-gamma 0 0
# Id: 8913305
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
UO2+2 + H2O = UO2OH+ + H+
log_k -5.897
delta_h 47.81 kJ
-gamma 0 0
# Id: 8933300
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
2UO2+2 + 2H2O = (UO2)2(OH)2+2 + 2H+
```

```
log_k -5.574
delta_h 41.82 kJ
-gamma 0 0
# Id: 8933301
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
3UO2+2 + 5H2O = (UO2)3(OH)5+ + 5H+
log_k -15.585
delta_h 108.05 kJ
-gamma 0 0
# Id: 8933302
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Be+2 + H2O = BeOH+ + H+
log_k -5.397
delta_h 0 kJ
-gamma 6.5 0
# Id: 1103301
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Be+2 + 2H2O = Be(OH)2 + 2H+
log_k -13.594
delta_h 0 kJ
-gamma 6.5 0
# Id: 1103302
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Be+2 + 3H2O = Be(OH)3- + 3H+
log_k -23.191
delta_h 0 kJ
-gamma 6.5 0
# Id: 1103303
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Be+2 + 4H2O = Be(OH)4-2 + 4H+
log_k -37.388
delta_h 0 kJ
-gamma 6.5 0
# Id: 1103304
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
2Be+2 + H2O = Be2OH+3 + H+
log_k -3.177
delta_h 0 kJ
-gamma 6.5 0
# Id: 1103305
# log K source: NIST46.4
# Delta H source: MTQ3.11
```

```
#T and ionic strength:  0.10 25.0
3Be+2 + 3H2O = Be3(OH)3+3 + 3H+
log_k -8.8076
delta_h 0 kJ
-gamma 6.5 0
# Id:  1103306
# log K source:  NIST46.4
# Delta H source:  MTQ3.11
#T and ionic strength:  0.10 25.0
Mg+2 + H2O = MgOH+ + H+
log_k -11.397
delta_h 67.81 kJ
-gamma 6.5 0
# Id:  4603300
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  0.00 25.0
Ca+2 + H2O = CaOH+ + H+
log_k -12.697
delta_h 64.11 kJ
-gamma 6 0
# Id:  1503300
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  0.00 25.0
Sr+2 + H2O = SrOH+ + H+
log_k -13.177
delta_h 60.81 kJ
-gamma 5 0
# Id:  8003300
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  0.00 25.0
Ba+2 + H2O = BaOH+ + H+
log_k -13.357
delta_h 60.81 kJ
-gamma 5 0
# Id:  1003300
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  0.00 25.0
H+ + F- = HF
log_k 3.17
delta_h 13.3 kJ
-gamma 0 0
# Id:  3302700
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  0.00 25.0
H+ + 2F- = HF2-
log_k 3.75
delta_h 17.4 kJ
-gamma 3.5 0
# Id:  3302701
```

```
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
2F- + 2H+ = H2F2
log_k 6.768
delta_h 0 kJ
-gamma 0 0
# Id: 3302702
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Sb(OH)3 + F- + H+ = SbOF + 2H2O
log_k 6.1864
delta_h 0 kJ
-gamma 0 0
# Id: 7402700
# log K source: PNL89
# Delta H source: PNL89
#T and ionic strength:
Sb(OH)3 + F- + H+ = Sb(OH)2F + H2O
log_k 6.1937
delta_h 0 kJ
-gamma 0 0
# Id: 7402702
# log K source: PNL89
# Delta H source: PNL89
#T and ionic strength:
H4SiO4 + 4H+ + 6F- = SiF6-2 + 4H2O
log_k 30.18
delta_h -68 kJ
-gamma 5 0
# Id: 7702700
# log K source: Nord90
# Delta H source: Nord90
#T and ionic strength: 0.00 25.0
Sn(OH)2 + 2H+ + F- = SnF+ + 2H2O
log_k 11.582
delta_h 0 kJ
-gamma 0 0
# Id: 7902701
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
Sn(OH)2 + 2H+ + 2F- = SnF2 + 2H2O
log_k 14.386
delta_h 0 kJ
-gamma 0 0
# Id: 7902702
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
Sn(OH)2 + 2H+ + 3F- = SnF3- + 2H2O
log_k 17.206
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 7902703
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
Sn(OH)6-2 + 6H+ + 6F- = SnF6-2 + 6H2O
log_k 33.5844
delta_h 0 kJ
-gamma 0 0
# Id: 7912701
# log K source: Bard85
# Delta H source: MTQ3.11
#T and ionic strength:
Pb+2 + F- = PbF+
log_k 1.848
delta_h 0 kJ
-gamma 0 0
# Id: 6002700
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
Pb+2 + 2F- = PbF2
log_k 3.142
delta_h 0 kJ
-gamma 0 0
# Id: 6002701
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
Pb+2 + 3F- = PbF3-
log_k 3.42
delta_h 0 kJ
-gamma 0 0
# Id: 6002702
# log K source: SCD3.02 (1956 TKa)
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Pb+2 + 4F- = PbF4-2
log_k 3.1
delta_h 0 kJ
-gamma 0 0
# Id: 6002703
# log K source: SCD3.02 (1956 TKa)
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
H3BO3 + 3H+ + 4F- = BF4- + 3H2O
log_k 19.912
delta_h -18.67 kJ
-gamma 2.5 0
# Id: 902703
# log K source: NIST46.3
# Delta H source: NIST2.1.1
#T and ionic strength: 1.00 25.0
Al+3 + F- = AlF+2
```

```
log_k 7
delta_h 4.6 kJ
-gamma 5.4 0
# Id: 302700
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Al+3 + 2F- = AlF2+
log_k 12.6
delta_h 8.3 kJ
-gamma 5.4 0
# Id: 302701
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Al+3 + 3F- = AlF3
log_k 16.7
delta_h 8.7 kJ
-gamma 0 0
# Id: 302702
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Al+3 + 4F- = AlF4-
log_k 19.4
delta_h 8.7 kJ
-gamma 4.5 0
# Id: 302703
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Tl+ + F- = TlF
log_k 0.1
delta_h 0 kJ
-gamma 0 0
# Id: 8702700
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Zn+2 + F- = ZnF+
log_k 1.3
delta_h 11 kJ
-gamma 0 0
# Id: 9502700
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Cd+2 + F- = CdF+
log_k 1.2
delta_h 5 kJ
-gamma 0 0
# Id: 1602700
# log K source: NIST46.3
# Delta H source: NIST46.3
```

```
#T and ionic strength:  0.00 25.0
Cd+2 + 2F- = CdF2
log_k 1.5
delta_h 0 kJ
-gamma 0 0
# Id:  1602701
# log K source:  MTQ3.11
# Delta H source:  MTQ3.11
#T and ionic strength:
Hg(OH)2 + 2H+ + F- = HgF+ + 2H2O
log_k 7.763
delta_h -35.72 kJ
-gamma 0 0
# Id:  3612701
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  0.50 25.0
Cu+2 + F- = CuF+
log_k 1.8
delta_h 13 kJ
-gamma 0 0
# Id:  2312700
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  0.00 25.0
Ag+ + F- = AgF
log_k 0.4
delta_h 12 kJ
-gamma 0 0
# Id:  202700
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  0.00 25.0
Ni+2 + F- = NiF+
log_k 1.4
delta_h 7.1 kJ
-gamma 0 0
# Id:  5402700
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  0.00 25.0
Co+2 + F- = CoF+
log_k 1.5
delta_h 9.2 kJ
-gamma 0 0
# Id:  2002700
# log K source:  NIST46.4
# Delta H source:  NIST46.4
#T and ionic strength:  0.00 25.0
Fe+3 + F- = FeF+2
log_k 6.04
delta_h 10 kJ
-gamma 5 0
# Id:  2812700
```

```
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Fe+3 + 2F- = FeF2+
log_k 10.4675
delta_h 17 kJ
-gamma 5 0
# Id: 2812701
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.50 25.0
Fe+3 + 3F- = FeF3
log_k 13.617
delta_h 29 kJ
-gamma 0 0
# Id: 2812702
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.50 25.0
Mn+2 + F- = MnF+
log_k 1.6
delta_h 11 kJ
-gamma 5 0
# Id: 4702700
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Cr(OH)2+ + 2H+ + F- = CrF+2 + 2H2O
log_k 14.7688
delta_h -70.2452 kJ
-gamma 0 0
# Id: 2112700
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
VO+2 + F- = VOF+
log_k 3.778
delta_h 7.9 kJ
-gamma 0 0
# Id: 9022700
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 1.00 25.0
VO+2 + 2F- = VOF2
log_k 6.352
delta_h 14 kJ
-gamma 0 0
# Id: 9022701
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 1.00 25.0
VO+2 + 3F- = VOF3-
log_k 7.902
delta_h 20 kJ
```

```
-gamma 0 0
# Id: 9022702
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 1.00 25.0
VO+2 + 4F- = VOF4-2
log_k 8.508
delta_h 26 kJ
-gamma 0 0
# Id: 9022703
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 1.00 25.0
VO2+ + F- = VO2F
log_k 3.244
delta_h 0 kJ
-gamma 0 0
# Id: 9032700
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
VO2+ + 2F- = VO2F2-
log_k 5.804
delta_h 0 kJ
-gamma 0 0
# Id: 9032701
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 20.0
VO2+ + 3F- = VO2F3-2
log_k 6.9
delta_h 0 kJ
-gamma 0 0
# Id: 9032702
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 20.0
VO2+ + 4F- = VO2F4-3
log_k 6.592
delta_h 0 kJ
-gamma 0 0
# Id: 9032703
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 20.0
U+4 + F- = UF+3
log_k 9.3
delta_h 21.1292 kJ
-gamma 0 0
# Id: 8912700
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
U+4 + 2F- = UF2+2
```

```
log_k 16.4
delta_h 30.1248 kJ
-gamma 0 0
# Id: 8912701
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
U+4 + 3F- = UF3+
log_k 21.6
delta_h 29.9156 kJ
-gamma 0 0
# Id: 8912702
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
U+4 + 4F- = UF4
log_k 23.64
delta_h 19.2464 kJ
-gamma 0 0
# Id: 8912703
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
U+4 + 5F- = UF5-
log_k 25.238
delta_h 20.2924 kJ
-gamma 0 0
# Id: 8912704
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
U+4 + 6F- = UF6-2
log_k 27.718
delta_h 13.8072 kJ
-gamma 0 0
# Id: 8912705
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
UO2+2 + F- = UO2F+
log_k 5.14
delta_h 1 kJ
-gamma 0 0
# Id: 8932700
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
UO2+2 + 2F- = UO2F2
log_k 8.6
delta_h 2 kJ
-gamma 0 0
# Id: 8932701
# log K source: NIST46.3
# Delta H source: NIST46.3
```

```
#T and ionic strength:  0.00 25.0
UO2+2 + 3F- = UO2F3-
log_k 11
delta_h 2 kJ
-gamma 0 0
# Id:  8932702
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  0.00 25.0
UO2+2 + 4F- = UO2F4-2
log_k 11.9
delta_h 0.4 kJ
-gamma 0 0
# Id:  8932703
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  0.00 25.0
Be+2 + F- = BeF+
log_k 5.249
delta_h 0 kJ
-gamma 0 0
# Id:  1102701
# log K source:  NIST46.4
# Delta H source:  NIST46.4
#T and ionic strength:  0.50 25.0
Be+2 + 2F- = BeF2
log_k 9.1285
delta_h -4 kJ
-gamma 0 0
# Id:  1102702
# log K source:  NIST46.4
# Delta H source:  NIST46.4
#T and ionic strength:  0.50 25.0
Be+2 + 3F- = BeF3-
log_k 11.9085
delta_h -8 kJ
-gamma 0 0
# Id:  1102703
# log K source:  NIST46.4
# Delta H source:  NIST46.4
#T and ionic strength:  0.50 25.0
Mg+2 + F- = MgF+
log_k 2.05
delta_h 13 kJ
-gamma 4.5 0
# Id:  4602700
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  0.00 25.0
Ca+2 + F- = CaF+
log_k 1.038
delta_h 14 kJ
-gamma 5 0
# Id:  1502700
```

```
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 1.00 25.0
Sr+2 + F- = SrF+
log_k 0.548
delta_h 16 kJ
-gamma 0 0
# Id: 8002701
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 1.00 25.0
Na+ + F- = NaF
log_k -0.2
delta_h 12 kJ
-gamma 0 0
# Id: 5002700
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Sn(OH)2 + 2H+ + Cl- = SnCl+ + 2H2O
log_k 8.734
delta_h 0 kJ
-gamma 0 0
# Id: 7901801
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Sn(OH)2 + 2H+ + 2Cl- = SnCl2 + 2H2O
log_k 9.524
delta_h 0 kJ
-gamma 0 0
# Id: 7901802
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Sn(OH)2 + 2H+ + 3Cl- = SnCl3- + 2H2O
log_k 8.3505
delta_h 0 kJ
-gamma 0 0
# Id: 7901803
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 2.00 25.0
Pb+2 + Cl- = PbCl+
log_k 1.55
delta_h 8.7 kJ
-gamma 0 0
# Id: 6001800
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Pb+2 + 2Cl- = PbCl2
log_k 2.2
delta_h 12 kJ
```

```
-gamma 0 0
# Id: 6001801
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Pb+2 + 3Cl- = PbCl3-
log_k 1.8
delta_h 4 kJ
-gamma 0 0
# Id: 6001802
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Pb+2 + 4Cl- = PbCl4-2
log_k 1.46
delta_h 14.7695 kJ
-gamma 0 0
# Id: 6001803
# log K source: SCD3.02 (1984 SEa)
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Tl+ + Cl- = TlCl
log_k 0.51
delta_h -6.2 kJ
-gamma 0 0
# Id: 8701800
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Tl+ + 2Cl- = TlCl2-
log_k 0.28
delta_h 0 kJ
-gamma 0 0
# Id: 8701801
# log K source: SCD3.02 (1992 RAb)
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Tl(OH)3 + 3H+ + Cl- = TlCl+2 + 3H2O
log_k 11.011
delta_h 0 kJ
-gamma 0 0
# Id: 8711800
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Tl(OH)3 + 3H+ + 2Cl- = TlCl2+ + 3H2O
log_k 16.771
delta_h 0 kJ
-gamma 0 0
# Id: 8711801
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Tl(OH)3 + 3H+ + 3Cl- = TlCl3 + 3H2O
```

```
log_k 19.791
delta_h 0 kJ
-gamma 0 0
# Id: 8711802
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Tl(OH)3 + 3H+ + 4Cl- = TlCl4- + 3H2O
log_k 21.591
delta_h 0 kJ
-gamma 0 0
# Id: 8711803
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Tl(OH)3 + Cl- + 2H+ = TlOHCl+ + 2H2O
log_k 10.629
delta_h 0 kJ
-gamma 0 0
# Id: 8711804
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Zn+2 + Cl- = ZnCl+
log_k 0.4
delta_h 5.4 kJ
-gamma 4 0
# Id: 9501800
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Zn+2 + 2Cl- = ZnCl2
log_k 0.6
delta_h 37 kJ
-gamma 0 0
# Id: 9501801
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Zn+2 + 3Cl- = ZnCl3-
log_k 0.5
delta_h 39.999 kJ
-gamma 4 0
# Id: 9501802
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Zn+2 + 4Cl- = ZnCl4-2
log_k 0.199
delta_h 45.8566 kJ
-gamma 5 0
# Id: 9501803
# log K source: MTQ3.11
# Delta H source: MTQ3.11
```

```
#T and ionic strength:
Zn+2 + H2O + Cl- = ZnOHCl + H+
log_k -7.48
delta_h 0 kJ
-gamma 0 0
# Id: 9501804
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Cd+2 + Cl- = CdCl+
log_k 1.98
delta_h 1 kJ
-gamma 0 0
# Id: 1601800
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Cd+2 + 2Cl- = CdCl2
log_k 2.6
delta_h 3 kJ
-gamma 0 0
# Id: 1601801
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Cd+2 + 3Cl- = CdCl3-
log_k 2.4
delta_h 10 kJ
-gamma 0 0
# Id: 1601802
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Cd+2 + H2O + Cl- = CdOHCl + H+
log_k -7.404
delta_h 18.2213 kJ
-gamma 0 0
# Id: 1601803
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Hg(OH)2 + 2H+ + Cl- = HgCl+ + 2H2O
log_k 13.494
delta_h -62.72 kJ
-gamma 0 0
# Id: 3611800
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Hg(OH)2 + 2H+ + 2Cl- = HgCl2 + 2H2O
log_k 20.194
delta_h -92.42 kJ
-gamma 0 0
# Id: 3611801
```

```
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Hg(OH)2 + 2H+ + 3Cl- = HgCl3- + 2H2O
log_k 21.194
delta_h -94.02 kJ
-gamma 0 0
# Id: 3611802
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Hg(OH)2 + 2H+ + 4Cl- = HgCl4-2 + 2H2O
log_k 21.794
delta_h -100.72 kJ
-gamma 0 0
# Id: 3611803
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Hg(OH)2 + Cl- + I- + 2H+ = HgClI + 2H2O
log_k 25.532
delta_h -135.3 kJ
-gamma 0 0
# Id: 3611804
# log K source: NIST2.1.1
# Delta H source: NIST2.1.1
#T and ionic strength:
Hg(OH)2 + H+ + Cl- = HgClOH + H2O
log_k 10.444
delta_h -42.72 kJ
-gamma 0 0
# Id: 3611805
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 1.00 25.0
Cu+2 + Cl- = CuCl+
log_k 0.2
delta_h 8.3 kJ
-gamma 4 0
# Id: 2311800
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Cu+2 + 2Cl- = CuCl2
log_k -0.26
delta_h 44.183 kJ
-gamma 0 0
# Id: 2311801
# log K source: SCD3.02 (1989 IPa)
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Cu+2 + 3Cl- = CuCl3-
log_k -2.29
delta_h 57.279 kJ
```

```
-gamma 4 0
# Id: 2311802
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Cu+2 + 4Cl- = CuCl4-2
log_k -4.59
delta_h 32.5515 kJ
-gamma 5 0
# Id: 2311803
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Cu+ + 2Cl- = CuCl2-
log_k 5.42
delta_h -1.7573 kJ
-gamma 4 0
# Id: 2301800
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Cu+ + 3Cl- = CuCl3-2
log_k 4.75
delta_h 1.0878 kJ
-gamma 5 0
# Id: 2301801
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Cu+ + Cl- = CuCl
log_k 3.1
delta_h 0 kJ
-gamma 0 0
# Id: 2301802
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Ag+ + Cl- = AgCl
log_k 3.31
delta_h -12 kJ
-gamma 0 0
# Id: 201800
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Ag+ + 2Cl- = AgCl2-
log_k 5.25
delta_h -16 kJ
-gamma 0 0
# Id: 201801
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Ag+ + 3Cl- = AgCl3-2
```

```
log_k 5.2
delta_h 0 kJ
-gamma 0 0
# Id: 201802
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Ag+ + 4Cl- = AgCl4-3
log_k 5.51
delta_h 0 kJ
-gamma 0 0
# Id: 201803
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Ni+2 + Cl- = NiCl+
log_k 0.408
delta_h 2 kJ
-gamma 0 0
# Id: 5401800
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 1.00 25.0
Ni+2 + 2Cl- = NiCl2
log_k -1.89
delta_h 0 kJ
-gamma 0 0
# Id: 5401801
# log K source: SCD3.02 (1989 IPa)
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Co+2 + Cl- = CoCl+
log_k 0.539
delta_h 2 kJ
-gamma 0 0
# Id: 2001800
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.50 25.0
Co+3 + Cl- = CoCl+2
log_k 2.3085
delta_h 16 kJ
-gamma 0 0
# Id: 2011800
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.50 25.0
Fe+3 + Cl- = FeCl+2
log_k 1.48
delta_h 23 kJ
-gamma 5 0
# Id: 2811800
# log K source: NIST46.3
# Delta H source: NIST46.3
```

```
#T and ionic strength:  0.00 25.0
Fe+3 + 2Cl- = FeCl2+
log_k 2.13
delta_h 0 kJ
-gamma 5 0
# Id:  2811801
# log K source:  NIST46.3
# Delta H source:  MTQ3.11
#T and ionic strength:  0.00 25.0
Fe+3 + 3Cl- = FeCl3
log_k 1.13
delta_h 0 kJ
-gamma 0 0
# Id:  2811802
# log K source:  Nord90
# Delta H source:  MTQ3.11
#T and ionic strength:  0.00 25.0
Mn+2 + Cl- = MnCl+
log_k 0.1
delta_h 0 kJ
-gamma 5 0
# Id:  4701800
# log K source:  NIST46.3
# Delta H source:  MTQ3.11
#T and ionic strength:  0.00 20.0
Mn+2 + 2Cl- = MnCl2
log_k 0.25
delta_h 0 kJ
-gamma 0 0
# Id:  4701801
# log K source:  Nord90
# Delta H source:  MTQ3.11
#T and ionic strength:  0.00 25.0
Mn+2 + 3Cl- = MnCl3-
log_k -0.31
delta_h 0 kJ
-gamma 5 0
# Id:  4701802
# log K source:  Nord90
# Delta H source:  MTQ3.11
#T and ionic strength:  0.00 25.0
Cr(OH)2+ + 2H+ + Cl- = CrCl+2 + 2H2O
log_k 9.6808
delta_h -103.62 kJ
-gamma 0 0
# Id:  2111800
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  1.00 25.0
Cr(OH)2+ + 2Cl- + 2H+ = CrCl2+ + 2H2O
log_k 8.658
delta_h -39.2208 kJ
-gamma 0 0
# Id:  2111801
```

```
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Cr(OH)2+ + 2Cl- + H+ = CrOHCl2 + H2O
log_k 2.9627
delta_h 0 kJ
-gamma 0 0
# Id: 2111802
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
VO+2 + Cl- = VOCl+
log_k 0.448
delta_h 0 kJ
-gamma 0 0
# Id: 9021800
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 20.0
U+4 + Cl- = UCl+3
log_k 1.7
delta_h -20 kJ
-gamma 0 0
# Id: 8911800
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
UO2+2 + Cl- = UO2Cl+
log_k 0.21
delta_h 16 kJ
-gamma 0 0
# Id: 8931800
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Be+2 + Cl- = BeCl+
log_k 0.2009
delta_h 0 kJ
-gamma 5 0
# Id: 1101801
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.70 20.0
Sn(OH)2 + 2H+ + Br- = SnBr+ + 2H2O
log_k 8.254
delta_h 0 kJ
-gamma 0 0
# Id: 7901301
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Sn(OH)2 + 2H+ + 2Br- = SnBr2 + 2H2O
log_k 8.794
delta_h 0 kJ
```

-gamma 0 0
Id: 7901302
log K source: NIST46.4
Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Sn(OH)2 + 2H+ + 3Br- = SnBr3- + 2H2O
log_k 7.48
delta_h 0 kJ
-gamma 0 0
Id: 7901303
log K source: NIST46.4
Delta H source: NIST46.4
#T and ionic strength: 3.00 25.0
Pb+2 + Br- = PbBr+
log_k 1.7
delta_h 8 kJ
-gamma 0 0
Id: 6001300
log K source: NIST46.3
Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Pb+2 + 2Br- = PbBr2
log_k 2.6
delta_h -4 kJ
-gamma 0 0
Id: 6001301
log K source: NIST46.3
Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Tl+ + Br- = TlBr
log_k 0.91
delta_h -12 kJ
-gamma 0 0
Id: 8701300
log K source: NIST46.3
Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Tl+ + 2Br- = TlBr2-
log_k -0.384
delta_h 12.36 kJ
-gamma 0 0
Id: 8701301
log K source: NIST46.3
Delta H source: NIST2.1.1
#T and ionic strength: 4.00 25.0
Tl+ + Br- + Cl- = TlBrCl-
log_k 0.8165
delta_h 0 kJ
-gamma 0 0
Id: 8701302
log K source: MTQ3.11
Delta H source: MTQ3.11
#T and ionic strength:
Tl+ + I- + Br- = TlIBr-

```
log_k 2.185
delta_h 0 kJ
-gamma 0 0
# Id: 8703802
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Tl(OH)3 + 3H+ + Br- = TlBr+2 + 3H2O
log_k 12.803
delta_h 0 kJ
-gamma 0 0
# Id: 8711300
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
Tl(OH)3 + 3H+ + 2Br- = TlBr2+ + 3H2O
log_k 20.711
delta_h 0 kJ
-gamma 0 0
# Id: 8711301
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
Tl(OH)3 + 3Br- + 3H+ = TlBr3 + 3H2O
log_k 27.0244
delta_h 0 kJ
-gamma 0 0
# Id: 8711302
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Tl(OH)3 + 4Br- + 3H+ = TlBr4- + 3H2O
log_k 31.1533
delta_h 0 kJ
-gamma 0 0
# Id: 8711303
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Zn+2 + Br- = ZnBr+
log_k -0.07
delta_h 1 kJ
-gamma 0 0
# Id: 9501300
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Zn+2 + 2Br- = ZnBr2
log_k -0.98
delta_h 0 kJ
-gamma 0 0
# Id: 9501301
# log K source: MTQ3.11
# Delta H source: MTQ3.11
```

```
#T and ionic strength:
Cd+2 + Br- = CdBr+
log_k 2.15
delta_h -3 kJ
-gamma 0 0
# Id: 1601300
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Cd+2 + 2Br- = CdBr2
log_k 3
delta_h -3 kJ
-gamma 0 0
# Id: 1601301
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Hg(OH)2 + 2H+ + Br- = HgBr+ + 2H2O
log_k 15.803
delta_h -81.92 kJ
-gamma 0 0
# Id: 3611301
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.50 25.0
Hg(OH)2 + 2H+ + 2Br- = HgBr2 + 2H2O
log_k 24.2725
delta_h -127.12 kJ
-gamma 0 0
# Id: 3611302
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.50 25.0
Hg(OH)2 + 2H+ + 3Br- = HgBr3- + 2H2O
log_k 26.7025
delta_h -138.82 kJ
-gamma 0 0
# Id: 3611303
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.50 25.0
Hg(OH)2 + 2H+ + 4Br- = HgBr4-2 + 2H2O
log_k 27.933
delta_h -153.72 kJ
-gamma 0 0
# Id: 3611304
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.50 25.0
Hg(OH)2 + Br- + Cl- + 2H+ = HgBrCl + 2H2O
log_k 22.1811
delta_h -113.77 kJ
-gamma 0 0
# Id: 3611305
```

```
# log K source: NIST2.1.1
# Delta H source: NIST2.1.1
#T and ionic strength:
Hg(OH)2 + Br- + I- + 2H+ = HgBrI + 2H2O
log_k 27.3133
delta_h -151.27 kJ
-gamma 0 0
# Id: 3611306
# log K source: NIST2.1.1
# Delta H source: NIST2.1.1
#T and ionic strength:
Hg(OH)2 + Br- + 3I- + 2H+ = HgBrI3-2 + 2H2O
log_k 34.2135
delta_h 0 kJ
-gamma 0 0
# Id: 3611307
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Hg(OH)2 + 2Br- + 2I- + 2H+ = HgBr2I2-2 + 2H2O
log_k 32.3994
delta_h 0 kJ
-gamma 0 0
# Id: 3611308
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Hg(OH)2 + 3Br- + I- + 2H+ = HgBr3I-2 + 2H2O
log_k 30.1528
delta_h 0 kJ
-gamma 0 0
# Id: 3611309
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Hg(OH)2 + H+ + Br- = HgBrOH + H2O
log_k 12.433
delta_h 0 kJ
-gamma 0 0
# Id: 3613301
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.50 25.0
Ag+ + Br- = AgBr
log_k 4.6
delta_h 0 kJ
-gamma 0 0
# Id: 201300
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Ag+ + 2Br- = AgBr2-
log_k 7.5
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 201301
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Ag+ + 3Br- = AgBr3-2
log_k 8.1
delta_h 0 kJ
-gamma 0 0
# Id: 201302
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Ni+2 + Br- = NiBr+
log_k 0.5
delta_h 0 kJ
-gamma 0 0
# Id: 5401300
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Cr(OH)2+ + Br- + 2H+ = CrBr+2 + 2H2O
log_k 7.5519
delta_h -46.9068 kJ
-gamma 0 0
# Id: 2111300
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Be+2 + Br- = BeBr+
log_k 0.1009
delta_h 0 kJ
-gamma 5 0
# Id: 1101301
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.70 20.0
Pb+2 + I- = PbI+
log_k 2
delta_h 0 kJ
-gamma 0 0
# Id: 6003800
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Pb+2 + 2I- = PbI2
log_k 3.2
delta_h 0 kJ
-gamma 0 0
# Id: 6003801
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Tl+ + I- = TlI
```

log_k 1.4279
delta_h 0 kJ
-gamma 0 0
Id: 8703800
log K source: MTQ3.11
Delta H source: MTQ3.11
#T and ionic strength:
Tl+ + 2I- = TlI2-
log_k 1.8588
delta_h 0 kJ
-gamma 0 0
Id: 8703801
log K source: MTQ3.11
Delta H source: MTQ3.11
#T and ionic strength:
Tl(OH)3 + 4I- + 3H+ = TlI4- + 3H2O
log_k 34.7596
delta_h 0 kJ
-gamma 0 0
Id: 8713800
log K source: MTQ3.11
Delta H source: MTQ3.11
#T and ionic strength:
Zn+2 + I- = ZnI+
log_k -2.0427
delta_h -4 kJ
-gamma 0 0
Id: 9503800
log K source: NIST46.3
Delta H source: NIST46.3
#T and ionic strength: 3.00 25.0
Zn+2 + 2I- = ZnI2
log_k -1.69
delta_h 0 kJ
-gamma 0 0
Id: 9503801
log K source: MTQ3.11
Delta H source: MTQ3.11
#T and ionic strength:
Cd+2 + I- = CdI+
log_k 2.28
delta_h -9.6 kJ
-gamma 0 0
Id: 1603800
log K source: NIST46.3
Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Cd+2 + 2I- = CdI2
log_k 3.92
delta_h -12 kJ
-gamma 0 0
Id: 1603801
log K source: NIST46.3
Delta H source: NIST46.3

```
#T and ionic strength: 0.00 25.0
Hg(OH)2 + 2H+ + I- = HgI+ + 2H2O
log_k 19.603
delta_h -111.22 kJ
-gamma 0 0
# Id: 3613801
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.50 25.0
Hg(OH)2 + 2H+ + 2I- = HgI2 + 2H2O
log_k 30.8225
delta_h -182.72 kJ
-gamma 0 0
# Id: 3613802
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.50 25.0
Hg(OH)2 + 2H+ + 3I- = HgI3- + 2H2O
log_k 34.6025
delta_h -194.22 kJ
-gamma 0 0
# Id: 3613803
# log K source: NIST46.4
# Delta H source: NIST2.1.1
#T and ionic strength: 0.50 25.0
Hg(OH)2 + 2H+ + 4I- = HgI4-2 + 2H2O
log_k 36.533
delta_h -220.72 kJ
-gamma 0 0
# Id: 3613804
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.50 25.0
Ag+ + I- = AgI
log_k 6.6
delta_h 0 kJ
-gamma 0 0
# Id: 203800
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 18.0
Ag+ + 2I- = AgI2-
log_k 11.7
delta_h 0 kJ
-gamma 0 0
# Id: 203801
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 18.0
Ag+ + 3I- = AgI3-2
log_k 12.6
delta_h -122 kJ
-gamma 0 0
# Id: 203802
```

```
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Ag+ + 4I- = AgI4-3
log_k 14.229
delta_h 0 kJ
-gamma 0 0
# Id: 203803
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 2.00 25.0
Cr(OH)2+ + I- + 2H+ = CrI+2 + 2H2O
log_k 4.8289
delta_h 0 kJ
-gamma 0 0
# Id: 2113800
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
H+ + HS- = H2S
log_k 7.02
delta_h -22 kJ
-gamma 0 0
# Id: 3307300
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Pb+2 + 2HS- = Pb(HS)2
log_k 15.27
delta_h 0 kJ
-gamma 0 0
# Id: 6007300
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Pb+2 + 3HS- = Pb(HS)3-
log_k 16.57
delta_h 0 kJ
-gamma 0 0
# Id: 6007301
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Tl+ + HS- = TlHS
log_k 2.474
delta_h 0 kJ
-gamma 0 0
# Id: 8707300
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
2Tl+ + HS- = Tl2HS+
log_k 5.974
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 8707301
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
2Tl+ + 3HS- + H2O = Tl2OH(HS)3-2 + H+
log_k 1.0044
delta_h 0 kJ
-gamma 0 0
# Id: 8707302
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
2Tl+ + 2HS- + 2H2O = Tl2(OH)2(HS)2-2 + 2H+
log_k -11.0681
delta_h 0 kJ
-gamma 0 0
# Id: 8707303
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Zn+2 + 2HS- = Zn(HS)2
log_k 12.82
delta_h 0 kJ
-gamma 0 0
# Id: 9507300
# log K source: DHa1993
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Zn+2 + 3HS- = Zn(HS)3-
log_k 16.1
delta_h 0 kJ
-gamma 0 0
# Id: 9507301
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Zn+2 + 3HS- = ZnS(HS)2-2 + H+
log_k 6.12
delta_h 0 kJ
-gamma 0 0
# Id: 9507302
# log K source: DHa1993
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Zn+2 + 2HS- + 2HS- = Zn(HS)4-2
log_k 14.64
delta_h 0 kJ
-gamma 0 0
# Id: 9507303
# log K source: DHa1993
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Zn+2 + 2HS- = ZnS(HS)- + H+
```

```
log_k 6.81
delta_h 0 kJ
-gamma 0 0
# Id: 9507304
# log K source: DHa1993
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Cd+2 + HS- = CdHS+
log_k 8.008
delta_h 0 kJ
-gamma 0 0
# Id: 1607300
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
Cd+2 + 2HS- = Cd(HS)2
log_k 15.212
delta_h 0 kJ
-gamma 0 0
# Id: 1607301
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
Cd+2 + 3HS- = Cd(HS)3-
log_k 17.112
delta_h 0 kJ
-gamma 0 0
# Id: 1607302
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
Cd+2 + 4HS- = Cd(HS)4-2
log_k 19.308
delta_h 0 kJ
-gamma 0 0
# Id: 1607303
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
Hg(OH)2 + 2HS- = HgS2-2 + 2H2O
log_k 29.414
delta_h 0 kJ
-gamma 0 0
# Id: 3617300
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 20.0
Hg(OH)2 + 2H+ + 2HS- = Hg(HS)2 + 2H2O
log_k 44.516
delta_h 0 kJ
-gamma 0 0
# Id: 3617301
# log K source: NIST46.3
# Delta H source: MTQ3.11
```

```
#T and ionic strength:  1.00 20.0
Hg(OH)2 + H+ + 2HS- = HgHS2- + 2H2O
log_k 38.122
delta_h 0 kJ
-gamma 0 0
# Id:  3617302
# log K source:  NIST46.4
# Delta H source:  MTQ3.11
#T and ionic strength:  1.00 20.0
Cu+2 + 3HS- = Cu(HS)3-
log_k 25.899
delta_h 0 kJ
-gamma 0 0
# Id:  2317300
# log K source:  MTQ3.11
# Delta H source:  MTQ3.11
#T and ionic strength:
Ag+ + HS- = AgHS
log_k 13.8145
delta_h 0 kJ
-gamma 0 0
# Id:  207300
# log K source:  NIST46.3
# Delta H source:  MTQ3.11
#T and ionic strength:  0.10 20.0
Ag+ + 2HS- = Ag(HS)2-
log_k 17.9145
delta_h 0 kJ
-gamma 0 0
# Id:  207301
# log K source:  NIST46.3
# Delta H source:  MTQ3.11
#T and ionic strength:  0.10 20.0
Fe+2 + 2HS- = Fe(HS)2
log_k 8.95
delta_h 0 kJ
-gamma 0 0
# Id:  2807300
# log K source:  MTQ3.11
# Delta H source:  MTQ3.11
#T and ionic strength:
Fe+2 + 3HS- = Fe(HS)3-
log_k 10.987
delta_h 0 kJ
-gamma 0 0
# Id:  2807301
# log K source:  MTQ3.11
# Delta H source:  MTQ3.11
#T and ionic strength:
HS- = S2-2 + H+
log_k -11.7828
delta_h 46.4 kJ
-gamma 0 0
-no_check
```

```
# Id: 7317300
# log K source: NIST2.1.1
# Delta H source: NIST2.1.1
#T and ionic strength:
HS- = S3-2 + H+
log_k -10.7667
delta_h 42.2 kJ
-gamma 0 0
-no_check
# Id: 7317301
# log K source: NIST2.1.1
# Delta H source: NIST2.1.1
#T and ionic strength:
HS- = S4-2 + H+
log_k -9.9608
delta_h 39.3 kJ
-gamma 0 0
-no_check
# Id: 7317302
# log K source: NIST2.1.1
# Delta H source: NIST2.1.1
#T and ionic strength:
HS- = S5-2 + H+
log_k -9.3651
delta_h 37.6 kJ
-gamma 0 0
-no_check
# Id: 7317303
# log K source: NIST2.1.1
# Delta H source: NIST2.1.1
#T and ionic strength:
HS- = S6-2 + H+
log_k -9.881
delta_h 0 kJ
-gamma 0 0
-no_check
# Id: 7317304
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
2Sb(OH)3 + 4HS- + 2H+ = Sb2S4-2 + 6H2O
log_k 49.3886
delta_h -321.78 kJ
-gamma 0 0
# Id: 7407300
# log K source: NIST2.1.1
# Delta H source: NIST2.1.1
#T and ionic strength:
Cu+ + 2HS- = Cu(S4)2-3 + 2H+
log_k 3.39
delta_h 0 kJ
-gamma 23 0
-no_check
# Id: 2307300
```

```
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Cu+ + 2HS- = CuS4S5-3 + 2H+
log_k 2.66
delta_h 0 kJ
-gamma 25 0
-no_check
# Id: 2307301
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Ag+ + 2HS- = Ag(S4)2-3 + 2H+
log_k 0.991
delta_h 0 kJ
-gamma 22 0
-no_check
# Id: 207302
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Ag+ + 2HS- = AgS4S5-3 + 2H+
log_k 0.68
delta_h 0 kJ
-gamma 24 0
-no_check
# Id: 207303
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Ag+ + 2HS- = Ag(HS)S4-2 + H+
log_k 10.431
delta_h 0 kJ
-gamma 15 0
-no_check
# Id: 207304
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
H+ + SO4-2 = HSO4-
log_k 1.99
delta_h 22 kJ
-gamma 4.5 0
# Id: 3307320
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
NH4+ + SO4-2 = NH4SO4-
log_k 1.03
delta_h 0 kJ
-gamma 5 0
# Id: 4907320
# log K source: NIST46.3
# Delta H source: MTQ3.11
```

```
#T and ionic strength:  0.00 25.0
Pb+2 + SO4-2 = PbSO4
log_k 2.69
delta_h 0 kJ
-gamma 0 0
# Id:  6007320
# log K source:  NIST46.3
# Delta H source:  MTQ3.11
#T and ionic strength:  0.00 25.0
Pb+2 + 2SO4-2 = Pb(SO4)2-2
log_k 3.47
delta_h 0 kJ
-gamma 0 0
# Id:  6007321
# log K source:  SCD3.02 (1960 RKa)
# Delta H source:  MTQ3.11
#T and ionic strength:  0.00 25.0
Al+3 + SO4-2 = AlSO4+
log_k 3.89
delta_h 28 kJ
-gamma 4.5 0
# Id:  307320
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  0.00 25.0
Al+3 + 2SO4-2 = Al(SO4)2-
log_k 4.92
delta_h 11.9 kJ
-gamma 4.5 0
# Id:  307321
# log K source:  Nord90
# Delta H source:  Nord90
#T and ionic strength:  0.00 25.0
Tl+ + SO4-2 = TlSO4-
log_k 1.37
delta_h -0.8 kJ
-gamma 0 0
# Id:  8707320
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  0.00 25.0
Zn+2 + SO4-2 = ZnSO4
log_k 2.34
delta_h 6.2 kJ
-gamma 0 0
# Id:  9507320
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  0.00 25.0
Zn+2 + 2SO4-2 = Zn(SO4)2-2
log_k 3.28
delta_h 0 kJ
-gamma 0 0
# Id:  9507321
```

```
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Cd+2 + SO4-2 = CdSO4
log_k 2.37
delta_h 8.7 kJ
-gamma 0 0
# Id: 1607320
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Cd+2 + 2SO4-2 = Cd(SO4)2-2
log_k 3.5
delta_h 0 kJ
-gamma 0 0
# Id: 1607321
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Hg(OH)2 + 2H+ + SO4-2 = HgSO4 + 2H2O
log_k 8.612
delta_h 0 kJ
-gamma 0 0
# Id: 3617320
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.50 25.0
Cu+2 + SO4-2 = CuSO4
log_k 2.36
delta_h 8.7 kJ
-gamma 0 0
# Id: 2317320
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Ag+ + SO4-2 = AgSO4-
log_k 1.3
delta_h 6.2 kJ
-gamma 0 0
# Id: 207320
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Ni+2 + SO4-2 = NiSO4
log_k 2.3
delta_h 5.8 kJ
-gamma 0 0
# Id: 5407320
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Ni+2 + 2SO4-2 = Ni(SO4)2-2
log_k 0.82
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 5407321
# log K source: SCD3.02 (1978 BLa)
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Co+2 + SO4-2 = CoSO4
log_k 2.3
delta_h 6.2 kJ
-gamma 0 0
# Id: 2007320
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Fe+2 + SO4-2 = FeSO4
log_k 2.39
delta_h 8 kJ
-gamma 0 0
# Id: 2807320
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Fe+3 + SO4-2 = FeSO4+
log_k 4.05
delta_h 25 kJ
-gamma 5 0
# Id: 2817320
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Fe+3 + 2SO4-2 = Fe(SO4)2-
log_k 5.38
delta_h 19.2 kJ
-gamma 0 0
# Id: 2817321
# log K source: Nord90
# Delta H source: Nord90
#T and ionic strength: 0.00 25.0
Mn+2 + SO4-2 = MnSO4
log_k 2.25
delta_h 8.7 kJ
-gamma 0 0
# Id: 4707320
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Cr(OH)2+ + 2H+ + SO4-2 = CrSO4+ + 2H2O
log_k 12.9371
delta_h -98.62 kJ
-gamma 0 0
# Id: 2117320
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 1.00 50.0
Cr(OH)2+ + H+ + SO4-2 = CrOHSO4 + H2O
```

```
log_k 8.2871
delta_h 0 kJ
-gamma 0 0
# Id: 2117321
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.10 25.0
2Cr(OH)2+ + SO4-2 + 2H+ = Cr2(OH)2SO4+2 + 2H2O
log_k 16.155
delta_h 0 kJ
-gamma 0 0
# Id: 2117323
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
2Cr(OH)2+ + 2SO4-2 + 2H+ = Cr2(OH)2(SO4)2 + 2H2O
log_k 17.9288
delta_h 0 kJ
-gamma 0 0
# Id: 2117324
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
U+4 + SO4-2 = USO4+2
log_k 6.6
delta_h 8 kJ
-gamma 0 0
# Id: 8917320
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
U+4 + 2SO4-2 = U(SO4)2
log_k 10.5
delta_h 33 kJ
-gamma 0 0
# Id: 8917321
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
UO2+2 + SO4-2 = UO2SO4
log_k 3.18
delta_h 20 kJ
-gamma 0 0
# Id: 8937320
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
UO2+2 + 2SO4-2 = UO2(SO4)2-2
log_k 4.3
delta_h 38 kJ
-gamma 0 0
# Id: 8937321
# log K source: NIST46.3
# Delta H source: NIST46.3
```

```
#T and ionic strength:  0.00 25.0
V+3 + SO4-2 = VSO4+
log_k 2.674
delta_h 0 kJ
-gamma 0 0
# Id:  9017320
# log K source:  NIST46.3
# Delta H source:  MTQ3.11
#T and ionic strength:  1.00 25.0
VO+2 + SO4-2 = VOSO4
log_k 2.44
delta_h 17 kJ
-gamma 0 0
# Id:  9027320
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  0.00 25.0
VO2+ + SO4-2 = VO2SO4-
log_k 1.378
delta_h 0 kJ
-gamma 0 0
# Id:  9037320
# log K source:  NIST46.3
# Delta H source:  MTQ3.11
#T and ionic strength:  1.00 20.0
Be+2 + SO4-2 = BeSO4
log_k 2.19
delta_h 29 kJ
-gamma 0 0
# Id:  1107321
# log K source:  NIST46.4
# Delta H source:  NIST46.4
#T and ionic strength:  0.00 25.0
Be+2 + 2SO4-2 = Be(SO4)2-2
log_k 2.596
delta_h 0 kJ
-gamma 0 0
# Id:  1107322
# log K source:  NIST46.4
# Delta H source:  MTQ3.11
#T and ionic strength:  1.00 25.0
Mg+2 + SO4-2 = MgSO4
log_k 2.26
delta_h 5.8 kJ
-gamma 0 0
# Id:  4607320
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  0.00 25.0
Ca+2 + SO4-2 = CaSO4
log_k 2.36
delta_h 7.1 kJ
-gamma 0 0
# Id:  1507320
```

```
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Sr+2 + SO4-2 = SrSO4
log_k 2.3
delta_h 8 kJ
-gamma 0 0
# Id: 8007321
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Li+ + SO4-2 = LiSO4-
log_k 0.64
delta_h 0 kJ
-gamma 5 0
# Id: 4407320
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Na+ + SO4-2 = NaSO4-
log_k 0.73
delta_h 1 kJ
-gamma 5.4 0
# Id: 5007320
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
K+ + SO4-2 = KSO4-
log_k 0.85
delta_h 4.1 kJ
-gamma 5.4 0
# Id: 4107320
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
HSe- + H+ = H2Se
log_k 3.89
delta_h 3.3 kJ
-gamma 0 0
# Id: 3307600
# log K source: NIST46.3
# Delta H source: NIST2.1.1
#T and ionic strength: 0.00 25.0
2Ag+ + HSe- = Ag2Se + H+
log_k 34.911
delta_h 0 kJ
-gamma 0 0
# Id: 207600
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
Ag+ + H2O + 2HSe- = AgOH(Se)2-4 + 3H+
log_k -20.509
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 207601
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
Mn+2 + HSe- = MnSe + H+
log_k -5.385
delta_h 0 kJ
-gamma 0 0
# Id: 4707600
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
HSeO3- = SeO3-2 + H+
log_k -8.4
delta_h 5.02 kJ
-gamma 0 0
# Id: 3307611
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
HSeO3- + H+ = H2SeO3
log_k 2.63
delta_h 6.2 kJ
-gamma 0 0
# Id: 3307610
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Cd+2 + 2HSeO3- = Cd(SeO3)2-2 + 2H+
log_k -10.884
delta_h 0 kJ
-gamma 0 0
# Id: 1607610
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
Ag+ + HSeO3- = AgSeO3- + H+
log_k -5.592
delta_h 0 kJ
-gamma 0 0
# Id: 207610
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
Ag+ + 2HSeO3- = Ag(SeO3)2-3 + 2H+
log_k -13.04
delta_h 0 kJ
-gamma 0 0
# Id: 207611
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
Fe+3 + HSeO3- = FeHSeO3+2
```

```
log_k 3.422
delta_h 25 kJ
-gamma 0 0
# Id: 2817610
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 1.00 25.0
SeO4-2 + H+ = HSeO4-
log_k 1.7
delta_h 23 kJ
-gamma 0 0
# Id: 3307620
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Zn+2 + SeO4-2 = ZnSeO4
log_k 2.19
delta_h 0 kJ
-gamma 0 0
# Id: 9507620
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Zn+2 + 2SeO4-2 = Zn(SeO4)2-2
log_k 2.196
delta_h 0 kJ
-gamma 0 0
# Id: 9507621
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
Cd+2 + SeO4-2 = CdSeO4
log_k 2.27
delta_h 0 kJ
-gamma 0 0
# Id: 1607620
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Ni+2 + SeO4-2 = NiSeO4
log_k 2.67
delta_h 14 kJ
-gamma 0 0
# Id: 5407620
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Co+2 + SeO4-2 = CoSeO4
log_k 2.7
delta_h 12 kJ
-gamma 0 0
# Id: 2007621
# log K source: NIST46.4
# Delta H source: NIST46.4
```

```
#T and ionic strength:  0.00 25.0
Mn+2 + SeO4-2 = MnSeO4
log_k 2.43
delta_h 14 kJ
-gamma 0 0
# Id:  4707620
# log K source:  NIST46.4
# Delta H source:  NIST46.4
#T and ionic strength:  0.00 25.0
NH4+ = NH3 + H+
log_k -9.244
delta_h 52 kJ
-gamma 0 0
# Id:  3304900
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  0.00 25.0
Ag+ + NH4+ = AgNH3+ + H+
log_k -5.934
delta_h -72 kJ
-gamma 0 0
# Id:  204901
# log K source:  NIST46.4
# Delta H source:  NIST46.4
#T and ionic strength:  0.00 25.0
Ag+ + 2NH4+ = Ag(NH3)2+ + 2H+
log_k -11.268
delta_h -160 kJ
-gamma 0 0
# Id:  204902
# log K source:  NIST46.4
# Delta H source:  NIST46.4
#T and ionic strength:  0.00 25.0
Hg(OH)2 + H+ + NH4+ = HgNH3+2 + 2H2O
log_k 5.75
delta_h 0 kJ
-gamma 0 0
# Id:  3614900
# log K source:  NIST46.3
# Delta H source:  MTQ3.11
#T and ionic strength:  2.00 22.0
Hg(OH)2 + 2NH4+ = Hg(NH3)2+2 + 2H2O
log_k 5.506
delta_h -246.72 kJ
-gamma 0 0
# Id:  3614901
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  1.00 25.0
Hg(OH)2 + 3NH4+ = Hg(NH3)3+2 + 2H2O + H+
log_k -3.138
delta_h -312.72 kJ
-gamma 0 0
# Id:  3614902
```

```
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 2.00 25.0
Hg(OH)2 + 4NH4+ = Hg(NH3)4+2 + 2H2O + 2H+
log_k -11.482
delta_h -379.72 kJ
-gamma 0 0
# Id: 3614903
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.10 25.0
Cu+2 + NH4+ = CuNH3+2 + H+
log_k -5.234
delta_h -72 kJ
-gamma 0 0
# Id: 2314901
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Ni+2 + NH4+ = NiNH3+2 + H+
log_k -6.514
delta_h -67 kJ
-gamma 0 0
# Id: 5404901
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.10 25.0
Ni+2 + 2NH4+ = Ni(NH3)2+2 + 2H+
log_k -13.598
delta_h -111.6 kJ
-gamma 0 0
# Id: 5404902
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.10 25.0
Co+2 + NH4+ = Co(NH3)+2 + H+
log_k -7.164
delta_h -65 kJ
-gamma 0 0
# Id: 2004900
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.10 25.0
Co+2 + 2NH4+ = Co(NH3)2+2 + 2H+
log_k -14.778
delta_h 0 kJ
-gamma 0 0
# Id: 2004901
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 2.00 25.0
Co+2 + 3NH4+ = Co(NH3)3+2 + 3H+
log_k -22.922
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 2004902
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 2.00 25.0
Co+2 + 4NH4+ = Co(NH3)4+2 + 4H+
log_k -31.446
delta_h 0 kJ
-gamma 0 0
# Id: 2004903
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 2.00 30.0
Co+2 + 5NH4+ = Co(NH3)5+2 + 5H+
log_k -40.47
delta_h 0 kJ
-gamma 0 0
# Id: 2004904
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 2.00 30.0
Co+3 + 6NH4+ + H2O = Co(NH3)6OH+2 + 7H+
log_k -43.7148
delta_h 0 kJ
-gamma 0 0
# Id: 2014901
# log K source: NIST2.1.1
# Delta H source: MTQ3.11
#T and ionic strength:
Co+3 + 5NH4+ + Cl- = Co(NH3)5Cl+2 + 5H+
log_k -17.9584
delta_h 113.38 kJ
-gamma 0 0
# Id: 2014902
# log K source: NIST2.1.1
# Delta H source: NIST2.1.1
#T and ionic strength:
Co+3 + 6NH4+ + Cl- = Co(NH3)6Cl+2 + 6H+
log_k -33.9179
delta_h 104.34 kJ
-gamma 0 0
# Id: 2014903
# log K source: NIST2.1.1
# Delta H source: NIST2.1.1
#T and ionic strength:
Co+3 + 6NH4+ + Br- = Co(NH3)6Br+2 + 6H+
log_k -33.8884
delta_h 110.57 kJ
-gamma 0 0
# Id: 2014904
# log K source: NIST2.1.1
# Delta H source: NIST2.1.1
#T and ionic strength:
Co+3 + 6NH4+ + I- = Co(NH3)6I+2 + 6H+
```

log_k -33.4808
delta_h 115.44 kJ
-gamma 0 0
Id: 2014905
log K source: NIST2.1.1
Delta H source: NIST2.1.1
#T and ionic strength:
Co+3 + 6NH4+ + SO4-2 = Co(NH3)6SO4+ + 6H+
log_k -28.9926
delta_h 124.5 kJ
-gamma 0 0
Id: 2014906
log K source: NIST2.1.1
Delta H source: NIST2.1.1
#T and ionic strength:
Cr(OH)2+ + 6NH4+ = Cr(NH3)6+3 + 2H2O + 4H+
log_k -32.8952
delta_h 0 kJ
-gamma 0 0
Id: 2114900
log K source: NIST46.3
Delta H source: MTQ3.11
#T and ionic strength: 4.50 25.0
Cr(OH)2+ + 5NH4+ = Cr(NH3)5OH+2 + 4H+ + H2O
log_k -30.2759
delta_h 0 kJ
-gamma 0 0
Id: 2114901
log K source: MTQ3.11
Delta H source: MTQ3.11
#T and ionic strength:
Cr(OH)2+ + 6NH4+ + Cl- = Cr(NH3)6Cl+2 + 2H2O + 4H+
log_k -31.7932
delta_h 0 kJ
-gamma 0 0
Id: 2114904
log K source: MTQ3.11
Delta H source: MTQ3.11
#T and ionic strength:
Cr(OH)2+ + 6NH4+ + Br- = Cr(NH3)6Br+2 + 4H+ + 2H2O
log_k -31.887
delta_h 0 kJ
-gamma 0 0
Id: 2114905
log K source: MTQ3.11
Delta H source: MTQ3.11
#T and ionic strength:
Cr(OH)2+ + 6NH4+ + I- = Cr(NH3)6I+2 + 4H+ + 2H2O
log_k -32.008
delta_h 0 kJ
-gamma 0 0
Id: 2114906
log K source: MTQ3.11
Delta H source: MTQ3.11

#T and ionic strength:
#Cr(OH)2+ + 4NH4+ = cis+ + 4H+
log_k -29.8574
delta_h 0 kJ
-gamma 0 0
Id: 4902113
log K source: MTQ3.11
Delta H source: MTQ3.11
#T and ionic strength:
#Cr(OH)2+ + 4NH4+ = trans+ + 4H+
log_k -30.5537
delta_h 0 kJ
-gamma 0 0
Id: 4902114
log K source: MTQ3.11
Delta H source: MTQ3.11
#T and ionic strength:
Ca+2 + NH4+ = CaNH3+2 + H+
log_k -9.144
delta_h 0 kJ
-gamma 0 0
Id: 1504901
log K source: NIST46.4
Delta H source: MTQ3.11
#T and ionic strength: 0.50 25.0
Ca+2 + 2NH4+ = Ca(NH3)2+2 + 2H+
log_k -18.788
delta_h 0 kJ
-gamma 0 0
Id: 1504902
log K source: NIST46.4
Delta H source: MTQ3.11
#T and ionic strength: 0.50 25.0
Sr+2 + NH4+ = SrNH3+2 + H+
log_k -9.344
delta_h 0 kJ
-gamma 0 0
Id: 8004901
log K source: NIST46.4
Delta H source: MTQ3.11
#T and ionic strength: 0.50 25.0
Ba+2 + NH4+ = BaNH3+2 + H+
log_k -9.444
delta_h 0 kJ
-gamma 0 0
Id: 1004901
log K source: NIST46.4
Delta H source: MTQ3.11
#T and ionic strength: 0.50 25.0
Tl+ + NO2- = TlNO2
log_k 0.83
delta_h 0 kJ
-gamma 0 0
Id: 8704910

```
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Ag+ + NO2- = AgNO2
log_k 2.32
delta_h -29 kJ
-gamma 0 0
# Id: 204911
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Ag+ + 2NO2- = Ag(NO2)2-
log_k 2.51
delta_h -46 kJ
-gamma 0 0
# Id: 204910
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Cu+2 + NO2- = CuNO2+
log_k 2.02
delta_h 0 kJ
-gamma 0 0
# Id: 2314911
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Cu+2 + 2NO2- = Cu(NO2)2
log_k 3.03
delta_h 0 kJ
-gamma 0 0
# Id: 2314912
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Co+2 + NO2- = CoNO2+
log_k 0.848
delta_h 0 kJ
-gamma 0 0
# Id: 2004911
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
Sn(OH)2 + 2H+ + NO3- = SnNO3+ + 2H2O
log_k 7.942
delta_h 0 kJ
-gamma 0 0
# Id: 7904921
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 25.0
Pb+2 + NO3- = PbNO3+
log_k 1.17
delta_h 2 kJ
```

```
-gamma 0 0
# Id: 6004920
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Pb+2 + 2NO3- = Pb(NO3)2
log_k 1.4
delta_h -6.6 kJ
-gamma 0 0
# Id: 6004921
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Tl+ + NO3- = TlNO3
log_k 0.33
delta_h -2 kJ
-gamma 0 0
# Id: 8704920
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Tl(OH)3 + NO3- + 3H+ = TlNO3+2 + 3H2O
log_k 7.0073
delta_h 0 kJ
-gamma 0 0
# Id: 8714920
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Cd+2 + NO3- = CdNO3+
log_k 0.5
delta_h -21 kJ
-gamma 0 0
# Id: 1604920
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Cd+2 + 2NO3- = Cd(NO3)2
log_k 0.2
delta_h 0 kJ
-gamma 0 0
# Id: 1604921
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Hg(OH)2 + 2H+ + NO3- = HgNO3+ + 2H2O
log_k 5.7613
delta_h 0 kJ
-gamma 0 0
# Id: 3614920
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 3.00 25.0
Hg(OH)2 + 2H+ + 2NO3- = Hg(NO3)2 + 2H2O
```

```
log_k 5.38
delta_h 0 kJ
-gamma 0 0
# Id: 3614921
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 3.00 25.0
Cu+2 + NO3- = CuNO3+
log_k 0.5
delta_h -4.1 kJ
-gamma 0 0
# Id: 2314921
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Cu+2 + 2NO3- = Cu(NO3)2
log_k -0.4
delta_h 0 kJ
-gamma 0 0
# Id: 2314922
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Zn+2 + NO3- = ZnNO3+
log_k 0.4
delta_h -4.6 kJ
-gamma 0 0
# Id: 9504921
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Zn+2 + 2NO3- = Zn(NO3)2
log_k -0.3
delta_h 0 kJ
-gamma 0 0
# Id: 9504922
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Ag+ + NO3- = AgNO3
log_k -0.1
delta_h 22.6 kJ
-gamma 0 0
# Id: 204920
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Ni+2 + NO3- = NiNO3+
log_k 0.4
delta_h 0 kJ
-gamma 0 0
# Id: 5404921
# log K source: NIST46.4
# Delta H source: MTQ3.11
```

```
#T and ionic strength:  0.00 25.0
Co+2 + NO3- = CoNO3+
log_k 0.2
delta_h 0 kJ
-gamma 0 0
# Id:  2004921
# log K source:  NIST46.4
# Delta H source:  MTQ3.11
#T and ionic strength:  0.00 25.0
Co+2 + 2NO3- = Co(NO3)2
log_k 0.5085
delta_h 0 kJ
-gamma 0 0
# Id:  2004922
# log K source:  NIST46.4
# Delta H source:  MTQ3.11
#T and ionic strength:  0.50 25.0
Fe+3 + NO3- = FeNO3+2
log_k 1
delta_h -37 kJ
-gamma 0 0
# Id:  2814921
# log K source:  NIST46.4
# Delta H source:  NIST46.4
#T and ionic strength:  0.00 25.0
Mn+2 + NO3- = MnNO3+
log_k 0.2
delta_h 0 kJ
-gamma 0 0
# Id:  4704921
# log K source:  NIST46.4
# Delta H source:  MTQ3.11
#T and ionic strength:  0.00 25.0
Mn+2 + 2NO3- = Mn(NO3)2
log_k 0.6
delta_h -1.6569 kJ
-gamma 0 0
# Id:  4704920
# log K source:  NIST46.3
# Delta H source:  MTQ3.11
#T and ionic strength:  0.00 25.0
Cr(OH)2+ + NO3- + 2H+ = CrNO3+2 + 2H2O
log_k 8.2094
delta_h -65.4378 kJ
-gamma 0 0
# Id:  2114920
# log K source:  MTQ3.11
# Delta H source:  MTQ3.11
#T and ionic strength:
UO2+2 + NO3- = UO2NO3+
log_k 0.3
delta_h -12 kJ
-gamma 0 0
# Id:  8934921
```

```
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
VO2+ + NO3- = VO2NO3
log_k -0.296
delta_h 0 kJ
-gamma 0 0
# Id: 9034920
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 1.00 20.0
Ca+2 + NO3- = CaNO3+
log_k 0.5
delta_h -5.4 kJ
-gamma 0 0
# Id: 1504921
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Sr+2 + NO3- = SrNO3+
log_k 0.6
delta_h -10 kJ
-gamma 0 0
# Id: 8004921
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Ba+2 + NO3- = BaNO3+
log_k 0.7
delta_h -13 kJ
-gamma 0 0
# Id: 1004921
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
H+ + Cyanide- = HCyanide
log_k 9.21
delta_h -43.63 kJ
-gamma 0 0
# Id: 3301431
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Cd+2 + Cyanide- = CdCyanide+
log_k 6.01
delta_h -30 kJ
-gamma 0 0
# Id: 1601431
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Cd+2 + 2Cyanide- = Cd(Cyanide)2
log_k 11.12
delta_h -54.3 kJ
```

```
-gamma 0 0
# Id: 1601432
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Cd+2 + 3Cyanide- = Cd(Cyanide)3-
log_k 15.65
delta_h -90.3 kJ
-gamma 0 0
# Id: 1601433
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Cd+2 + 4Cyanide- = Cd(Cyanide)4-2
log_k 17.92
delta_h -112 kJ
-gamma 0 0
# Id: 1601434
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Hg(OH)2 + 2H+ + Cyanide- = HgCyanide+ + 2H2O
log_k 23.194
delta_h -136.72 kJ
-gamma 0 0
# Id: 3611431
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Hg(OH)2 + 2H+ + 2Cyanide- = Hg(Cyanide)2 + 2H2O
log_k 38.944
delta_h 154.28 kJ
-gamma 0 0
# Id: 3611432
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Hg(OH)2 + 2H+ + 3Cyanide- = Hg(Cyanide)3- + 2H2O
log_k 42.504
delta_h -262.72 kJ
-gamma 0 0
# Id: 3611433
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Hg(OH)2 + 2H+ + 4Cyanide- = Hg(Cyanide)4-2 + 2H2O
log_k 45.164
delta_h -288.72 kJ
-gamma 0 0
# Id: 3611434
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Cu+ + 2Cyanide- = Cu(Cyanide)2-
```

```
log_k 21.9145
delta_h -121 kJ
-gamma 0 0
# Id: 2301432
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.10 25.0
Cu+ + 3Cyanide- = Cu(Cyanide)3-2
log_k 27.2145
delta_h -167.4 kJ
-gamma 0 0
# Id: 2301433
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Cu+ + 4Cyanide- = Cu(Cyanide)4-3
log_k 28.7145
delta_h -214.2 kJ
-gamma 0 0
# Id: 2301431
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Ag+ + 2Cyanide- = Ag(Cyanide)2-
log_k 20.48
delta_h -137 kJ
-gamma 0 0
# Id: 201432
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Ag+ + 3Cyanide- = Ag(Cyanide)3-2
log_k 21.7
delta_h -140 kJ
-gamma 0 0
# Id: 201433
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Ag+ + H2O + Cyanide- = Ag(Cyanide)OH- + H+
log_k -0.777
delta_h 0 kJ
-gamma 0 0
# Id: 201431
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Ni+2 + 4Cyanide- = Ni(Cyanide)4-2
log_k 30.2
delta_h -180 kJ
-gamma 0 0
# Id: 5401431
# log K source: NIST46.4
# Delta H source: NIST46.4
```

```
#T and ionic strength:  0.00 25.0
Ni+2 + 4Cyanide- + H+ = NiH(Cyanide)4-
log_k 36.0289
delta_h 0 kJ
-gamma 0 0
# Id:  5401432
# log K source:  NIST46.4
# Delta H source:  MTQ3.11
#T and ionic strength:  0.10 25.0
Ni+2 + 4Cyanide- + 2H+ = NiH2Cyanide4
log_k 40.7434
delta_h 0 kJ
-gamma 0 0
# Id:  5401433
# log K source:  NIST46.4
# Delta H source:  MTQ3.11
#T and ionic strength:  0.10 25.0
Ni+2 + 4Cyanide- + 3H+ = NiH3(Cyanide)4+
log_k 43.3434
delta_h 0 kJ
-gamma 0 0
# Id:  5401434
# log K source:  NIST46.4
# Delta H source:  MTQ3.11
#T and ionic strength:  0.10 25.0
Co+2 + 3Cyanide- = Co(Cyanide)3-
log_k 14.312
delta_h 0 kJ
-gamma 0 0
# Id:  2001431
# log K source:  NIST46.4
# Delta H source:  MTQ3.11
#T and ionic strength:  1.00 25.0
Co+2 + 5Cyanide- = Co(Cyanide)5-3
log_k 23
delta_h -257 kJ
-gamma 0 0
# Id:  2001432
# log K source:  NIST46.4
# Delta H source:  NIST46.4
#T and ionic strength:  1.00 25.0
Fe+2 + 6Cyanide- = Fe(Cyanide)6-4
log_k 35.4
delta_h -358 kJ
-gamma 0 0
# Id:  2801431
# log K source:  NIST46.4
# Delta H source:  NIST46.4
#T and ionic strength:  0.00 25.0
H+ + Fe+2 + 6Cyanide- = HFe(Cyanide)6-3
log_k 39.71
delta_h -356 kJ
-gamma 0 0
# Id:  2801432
```

```
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
2H+ + Fe+2 + 6Cyanide- = H2Fe(Cyanide)6-2
log_k 42.11
delta_h -352 kJ
-gamma 0 0
# Id: 2801433
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Fe+3 + 6Cyanide- = Fe(Cyanide)6-3
log_k 43.6
delta_h -293 kJ
-gamma 0 0
# Id: 2811431
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
2Fe+3 + 6Cyanide- = Fe2(Cyanide)6
log_k 47.6355
delta_h -218 kJ
-gamma 0 0
# Id: 2811432
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.50 25.0
Sn(OH)2 + Fe+3 + 6Cyanide- + 2H+ = SnFe(Cyanide)6- + 2H2O
log_k 53.54
delta_h 0 kJ
-gamma 0 0
# Id: 7901431
# log K source: Ba1987
# Delta H source:
#T and ionic strength: 0.00 25.0
NH4+ + Fe+2 + 6Cyanide- = NH4Fe(Cyanide)6-3
log_k 37.7
delta_h -354 kJ
-gamma 0 0
# Id: 4901431
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Tl+ + Fe+2 + 6Cyanide- = TlFe(Cyanide)6-3
log_k 38.4
delta_h -365.5 kJ
-gamma 0 0
# Id: 8701432
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Mg+2 + Fe+3 + 6Cyanide- = MgFe(Cyanide)6-
log_k 46.39
delta_h -290 kJ
```

```
-gamma 0 0
# Id: 4601431
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Mg+2 + Fe+2 + 6Cyanide- = MgFe(Cyanide)6-2
log_k 39.21
delta_h -346 kJ
-gamma 0 0
# Id: 4601432
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Ca+2 + Fe+3 + 6Cyanide- = CaFe(Cyanide)6-
log_k 46.43
delta_h -291 kJ
-gamma 0 0
# Id: 1501431
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Ca+2 + Fe+2 + 6Cyanide- = CaFe(Cyanide)6-2
log_k 39.1
delta_h -347 kJ
-gamma 0 0
# Id: 1501432
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
2Ca+2 + Fe+2 + 6Cyanide- = Ca2Fe(Cyanide)6
log_k 40.6
delta_h -350.201 kJ
-gamma 0 0
# Id: 1501433
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Sr+2 + Fe+3 + 6Cyanide- = SrFe(Cyanide)6-
log_k 46.45
delta_h -292 kJ
-gamma 0 0
# Id: 8001431
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Sr+2 + Fe+2 + 6Cyanide- = SrFe(Cyanide)6-2
log_k 39.1
delta_h -350 kJ
-gamma 0 0
# Id: 8001432
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Ba+2 + Fe+2 + 6Cyanide- = BaFe(Cyanide)6-2
```

```
log_k 39.19
delta_h -342 kJ
-gamma 0 0
# Id: 1001430
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Ba+2 + Fe+3 + 6Cyanide- = BaFe(Cyanide)6-
log_k 46.48
delta_h -292 kJ
-gamma 0 0
# Id: 1001431
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Na+ + Fe+2 + 6Cyanide- = NaFe(Cyanide)6-3
log_k 37.6
delta_h -354 kJ
-gamma 0 0
# Id: 5001431
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
K+ + Fe+2 + 6Cyanide- = KFe(Cyanide)6-3
log_k 37.75
delta_h -353.9 kJ
-gamma 0 0
# Id: 4101433
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
K+ + Fe+3 + 6Cyanide- = KFe(Cyanide)6-2
log_k 45.04
delta_h -291 kJ
-gamma 0 0
# Id: 4101430
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
H+ + PO4-3 = HPO4-2
log_k 12.375
delta_h -15 kJ
-gamma 5 0
# Id: 3305800
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
2H+ + PO4-3 = H2PO4-
log_k 19.573
delta_h -18 kJ
-gamma 5.4 0
# Id: 3305801
# log K source: NIST46.3
# Delta H source: NIST46.3
```

```
#T and ionic strength:  0.00 25.0
3H+ + PO4-3 = H3PO4
log_k 21.721
delta_h -10.1 kJ
-gamma 0 0
# Id:  3305802
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  0.00 25.0
Co+2 + H+ + PO4-3 = CoHPO4
log_k 15.4128
delta_h 0 kJ
-gamma 0 0
# Id:  2005800
# log K source:  NIST46.4
# Delta H source:  MTQ3.11
#T and ionic strength:  0.10 25.0
Fe+2 + 2H+ + PO4-3 = FeH2PO4+
log_k 22.273
delta_h 0 kJ
-gamma 5.4 0
# Id:  2805800
# log K source:  NIST46.3
# Delta H source:  MTQ3.11
#T and ionic strength:  0.00 25.0
Fe+2 + H+ + PO4-3 = FeHPO4
log_k 15.975
delta_h 0 kJ
-gamma 0 0
# Id:  2805801
# log K source:  NIST46.3
# Delta H source:  MTQ3.11
#T and ionic strength:  0.00 25.0
Fe+3 + 2H+ + PO4-3 = FeH2PO4+2
log_k 23.8515
delta_h 0 kJ
-gamma 5.4 0
# Id:  2815801
# log K source:  NIST46.3
# Delta H source:  MTQ3.11
#T and ionic strength:  0.50 25.0
Fe+3 + H+ + PO4-3 = FeHPO4+
log_k 22.292
delta_h -30.5432 kJ
-gamma 5.4 0
# Id:  2815800
# log K source:  NIST46.3
# Delta H source:  MTQ3.11
#T and ionic strength:  0.50 25.0
Cr(OH)2+ + 4H+ + PO4-3 = CrH2PO4+2 + 2H2O
log_k 31.9068
delta_h 0 kJ
-gamma 0 0
# Id:  2115800
```

```
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
U+4 + PO4-3 + H+ = UHPO4+2
log_k 24.443
delta_h 31.38 kJ
-gamma 0 0
# Id: 8915800
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
U+4 + 2PO4-3 + 2H+ = U(HPO4)2
log_k 46.833
delta_h 7.1128 kJ
-gamma 0 0
# Id: 8915801
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
U+4 + 3PO4-3 + 3H+ = U(HPO4)3-2
log_k 67.564
delta_h -32.6352 kJ
-gamma 0 0
# Id: 8915802
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
U+4 + 4PO4-3 + 4H+ = U(HPO4)4-4
log_k 88.483
delta_h -110.876 kJ
-gamma 0 0
# Id: 8915803
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
UO2+2 + H+ + PO4-3 = UO2HPO4
log_k 19.655
delta_h -8.7864 kJ
-gamma 0 0
# Id: 8935800
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
UO2+2 + 2PO4-3 + 2H+ = UO2(HPO4)2-2
log_k 42.988
delta_h -47.6934 kJ
-gamma 0 0
# Id: 8935801
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
UO2+2 + 2H+ + PO4-3 = UO2H2PO4+
log_k 22.833
delta_h -15.4808 kJ
```

```
-gamma 0 0
# Id: 8935802
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
UO2+2 + 2PO4-3 + 4H+ = UO2(H2PO4)2
log_k 44.7
delta_h -69.036 kJ
-gamma 0 0
# Id: 8935803
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
UO2+2 + 3PO4-3 + 6H+ = UO2(H2PO4)3-
log_k 66.245
delta_h -119.662 kJ
-gamma 0 0
# Id: 8935804
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
UO2+2 + PO4-3 = UO2PO4-
log_k 13.25
delta_h 0 kJ
-gamma 0 0
# Id: 8935805
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Mg+2 + PO4-3 = MgPO4-
log_k 4.654
delta_h 12.9704 kJ
-gamma 5.4 0
# Id: 4605800
# log K source: SCD3.02 (1993 GMa)
# Delta H source: MTQ3.11
#T and ionic strength: 0.20 25.0
Mg+2 + 2H+ + PO4-3 = MgH2PO4+
log_k 21.2561
delta_h -4.6861 kJ
-gamma 5.4 0
# Id: 4605801
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 37.0
Mg+2 + H+ + PO4-3 = MgHPO4
log_k 15.175
delta_h -3 kJ
-gamma 0 0
# Id: 4605802
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Ca+2 + H+ + PO4-3 = CaHPO4
```

```
log_k 15.035
delta_h -3 kJ
-gamma 0 0
# Id: 1505800
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Ca+2 + PO4-3 = CaPO4-
log_k 6.46
delta_h 12.9704 kJ
-gamma 5.4 0
# Id: 1505801
# log K source: SCD3.02 (1993 GMa)
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Ca+2 + 2H+ + PO4-3 = CaH2PO4+
log_k 20.923
delta_h -6 kJ
-gamma 5.4 0
# Id: 1505802
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Sr+2 + H+ + PO4-3 = SrHPO4
log_k 14.8728
delta_h 0 kJ
-gamma 0 0
# Id: 8005800
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.10 25.0
Sr+2 + 2H+ + PO4-3 = SrH2PO4+
log_k 20.4019
delta_h 0 kJ
-gamma 0 0
# Id: 8005801
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.10 20.0
Na+ + H+ + PO4-3 = NaHPO4-
log_k 13.445
delta_h 0 kJ
-gamma 5.4 0
# Id: 5005800
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
K+ + H+ + PO4-3 = KHPO4-
log_k 13.255
delta_h 0 kJ
-gamma 5.4 0
# Id: 4105800
# log K source: NIST46.3
# Delta H source: MTQ3.11
```

```
#T and ionic strength:  0.00 25.0
H3AsO3 = AsO3-3 + 3H+
log_k -34.744
delta_h 84.726 kJ
-gamma 0 0
# Id:  3300602
# log K source:  MTQ3.11
# Delta H source:  MTQ3.11
#T and ionic strength:
H3AsO3 = HAsO3-2 + 2H+
log_k -21.33
delta_h 59.4086 kJ
-gamma 0 0
# Id:  3300601
# log K source:  MTQ3.11
# Delta H source:  MTQ3.11
#T and ionic strength:
H3AsO3 = H2AsO3- + H+
log_k -9.29
delta_h 27.41 kJ
-gamma 0 0
# Id:  3300600
# log K source:  NIST46.4
# Delta H source:  NIST2.1.1
#T and ionic strength:  0.00 25.0
H3AsO3 + H+ = H4AsO3+
log_k -0.305
delta_h 0 kJ
-gamma 0 0
# Id:  3300603
# log K source:  MTQ3.11
# Delta H source:  MTQ3.11
#T and ionic strength:
H3AsO4 = AsO4-3 + 3H+
log_k -20.7
delta_h 12.9 kJ
-gamma 0 0
# Id:  3300613
# log K source:  NIST46.4
# Delta H source:  NIST46.4
#T and ionic strength:  0.00 25.0
H3AsO4 = HAsO4-2 + 2H+
log_k -9.2
delta_h -4.1 kJ
-gamma 0 0
# Id:  3300612
# log K source:  NIST46.4
# Delta H source:  NIST46.4
#T and ionic strength:  0.00 25.0
H3AsO4 = H2AsO4- + H+
log_k -2.24
delta_h -7.1 kJ
-gamma 0 0
# Id:  3300611
```

```
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Sb(OH)3 + H2O = Sb(OH)4- + H+
log_k -12.0429
delta_h 69.8519 kJ
-gamma 0 0
# Id: 7400020
# log K source: PNL89
# Delta H source: PNL89
#T and ionic strength:
Sb(OH)3 + H+ = Sb(OH)2+ + H2O
log_k 1.3853
delta_h 0 kJ
-gamma 0 0
# Id: 7403302
# log K source: PNL89
# Delta H source: PNL89
#T and ionic strength:
Sb(OH)3 = HSbO2 + H2O
log_k -0.0105
delta_h -0.13 kJ
-gamma 0 0
# Id: 7400021
# log K source: NIST2.1.1
# Delta H source: NIST2.1.1
#T and ionic strength:
Sb(OH)3 = SbO2- + H2O + H+
log_k -11.8011
delta_h 70.1866 kJ
-gamma 0 0
# Id: 7403301
# log K source: PNL89
# Delta H source: PNL89
#T and ionic strength:
Sb(OH)3 + H+ = SbO+ + 2H2O
log_k 0.9228
delta_h 8.2425 kJ
-gamma 0 0
# Id: 7403300
# log K source: PNL89
# Delta H source: PNL89
#T and ionic strength:
Sb(OH)6- = SbO3- + 3H2O
log_k 2.9319
delta_h 0 kJ
-gamma 0 0
# Id: 7410021
# log K source: PNL89
# Delta H source: PNL89
#T and ionic strength:
Sb(OH)6- + 2H+ = SbO2+ + 4H2O
log_k 2.3895
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 7413300
# log K source: PNL89
# Delta H source: PNL89
#T and ionic strength:
H+ + CO3-2 = HCO3-
log_k 10.329
delta_h -14.6 kJ
-gamma 5.4 0
# Id: 3301400
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
2H+ + CO3-2 = H2CO3
log_k 16.681
delta_h -23.76 kJ
-gamma 0 0
# Id: 3301401
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Pb+2 + 2CO3-2 = Pb(CO3)2-2
log_k 9.938
delta_h 0 kJ
-gamma 0 0
# Id: 6001400
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.50 25.0
Pb+2 + CO3-2 = PbCO3
log_k 6.478
delta_h 0 kJ
-gamma 0 0
# Id: 6001401
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.50 25.0
Pb+2 + CO3-2 + H+ = PbHCO3+
log_k 13.2
delta_h 0 kJ
-gamma 0 0
# Id: 6001402
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
Zn+2 + CO3-2 = ZnCO3
log_k 4.76
delta_h 0 kJ
-gamma 0 0
# Id: 9501401
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Zn+2 + H+ + CO3-2 = ZnHCO3+
```

```
log_k 11.829
delta_h 0 kJ
-gamma 0 0
# Id: 9501400
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Hg(OH)2 + 2H+ + CO3-2 = HgCO3 + 2H2O
log_k 18.272
delta_h 0 kJ
-gamma 0 0
# Id: 3611401
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.50 25.0
Hg(OH)2 + 2H+ + 2CO3-2 = Hg(CO3)2-2 + 2H2O
log_k 21.772
delta_h 0 kJ
-gamma 0 0
# Id: 3611402
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.50 25.0
Hg(OH)2 + 3H+ + CO3-2 = HgHCO3+ + 2H2O
log_k 22.542
delta_h 0 kJ
-gamma 0 0
# Id: 3611403
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.50 25.0
Cd+2 + CO3-2 = CdCO3
log_k 4.3578
delta_h 0 kJ
-gamma 0 0
# Id: 1601401
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.10 25.0
Cd+2 + H+ + CO3-2 = CdHCO3+
log_k 10.6863
delta_h 0 kJ
-gamma 0 0
# Id: 1601400
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 3.00 25.0
Cd+2 + 2CO3-2 = Cd(CO3)2-2
log_k 7.2278
delta_h 0 kJ
-gamma 0 0
# Id: 1601403
# log K source: NIST46.4
# Delta H source: MTQ3.11
```

```
#T and ionic strength:  0.10 20.0
Cu+2 + CO3-2 = CuCO3
log_k 6.77
delta_h 0 kJ
-gamma 0 0
# Id:  2311400
# log K source:  NIST46.4
# Delta H source:  MTQ3.11
#T and ionic strength:  0.00 25.0
Cu+2 + H+ + CO3-2 = CuHCO3+
log_k 12.129
delta_h 0 kJ
-gamma 0 0
# Id:  2311402
# log K source:  NIST46.4
# Delta H source:  MTQ3.11
#T and ionic strength:  0.00 25.0
Cu+2 + 2CO3-2 = Cu(CO3)2-2
log_k 10.2
delta_h 0 kJ
-gamma 0 0
# Id:  2311401
# log K source:  NIST46.4
# Delta H source:  MTQ3.11
#T and ionic strength:  0.00 25.0
Ni+2 + CO3-2 = NiCO3
log_k 4.5718
delta_h 0 kJ
-gamma 0 0
# Id:  5401401
# log K source:  NIST46.3
# Delta H source:  MTQ3.11
#T and ionic strength:  0.70 25.0
Ni+2 + H+ + CO3-2 = NiHCO3+
log_k 12.4199
delta_h 0 kJ
-gamma 0 0
# Id:  5401400
# log K source:  NIST46.3
# Delta H source:  MTQ3.11
#T and ionic strength:  0.70 25.0
Co+2 + CO3-2 = CoCO3
log_k 4.228
delta_h 0 kJ
-gamma 0 0
# Id:  2001400
# log K source:  NIST46.4
# Delta H source:  MTQ3.11
#T and ionic strength:  0.50 25.0
Co+2 + H+ + CO3-2 = CoHCO3+
log_k 12.2199
delta_h 0 kJ
-gamma 0 0
# Id:  2001401
```

```
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.70 25.0
Fe+2 + H+ + CO3-2 = FeHCO3+
log_k 11.429
delta_h 0 kJ
-gamma 6 0
# Id: 2801400
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Mn+2 + H+ + CO3-2 = MnHCO3+
log_k 11.629
delta_h -10.6 kJ
-gamma 5 0
# Id: 4701400
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
UO2+2 + CO3-2 = UO2CO3
log_k 9.6
delta_h 4 kJ
-gamma 0 0
# Id: 8931400
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
UO2+2 + 2CO3-2 = UO2(CO3)2-2
log_k 16.9
delta_h 16 kJ
-gamma 0 0
# Id: 8931401
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
UO2+2 + 3CO3-2 = UO2(CO3)3-4
log_k 21.6
delta_h -40 kJ
-gamma 0 0
# Id: 8931402
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Be+2 + CO3-2 = BeCO3
log_k 6.2546
delta_h 0 kJ
-gamma 0 0
# Id: 1101401
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 3.00 25.0
Mg+2 + CO3-2 = MgCO3
log_k 2.92
delta_h 12 kJ
```

```
-gamma 0 0
# Id: 4601400
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Mg+2 + H+ + CO3-2 = MgHCO3+
log_k 11.339
delta_h -10.6 kJ
-gamma 4 0
# Id: 4601401
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Ca+2 + H+ + CO3-2 = CaHCO3+
log_k 11.599
delta_h 5.4 kJ
-gamma 6 0
# Id: 1501400
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
CO3-2 + Ca+2 = CaCO3
log_k 3.2
delta_h 16 kJ
-gamma 0 0
# Id: 1501401
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
Sr+2 + CO3-2 = SrCO3
log_k 2.81
delta_h 20 kJ
-gamma 0 0
# Id: 8001401
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Sr+2 + H+ + CO3-2 = SrHCO3+
log_k 11.539
delta_h 10.4 kJ
-gamma 6 0
# Id: 8001400
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Ba+2 + CO3-2 = BaCO3
log_k 2.71
delta_h 16 kJ
-gamma 0 0
# Id: 1001401
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Ba+2 + H+ + CO3-2 = BaHCO3+
```

```
log_k 11.309
delta_h 10.4 kJ
-gamma 6 0
# Id: 1001400
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Na+ + CO3-2 = NaCO3-
log_k 1.27
delta_h -20.35 kJ
-gamma 5.4 0
# Id: 5001400
# log K source: NIST46.3
# Delta H source: NIST2.1.1
#T and ionic strength: 0.00 25.0
Na+ + H+ + CO3-2 = NaHCO3
log_k 10.079
delta_h -28.3301 kJ
-gamma 0 0
# Id: 5001401
# log K source: NIST46.3
# Delta H source: NIST2.1.1
#T and ionic strength: 0.00 25.0
H4SiO4 = H2SiO4-2 + 2H+
log_k -23.04
delta_h 61 kJ
-gamma 5.4 0
# Id: 3307701
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
H4SiO4 = H3SiO4- + H+
log_k -9.84
delta_h 20 kJ
-gamma 4 0
# Id: 3307700
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
UO2+2 + H4SiO4 = UO2H3SiO4+ + H+
log_k -1.9111
delta_h 0 kJ
-gamma 0 0
# Id: 8937700
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.10 25.0
H3BO3 = H2BO3- + H+
log_k -9.236
delta_h 13 kJ
-gamma 2.5 0
# Id: 3300900
# log K source: NIST46.4
# Delta H source: NIST46.4
```

```
#T and ionic strength:  0.00 25.0
2H3BO3 = H5(BO3)2- + H+
log_k -9.306
delta_h 8.4 kJ
-gamma 2.5 0
# Id:  3300901
# log K source:  NIST46.4
# Delta H source:  NIST46.4
#T and ionic strength:  0.00 25.0
3H3BO3 = H8(BO3)3- + H+
log_k -7.306
delta_h 29.4 kJ
-gamma 2.5 0
# Id:  3300902
# log K source:  NIST46.4
# Delta H source:  NIST46.4
#T and ionic strength:  0.00 25.0
Ag+ + H3BO3 = AgH2BO3 + H+
log_k -8.036
delta_h 0 kJ
-gamma 2.5 0
# Id:  200901
# log K source:  NIST46.4
# Delta H source:  MTQ3.11
#T and ionic strength:  0.00 25.0
Mg+2 + H3BO3 = MgH2BO3+ + H+
log_k -7.696
delta_h 13 kJ
-gamma 2.5 0
# Id:  4600901
# log K source:  NIST46.4
# Delta H source:  NIST46.4
#T and ionic strength:  0.00 25.0
Ca+2 + H3BO3 = CaH2BO3+ + H+
log_k -7.476
delta_h 17 kJ
-gamma 2.5 0
# Id:  1500901
# log K source:  NIST46.4
# Delta H source:  NIST46.4
#T and ionic strength:  0.00 25.0
Sr+2 + H3BO3 = SrH2BO3+ + H+
log_k -7.686
delta_h 17 kJ
-gamma 2.5 0
# Id:  8000901
# log K source:  NIST46.4
# Delta H source:  NIST46.4
#T and ionic strength:  0.00 25.0
Ba+2 + H3BO3 = BaH2BO3+ + H+
log_k -7.746
delta_h 17 kJ
-gamma 2.5 0
# Id:  1000901
```

```
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Na+ + H3BO3 = NaH2BO3 + H+
log_k -9.036
delta_h 0 kJ
-gamma 2.5 0
# Id: 5000901
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
CrO4-2 + H+ = HCrO4-
log_k 6.51
delta_h 2 kJ
-gamma 0 0
# Id: 2123300
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
CrO4-2 + 2H+ = H2CrO4
log_k 6.4188
delta_h 39 kJ
-gamma 0 0
# Id: 2123301
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 20.0
2CrO4-2 + 2H+ = Cr2O7-2 + H2O
log_k 14.56
delta_h -15 kJ
-gamma 0 0
# Id: 2123302
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
CrO4-2 + Cl- + 2H+ = CrO3Cl- + H2O
log_k 7.3086
delta_h 0 kJ
-gamma 0 0
# Id: 2121800
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
CrO4-2 + SO4-2 + 2H+ = CrO3SO4-2 + H2O
log_k 8.9937
delta_h 0 kJ
-gamma 0 0
# Id: 2127320
# log K source: MTQ3.11
# Delta H source: MTQ3.11
#T and ionic strength:
CrO4-2 + 4H+ + PO4-3 = CrO3H2PO4- + H2O
log_k 29.3634
delta_h 0 kJ
```

-gamma 0 0
Id: 2125800
log K source: MTQ3.11
Delta H source: MTQ3.11
#T and ionic strength:
CrO4-2 + 3H+ + PO4-3 = CrO3HPO4-2 + H2O
log_k 26.6806
delta_h 0 kJ
-gamma 0 0
Id: 2125801
log K source: MTQ3.11
Delta H source: MTQ3.11
#T and ionic strength:
CrO4-2 + Na+ = NaCrO4-
log_k 0.6963
delta_h 0 kJ
-gamma 0 0
Id: 5002120
log K source: MTQ3.11
Delta H source: MTQ3.11
#T and ionic strength:
K+ + CrO4-2 = KCrO4-
log_k 0.57
delta_h 0 kJ
-gamma 0 0
Id: 4102120
log K source: NIST46.4
Delta H source: MTQ3.11
#T and ionic strength: 0.00 18.0
MoO4-2 + H+ = HMoO4-
log_k 4.2988
delta_h 20 kJ
-gamma 0 0
Id: 3304801
log K source: NIST46.4
Delta H source: NIST46.4
#T and ionic strength: 0.00 20.0
MoO4-2 + 2H+ = H2MoO4
log_k 8.1636
delta_h -26 kJ
-gamma 0 0
Id: 3304802
log K source: NIST46.4
Delta H source: NIST46.4
#T and ionic strength: 0.00 20.0
7MoO4-2 + 8H+ = Mo7O24-6 + 4H2O
log_k 52.99
delta_h -228 kJ
-gamma 0 0
Id: 3304803
log K source: NIST46.4
Delta H source: NIST46.4
#T and ionic strength: 0.10 25.0
7MoO4-2 + 9H+ = HMo7O24-5 + 4H2O

log_k 59.3768
delta_h -218 kJ
-gamma 0 0
Id: 3304804
log K source: NIST46.4
Delta H source: NIST46.4
#T and ionic strength: 0.10 25.0
7MoO4-2 + 10H+ = H2Mo7O24-4 + 4H2O
log_k 64.159
delta_h -215 kJ
-gamma 0 0
Id: 3304805
log K source: NIST46.4
Delta H source: NIST46.4
#T and ionic strength: 0.10 25.0
7MoO4-2 + 11H+ = H3Mo7O24-3 + 4H2O
log_k 67.405
delta_h -217 kJ
-gamma 0 0
Id: 3304806
log K source: NIST46.4
Delta H source: NIST46.4
#T and ionic strength: 1.00 25.0
6MoO4-2 + Al+3 + 6H+ = AlMo6O21-3 + 3H2O
log_k 54.9925
delta_h 0 kJ
-gamma 0 0
Id: 304801
log K source: NIST46.4
Delta H source: MTQ3.11
#T and ionic strength: 0.50 25.0
MoO4-2 + 2Ag+ = Ag2MoO4
log_k -0.4219
delta_h -1.18 kJ
-gamma 0 0
Id: 204801
log K source: Bard85
Delta H source: Bard85
#T and ionic strength:
VO2+ + 2H2O = VO4-3 + 4H+
log_k -30.2
delta_h -25 kJ
-gamma 0 0
Id: 9033303
log K source: NIST46.4
Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
VO2+ + 2H2O = HVO4-2 + 3H+
log_k -15.9
delta_h 0 kJ
-gamma 0 0
Id: 9033302
log K source: NIST46.3
Delta H source: NIST46.3

```
#T and ionic strength:  0.00 25.0
VO2+ + 2H2O = H2VO4- + 2H+
log_k -7.3
delta_h 0 kJ
-gamma 0 0
# Id:  9033301
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  0.00 25.0
VO2+ + 2H2O = H3VO4 + H+
log_k -3.3
delta_h 44.4759 kJ
-gamma 0 0
# Id:  9033300
# log K source:  MTQ3.11
# Delta H source:  MTQ3.11
#T and ionic strength:
2VO2+ + 3H2O = V2O7-4 + 6H+
log_k -31.24
delta_h -28 kJ
-gamma 0 0
# Id:  9030020
# log K source:  NIST46.3
# Delta H source:  NIST46.3
#T and ionic strength:  0.00 25.0
2VO2+ + 3H2O = HV2O7-3 + 5H+
log_k -20.67
delta_h 0 kJ
-gamma 0 0
# Id:  9030021
# log K source:  NIST46.3
# Delta H source:  MTQ3.11
#T and ionic strength:  0.00 25.0
2VO2+ + 3H2O = H3V2O7- + 3H+
log_k -3.79
delta_h 0 kJ
-gamma 0 0
# Id:  9030022
# log K source:  MTQ3.11
# Delta H source:  MTQ3.11
#T and ionic strength:
3VO2+ + 3H2O = V3O9-3 + 6H+
log_k -15.88
delta_h 0 kJ
-gamma 0 0
# Id:  9030023
# log K source:  MTQ3.11
# Delta H source:  MTQ3.11
#T and ionic strength:
4VO2+ + 4H2O = V4O12-4 + 8H+
log_k -20.56
delta_h -87 kJ
-gamma 0 0
# Id:  9030024
```

```
# log K source: NIST46.3
# Delta H source: NIST46.3
#T and ionic strength: 0.00 25.0
10VO2+ + 8H2O = V10O28-6 + 16H+
log_k -24.0943
delta_h 0 kJ
-gamma 0 0
# Id: 9030025
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.10 20.0
10VO2+ + 8H2O = HV10O28-5 + 15H+
log_k -15.9076
delta_h 90.0397 kJ
-gamma 0 0
# Id: 9030026
# log K source: NIST46.4
# Delta H source: MTQ3.11
#T and ionic strength: 0.10 20.0
10VO2+ + 8H2O = H2V10O28-4 + 14H+
log_k -10.7
delta_h 0 kJ
-gamma 0 0
# Id: 9030027
# log K source: NIST46.3
# Delta H source: MTQ3.11
#T and ionic strength: 0.00 25.0
Benzoate- + H+ = H(Benzoate)
log_k 4.202
delta_h -0.4602 kJ
-gamma 0 0
# Id: 3309171
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Benzoate- + Pb+2 = Pb(Benzoate)+
log_k 2.4
delta_h 0 kJ
-gamma 0 0
# Id: 6009171
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Benzoate- + Al+3 = Al(Benzoate)+2
log_k 2.05
delta_h 0 kJ
-gamma 0 0
# Id: 309171
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Benzoate- + Al+3 + H2O = AlOH(Benzoate)+ + H+
log_k -0.56
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 309172
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Benzoate- + Zn+2 = Zn(Benzoate)+
log_k 1.7
delta_h 0 kJ
-gamma 0 0
# Id: 9509171
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Benzoate- + Cd+2 = Cd(Benzoate)+
log_k 1.8
delta_h 0 kJ
-gamma 0 0
# Id: 1609171
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
2Benzoate- + Cd+2 = Cd(Benzoate)2
log_k 1.82
delta_h 0 kJ
-gamma 0 0
# Id: 1609172
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Benzoate- + Cu+2 = Cu(Benzoate)+
log_k 2.19
delta_h 0 kJ
-gamma 0 0
# Id: 2319171
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Benzoate- + Ag+ = Ag(Benzoate)
log_k 0.91
delta_h 0 kJ
-gamma 0 0
# Id: 209171
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Benzoate- + Ni+2 = Ni(Benzoate)+
log_k 1.86
delta_h 0 kJ
-gamma 0 0
# Id: 5409171
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Co+2 + Benzoate- = Co(Benzoate)+
```

```
log_k 1.0537
delta_h 12 kJ
-gamma 0 0
# Id: 2009171
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.50 30.0
Benzoate- + Mn+2 = Mn(Benzoate)+
log_k 2.06
delta_h 0 kJ
-gamma 0 0
# Id: 4709171
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Benzoate- + Mg+2 = Mg(Benzoate)+
log_k 1.26
delta_h 0 kJ
-gamma 0 0
# Id: 4609171
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Benzoate- + Ca+2 = Ca(Benzoate)+
log_k 1.55
delta_h 0 kJ
-gamma 0 0
# Id: 1509171
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Phenylacetate- + H+ = H(Phenylacetate)
log_k 4.31
delta_h 2.1757 kJ
-gamma 0 0
# Id: 3309181
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Phenylacetate- + Zn+2 = Zn(Phenylacetate)+
log_k 1.57
delta_h 0 kJ
-gamma 0 0
# Id: 9509181
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Phenylacetate- + Cu+2 = Cu(Phenylacetate)+
log_k 1.97
delta_h 0 kJ
-gamma 0 0
# Id: 2319181
# log K source: NIST46.2
# Delta H source: NIST46.2
```

```
#T and ionic strength:
Co+2 + Phenylacetate- = Co(Phenylacetate)+
log_k 0.591
delta_h 0 kJ
-gamma 0 0
# Id: 2009181
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 2.00 25.0
Co+2 + 2Phenylacetate- = Co(Phenylacetate)2
log_k 0.4765
delta_h 0 kJ
-gamma 0 0
# Id: 2009182
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 2.00 25.0
Isophthalate-2 + H+ = H(Isophthalate)-
log_k 4.5
delta_h 1.6736 kJ
-gamma 0 0
# Id: 3309201
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Isophthalate-2 + 2H+ = H2(Isophthalate)
log_k 8
delta_h 1.6736 kJ
-gamma 0 0
# Id: 3309202
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Isophthalate-2 + Pb+2 = Pb(Isophthalate)
log_k 2.99
delta_h 0 kJ
-gamma 0 0
# Id: 6009201
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
2Isophthalate-2 + Pb+2 = Pb(Isophthalate)2-2
log_k 4.18
delta_h 0 kJ
-gamma 0 0
# Id: 6009202
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Isophthalate-2 + Pb+2 + H+ = PbH(Isophthalate)+
log_k 6.69
delta_h 0 kJ
-gamma 0 0
# Id: 6009203
```

```
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Isophthalate-2 + Cd+2 = Cd(Isophthalate)
log_k 2.15
delta_h 0 kJ
-gamma 0 0
# Id: 1609201
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
2Isophthalate-2 + Cd+2 = Cd(Isophthalate)2-2
log_k 2.99
delta_h 0 kJ
-gamma 0 0
# Id: 1609202
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Isophthalate-2 + Cd+2 + H+ = CdH(Isophthalate)+
log_k 5.73
delta_h 0 kJ
-gamma 0 0
# Id: 1609203
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Isophthalate-2 + Ca+2 = Ca(Isophthalate)
log_k 2
delta_h 0 kJ
-gamma 0 0
# Id: 1509200
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Isophthalate-2 + Ba+2 = Ba(Isophthalate)
log_k 1.55
delta_h 0 kJ
-gamma 0 0
# Id: 1009201
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
H+ + Diethylamine = H(Diethylamine)+
log_k 10.933
delta_h -53.1368 kJ
-gamma 0 0
# Id: 3309551
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + Diethylamine = Zn(Diethylamine)+2
log_k 2.74
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 9509551
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Zn+2 + 2Diethylamine = Zn(Diethylamine)2+2
log_k 5.27
delta_h 0 kJ
-gamma 0 0
# Id: 9509552
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Zn+2 + 3Diethylamine = Zn(Diethylamine)3+2
log_k 7.71
delta_h 0 kJ
-gamma 0 0
# Id: 9509553
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Zn+2 + 4Diethylamine = Zn(Diethylamine)4+2
log_k 9.84
delta_h 0 kJ
-gamma 0 0
# Id: 9509554
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cd+2 + Diethylamine = Cd(Diethylamine)+2
log_k 2.73
delta_h 0 kJ
-gamma 0 0
# Id: 1609551
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cd+2 + 2Diethylamine = Cd(Diethylamine)2+2
log_k 4.86
delta_h 0 kJ
-gamma 0 0
# Id: 1609552
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cd+2 + 3Diethylamine = Cd(Diethylamine)3+2
log_k 6.37
delta_h 0 kJ
-gamma 0 0
# Id: 1609553
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cd+2 + 4Diethylamine = Cd(Diethylamine)4+2
```

```
log_k 7.32
delta_h 0 kJ
-gamma 0 0
# Id: 1609554
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Ag+ + Diethylamine = Ag(Diethylamine)+
log_k 2.98
delta_h 0 kJ
-gamma 0 0
# Id: 209551
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + 2Diethylamine = Ag(Diethylamine)2+
log_k 6.38
delta_h -44.7688 kJ
-gamma 0 0
# Id: 209552
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + Diethylamine = Ni(Diethylamine)+2
log_k 2.78
delta_h 0 kJ
-gamma 0 0
# Id: 5409551
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Ni+2 + 2Diethylamine = Ni(Diethylamine)2+2
log_k 4.97
delta_h 0 kJ
-gamma 0 0
# Id: 5409552
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Ni+2 + 3Diethylamine = Ni(Diethylamine)3+2
log_k 6.72
delta_h 0 kJ
-gamma 0 0
# Id: 5409553
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Ni+2 + 4Diethylamine = Ni(Diethylamine)4+2
log_k 7.93
delta_h 0 kJ
-gamma 0 0
# Id: 5409554
# log K source: SCD2.62
# Delta H source: SCD2.62
```

#T and ionic strength:
Ni+2 + 5Diethylamine = Ni(Diethylamine)5+2
log_k 8.87
delta_h 0 kJ
-gamma 0 0
Id: 5409555
log K source: SCD2.62
Delta H source: SCD2.62
#T and ionic strength:
H+ + Butylamine = H(Butylamine)+
log_k 10.64
delta_h -58.2831 kJ
-gamma 0 0
Id: 3309561
log K source: NIST46.2
Delta H source: NIST46.2
#T and ionic strength:
Hg(OH)2 + Butylamine + 2H+ = Hg(Butylamine)+2 + 2H2O
log_k 14.84
delta_h 0 kJ
-gamma 0 0
Id: 3619561
log K source: NIST46.2
Delta H source: NIST46.2
#T and ionic strength:
Hg(OH)2 + 2Butylamine + 2H+ = Hg(Butylamine)2+2 + 2H2O
log_k 24.24
delta_h 0 kJ
-gamma 0 0
Id: 3619562
log K source: NIST46.2
Delta H source: NIST46.2
#T and ionic strength:
Hg(OH)2 + 3Butylamine + 2H+ = Hg(Butylamine)3+2 + 2H2O
log_k 25.1
delta_h 0 kJ
-gamma 0 0
Id: 3619563
log K source: NIST46.2
Delta H source: NIST46.2
#T and ionic strength:
Hg(OH)2 + 4Butylamine + 2H+ = Hg(Butylamine)4+2 + 2H2O
log_k 26.1
delta_h 0 kJ
-gamma 0 0
Id: 3619564
log K source: NIST46.2
Delta H source: NIST46.2
#T and ionic strength:
Ag+ + Butylamine = Ag(Butylamine)+
log_k 3.42
delta_h -16.736 kJ
-gamma 0 0
Id: 209561

```
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + 2Butylamine = Ag(Butylamine)2+
log_k 7.47
delta_h -52.7184 kJ
-gamma 0 0
# Id: 209562
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
H+ + Methylamine = H(Methylamine)+
log_k 10.64
delta_h -55.2288 kJ
-gamma 0 0
# Id: 3309581
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + Methylamine = Cd(Methylamine)+2
log_k 2.75
delta_h 0 kJ
-gamma 0 0
# Id: 1609581
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + 2Methylamine = Cd(Methylamine)2+2
log_k 4.81
delta_h -29.288 kJ
-gamma 0 0
# Id: 1609582
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + 3Methylamine = Cd(Methylamine)3+2
log_k 5.94
delta_h 0 kJ
-gamma 0 0
# Id: 1609583
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + 4Methylamine = Cd(Methylamine)4+2
log_k 6.55
delta_h -58.576 kJ
-gamma 0 0
# Id: 1609584
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Hg(OH)2 + Methylamine + 2H+ = Hg(Methylamine)+2 + 2H2O
log_k 14.76
delta_h 0 kJ
```

-gamma 0 0
Id: 3619581
log K source: NIST46.2
Delta H source: NIST46.2
#T and ionic strength:
Hg(OH)2 + 2Methylamine + 2H+ = Hg(Methylamine)2+2 + 2H2O
log_k 23.96
delta_h 0 kJ
-gamma 0 0
Id: 3619582
log K source: NIST46.2
Delta H source: NIST46.2
#T and ionic strength:
Hg(OH)2 + 3Methylamine + 2H+ = Hg(Methylamine)3+2 + 2H2O
log_k 24.3
delta_h 0 kJ
-gamma 0 0
Id: 3619583
log K source: NIST46.2
Delta H source: NIST46.2
#T and ionic strength:
Hg(OH)2 + 4Methylamine + 2H+ = Hg(Methylamine)4+2 + 2H2O
log_k 24.6
delta_h 0 kJ
-gamma 0 0
Id: 3619584
log K source: NIST46.2
Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Methylamine = Cu(Methylamine)+2
log_k 4.11
delta_h 0 kJ
-gamma 0 0
Id: 2319581
log K source: NIST46.2
Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + 2Methylamine = Cu(Methylamine)2+2
log_k 7.51
delta_h 0 kJ
-gamma 0 0
Id: 2319582
log K source: NIST46.2
Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + 3Methylamine = Cu(Methylamine)3+2
log_k 10.21
delta_h 0 kJ
-gamma 0 0
Id: 2319583
log K source: NIST46.2
Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + 4Methylamine = Cu(Methylamine)4+2

```
log_k 12.08
delta_h 0 kJ
-gamma 0 0
# Id: 2319584
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + Methylamine = Ag(Methylamine)+
log_k 3.07
delta_h -12.552 kJ
-gamma 0 0
# Id: 209581
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + 2Methylamine = Ag(Methylamine)2+
log_k 6.89
delta_h -48.9528 kJ
-gamma 0 0
# Id: 209582
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + Methylamine = Ni(Methylamine)+2
log_k 2.23
delta_h 0 kJ
-gamma 0 0
# Id: 5409581
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
H+ + Dimethylamine = H(Dimethylamine)+
log_k 10.774
delta_h -50.208 kJ
-gamma 0 0
# Id: 3309591
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + 2Dimethylamine = Ag(Dimethylamine)2+
log_k 5.37
delta_h -40.5848 kJ
-gamma 0 0
# Id: 209591
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + Dimethylamine = Ni(Dimethylamine)+2
log_k 1.47
delta_h 0 kJ
-gamma 0 0
# Id: 5409591
# log K source: NIST46.2
# Delta H source: NIST46.2
```

```
#T and ionic strength:
H+ + Hexylamine = H(Hexylamine)+
log_k 10.63
delta_h -58.576 kJ
-gamma 0 0
# Id: 3309611
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + Hexylamine = Ag(Hexylamine)+
log_k 3.54
delta_h -25.104 kJ
-gamma 0 0
# Id: 209611
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + 2Hexylamine = Ag(Hexylamine)2+
log_k 7.55
delta_h -53.1368 kJ
-gamma 0 0
# Id: 209612
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
H+ + Ethylenediamine = H(Ethylenediamine)+
log_k 9.928
delta_h -49.7896 kJ
-gamma 0 0
# Id: 3309631
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
2H+ + Ethylenediamine = H2(Ethylenediamine)+2
log_k 16.776
delta_h -95.3952 kJ
-gamma 0 0
# Id: 3309632
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Pb+2 + Ethylenediamine = Pb(Ethylenediamine)+2
log_k 5.04
delta_h 0 kJ
-gamma 0 0
# Id: 6009631
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Pb+2 + 2Ethylenediamine = Pb(Ethylenediamine)2+2
log_k 8.5
delta_h 0 kJ
-gamma 0 0
# Id: 6009632
```

```
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + Ethylenediamine = Zn(Ethylenediamine)+2
log_k 5.66
delta_h -29.288 kJ
-gamma 0 0
# Id: 9509631
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + 2Ethylenediamine = Zn(Ethylenediamine)2+2
log_k 10.6
delta_h -48.116 kJ
-gamma 0 0
# Id: 9509632
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + 3Ethylenediamine = Zn(Ethylenediamine)3+2
log_k 13.9
delta_h -71.5464 kJ
-gamma 0 0
# Id: 9509633
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + Ethylenediamine = Cd(Ethylenediamine)+2
log_k 5.41
delta_h -28.4512 kJ
-gamma 0 0
# Id: 1609631
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + 2Ethylenediamine = Cd(Ethylenediamine)2+2
log_k 9.9
delta_h -55.6472 kJ
-gamma 0 0
# Id: 1609632
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + 3Ethylenediamine = Cd(Ethylenediamine)3+2
log_k 11.6
delta_h -82.4248 kJ
-gamma 0 0
# Id: 1609633
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Hg(OH)2 + Ethylenediamine + 2H+ = Hg(Ethylenediamine)+2 + 2H2O
log_k 20.4
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 3619631
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Hg(OH)2 + 2Ethylenediamine + 2H+ = Hg(Ethylenediamine)2+2 + 2H2O
log_k 29.3
delta_h -173.218 kJ
-gamma 0 0
# Id: 3619632
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Hg(OH)2 + 2Ethylenediamine + 3H+ = HgH(Ethylenediamine)2+3 + 2H2O
log_k 34.7
delta_h 0 kJ
-gamma 0 0
# Id: 3619633
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+ + 2Ethylenediamine = Cu(Ethylenediamine)2+
log_k 11.2
delta_h 0 kJ
-gamma 0 0
# Id: 2309631
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Ethylenediamine = Cu(Ethylenediamine)+2
log_k 10.5
delta_h -52.7184 kJ
-gamma 0 0
# Id: 2319631
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + 2Ethylenediamine = Cu(Ethylenediamine)2+2
log_k 19.6
delta_h -105.437 kJ
-gamma 0 0
# Id: 2319632
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + Ethylenediamine = Ag(Ethylenediamine)+
log_k 4.6
delta_h -48.9528 kJ
-gamma 0 0
# Id: 209631
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + 2Ethylenediamine = Ag(Ethylenediamine)2+
```

```
log_k 7.5
delta_h -52.3 kJ
-gamma 0 0
# Id: 209632
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + Ethylenediamine + H+ = AgH(Ethylenediamine)+2
log_k 11.99
delta_h -75.312 kJ
-gamma 0 0
# Id: 209633
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
2Ag+ + Ethylenediamine = Ag2(Ethylenediamine)+2
log_k 6.5
delta_h 0 kJ
-gamma 0 0
# Id: 209634
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
2Ag+ + 2Ethylenediamine = Ag2(Ethylenediamine)2+2
log_k 12.7
delta_h -97.0688 kJ
-gamma 0 0
# Id: 209635
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + 2Ethylenediamine + 2H+ = Ag(HEthylenediamine)2+3
log_k 24
delta_h -150.206 kJ
-gamma 0 0
# Id: 209636
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + 2Ethylenediamine + H+ = AgH(Ethylenediamine)2+2
log_k 8.4
delta_h -47.6976 kJ
-gamma 0 0
# Id: 209637
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + Ethylenediamine = Ni(Ethylenediamine)+2
log_k 7.32
delta_h -37.656 kJ
-gamma 0 0
# Id: 5409631
# log K source: NIST46.2
# Delta H source: NIST46.2
```

```
#T and ionic strength:
Ni+2 + 2Ethylenediamine = Ni(Ethylenediamine)2+2
log_k 13.5
delta_h -76.5672 kJ
-gamma 0 0
# Id: 5409632
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + 3Ethylenediamine = Ni(Ethylenediamine)3+2
log_k 17.6
delta_h -117.152 kJ
-gamma 0 0
# Id: 5409633
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Co+2 + Ethylenediamine = Co(Ethylenediamine)+2
log_k 5.5
delta_h -28 kJ
-gamma 0 0
# Id: 2009631
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.10 25.0
Co+2 + 2Ethylenediamine = Co(Ethylenediamine)2+2
log_k 10.1
delta_h -58.5 kJ
-gamma 0 0
# Id: 2009632
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.10 25.0
Co+2 + 3Ethylenediamine = Co(Ethylenediamine)3+2
log_k 13.2
delta_h -92.8 kJ
-gamma 0 0
# Id: 2009633
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.10 25.0
Co+3 + 2Ethylenediamine = Co(Ethylenediamine)2+3
log_k 34.7
delta_h 0 kJ
-gamma 0 0
# Id: 2019631
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 1.00 25.0
Co+3 + 3Ethylenediamine = Co(Ethylenediamine)3+3
log_k 48.69
delta_h 0 kJ
-gamma 0 0
# Id: 2019632
```

```
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 1.50 30.0
Fe+2 + Ethylenediamine = Fe(Ethylenediamine)+2
log_k 4.26
delta_h 0 kJ
-gamma 0 0
# Id: 2809631
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Fe+2 + 2Ethylenediamine = Fe(Ethylenediamine)2+2
log_k 7.73
delta_h 0 kJ
-gamma 0 0
# Id: 2809632
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Fe+2 + 3Ethylenediamine = Fe(Ethylenediamine)3+2
log_k 10.17
delta_h 0 kJ
-gamma 0 0
# Id: 2809633
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Mn+2 + Ethylenediamine = Mn(Ethylenediamine)+2
log_k 2.74
delta_h -11.7152 kJ
-gamma 0 0
# Id: 4709631
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Mn+2 + 2Ethylenediamine = Mn(Ethylenediamine)2+2
log_k 4.8
delta_h -25.104 kJ
-gamma 0 0
# Id: 4709632
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cr(OH)2+ + 2Ethylenediamine + 2H+ = Cr(Ethylenediamine)2+3 + 2H2O
log_k 22.57
delta_h 0 kJ
-gamma 0 0
# Id: 2119631
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cr(OH)2+ + 3Ethylenediamine + 2H+ = Cr(Ethylenediamine)3+3 + 2H2O
log_k 29
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 2119632
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Mg+2 + Ethylenediamine = Mg(Ethylenediamine)+2
log_k 0.37
delta_h 0 kJ
-gamma 0 0
# Id: 4609631
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ca+2 + Ethylenediamine = Ca(Ethylenediamine)+2
log_k 0.11
delta_h 0 kJ
-gamma 0 0
# Id: 1509631
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
H+ + Propylamine = H(Propylamine)+
log_k 10.566
delta_h -57.53 kJ
-gamma 0 0
# Id: 3309641
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + Propylamine = Zn(Propylamine)+2
log_k 2.42
delta_h 0 kJ
-gamma 0 0
# Id: 9509641
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Zn+2 + 2Propylamine = Zn(Propylamine)2+2
log_k 4.85
delta_h 0 kJ
-gamma 0 0
# Id: 9509642
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Zn+2 + 3Propylamine = Zn(Propylamine)3+2
log_k 7.38
delta_h 0 kJ
-gamma 0 0
# Id: 9509643
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Zn+2 + 4Propylamine = Zn(Propylamine)4+2
```

```
log_k 9.49
delta_h 0 kJ
-gamma 0 0
# Id: 9509644
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cd+2 + Propylamine = Cd(Propylamine)+2
log_k 2.62
delta_h 0 kJ
-gamma 0 0
# Id: 1609641
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cd+2 + 2Propylamine = Cd(Propylamine)2+2
log_k 4.64
delta_h 0 kJ
-gamma 0 0
# Id: 1609642
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cd+2 + 3Propylamine = Cd(Propylamine)3+2
log_k 6.03
delta_h 0 kJ
-gamma 0 0
# Id: 1609643
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Ag+ + Propylamine = Ag(Propylamine)+
log_k 3.45
delta_h -12.552 kJ
-gamma 0 0
# Id: 209641
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + 2Propylamine = Ag(Propylamine)2+
log_k 7.44
delta_h -53.1368 kJ
-gamma 0 0
# Id: 209642
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + Propylamine = Ni(Propylamine)+2
log_k 2.81
delta_h 0 kJ
-gamma 0 0
# Id: 5409641
# log K source: SCD2.62
# Delta H source: SCD2.62
```

```
#T and ionic strength:
Ni+2 + 2Propylamine = Ni(Propylamine)2+2
log_k 5.02
delta_h 0 kJ
-gamma 0 0
# Id: 5409642
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Ni+2 + 3Propylamine = Ni(Propylamine)3+2
log_k 6.79
delta_h 0 kJ
-gamma 0 0
# Id: 5409643
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Ni+2 + 4Propylamine = Ni(Propylamine)4+2
log_k 8.31
delta_h 0 kJ
-gamma 0 0
# Id: 5409644
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
H+ + Isopropylamine = H(Isopropylamine)+
log_k 10.67
delta_h -58.3668 kJ
-gamma 0 0
# Id: 3309651
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + Isopropylamine = Zn(Isopropylamine)+2
log_k 2.37
delta_h 0 kJ
-gamma 0 0
# Id: 9509651
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Zn+2 + 2Isopropylamine = Zn(Isopropylamine)2+2
log_k 4.67
delta_h 0 kJ
-gamma 0 0
# Id: 9509652
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Zn+2 + 3Isopropylamine = Zn(Isopropylamine)3+2
log_k 7.14
delta_h 0 kJ
-gamma 0 0
# Id: 9509653
```

```
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Zn+2 + 4Isopropylamine = Zn(Isopropylamine)4+2
log_k 9.44
delta_h 0 kJ
-gamma 0 0
# Id: 9509654
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cd+2 + Isopropylamine = Cd(Isopropylamine)+2
log_k 2.55
delta_h 0 kJ
-gamma 0 0
# Id: 1609651
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cd+2 + 2Isopropylamine = Cd(Isopropylamine)2+2
log_k 4.57
delta_h 0 kJ
-gamma 0 0
# Id: 1609652
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cd+2 + 3Isopropylamine = Cd(Isopropylamine)3+2
log_k 6.07
delta_h 0 kJ
-gamma 0 0
# Id: 1609653
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cd+2 + 4Isopropylamine = Cd(Isopropylamine)4+2
log_k 6.9
delta_h 0 kJ
-gamma 0 0
# Id: 1609654
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Hg(OH)2 + Isopropylamine + 2H+ = Hg(Isopropylamine)+2 + 2H2O
log_k 14.85
delta_h 0 kJ
-gamma 0 0
# Id: 3619651
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Hg(OH)2 + 2Isopropylamine + 2H+ = Hg(Isopropylamine)2+2 + 2H2O
log_k 24.37
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 3619652
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + Isopropylamine = Ag(Isopropylamine)+
log_k 3.67
delta_h -23.8488 kJ
-gamma 0 0
# Id: 209651
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + 2Isopropylamine = Ag(Isopropylamine)2+
log_k 7.77
delta_h -59.8312 kJ
-gamma 0 0
# Id: 209652
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + Isopropylamine = Ni(Isopropylamine)+2
log_k 2.71
delta_h 0 kJ
-gamma 0 0
# Id: 5409651
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Ni+2 + 2Isopropylamine = Ni(Isopropylamine)2+2
log_k 4.86
delta_h 0 kJ
-gamma 0 0
# Id: 5409652
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Ni+2 + 3Isopropylamine = Ni(Isopropylamine)3+2
log_k 6.57
delta_h 0 kJ
-gamma 0 0
# Id: 5409653
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Ni+2 + 4Isopropylamine = Ni(Isopropylamine)4+2
log_k 7.83
delta_h 0 kJ
-gamma 0 0
# Id: 5409654
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Ni+2 + 5Isopropylamine = Ni(Isopropylamine)5+2
```

```
log_k 8.43
delta_h 0 kJ
-gamma 0 0
# Id: 5409655
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
H+ + Trimethylamine = H(Trimethylamine)+
log_k 9.8
delta_h -36.8192 kJ
-gamma 0 0
# Id: 3309661
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + Trimethylamine = Ag(Trimethylamine)+
log_k 1.701
delta_h 0 kJ
-gamma 0 0
# Id: 209661
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
H+ + Citrate-3 = H(Citrate)-2
log_k 6.396
delta_h 3.3472 kJ
-gamma 0 0
# Id: 3309671
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
2H+ + Citrate-3 = H2(Citrate)-
log_k 11.157
delta_h 1.297 kJ
-gamma 0 0
# Id: 3309672
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
3H+ + Citrate-3 = H3(Citrate)
log_k 14.285
delta_h -2.7614 kJ
-gamma 0 0
# Id: 3309673
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Pb+2 + Citrate-3 = Pb(Citrate)-
log_k 7.27
delta_h 0 kJ
-gamma 0 0
# Id: 6009671
# log K source: SCD2.62
# Delta H source: SCD2.62
```

```
#T and ionic strength:
Pb+2 + 2Citrate-3 = Pb(Citrate)2-4
log_k 6.53
delta_h 0 kJ
-gamma 0 0
# Id: 6009672
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Al+3 + Citrate-3 = Al(Citrate)
log_k 9.97
delta_h 0 kJ
-gamma 0 0
# Id: 309671
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Al+3 + 2Citrate-3 = Al(Citrate)2-3
log_k 14.8
delta_h 0 kJ
-gamma 0 0
# Id: 309672
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Al+3 + Citrate-3 + H+ = AlH(Citrate)+
log_k 12.85
delta_h 0 kJ
-gamma 0 0
# Id: 309673
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Tl+ + Citrate-3 = Tl(Citrate)-2
log_k 1.48
delta_h 0 kJ
-gamma 0 0
# Id: 8709671
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + Citrate-3 = Zn(Citrate)-
log_k 6.21
delta_h 8.368 kJ
-gamma 0 0
# Id: 9509671
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + 2Citrate-3 = Zn(Citrate)2-4
log_k 7.4
delta_h 25.104 kJ
-gamma 0 0
# Id: 9509672
```

```
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + Citrate-3 + H+ = ZnH(Citrate)
log_k 10.2
delta_h 3.3472 kJ
-gamma 0 0
# Id: 9509673
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + Citrate-3 + 2H+ = ZnH2(Citrate)+
log_k 12.84
delta_h 0 kJ
-gamma 0 0
# Id: 9509674
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cd+2 + Citrate-3 = Cd(Citrate)-
log_k 4.98
delta_h 8.368 kJ
-gamma 0 0
# Id: 1609671
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + Citrate-3 + H+ = CdH(Citrate)
log_k 9.44
delta_h 3.3472 kJ
-gamma 0 0
# Id: 1609672
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + Citrate-3 + 2H+ = CdH2(Citrate)+
log_k 12.9
delta_h 0 kJ
-gamma 0 0
# Id: 1609673
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + 2Citrate-3 = Cd(Citrate)2-4
log_k 5.9
delta_h 20.92 kJ
-gamma 0 0
# Id: 1609674
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Hg(OH)2 + Citrate-3 + 2H+ = Hg(Citrate)- + 2H2O
log_k 18.3
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 3619671
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Citrate-3 = Cu(Citrate)-
log_k 7.57
delta_h 0 kJ
-gamma 0 0
# Id: 2319671
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cu+2 + 2Citrate-3 = Cu(Citrate)2-4
log_k 8.9
delta_h 0 kJ
-gamma 0 0
# Id: 2319672
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cu+2 + Citrate-3 + H+ = CuH(Citrate)
log_k 10.87
delta_h 11.7152 kJ
-gamma 0 0
# Id: 2319673
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Citrate-3 + 2H+ = CuH2(Citrate)+
log_k 13.23
delta_h 0 kJ
-gamma 0 0
# Id: 2319674
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
2Cu+2 + 2Citrate-3 = Cu2(Citrate)2-2
log_k 16.9
delta_h 41.84 kJ
-gamma 0 0
# Id: 2319675
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + Citrate-3 = Ni(Citrate)-
log_k 6.59
delta_h 16.736 kJ
-gamma 0 0
# Id: 5409671
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + Citrate-3 + H+ = NiH(Citrate)
```

```
log_k 10.5
delta_h 15.8992 kJ
-gamma 0 0
# Id: 5409672
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + Citrate-3 + 2H+ = NiH2(Citrate)+
log_k 13.3
delta_h 0 kJ
-gamma 0 0
# Id: 5409673
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + 2Citrate-3 = Ni(Citrate)2-4
log_k 8.77
delta_h 12.552 kJ
-gamma 0 0
# Id: 5409674
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + 2Citrate-3 + H+ = NiH(Citrate)2-3
log_k 14.9
delta_h 32.6352 kJ
-gamma 0 0
# Id: 5409675
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Co+2 + Citrate-3 = Co(Citrate)-
log_k 6.1867
delta_h 0 kJ
-gamma 0 0
# Id: 2009671
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.10 25.0
Co+2 + H+ + Citrate-3 = CoHCitrate
log_k 10.4438
delta_h 0 kJ
-gamma 0 0
# Id: 2009672
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.10 25.0
Co+2 + 2H+ + Citrate-3 = CoH2Citrate+
log_k 12.7859
delta_h 0 kJ
-gamma 0 0
# Id: 2009673
# log K source: NIST46.4
# Delta H source: NIST46.2
```

```
#T and ionic strength:  0.10 20.0
Fe+2 + Citrate-3 = Fe(Citrate)-
log_k 6.1
delta_h 0 kJ
-gamma 0 0
# Id:  2809671
# log K source:  NIST46.2
# Delta H source:  NIST46.2
#T and ionic strength:
Fe+2 + Citrate-3 + H+ = FeH(Citrate)
log_k 10.2
delta_h 0 kJ
-gamma 0 0
# Id:  2809672
# log K source:  NIST46.2
# Delta H source:  NIST46.2
#T and ionic strength:
Fe+3 + Citrate-3 = Fe(Citrate)
log_k 13.1
delta_h 0 kJ
-gamma 0 0
# Id:  2819671
# log K source:  NIST46.2
# Delta H source:  NIST46.2
#T and ionic strength:
Fe+3 + Citrate-3 + H+ = FeH(Citrate)+
log_k 14.4
delta_h 0 kJ
-gamma 0 0
# Id:  2819672
# log K source:  NIST46.2
# Delta H source:  NIST46.2
#T and ionic strength:
Mn+2 + Citrate-3 = Mn(Citrate)-
log_k 4.28
delta_h 0 kJ
-gamma 0 0
# Id:  4709671
# log K source:  SCD2.62
# Delta H source:  SCD2.62
#T and ionic strength:
Mn+2 + Citrate-3 + H+ = MnH(Citrate)
log_k 9.6
delta_h 0 kJ
-gamma 0 0
# Id:  4709672
# log K source:  NIST46.2
# Delta H source:  NIST46.2
#T and ionic strength:
Be+2 + Citrate-3 = Be(Citrate)-
log_k 5.534
delta_h 0 kJ
-gamma 0 0
# Id:  1109671
```

```
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 1.00 25.0
Be+2 + H+ + Citrate-3 = BeH(Citrate)
log_k 9.442
delta_h 0 kJ
-gamma 0 0
# Id: 1109672
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 1.00 25.0
Ca+2 + Citrate-3 = Ca(Citrate)-
log_k 4.87
delta_h -8.368 kJ
-gamma 0 0
# Id: 1509671
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ca+2 + Citrate-3 + H+ = CaH(Citrate)
log_k 9.26
delta_h -0.8368 kJ
-gamma 0 0
# Id: 1509672
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ca+2 + Citrate-3 + 2H+ = CaH2(Citrate)+
log_k 12.257
delta_h 0 kJ
-gamma 0 0
# Id: 1509673
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Mg+2 + Citrate-3 = Mg(Citrate)-
log_k 4.89
delta_h 8.368 kJ
-gamma 0 0
# Id: 4609671
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Mg+2 + Citrate-3 + H+ = MgH(Citrate)
log_k 8.91
delta_h 3.3472 kJ
-gamma 0 0
# Id: 4609672
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Mg+2 + Citrate-3 + 2H+ = MgH2(Citrate)+
log_k 12.2
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 4609673
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Sr+2 + Citrate-3 = Sr(Citrate)-
log_k 4.3367
delta_h 0 kJ
-gamma 0 0
# Id: 8009671
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.10 25.0
Sr+2 + H+ + Citrate-3 = SrH(Citrate)
log_k 8.9738
delta_h 0 kJ
-gamma 0 0
# Id: 8009672
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.10 25.0
Sr+2 + 2H+ + Citrate-3 = SrH2(Citrate)+
log_k 12.4859
delta_h 0 kJ
-gamma 0 0
# Id: 8009673
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.10 25.0
Ba+2 + Citrate-3 = Ba(Citrate)-
log_k 4.1
delta_h 0 kJ
-gamma 0 0
# Id: 1009671
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ba+2 + Citrate-3 + H+ = BaH(Citrate)
log_k 8.74
delta_h 0 kJ
-gamma 0 0
# Id: 1009672
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ba+2 + Citrate-3 + 2H+ = BaH2(Citrate)+
log_k 12.3
delta_h 0 kJ
-gamma 0 0
# Id: 1009673
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Na+ + Citrate-3 = Na(Citrate)-2
```

```
log_k 1.03
delta_h -2.8033 kJ
-gamma 0 0
# Id: 5009671
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
2Na+ + Citrate-3 = Na2(Citrate)-
log_k 1.5
delta_h -5.1045 kJ
-gamma 0 0
# Id: 5009672
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Na+ + Citrate-3 + H+ = NaH(Citrate)-
log_k 6.45
delta_h -3.5982 kJ
-gamma 0 0
# Id: 5009673
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
K+ + Citrate-3 = K(Citrate)-2
log_k 1.1
delta_h 5.4392 kJ
-gamma 0 0
# Id: 4109671
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
H+ + Nta-3 = H(Nta)-2
log_k 10.278
delta_h -18.828 kJ
-gamma 0 0
# Id: 3309681
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
2H+ + Nta-3 = H2(Nta)-
log_k 13.22
delta_h -17.9912 kJ
-gamma 0 0
# Id: 3309682
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
3H+ + Nta-3 = H3(Nta)
log_k 15.22
delta_h -16.3176 kJ
-gamma 0 0
# Id: 3309683
# log K source: NIST46.2
# Delta H source: NIST46.2
```

```
#T and ionic strength:
4H+ + Nta-3 = H4(Nta)+
log_k 16.22
delta_h -16.3176 kJ
-gamma 0 0
# Id: 3309684
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Pb+2 + Nta-3 = Pb(Nta)-
log_k 12.7
delta_h -15.8992 kJ
-gamma 0 0
# Id: 6009681
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Pb+2 + Nta-3 + H+ = PbH(Nta)
log_k 15.3
delta_h 0 kJ
-gamma 0 0
# Id: 6009682
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Al+3 + Nta-3 = Al(Nta)
log_k 13.3
delta_h 0 kJ
-gamma 0 0
# Id: 309681
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Al+3 + Nta-3 + H+ = AlH(Nta)+
log_k 15.2
delta_h 0 kJ
-gamma 0 0
# Id: 309682
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Al+3 + Nta-3 + H2O = AlOH(Nta)- + H+
log_k 8
delta_h 0 kJ
-gamma 0 0
# Id: 309683
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Tl+ + Nta-3 = Tl(Nta)-2
log_k 5.39
delta_h 0 kJ
-gamma 0 0
# Id: 8709681
```

```
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + Nta-3 = Zn(Nta)-
log_k 11.95
delta_h -3.7656 kJ
-gamma 0 0
# Id: 9509681
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + 2Nta-3 = Zn(Nta)2-4
log_k 14.88
delta_h -15.0624 kJ
-gamma 0 0
# Id: 9509682
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + Nta-3 + H2O = ZnOH(Nta)-2 + H+
log_k 1.46
delta_h 46.4424 kJ
-gamma 0 0
# Id: 9509683
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + Nta-3 = Cd(Nta)-
log_k 11.07
delta_h -16.736 kJ
-gamma 0 0
# Id: 1609681
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + 2Nta-3 = Cd(Nta)2-4
log_k 15.03
delta_h -38.0744 kJ
-gamma 0 0
# Id: 1609682
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + Nta-3 + H2O = CdOH(Nta)-2 + H+
log_k -0.61
delta_h 29.288 kJ
-gamma 0 0
# Id: 1609683
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Hg(OH)2 + Nta-3 + 2H+ = Hg(Nta)- + 2H2O
log_k 21.7
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 3619681
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Nta-3 = Cu(Nta)-
log_k 14.4
delta_h -7.9496 kJ
-gamma 0 0
# Id: 2319681
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + 2Nta-3 = Cu(Nta)2-4
log_k 18.1
delta_h -37.2376 kJ
-gamma 0 0
# Id: 2319682
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Nta-3 + H+ = CuH(Nta)
log_k 16.2
delta_h 0 kJ
-gamma 0 0
# Id: 2319683
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Nta-3 + H2O = CuOH(Nta)-2 + H+
log_k 4.8
delta_h 25.5224 kJ
-gamma 0 0
# Id: 2319684
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + Nta-3 = Ag(Nta)-2
log_k 6
delta_h -26.3592 kJ
-gamma 0 0
# Id: 209681
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + Nta-3 = Ni(Nta)-
log_k 12.79
delta_h -10.0416 kJ
-gamma 0 0
# Id: 5409681
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + 2Nta-3 = Ni(Nta)2-4
```

```
log_k 16.96
delta_h -32.6352 kJ
-gamma 0 0
# Id: 5409682
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + Nta-3 + H2O = NiOH(Nta)-2 + H+
log_k 1.5
delta_h 15.0624 kJ
-gamma 0 0
# Id: 5409683
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Co+2 + Nta-3 = Co(Nta)-
log_k 11.6667
delta_h -0.4 kJ
-gamma 0 0
# Id: 2009681
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.10 25.0
Co+2 + 2Nta-3 = Co(Nta)2-4
log_k 14.9734
delta_h -20 kJ
-gamma 0 0
# Id: 2009682
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.10 25.0
Co+2 + Nta-3 + H2O = CoOH(Nta)-2 + H+
log_k 0.4378
delta_h 45.6 kJ
-gamma 0 0
# Id: 2009683
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.10 25.0
Fe+2 + Nta-3 = Fe(Nta)-
log_k 10.19
delta_h 0 kJ
-gamma 0 0
# Id: 2809681
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Fe+2 + 2Nta-3 = Fe(Nta)2-4
log_k 12.62
delta_h 0 kJ
-gamma 0 0
# Id: 2809682
# log K source: NIST46.2
# Delta H source: NIST46.2
```

```
#T and ionic strength:
Fe+2 + Nta-3 + H+ = FeH(Nta)
log_k 12.29
delta_h 0 kJ
-gamma 0 0
# Id: 2809683
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Fe+2 + Nta-3 + H2O = FeOH(Nta)-2 + H+
log_k -1.06
delta_h 0 kJ
-gamma 0 0
# Id: 2809684
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Fe+3 + Nta-3 = Fe(Nta)
log_k 17.8
delta_h 13.3888 kJ
-gamma 0 0
# Id: 2819681
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Fe+3 + 2Nta-3 = Fe(Nta)2-3
log_k 25.9
delta_h 0 kJ
-gamma 0 0
# Id: 2819682
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Fe+3 + Nta-3 + H2O = FeOH(Nta)- + H+
log_k 13.23
delta_h 0 kJ
-gamma 0 0
# Id: 2819683
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Mn+2 + Nta-3 = Mn(Nta)-
log_k 8.573
delta_h 5.8576 kJ
-gamma 0 0
# Id: 4709681
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Mn+2 + 2Nta-3 = Mn(Nta)2-4
log_k 11.58
delta_h -17.1544 kJ
-gamma 0 0
# Id: 4709682
```

```
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cr(OH)2+ + Nta-3 + 2H+ = Cr(Nta) + 2H2O
log_k 21.2
delta_h 0 kJ
-gamma 0 0
# Id: 2119681
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cr(OH)2+ + 2Nta-3 + 2H+ = Cr(Nta)2-3 + 2H2O
log_k 29.5
delta_h 0 kJ
-gamma 0 0
# Id: 2119682
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
MoO4-2 + 2H+ + Nta-3 = MoO3(Nta)-3 + H2O
log_k 19.5434
delta_h -69 kJ
-gamma 0 0
# Id: 4809681
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.10 25.0
MoO4-2 + 3H+ + Nta-3 = MoO3H(Nta)-2 + H2O
log_k 23.3954
delta_h -71 kJ
-gamma 0 0
# Id: 4809682
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 1.00 25.0
MoO4-2 + 4H+ + Nta-3 = MoO3H2(Nta)- + H2O
log_k 25.3534
delta_h -71 kJ
-gamma 0 0
# Id: 4809683
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 1.00 25.0
Be+2 + Nta-3 = Be(Nta)-
log_k 9.0767
delta_h 25 kJ
-gamma 0 0
# Id: 1109681
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.10 25.0
Mg+2 + Nta-3 = Mg(Nta)-
log_k 6.5
delta_h 17.9912 kJ
```

```
-gamma 0 0
# Id: 4609681
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ca+2 + Nta-3 = Ca(Nta)-
log_k 7.608
delta_h -5.6902 kJ
-gamma 0 0
# Id: 1509681
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ca+2 + 2Nta-3 = Ca(Nta)2-4
log_k 8.81
delta_h -32.6352 kJ
-gamma 0 0
# Id: 1509682
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Sr+2 + Nta-3 = Sr(Nta)-
log_k 6.2767
delta_h -2.2 kJ
-gamma 0 0
# Id: 8009681
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.10 25.0
Ba+2 + Nta-3 = Ba(Nta)-
log_k 5.875
delta_h -6.025 kJ
-gamma 0 0
# Id: 1009681
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
H+ + Edta-4 = H(Edta)-3
log_k 10.948
delta_h -23.4304 kJ
-gamma 0 0
# Id: 3309691
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
2H+ + Edta-4 = H2(Edta)-2
log_k 17.221
delta_h -41.0032 kJ
-gamma 0 0
# Id: 3309692
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
3H+ + Edta-4 = H3(Edta)-
```

```
log_k 20.34
delta_h -35.564 kJ
-gamma 0 0
# Id: 3309693
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
4H+ + Edta-4 = H4(Edta)
log_k 22.5
delta_h -34.3088 kJ
-gamma 0 0
# Id: 3309694
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
5H+ + Edta-4 = H5(Edta)+
log_k 24
delta_h -32.2168 kJ
-gamma 0 0
# Id: 3309695
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Sn(OH)2 + 2H+ + Edta-4 = Sn(Edta)-2 + 2H2O
log_k 27.026
delta_h 0 kJ
-gamma 0 0
# Id: 7909691
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 1.00 20.0
Sn(OH)2 + 3H+ + Edta-4 = SnH(Edta)- + 2H2O
log_k 29.934
delta_h 0 kJ
-gamma 0 0
# Id: 7909692
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 1.00 20.0
Sn(OH)2 + 4H+ + Edta-4 = SnH2(Edta) + 2H2O
log_k 31.638
delta_h 0 kJ
-gamma 0 0
# Id: 7909693
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 1.00 20.0
Pb+2 + Edta-4 = Pb(Edta)-2
log_k 19.8
delta_h -54.8104 kJ
-gamma 0 0
# Id: 6009691
# log K source: NIST46.2
# Delta H source: NIST46.2
```

```
#T and ionic strength:
Pb+2 + Edta-4 + H+ = PbH(Edta)-
log_k 23
delta_h 0 kJ
-gamma 0 0
# Id: 6009692
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Pb+2 + Edta-4 + 2H+ = PbH2(Edta)
log_k 24.9
delta_h 0 kJ
-gamma 0 0
# Id: 6009693
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Al+3 + Edta-4 = Al(Edta)-
log_k 19.1
delta_h 52.7184 kJ
-gamma 0 0
# Id: 309690
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Al+3 + Edta-4 + H+ = AlH(Edta)
log_k 21.8
delta_h 36.4008 kJ
-gamma 0 0
# Id: 309691
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Al+3 + Edta-4 + H2O = AlOH(Edta)-2 + H+
log_k 12.8
delta_h 73.6384 kJ
-gamma 0 0
# Id: 309692
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Tl+ + Edta-4 = Tl(Edta)-3
log_k 7.27
delta_h -43.5136 kJ
-gamma 0 0
# Id: 8709691
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Tl+ + Edta-4 + H+ = TlH(Edta)-2
log_k 13.68
delta_h 0 kJ
-gamma 0 0
# Id: 8709692
```

```
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + Edta-4 = Zn(Edta)-2
log_k 18
delta_h -19.2464 kJ
-gamma 0 0
# Id: 9509691
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + Edta-4 + H+ = ZnH(Edta)-
log_k 21.4
delta_h -28.4512 kJ
-gamma 0 0
# Id: 9509692
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + Edta-4 + H2O = ZnOH(Edta)-3 + H+
log_k 5.8
delta_h 0 kJ
-gamma 0 0
# Id: 9509693
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + Edta-4 = Cd(Edta)-2
log_k 18.2
delta_h -38.0744 kJ
-gamma 0 0
# Id: 1609691
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + Edta-4 + H+ = CdH(Edta)-
log_k 21.5
delta_h -39.748 kJ
-gamma 0 0
# Id: 1609692
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Hg(OH)2 + Edta-4 + 2H+ = Hg(Edta)-2 + 2H2O
log_k 29.3
delta_h -125.102 kJ
-gamma 0 0
# Id: 3619691
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Hg(OH)2 + Edta-4 + 3H+ = HgH(Edta)- + 2H2O
log_k 32.9
delta_h -128.449 kJ
```

```
-gamma 0 0
# Id: 3619692
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Edta-4 = Cu(Edta)-2
log_k 20.5
delta_h -34.7272 kJ
-gamma 0 0
# Id: 2319691
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Edta-4 + H+ = CuH(Edta)-
log_k 24
delta_h -43.0952 kJ
-gamma 0 0
# Id: 2319692
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Edta-4 + 2H+ = CuH2(Edta)
log_k 26.2
delta_h 0 kJ
-gamma 0 0
# Id: 2319693
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Edta-4 + H2O = CuOH(Edta)-3 + H+
log_k 8.5
delta_h 0 kJ
-gamma 0 0
# Id: 2319694
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + Edta-4 = Ag(Edta)-3
log_k 8.08
delta_h -31.38 kJ
-gamma 0 0
# Id: 209691
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + Edta-4 + H+ = AgH(Edta)-2
log_k 15.21
delta_h 0 kJ
-gamma 0 0
# Id: 209693
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Ni+2 + Edta-4 = Ni(Edta)-2
```

```
log_k 20.1
delta_h -30.9616 kJ
-gamma 0 0
# Id: 5409691
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + Edta-4 + H+ = NiH(Edta)-
log_k 23.6
delta_h -38.4928 kJ
-gamma 0 0
# Id: 5409692
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + Edta-4 + H2O = NiOH(Edta)-3 + H+
log_k 7.6
delta_h 0 kJ
-gamma 0 0
# Id: 5409693
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Co+2 + Edta-4 = Co(Edta)-2
log_k 18.1657
delta_h -15 kJ
-gamma 0 0
# Id: 2009691
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.10 25.0
Co+2 + Edta-4 + H+ = CoH(Edta)-
log_k 21.5946
delta_h -22.9 kJ
-gamma 0 0
# Id: 2009692
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.10 25.0
Co+2 + Edta-4 + 2H+ = CoH2(Edta)
log_k 23.4986
delta_h 0 kJ
-gamma 0 0
# Id: 2009693
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 1.00 25.0
Co+3 + Edta-4 = Co(Edta)-
log_k 43.9735
delta_h 0 kJ
-gamma 0 0
# Id: 2019691
# log K source: NIST46.4
# Delta H source: NIST46.2
```

```
#T and ionic strength:  0.10 25.0
Co+3 + Edta-4 + H+ = CoH(Edta)
log_k 47.168
delta_h 0 kJ
-gamma 0 0
# Id:  2019692
# log K source:  NIST46.4
# Delta H source:  NIST46.2
#T and ionic strength:  0.10 20.0
Fe+2 + Edta-4 = Fe(Edta)-2
log_k 16
delta_h -16.736 kJ
-gamma 0 0
# Id:  2809690
# log K source:  NIST46.2
# Delta H source:  NIST46.2
#T and ionic strength:
Fe+2 + Edta-4 + H+ = FeH(Edta)-
log_k 19.06
delta_h -27.6144 kJ
-gamma 0 0
# Id:  2809691
# log K source:  NIST46.2
# Delta H source:  NIST46.2
#T and ionic strength:
Fe+2 + Edta-4 + H2O = FeOH(Edta)-3 + H+
log_k 6.5
delta_h 0 kJ
-gamma 0 0
# Id:  2809692
# log K source:  SCD2.62
# Delta H source:  SCD2.62
#T and ionic strength:
Fe+2 + Edta-4 + 2H2O = Fe(OH)2(Edta)-4 + 2H+
log_k -4
delta_h 0 kJ
-gamma 0 0
# Id:  2809693
# log K source:  SCD2.62
# Delta H source:  SCD2.62
#T and ionic strength:
Fe+3 + Edta-4 = Fe(Edta)-
log_k 27.7
delta_h -11.2968 kJ
-gamma 0 0
# Id:  2819690
# log K source:  NIST46.2
# Delta H source:  NIST46.2
#T and ionic strength:
Fe+3 + Edta-4 + H+ = FeH(Edta)
log_k 29.2
delta_h -11.7152 kJ
-gamma 0 0
# Id:  2819691
```

```
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Fe+3 + Edta-4 + H2O = FeOH(Edta)-2 + H+
log_k 19.9
delta_h 0 kJ
-gamma 0 0
# Id: 2819692
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Fe+3 + Edta-4 + 2H2O = Fe(OH)2(Edta)-3 + 2H+
log_k 9.85
delta_h 0 kJ
-gamma 0 0
# Id: 2819693
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Mn+2 + Edta-4 = Mn(Edta)-2
log_k 15.6
delta_h -19.2464 kJ
-gamma 0 0
# Id: 4709691
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Mn+2 + Edta-4 + H+ = MnH(Edta)-
log_k 19.1
delta_h -24.2672 kJ
-gamma 0 0
# Id: 4709692
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cr+2 + Edta-4 = Cr(Edta)-2
log_k 15.3
delta_h 0 kJ
-gamma 0 0
# Id: 2109691
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cr+2 + Edta-4 + H+ = CrH(Edta)-
log_k 19.1
delta_h 0 kJ
-gamma 0 0
# Id: 2109692
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cr(OH)2+ + Edta-4 + 2H+ = Cr(Edta)- + 2H2O
log_k 35.5
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 2119691
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cr(OH)2+ + Edta-4 + 3H+ = CrH(Edta) + 2H2O
log_k 37.4
delta_h 0 kJ
-gamma 0 0
# Id: 2119692
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cr(OH)2+ + Edta-4 + H+ = CrOH(Edta)-2 + H2O
log_k 27.7
delta_h 0 kJ
-gamma 0 0
# Id: 2119693
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Be+2 + Edta-4 = Be(Edta)-2
log_k 11.4157
delta_h 41 kJ
-gamma 0 0
# Id: 1109691
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.10 25.0
Mg+2 + Edta-4 = Mg(Edta)-2
log_k 10.57
delta_h 13.8072 kJ
-gamma 0 0
# Id: 4609690
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Mg+2 + Edta-4 + H+ = MgH(Edta)-
log_k 14.97
delta_h 0 kJ
-gamma 0 0
# Id: 4609691
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ca+2 + Edta-4 = Ca(Edta)-2
log_k 12.42
delta_h -25.5224 kJ
-gamma 0 0
# Id: 1509690
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ca+2 + Edta-4 + H+ = CaH(Edta)-
```

```
log_k 15.9
delta_h 0 kJ
-gamma 0 0
# Id: 1509691
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Sr+2 + Edta-4 = Sr(Edta)-2
log_k 10.4357
delta_h -17 kJ
-gamma 0 0
# Id: 8009691
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.10 25.0
Sr+2 + Edta-4 + H+ = SrH(Edta)-
log_k 14.7946
delta_h 0 kJ
-gamma 0 0
# Id: 8009692
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.10 20.0
Ba+2 + Edta-4 = Ba(Edta)-2
log_k 7.72
delta_h -20.5016 kJ
-gamma 0 0
# Id: 1009691
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Na+ + Edta-4 = Na(Edta)-3
log_k 2.7
delta_h -5.8576 kJ
-gamma 0 0
# Id: 5009690
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
K+ + Edta-4 = K(Edta)-3
log_k 1.7
delta_h 0 kJ
-gamma 0 0
# Id: 4109690
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
H+ + Propionate- = H(Propionate)
log_k 4.874
delta_h 0.66 kJ
-gamma 0 0
# Id: 3309711
# log K source: NIST46.4
# Delta H source: NIST46.4
```

```
#T and ionic strength:  0.00 25.0
Pb+2 + Propionate- = Pb(Propionate)+
log_k 2.64
delta_h 0 kJ
-gamma 0 0
# Id:  6009711
# log K source:  NIST46.4
# Delta H source:  SCD2.62
#T and ionic strength:  0.00 35.0
Pb+2 + 2Propionate- = Pb(Propionate)2
log_k 3.1765
delta_h 0 kJ
-gamma 0 0
# Id:  6009712
# log K source:  NIST46.4
# Delta H source:  SCD2.62
#T and ionic strength:  2.00 25.0
Zn+2 + Propionate- = Zn(Propionate)+
log_k 1.4389
delta_h 0 kJ
-gamma 0 0
# Id:  9509711
# log K source:  NIST46.4
# Delta H source:  NIST46.2
#T and ionic strength:  0.10 25.0
Zn+2 + 2Propionate- = Zn(Propionate)2
log_k 1.842
delta_h 0 kJ
-gamma 0 0
# Id:  9509712
# log K source:  NIST46.4
# Delta H source:  NIST46.2
#T and ionic strength:  1.00 25.0
Cd+2 + Propionate- = Cd(Propionate)+
log_k 1.598
delta_h 0 kJ
-gamma 0 0
# Id:  1609711
# log K source:  NIST46.4
# Delta H source:  NIST46.2
#T and ionic strength:  1.00 25.0
Cd+2 + 2Propionate- = Cd(Propionate)2
log_k 2.472
delta_h 0 kJ
-gamma 0 0
# Id:  1609712
# log K source:  NIST46.4
# Delta H source:  NIST46.2
#T and ionic strength:  1.00 25.0
Hg(OH)2 + 2H+ + Propionate- = Hg(Propionate)+ + 2H2O
log_k 10.594
delta_h 0 kJ
-gamma 0 0
# Id:  3619711
```

```
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.00 25.0
Cu+2 + Propionate- = Cu(Propionate)+
log_k 2.22
delta_h 4.1 kJ
-gamma 0 0
# Id: 2319711
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Cu+2 + 2Propionate- = Cu(Propionate)2
log_k 3.5
delta_h 0 kJ
-gamma 0 0
# Id: 2319712
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.00 25.0
Ni+2 + Propionate- = Ni(Propionate)+
log_k 0.908
delta_h 0 kJ
-gamma 0 0
# Id: 5409711
# log K source: NIST46.4
# Delta H source: SCD2.62
#T and ionic strength: 1.00 25.0
Co+2 + Propionate- = Co(Propionate)+
log_k 0.671
delta_h 4.6 kJ
-gamma 0 0
# Id: 2009711
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 2.00 25.0
Co+2 + 2Propionate- = Co(Propionate)2
log_k 0.5565
delta_h 16 kJ
-gamma 0 0
# Id: 2009712
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 2.00 25.0
Fe+3 + Propionate- = Fe(Propionate)+2
log_k 4.012
delta_h 0 kJ
-gamma 0 0
# Id: 2819711
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 1.00 20.0
Cr(OH)2+ + 2H+ + Propionate- = Cr(Propionate)+2 + 2H2O
log_k 15.0773
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 2119711
# log K source: NIST46.4
# Delta H source: SCD2.62
#T and ionic strength: 0.50 25.0
Cr(OH)2+ + 2H+ + 2Propionate- = Cr(Propionate)2+ + 2H2O
log_k 17.9563
delta_h 0 kJ
-gamma 0 0
# Id: 2119712
# log K source: NIST46.4
# Delta H source: SCD2.62
#T and ionic strength: 0.50 25.0
Cr(OH)2+ + 2H+ + 3Propionate- = Cr(Propionate)3 + 2H2O
log_k 20.8858
delta_h 0 kJ
-gamma 0 0
# Id: 2119713
# log K source: NIST46.4
# Delta H source: SCD2.62
#T and ionic strength: 0.50 25.0
Mg+2 + Propionate- = Mg(Propionate)+
log_k 0.9689
delta_h 4.2677 kJ
-gamma 0 0
# Id: 4609710
# log K source: NIST46.4
# Delta H source: SCD2.62
#T and ionic strength: 0.10 25.0
Ca+2 + Propionate- = Ca(Propionate)+
log_k 0.9289
delta_h 3.3472 kJ
-gamma 0 0
# Id: 1509710
# log K source: NIST46.4
# Delta H source: SCD2.62
#T and ionic strength: 0.10 25.0
Sr+2 + Propionate- = Sr(Propionate)+
log_k 0.8589
delta_h 0 kJ
-gamma 0 0
# Id: 8009711
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.10 25.0
Ba+2 + Propionate- = Ba(Propionate)+
log_k 0.7689
delta_h 0 kJ
-gamma 0 0
# Id: 1009711
# log K source: NIST46.4
# Delta H source: SCD2.62
#T and ionic strength: 0.10 25.0
Ba+2 + 2Propionate- = Ba(Propionate)2
```

```
log_k 0.9834
delta_h 0 kJ
-gamma 0 0
# Id: 1009712
# log K source: NIST46.4
# Delta H source: SCD2.62
#T and ionic strength: 0.10 25.0
H+ + Butyrate- = H(Butyrate)
log_k 4.819
delta_h 2.8 kJ
-gamma 0 0
# Id: 3309721
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Pb+2 + Butyrate- = Pb(Butyrate)+
log_k 2.101
delta_h 0 kJ
-gamma 0 0
# Id: 6009721
# log K source: NIST46.4
# Delta H source: SCD2.62
#T and ionic strength: 2.00 25.0
Zn+2 + Butyrate- = Zn(Butyrate)+
log_k 1.4289
delta_h 0 kJ
-gamma 0 0
# Id: 9509721
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.10 25.0
Hg(OH)2 + 2H+ + Butyrate- = Hg(Butyrate)+ + 2H2O
log_k 10.3529
delta_h 0 kJ
-gamma 0 0
# Id: 3619721
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.10 25.0
Cu+2 + Butyrate- = Cu(Butyrate)+
log_k 2.14
delta_h 0 kJ
-gamma 0 0
# Id: 2319721
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.00 25.0
Ni+2 + Butyrate- = Ni(Butyrate)+
log_k 0.691
delta_h 0 kJ
-gamma 0 0
# Id: 5409721
# log K source: NIST46.4
# Delta H source: SCD2.62
```

```
#T and ionic strength: 2.00 25.0
Co+2 + Butyrate- = Co(Butyrate)+
log_k 0.591
delta_h 0 kJ
-gamma 0 0
# Id: 2009721
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 2.00 25.0
Co+2 + 2Butyrate- = Co(Butyrate)2
log_k 0.7765
delta_h 0 kJ
-gamma 0 0
# Id: 2009722
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 2.00 25.0
Mg+2 + Butyrate- = Mg(Butyrate)+
log_k 0.9589
delta_h 0 kJ
-gamma 0 0
# Id: 4609720
# log K source: NIST46.4
# Delta H source: SCD2.62
#T and ionic strength: 0.10 25.0
Ca+2 + Butyrate- = Ca(Butyrate)+
log_k 0.9389
delta_h 3.3472 kJ
-gamma 0 0
# Id: 1509720
# log K source: NIST46.4
# Delta H source: SCD2.62
#T and ionic strength: 0.10 25.0
Sr+2 + Butyrate- = Sr(Butyrate)+
log_k 0.7889
delta_h 0 kJ
-gamma 0 0
# Id: 8009721
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.10 25.0
Ba+2 + Butyrate- = Ba(Butyrate)+
log_k 0.7389
delta_h 0 kJ
-gamma 0 0
# Id: 1009721
# log K source: NIST46.4
# Delta H source: SCD2.62
#T and ionic strength: 0.10 25.0
Ba+2 + 2Butyrate- = Ba(Butyrate)2
log_k 0.88
delta_h 0 kJ
-gamma 0 0
# Id: 1009722
```

```
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
H+ + Isobutyrate- = H(Isobutyrate)
log_k 4.849
delta_h 3.2217 kJ
-gamma 0 0
# Id: 3309731
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + Isobutyrate- = Zn(Isobutyrate)+
log_k 1.44
delta_h 0 kJ
-gamma 0 0
# Id: 9509731
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Isobutyrate- = Cu(Isobutyrate)+
log_k 2.17
delta_h 0 kJ
-gamma 0 0
# Id: 2319731
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + 2Isobutyrate- = Cu(Isobutyrate)2
log_k 3.3
delta_h 0 kJ
-gamma 0 0
# Id: 2319732
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Fe+3 + Isobutyrate- = Fe(Isobutyrate)+2
log_k 4.2
delta_h 0 kJ
-gamma 0 0
# Id: 2819731
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ca+2 + Isobutyrate- = Ca(Isobutyrate)+
log_k 0.51
delta_h 0 kJ
-gamma 0 0
# Id: 1509731
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
H+ + Two_picoline = H(Two_picoline)+
log_k 5.95
delta_h -25.5224 kJ
```

```
-gamma 0 0
# Id: 3309801
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Two_picoline = Cu(Two_picoline)+2
log_k 1.3
delta_h 0 kJ
-gamma 0 0
# Id: 2319801
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + 2Two_picoline = Cu(Two_picoline)2+2
log_k 2.8
delta_h 0 kJ
-gamma 0 0
# Id: 2319802
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+ + Two_picoline = Cu(Two_picoline)+
log_k 5.4
delta_h 0 kJ
-gamma 0 0
# Id: 2309801
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+ + 2Two_picoline = Cu(Two_picoline)2+
log_k 7.65
delta_h 0 kJ
-gamma 0 0
# Id: 2309802
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+ + 3Two_picoline = Cu(Two_picoline)3+
log_k 8.5
delta_h 0 kJ
-gamma 0 0
# Id: 2309803
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + Two_picoline = Ag(Two_picoline)+
log_k 2.32
delta_h -24.2672 kJ
-gamma 0 0
# Id: 209801
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + 2Two_picoline = Ag(Two_picoline)2+
```

```
log_k 4.68
delta_h -42.6768 kJ
-gamma 0 0
# Id: 209802
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + Two_picoline = Ni(Two_picoline)+2
log_k 0.4
delta_h 0 kJ
-gamma 0 0
# Id: 5409801
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
H+ + Three_picoline = H(Three_picoline)+
log_k 5.7
delta_h -23.8488 kJ
-gamma 0 0
# Id: 3309811
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + Three_picoline = Zn(Three_picoline)+2
log_k 1
delta_h 0 kJ
-gamma 0 0
# Id: 9509811
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + 2Three_picoline = Zn(Three_picoline)2+2
log_k 2.1
delta_h 0 kJ
-gamma 0 0
# Id: 9509812
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + 3Three_picoline = Zn(Three_picoline)3+2
log_k 2.6
delta_h 0 kJ
-gamma 0 0
# Id: 9509813
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + 4Three_picoline = Zn(Three_picoline)4+2
log_k 3.7
delta_h 0 kJ
-gamma 0 0
# Id: 9509814
# log K source: NIST46.2
# Delta H source: NIST46.2
```

```
#T and ionic strength:
Cd+2 + Three_picoline = Cd(Three_picoline)+2
log_k 1.42
delta_h 0 kJ
-gamma 0 0
# Id: 1609811
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cd+2 + 2Three_picoline = Cd(Three_picoline)2+2
log_k 2.27
delta_h 0 kJ
-gamma 0 0
# Id: 1609812
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cd+2 + 3Three_picoline = Cd(Three_picoline)3+2
log_k 3.6
delta_h 0 kJ
-gamma 0 0
# Id: 1609813
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + 4Three_picoline = Cd(Three_picoline)4+2
log_k 4
delta_h 0 kJ
-gamma 0 0
# Id: 1609814
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+ + Three_picoline = Cu(Three_picoline)+
log_k 5.6
delta_h 0 kJ
-gamma 0 0
# Id: 2309811
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+ + 2Three_picoline = Cu(Three_picoline)2+
log_k 7.78
delta_h 0 kJ
-gamma 0 0
# Id: 2309812
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+ + 3Three_picoline = Cu(Three_picoline)3+
log_k 8.6
delta_h 0 kJ
-gamma 0 0
# Id: 2309813
```

```
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+ + 4Three_picoline = Cu(Three_picoline)4+
log_k 9
delta_h 0 kJ
-gamma 0 0
# Id: 2309814
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Three_picoline = Cu(Three_picoline)+2
log_k 2.77
delta_h 0 kJ
-gamma 0 0
# Id: 2319811
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + 2Three_picoline = Cu(Three_picoline)2+2
log_k 4.8
delta_h 0 kJ
-gamma 0 0
# Id: 2319812
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + 3Three_picoline = Cu(Three_picoline)3+2
log_k 6.3
delta_h 0 kJ
-gamma 0 0
# Id: 2319813
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + 4Three_picoline = Cu(Three_picoline)4+2
log_k 7.2
delta_h 0 kJ
-gamma 0 0
# Id: 2319814
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + Three_picoline = Ag(Three_picoline)+
log_k 2.2
delta_h -21.7568 kJ
-gamma 0 0
# Id: 209811
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + 2Three_picoline = Ag(Three_picoline)2+
log_k 4.46
delta_h -49.7896 kJ
```

```
-gamma 0 0
# Id: 209812
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + Three_picoline = Ni(Three_picoline)+2
log_k 1.87
delta_h 0 kJ
-gamma 0 0
# Id: 5409811
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + 2Three_picoline = Ni(Three_picoline)2+2
log_k 3.3
delta_h 0 kJ
-gamma 0 0
# Id: 5409812
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + 3Three_picoline = Ni(Three_picoline)3+2
log_k 4.1
delta_h 0 kJ
-gamma 0 0
# Id: 5409813
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + 4Three_picoline = Ni(Three_picoline)4+2
log_k 4.6
delta_h 0 kJ
-gamma 0 0
# Id: 5409814
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Co+2 + Three_picoline = Co(Three_picoline)+2
log_k 1.4
delta_h 0 kJ
-gamma 0 0
# Id: 2009811
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.50 25.0
Co+2 + 2Three_picoline = Co(Three_picoline)2+2
log_k 2.2
delta_h 0 kJ
-gamma 0 0
# Id: 2009812
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.50 25.0
Co+2 + 3Three_picoline = Co(Three_picoline)3+2
```

```
log_k 2.5
delta_h 0 kJ
-gamma 0 0
# Id: 2009813
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.50 25.0
H+ + Four_picoline = H(Four_picoline)+
log_k 6.03
delta_h -25.3132 kJ
-gamma 0 0
# Id: 3309821
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + Four_picoline = Zn(Four_picoline)+2
log_k 1.4
delta_h 0 kJ
-gamma 0 0
# Id: 9509821
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + 2Four_picoline = Zn(Four_picoline)2+2
log_k 2.11
delta_h 0 kJ
-gamma 0 0
# Id: 9509822
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + 3Four_picoline = Zn(Four_picoline)3+2
log_k 2.85
delta_h 0 kJ
-gamma 0 0
# Id: 9509823
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + Four_picoline = Cd(Four_picoline)+2
log_k 1.59
delta_h 0 kJ
-gamma 0 0
# Id: 1609821
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cd+2 + 2Four_picoline = Cd(Four_picoline)2+2
log_k 2.4
delta_h 0 kJ
-gamma 0 0
# Id: 1609822
# log K source: SCD2.62
# Delta H source: SCD2.62
```

```
#T and ionic strength:
Cd+2 + 3Four_picoline = Cd(Four_picoline)3+2
log_k 3.18
delta_h 0 kJ
-gamma 0 0
# Id: 1609823
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cd+2 + 4Four_picoline = Cd(Four_picoline)4+2
log_k 4
delta_h 0 kJ
-gamma 0 0
# Id: 1609824
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+ + Four_picoline = Cu(Four_picoline)+
log_k 5.65
delta_h 0 kJ
-gamma 0 0
# Id: 2309821
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+ + 2Four_picoline = Cu(Four_picoline)2+
log_k 8.2
delta_h 0 kJ
-gamma 0 0
# Id: 2309822
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+ + 3Four_picoline = Cu(Four_picoline)3+
log_k 8.8
delta_h 0 kJ
-gamma 0 0
# Id: 2309823
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+ + 4Four_picoline = Cu(Four_picoline)4+
log_k 9.2
delta_h 0 kJ
-gamma 0 0
# Id: 2309824
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Four_picoline = Cu(Four_picoline)+2
log_k 2.88
delta_h 0 kJ
-gamma 0 0
# Id: 2319821
```

```
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + 2Four_picoline = Cu(Four_picoline)2+2
log_k 5.16
delta_h 0 kJ
-gamma 0 0
# Id: 2319822
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + 3Four_picoline = Cu(Four_picoline)3+2
log_k 6.77
delta_h 0 kJ
-gamma 0 0
# Id: 2319823
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + 4Four_picoline = Cu(Four_picoline)4+2
log_k 8.08
delta_h 0 kJ
-gamma 0 0
# Id: 2319824
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + 5Four_picoline = Cu(Four_picoline)5+2
log_k 8.3
delta_h 0 kJ
-gamma 0 0
# Id: 2319825
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + Four_picoline = Ag(Four_picoline)+
log_k 2.03
delta_h -25.5224 kJ
-gamma 0 0
# Id: 209821
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + 2Four_picoline = Ag(Four_picoline)2+
log_k 4.39
delta_h -53.5552 kJ
-gamma 0 0
# Id: 209822
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + Four_picoline = Ni(Four_picoline)+2
log_k 2.11
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 5409821
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + 2Four_picoline = Ni(Four_picoline)2+2
log_k 3.59
delta_h 0 kJ
-gamma 0 0
# Id: 5409822
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + 3Four_picoline = Ni(Four_picoline)3+2
log_k 4.34
delta_h 0 kJ
-gamma 0 0
# Id: 5409823
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + 4Four_picoline = Ni(Four_picoline)4+2
log_k 4.7
delta_h 0 kJ
-gamma 0 0
# Id: 5409824
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Co+2 + Four_picoline = Co(Four_picoline)+2
log_k 1.56
delta_h 0 kJ
-gamma 0 0
# Id: 2009821
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.50 25.0
Co+2 + 2Four_picoline = Co(Four_picoline)2+2
log_k 2.51
delta_h 0 kJ
-gamma 0 0
# Id: 2009822
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.50 25.0
Co+2 + 3Four_picoline = Co(Four_picoline)3+2
log_k 2.94
delta_h 0 kJ
-gamma 0 0
# Id: 2009823
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.50 25.0
Co+2 + 4Four_picoline = Co(Four_picoline)4+2
```

```
log_k 3.17
delta_h 0 kJ
-gamma 0 0
# Id: 2009824
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.50 25.0
H+ + Formate- = H(Formate)
log_k 3.745
delta_h 0.1674 kJ
-gamma 0 0
# Id: 3309831
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Pb+2 + Formate- = Pb(Formate)+
log_k 2.2
delta_h 0 kJ
-gamma 0 0
# Id: 6009831
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Zn+2 + Formate- = Zn(Formate)+
log_k 1.44
delta_h 0 kJ
-gamma 0 0
# Id: 9509831
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + Formate- = Cd(Formate)+
log_k 1.7
delta_h 0 kJ
-gamma 0 0
# Id: 1609831
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Hg(OH)2 + Formate- + 2H+ = Hg(Formate)+ + 2H2O
log_k 9.6
delta_h 0 kJ
-gamma 0 0
# Id: 3619831
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Formate- = Cu(Formate)+
log_k 2
delta_h 0 kJ
-gamma 0 0
# Id: 2319831
# log K source: NIST46.2
# Delta H source: NIST46.2
```

```
#T and ionic strength:
Ni+2 + Formate- = Ni(Formate)+
log_k 1.22
delta_h 0 kJ
-gamma 0 0
# Id: 5409831
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Co+2 + Formate- = Co(Formate)+
log_k 1.209
delta_h 0 kJ
-gamma 0 0
# Id: 2009831
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.50 30.0
Co+2 + 2Formate- = Co(Formate)2
log_k 1.1365
delta_h 0 kJ
-gamma 0 0
# Id: 2009832
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 2.00 25.0
Cr+2 + Formate- = Cr(Formate)+
log_k 1.07
delta_h 0 kJ
-gamma 0 0
# Id: 2109831
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Mg+2 + Formate- = Mg(Formate)+
log_k 1.43
delta_h 0 kJ
-gamma 0 0
# Id: 4609831
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ca+2 + Formate- = Ca(Formate)+
log_k 1.43
delta_h 4.184 kJ
-gamma 0 0
# Id: 1509831
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Sr+2 + Formate- = Sr(Formate)+
log_k 1.39
delta_h 4 kJ
-gamma 0 0
# Id: 8009831
```

```
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Ba+2 + Formate- = Ba(Formate)+
log_k 1.38
delta_h 0 kJ
-gamma 0 0
# Id: 1009831
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
H+ + Isovalerate- = H(Isovalerate)
log_k 4.781
delta_h 4.5606 kJ
-gamma 0 0
# Id: 3309841
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + Isovalerate- = Zn(Isovalerate)+
log_k 1.39
delta_h 0 kJ
-gamma 0 0
# Id: 9509841
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Isovalerate- = Cu(Isovalerate)+
log_k 2.08
delta_h 0 kJ
-gamma 0 0
# Id: 2319841
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ca+2 + Isovalerate- = Ca(Isovalerate)+
log_k 0.2
delta_h 0 kJ
-gamma 0 0
# Id: 1509841
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
H+ + Valerate- = H(Valerate)
log_k 4.843
delta_h 2.887 kJ
-gamma 0 0
# Id: 3309851
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Valerate- = Cu(Valerate)+
log_k 2.12
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 2319851
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ca+2 + Valerate- = Ca(Valerate)+
log_k 0.3
delta_h 0 kJ
-gamma 0 0
# Id: 1509851
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Ba+2 + Valerate- = Ba(Valerate)+
log_k -0.2
delta_h 0 kJ
-gamma 0 0
# Id: 1009851
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
H+ + Acetate- = H(Acetate)
log_k 4.757
delta_h 0.41 kJ
-gamma 0 0
# Id: 3309921
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Sn(OH)2 + 2H+ + Acetate- = Sn(Acetate)+ + 2H2O
log_k 10.0213
delta_h 0 kJ
-gamma 0 0
# Id: 7909921
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 3.00 25.0
Sn(OH)2 + 2H+ + 2Acetate- = Sn(Acetate)2 + 2H2O
log_k 12.32
delta_h 0 kJ
-gamma 0 0
# Id: 7909922
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 3.00 25.0
Sn(OH)2 + 2H+ + 3Acetate- = Sn(Acetate)3- + 2H2O
log_k 13.55
delta_h 0 kJ
-gamma 0 0
# Id: 7909923
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 3.00 25.0
Pb+2 + Acetate- = Pb(Acetate)+
```

```
log_k 2.68
delta_h -0.4 kJ
-gamma 0 0
# Id: 6009921
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Pb+2 + 2Acetate- = Pb(Acetate)2
log_k 4.08
delta_h -0.8 kJ
-gamma 0 0
# Id: 6009922
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Tl+ + Acetate- = Tl(Acetate)
log_k -0.11
delta_h 0 kJ
-gamma 0 0
# Id: 8709921
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.00 25.0
Zn+2 + Acetate- = Zn(Acetate)+
log_k 1.58
delta_h 8.3 kJ
-gamma 0 0
# Id: 9509921
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Zn+2 + 2Acetate- = Zn(Acetate)2
log_k 2.6434
delta_h 22 kJ
-gamma 0 0
# Id: 9509922
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.10 25.0
Cd+2 + Acetate- = Cd(Acetate)+
log_k 1.93
delta_h 9.6 kJ
-gamma 0 0
# Id: 1609921
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Cd+2 + 2Acetate- = Cd(Acetate)2
log_k 2.86
delta_h 15 kJ
-gamma 0 0
# Id: 1609922
# log K source: NIST46.4
# Delta H source: NIST46.4
```

```
#T and ionic strength: 0.00 25.0
Hg(OH)2 + 2H+ + Acetate- = Hg(Acetate)+ + 2H2O
log_k 10.494
delta_h 0 kJ
-gamma 0 0
# Id: 3619920
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.00 25.0
Hg(OH)2 + 2H+ + 2Acetate- = Hg(Acetate)2 + 2H2O
log_k 13.83
delta_h 0 kJ
-gamma 0 0
# Id: 3619921
# log K source: NIST46.4
# Delta H source: SCD2.62
#T and ionic strength: 3.00 25.0
Cu+2 + Acetate- = Cu(Acetate)+
log_k 2.21
delta_h 7.1 kJ
-gamma 0 0
# Id: 2319921
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Cu+2 + 2Acetate- = Cu(Acetate)2
log_k 3.4
delta_h 12 kJ
-gamma 0 0
# Id: 2319922
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Cu+2 + 3Acetate- = Cu(Acetate)3-
log_k 3.9434
delta_h 6.2 kJ
-gamma 0 0
# Id: 2319923
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.10 25.0
Ag+ + Acetate- = Ag(Acetate)
log_k 0.73
delta_h 3 kJ
-gamma 0 0
# Id: 209921
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Ag+ + 2Acetate- = Ag(Acetate)2-
log_k 0.64
delta_h 3 kJ
-gamma 0 0
# Id: 209922
```

```
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Ni+2 + Acetate- = Ni(Acetate)+
log_k 1.37
delta_h 8.7 kJ
-gamma 0 0
# Id: 5409921
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Ni+2 + 2Acetate- = Ni(Acetate)2
log_k 2.1
delta_h 10 kJ
-gamma 0 0
# Id: 5409922
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Co+2 + Acetate- = Co(Acetate)+
log_k 1.38
delta_h 0 kJ
-gamma 0 0
# Id: 2009921
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.00 25.0
Co+2 + 2Acetate- = Co(Acetate)2
log_k 0.7565
delta_h 0 kJ
-gamma 0 0
# Id: 2009922
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 2.00 25.0
Fe+2 + Acetate- = Fe(Acetate)+
log_k 1.4
delta_h 0 kJ
-gamma 0 0
# Id: 2809920
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.00 25.0
Fe+3 + Acetate- = Fe(Acetate)+2
log_k 4.0234
delta_h 0 kJ
-gamma 0 0
# Id: 2819920
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.10 20.0
Fe+3 + 2Acetate- = Fe(Acetate)2+
log_k 7.5723
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 2819921
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.10 20.0
Fe+3 + 3Acetate- = Fe(Acetate)3
log_k 9.5867
delta_h 0 kJ
-gamma 0 0
# Id: 2819922
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.10 20.0
Mn+2 + Acetate- = Mn(Acetate)+
log_k 1.4
delta_h 0 kJ
-gamma 0 0
# Id: 4709920
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.00 25.0
Cr+2 + Acetate- = Cr(Acetate)+
log_k 1.8
delta_h 0 kJ
-gamma 0 0
# Id: 2109921
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.00 25.0
Cr+2 + 2Acetate- = Cr(Acetate)2
log_k 2.92
delta_h 0 kJ
-gamma 0 0
# Id: 2109922
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.00 25.0
Cr(OH)2+ + 2H+ + Acetate- = Cr(Acetate)+2 + 2H2O
log_k 15.0073
delta_h -125.62 kJ
-gamma 0 0
# Id: 2119921
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.50 25.0
Cr(OH)2+ + 2H+ + 2Acetate- = Cr(Acetate)2+ + 2H2O
log_k 17.9963
delta_h -117.62 kJ
-gamma 0 0
# Id: 2119922
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.50 25.0
Cr(OH)2+ + 2H+ + 3Acetate- = Cr(Acetate)3 + 2H2O
```

```
log_k 20.7858
delta_h -96.62 kJ
-gamma 0 0
# Id: 2119923
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.50 25.0
Be+2 + Acetate- = Be(Acetate)+
log_k 2.0489
delta_h 0 kJ
-gamma 0 0
# Id: 1109921
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.10 25.0
Be+2 + 2Acetate- = Be(Acetate)2
log_k 3.0034
delta_h 0 kJ
-gamma 0 0
# Id: 1109922
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.10 25.0
Mg+2 + Acetate- = Mg(Acetate)+
log_k 1.27
delta_h 0 kJ
-gamma 0 0
# Id: 4609920
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.00 25.0
Ca+2 + Acetate- = Ca(Acetate)+
log_k 1.18
delta_h 4 kJ
-gamma 0 0
# Id: 1509920
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Sr+2 + Acetate- = Sr(Acetate)+
log_k 1.14
delta_h 0 kJ
-gamma 0 0
# Id: 8009921
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.00 25.0
Ba+2 + Acetate- = Ba(Acetate)+
log_k 1.07
delta_h 0 kJ
-gamma 0 0
# Id: 1009921
# log K source: NIST46.4
# Delta H source: NIST46.2
```

```
#T and ionic strength:  0.00 25.0
Na+ + Acetate- = Na(Acetate)
log_k -0.18
delta_h 12 kJ
-gamma 0 0
# Id:  5009920
# log K source:  NIST46.4
# Delta H source:  NIST46.4
#T and ionic strength:  0.00 25.0
K+ + Acetate- = K(Acetate)
log_k -0.1955
delta_h 4.184 kJ
-gamma 0 0
# Id:  4109921
# log K source:  NIST46.4
# Delta H source:  NIST46.2
#T and ionic strength:  0.10 25.0
H+ + Tartarate-2 = H(Tartarate)-
log_k 4.366
delta_h -0.7531 kJ
-gamma 0 0
# Id:  3309931
# log K source:  NIST46.2
# Delta H source:  NIST46.2
#T and ionic strength:
2H+ + Tartarate-2 = H2(Tartarate)
log_k 7.402
delta_h -3.6819 kJ
-gamma 0 0
# Id:  3309932
# log K source:  NIST46.2
# Delta H source:  NIST46.2
#T and ionic strength:
Sn(OH)2 + 2H+ + Tartarate-2 = Sn(Tartarate) + 2H2O
log_k 13.1518
delta_h 0 kJ
-gamma 0 0
# Id:  7909931
# log K source:  NIST46.4
# Delta H source:  NIST46.2
#T and ionic strength:  0.10 20.0
Pb+2 + Tartarate-2 = Pb(Tartarate)
log_k 3.98
delta_h 0 kJ
-gamma 0 0
# Id:  6009931
# log K source:  NIST46.2
# Delta H source:  NIST46.2
#T and ionic strength:
Al+3 + 2Tartarate-2 = Al(Tartarate)2-
log_k 9.37
delta_h 0 kJ
-gamma 0 0
# Id:  309931
```

```
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Tl+ + Tartarate-2 = Tl(Tartarate)-
log_k 1.4
delta_h 0 kJ
-gamma 0 0
# Id: 8709931
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Tl+ + Tartarate-2 + H+ = TlH(Tartarate)
log_k 4.8
delta_h 0 kJ
-gamma 0 0
# Id: 8709932
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + Tartarate-2 = Zn(Tartarate)
log_k 3.43
delta_h 0 kJ
-gamma 0 0
# Id: 9509931
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + 2Tartarate-2 = Zn(Tartarate)2-2
log_k 5.5
delta_h 0 kJ
-gamma 0 0
# Id: 9509932
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + Tartarate-2 + H+ = ZnH(Tartarate)+
log_k 5.9
delta_h 0 kJ
-gamma 0 0
# Id: 9509933
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + Tartarate-2 = Cd(Tartarate)
log_k 2.7
delta_h 0 kJ
-gamma 0 0
# Id: 1609931
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + 2Tartarate-2 = Cd(Tartarate)2-2
log_k 4.1
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 1609932
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Hg(OH)2 + Tartarate-2 + 2H+ = Hg(Tartarate) + 2H2O
log_k 14
delta_h 0 kJ
-gamma 0 0
# Id: 3619931
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Tartarate-2 = Cu(Tartarate)
log_k 3.97
delta_h 0 kJ
-gamma 0 0
# Id: 2319931
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Tartarate-2 + H+ = CuH(Tartarate)+
log_k 6.7
delta_h 0 kJ
-gamma 0 0
# Id: 2319932
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + Tartarate-2 = Ni(Tartarate)
log_k 3.46
delta_h 0 kJ
-gamma 0 0
# Id: 5409931
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + Tartarate-2 + H+ = NiH(Tartarate)+
log_k 5.89
delta_h 0 kJ
-gamma 0 0
# Id: 5409932
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Co+2 + Tartarate-2 = Co(Tartarate)
log_k 3.05
delta_h 0 kJ
-gamma 0 0
# Id: 2009931
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.00 25.0
Co+2 + 2Tartarate-2 = Co(Tartarate)2-2
```

```
log_k 4
delta_h 0 kJ
-gamma 0 0
# Id: 2009932
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.00 25.0
Co+2 + H+ + Tartarate-2 = CoH(Tartarate)+
log_k 5.754
delta_h 0 kJ
-gamma 0 0
# Id: 2009933
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 1.00 20.0
Fe+2 + Tartarate-2 = Fe(Tartarate)
log_k 3.1
delta_h 0 kJ
-gamma 0 0
# Id: 2809931
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Fe+3 + Tartarate-2 = Fe(Tartarate)+
log_k 7.78
delta_h 0 kJ
-gamma 0 0
# Id: 2819931
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Mn+2 + Tartarate-2 = Mn(Tartarate)
log_k 3.38
delta_h 0 kJ
-gamma 0 0
# Id: 4709931
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Mn+2 + Tartarate-2 + H+ = MnH(Tartarate)+
log_k 6
delta_h 0 kJ
-gamma 0 0
# Id: 4709932
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Mg+2 + Tartarate-2 = Mg(Tartarate)
log_k 2.3
delta_h 0 kJ
-gamma 0 0
# Id: 4609931
# log K source: NIST46.2
# Delta H source: NIST46.2
```

```
#T and ionic strength:
Mg+2 + Tartarate-2 + H+ = MgH(Tartarate)+
log_k 5.75
delta_h 0 kJ
-gamma 0 0
# Id: 4609932
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Be+2 + Tartarate-2 = Be(Tartarate)
log_k 2.768
delta_h 0 kJ
-gamma 0 0
# Id: 1109931
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.50 25.0
Be+2 + 2Tartarate-2 = Be(Tartarate)2-2
log_k 4.008
delta_h 0 kJ
-gamma 0 0
# Id: 1109932
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.50 25.0
Ca+2 + Tartarate-2 = Ca(Tartarate)
log_k 2.8
delta_h -8.368 kJ
-gamma 0 0
# Id: 1509931
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ca+2 + Tartarate-2 + H+ = CaH(Tartarate)+
log_k 5.86
delta_h -9.1211 kJ
-gamma 0 0
# Id: 1509932
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Sr+2 + Tartarate-2 = Sr(Tartarate)
log_k 2.55
delta_h 0 kJ
-gamma 0 0
# Id: 8009931
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.00 20.0
Sr+2 + H+ + Tartarate-2 = SrH(Tartarate)+
log_k 5.8949
delta_h 0 kJ
-gamma 0 0
# Id: 8009932
```

```
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.10 25.0
Ba+2 + Tartarate-2 = Ba(Tartarate)
log_k 2.54
delta_h 0 kJ
-gamma 0 0
# Id: 1009931
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ba+2 + Tartarate-2 + H+ = BaH(Tartarate)+
log_k 5.77
delta_h 0 kJ
-gamma 0 0
# Id: 1009932
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Na+ + Tartarate-2 = Na(Tartarate)-
log_k 0.9
delta_h -0.8368 kJ
-gamma 0 0
# Id: 5009931
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Na+ + Tartarate-2 + H+ = NaH(Tartarate)
log_k 4.58
delta_h -2.8451 kJ
-gamma 0 0
# Id: 5009932
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
K+ + Tartarate-2 = K(Tartarate)-
log_k 0.8
delta_h 0 kJ
-gamma 0 0
# Id: 4109931
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
H+ + Glycine- = H(Glycine)
log_k 9.778
delta_h -44.3504 kJ
-gamma 0 0
# Id: 3309941
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
2H+ + Glycine- = H2(Glycine)+
log_k 12.128
delta_h -48.4507 kJ
```

```
-gamma 0 0
# Id: 3309942
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Pb+2 + Glycine- = Pb(Glycine)+
log_k 5.47
delta_h 0 kJ
-gamma 0 0
# Id: 6009941
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Pb+2 + 2Glycine- = Pb(Glycine)2
log_k 8.86
delta_h 0 kJ
-gamma 0 0
# Id: 6009942
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Tl+ + Glycine- = Tl(Glycine)
log_k 1.72
delta_h 0 kJ
-gamma 0 0
# Id: 8709941
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + Glycine- = Zn(Glycine)+
log_k 5.38
delta_h -11.7152 kJ
-gamma 0 0
# Id: 9509941
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + 2Glycine- = Zn(Glycine)2
log_k 9.81
delta_h -24.2672 kJ
-gamma 0 0
# Id: 9509942
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + 3Glycine- = Zn(Glycine)3-
log_k 12.3
delta_h -39.748 kJ
-gamma 0 0
# Id: 9509943
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + Glycine- = Cd(Glycine)+
```

```
log_k 4.69
delta_h -8.7864 kJ
-gamma 0 0
# Id: 1609941
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + 2Glycine- = Cd(Glycine)2
log_k 8.4
delta_h -22.5936 kJ
-gamma 0 0
# Id: 1609942
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + 3Glycine- = Cd(Glycine)3-
log_k 10.7
delta_h -35.9824 kJ
-gamma 0 0
# Id: 1609943
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Hg(OH)2 + Glycine- + 2H+ = Hg(Glycine)+ + 2H2O
log_k 17
delta_h 0 kJ
-gamma 0 0
# Id: 3619941
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Hg(OH)2 + 2Glycine- + 2H+ = Hg(Glycine)2 + 2H2O
log_k 25.8
delta_h 0 kJ
-gamma 0 0
# Id: 3619942
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cu+ + 2Glycine- = Cu(Glycine)2-
log_k 10.3
delta_h 0 kJ
-gamma 0 0
# Id: 2309941
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Glycine- = Cu(Glycine)+
log_k 8.57
delta_h -25.104 kJ
-gamma 0 0
# Id: 2319941
# log K source: NIST46.2
# Delta H source: NIST46.2
```

```
#T and ionic strength:
Cu+2 + 2Glycine- = Cu(Glycine)2
log_k 15.7
delta_h -54.8104 kJ
-gamma 0 0
# Id: 2319942
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + Glycine- = Ag(Glycine)
log_k 3.51
delta_h -19.2464 kJ
-gamma 0 0
# Id: 209941
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + 2Glycine- = Ag(Glycine)2-
log_k 6.89
delta_h -48.116 kJ
-gamma 0 0
# Id: 209942
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + Glycine- = Ni(Glycine)+
log_k 6.15
delta_h -18.828 kJ
-gamma 0 0
# Id: 5409941
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + 2Glycine- = Ni(Glycine)2
log_k 11.12
delta_h -38.0744 kJ
-gamma 0 0
# Id: 5409942
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + 3Glycine- = Ni(Glycine)3-
log_k 14.63
delta_h -62.3416 kJ
-gamma 0 0
# Id: 5409943
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Co+2 + Glycine- = Co(Glycine)+
log_k 5.07
delta_h -12 kJ
-gamma 0 0
# Id: 2009941
```

```
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Co+2 + 2Glycine- = Co(Glycine)2
log_k 9.07
delta_h -26 kJ
-gamma 0 0
# Id: 2009942
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Co+2 + 3Glycine- = Co(Glycine)3-
log_k 11.6
delta_h -41 kJ
-gamma 0 0
# Id: 2009943
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Co+2 + Glycine- + H2O = CoOH(Glycine) + H+
log_k -5.02
delta_h 0 kJ
-gamma 0 0
# Id: 2009944
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.10 25.0
Fe+2 + Glycine- = Fe(Glycine)+
log_k 4.31
delta_h -15.0624 kJ
-gamma 0 0
# Id: 2809941
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Fe+2 + 2Glycine- = Fe(Glycine)2
log_k 8.29
delta_h 0 kJ
-gamma 0 0
# Id: 2809942
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Fe+3 + Glycine- = Fe(Glycine)+2
log_k 9.38
delta_h 0 kJ
-gamma 0 0
# Id: 2819941
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Fe+3 + Glycine- + H+ = FeH(Glycine)+3
log_k 11.55
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 2819942
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Mn+2 + Glycine- = Mn(Glycine)+
log_k 3.19
delta_h -1.2552 kJ
-gamma 0 0
# Id: 4709941
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Mn+2 + 2Glycine- = Mn(Glycine)2
log_k 5.4
delta_h 0 kJ
-gamma 0 0
# Id: 4709942
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cr(OH)2+ + Glycine- + 2H+ = Cr(Glycine)+2 + 2H2O
log_k 18.7
delta_h 0 kJ
-gamma 0 0
# Id: 2119941
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cr(OH)2+ + 2Glycine- + 2H+ = Cr(Glycine)2+ + 2H2O
log_k 25.6
delta_h 0 kJ
-gamma 0 0
# Id: 2119942
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cr(OH)2+ + 3Glycine- + 2H+ = Cr(Glycine)3 + 2H2O
log_k 31.6
delta_h 0 kJ
-gamma 0 0
# Id: 2119943
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Mg+2 + Glycine- = Mg(Glycine)+
log_k 2.08
delta_h 4.184 kJ
-gamma 0 0
# Id: 4609941
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ca+2 + Glycine- = Ca(Glycine)+
```

```
log_k 1.39
delta_h -4.184 kJ
-gamma 0 0
# Id: 1509941
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ca+2 + Glycine- + H+ = CaH(Glycine)+2
log_k 10.1
delta_h -35.9824 kJ
-gamma 0 0
# Id: 1509942
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Sr+2 + Glycine- = Sr(Glycine)+
log_k 0.91
delta_h 0 kJ
-gamma 0 0
# Id: 8009941
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.00 25.0
Ba+2 + Glycine- = Ba(Glycine)+
log_k 0.77
delta_h 0 kJ
-gamma 0 0
# Id: 1009941
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
H+ + Salicylate-2 = H(Salicylate)-
log_k 13.7
delta_h -35.7732 kJ
-gamma 0 0
# Id: 3309951
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
2H+ + Salicylate-2 = H2(Salicylate)
log_k 16.8
delta_h -38.7857 kJ
-gamma 0 0
# Id: 3309952
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + Salicylate-2 = Zn(Salicylate)
log_k 7.71
delta_h 0 kJ
-gamma 0 0
# Id: 9509951
# log K source: SCD2.62
# Delta H source: SCD2.62
```

```
#T and ionic strength:
Zn+2 + Salicylate-2 + H+ = ZnH(Salicylate)+
log_k 15.5
delta_h 0 kJ
-gamma 0 0
# Id: 9509952
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + Salicylate-2 = Cd(Salicylate)
log_k 6.2
delta_h 0 kJ
-gamma 0 0
# Id: 1609951
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + Salicylate-2 + H+ = CdH(Salicylate)+
log_k 16
delta_h 0 kJ
-gamma 0 0
# Id: 1609952
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Salicylate-2 = Cu(Salicylate)
log_k 11.3
delta_h -17.9912 kJ
-gamma 0 0
# Id: 2319951
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + 2Salicylate-2 = Cu(Salicylate)2-2
log_k 19.3
delta_h 0 kJ
-gamma 0 0
# Id: 2319952
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Salicylate-2 + H+ = CuH(Salicylate)+
log_k 14.8
delta_h 0 kJ
-gamma 0 0
# Id: 2319953
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + Salicylate-2 = Ni(Salicylate)
log_k 8.2
delta_h 0 kJ
-gamma 0 0
# Id: 5409951
```

```
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + 2Salicylate-2 = Ni(Salicylate)2-2
log_k 12.64
delta_h 0 kJ
-gamma 0 0
# Id: 5409952
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Co+2 + Salicylate-2 = Co(Salicylate)
log_k 7.4289
delta_h 0 kJ
-gamma 0 0
# Id: 2009951
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.10 20.0
Co+2 + 2Salicylate-2 = Co(Salicylate)2-2
log_k 11.8
delta_h 0 kJ
-gamma 0 0
# Id: 2009952
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.10 20.0
Fe+2 + Salicylate-2 = Fe(Salicylate)
log_k 7.2
delta_h 0 kJ
-gamma 0 0
# Id: 2809951
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Fe+2 + 2Salicylate-2 = Fe(Salicylate)2-2
log_k 11.6
delta_h 0 kJ
-gamma 0 0
# Id: 2809952
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Fe+3 + Salicylate-2 = Fe(Salicylate)+
log_k 17.6
delta_h 0 kJ
-gamma 0 0
# Id: 2819951
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Fe+3 + 2Salicylate-2 = Fe(Salicylate)2-
log_k 29.3
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 2819952
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Mn+2 + Salicylate-2 = Mn(Salicylate)
log_k 6.5
delta_h 0 kJ
-gamma 0 0
# Id: 4709951
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Mn+2 + 2Salicylate-2 = Mn(Salicylate)2-2
log_k 10.1
delta_h 0 kJ
-gamma 0 0
# Id: 4709952
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Be+2 + Salicylate-2 = Be(Salicylate)
log_k 13.3889
delta_h -31.7732 kJ
-gamma 0 0
# Id: 1109951
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.10 25.0
Be+2 + 2Salicylate-2 = Be(Salicylate)2-2
log_k 23.25
delta_h 0 kJ
-gamma 0 0
# Id: 1109952
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.10 25.0
Mg+2 + Salicylate-2 = Mg(Salicylate)
log_k 5.76
delta_h 0 kJ
-gamma 0 0
# Id: 4609951
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Mg+2 + Salicylate-2 + H+ = MgH(Salicylate)+
log_k 15.3
delta_h 0 kJ
-gamma 0 0
# Id: 4609952
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Ca+2 + Salicylate-2 = Ca(Salicylate)
```

```
log_k 4.05
delta_h 0 kJ
-gamma 0 0
# Id: 1509951
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ca+2 + Salicylate-2 + H+ = CaH(Salicylate)+
log_k 14.3
delta_h 0 kJ
-gamma 0 0
# Id: 1509952
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ba+2 + Salicylate-2 + H+ = BaH(Salicylate)+
log_k 13.9
delta_h 0 kJ
-gamma 0 0
# Id: 1009951
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
H+ + Glutamate-2 = H(Glutamate)-
log_k 9.96
delta_h -41.0032 kJ
-gamma 0 0
# Id: 3309961
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
2H+ + Glutamate-2 = H2(Glutamate)
log_k 14.26
delta_h -43.5136 kJ
-gamma 0 0
# Id: 3309962
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
3H+ + Glutamate-2 = H3(Glutamate)+
log_k 16.42
delta_h -46.8608 kJ
-gamma 0 0
# Id: 3309963
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Pb+2 + Glutamate-2 = Pb(Glutamate)
log_k 6.43
delta_h 0 kJ
-gamma 0 0
# Id: 6009961
# log K source: SCD2.62
# Delta H source: SCD2.62
```

```
#T and ionic strength:
Pb+2 + 2Glutamate-2 = Pb(Glutamate)2-2
log_k 8.61
delta_h 0 kJ
-gamma 0 0
# Id: 6009962
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Pb+2 + Glutamate-2 + H+ = PbH(Glutamate)+
log_k 14.08
delta_h 0 kJ
-gamma 0 0
# Id: 6009963
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Al+3 + Glutamate-2 + H+ = AlH(Glutamate)+2
log_k 13.07
delta_h 0 kJ
-gamma 0 0
# Id: 309961
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + Glutamate-2 = Zn(Glutamate)
log_k 6.2
delta_h 0 kJ
-gamma 0 0
# Id: 9509961
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Zn+2 + 2Glutamate-2 = Zn(Glutamate)2-2
log_k 9.13
delta_h 0 kJ
-gamma 0 0
# Id: 9509962
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Zn+2 + 3Glutamate-2 = Zn(Glutamate)3-4
log_k 9.8
delta_h 0 kJ
-gamma 0 0
# Id: 9509963
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cd+2 + Glutamate-2 = Cd(Glutamate)
log_k 4.7
delta_h 0 kJ
-gamma 0 0
# Id: 1609961
```

```
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + 2Glutamate-2 = Cd(Glutamate)2-2
log_k 7.59
delta_h 0 kJ
-gamma 0 0
# Id: 1609962
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Hg(OH)2 + Glutamate-2 + 2H+ = Hg(Glutamate) + 2H2O
log_k 19.8
delta_h 0 kJ
-gamma 0 0
# Id: 3619961
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Hg(OH)2 + 2Glutamate-2 + 2H+ = Hg(Glutamate)2-2 + 2H2O
log_k 26.2
delta_h 0 kJ
-gamma 0 0
# Id: 3619962
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cu+2 + Glutamate-2 = Cu(Glutamate)
log_k 9.17
delta_h -20.92 kJ
-gamma 0 0
# Id: 2319961
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + 2Glutamate-2 = Cu(Glutamate)2-2
log_k 15.78
delta_h -48.116 kJ
-gamma 0 0
# Id: 2319962
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Glutamate-2 + H+ = CuH(Glutamate)+
log_k 13.3
delta_h -28.0328 kJ
-gamma 0 0
# Id: 2319963
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + Glutamate-2 = Ag(Glutamate)-
log_k 4.22
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 209961
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ag+ + 2Glutamate-2 = Ag(Glutamate)2-3
log_k 7.36
delta_h 0 kJ
-gamma 0 0
# Id: 209962
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
2Ag+ + Glutamate-2 = Ag2(Glutamate)
log_k 3.4
delta_h 0 kJ
-gamma 0 0
# Id: 209963
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + Glutamate-2 = Ni(Glutamate)
log_k 6.47
delta_h 0 kJ
-gamma 0 0
# Id: 5409961
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + 2Glutamate-2 = Ni(Glutamate)2-2
log_k 10.7
delta_h -30.9616 kJ
-gamma 0 0
# Id: 5409962
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Co+2 + Glutamate-2 = Co(Glutamate)
log_k 5.4178
delta_h 0 kJ
-gamma 0 0
# Id: 2009961
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.10 25.0
Co+2 + 2Glutamate-2 = Co(Glutamate)2-2
log_k 8.7178
delta_h 0 kJ
-gamma 0 0
# Id: 2009962
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.10 25.0
Mn+2 + Glutamate-2 = Mn(Glutamate)
```

log_k 4.95
delta_h 0 kJ
-gamma 0 0
Id: 4709961
log K source: SCD2.62
Delta H source: SCD2.62
#T and ionic strength:
Mn+2 + 2Glutamate-2 = Mn(Glutamate)2-2
log_k 8.48
delta_h 0 kJ
-gamma 0 0
Id: 4709962
log K source: SCD2.62
Delta H source: SCD2.62
#T and ionic strength:
Cr(OH)2+ + Glutamate-2 + 2H+ = Cr(Glutamate)+ + 2H2O
log_k 22.6
delta_h 0 kJ
-gamma 0 0
Id: 2119961
log K source: SCD2.62
Delta H source: SCD2.62
#T and ionic strength:
Cr(OH)2+ + 2Glutamate-2 + 2H+ = Cr(Glutamate)2- + 2H2O
log_k 30.7
delta_h 0 kJ
-gamma 0 0
Id: 2119962
log K source: SCD2.62
Delta H source: SCD2.62
#T and ionic strength:
Cr(OH)2+ + Glutamate-2 + 3H+ = CrH(Glutamate)+2 + 2H2O
log_k 25.2
delta_h 0 kJ
-gamma 0 0
Id: 2119963
log K source: SCD2.62
Delta H source: SCD2.62
#T and ionic strength:
Mg+2 + Glutamate-2 = Mg(Glutamate)
log_k 2.8
delta_h 0 kJ
-gamma 0 0
Id: 4609961
log K source: NIST46.2
Delta H source: NIST46.2
#T and ionic strength:
Ca+2 + Glutamate-2 = Ca(Glutamate)
log_k 2.06
delta_h 0 kJ
-gamma 0 0
Id: 1509961
log K source: NIST46.2
Delta H source: NIST46.2

```
#T and ionic strength:
Ca+2 + Glutamate-2 + H+ = CaH(Glutamate)+
log_k 11.13
delta_h 0 kJ
-gamma 0 0
# Id: 1509962
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Sr+2 + Glutamate-2 = Sr(Glutamate)
log_k 2.2278
delta_h 0 kJ
-gamma 0 0
# Id: 8009961
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.10 25.0
Ba+2 + Glutamate-2 = Ba(Glutamate)
log_k 2.14
delta_h 0 kJ
-gamma 0 0
# Id: 1009961
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
H+ + Phthalate-2 = H(Phthalate)-
log_k 5.408
delta_h 2.1757 kJ
-gamma 0 0
# Id: 3309971
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
2H+ + Phthalate-2 = H2(Phthalate)
log_k 8.358
delta_h 4.8534 kJ
-gamma 0 0
# Id: 3309972
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Pb+2 + Phthalate-2 = Pb(Phthalate)
log_k 4.26
delta_h 0 kJ
-gamma 0 0
# Id: 6009971
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Pb+2 + 2Phthalate-2 = Pb(Phthalate)2-2
log_k 4.83
delta_h 0 kJ
-gamma 0 0
# Id: 6009972
```

```
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Pb+2 + Phthalate-2 + H+ = PbH(Phthalate)+
log_k 6.98
delta_h 0 kJ
-gamma 0 0
# Id: 6009973
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Al+3 + Phthalate-2 = Al(Phthalate)+
log_k 4.56
delta_h 0 kJ
-gamma 0 0
# Id: 309971
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Al+3 + 2Phthalate-2 = Al(Phthalate)2-
log_k 7.2
delta_h 0 kJ
-gamma 0 0
# Id: 309972
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + Phthalate-2 = Zn(Phthalate)
log_k 2.91
delta_h 13.3888 kJ
-gamma 0 0
# Id: 9509971
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Zn+2 + 2Phthalate-2 = Zn(Phthalate)2-2
log_k 4.2
delta_h 0 kJ
-gamma 0 0
# Id: 9509972
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + Phthalate-2 = Cd(Phthalate)
log_k 3.43
delta_h 0 kJ
-gamma 0 0
# Id: 1609971
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + Phthalate-2 + H+ = CdH(Phthalate)+
log_k 6.3
delta_h 0 kJ
```

```
-gamma 0 0
# Id: 1609973
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cd+2 + 2Phthalate-2 = Cd(Phthalate)2-2
log_k 3.7
delta_h 0 kJ
-gamma 0 0
# Id: 1609972
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Phthalate-2 = Cu(Phthalate)
log_k 4.02
delta_h 8.368 kJ
-gamma 0 0
# Id: 2319971
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + Phthalate-2 + H+ = CuH(Phthalate)+
log_k 7.1
delta_h 3.8493 kJ
-gamma 0 0
# Id: 2319970
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cu+2 + 2Phthalate-2 = Cu(Phthalate)2-2
log_k 5.3
delta_h 15.8992 kJ
-gamma 0 0
# Id: 2319972
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + Phthalate-2 = Ni(Phthalate)
log_k 2.95
delta_h 7.5312 kJ
-gamma 0 0
# Id: 5409971
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Ni+2 + Phthalate-2 + H+ = NiH(Phthalate)+
log_k 6.6
delta_h 0 kJ
-gamma 0 0
# Id: 5409972
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Co+2 + Phthalate-2 = Co(Phthalate)
```

```
log_k 2.83
delta_h 7.9 kJ
-gamma 0 0
# Id: 2009971
# log K source: NIST46.4
# Delta H source: NIST46.4
#T and ionic strength: 0.00 25.0
Co+2 + H+ + Phthalate-2 = CoH(Phthalate)+
log_k 7.227
delta_h 0 kJ
-gamma 0 0
# Id: 2009972
# log K source: NIST46.4
# Delta H source: NIST46.2
#T and ionic strength: 0.50 25.0
Mn+2 + Phthalate-2 = Mn(Phthalate)
log_k 2.74
delta_h 10.0416 kJ
-gamma 0 0
# Id: 4709971
# log K source: NIST46.2
# Delta H source: NIST46.2
#T and ionic strength:
Cr(OH)2+ + Phthalate-2 + 2H+ = Cr(Phthalate)+ + 2H2O
log_k 16.3
delta_h 0 kJ
-gamma 0 0
# Id: 2119971
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cr(OH)2+ + 2Phthalate-2 + 2H+ = Cr(Phthalate)2- + 2H2O
log_k 21.2
delta_h 0 kJ
-gamma 0 0
# Id: 2119972
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Cr(OH)2+ + 3Phthalate-2 + 2H+ = Cr(Phthalate)3-3 + 2H2O
log_k 23.3
delta_h 0 kJ
-gamma 0 0
# Id: 2119973
# log K source: SCD2.62
# Delta H source: SCD2.62
#T and ionic strength:
Be+2 + Phthalate-2 = Be(Phthalate)
log_k 4.8278
delta_h 0 kJ
-gamma 0 0
# Id: 1109971
# log K source: NIST46.4
# Delta H source: NIST46.2
```

#T and ionic strength: 0.10 25.0
Be+2 + 2Phthalate-2 = Be(Phthalate)2-2
log_k 6.5478
delta_h 0 kJ
-gamma 0 0
Id: 1109972
log K source: NIST46.4
Delta H source: NIST46.2
#T and ionic strength: 0.10 25.0
Mg+2 + Phthalate-2 = Mg(Phthalate)
log_k 2.49
delta_h 0 kJ
-gamma 0 0
Id: 4609971
log K source: SCD2.62
Delta H source: SCD2.62
#T and ionic strength:
Ca+2 + Phthalate-2 = Ca(Phthalate)
log_k 2.45
delta_h 0 kJ
-gamma 0 0
Id: 1509970
log K source: NIST46.2
Delta H source: NIST46.2
#T and ionic strength:
Ca+2 + Phthalate-2 + H+ = CaH(Phthalate)+
log_k 6.43
delta_h 0 kJ
-gamma 0 0
Id: 1509971
log K source: NIST46.2
Delta H source: NIST46.2
#T and ionic strength:
Ba+2 + Phthalate-2 = Ba(Phthalate)
log_k 2.33
delta_h 0 kJ
-gamma 0 0
Id: 1009971
log K source: NIST46.2
Delta H source: NIST46.2
#T and ionic strength:
Na+ + Phthalate-2 = Na(Phthalate)-
log_k 0.8
delta_h 4.184 kJ
-gamma 0 0
Id: 5009970
log K source: NIST46.2
Delta H source: NIST46.2
#T and ionic strength:
K+ + Phthalate-2 = K(Phthalate)-
log_k 0.7
delta_h 3.7656 kJ
-gamma 0 0
Id: 4109971

```
# log K source:  NIST46.2
# Delta H source:  NIST46.2
#T and ionic strength:
PHASES
Sulfur
S + H+ + 2e- = HS-
log_k -2.1449
delta_h -16.3 kJ
Semetal(hex
Se + H+ + 2e- = HSe-
log_k -7.7084
delta_h 15.9 kJ
Semetal(am)
Se + H+ + 2e- = HSe-
log_k -7.1099
delta_h 10.8784 kJ
Sbmetal
Sb + 3H2O = Sb(OH)3 + 3H+ + 3e-
log_k -11.6889
delta_h 83.89 kJ
Snmetal(wht)
Sn + 2H2O = Sn(OH)2 + 2H+ + 2e-
log_k -2.3266
delta_h -0 kJ
Pbmetal
Pb = Pb+2 + 2e-
log_k 4.2462
delta_h 0.92 kJ
Tlmetal
Tl = Tl+ + e-
log_k 5.6762
delta_h 5.36 kJ
Znmetal
Zn = Zn+2 + 2e-
log_k 25.7886
delta_h -153.39 kJ
Cdmetal(alpha)
Cd = Cd+2 + 2e-
log_k 13.5147
delta_h -75.33 kJ
Cdmetal(gamma)
Cd = Cd+2 + 2e-
log_k 13.618
delta_h -75.92 kJ
Hgmetal(l)
Hg = 0.5Hg2+2 + e-
log_k -13.4517
delta_h 83.435 kJ
Cumetal
Cu = Cu+ + e-
log_k -8.756
delta_h 71.67 kJ
Agmetal
Ag = Ag+ + e-
```

log_k -13.5065
delta_h 105.79 kJ
Crmetal
Cr = Cr+2 + 2e-
log_k 30.4831
delta_h -172 kJ
Vmetal
V = V+3 + 3e-
log_k 44.0253
delta_h -259 kJ
Stibnite
Sb2S3 + 6H2O = 2Sb(OH)3 + 3H+ + 3HS-
log_k -50.46
delta_h 293.78 kJ
Orpiment
As2S3 + 6H2O = 2H3AsO3 + 3HS- + 3H+
log_k -61.0663
delta_h 350.68 kJ
Realgar
AsS + 3H2O = H3AsO3 + HS- + 2H+ + e-
log_k -19.747
delta_h 127.8 kJ
SnS
SnS + 2H2O = Sn(OH)2 + H+ + HS-
log_k -19.114
delta_h -0 kJ
SnS2
SnS2 + 6H2O = Sn(OH)6-2 + 4H+ + 2HS-
log_k -57.4538
delta_h -0 kJ
Galena
PbS + H+ = Pb+2 + HS-
log_k -13.97
delta_h 80 kJ
Tl2S
Tl2S + H+ = 2Tl+ + HS-
log_k -7.19
delta_h 91.52 kJ
ZnS(am)
ZnS + H+ = Zn+2 + HS-
log_k -9.052
delta_h 15.3553 kJ
Sphalerite
ZnS + H+ = Zn+2 + HS-
log_k -11.45
delta_h 30 kJ
Wurtzite
ZnS + H+ = Zn+2 + HS-
log_k -8.95
delta_h 21.171 kJ
Greenockite
CdS + H+ = Cd+2 + HS-
log_k -14.36
delta_h 55 kJ

Hg2S
Hg2S + H+ = Hg2+2 + HS-
log_k -11.6765
delta_h 69.7473 kJ
Cinnabar
HgS + 2H2O = Hg(OH)2 + H+ + HS-
log_k -45.694
delta_h 253.76 kJ
Metacinnabar
HgS + 2H2O = Hg(OH)2 + H+ + HS-
log_k -45.094
delta_h 253.72 kJ
Chalcocite
Cu2S + H+ = 2Cu+ + HS-
log_k -34.92
delta_h 168 kJ
Djurleite
Cu0.066Cu1.868S + H+ = 0.066Cu+2 + 1.868Cu+ + HS-
log_k -33.92
delta_h 200.334 kJ
Anilite
Cu0.25Cu1.5S + H+ = 0.25Cu+2 + 1.5Cu+ + HS-
log_k -31.878
delta_h 182.15 kJ
BlaubleiII
Cu0.6Cu0.8S + H+ = 0.6Cu+2 + 0.8Cu+ + HS-
log_k -27.279
delta_h -0 kJ
BlaubleiI
Cu0.9Cu0.2S + H+ = 0.9Cu+2 + 0.2Cu+ + HS-
log_k -24.162
delta_h -0 kJ
Covellite
CuS + H+ = Cu+2 + HS-
log_k -22.3
delta_h 97 kJ
Chalcopyrite
CuFeS2 + 2H+ = Cu+2 + Fe+2 + 2HS-
log_k -35.27
delta_h 148.448 kJ
Acanthite
Ag2S + H+ = 2Ag+ + HS-
log_k -36.22
delta_h 227 kJ
NiS(alpha)
NiS + H+ = Ni+2 + HS-
log_k -5.6
delta_h -0 kJ
NiS(beta)
NiS + H+ = Ni+2 + HS-
log_k -11.1
delta_h -0 kJ
NiS(gamma)
NiS + H+ = Ni+2 + HS-

log_k -12.8
delta_h -0 kJ
CoS(alpha)
CoS + H+ = Co+2 + HS-
log_k -7.44
delta_h -0 kJ
CoS(beta)
CoS + H+ = Co+2 + HS-
log_k -11.07
delta_h -0 kJ
FeS(ppt)
FeS + H+ = Fe+2 + HS-
log_k -2.95
delta_h -11 kJ
Greigite
Fe3S4 + 4H+ = 2Fe+3 + Fe+2 + 4HS-
log_k -45.035
delta_h -0 kJ
Mackinawite
FeS + H+ = Fe+2 + HS-
log_k -3.6
delta_h -0 kJ
Pyrite
FeS2 + 2H+ + 2e- = Fe+2 + 2HS-
log_k -18.5082
delta_h 49.844 kJ
MnS(grn)
MnS + H+ = Mn+2 + HS-
log_k 0.17
delta_h -32 kJ
MnS(pnk)
MnS + H+ = Mn+2 + HS-
log_k 3.34
delta_h -0 kJ
MoS2
MoS2 + 4H2O = MoO4-2 + 6H+ + 2HS- + 2e-
log_k -70.2596
delta_h 389.02 kJ
BeS
BeS + H+ = Be+2 + HS-
log_k 19.38
delta_h -0 kJ
BaS
BaS + H+ = Ba+2 + HS-
log_k 16.18
delta_h -0 kJ
Hg2(Cyanide)2
Hg2(Cyanide)2 = Hg2+2 + 2Cyanide-
log_k -39.3
delta_h -0 kJ
CuCyanide
CuCyanide = Cu+ + Cyanide-
log_k -19.5
delta_h -19 kJ

AgCyanide
AgCyanide = Ag+ + Cyanide-
log_k -15.74
delta_h 110.395 kJ
Ag2(Cyanide)2
Ag2(Cyanide)2 = 2Ag+ + 2Cyanide-
log_k -11.3289
delta_h -0 kJ
NaCyanide(cubic)
NaCyanide = Cyanide- + Na+
log_k 1.6012
delta_h 0.969 kJ
KCyanide(cubic)
KCyanide = Cyanide- + K+
log_k 1.4188
delta_h 11.93 kJ
Pb2Fe(Cyanide)6
Pb2Fe(Cyanide)6 = 2Pb+2 + Fe+2 + 6Cyanide-
log_k -53.42
delta_h -0 kJ
Zn2Fe(Cyanide)6
Zn2Fe(Cyanide)6 = 2Zn+2 + Fe+2 + 6Cyanide-
log_k -51.08
delta_h -0 kJ
Cd2Fe(Cyanide)6
Cd2Fe(Cyanide)6 = 2Cd+2 + Fe+2 + 6Cyanide-
log_k -52.78
delta_h -0 kJ
Ag4Fe(Cyanide)6
Ag4Fe(Cyanide)6 = 4Ag+ + Fe+2 + 6Cyanide-
log_k -79.47
delta_h -0 kJ
Ag3Fe(Cyanide)6
Ag3Fe(Cyanide)6 = 3Ag+ + Fe+3 + 6Cyanide-
log_k -72.7867
delta_h -0 kJ
Mn3(Fe(Cyanide)6)2
Mn3(Fe(Cyanide)6)2 = 3Mn+2 + 2Fe+3 + 12Cyanide-
log_k -105.4
delta_h -0 kJ
Sb2Se3
Sb2Se3 + 6H2O = 2Sb(OH)3 + 3HSe- + 3H+
log_k -67.7571
delta_h 343.046 kJ
SnSe
SnSe + 2H2O = Sn(OH)2 + H+ + HSe-
log_k -30.494
delta_h -0 kJ
SnSe2
SnSe2 + 6H2O = Sn(OH)6-2 + 4H+ + 2HSe-
log_k -65.1189
delta_h -0 kJ
Clausthalite
PbSe + H+ = Pb+2 + HSe-

log_k -27.1
delta_h 119.72 kJ
Tl2Se
Tl2Se + H+ = 2Tl+ + HSe-
log_k -18.1
delta_h 85.62 kJ
ZnSe
ZnSe + H+ = Zn+2 + HSe-
log_k -14.4
delta_h 25.51 kJ
CdSe
CdSe + H+ = Cd+2 + HSe-
log_k -20.2
delta_h 75.9814 kJ
HgSe
HgSe + 2H2O = Hg(OH)2 + H+ + HSe-
log_k -55.694
delta_h -0 kJ
Cu2Se(alpha)
Cu2Se + H+ = 2Cu+ + HSe-
log_k -45.8
delta_h 214.263 kJ
Cu3Se2
Cu3Se2 + 2H+ = 2HSe- + 2Cu+ + Cu+2
log_k -63.4911
delta_h 340.327 kJ
CuSe
CuSe + H+ = Cu+2 + HSe-
log_k -33.1
delta_h 121.127 kJ
CuSe2
CuSe2 + 2H+ + 2e- = 2HSe- + Cu+2
log_k -33.3655
delta_h 140.582 kJ
Ag2Se
Ag2Se + H+ = 2Ag+ + HSe-
log_k -48.7
delta_h 265.48 kJ
NiSe
NiSe + H+ = Ni+2 + HSe-
log_k -17.7
delta_h -0 kJ
CoSe
CoSe + H+ = Co+2 + HSe-
log_k -16.2
delta_h -0 kJ
FeSe
FeSe + H+ = Fe+2 + HSe-
log_k -11
delta_h 2.092 kJ
Ferroselite
FeSe2 + 2H+ + 2e- = 2HSe- + Fe+2
log_k -18.5959
delta_h 47.2792 kJ

MnSe
MnSe + H+ = Mn+2 + HSe-
log_k 3.5
delta_h -98.15 kJ
AlSb
AlSb + 3H2O = Sb(OH)3 + 6e- + Al+3 + 3H+
log_k 65.6241
delta_h -0 kJ
ZnSb
ZnSb + 3H2O = Sb(OH)3 + 5e- + Zn+2 + 3H+
log_k 11.0138
delta_h -54.8773 kJ
CdSb
CdSb + 3H2O = Sb(OH)3 + 5e- + 3H+ + Cd+2
log_k -0.3501
delta_h 22.36 kJ
Cu2Sb:3H2O
Cu2Sb:3H2O = Sb(OH)3 + 6e- + 3H+ + Cu+ + Cu+2
log_k -34.8827
delta_h 233.237 kJ
Cu3Sb
Cu3Sb + 3H2O = Sb(OH)3 + 6e- + 3H+ + 3Cu+
log_k -42.5937
delta_h 308.131 kJ
#Ag4Sb
Ag4Sb + 3H2O = Sb(OH)3 + 6e- + 3Ag+ + 3H+
log_k -56.1818
delta_h -0 kJ
Breithauptite
NiSb + 3H2O = Sb(OH)3 + 5e- + 3H+ + Ni+2
log_k -18.5225
delta_h 96.0019 kJ
MnSb
MnSb + 3H2O = Mn+3 + Sb(OH)3 + 6e- + 3H+
log_k -2.9099
delta_h 21.1083 kJ
Mn2Sb
Mn2Sb + 3H2O = 2Mn+2 + Sb(OH)3 + 7e- + 3H+
log_k 61.0796
delta_h -0 kJ
USb2
USb2 + 8H2O = UO2+2 + 2Sb(OH)3 + 12e- + 10H+
log_k 29.5771
delta_h -103.56 kJ
U3Sb4
U3Sb4 + 12H2O = 3U+4 + 4Sb(OH)3 + 24e- + 12H+
log_k 152.383
delta_h -986.04 kJ
Mg2Sb3
Mg2Sb3 + 9H2O = 2Mg+2 + 3Sb(OH)3 + 9H+ + 13e-
log_k 74.6838
delta_h -0 kJ
Ca3Sb2
Ca3Sb2 + 6H2O = 3Ca+2 + 2Sb(OH)3 + 6H+ + 12e-

log_k 142.974
delta_h -732.744 kJ
NaSb
NaSb + 3H2O = Na+ + Sb(OH)3 + 3H+ + 4e-
log_k 23.1658
delta_h -93.45 kJ
Na3Sb
Na3Sb + 3H2O = 3Na+ + Sb(OH)3 + 3H+ + 6e-
log_k 94.4517
delta_h -432.13 kJ
SeO2
SeO2 + H2O = HSeO3- + H+
log_k 0.1246
delta_h 1.4016 kJ
SeO3
SeO3 + H2O = SeO4-2 + 2H+
log_k 21.044
delta_h -146.377 kJ
Sb2O5
Sb2O5 + 7H2O = 2Sb(OH)6- + 2H+
log_k -9.6674
delta_h -0 kJ
SbO2
SbO2 + 4H2O = Sb(OH)6- + e- + 2H+
log_k -27.8241
delta_h -0 kJ
Sb2O4
Sb2O4 + 2H2O + 2H+ + 2e- = 2Sb(OH)3
log_k 3.4021
delta_h -68.04 kJ
Sb4O6(cubic)
Sb4O6 + 6H2O = 4Sb(OH)3
log_k -18.2612
delta_h 61.1801 kJ
Sb4O6(orth)
Sb4O6 + 6H2O = 4Sb(OH)3
log_k -17.9012
delta_h 37.6801 kJ
Sb(OH)3
Sb(OH)3 = Sb(OH)3
log_k -7.1099
delta_h 30.1248 kJ
Senarmontite
Sb2O3 + 3H2O = 2Sb(OH)3
log_k -12.3654
delta_h 30.6478 kJ
Valentinite
Sb2O3 + 3H2O = 2Sb(OH)3
log_k -8.4806
delta_h 19.0163 kJ
Chalcedony
SiO2 + 2H2O = H4SiO4
log_k -3.55
delta_h 19.7 kJ

Cristobalite
SiO2 + 2H2O = H4SiO4
log_k -3.35
delta_h 20.006 kJ
Quartz
SiO2 + 2H2O = H4SiO4
log_k -4
delta_h 22.36 kJ
SiO2(am-gel)
SiO2 + 2H2O = H4SiO4
log_k -2.71
delta_h 14 kJ
SiO2(am-ppt)
SiO2 + 2H2O = H4SiO4
log_k -2.74
delta_h 15.15 kJ
SnO
SnO + H2O = Sn(OH)2
log_k -4.9141
delta_h -0 kJ
SnO2
SnO2 + 4H2O = Sn(OH)6-2 + 2H+
log_k -28.9749
delta_h -0 kJ
Sn(OH)2
Sn(OH)2 = Sn(OH)2
log_k -5.4309
delta_h -0 kJ
Sn(OH)4
Sn(OH)4 + 2H2O = Sn(OH)6-2 + 2H+
log_k -22.2808
delta_h -0 kJ
H2Sn(OH)6
H2Sn(OH)6 = Sn(OH)6-2 + 2H+
log_k -23.5281
delta_h -0 kJ
Massicot
PbO + 2H+ = Pb+2 + H2O
log_k 12.894
delta_h -66.848 kJ
Litharge
PbO + 2H+ = Pb+2 + H2O
log_k 12.694
delta_h -65.501 kJ
PbO:0.3H2O
PbO:0.33H2O + 2H+ = Pb+2 + 1.33H2O
log_k 12.98
delta_h -0 kJ
Plattnerite
PbO2 + 4H+ + 2e- = Pb+2 + 2H2O
log_k 49.6001
delta_h -296.27 kJ
Pb(OH)2
Pb(OH)2 + 2H+ = Pb+2 + 2H2O

log_k 8.15
delta_h -58.5342 kJ
Pb2O(OH)2
Pb2O(OH)2 + 4H+ = 2Pb+2 + 3H2O
log_k 26.188
delta_h -0 kJ
Al(OH)3(am)
Al(OH)3 + 3H+ = Al+3 + 3H2O
log_k 10.8
delta_h -111 kJ
Boehmite
AlOOH + 3H+ = Al+3 + 2H2O
log_k 8.578
delta_h -117.696 kJ
Diaspore
AlOOH + 3H+ = Al+3 + 2H2O
log_k 6.873
delta_h -103.052 kJ
Gibbsite
Al(OH)3 + 3H+ = Al+3 + 3H2O
log_k 8.291
delta_h -95.3952 kJ
Tl2O
Tl2O + 2H+ = 2Tl+ + H2O
log_k 27.0915
delta_h -96.41 kJ
TlOH
TlOH + H+ = Tl+ + H2O
log_k 12.9186
delta_h -41.57 kJ
Avicennite
Tl2O3 + 3H2O = 2Tl(OH)3
log_k -13
delta_h -0 kJ
Tl(OH)3
Tl(OH)3 = Tl(OH)3
log_k -5.441
delta_h -0 kJ
Zn(OH)2(am)
Zn(OH)2 + 2H+ = Zn+2 + 2H2O
log_k 12.474
delta_h -80.62 kJ
Zn(OH)2
Zn(OH)2 + 2H+ = Zn+2 + 2H2O
log_k 12.2
delta_h -0 kJ
Zn(OH)2(beta)
Zn(OH)2 + 2H+ = Zn+2 + 2H2O
log_k 11.754
delta_h -83.14 kJ
Zn(OH)2(gamma)
Zn(OH)2 + 2H+ = Zn+2 + 2H2O
log_k 11.734
delta_h -0 kJ

Zn(OH)2(epsilon)
Zn(OH)2 + 2H+ = Zn+2 + 2H2O
log_k 11.534
delta_h -81.8 kJ
ZnO(active)
ZnO + 2H+ = Zn+2 + H2O
log_k 11.1884
delta_h -88.76 kJ
Zincite
ZnO + 2H+ = Zn+2 + H2O
log_k 11.334
delta_h -89.62 kJ
Cd(OH)2(am)
Cd(OH)2 + 2H+ = Cd+2 + 2H2O
log_k 13.73
delta_h -86.9017 kJ
Cd(OH)2
Cd(OH)2 + 2H+ = Cd+2 + 2H2O
log_k 13.644
delta_h -94.62 kJ
Monteponite
CdO + 2H+ = Cd+2 + H2O
log_k 15.1034
delta_h -103.4 kJ
Hg2(OH)2
Hg2(OH)2 + 2H+ = Hg2+2 + 2H2O
log_k 5.2603
delta_h -0 kJ
Montroydite
HgO + H2O = Hg(OH)2
log_k -3.64
delta_h -38.9 kJ
Hg(OH)2
Hg(OH)2 = Hg(OH)2
log_k -3.4963
delta_h -0 kJ
Cuprite
Cu2O + 2H+ = 2Cu+ + H2O
log_k -1.406
delta_h -124.02 kJ
Cu(OH)2
Cu(OH)2 + 2H+ = Cu+2 + 2H2O
log_k 8.674
delta_h -56.42 kJ
Tenorite
CuO + 2H+ = Cu+2 + H2O
log_k 7.644
delta_h -64.867 kJ
Ag2O
Ag2O + 2H+ = 2Ag+ + H2O
log_k 12.574
delta_h -45.62 kJ
Ni(OH)2
Ni(OH)2 + 2H+ = Ni+2 + 2H2O

log_k 12.794
delta_h -95.96 kJ
Bunsenite
NiO + 2H+ = Ni+2 + H2O
log_k 12.4456
delta_h -100.13 kJ
CoO
CoO + 2H+ = Co+2 + H2O
log_k 13.5864
delta_h -106.295 kJ
Co(OH)2
Co(OH)2 + 2H+ = Co+2 + 2H2O
log_k 13.094
delta_h -0 kJ
Co(OH)3
Co(OH)3 + 3H+ = Co+3 + 3H2O
log_k -2.309
delta_h -92.43 kJ
#Wustite-0.11
WUSTITE-0.11 + 2H+ = 0.947Fe+2 + H2O
log_k 11.6879
delta_h -103.938 kJ
Fe(OH)2
Fe(OH)2 + 2H+ = Fe+2 + 2H2O
log_k 13.564
delta_h -0 kJ
Ferrihydrite
Fe(OH)3 + 3H+ = Fe+3 + 3H2O
log_k 3.191
delta_h -73.374 kJ
Fe3(OH)8
Fe3(OH)8 + 8H+ = 2Fe+3 + Fe+2 + 8H2O
log_k 20.222
delta_h -0 kJ
Goethite
FeOOH + 3H+ = Fe+3 + 2H2O
log_k 0.491
delta_h -60.5843 kJ
Pyrolusite
MnO2 + 4H+ + 2e- = Mn+2 + 2H2O
log_k 41.38
delta_h -272 kJ
Birnessite
MnO2 + 4H+ + e- = Mn+3 + 2H2O
log_k 18.091
delta_h -0 kJ
Nsutite
MnO2 + 4H+ + e- = Mn+3 + 2H2O
log_k 17.504
delta_h -0 kJ
Pyrochroite
Mn(OH)2 + 2H+ = Mn+2 + 2H2O
log_k 15.194
delta_h -97.0099 kJ

Manganite
MnOOH + 3H+ + e- = Mn+2 + 2H2O
log_k 25.34
delta_h -0 kJ
Cr(OH)2
Cr(OH)2 + 2H+ = Cr+2 + 2H2O
log_k 10.8189
delta_h -35.6058 kJ
Cr(OH)3(am)
Cr(OH)3 + H+ = Cr(OH)2+ + H2O
log_k -0.75
delta_h -0 kJ
Cr(OH)3
Cr(OH)3 + H+ = Cr(OH)2+ + H2O
log_k 1.3355
delta_h -29.7692 kJ
CrO3
CrO3 + H2O = CrO4-2 + 2H+
log_k -3.2105
delta_h -5.2091 kJ
MoO3
MoO3 + H2O = MoO4-2 + 2H+
log_k -8
delta_h -0 kJ
VO
VO + 2H+ = V+3 + H2O + e-
log_k 14.7563
delta_h -113.041 kJ
V(OH)3
V(OH)3 + 3H+ = V+3 + 3H2O
log_k 7.591
delta_h -0 kJ
VO(OH)2
VO(OH)2 + 2H+ = VO+2 + 2H2O
log_k 5.1506
delta_h -0 kJ
Uraninite
UO2 + 4H+ = U+4 + 2H2O
log_k -4.6693
delta_h -77.86 kJ
UO2(am)
UO2 + 4H+ = U+4 + 2H2O
log_k 0.934
delta_h -109.746 kJ
UO3
UO3 + 2H+ = UO2+2 + H2O
log_k 7.7
delta_h -81.0299 kJ
Gummite
UO3 + 2H+ = UO2+2 + H2O
log_k 7.6718
delta_h -81.0299 kJ
UO2(OH)2(beta)
UO2(OH)2 + 2H+ = UO2+2 + 2H2O

log_k 5.6116
delta_h -56.7599 kJ
Schoepite
UO2(OH)2:H2O + 2H+ = UO2+2 + 3H2O
log_k 5.994
delta_h -49.79 kJ
Be(OH)2(am)
Be(OH)2 + 2H+ = Be+2 + 2H2O
log_k 7.194
delta_h -0 kJ
Be(OH)2(alpha)
Be(OH)2 + 2H+ = Be+2 + 2H2O
log_k 6.894
delta_h -0 kJ
Be(OH)2(beta)
Be(OH)2 + 2H+ = Be+2 + 2H2O
log_k 6.494
delta_h -0 kJ
Brucite
Mg(OH)2 + 2H+ = Mg+2 + 2H2O
log_k 16.844
delta_h -113.996 kJ
Periclase
MgO + 2H+ = Mg+2 + H2O
log_k 21.5841
delta_h -151.23 kJ
Mg(OH)2(active)
Mg(OH)2 + 2H+ = Mg+2 + 2H2O
log_k 18.794
delta_h -0 kJ
Lime
CaO + 2H+ = Ca+2 + H2O
log_k 32.6993
delta_h -193.91 kJ
Portlandite
Ca(OH)2 + 2H+ = Ca+2 + 2H2O
log_k 22.804
delta_h -128.62 kJ
Ba(OH)2:8H2O
Ba(OH)2:8H2O + 2H+ = Ba+2 + 10H2O
log_k 24.394
delta_h -54.32 kJ
Cu(SbO3)2
Cu(SbO3)2 + 6H+ + 4e- = 2Sb(OH)3 + Cu+2
log_k 45.2105
delta_h -0 kJ
Arsenolite
As4O6 + 6H2O = 4H3AsO3
log_k -2.76
delta_h 59.9567 kJ
Claudetite
As4O6 + 6H2O = 4H3AsO3
log_k -3.065
delta_h 55.6054 kJ

As2O5
As2O5 + 3H2O = 2H3AsO4
log_k 6.7061
delta_h -22.64 kJ
Pb2O3
Pb2O3 + 6H+ + 2e- = 2Pb+2 + 3H2O
log_k 61.04
delta_h -0 kJ
Minium
Pb3O4 + 8H+ + 2e- = 3Pb+2 + 4H2O
log_k 73.5219
delta_h -421.874 kJ
Al2O3
Al2O3 + 6H+ = 2Al+3 + 3H2O
log_k 19.6524
delta_h -258.59 kJ
Co3O4
Co3O4 + 8H+ = Co+2 + 2Co+3 + 4H2O
log_k -10.4956
delta_h -107.5 kJ
CoFe2O4
CoFe2O4 + 8H+ = Co+2 + 2Fe+3 + 4H2O
log_k -3.5281
delta_h -158.82 kJ
Magnetite
Fe3O4 + 8H+ = 2Fe+3 + Fe+2 + 4H2O
log_k 3.4028
delta_h -208.526 kJ
Hercynite
FeAl2O4 + 8H+ = Fe+2 + 2Al+3 + 4H2O
log_k 22.893
delta_h -313.92 kJ
Hematite
Fe2O3 + 6H+ = 2Fe+3 + 3H2O
log_k -1.418
delta_h -128.987 kJ
Maghemite
Fe2O3 + 6H+ = 2Fe+3 + 3H2O
log_k 6.386
delta_h -0 kJ
Lepidocrocite
FeOOH + 3H+ = Fe+3 + 2H2O
log_k 1.371
delta_h -0 kJ
Hausmannite
Mn3O4 + 8H+ + 2e- = 3Mn+2 + 4H2O
log_k 61.03
delta_h -421 kJ
Bixbyite
Mn2O3 + 6H+ = 2Mn+3 + 3H2O
log_k -0.6445
delta_h -124.49 kJ
Cr2O3
Cr2O3 + H2O + 2H+ = 2Cr(OH)2+

log_k -2.3576
delta_h -50.731 kJ
#V2O3
V2O3 + 3H+ = V+3 + 1.5H2O
log_k 4.9
delta_h -82.5085 kJ
V3O5
V3O5 + 4H+ = 3VO+2 + 2H2O + 2e-
log_k 1.8361
delta_h -98.46 kJ
#V2O4
V2O4 + 2H+ = VO+2 + H2O
log_k 4.27
delta_h -58.8689 kJ
V4O7
V4O7 + 6H+ = 4VO+2 + 3H2O + 2e-
log_k 7.1865
delta_h -163.89 kJ
V6O13
V6O13 + 2H+ = 6VO2+ + H2O + 4e-
log_k -60.86
delta_h 271.5 kJ
V2O5
V2O5 + 2H+ = 2VO2+ + H2O
log_k -1.36
delta_h 34 kJ
U4O9
U4O9 + 18H+ + 2e- = 4U+4 + 9H2O
log_k -3.0198
delta_h -426.87 kJ
U3O8
U3O8 + 16H+ + 4e- = 3U+4 + 8H2O
log_k 21.0834
delta_h -485.44 kJ
Spinel
MgAl2O4 + 8H+ = Mg+2 + 2Al+3 + 4H2O
log_k 36.8476
delta_h -388.012 kJ
Magnesioferrite
Fe2MgO4 + 8H+ = Mg+2 + 2Fe+3 + 4H2O
log_k 16.8597
delta_h -278.92 kJ
Natron
Na2CO3:10H2O = 2Na+ + CO3-2 + 10H2O
log_k -1.311
delta_h 65.8771 kJ
Cuprousferrite
CuFeO2 + 4H+ = Cu+ + Fe+3 + 2H2O
log_k -8.9171
delta_h -15.89 kJ
Cupricferrite
CuFe2O4 + 8H+ = Cu+2 + 2Fe+3 + 4H2O
log_k 5.9882
delta_h -210.21 kJ

FeCr2O4
FeCr2O4 + 4H+ = 2Cr(OH)2+ + Fe+2
log_k 7.2003
delta_h -140.4 kJ
MgCr2O4
MgCr2O4 + 4H+ = 2Cr(OH)2+ + Mg+2
log_k 16.2007
delta_h -179.4 kJ
SbF3
SbF3 + 3H2O = Sb(OH)3 + 3H+ + 3F-
log_k -10.2251
delta_h -6.7279 kJ
PbF2
PbF2 = Pb+2 + 2F-
log_k -7.44
delta_h 20 kJ
ZnF2
ZnF2 = Zn+2 + 2F-
log_k -0.5343
delta_h -59.69 kJ
CdF2
CdF2 = Cd+2 + 2F-
log_k -1.2124
delta_h -46.22 kJ
Hg2F2
Hg2F2 = Hg2+2 + 2F-
log_k -10.3623
delta_h -18.486 kJ
CuF
CuF = Cu+ + F-
log_k -4.9056
delta_h 16.648 kJ
CuF2
CuF2 = Cu+2 + 2F-
log_k 1.115
delta_h -66.901 kJ
CuF2:2H2O
CuF2:2H2O = Cu+2 + 2F- + 2H2O
log_k -4.55
delta_h -15.2716 kJ
AgF:4H2O
AgF:4H2O = Ag+ + F- + 4H2O
log_k 1.0491
delta_h 15.4202 kJ
CoF2
CoF2 = Co+2 + 2F-
log_k -1.5969
delta_h -57.368 kJ
CoF3
CoF3 = Co+3 + 3F-
log_k -1.4581
delta_h -123.692 kJ
CrF3
CrF3 + 2H2O = Cr(OH)2+ + 3F- + 2H+

log_k -11.3367
delta_h -23.3901 kJ
VF4
VF4 + H2O = VO+2 + 4F- + 2H+
log_k 14.93
delta_h -199.117 kJ
UF4
UF4 = U+4 + 4F-
log_k -29.5371
delta_h -79.0776 kJ
UF4:2.5H2O
UF4:2.5H2O = U+4 + 4F- + 2.5H2O
log_k -32.7179
delta_h 24.325 kJ
MgF2
MgF2 = Mg+2 + 2F-
log_k -8.13
delta_h -8 kJ
Fluorite
CaF2 = Ca+2 + 2F-
log_k -10.5
delta_h 8 kJ
SrF2
SrF2 = Sr+2 + 2F-
log_k -8.58
delta_h 4 kJ
BaF2
BaF2 = Ba+2 + 2F-
log_k -5.82
delta_h 4 kJ
Cryolite
Na3AlF6 = 3Na+ + Al+3 + 6F-
log_k -33.84
delta_h 38 kJ
SbCl3
SbCl3 + 3H2O = Sb(OH)3 + 3Cl- + 3H+
log_k 0.5719
delta_h -35.18 kJ
SnCl2
SnCl2 + 2H2O = Sn(OH)2 + 2H+ + 2Cl-
log_k -9.2752
delta_h -0 kJ
Cotunnite
PbCl2 = Pb+2 + 2Cl-
log_k -4.78
delta_h 26.166 kJ
Matlockite
PbClF = Pb+2 + Cl- + F-
log_k -8.9733
delta_h 33.19 kJ
Phosgenite
PbCl2:PbCO3 = 2Pb+2 + 2Cl- + CO3-2
log_k -19.81
delta_h -0 kJ

Laurionite
PbOHCl + H+ = Pb+2 + Cl- + H2O
log_k 0.623
delta_h -0 kJ
Pb2(OH)3Cl
Pb2(OH)3Cl + 3H+ = 2Pb+2 + 3H2O + Cl-
log_k 8.793
delta_h -0 kJ
TlCl
TlCl = Tl+ + Cl-
log_k -3.74
delta_h 41 kJ
ZnCl2
ZnCl2 = Zn+2 + 2Cl-
log_k 7.05
delta_h -72.5 kJ
Zn2(OH)3Cl
Zn2(OH)3Cl + 3H+ = 2Zn+2 + 3H2O + Cl-
log_k 15.191
delta_h -0 kJ
Zn5(OH)8Cl2
Zn5(OH)8Cl2 + 8H+ = 5Zn+2 + 8H2O + 2Cl-
log_k 38.5
delta_h -0 kJ
CdCl2
CdCl2 = Cd+2 + 2Cl-
log_k -0.6588
delta_h -18.58 kJ
CdCl2:1H2O
CdCl2:1H2O = Cd+2 + 2Cl- + H2O
log_k -1.6932
delta_h -7.47 kJ
CdCl2:2.5H2O
CdCl2:2.5H2O = Cd+2 + 2Cl- + 2.5H2O
log_k -1.913
delta_h 7.2849 kJ
CdOHCl
CdOHCl + H+ = Cd+2 + H2O + Cl-
log_k 3.5373
delta_h -30.93 kJ
Calomel
Hg2Cl2 = Hg2+2 + 2Cl-
log_k -17.91
delta_h 92 kJ
HgCl2
HgCl2 + 2H2O = Hg(OH)2 + 2Cl- + 2H+
log_k -21.2621
delta_h 107.82 kJ
Nantokite
CuCl = Cu+ + Cl-
log_k -6.73
delta_h 42.662 kJ
Melanothallite
CuCl2 = Cu+2 + 2Cl-

log_k 6.2572
delta_h -63.407 kJ
Atacamite
Cu2(OH)3Cl + 3H+ = 2Cu+2 + 3H2O + Cl-
log_k 7.391
delta_h -93.43 kJ
Cerargyrite
AgCl = Ag+ + Cl-
log_k -9.75
delta_h 65.2 kJ
CoCl2
CoCl2 = Co+2 + 2Cl-
log_k 8.2672
delta_h -79.815 kJ
CoCl2:6H2O
CoCl2:6H2O = Co+2 + 2Cl- + 6H2O
log_k 2.5365
delta_h 8.0598 kJ
(Co(NH3)6)Cl3
(Co(NH3)6)Cl3 + 6H+ = Co+3 + 6NH4+ + 3Cl-
log_k 20.0317
delta_h -33.1 kJ
(Co(NH3)5OH2)Cl3
(Co(NH3)5OH2)Cl3 + 5H+ = Co+3 + 5NH4+ + 3Cl- + H2O
log_k 11.7351
delta_h -25.37 kJ
(Co(NH3)5Cl)Cl2
(Co(NH3)5Cl)Cl2 + 5H+ = Co+3 + 5NH4+ + 3Cl-
log_k 4.5102
delta_h -10.74 kJ
Fe(OH)2.7Cl.3
Fe(OH)2.7Cl.3 + 2.7H+ = Fe+3 + 2.7H2O + 0.3Cl-
log_k -3.04
delta_h -0 kJ
MnCl2:4H2O
MnCl2:4H2O = Mn+2 + 2Cl- + 4H2O
log_k 2.7151
delta_h -10.83 kJ
CrCl2
CrCl2 = Cr+2 + 2Cl-
log_k 14.0917
delta_h -110.76 kJ
CrCl3
CrCl3 + 2H2O = Cr(OH)2+ + 3Cl- + 2H+
log_k 15.1145
delta_h -121.08 kJ
VCl2
VCl2 = V+3 + 2Cl- + e-
log_k 18.8744
delta_h -141.16 kJ
VCl3
VCl3 = V+3 + 3Cl-
log_k 23.4326
delta_h -179.54 kJ

VOCl
VOCl + 2H+ = V+3 + Cl- + H2O
log_k 11.1524
delta_h -104.91 kJ
VOCl2
VOCl2 = VO+2 + 2Cl-
log_k 12.7603
delta_h -117.76 kJ
VO2Cl
VO2Cl = VO2+ + Cl-
log_k 2.8413
delta_h -40.28 kJ
Halite
NaCl = Na+ + Cl-
log_k 1.6025
delta_h 3.7 kJ
SbBr3
SbBr3 + 3H2O = Sb(OH)3 + 3Br- + 3H+
log_k 0.9689
delta_h -20.94 kJ
SnBr2
SnBr2 + 2H2O = Sn(OH)2 + 2H+ + 2Br-
log_k -9.5443
delta_h -0 kJ
SnBr4
SnBr4 + 6H2O = Sn(OH)6-2 + 6H+ + 4Br-
log_k -28.8468
delta_h -0 kJ
PbBr2
PbBr2 = Pb+2 + 2Br-
log_k -5.3
delta_h 35.499 kJ
PbBrF
PbBrF = Pb+2 + Br- + F-
log_k -8.49
delta_h -0 kJ
TlBr
TlBr = Tl+ + Br-
log_k -5.44
delta_h 54 kJ
ZnBr2:2H2O
ZnBr2:2H2O = Zn+2 + 2Br- + 2H2O
log_k 5.2005
delta_h -30.67 kJ
CdBr2:4H2O
CdBr2:4H2O = Cd+2 + 2Br- + 4H2O
log_k -2.425
delta_h 30.5001 kJ
Hg2Br2
Hg2Br2 = Hg2+2 + 2Br-
log_k -22.25
delta_h 133 kJ
HgBr2
HgBr2 + 2H2O = Hg(OH)2 + 2Br- + 2H+

log_k -25.2734
delta_h 138.492 kJ
CuBr
CuBr = Cu+ + Br-
log_k -8.3
delta_h 54.86 kJ
Cu2(OH)3Br
Cu2(OH)3Br + 3H+ = 2Cu+2 + 3H2O + Br-
log_k 7.9085
delta_h -93.43 kJ
Bromyrite
AgBr = Ag+ + Br-
log_k -12.3
delta_h 84.5 kJ
(Co(NH3)6)Br3
(Co(NH3)6)Br3 + 6H+ = Co+3 + 6NH4+ + 3Br-
log_k 18.3142
delta_h -21.1899 kJ
(Co(NH3)5Cl)Br2
(Co(NH3)5Cl)Br2 + 5H+ = Co+3 + 5NH4+ + Cl- + 2Br-
log_k 5.0295
delta_h -6.4 kJ
CrBr3
CrBr3 + 2H2O = Cr(OH)2+ + 3Br- + 2H+
log_k 19.9086
delta_h -141.323 kJ
AsI3
AsI3 + 3H2O = H3AsO3 + 3I- + 3H+
log_k 4.2307
delta_h 3.15 kJ
SbI3
SbI3 + 3H2O = Sb(OH)3 + 3H+ + 3I-
log_k -0.538
delta_h 13.5896 kJ
PbI2
PbI2 = Pb+2 + 2I-
log_k -8.1
delta_h 62 kJ
TlI
TlI = Tl+ + I-
log_k -7.23
delta_h 75 kJ
ZnI2
ZnI2 = Zn+2 + 2I-
log_k 7.3055
delta_h -58.92 kJ
CdI2
CdI2 = Cd+2 + 2I-
log_k -3.5389
delta_h 13.82 kJ
Hg2I2
Hg2I2 = Hg2+2 + 2I-
log_k -28.34
delta_h 163 kJ

Coccinite
HgI2 + 2H2O = Hg(OH)2 + 2H+ + 2I-
log_k -34.9525
delta_h 210.72 kJ
HgI2:2NH3
HgI2:2NH3 + 2H2O = Hg(OH)2 + 2I- + 2NH4+
log_k -16.2293
delta_h 132.18 kJ
HgI2:6NH3
HgI2:6NH3 + 2H2O + 4H+ = Hg(OH)2 + 2I- + 6NH4+
log_k 33.7335
delta_h -90.3599 kJ
CuI
CuI = Cu+ + I-
log_k -12
delta_h 82.69 kJ
Iodyrite
AgI = Ag+ + I-
log_k -16.08
delta_h 110 kJ
(Co(NH3)6)I3
(Co(NH3)6)I3 + 6H+ = Co+3 + 6NH4+ + 3I-
log_k 16.5831
delta_h -9.6999 kJ
(Co(NH3)5Cl)I2
(Co(NH3)5Cl)I2 + 5H+ = Co+3 + 5NH4+ + Cl- + 2I-
log_k 5.5981
delta_h 0.66 kJ
CrI3
CrI3 + 2H2O = Cr(OH)2+ + 3I- + 2H+
log_k 20.4767
delta_h -134.419 kJ
Cerussite
PbCO3 = Pb+2 + CO3-2
log_k -13.13
delta_h 24.79 kJ
Pb2OCO3
Pb2OCO3 + 2H+ = 2Pb+2 + H2O + CO3-2
log_k -0.5578
delta_h -40.8199 kJ
Pb3O2CO3
Pb3O2CO3 + 4H+ = 3Pb+2 + CO3-2 + 2H2O
log_k 11.02
delta_h -110.583 kJ
Hydrocerussite
Pb3(OH)2(CO3)2 + 2H+ = 3Pb+2 + 2H2O + 2CO3-2
log_k -18.7705
delta_h -0 kJ
Pb10(OH)6O(CO3)6
Pb10(OH)6O(CO3)6 + 8H+ = 10Pb+2 + 6CO3-2 + 7H2O
log_k -8.76
delta_h -0 kJ
Tl2CO3
Tl2CO3 = 2Tl+ + CO3-2

log_k -3.8367
delta_h 35.49 kJ
Smithsonite
ZnCO3 = Zn+2 + CO3-2
log_k -10
delta_h -15.84 kJ
ZnCO3:1H2O
ZnCO3:1H2O = Zn+2 + CO3-2 + H2O
log_k -10.26
delta_h -0 kJ
Otavite
CdCO3 = Cd+2 + CO3-2
log_k -12
delta_h -0.55 kJ
Hg2CO3
Hg2CO3 = Hg2+2 + CO3-2
log_k -16.05
delta_h 45.14 kJ
Hg3O2CO3
Hg3O2CO3 + 4H2O = 3Hg(OH)2 + 2H+ + CO3-2
log_k -29.682
delta_h -0 kJ
CuCO3
CuCO3 = Cu+2 + CO3-2
log_k -11.5
delta_h -0 kJ
Malachite
Cu2(OH)2CO3 + 2H+ = 2Cu+2 + 2H2O + CO3-2
log_k -5.306
delta_h 76.38 kJ
Azurite
Cu3(OH)2(CO3)2 + 2H+ = 3Cu+2 + 2H2O + 2CO3-2
log_k -16.906
delta_h -95.22 kJ
Ag2CO3
Ag2CO3 = 2Ag+ + CO3-2
log_k -11.09
delta_h 42.15 kJ
NiCO3
NiCO3 = Ni+2 + CO3-2
log_k -6.87
delta_h -41.589 kJ
CoCO3
CoCO3 = Co+2 + CO3-2
log_k -9.98
delta_h -12.7612 kJ
Siderite
FeCO3 = Fe+2 + CO3-2
log_k -10.24
delta_h -16 kJ
Rhodochrosite
MnCO3 = Mn+2 + CO3-2
log_k -10.58
delta_h -1.88 kJ

Rutherfordine
UO2CO3 = UO2+2 + CO3-2
log_k -14.5
delta_h -3.03 kJ
Artinite
MgCO3:Mg(OH)2:3H2O + 2H+ = 2Mg+2 + CO3-2 + 5H2O
log_k 9.6
delta_h -120.257 kJ
Hydromagnesite
Mg5(CO3)4(OH)2:4H2O + 2H+ = 5Mg+2 + 4CO3-2 + 6H2O
log_k -8.766
delta_h -218.447 kJ
Magnesite
MgCO3 = Mg+2 + CO3-2
log_k -7.46
delta_h 20 kJ
Nesquehonite
MgCO3:3H2O = Mg+2 + CO3-2 + 3H2O
log_k -4.67
delta_h -24.2212 kJ
Aragonite
CaCO3 = Ca+2 + CO3-2
log_k -8.3
delta_h -12 kJ
Calcite
CaCO3 = Ca+2 + CO3-2
log_k -8.48
delta_h -8 kJ
Dolomite(ordered)
CaMg(CO3)2 = Ca+2 + Mg+2 + 2CO3-2
log_k -17.09
delta_h -39.5 kJ
Dolomite(disordered)
CaMg(CO3)2 = Ca+2 + Mg+2 + 2CO3-2
log_k -16.54
delta_h -46.4 kJ
Huntite
CaMg3(CO3)4 = 3Mg+2 + Ca+2 + 4CO3-2
log_k -29.968
delta_h -107.78 kJ
Strontianite
SrCO3 = Sr+2 + CO3-2
log_k -9.27
delta_h -0 kJ
Witherite
BaCO3 = Ba+2 + CO3-2
log_k -8.57
delta_h 4 kJ
Thermonatrite
Na2CO3:H2O = 2Na+ + CO3-2 + H2O
log_k 0.637
delta_h -10.4799 kJ
TlNO3
TlNO3 = Tl+ + NO3-

log_k -1.6127
delta_h 42.44 kJ
Zn(NO3)2:6H2O
Zn(NO3)2:6H2O = Zn+2 + 2NO3- + 6H2O
log_k 3.3153
delta_h 24.5698 kJ
Cu2(OH)3NO3
Cu2(OH)3NO3 + 3H+ = 2Cu+2 + 3H2O + NO3-
log_k 9.251
delta_h -72.5924 kJ
(Co(NH3)6)(NO3)3
(Co(NH3)6)(NO3)3 + 6H+ = Co+3 + 6NH4+ + 3NO3-
log_k 17.9343
delta_h 1.59 kJ
(Co(NH3)5Cl)(NO3)2
(Co(NH3)5Cl)(NO3)2 + 5H+ = Co+3 + 5NH4+ + Cl- + 2NO3-
log_k 6.2887
delta_h 6.4199 kJ
UO2(NO3)2
UO2(NO3)2 = UO2+2 + 2NO3-
log_k 12.1476
delta_h -83.3999 kJ
UO2(NO3)2:2H2O
UO2(NO3)2:2H2O = UO2+2 + 2NO3- + 2H2O
log_k 4.851
delta_h -25.355 kJ
UO2(NO3)2:3H2O
UO2(NO3)2:3H2O = UO2+2 + 2NO3- + 3H2O
log_k 3.39
delta_h -9.1599 kJ
UO2(NO3)2:6H2O
UO2(NO3)2:6H2O = UO2+2 + 2NO3- + 6H2O
log_k 2.0464
delta_h 20.8201 kJ
Pb(BO2)2
Pb(BO2)2 + 2H2O + 2H+ = Pb+2 + 2H3BO3
log_k 6.5192
delta_h -15.6119 kJ
Zn(BO2)2
Zn(BO2)2 + 2H2O + 2H+ = Zn+2 + 2H3BO3
log_k 8.29
delta_h -0 kJ
Cd(BO2)2
Cd(BO2)2 + 2H2O + 2H+ = Cd+2 + 2H3BO3
log_k 9.84
delta_h -0 kJ
Co(BO2)2
Co(BO2)2 + 2H2O + 2H+ = Co+2 + 2H3BO3
log_k 27.0703
delta_h -0 kJ
SnSO4
SnSO4 + 2H2O = Sn(OH)2 + 2H+ + SO4-2
log_k -56.9747
delta_h -0 kJ

Sn(SO4)2
Sn(SO4)2 + 6H2O = Sn(OH)6-2 + 6H+ + 2SO4-2
log_k -15.2123
delta_h -0 kJ
Larnakite
PbO:PbSO4 + 2H+ = 2Pb+2 + SO4-2 + H2O
log_k -0.4344
delta_h -21.83 kJ
Pb3O2SO4
Pb3O2SO4 + 4H+ = 3Pb+2 + SO4-2 + 2H2O
log_k 10.6864
delta_h -79.14 kJ
Pb4O3SO4
Pb4O3SO4 + 6H+ = 4Pb+2 + SO4-2 + 3H2O
log_k 21.8772
delta_h -136.45 kJ
Anglesite
PbSO4 = Pb+2 + SO4-2
log_k -7.79
delta_h 12 kJ
Pb4(OH)6SO4
Pb4(OH)6SO4 + 6H+ = 4Pb+2 + SO4-2 + 6H2O
log_k 21.1
delta_h -0 kJ
AlOHSO4
AlOHSO4 + H+ = Al+3 + SO4-2 + H2O
log_k -3.23
delta_h -0 kJ
Al4(OH)10SO4
Al4(OH)10SO4 + 10H+ = 4Al+3 + SO4-2 + 10H2O
log_k 22.7
delta_h -0 kJ
Tl2SO4
Tl2SO4 = 2Tl+ + SO4-2
log_k -3.7868
delta_h 33.1799 kJ
Zn2(OH)2SO4
Zn2(OH)2SO4 + 2H+ = 2Zn+2 + 2H2O + SO4-2
log_k 7.5
delta_h -0 kJ
Zn4(OH)6SO4
Zn4(OH)6SO4 + 6H+ = 4Zn+2 + 6H2O + SO4-2
log_k 28.4
delta_h -0 kJ
Zn3O(SO4)2
Zn3O(SO4)2 + 2H+ = 3Zn+2 + 2SO4-2 + H2O
log_k 18.9135
delta_h -258.08 kJ
Zincosite
ZnSO4 = Zn+2 + SO4-2
log_k 3.9297
delta_h -82.586 kJ
ZnSO4:1H2O
ZnSO4:1H2O = Zn+2 + SO4-2 + H2O

log_k -0.638
delta_h -44.0699 kJ
Bianchite
ZnSO4:6H2O = Zn+2 + SO4-2 + 6H2O
log_k -1.765
delta_h -0.6694 kJ
Goslarite
ZnSO4:7H2O = Zn+2 + SO4-2 + 7H2O
log_k -2.0112
delta_h 14.21 kJ
Cd3(OH)4SO4
Cd3(OH)4SO4 + 4H+ = 3Cd+2 + 4H2O + SO4-2
log_k 22.56
delta_h -0 kJ
Cd3(OH)2(SO4)2
Cd3(OH)2(SO4)2 + 2H+ = 3Cd+2 + 2H2O + 2SO4-2
log_k 6.71
delta_h -0 kJ
Cd4(OH)6SO4
Cd4(OH)6SO4 + 6H+ = 4Cd+2 + 6H2O + SO4-2
log_k 28.4
delta_h -0 kJ
CdSO4
CdSO4 = Cd+2 + SO4-2
log_k -0.1722
delta_h -51.98 kJ
CdSO4:1H2O
CdSO4:1H2O = Cd+2 + SO4-2 + H2O
log_k -1.7261
delta_h -31.5399 kJ
CdSO4:2.67H2O
CdSO4:2.67H2O = Cd+2 + SO4-2 + 2.67H2O
log_k -1.873
delta_h -17.9912 kJ
Hg2SO4
Hg2SO4 = Hg2+2 + SO4-2
log_k -6.13
delta_h 5.4 kJ
HgSO4
HgSO4 + 2H2O = Hg(OH)2 + SO4-2 + 2H+
log_k -9.4189
delta_h 14.6858 kJ
Cu2SO4
Cu2SO4 = 2Cu+ + SO4-2
log_k -1.95
delta_h -19.079 kJ
Antlerite
Cu3(OH)4SO4 + 4H+ = 3Cu+2 + 4H2O + SO4-2
log_k 8.788
delta_h -0 kJ
Brochantite
Cu4(OH)6SO4 + 6H+ = 4Cu+2 + 6H2O + SO4-2
log_k 15.222
delta_h -202.86 kJ

Langite
Cu4(OH)6SO4:H2O + 6H+ = 4Cu+2 + 7H2O + SO4-2
log_k 17.4886
delta_h -165.55 kJ
CuOCuSO4
CuOCuSO4 + 2H+ = 2Cu+2 + H2O + SO4-2
log_k 10.3032
delta_h -137.777 kJ
CuSO4
CuSO4 = Cu+2 + SO4-2
log_k 2.9395
delta_h -73.04 kJ
Chalcanthite
CuSO4:5H2O = Cu+2 + SO4-2 + 5H2O
log_k -2.64
delta_h 6.025 kJ
Ag2SO4
Ag2SO4 = 2Ag+ + SO4-2
log_k -4.82
delta_h 17 kJ
Ni4(OH)6SO4
Ni4(OH)6SO4 + 6H+ = 4Ni+2 + SO4-2 + 6H2O
log_k 32
delta_h -0 kJ
Retgersite
NiSO4:6H2O = Ni+2 + SO4-2 + 6H2O
log_k -2.04
delta_h 4.6024 kJ
Morenosite
NiSO4:7H2O = Ni+2 + SO4-2 + 7H2O
log_k -2.1449
delta_h 12.1802 kJ
CoSO4
CoSO4 = Co+2 + SO4-2
log_k 2.8024
delta_h -79.277 kJ
CoSO4:6H2O
CoSO4:6H2O = Co+2 + SO4-2 + 6H2O
log_k -2.4726
delta_h 1.0801 kJ
Melanterite
FeSO4:7H2O = Fe+2 + SO4-2 + 7H2O
log_k -2.209
delta_h 20.5 kJ
Fe2(SO4)3
Fe2(SO4)3 = 2Fe+3 + 3SO4-2
log_k -3.7343
delta_h -242.028 kJ
H-Jarosite
(H3O)Fe3(SO4)2(OH)6 + 5H+ = 3Fe+3 + 2SO4-2 + 7H2O
log_k -12.1
delta_h -230.748 kJ
Na-Jarosite
NaFe3(SO4)2(OH)6 + 6H+ = Na+ + 3Fe+3 + 2SO4-2 + 6H2O

log_k -11.2
delta_h -151.377 kJ
K-Jarosite
KFe3(SO4)2(OH)6 + 6H+ = K+ + 3Fe+3 + 2SO4-2 + 6H2O
log_k -14.8
delta_h -130.875 kJ
MnSO4
MnSO4 = Mn+2 + SO4-2
log_k 2.5831
delta_h -64.8401 kJ
Mn2(SO4)3
Mn2(SO4)3 = 2Mn+3 + 3SO4-2
log_k -5.711
delta_h -163.427 kJ
VOSO4
VOSO4 = VO+2 + SO4-2
log_k 3.6097
delta_h -86.7401 kJ
Epsomite
MgSO4:7H2O = Mg+2 + SO4-2 + 7H2O
log_k -2.1265
delta_h 11.5601 kJ
Anhydrite
CaSO4 = Ca+2 + SO4-2
log_k -4.36
delta_h -7.2 kJ
Gypsum
CaSO4:2H2O = Ca+2 + SO4-2 + 2H2O
log_k -4.61
delta_h 1 kJ
Celestite
SrSO4 = Sr+2 + SO4-2
log_k -6.62
delta_h 2 kJ
Barite
BaSO4 = Ba+2 + SO4-2
log_k -9.98
delta_h 23 kJ
Mirabilite
Na2SO4:10H2O = 2Na+ + SO4-2 + 10H2O
log_k -1.114
delta_h 79.4416 kJ
Thenardite
Na2SO4 = 2Na+ + SO4-2
log_k 0.3217
delta_h -9.121 kJ
K-Alum
KAl(SO4)2:12H2O = K+ + Al+3 + 2SO4-2 + 12H2O
log_k -5.17
delta_h 30.2085 kJ
Alunite
KAl3(SO4)2(OH)6 + 6H+ = K+ + 3Al+3 + 2SO4-2 + 6H2O
log_k -1.4
delta_h -210 kJ

(NH4)2CrO4
(NH4)2CrO4 = CrO4-2 + 2NH4+
log_k 0.4046
delta_h 9.163 kJ
PbCrO4
PbCrO4 = Pb+2 + CrO4-2
log_k -12.6
delta_h 44.18 kJ
Tl2CrO4
Tl2CrO4 = 2Tl+ + CrO4-2
log_k -12.01
delta_h 74.27 kJ
Hg2CrO4
Hg2CrO4 = Hg2+2 + CrO4-2
log_k -8.7
delta_h -0 kJ
CuCrO4
CuCrO4 = Cu+2 + CrO4-2
log_k -5.44
delta_h -0 kJ
Ag2CrO4
Ag2CrO4 = 2Ag+ + CrO4-2
log_k -11.59
delta_h 62 kJ
MgCrO4
MgCrO4 = CrO4-2 + Mg+2
log_k 5.3801
delta_h -88.9518 kJ
CaCrO4
CaCrO4 = Ca+2 + CrO4-2
log_k -2.2657
delta_h -26.945 kJ
SrCrO4
SrCrO4 = Sr+2 + CrO4-2
log_k -4.65
delta_h -10.1253 kJ
BaCrO4
BaCrO4 = Ba+2 + CrO4-2
log_k -9.67
delta_h 33 kJ
Li2CrO4
Li2CrO4 = CrO4-2 + 2Li+
log_k 4.8568
delta_h -45.2792 kJ
Na2CrO4
Na2CrO4 = CrO4-2 + 2Na+
log_k 2.9302
delta_h -19.6301 kJ
Na2Cr2O7
Na2Cr2O7 + H2O = 2CrO4-2 + 2Na+ + 2H+
log_k -9.8953
delta_h 22.1961 kJ
K2CrO4
K2CrO4 = CrO4-2 + 2K+

log_k -0.5134
delta_h 18.2699 kJ
K2Cr2O7
K2Cr2O7 + H2O = 2CrO4-2 + 2K+ + 2H+
log_k -17.2424
delta_h 80.7499 kJ
Hg2SeO3
Hg2SeO3 + H+ = Hg2+2 + HSeO3-
log_k -4.657
delta_h -0 kJ
HgSeO3
HgSeO3 + 2H2O = Hg(OH)2 + H+ + HSeO3-
log_k -12.43
delta_h -0 kJ
Ag2SeO3
Ag2SeO3 + H+ = 2Ag+ + HSeO3-
log_k -7.15
delta_h 39.68 kJ
CuSeO3:2H2O
CuSeO3:2H2O + H+ = Cu+2 + HSeO3- + 2H2O
log_k 0.5116
delta_h -36.861 kJ
NiSeO3:2H2O
NiSeO3:2H2O + H+ = HSeO3- + Ni+2 + 2H2O
log_k 2.8147
delta_h -31.0034 kJ
CoSeO3
CoSeO3 + H+ = Co+2 + HSeO3-
log_k 1.32
delta_h -0 kJ
Fe2(SeO3)3:2H2O
Fe2(SeO3)3:2H2O + 3H+ = 3HSeO3- + 2Fe+3 + 2H2O
log_k -20.6262
delta_h -0 kJ
Fe2(OH)4SeO3
Fe2(OH)4SeO3 + 5H+ = HSeO3- + 2Fe+3 + 4H2O
log_k 1.5539
delta_h -0 kJ
MnSeO3
MnSeO3 + H+ = Mn+2 + HSeO3-
log_k 1.13
delta_h -0 kJ
MnSeO3:2H2O
MnSeO3:2H2O + H+ = HSeO3- + Mn+2 + 2H2O
log_k 0.9822
delta_h 8.4935 kJ
MgSeO3:6H2O
MgSeO3:6H2O + H+ = Mg+2 + HSeO3- + 6H2O
log_k 3.0554
delta_h 5.23 kJ
CaSeO3:2H2O
CaSeO3:2H2O + H+ = HSeO3- + Ca+2 + 2H2O
log_k 2.8139
delta_h -19.4556 kJ

SrSeO3
SrSeO3 + H+ = Sr+2 + HSeO3-
log_k 2.3
delta_h -0 kJ
BaSeO3
BaSeO3 + H+ = Ba+2 + HSeO3-
log_k 1.83
delta_h 11.98 kJ
Na2SeO3:5H2O
Na2SeO3:5H2O + H+ = 2Na+ + HSeO3- + 5H2O
log_k 10.3
delta_h -0 kJ
PbSeO4
PbSeO4 = Pb+2 + SeO4-2
log_k -6.84
delta_h 15 kJ
Tl2SeO4
Tl2SeO4 = 2Tl+ + SeO4-2
log_k -4.1
delta_h 43 kJ
ZnSeO4:6H2O
ZnSeO4:6H2O = Zn+2 + SeO4-2 + 6H2O
log_k -1.52
delta_h -0 kJ
CdSeO4:2H2O
CdSeO4:2H2O = Cd+2 + SeO4-2 + 2H2O
log_k -1.85
delta_h -0 kJ
Ag2SeO4
Ag2SeO4 = 2Ag+ + SeO4-2
log_k -8.91
delta_h -43.5 kJ
CuSeO4:5H2O
CuSeO4:5H2O = Cu+2 + SeO4-2 + 5H2O
log_k -2.44
delta_h -0 kJ
NiSeO4:6H2O
NiSeO4:6H2O = Ni+2 + SeO4-2 + 6H2O
log_k -1.52
delta_h -0 kJ
CoSeO4:6H2O
CoSeO4:6H2O = Co+2 + SeO4-2 + 6H2O
log_k -1.53
delta_h -0 kJ
MnSeO4:5H2O
MnSeO4:5H2O = Mn+2 + SeO4-2 + 5H2O
log_k -2.05
delta_h -0 kJ
UO2SeO4:4H2O
UO2SeO4:4H2O = UO2+2 + SeO4-2 + 4H2O
log_k -2.25
delta_h -0 kJ
MgSeO4:6H2O
MgSeO4:6H2O = Mg+2 + SeO4-2 + 6H2O

log_k -1.2
delta_h -0 kJ
CaSeO4:2H2O
CaSeO4:2H2O = Ca+2 + SeO4-2 + 2H2O
log_k -3.02
delta_h -8.3 kJ
SrSeO4
SrSeO4 = Sr+2 + SeO4-2
log_k -4.4
delta_h 0.4 kJ
BaSeO4
BaSeO4 = Ba+2 + SeO4-2
log_k -7.46
delta_h 22 kJ
BeSeO4:4H2O
BeSeO4:4H2O = Be+2 + SeO4-2 + 4H2O
log_k -2.94
delta_h -0 kJ
Na2SeO4
Na2SeO4 = 2Na+ + SeO4-2
log_k 1.28
delta_h -0 kJ
K2SeO4
K2SeO4 = 2K+ + SeO4-2
log_k -0.73
delta_h -0 kJ
(NH4)2SeO4
(NH4)2SeO4 = 2NH4+ + SeO4-2
log_k 0.45
delta_h -0 kJ
H2MoO4
H2MoO4 = MoO4-2 + 2H+
log_k -12.8765
delta_h 49 kJ
PbMoO4
PbMoO4 = Pb+2 + MoO4-2
log_k -15.62
delta_h 53.93 kJ
Al2(MoO4)3
Al2(MoO4)3 = 3MoO4-2 + 2Al+3
log_k 2.3675
delta_h -260.8 kJ
Tl2MoO4
Tl2MoO4 = MoO4-2 + 2Tl+
log_k -7.9887
delta_h -0 kJ
ZnMoO4
ZnMoO4 = MoO4-2 + Zn+2
log_k -10.1254
delta_h -10.6901 kJ
CdMoO4
CdMoO4 = MoO4-2 + Cd+2
log_k -14.1497
delta_h 19.48 kJ

CuMoO4
CuMoO4 = MoO4-2 + Cu+2
log_k -13.0762
delta_h 12.2 kJ
Ag2MoO4
Ag2MoO4 = 2Ag+ + MoO4-2
log_k -11.55
delta_h 52.7 kJ
NiMoO4
NiMoO4 = MoO4-2 + Ni+2
log_k -11.1421
delta_h 1.3 kJ
CoMoO4
CoMoO4 = MoO4-2 + Co+2
log_k -7.7609
delta_h -23.3999 kJ
FeMoO4
FeMoO4 = MoO4-2 + Fe+2
log_k -10.091
delta_h -11.1 kJ
BeMoO4
BeMoO4 = MoO4-2 + Be+2
log_k -1.7817
delta_h -56.4 kJ
MgMoO4
MgMoO4 = Mg+2 + MoO4-2
log_k -1.85
delta_h -0 kJ
CaMoO4
CaMoO4 = Ca+2 + MoO4-2
log_k -7.95
delta_h -2 kJ
BaMoO4
BaMoO4 = MoO4-2 + Ba+2
log_k -6.9603
delta_h 10.96 kJ
Li2MoO4
Li2MoO4 = MoO4-2 + 2Li+
log_k 2.4416
delta_h -33.9399 kJ
Na2MoO4
Na2MoO4 = MoO4-2 + 2Na+
log_k 1.4901
delta_h -9.98 kJ
Na2MoO4:2H2O
Na2MoO4:2H2O = MoO4-2 + 2Na+ + 2H2O
log_k 1.224
delta_h -0 kJ
Na2Mo2O7
Na2Mo2O7 + H2O = 2MoO4-2 + 2Na+ + 2H+
log_k -16.5966
delta_h 56.2502 kJ
K2MoO4
K2MoO4 = MoO4-2 + 2K+

log_k 3.2619
delta_h -3.38 kJ
PbHPO4
PbHPO4 = Pb+2 + H+ + PO4-3
log_k -23.805
delta_h -0 kJ
Pb3(PO4)2
Pb3(PO4)2 = 3Pb+2 + 2PO4-3
log_k -43.53
delta_h -0 kJ
Pyromorphite
Pb5(PO4)3Cl = 5Pb+2 + 3PO4-3 + Cl-
log_k -84.43
delta_h -0 kJ
Hydroxylpyromorphite
Pb5(PO4)3OH + H+ = 5Pb+2 + 3PO4-3 + H2O
log_k -62.79
delta_h -0 kJ
Plumbgummite
PbAl3(PO4)2(OH)5:H2O + 5H+ = Pb+2 + 3Al+3 + 2PO4-3 + 6H2O
log_k -32.79
delta_h -0 kJ
Hinsdalite
PbAl3PO4SO4(OH)6 + 6H+ = Pb+2 + 3Al+3 + PO4-3 + SO4-2 + 6H2O
log_k -2.5
delta_h -0 kJ
Tsumebite
Pb2CuPO4(OH)3:3H2O + 3H+ = 2Pb+2 + Cu+2 + PO4-3 + 6H2O
log_k -9.79
delta_h -0 kJ
Zn3(PO4)2:4H2O
Zn3(PO4)2:4H2O = 3Zn+2 + 2PO4-3 + 4H2O
log_k -35.42
delta_h -0 kJ
Cd3(PO4)2
Cd3(PO4)2 = 3Cd+2 + 2PO4-3
log_k -32.6
delta_h -0 kJ
Hg2HPO4
Hg2HPO4 = Hg2+2 + H+ + PO4-3
log_k -24.775
delta_h -0 kJ
Cu3(PO4)2
Cu3(PO4)2 = 3Cu+2 + 2PO4-3
log_k -36.85
delta_h -0 kJ
Cu3(PO4)2:3H2O
Cu3(PO4)2:3H2O = 3Cu+2 + 2PO4-3 + 3H2O
log_k -35.12
delta_h -0 kJ
Ag3PO4
Ag3PO4 = 3Ag+ + PO4-3
log_k -17.59
delta_h -0 kJ

Ni3(PO4)2
Ni3(PO4)2 = 3Ni+2 + 2PO4-3
log_k -31.3
delta_h -0 kJ
CoHPO4
CoHPO4 = Co+2 + PO4-3 + H+
log_k -19.0607
delta_h -0 kJ
Co3(PO4)2
Co3(PO4)2 = 3Co+2 + 2PO4-3
log_k -34.6877
delta_h -0 kJ
Vivianite
Fe3(PO4)2:8H2O = 3Fe+2 + 2PO4-3 + 8H2O
log_k -36
delta_h -0 kJ
Strengite
FePO4:2H2O = Fe+3 + PO4-3 + 2H2O
log_k -26.4
delta_h -9.3601 kJ
Mn3(PO4)2
Mn3(PO4)2 = 3Mn+2 + 2PO4-3
log_k -23.827
delta_h 8.8701 kJ
MnHPO4
MnHPO4 = Mn+2 + PO4-3 + H+
log_k -25.4
delta_h -0 kJ
(VO)3(PO4)2
(VO)3(PO4)2 = 3VO+2 + 2PO4-3
log_k -25.1
delta_h -0 kJ
Mg3(PO4)2
Mg3(PO4)2 = 3Mg+2 + 2PO4-3
log_k -23.28
delta_h -0 kJ
MgHPO4:3H2O
MgHPO4:3H2O = Mg+2 + H+ + PO4-3 + 3H2O
log_k -18.175
delta_h -0 kJ
FCO3Apatite
Ca9.316Na0.36Mg0.144(PO4)4.8(CO3)1.2F2.48 = 9.316Ca+2 + 0.36Na+ + 0.144Mg+2 + 4.8PO4-3 + 1.2CO3-2 + 2.48F-
log_k -114.4
delta_h 164.808 kJ
Hydroxylapatite
Ca5(PO4)3OH + H+ = 5Ca+2 + 3PO4-3 + H2O
log_k -44.333
delta_h -0 kJ
CaHPO4:2H2O
CaHPO4:2H2O = Ca+2 + H+ + PO4-3 + 2H2O
log_k -18.995
delta_h 23 kJ
CaHPO4

CaHPO4 = Ca+2 + H+ + PO4-3
log_k -19.275
delta_h 31 kJ
Ca3(PO4)2(beta)
Ca3(PO4)2 = 3Ca+2 + 2PO4-3
log_k -28.92
delta_h 54 kJ
Ca4H(PO4)3:3H2O
Ca4H(PO4)3:3H2O = 4Ca+2 + H+ + 3PO4-3 + 3H2O
log_k -47.08
delta_h -0 kJ
SrHPO4
SrHPO4 = Sr+2 + H+ + PO4-3
log_k -19.295
delta_h -0 kJ
BaHPO4
BaHPO4 = Ba+2 + H+ + PO4-3
log_k -19.775
delta_h -0 kJ
U(HPO4)2:4H2O
U(HPO4)2:4H2O = U+4 + 2PO4-3 + 2H+ + 4H2O
log_k -51.584
delta_h 16.0666 kJ
(UO2)3(PO4)2
(UO2)3(PO4)2 = 3UO2+2 + 2PO4-3
log_k -49.4
delta_h 397.062 kJ
UO2HPO4
UO2HPO4 = UO2+2 + H+ + PO4-3
log_k -24.225
delta_h -0 kJ
Uramphite
(NH4)2(UO2)2(PO4)2 = 2UO2+2 + 2NH4+ + 2PO4-3
log_k -51.749
delta_h 40.5848 kJ
Przhevalskite
Pb(UO2)2(PO4)2 = 2UO2+2 + Pb+2 + 2PO4-3
log_k -44.365
delta_h -46.024 kJ
Torbernite
Cu(UO2)2(PO4)2 = 2UO2+2 + Cu+2 + 2PO4-3
log_k -45.279
delta_h -66.5256 kJ
Bassetite
Fe(UO2)2(PO4)2 = 2UO2+2 + Fe+2 + 2PO4-3
log_k -44.485
delta_h -83.2616 kJ
Saleeite
Mg(UO2)2(PO4)2 = 2UO2+2 + Mg+2 + 2PO4-3
log_k -43.646
delta_h -84.4331 kJ
Ningyoite
CaU(PO4)2:2H2O = U+4 + Ca+2 + 2PO4-3 + 2H2O
log_k -53.906

delta_h -9.4977 kJ
H-Autunite
H2(UO2)2(PO4)2 = 2UO2+2 + 2H+ + 2PO4-3
log_k -47.931
delta_h -15.0624 kJ
Autunite
Ca(UO2)2(PO4)2 = 2UO2+2 + Ca+2 + 2PO4-3
log_k -43.927
delta_h -59.9986 kJ
Sr-Autunite
Sr(UO2)2(PO4)2 = 2UO2+2 + Sr+2 + 2PO4-3
log_k -44.457
delta_h -54.6012 kJ
Na-Autunite
Na2(UO2)2(PO4)2 = 2UO2+2 + 2Na+ + 2PO4-3
log_k -47.409
delta_h -1.9246 kJ
K-Autunite
K2(UO2)2(PO4)2 = 2UO2+2 + 2K+ + 2PO4-3
log_k -48.244
delta_h 24.5182 kJ
Uranocircite
Ba(UO2)2(PO4)2 = 2UO2+2 + Ba+2 + 2PO4-3
log_k -44.631
delta_h -42.2584 kJ
Pb3(AsO4)2
Pb3(AsO4)2 + 6H+ = 3Pb+2 + 2H3AsO4
log_k 5.8
delta_h -0 kJ
AlAsO4:2H2O
AlAsO4:2H2O + 3H+ = Al+3 + H3AsO4 + 2H2O
log_k 4.8
delta_h -0 kJ
Zn3(AsO4)2:2.5H2O
Zn3(AsO4)2:2.5H2O + 6H+ = 3Zn+2 + 2H3AsO4 + 2.5H2O
log_k 13.65
delta_h -0 kJ
Cu3(AsO4)2:2H2O
Cu3(AsO4)2:2H2O + 6H+ = 3Cu+2 + 2H3AsO4 + 2H2O
log_k 6.1
delta_h -0 kJ
Ag3AsO3
Ag3AsO3 + 3H+ = 3Ag+ + H3AsO3
log_k 2.1573
delta_h -0 kJ
Ag3AsO4
Ag3AsO4 + 3H+ = 3Ag+ + H3AsO4
log_k -2.7867
delta_h -0 kJ
Ni3(AsO4)2:8H2O
Ni3(AsO4)2:8H2O + 6H+ = 3Ni+2 + 2H3AsO4 + 8H2O
log_k 15.7
delta_h -0 kJ
Co3(AsO4)2

Co3(AsO4)2 + 6H+ = 3Co+2 + 2H3AsO4
log_k 13.0341
delta_h -0 kJ
FeAsO4:2H2O
FeAsO4:2H2O + 3H+ = Fe+3 + H3AsO4 + 2H2O
log_k 0.4
delta_h -0 kJ
Mn3(AsO4)2:8H2O
Mn3(AsO4)2:8H2O + 6H+ = 3Mn+2 + 2H3AsO4 + 8H2O
log_k 12.5
delta_h -0 kJ
Ca3(AsO4)2:4H2O
Ca3(AsO4)2:4H2O + 6H+ = 3Ca+2 + 2H3AsO4 + 4H2O
log_k 22.3
delta_h -0 kJ
Ba3(AsO4)2
Ba3(AsO4)2 + 6H+ = 3Ba+2 + 2H3AsO4
log_k -8.91
delta_h 11.0458 kJ
#NH4VO3
NH4VO3 + 2H+ = 2VO2+ + H2O
log_k 3.8
delta_h 30 kJ
Pb3(VO4)2
Pb3(VO4)2 + 8H+ = 3Pb+2 + 2VO2+ + 4H2O
log_k 6.14
delta_h -72.6342 kJ
Pb2V2O7
Pb2V2O7 + 6H+ = 2Pb+2 + 2VO2+ + 3H2O
log_k -1.9
delta_h -26.945 kJ
AgVO3
AgVO3 + 2H+ = Ag+ + VO2+ + H2O
log_k 0.77
delta_h -0 kJ
Ag2HVO4
Ag2HVO4 + 3H+ = 2Ag+ + VO2+ + 2H2O
log_k 1.48
delta_h -0 kJ
Ag3H2VO5
Ag3H2VO5 + 4H+ = 3Ag+ + VO2+ + 3H2O
log_k 5.18
delta_h -0 kJ
Fe(VO3)2
Fe(VO3)2 + 4H+ = Fe+2 + 2VO2+ + 2H2O
log_k -3.72
delta_h -61.6722 kJ
Mn(VO3)2
Mn(VO3)2 + 4H+ = Mn+2 + 2VO2+ + 2H2O
log_k 4.9
delta_h -92.4664 kJ
Mg(VO3)2
Mg(VO3)2 + 4H+ = Mg+2 + 2VO2+ + 2H2O
log_k 11.28

delta_h -136.649 kJ
Mg2V2O7
Mg2V2O7 + 6H+ = 2Mg+2 + 2VO2+ + 3H2O
log_k 26.36
delta_h -255.224 kJ
Carnotite
KUO2VO4 + 4H+ = K+ + UO2+2 + VO2+ + 2H2O
log_k 0.23
delta_h -36.4008 kJ
Tyuyamunite
Ca(UO2)2(VO4)2 + 8H+ = Ca+2 + 2UO2+2 + 2VO2+ + 4H2O
log_k 4.08
delta_h -153.134 kJ
Ca(VO3)2
Ca(VO3)2 + 4H+ = Ca+2 + 2VO2+ + 2H2O
log_k 5.66
delta_h -84.7678 kJ
Ca3(VO4)2
Ca3(VO4)2 + 8H+ = 3Ca+2 + 2VO2+ + 4H2O
log_k 38.96
delta_h -293.466 kJ
Ca2V2O7
Ca2V2O7 + 6H+ = 2Ca+2 + 2VO2+ + 3H2O
log_k 17.5
delta_h -159.494 kJ
Ca3(VO4)2:4H2O
Ca3(VO4)2:4H2O + 8H+ = 3Ca+2 + 2VO2+ + 8H2O
log_k 39.86
delta_h -0 kJ
Ca2V2O7:2H2O
Ca2V2O7:2H2O + 6H+ = 2Ca+2 + 2VO2+ + 5H2O
log_k 21.552
delta_h -0 kJ
Ba3(VO4)2:4H2O
Ba3(VO4)2:4H2O + 8H+ = 3Ba+2 + 2VO2+ + 8H2O
log_k 32.94
delta_h -0 kJ
Ba2V2O7:2H2O
Ba2V2O7:2H2O + 6H+ = 2Ba+2 + 2VO2+ + 5H2O
log_k 15.872
delta_h -0 kJ
NaVO3
NaVO3 + 2H+ = Na+ + VO2+ + H2O
log_k 3.8582
delta_h -30.1799 kJ
Na3VO4
Na3VO4 + 4H+ = 3Na+ + VO2+ + 2H2O
log_k 36.6812
delta_h -184.61 kJ
Na4V2O7
Na4V2O7 + 6H+ = 4Na+ + 2VO2+ + 3H2O
log_k 37.4
delta_h -201.083 kJ
Halloysite

Al2Si2O5(OH)4 + 6H+ = 2Al+3 + 2H4SiO4 + H2O
log_k 9.5749
delta_h -181.43 kJ
Kaolinite
Al2Si2O5(OH)4 + 6H+ = 2Al+3 + 2H4SiO4 + H2O
log_k 7.435
delta_h -148 kJ
Greenalite
Fe3Si2O5(OH)4 + 6H+ = 3Fe+2 + 2H4SiO4 + H2O
log_k 20.81
delta_h -0 kJ
Chrysotile
Mg3Si2O5(OH)4 + 6H+ = 3Mg+2 + 2H4SiO4 + H2O
log_k 32.2
delta_h -196 kJ
Sepiolite
Mg2Si3O7.5OH:3H2O + 4H+ + 0.5H2O = 2Mg+2 + 3H4SiO4
log_k 15.76
delta_h -114.089 kJ
Sepiolite(A)
Mg2Si3O7.5OH:3H2O + 0.5H2O + 4H+ = 2Mg+2 + 3H4SiO4
log_k 18.78
delta_h -0 kJ
PHASES
O2(g)
O2 + 4H+ + 4e- = 2H2O
log_k 83.0894
delta_h -571.66 kJ
CH4(g)
CH4 + 3H2O = CO3-2 + 8e- + 10H+
log_k -41.0452
delta_h 257.133 kJ
CO2(g)
CO2 + H2O = 2H+ + CO3-2
log_k -18.147
delta_h 4.06 kJ
H2S(g)
H2S = H+ + HS-
log_k -8.01
delta_h -0 kJ
H2Se(g)
H2Se = HSe- + H+
log_k -4.96
delta_h -15.3 kJ
Hg(g)
Hg = 0.5Hg2+2 + e-
log_k -7.8733
delta_h 22.055 kJ
Hg2(g)
Hg2 = Hg2+2 + 2e-
log_k -14.9554
delta_h 58.07 kJ
Hg(CH3)2(g)
Hg(CH3)2 + 8H2O = Hg(OH)2 + 2CO3-2 + 16e- + 20H+

```
log_k -73.7066
delta_h 481.99 kJ
HgF(g)
HgF = 0.5Hg2+2 + F-
log_k 32.6756
delta_h -254.844 kJ
HgF2(g)
HgF2 + 2H2O = Hg(OH)2 + 2F- + 2H+
log_k 12.5652
delta_h -165.186 kJ
HgCl(g)
HgCl = 0.5Hg2+2 + Cl-
log_k 19.4966
delta_h -162.095 kJ
HgBr(g)
HgBr = 0.5Hg2+2 + Br-
log_k 16.7566
delta_h -142.157 kJ
HgBr2(g)
HgBr2 + 2H2O = Hg(OH)2 + 2Br- + 2H+
log_k -18.3881
delta_h 54.494 kJ
HgI(g)
HgI = 0.5Hg2+2 + I-
log_k 11.3322
delta_h -106.815 kJ
HgI2(g)
HgI2 + 2H2O = Hg(OH)2 + 2I- + 2H+
log_k -27.2259
delta_h 114.429 kJ
SURFACE_MASTER_SPECIES
Hfo_s Hfo_sOH
Hfo_w Hfo_wOH
Hao_ Hao_OH #hydrous aluminum oxides - gibbsite
SURFACE_SPECIES
Hfo_wOH = Hfo_wOH
log_k 0.0
Hfo_sOH = Hfo_sOH
log_k 0.0
Hao_OH = Hao_OH
log_k 0.0

Hfo_sOH + H+ = Hfo_sOH2+
log_k 7.29
delta_h 0 kJ
# Id: 8113302
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_sOH = Hfo_sO- + H+
log_k -8.93
delta_h 0 kJ
# Id: 8113301
# log K source:
```

```
# Delta H source:
#T and ionic strength:
Hfo_wOH + H+ = Hfo_wOH2+
log_k 7.29
delta_h 0 kJ
# Id: 8123302
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_wOH = Hfo_wO- + H+
log_k -8.93
delta_h 0 kJ
# Id: 8123301
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_sOH + Ba+2 = Hfo_sOHBa+2
log_k 5.46
delta_h 0 kJ
# Id: 8111000
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_wOH + Ba+2 = Hfo_wOBa+ + H+
log_k -7.2
delta_h 0 kJ
# Id: 8121000
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_sOH + Ca+2 = Hfo_sOHCa+2
log_k 4.97
delta_h 0 kJ
# Id: 8111500
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_wOH + Ca+2 = Hfo_wOCa+ + H+
log_k -5.85
delta_h 0 kJ
# Id: 8121500
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_wOH + Mg+2 = Hfo_wOMg+ + H+
log_k -4.6
delta_h 0 kJ
# Id: 8124600
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_sOH + Ag+ = Hfo_sOAg + H+
log_k -1.72
delta_h 0 kJ
```

```
# Id: 8110200
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_wOH + Ag+ = Hfo_wOAg + H+
log_k -5.3
delta_h 0 kJ
# Id: 8120200
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_sOH + Ni+2 = Hfo_sONi+ + H+
log_k 0.37
delta_h 0 kJ
# Id: 8115400
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_wOH + Ni+2 = Hfo_wONi+ + H+
log_k -2.5
delta_h 0 kJ
# Id: 8125400
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_sOH + Cd+2 = Hfo_sOCd+ + H+
log_k 0.47
delta_h 0 kJ
# Id: 8111600
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_wOH + Cd+2 = Hfo_wOCd+ + H+
log_k -2.9
delta_h 0 kJ
# Id: 8121600
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_sOH + Co+2 = Hfo_sOCo+ + H+
log_k -0.46
delta_h 0 kJ
# Id: 8112000
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_wOH + Co+2 = Hfo_wOCo+ + H+
log_k -3.01
delta_h 0 kJ
# Id: 8122000
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_sOH + Zn+2 = Hfo_sOZn+ + H+
```

```
log_k 0.99
delta_h 0 kJ
# Id: 8119500
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_wOH + Zn+2 = Hfo_wOZn+ + H+
log_k -1.99
delta_h 0 kJ
# Id: 8129500
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_sOH + Cu+2 = Hfo_sOCu+ + H+
log_k 2.89
delta_h 0 kJ
# Id: 8112310
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_wOH + Cu+2 = Hfo_wOCu+ + H+
log_k 0.6
delta_h 0 kJ
# Id: 8123100
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_sOH + Pb+2 = Hfo_sOPb+ + H+
log_k 4.65
delta_h 0 kJ
# Id: 8116000
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_wOH + Pb+2 = Hfo_wOPb+ + H+
log_k 0.3
delta_h 0 kJ
# Id: 8126000
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_sOH + Be+2 = Hfo_sOBe+ + H+
log_k 5.7
delta_h 0 kJ
# Id: 8111100
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_wOH + Be+2 = Hfo_wOBe+ + H+
log_k 3.3
delta_h 0 kJ
# Id: 8121100
# log K source:
# Delta H source:
```

#T and ionic strength:
Hfo_sOH + Hg(OH)2 + H+ = Hfo_sOHg+ + 2H2O
log_k 13.95
delta_h 0 kJ
Id: 8113610
log K source:
Delta H source:
#T and ionic strength:
Hfo_wOH + Hg(OH)2 + H+ = Hfo_wOHg+ + 2H2O
log_k 12.64
delta_h 0 kJ
Id: 8123610
log K source:
Delta H source:
#T and ionic strength:
Hfo_sOH + Sn(OH)2 + H+ = Hfo_sOSn+ + 2H2O
log_k 15.1
delta_h 0 kJ
Id: 8117900
log K source:
Delta H source:
#T and ionic strength:
Hfo_wOH + Sn(OH)2 + H+ = Hfo_wOSn+ + 2H2O
log_k 13
delta_h 0 kJ
Id: 8127900
log K source:
Delta H source:
#T and ionic strength:
Hfo_sOH + Cr(OH)2+ = Hfo_sOCrOH+ + H2O
log_k 11.63
delta_h 0 kJ
Id: 8112110
log K source:
Delta H source:
#T and ionic strength:
Hfo_sOH + H3AsO3 = Hfo_sH2AsO3 + H2O
log_k 5.41
delta_h 0 kJ
Id: 8110600
log K source:
Delta H source:
#T and ionic strength:
Hfo_wOH + H3AsO3 = Hfo_wH2AsO3 + H2O
log_k 5.41
delta_h 0 kJ
Id: 8120600
log K source:
Delta H source:
#T and ionic strength:
Hfo_sOH + H3BO3 = Hfo_sH2BO3 + H2O
log_k 0.62
delta_h 0 kJ
Id: 8110900

```
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_wOH + H3BO3 = Hfo_wH2BO3 + H2O
log_k 0.62
delta_h 0 kJ
# Id: 8120900
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_sOH + PO4-3 + 3H+ = Hfo_sH2PO4 + H2O
log_k 31.29
delta_h 0 kJ
# Id: 8115800
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_wOH + PO4-3 + 3H+ = Hfo_wH2PO4 + H2O
log_k 31.29
delta_h 0 kJ
# Id: 8125800
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_sOH + PO4-3 + 2H+ = Hfo_sHPO4- + H2O
log_k 25.39
delta_h 0 kJ
# Id: 8115801
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_wOH + PO4-3 + 2H+ = Hfo_wHPO4- + H2O
log_k 25.39
delta_h 0 kJ
# Id: 8125801
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_sOH + PO4-3 + H+ = Hfo_sPO4-2 + H2O
log_k 17.72
delta_h 0 kJ
# Id: 8115802
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_wOH + PO4-3 + H+ = Hfo_wPO4-2 + H2O
log_k 17.72
delta_h 0 kJ
# Id: 8125802
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_sOH + H3AsO4 = Hfo_sH2AsO4 + H2O
log_k 8.61
```

delta_h 0 kJ
Id: 8110610
log K source:
Delta H source:
#T and ionic strength:
Hfo_wOH + H3AsO4 = Hfo_wH2AsO4 + H2O
log_k 8.61
delta_h 0 kJ
Id: 8120610
log K source:
Delta H source:
#T and ionic strength:
Hfo_sOH + H3AsO4 = Hfo_sHAsO4- + H2O + H+
log_k 2.81
delta_h 0 kJ
Id: 8110611
log K source:
Delta H source:
#T and ionic strength:
Hfo_wOH + H3AsO4 = Hfo_wHAsO4- + H2O + H+
log_k 2.81
delta_h 0 kJ
Id: 8120611
log K source:
Delta H source:
#T and ionic strength:
Hfo_sOH + H3AsO4 = Hfo_sOHAsO4-3 + 3H+
log_k -10.12
delta_h 0 kJ
Id: 8110613
log K source:
Delta H source:
#T and ionic strength:
Hfo_wOH + H3AsO4 = Hfo_wOHAsO4-3 + 3H+
log_k -10.12
delta_h 0 kJ
Id: 8120613
log K source:
Delta H source:
#T and ionic strength:
Hfo_sOH + VO2+ + 2H2O = Hfo_sOHVO4-3 + 4H+
log_k -16.63
delta_h 0 kJ
Id: 8119031
log K source:
Delta H source:
#T and ionic strength:
Hfo_wOH + VO2+ + 2H2O = Hfo_wOHVO4-3 + 4H+
log_k -16.63
delta_h 0 kJ
Id: 8129031
log K source:
Delta H source:
#T and ionic strength:

Hfo_sOH + SO4-2 + H+ = Hfo_sSO4- + H2O
log_k 7.78
delta_h 0 kJ
Id: 8117320
log K source:
Delta H source:
#T and ionic strength:
Hfo_wOH + SO4-2 + H+ = Hfo_wSO4- + H2O
log_k 7.78
delta_h 0 kJ
Id: 8127320
log K source:
Delta H source:
#T and ionic strength:
Hfo_sOH + SO4-2 = Hfo_sOHSO4-2
log_k 0.79
delta_h 0 kJ
Id: 8117321
log K source:
Delta H source:
#T and ionic strength:
Hfo_wOH + SO4-2 = Hfo_wOHSO4-2
log_k 0.79
delta_h 0 kJ
Id: 8127321
log K source:
Delta H source:
#T and ionic strength:
Hfo_sOH + HSeO3- = Hfo_sSeO3- + H2O
log_k 4.29
delta_h 0 kJ
Id: 8117610
log K source:
Delta H source:
#T and ionic strength:
Hfo_wOH + HSeO3- = Hfo_wSeO3- + H2O
log_k 4.29
delta_h 0 kJ
Id: 8127610
log K source:
Delta H source:
#T and ionic strength:
Hfo_sOH + HSeO3- = Hfo_sOHSeO3-2 + H+
log_k -3.23
delta_h 0 kJ
Id: 8117611
log K source:
Delta H source:
#T and ionic strength:
Hfo_wOH + HSeO3- = Hfo_wOHSeO3-2 + H+
log_k -3.23
delta_h 0 kJ
Id: 8127611
log K source:

```
# Delta H source:
#T and ionic strength:
Hfo_sOH + SeO4-2 + H+ = Hfo_sSeO4- + H2O
log_k 7.73
delta_h 0 kJ
# Id: 8117620
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_wOH + SeO4-2 + H+ = Hfo_wSeO4- + H2O
log_k 7.73
delta_h 0 kJ
# Id: 8127620
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_sOH + SeO4-2 = Hfo_sOHSeO4-2
log_k 0.8
delta_h 0 kJ
# Id: 8117621
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_wOH + SeO4-2 = Hfo_wOHSeO4-2
log_k 0.8
delta_h 0 kJ
# Id: 8127621
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_sOH + CrO4-2 + H+ = Hfo_sCrO4- + H2O
log_k 10.85
delta_h 0 kJ
# Id: 8112120
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_wOH + CrO4-2 + H+ = Hfo_wCrO4- + H2O
log_k 10.85
delta_h 0 kJ
# Id: 8122120
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_sOH + CrO4-2 = Hfo_sOHCrO4-2
log_k 3.9
delta_h 0 kJ
# Id: 8112121
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_wOH + CrO4-2 = Hfo_wOHCrO4-2
log_k 3.9
delta_h 0 kJ
```

Id: 8122121
log K source:
Delta H source:
#T and ionic strength:
Hfo_sOH + MoO4-2 + H+ = Hfo_sMoO4- + H2O
log_k 9.5
delta_h 0 kJ
Id: 8114800
log K source:
Delta H source:
#T and ionic strength:
Hfo_wOH + MoO4-2 + H+ = Hfo_wMoO4- + H2O
log_k 9.5
delta_h 0 kJ
Id: 8124800
log K source:
Delta H source:
#T and ionic strength:
Hfo_sOH + MoO4-2 = Hfo_sOHMoO4-2
log_k 2.4
delta_h 0 kJ
Id: 8114801
log K source:
Delta H source:
#T and ionic strength:
Hfo_wOH + MoO4-2 = Hfo_wOHMoO4-2
log_k 2.4
delta_h 0 kJ
Id: 8124801
log K source:
Delta H source:
#T and ionic strength:
Hfo_sOH + Sb(OH)6- + H+ = Hfo_sSbO(OH)4 + 2H2O
log_k 8.4
delta_h 0 kJ
Id: 8117410
log K source:
Delta H source:
#T and ionic strength:
Hfo_wOH + Sb(OH)6- + H+ = Hfo_wSbO(OH)4 + 2H2O
log_k 8.4
delta_h 0 kJ
Id: 8127410
log K source:
Delta H source:
#T and ionic strength:
Hfo_sOH + Sb(OH)6- = Hfo_sOHSbO(OH)4- + H2O
log_k 1.3
delta_h 0 kJ
Id: 8117411
log K source:
Delta H source:
#T and ionic strength:
Hfo_wOH + Sb(OH)6- = Hfo_wOHSbO(OH)4- + H2O

```
log_k 1.3
delta_h 0 kJ
# Id: 8127411
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_sOH + Cyanide- + H+ = Hfo_sCyanide + H2O
log_k 13
delta_h 0 kJ
# Id: 8111430
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_wOH + Cyanide- + H+ = Hfo_wCyanide + H2O
log_k 13
delta_h 0 kJ
# Id: 8121430
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_sOH + Cyanide- = Hfo_sOHCyanide-
log_k 5.7
delta_h 0 kJ
# Id: 8111431
# log K source:
# Delta H source:
#T and ionic strength:
Hfo_wOH + Cyanide- = Hfo_wOHCyanide-
log_k 5.7
delta_h 0 kJ
# Id: 8121431
# log K source:
# Delta H source:
#T and ionic strength:
#Additions from GWB Minteq
Hfo_wOH + H4SiO4 = Hfo_wOSi(OH)3 + H2O
log_k 4.28
delta_h 0 kJ
Hfo_wOH + H4SiO4 = Hfo_wOSiO(OH)2- + H+ + H2O
log_k -3.22
delta_h 0 kJ
Hfo_sOH + H4SiO4 = Hfo_sOSi(OH)3 + H2O
log_k 4.28
delta_h 0
Hfo_sOH + H4SiO4 = Hfo_sOSiO(OH)2- + H+ + H2O
log_k -3.22
delta_h 0
Hfo_wOH + CO3-2 + H+ = Hfo_wCO3- + H2O
log_k 12.56
delta_h 0
Hfo_wOH + CO3-2 + 2H+= Hfo_wHCO3 + H2O
log_k 20.62
delta_h 0
Hfo_sOH + CO3-2 + H+ = Hfo_sCO3- + H2O
```

```
log_k 12.56
delta_h 0
Hfo_sOH + CO3-2 + 2H+= Hfo_sHCO3 + H2O
log_k 20.62
delta_h 0

#Karamalidis and Dzombak sorption to gibbsite (hao) as compiled in Cravotta 2021 (https://doi.org/10.1016/j.apgeochem.2020.104845) Table S4 unless otherwise noted
Hao_OH + Cu+2 = Hao_OCu+ + H+
log_k 0.25
Hao_OH + Pb+2 = Hao_OPb+ + H+
log_k 0.37
Hao_OH + Co+2 = Hao_OCo+ + H+
log_k -2.52
Hao_OH + Cd+2 = Hao_OCd+ + H+
log_k -2.73
Hao_OH + Mn+2 = Hao_OMn+ + H+
log_k -5.49
Hao_OH + Fe+2 = Hao_OFe+ + H+
log_k -3.77
Hao_OH + Ca+2 = Hao_OCa+ + H+
log_k -10.49
Hao_OH + Mg+2 = Hao_OMg+ + H+
log_k -5.93
Hao_OH + Ba+2 = Hao_OBa+ + H+
log_k -8.5
Hao_OH + Sr+2 = Hao_OSr+ + H+
log_k -8.26
Hao_OH + Zn+2 = Hao_OZn+ + H+
log_k -0.96
Hao_OH + PO4-3 + 3 H+ = Hao_H2PO4 + H2O
log_k 26.89
Hao_OH + PO4-3 + 2H+ = Hao_HPO4- + H2O
log_k 19.37
Hao_OH + PO4-3 + H+ = Hao_PO4-2 + H2O
log_k 13.57
#Hao_OH + SO4-2 + H+ = Hao_SO4- + H2O
# log_k -0.45
#Hao_OH + SO4-2 = Hao_OHSO4-2
# log_k 1.19
Hao_OH + F- + H+ = Hao_F + H2O
log_k 8.78
Hao_OH + F- = Hao_OHF-
log_k 2.88
Hao_OH + 2 F- + H+ = Hao_F2- + H2O
log_k 11.94
Hao_OH + H4SiO4 = Hao_OH4SiO4- + H+
log_k -4.16

#Modified value from Goldberg and Glaubig (1985)
Hao_OH + H3BO3 = Hao_H2BO3 + H2O
Log_k 4.83
Hao_OH + H3BO3 = Hao_H3BO4- + H+
Log_k -7.40

#Modified value from Kitadai et al. (2018)
```

```
Hao_OH + SO4-2 + H+ = Hao_SO4- + H2O
log_k 2.4
#Modified value from Kitadai et al. (2018)
Hao_OH + SO4-2 = Hao_OHSO4-2
log_k 7.5

END
```

ATTACHMENT C
Details of Geochemical Model Parameterization

Attachment C. Details of Geochemical Model Parameterization

Introduction

This appendix to the Groundwater Polishing Report for the Baldwin Fly Ash Pond System (FAPS) provides detailed information regarding geochemical model parameterization. The information provided includes sources of thermodynamic data, sources of data used in model parameterization, summarized values, and calculation methods. All solid-phase data is fully documented in the Nature and Extent Report.[1] All aqueous data have been posted to the facility's operating record in accordance with 35 I.A.C. § 845.800(d)(15).

Solid Phase Inputs

The solid phase inputs to the model included iron (hydr)oxides and aluminum (hydr)oxides. These phases tend to have relatively rapid precipitation kinetics and form an outer layer on the surfaces of aquifer solids, creating surface area for sorption and attenuation of boron. Input concentrations for iron and aluminum (hydr)oxides are ideally derived using sequential extraction procedure (SEP) data. SEP methods are described in the Geochemical Conceptual Site Model (GCSM)[2] and employ chemical extractants to dissolve metals from specific solid-associated phases. SEP methods use progressively stronger reagents to solubilize metals from increasingly recalcitrant phases. Although these procedures do not identify the discrete solid phases in a soil/aquifer matrix, they provide a means to evaluate and characterize the metal binding mechanisms and relative stability of metals in each phase, and to estimate the available mass of the respective attenuating phase(s) (i.e., aluminum and iron [hydr]oxide). However, SEP analyses of aluminum were not completed for Baldwin FAPS samples, and SEP analyses of iron completed for FAPS samples did not include the critical amorphous extraction step. The dataset constraints necessitated alternative means of deriving oxide inputs.

Because Baldwin FAPS SEP analyses did not include aluminum or an amorphous iron fraction, model input concentrations for ferrihydrite and gibbsite were derived using site-specific total metals and the proportion of total metals as crystalline metal oxides (aluminum) or amorphous metal oxides (iron) compiled from SEP datasets consisting of samples collected from similar geologic systems at various power generating facilities across Illinois. Much of the Baldwin FAPS PMP consists of the Cahokia Formation, so the analogous dataset for the PMP is comprised of samples collected from various power generating facilities across Illinois specifically within the Cahokia Formation. The

[1] The Nature and Extent Report was previously submitted to IEPA on April 3, 2024, and provided with relevant updates as Appendix D of the CAAA to which this report is attached.
[2] Ibid.; the GCSM is an appendix of the Nature and Extent Report.

FAPS UA consists of a bedrock formation which was not sampled at other Illinois power generating facilities; therefore, the UA analogous dataset is comprised of numerous samples collected from multiple geologic units at power generating facilities across Illinois. The geologic similarity (regional geology, similar lithologies and depositional environments, similar mineral assemblages) between the samples comprising these datasets and the Baldwin FAPS subsurface make these datasets appropriate for estimating the amount and distribution of sorbing solid phases in the absence of a complete site-specific dataset.

SEP data for iron and aluminum is available for 25 solid phase samples across six distinct hydrostratigraphic units (UA analogous dataset), of which 17 solid phase samples are specifically from the Cahokia Formation (PMP analogous dataset).

Total solid-phase iron was measured in eleven site-specific PMP/UA solids samples (two from the PMP, nine from the UA) at concentrations ranging from 5,500 milligrams per kilogram (mg/kg) to 38,000 mg/kg. Iron SEP analyses were completed for four PMP solids samples and four UA solids samples. The crystalline iron oxide component for the UA was determined by applying the average oxide fraction result from iron SEP analyses from UA samples to the average total iron concentration from UA samples. The crystalline iron oxide component for the PMP was determined by applying the average oxide fraction result from iron SEP analysis from the PMP to the average total iron concentration from all Baldwin FAPS samples. The amorphous ferrihydrite components for both hydrostratigraphic units were based on the 25th percentile of amorphous ferrihydrite distribution in each applicable analogous compiled SEP dataset.

The gibbsite component of the models was determined using the average mass of aluminum associated with the oxide fraction from each compiled SEP dataset described above.

In thermodynamic modeling, the amount of sorbing phase present is typically the dominant control on the concentration of constituents sorbed under a given pH. Therefore, different amounts of metal oxides were used to test the sensitivity of the model to the amount of sorbing phase present. The amount of metal oxides used were derived from the 25th percentile, median (*i.e.*, 50th percentile), and 75th percentile of the SEP results for the relevant iron and aluminum phases.

Sorption of inorganic constituents to iron (hydr)oxides in the MINTEQ v4 database[3] is represented by the hydrous ferric oxide (HFO) thermodynamic dataset presented in Dzombak and Morel (1990). Sorption of inorganic constituents to aluminum (hydr)oxides is represented by the hydrous aluminum oxide (HAO) thermodynamic data presented in Karamalidis and Dzombak (2010), Goldberg and Glaubig (1985) (boron), and Kitadai et al. (2018) (sulfate). These sorption data are based on gibbsite, a nearly ubiquitous crystalline aluminum hydroxide mineral (Karamalidis and Dzombak 2010).

The quantities of HFO and HAO in the model are represented by ferrihydrite ($Fe(OH)_3$) and gibbsite ($Al(OH)_3$), respectively. Ferrihydrite is the most similar naturally occurring iron oxide to HFO (Dzombak and Morel, 1990), and sorption data for HAO was determined using gibbsite (Karamalidis and Dzombak 2010). Metal concentrations are presented in milligrams per kilogram

[3] The default MINTEQ v4 database for PHREEQC does not include sorption data for carbonate and silicate to HFO. Thermodynamic constants for sorption of carbonate and silicate to HFO were added from the MINTEQ database associated with the Geochemist's Workbench software program.

of dry weight (mg/kg dw), whereas ferrihydrite and gibbsite inputs to the model represent moles of solid phase associated with one liter (L) of aqueous phase. The concentrations of iron and aluminum were converted to moles of ferrihydrite and gibbsite (respectively) according to the following:

The mass in kilograms (kg) of solid in the model (i.e., per 1 L of water) was calculated by:

$$Solid\ Mass\ In\ Model\ (kg) = \frac{(1-\phi)}{\phi} \times \frac{1000\ cm^3\ water}{L\ water} \times 1\ L\ water\ \times \rho\ \times \frac{1\ kg\ solid}{1000\ g\ solid}$$

Where:

ϕ = porosity (water volume in cubic centimeters [cm^3] / total volume in cm^3)

ρ = density of the solid (grams [g]/cm^3)

Porosity and density represent the median of measurements each hydrostratigraphic unit as reported in the Hydrogeologic Characterization Report[4].

Moles of ferrihydrite and gibbsite were determined using metal concentrations as described above, the molar mass of iron or aluminum, and the mass of solid phase in the model:

$$Moles\ of\ Metal\ Oxide = \frac{mg\ Fe\ or\ Al}{kg\ solid} \times \frac{g}{1000\ mg} \times \frac{moles\ Fe\ or\ Al}{g\ Fe\ or\ Al} \times kg\ Solid\ Mass\ in\ Model$$

The moles of ferrihydrite and gibbsite are represented by moles of Fe or Al (respectively) in a 1:1 ratio mased on the mineral formula. Ferrihydrite and gibbsite were allowed to precipitate or dissolve in the reaction phase of the model to evaluate the impact of source control on sorbing phase availability.

Calcite and dolomite were included as mineral phases in the model because carbonate mineral formation and dissolution are often major controls on groundwater pH. Calcite and dolomite are common carbonate minerals and were detected at levels of greater than 1% by weight in X-ray diffraction (XRD) analysis and are therefore considered to be present in excess within the aquifer. Therefore, the mass fractions reported in the XRD are used as model inputs. Both calcite and dolomite were allowed to precipitate in the reaction phase of the model.

Barite and gypsum are common sulfate minerals that have the potential to form under ambient environmental conditions. Neither mineral was detected in XRD results at well locations containing exceedances of GWPSs. Therefore, barite and gypsum did not have initial concentrations in the model but were allowed to precipitate or dissolve in the reaction phase of the model.

[4] The Hydrogeologic Characterization Report was previously submitted to IEPA as part of the Closure Permit Application and is provided as Appendix B.3 to the Construction Permit Application.

Aqueous Inputs

In addition to the constituent of concern boron, the following parameters are included in the model and are anticipated to capture the expected attenuation and mobilization mechanisms for reasons detailed below:

- Temperature, pH and pe: pH and pe (a measure of redox potential) are major controls on chemical attenuation and mobility.
- Chloride, potassium, and sodium: Major ions in groundwater typically required for the model to reach charge balance.
- Carbonate ion, calcium, and magnesium: Major ions in groundwater that may also form common minerals, including carbonates. Carbonate mineral formation and dissolution is often a major control on groundwater pH. Bicarbonate and carbonate ions, a major component of groundwater alkalinity, may also compete with sulfate/boron for sorbing sites.
- Silicon and phosphate: Silicate and phosphate are oxyanions that compete with sulfate/boron for sorbing sites.
- Aluminum, iron, and manganese: As discussed above, iron and aluminum form reactive metal (hydr)oxide minerals which have high capacities for sorbing other ions on their surfaces. Although sorption to manganese oxides was not considered in this model, manganese behaves similarly to iron and is included for completeness.
- Remaining constituents regulated under 35 IAC § 845.600[5]: Although these parameters are not subject to corrective action at NEW PAP, they are included in the model for completeness.

Values for pe and carbonate ion concentrations were derived from values previously reported in the analytical data according to the following methods.

pe is a non-dimension scale of redox potential and is calculated from oxidation reduction potential (ORP). First, the field-measured ORP was converted to Eh (i.e., the redox potential normalized to the standard hydrogen electrode). The following equation provided in the Horiba water quality meter instruction manual[6] was used:

$$Eh = ORP + 206 - 0.7*(T - 25)$$

Where both Eh and ORP are in volts (V) and T is temperature in degrees Celsius. Eh is then converted to pe:

$$pe = (Eh * F) / (2.303 * R * T)$$

Where:

F = Faraday constant (96,500 Joules (J) / V-equivalent)

---

[5] Mercury, thallium, total dissolved solids, and radium were not included in the model. Mercury reactions within the environment are highly complex and would require a separate modeling effort. Thallium forms a non-reactive monovalent cation and is rarely detected in the groundwater and is therefore not expected to contribute to model outcomes. Total dissolved solids are not a chemical parameter, but rather the result of other chemical abundances taken together. Radium is not included in most thermodynamic databases.

[6] https://static.horiba.com/fileadmin/Horiba/Products/Process_and_Environmental/Water_Pollution/Instruction_Manuals/U-50/U-50_Manual.pdf

R = Molar gas constant (8.31 J / Kelvin (K)-mole)

T = temperature in Kelvin

Data reported for groundwater at the site include carbonate and bicarbonate alkalinity in units of mg of calcium carbonate per liter (mg $CaCO_3$/L). For use in modeling, it is convenient to convert these values to a single carbonate (CO_3^{2-}) ion concentration. Because carbonate and bicarbonate alkalinity are reported in the same units (i.e., standardized to mg $CaCO_3$) and represent different protonation states of the same inorganic carbon oxyanion, they were summed to represent total alkalinity due to carbonate. This summed alkalinity was converted to concentration of carbonate ion according to the following equation:

$$\frac{mg\ CO_3^{2-}}{L} = \frac{mg\ CaCO_3}{L} \times \frac{mole\ CaCO_3}{100.1\ mg\ CaCO_3} \times \frac{1\ mole\ CO_3^{2-}}{1\ mole\ CaCO_3} \times \frac{60\ mg\ CO_3^{2-}}{mole\ CO_3^{2-}}$$

The full suite of geochemical parameters for this model was measured in Quarter 2 and Quarter 3, 2023, for wells MW-150 and MW-152, and Quarter 1, 2024 for wells MW-252 and MW-366. The medians of these results were used in the model to represent average groundwater interacting with the solid phase. For downgradient wells the median for each parameter was calculated for each location individually. For background wells, a single median for each parameter was calculated using data from all three background locations measured in Quarter 2 and Quarter 3, 2023.

The model was run without charge balancing and with charge balancing on chloride. The results during the reaction modeling did not substantially differ with and without charge balancing on chloride. The results presented in the Groundwater Polishing Report therefore represent the model results using charge balancing on chloride.

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ATTACHMENT D
Complete Geochemical Modeling Outputs

Attachment D. PHREEQC modeling output
Groundwater Polishing Report
Fly Ash Pond System
Baldwin Power Plant
Baldwin, IL

Location	Location Description	Model	Charge Balance	Solids Summary
MW-150	C - PMP	Initial Soln	TRUE	25p
MW-152	C - PMP	Initial Soln	TRUE	25p
MW-252	C - PMP	Initial Soln	TRUE	25p
MW-366	C - UA	Initial Soln	TRUE	25p
MW-150	C - PMP	Speciation Model	TRUE	25p
MW-152	C - PMP	Speciation Model	TRUE	25p
MW-252	C - PMP	Speciation Model	TRUE	25p
MW-366	C - UA	Speciation Model	TRUE	25p
MW-150	C - PMP	First Reaction	TRUE	25p
MW-150	C - PMP	Second Reaction	TRUE	25p
MW-152	C - PMP	First Reaction	TRUE	25p
MW-152	C - PMP	Second Reaction	TRUE	25p
MW-252	C - PMP	First Reaction	TRUE	25p
MW-252	C - PMP	Second Reaction	TRUE	25p
MW-366	C - UA	First Reaction	TRUE	25p
MW-366	C - UA	Second Reaction	TRUE	25p
MW-150	C - PMP	Initial Soln	TRUE	75p
MW-152	C - PMP	Initial Soln	TRUE	75p
MW-252	C - PMP	Initial Soln	TRUE	75p
MW-366	C - UA	Initial Soln	TRUE	75p
MW-150	C - PMP	Speciation Model	TRUE	75p
MW-152	C - PMP	Speciation Model	TRUE	75p
MW-252	C - PMP	Speciation Model	TRUE	75p
MW-366	C - UA	Speciation Model	TRUE	75p
MW-150	C - PMP	First Reaction	TRUE	75p
MW-150	C - PMP	Second Reaction	TRUE	75p
MW-152	C - PMP	First Reaction	TRUE	75p
MW-152	C - PMP	Second Reaction	TRUE	75p
MW-252	C - PMP	First Reaction	TRUE	75p
MW-252	C - PMP	Second Reaction	TRUE	75p
MW-366	C - UA	First Reaction	TRUE	75p
MW-366	C - UA	Second Reaction	TRUE	75p
MW-150	C - PMP	Initial Soln	TRUE	median
MW-152	C - PMP	Initial Soln	TRUE	median
MW-252	C - PMP	Initial Soln	TRUE	median
MW-366	C - UA	Initial Soln	TRUE	median
MW-150	C - PMP	Speciation Model	TRUE	median
MW-152	C - PMP	Speciation Model	TRUE	median
MW-252	C - PMP	Speciation Model	TRUE	median
MW-366	C - UA	Speciation Model	TRUE	median
MW-150	C - PMP	First Reaction	TRUE	median
MW-150	C - PMP	Second Reaction	TRUE	median
MW-152	C - PMP	First Reaction	TRUE	median

MW-152	C - PMP	Second Reaction	TRUE	median
MW-252	C - PMP	First Reaction	TRUE	median
MW-252	C - PMP	Second Reaction	TRUE	median
MW-366	C - UA	First Reaction	TRUE	median
MW-366	C - UA	Second Reaction	TRUE	median
MW-150	C - PMP	Initial Soln	FALSE	25p
MW-152	C - PMP	Initial Soln	FALSE	25p
MW-252	C - PMP	Initial Soln	FALSE	25p
MW-366	C - UA	Initial Soln	FALSE	25p
MW-150	C - PMP	Speciation Model	FALSE	25p
MW-152	C - PMP	Speciation Model	FALSE	25p
MW-252	C - PMP	Speciation Model	FALSE	25p
MW-366	C - UA	Speciation Model	FALSE	25p
MW-150	C - PMP	First Reaction	FALSE	25p
MW-150	C - PMP	Second Reaction	FALSE	25p
MW-152	C - PMP	First Reaction	FALSE	25p
MW-152	C - PMP	Second Reaction	FALSE	25p
MW-252	C - PMP	First Reaction	FALSE	25p
MW-252	C - PMP	Second Reaction	FALSE	25p
MW-366	C - UA	First Reaction	FALSE	25p
MW-366	C - UA	Second Reaction	FALSE	25p
MW-150	C - PMP	Initial Soln	FALSE	75p
MW-152	C - PMP	Initial Soln	FALSE	75p
MW-252	C - PMP	Initial Soln	FALSE	75p
MW-366	C - UA	Initial Soln	FALSE	75p
MW-150	C - PMP	Speciation Model	FALSE	75p
MW-152	C - PMP	Speciation Model	FALSE	75p
MW-252	C - PMP	Speciation Model	FALSE	75p
MW-366	C - UA	Speciation Model	FALSE	75p
MW-150	C - PMP	First Reaction	FALSE	75p
MW-150	C - PMP	Second Reaction	FALSE	75p
MW-152	C - PMP	First Reaction	FALSE	75p
MW-152	C - PMP	Second Reaction	FALSE	75p
MW-252	C - PMP	First Reaction	FALSE	75p
MW-252	C - PMP	Second Reaction	FALSE	75p
MW-366	C - UA	First Reaction	FALSE	75p
MW-366	C - UA	Second Reaction	FALSE	75p
MW-150	C - PMP	Initial Soln	FALSE	median
MW-152	C - PMP	Initial Soln	FALSE	median
MW-252	C - PMP	Initial Soln	FALSE	median
MW-366	C - UA	Initial Soln	FALSE	median
MW-150	C - PMP	Speciation Model	FALSE	median
MW-152	C - PMP	Speciation Model	FALSE	median
MW-252	C - PMP	Speciation Model	FALSE	median
MW-366	C - UA	Speciation Model	FALSE	median
MW-150	C - PMP	First Reaction	FALSE	median
MW-150	C - PMP	Second Reaction	FALSE	median
MW-152	C - PMP	First Reaction	FALSE	median
MW-152	C - PMP	Second Reaction	FALSE	median
MW-252	C - PMP	First Reaction	FALSE	median

MW-252	C - PMP	Second Reaction	FALSE	median
MW-366	C - UA	First Reaction	FALSE	median
MW-366	C - UA	Second Reaction	FALSE	median

NOTES:

All model results are in units of moles with the exceptions of:

pH and pe (standard units)

charge (equivalents)

Results beginning with 'd_' (change from prior model step)

Results beginning with 'si_' (saturation index)

pH	pe	charge	pct_err	S(6)
7.05	3.36	1.18e-17	2.62e-14	0.00950
6.93	5.81	8.00e-18	2.36e-14	0.00508
6.71	3.79	3.13e-17	8.07e-14	0.00470
6.87	5.37	-1.91e-16	-6.12e-13	0.00520
7.05	3.36	1.35e-17	3.00e-14	0.00950
6.93	5.81	1.49e-17	4.40e-14	0.00508
6.71	3.79	3.99e-17	1.03e-13	0.00470
6.87	5.37	-1.93e-16	-6.17e-13	0.00520
7.78	1.34	0.000145	0.172	0.00114
7.87	1.17	1.22e-05	0.0145	0.00104
7.70	2.90	0.000179	0.212	0.00108
7.81	2.47	1.89e-05	0.0225	0.00102
7.61	0.626	0.000162	0.190	0.00116
7.76	0.274	9.50e-06	0.0113	0.00106
7.61	2.86	0.000324	0.381	0.00114
7.73	2.42	3.31e-05	0.0393	0.00104
7.05	3.36	1.18e-17	2.62e-14	0.00950
6.93	5.81	8.00e-18	2.36e-14	0.00508
6.71	3.79	3.13e-17	8.07e-14	0.00470
6.87	5.37	-1.91e-16	-6.12e-13	0.00520
7.05	3.36	1.35e-17	3.00e-14	0.00950
6.93	5.81	1.49e-17	4.40e-14	0.00508
6.71	3.79	3.99e-17	1.03e-13	0.00470
6.87	5.37	-1.93e-16	-6.17e-13	0.00520
7.70	1.37	0.000160	0.186	0.00150
7.82	1.19	-3.79e-06	-4.48e-03	0.00115
7.61	3.36	0.000457	0.535	0.00121
7.74	3.06	5.80e-05	0.0687	0.00106
7.50	0.795	0.000360	0.414	0.00141
7.66	0.488	-1.25e-05	-1.47e-02	0.00120
7.46	3.35	0.00108	1.25	0.00139
7.57	3.07	0.000161	0.189	0.00108
7.05	3.36	1.18e-17	2.62e-14	0.00950
6.93	5.81	8.00e-18	2.36e-14	0.00508
6.71	3.79	3.13e-17	8.07e-14	0.00470
6.87	5.37	-1.91e-16	-6.12e-13	0.00520
7.05	3.36	1.35e-17	3.00e-14	0.00950
6.93	5.81	1.49e-17	4.40e-14	0.00508
6.71	3.79	3.99e-17	1.03e-13	0.00470
6.87	5.37	-1.93e-16	-6.17e-13	0.00520
7.75	1.37	0.000184	0.217	0.00122
7.85	1.21	2.17e-05	0.0259	0.00106
7.66	3.14	0.000265	0.313	0.00111

7.78	2.76	3.27e-05	0.0388	0.00103
7.56	0.722	0.000231	0.269	0.00123
7.72	0.404	1.52e-05	0.0180	0.00109
7.52	3.18	0.000647	0.757	0.00125
7.64	2.86	8.16e-05	0.0963	0.00106
7.05	3.36	0.00473	11.8	0.00950
6.93	5.81	0.00565	20.1	0.00508
6.71	3.79	0.00832	27.6	0.00470
6.87	5.37	0.00438	16.4	0.00520
7.05	3.36	0.00473	11.8	0.00950
6.93	5.81	0.00565	20.1	0.00508
6.71	3.79	0.00832	27.6	0.00470
6.87	5.37	0.00438	16.4	0.00520
7.78	1.33	0.000153	0.181	0.00113
7.87	1.16	1.26e-05	0.0150	0.00104
7.70	2.89	0.000186	0.220	0.00107
7.81	2.46	1.93e-05	0.0230	0.00102
7.61	0.602	0.000177	0.208	0.00115
7.76	0.252	1.02e-05	0.0121	0.00106
7.61	2.86	0.000322	0.379	0.00114
7.73	2.41	3.31e-05	0.0392	0.00104
7.05	3.36	0.00473	11.8	0.00950
6.93	5.81	0.00565	20.1	0.00508
6.71	3.79	0.00832	27.6	0.00470
6.87	5.37	0.00438	16.4	0.00520
7.05	3.36	0.00473	11.8	0.00950
6.93	5.81	0.00565	20.1	0.00508
6.71	3.79	0.00832	27.6	0.00470
6.87	5.37	0.00438	16.4	0.00520
7.70	1.35	0.000224	0.261	0.00147
7.83	1.17	5.96e-06	0.00705	0.00115
7.61	3.34	0.000531	0.622	0.00118
7.74	3.04	7.13e-05	0.0845	0.00106
7.50	0.759	0.000491	0.566	0.00136
7.67	0.459	1.02e-05	0.0119	0.00119
7.46	3.34	0.00107	1.24	0.00139
7.57	3.07	0.000160	0.188	0.00108
7.05	3.36	0.00473	11.8	0.00950
6.93	5.81	0.00565	20.1	0.00508
6.71	3.79	0.00832	27.6	0.00470
6.87	5.37	0.00438	16.4	0.00520
7.05	3.36	0.00473	11.8	0.00950
6.93	5.81	0.00565	20.1	0.00508
6.71	3.79	0.00832	27.6	0.00470
6.87	5.37	0.00438	16.4	0.00520
7.75	1.36	0.000203	0.239	0.00122
7.85	1.20	2.31e-05	0.0275	0.00106
7.66	3.13	0.000284	0.336	0.00110
7.78	2.75	3.44e-05	0.0409	0.00103
7.56	0.695	0.000268	0.312	0.00122

7.72	0.380	1.80e-05	0.0213	0.00109
7.52	3.17	0.000645	0.755	0.00125
7.64	2.85	8.17e-05	0.0964	0.00106

B	Li	As	C(4)	Cl
0.000394	7.27e-06	3.24e-08	0.00325	0.00627
0.000445	9.12e-07	3.57e-08	0.00395	0.00628
1.47e-05	1.82e-06	3.64e-08	0.00482	0.00937
0.000156	8.98e-07	3.17e-08	0.00312	0.00572
0.000394	7.27e-06	3.24e-08	0.00325	0.00627
0.000445	9.12e-07	3.57e-08	0.00395	0.00628
1.47e-05	1.82e-06	3.64e-08	0.00482	0.00937
0.000156	8.98e-07	3.17e-08	0.00312	0.00572
0.000126	1.12e-05	1.35e-07	0.00872	0.0316
0.000123	1.12e-05	1.27e-07	0.00861	0.0316
0.000190	1.12e-05	1.30e-07	0.00892	0.0316
0.000177	1.12e-05	1.24e-07	0.00871	0.0316
1.39e-05	1.12e-05	6.29e-08	0.00928	0.0316
1.89e-05	1.12e-05	5.33e-08	0.00887	0.0316
8.78e-05	1.12e-05	1.55e-07	0.00905	0.0316
0.000101	1.12e-05	1.45e-07	0.00893	0.0316
0.000394	7.27e-06	3.24e-08	0.00325	0.00627
0.000445	9.12e-07	3.57e-08	0.00395	0.00628
1.47e-05	1.82e-06	3.64e-08	0.00482	0.00937
0.000156	8.98e-07	3.17e-08	0.00312	0.00572
0.000394	7.27e-06	3.24e-08	0.00325	0.00627
0.000445	9.12e-07	3.57e-08	0.00395	0.00628
1.47e-05	1.82e-06	3.64e-08	0.00482	0.00937
0.000156	8.98e-07	3.17e-08	0.00312	0.00572
0.000160	1.12e-05	1.27e-07	0.00886	0.0316
0.000137	1.12e-05	1.25e-07	0.00880	0.0316
0.000247	1.12e-05	1.27e-07	0.00914	0.0316
0.000217	1.12e-05	1.25e-07	0.00894	0.0316
1.21e-05	1.12e-05	6.87e-08	0.00976	0.0316
1.19e-05	1.12e-05	5.57e-08	0.00928	0.0316
8.23e-05	1.12e-05	1.61e-07	0.00898	0.0316
7.76e-05	1.12e-05	1.70e-07	0.00945	0.0316
0.000394	7.27e-06	3.24e-08	0.00325	0.00627
0.000445	9.12e-07	3.57e-08	0.00395	0.00628
1.47e-05	1.82e-06	3.64e-08	0.00482	0.00937
0.000156	8.98e-07	3.17e-08	0.00312	0.00572
0.000394	7.27e-06	3.24e-08	0.00325	0.00627
0.000445	9.12e-07	3.57e-08	0.00395	0.00628
1.47e-05	1.82e-06	3.64e-08	0.00482	0.00937
0.000156	8.98e-07	3.17e-08	0.00312	0.00572
0.000133	1.12e-05	1.34e-07	0.00877	0.0316
0.000122	1.12e-05	1.30e-07	0.00867	0.0316
0.000207	1.12e-05	1.30e-07	0.00901	0.0316

0.000188	1.12e-05	1.26e-07	0.00879	0.0316
1.21e-05	1.12e-05	6.56e-08	0.00948	0.0316
1.36e-05	1.12e-05	5.49e-08	0.00902	0.0316
8.24e-05	1.12e-05	1.60e-07	0.00911	0.0316
8.25e-05	1.12e-05	1.59e-07	0.00921	0.0316
0.000394	7.27e-06	3.24e-08	0.00325	0.00154
0.000445	9.12e-07	3.57e-08	0.00395	0.000635
1.47e-05	1.82e-06	3.64e-08	0.00482	0.00106
0.000156	8.98e-07	3.17e-08	0.00312	0.00134
0.000394	7.27e-06	3.24e-08	0.00325	0.00154
0.000445	9.12e-07	3.57e-08	0.00395	0.000635
1.47e-05	1.82e-06	3.64e-08	0.00482	0.00106
0.000156	8.98e-07	3.17e-08	0.00312	0.00134
0.000125	1.12e-05	1.38e-07	0.00872	0.0316
0.000123	1.12e-05	1.31e-07	0.00861	0.0316
0.000190	1.12e-05	1.35e-07	0.00892	0.0316
0.000176	1.12e-05	1.29e-07	0.00871	0.0316
1.39e-05	1.12e-05	6.58e-08	0.00929	0.0316
1.89e-05	1.12e-05	5.58e-08	0.00887	0.0316
8.74e-05	1.12e-05	1.59e-07	0.00906	0.0316
0.000100	1.12e-05	1.49e-07	0.00893	0.0316
0.000394	7.27e-06	3.24e-08	0.00325	0.00154
0.000445	9.12e-07	3.57e-08	0.00395	0.000635
1.47e-05	1.82e-06	3.64e-08	0.00482	0.00106
0.000156	8.98e-07	3.17e-08	0.00312	0.00134
0.000394	7.27e-06	3.24e-08	0.00325	0.00154
0.000445	9.12e-07	3.57e-08	0.00395	0.000635
1.47e-05	1.82e-06	3.64e-08	0.00482	0.00106
0.000156	8.98e-07	3.17e-08	0.00312	0.00134
0.000160	1.12e-05	1.29e-07	0.00886	0.0316
0.000137	1.12e-05	1.27e-07	0.00880	0.0316
0.000248	1.12e-05	1.32e-07	0.00915	0.0316
0.000218	1.12e-05	1.29e-07	0.00894	0.0316
1.21e-05	1.12e-05	7.13e-08	0.00977	0.0316
1.18e-05	1.12e-05	5.78e-08	0.00928	0.0316
8.19e-05	1.12e-05	1.66e-07	0.00899	0.0316
7.73e-05	1.12e-05	1.75e-07	0.00945	0.0316
0.000394	7.27e-06	3.24e-08	0.00325	0.00154
0.000445	9.12e-07	3.57e-08	0.00395	0.000635
1.47e-05	1.82e-06	3.64e-08	0.00482	0.00106
0.000156	8.98e-07	3.17e-08	0.00312	0.00134
0.000394	7.27e-06	3.24e-08	0.00325	0.00154
0.000445	9.12e-07	3.57e-08	0.00395	0.000635
1.47e-05	1.82e-06	3.64e-08	0.00482	0.00106
0.000156	8.98e-07	3.17e-08	0.00312	0.00134
0.000133	1.12e-05	1.37e-07	0.00878	0.0316
0.000122	1.12e-05	1.33e-07	0.00867	0.0316
0.000207	1.12e-05	1.35e-07	0.00901	0.0316
0.000188	1.12e-05	1.31e-07	0.00879	0.0316
1.20e-05	1.12e-05	6.85e-08	0.00948	0.0316

1.36e-05	1.12e-05	5.74e-08	0.00901	0.0316
8.20e-05	1.12e-05	1.65e-07	0.00912	0.0316
8.21e-05	1.12e-05	1.63e-07	0.00921	0.0316

F	Ca	Mg	Na	K
3.82e-05	0.00511	0.00655	0.00470	2.25e-05
1.84e-05	0.00406	0.00316	0.00514	2.63e-05
1.21e-05	0.00542	0.00350	0.00433	4.57e-05
1.98e-05	0.00463	0.00331	0.00258	0.000104
3.82e-05	0.00511	0.00655	0.00470	2.25e-05
1.84e-05	0.00406	0.00316	0.00514	2.63e-05
1.21e-05	0.00542	0.00350	0.00433	4.57e-05
1.98e-05	0.00463	0.00331	0.00258	0.000104
0.000132	0.000531	0.000297	0.0409	8.47e-05
0.000133	0.000432	0.000210	0.0409	8.47e-05
0.000132	0.000626	0.000217	0.0409	8.47e-05
0.000133	0.000485	0.000170	0.0409	8.47e-05
0.000132	0.000743	0.000307	0.0409	8.47e-05
0.000133	0.000538	0.000210	0.0409	8.47e-05
0.000132	0.000769	0.000230	0.0409	8.47e-05
0.000133	0.000580	0.000172	0.0409	8.47e-05
3.82e-05	0.00511	0.00655	0.00470	2.25e-05
1.84e-05	0.00406	0.00316	0.00514	2.63e-05
1.21e-05	0.00542	0.00350	0.00433	4.57e-05
1.98e-05	0.00463	0.00331	0.00258	0.000104
3.82e-05	0.00511	0.00655	0.00470	2.25e-05
1.84e-05	0.00406	0.00316	0.00514	2.63e-05
1.21e-05	0.00542	0.00350	0.00433	4.57e-05
1.98e-05	0.00463	0.00331	0.00258	0.000104
0.000130	0.000638	0.000590	0.0409	8.47e-05
0.000133	0.000474	0.000349	0.0409	8.47e-05
0.000130	0.000769	0.000410	0.0409	8.47e-05
0.000133	0.000564	0.000237	0.0409	8.47e-05
0.000126	0.000954	0.000607	0.0409	8.47e-05
0.000134	0.000663	0.000363	0.0409	8.47e-05
0.000131	0.00114	0.000364	0.0409	8.47e-05
0.000133	0.000804	0.000225	0.0409	8.47e-05
3.82e-05	0.00511	0.00655	0.00470	2.25e-05
1.84e-05	0.00406	0.00316	0.00514	2.63e-05
1.21e-05	0.00542	0.00350	0.00433	4.57e-05
1.98e-05	0.00463	0.00331	0.00258	0.000104
3.82e-05	0.00511	0.00655	0.00470	2.25e-05
1.84e-05	0.00406	0.00316	0.00514	2.63e-05
1.21e-05	0.00542	0.00350	0.00433	4.57e-05
1.98e-05	0.00463	0.00331	0.00258	0.000104
0.000132	0.000571	0.000375	0.0409	8.47e-05
0.000133	0.000449	0.000241	0.0409	8.47e-05
0.000132	0.000685	0.000263	0.0409	8.47e-05

0.000133	0.000519	0.000178	0.0409	8.47e-05
0.000131	0.000828	0.000394	0.0409	8.47e-05
0.000133	0.000588	0.000244	0.0409	8.47e-05
0.000132	0.000949	0.000304	0.0409	8.47e-05
0.000133	0.000695	0.000197	0.0409	8.47e-05
3.82e-05	0.00511	0.00655	0.00470	2.25e-05
1.84e-05	0.00406	0.00316	0.00514	2.63e-05
1.21e-05	0.00542	0.00350	0.00433	4.57e-05
1.98e-05	0.00463	0.00331	0.00258	0.000104
3.82e-05	0.00511	0.00655	0.00470	2.25e-05
1.84e-05	0.00406	0.00316	0.00514	2.63e-05
1.21e-05	0.00542	0.00350	0.00433	4.57e-05
1.98e-05	0.00463	0.00331	0.00258	0.000104
0.000132	0.000530	0.000300	0.0409	8.47e-05
0.000133	0.000431	0.000211	0.0409	8.47e-05
0.000132	0.000624	0.000220	0.0409	8.47e-05
0.000133	0.000484	0.000170	0.0409	8.47e-05
0.000132	0.000741	0.000312	0.0409	8.47e-05
0.000133	0.000537	0.000212	0.0409	8.47e-05
0.000132	0.000767	0.000232	0.0409	8.47e-05
0.000133	0.000580	0.000172	0.0409	8.47e-05
3.82e-05	0.00511	0.00655	0.00470	2.25e-05
1.84e-05	0.00406	0.00316	0.00514	2.63e-05
1.21e-05	0.00542	0.00350	0.00433	4.57e-05
1.98e-05	0.00463	0.00331	0.00258	0.000104
3.82e-05	0.00511	0.00655	0.00470	2.25e-05
1.84e-05	0.00406	0.00316	0.00514	2.63e-05
1.21e-05	0.00542	0.00350	0.00433	4.57e-05
1.98e-05	0.00463	0.00331	0.00258	0.000104
0.000130	0.000636	0.000603	0.0409	8.47e-05
0.000133	0.000472	0.000353	0.0409	8.47e-05
0.000130	0.000764	0.000425	0.0409	8.47e-05
0.000133	0.000561	0.000242	0.0409	8.47e-05
0.000126	0.000947	0.000633	0.0409	8.47e-05
0.000134	0.000658	0.000371	0.0409	8.47e-05
0.000131	0.00114	0.000369	0.0409	8.47e-05
0.000133	0.000803	0.000227	0.0409	8.47e-05
3.82e-05	0.00511	0.00655	0.00470	2.25e-05
1.84e-05	0.00406	0.00316	0.00514	2.63e-05
1.21e-05	0.00542	0.00350	0.00433	4.57e-05
1.98e-05	0.00463	0.00331	0.00258	0.000104
3.82e-05	0.00511	0.00655	0.00470	2.25e-05
1.84e-05	0.00406	0.00316	0.00514	2.63e-05
1.21e-05	0.00542	0.00350	0.00433	4.57e-05
1.98e-05	0.00463	0.00331	0.00258	0.000104
0.000132	0.000570	0.000380	0.0409	8.47e-05
0.000133	0.000448	0.000242	0.0409	8.47e-05
0.000132	0.000682	0.000268	0.0409	8.47e-05
0.000133	0.000518	0.000179	0.0409	8.47e-05
0.000131	0.000825	0.000404	0.0409	8.47e-05

0.000133	0.000586	0.000247	0.0409	8.47e-05
0.000132	0.000947	0.000308	0.0409	8.47e-05
0.000133	0.000694	0.000198	0.0409	8.47e-05

Ba	Si	P	Mn	Fe
1.33e-07	0.000165	8.89e-07	5.74e-08	6.87e-07
1.81e-07	0.000153	2.91e-07	2.27e-07	1.43e-07
2.68e-07	0.000115	1.50e-06	6.28e-06	5.48e-06
2.38e-07	0.000138	2.59e-07	4.10e-07	1.43e-07
1.33e-07	0.000165	8.89e-07	5.74e-08	6.87e-07
1.81e-07	0.000153	2.91e-07	2.27e-07	1.43e-07
2.68e-07	0.000115	1.50e-06	6.28e-06	5.48e-06
2.38e-07	0.000138	2.59e-07	4.10e-07	1.43e-07
3.57e-07	9.48e-05	4.42e-06	5.24e-07	4.44e-08
3.86e-07	7.82e-05	4.72e-06	7.25e-07	3.50e-08
3.78e-07	7.11e-05	1.49e-06	7.55e-07	4.73e-09
3.93e-07	5.67e-05	1.71e-06	9.23e-07	4.62e-09
3.57e-07	3.87e-05	6.11e-06	1.08e-06	6.95e-07
3.81e-07	2.96e-05	6.81e-06	1.00e-06	5.46e-07
3.61e-07	8.39e-05	1.61e-06	8.29e-07	7.35e-09
3.89e-07	6.62e-05	1.84e-06	1.10e-06	7.49e-09
1.33e-07	0.000165	8.89e-07	5.74e-08	6.87e-07
1.81e-07	0.000153	2.91e-07	2.27e-07	1.43e-07
2.68e-07	0.000115	1.50e-06	6.28e-06	5.48e-06
2.38e-07	0.000138	2.59e-07	4.10e-07	1.43e-07
1.33e-07	0.000165	8.89e-07	5.74e-08	6.87e-07
1.81e-07	0.000153	2.91e-07	2.27e-07	1.43e-07
2.68e-07	0.000115	1.50e-06	6.28e-06	5.48e-06
2.38e-07	0.000138	2.59e-07	4.10e-07	1.43e-07
2.79e-07	0.000112	4.09e-06	1.58e-07	7.11e-08
3.54e-07	8.87e-05	4.70e-06	1.94e-07	4.58e-08
3.43e-07	8.62e-05	1.34e-06	3.11e-07	4.59e-09
3.82e-07	6.56e-05	1.57e-06	3.52e-07	3.52e-09
3.01e-07	4.87e-05	5.70e-06	1.42e-06	1.07e-06
3.45e-07	3.46e-05	6.29e-06	9.32e-07	6.79e-07
3.03e-07	0.000112	1.34e-06	5.01e-07	8.35e-09
3.81e-07	9.31e-05	1.62e-06	6.28e-07	6.75e-09
1.33e-07	0.000165	8.89e-07	5.74e-08	6.87e-07
1.81e-07	0.000153	2.91e-07	2.27e-07	1.43e-07
2.68e-07	0.000115	1.50e-06	6.28e-06	5.48e-06
2.38e-07	0.000138	2.59e-07	4.10e-07	1.43e-07
1.33e-07	0.000165	8.89e-07	5.74e-08	6.87e-07
1.81e-07	0.000153	2.91e-07	2.27e-07	1.43e-07
2.68e-07	0.000115	1.50e-06	6.28e-06	5.48e-06
2.38e-07	0.000138	2.59e-07	4.10e-07	1.43e-07
3.35e-07	0.000102	4.31e-06	3.36e-07	5.14e-08
3.81e-07	8.25e-05	4.77e-06	4.46e-07	3.66e-08
3.68e-07	7.73e-05	1.42e-06	5.53e-07	4.45e-09

3.92e-07	6.02e-05	1.65e-06	6.72e-07	3.86e-09
3.39e-07	4.26e-05	5.91e-06	1.13e-06	7.95e-07
3.74e-07	3.13e-05	6.61e-06	8.61e-07	5.46e-07
3.32e-07	9.96e-05	1.46e-06	5.67e-07	7.50e-09
3.86e-07	7.98e-05	1.71e-06	7.32e-07	6.34e-09
1.33e-07	0.000165	8.89e-07	5.74e-08	6.87e-07
1.81e-07	0.000153	2.91e-07	2.27e-07	1.43e-07
2.68e-07	0.000115	1.50e-06	6.28e-06	5.48e-06
2.38e-07	0.000138	2.59e-07	4.10e-07	1.43e-07
1.33e-07	0.000165	8.89e-07	5.74e-08	6.87e-07
1.81e-07	0.000153	2.91e-07	2.27e-07	1.43e-07
2.68e-07	0.000115	1.50e-06	6.28e-06	5.48e-06
2.38e-07	0.000138	2.59e-07	4.10e-07	1.43e-07
3.58e-07	9.45e-05	4.44e-06	5.25e-07	4.55e-08
3.86e-07	7.80e-05	4.74e-06	7.25e-07	3.57e-08
3.79e-07	7.08e-05	1.51e-06	7.60e-07	4.76e-09
3.93e-07	5.65e-05	1.73e-06	9.26e-07	4.64e-09
3.59e-07	3.85e-05	6.15e-06	1.12e-06	7.28e-07
3.81e-07	2.94e-05	6.86e-06	1.03e-06	5.70e-07
3.61e-07	8.37e-05	1.62e-06	8.32e-07	7.38e-09
3.89e-07	6.61e-05	1.85e-06	1.10e-06	7.52e-09
1.33e-07	0.000165	8.89e-07	5.74e-08	6.87e-07
1.81e-07	0.000153	2.91e-07	2.27e-07	1.43e-07
2.68e-07	0.000115	1.50e-06	6.28e-06	5.48e-06
2.38e-07	0.000138	2.59e-07	4.10e-07	1.43e-07
1.33e-07	0.000165	8.89e-07	5.74e-08	6.87e-07
1.81e-07	0.000153	2.91e-07	2.27e-07	1.43e-07
2.68e-07	0.000115	1.50e-06	6.28e-06	5.48e-06
2.38e-07	0.000138	2.59e-07	4.10e-07	1.43e-07
2.84e-07	0.000111	4.10e-06	1.60e-07	7.35e-08
3.54e-07	8.83e-05	4.72e-06	1.95e-07	4.69e-08
3.53e-07	8.57e-05	1.35e-06	3.20e-07	4.62e-09
3.84e-07	6.52e-05	1.58e-06	3.57e-07	3.54e-09
3.13e-07	4.84e-05	5.75e-06	1.53e-06	1.14e-06
3.47e-07	3.43e-05	6.34e-06	9.81e-07	7.13e-07
3.04e-07	0.000112	1.35e-06	5.05e-07	8.38e-09
3.81e-07	9.28e-05	1.63e-06	6.31e-07	6.77e-09
1.33e-07	0.000165	8.89e-07	5.74e-08	6.87e-07
1.81e-07	0.000153	2.91e-07	2.27e-07	1.43e-07
2.68e-07	0.000115	1.50e-06	6.28e-06	5.48e-06
2.38e-07	0.000138	2.59e-07	4.10e-07	1.43e-07
1.33e-07	0.000165	8.89e-07	5.74e-08	6.87e-07
1.81e-07	0.000153	2.91e-07	2.27e-07	1.43e-07
2.68e-07	0.000115	1.50e-06	6.28e-06	5.48e-06
2.38e-07	0.000138	2.59e-07	4.10e-07	1.43e-07
3.37e-07	0.000101	4.32e-06	3.38e-07	5.27e-08
3.81e-07	8.22e-05	4.79e-06	4.46e-07	3.74e-08
3.71e-07	7.69e-05	1.44e-06	5.60e-07	4.48e-09
3.92e-07	6.00e-05	1.66e-06	6.75e-07	3.88e-09
3.43e-07	4.23e-05	5.96e-06	1.19e-06	8.38e-07

3.74e-07	3.11e-05	6.65e-06	8.93e-07	5.70e-07
3.33e-07	9.93e-05	1.47e-06	5.71e-07	7.54e-09
3.86e-07	7.95e-05	1.72e-06	7.34e-07	6.36e-09

Al	Sb	Be	Cd	Cr
6.54e-07	1.65e-09	1.11e-08	1.56e-09	2.02e-08
3.78e-07	1.64e-09	2.78e-08	1.56e-09	4.91e-08
2.34e-07	1.97e-08	1.11e-08	1.56e-09	6.07e-08
2.34e-07	3.29e-09	1.11e-08	1.56e-09	1.68e-08
6.54e-07	1.65e-09	1.11e-08	1.56e-09	2.02e-08
3.78e-07	1.64e-09	2.78e-08	1.56e-09	4.91e-08
2.34e-07	1.97e-08	1.11e-08	1.56e-09	6.07e-08
2.34e-07	3.29e-09	1.11e-08	1.56e-09	1.68e-08
1.22e-07	1.65e-09	3.04e-09	2.14e-10	4.53e-09
1.47e-07	1.65e-09	2.50e-09	1.71e-10	4.01e-09
1.04e-07	1.65e-09	6.39e-09	3.14e-10	9.53e-09
1.31e-07	1.65e-09	4.92e-09	2.28e-10	7.95e-09
8.85e-08	1.65e-09	1.78e-09	3.69e-10	1.48e-08
1.19e-07	1.65e-09	1.27e-09	2.99e-10	1.48e-08
8.76e-08	1.65e-09	3.01e-09	4.08e-10	4.28e-09
1.11e-07	1.65e-09	2.25e-09	3.52e-10	3.87e-09
6.54e-07	1.65e-09	1.11e-08	1.56e-09	2.02e-08
3.78e-07	1.64e-09	2.78e-08	1.56e-09	4.91e-08
2.34e-07	1.97e-08	1.11e-08	1.56e-09	6.07e-08
2.34e-07	3.29e-09	1.11e-08	1.56e-09	1.68e-08
6.54e-07	1.65e-09	1.11e-08	1.56e-09	2.02e-08
3.78e-07	1.64e-09	2.78e-08	1.56e-09	4.91e-08
2.34e-07	1.97e-08	1.11e-08	1.56e-09	6.07e-08
2.34e-07	3.29e-09	1.11e-08	1.56e-09	1.68e-08
1.05e-07	1.65e-09	3.92e-09	3.40e-10	5.84e-09
1.34e-07	1.65e-09	2.96e-09	2.24e-10	4.71e-09
8.74e-08	1.65e-09	8.48e-09	5.39e-10	1.29e-08
1.13e-07	1.65e-09	5.95e-09	3.44e-10	9.92e-09
7.23e-08	1.65e-09	2.49e-09	5.51e-10	1.82e-08
9.72e-08	1.65e-09	1.65e-09	3.62e-10	1.53e-08
6.80e-08	1.65e-09	4.55e-09	5.38e-10	5.39e-09
8.21e-08	1.65e-09	3.33e-09	3.96e-10	4.34e-09
6.54e-07	1.65e-09	1.11e-08	1.56e-09	2.02e-08
3.78e-07	1.64e-09	2.78e-08	1.56e-09	4.91e-08
2.34e-07	1.97e-08	1.11e-08	1.56e-09	6.07e-08
2.34e-07	3.29e-09	1.11e-08	1.56e-09	1.68e-08
6.54e-07	1.65e-09	1.11e-08	1.56e-09	2.02e-08
3.78e-07	1.64e-09	2.78e-08	1.56e-09	4.91e-08
2.34e-07	1.97e-08	1.11e-08	1.56e-09	6.07e-08
2.34e-07	3.29e-09	1.11e-08	1.56e-09	1.68e-08
1.15e-07	1.65e-09	3.33e-09	2.47e-10	4.92e-09
1.42e-07	1.65e-09	2.63e-09	1.79e-10	4.15e-09
9.62e-08	1.65e-09	7.16e-09	3.81e-10	1.07e-08

1.23e-07	1.65e-09	5.27e-09	2.61e-10	8.55e-09
8.08e-08	1.65e-09	2.05e-09	4.18e-10	1.56e-08
1.09e-07	1.65e-09	1.40e-09	2.95e-10	1.40e-08
7.53e-08	1.65e-09	3.80e-09	4.74e-10	4.85e-09
9.32e-08	1.65e-09	2.77e-09	3.61e-10	4.03e-09
6.54e-07	1.65e-09	1.11e-08	1.56e-09	2.02e-08
3.78e-07	1.64e-09	2.78e-08	1.56e-09	4.91e-08
2.34e-07	1.97e-08	1.11e-08	1.56e-09	6.07e-08
2.34e-07	3.29e-09	1.11e-08	1.56e-09	1.68e-08
6.54e-07	1.65e-09	1.11e-08	1.56e-09	2.02e-08
3.78e-07	1.64e-09	2.78e-08	1.56e-09	4.91e-08
2.34e-07	1.97e-08	1.11e-08	1.56e-09	6.07e-08
2.34e-07	3.29e-09	1.11e-08	1.56e-09	1.68e-08
1.22e-07	1.65e-09	3.04e-09	2.52e-10	4.60e-09
1.48e-07	1.65e-09	2.50e-09	2.00e-10	4.07e-09
1.04e-07	1.65e-09	6.37e-09	4.00e-10	9.79e-09
1.32e-07	1.65e-09	4.91e-09	2.89e-10	8.18e-09
8.87e-08	1.65e-09	1.78e-09	5.13e-10	1.55e-08
1.19e-07	1.65e-09	1.27e-09	4.13e-10	1.55e-08
8.77e-08	1.65e-09	3.00e-09	4.88e-10	4.36e-09
1.11e-07	1.65e-09	2.25e-09	4.20e-10	3.96e-09
6.54e-07	1.65e-09	1.11e-08	1.56e-09	2.02e-08
3.78e-07	1.64e-09	2.78e-08	1.56e-09	4.91e-08
2.34e-07	1.97e-08	1.11e-08	1.56e-09	6.07e-08
2.34e-07	3.29e-09	1.11e-08	1.56e-09	1.68e-08
6.54e-07	1.65e-09	1.11e-08	1.56e-09	2.02e-08
3.78e-07	1.64e-09	2.78e-08	1.56e-09	4.91e-08
2.34e-07	1.97e-08	1.11e-08	1.56e-09	6.07e-08
2.34e-07	3.29e-09	1.11e-08	1.56e-09	1.68e-08
1.06e-07	1.65e-09	3.93e-09	4.05e-10	5.97e-09
1.35e-07	1.65e-09	2.97e-09	2.65e-10	4.80e-09
8.77e-08	1.65e-09	8.46e-09	7.01e-10	1.34e-08
1.14e-07	1.65e-09	5.93e-09	4.41e-10	1.02e-08
7.25e-08	1.65e-09	2.50e-09	7.82e-10	1.93e-08
9.77e-08	1.65e-09	1.65e-09	5.04e-10	1.62e-08
6.81e-08	1.65e-09	4.54e-09	6.46e-10	5.48e-09
8.22e-08	1.65e-09	3.33e-09	4.75e-10	4.42e-09
6.54e-07	1.65e-09	1.11e-08	1.56e-09	2.02e-08
3.78e-07	1.64e-09	2.78e-08	1.56e-09	4.91e-08
2.34e-07	1.97e-08	1.11e-08	1.56e-09	6.07e-08
2.34e-07	3.29e-09	1.11e-08	1.56e-09	1.68e-08
6.54e-07	1.65e-09	1.11e-08	1.56e-09	2.02e-08
3.78e-07	1.64e-09	2.78e-08	1.56e-09	4.91e-08
2.34e-07	1.97e-08	1.11e-08	1.56e-09	6.07e-08
2.34e-07	3.29e-09	1.11e-08	1.56e-09	1.68e-08
1.15e-07	1.65e-09	3.34e-09	2.92e-10	5.00e-09
1.42e-07	1.65e-09	2.63e-09	2.10e-10	4.21e-09
9.65e-08	1.65e-09	7.14e-09	4.90e-10	1.10e-08
1.23e-07	1.65e-09	5.26e-09	3.33e-10	8.80e-09
8.09e-08	1.65e-09	2.05e-09	5.84e-10	1.64e-08

1.09e-07	1.65e-09	1.39e-09	4.09e-10	1.47e-08
7.54e-08	1.65e-09	3.80e-09	5.68e-10	4.93e-09
9.33e-08	1.65e-09	2.77e-09	4.32e-10	4.11e-09

Co	Pb	Mo	Se	Hfo_s
8.50e-10	5.56e-09	1.75e-08	1.40e-08	0
1.61e-08	9.66e-09	1.38e-08	5.71e-09	0
3.48e-08	9.18e-09	1.38e-08	3.80e-09	0
2.89e-08	5.56e-09	3.18e-08	3.80e-09	0
8.50e-10	5.56e-09	1.75e-08	1.40e-08	0.000105
1.61e-08	9.66e-09	1.38e-08	5.71e-09	0.000105
3.48e-08	9.18e-09	1.38e-08	3.80e-09	0.000105
2.89e-08	5.56e-09	3.18e-08	3.80e-09	0.000205
7.48e-11	3.14e-09	8.41e-08	3.23e-08	0.000105
5.94e-11	2.96e-09	8.25e-08	2.71e-08	0.000105
2.12e-09	6.66e-09	8.44e-08	1.20e-08	0.000105
1.51e-09	5.91e-09	8.28e-08	1.10e-08	0.000105
5.85e-09	7.94e-09	8.36e-08	5.67e-09	0.000105
4.69e-09	8.36e-09	8.27e-08	5.09e-09	0.000105
5.02e-09	4.73e-09	1.02e-07	1.05e-08	0.000205
4.33e-09	4.96e-09	8.42e-08	9.78e-09	0.000205
8.50e-10	5.56e-09	1.75e-08	1.40e-08	0
1.61e-08	9.66e-09	1.38e-08	5.71e-09	0
3.48e-08	9.18e-09	1.38e-08	3.80e-09	0
2.89e-08	5.56e-09	3.18e-08	3.80e-09	0
8.50e-10	5.56e-09	1.75e-08	1.40e-08	0.000255
1.61e-08	9.66e-09	1.38e-08	5.71e-09	0.000255
3.48e-08	9.18e-09	1.38e-08	3.80e-09	0.000255
2.89e-08	5.56e-09	3.18e-08	3.80e-09	0.000800
1.20e-10	4.39e-09	8.61e-08	3.47e-08	0.000255
7.86e-11	3.71e-09	8.32e-08	3.26e-08	0.000255
3.69e-09	9.94e-09	8.60e-08	1.27e-08	0.000255
2.34e-09	8.17e-09	8.41e-08	1.20e-08	0.000255
8.86e-09	9.92e-09	8.45e-08	6.18e-09	0.000255
5.75e-09	8.65e-09	8.34e-08	5.41e-09	0.000255
6.63e-09	4.77e-09	1.41e-07	1.12e-08	0.000800
4.92e-09	4.53e-09	1.01e-07	1.14e-08	0.000800
8.50e-10	5.56e-09	1.75e-08	1.40e-08	0
1.61e-08	9.66e-09	1.38e-08	5.71e-09	0
3.48e-08	9.18e-09	1.38e-08	3.80e-09	0
2.89e-08	5.56e-09	3.18e-08	3.80e-09	0
8.50e-10	5.56e-09	1.75e-08	1.40e-08	0.000155
1.61e-08	9.66e-09	1.38e-08	5.71e-09	0.000155
3.48e-08	9.18e-09	1.38e-08	3.80e-09	0.000155
2.89e-08	5.56e-09	3.18e-08	3.80e-09	0.000440
8.66e-11	3.45e-09	8.49e-08	3.38e-08	0.000155
6.23e-11	3.05e-09	8.27e-08	3.02e-08	0.000155
2.60e-09	7.62e-09	8.50e-08	1.24e-08	0.000155

1.76e-09	6.54e-09	8.32e-08	1.15e-08	0.000155
6.66e-09	8.31e-09	8.40e-08	5.89e-09	0.000155
4.65e-09	7.72e-09	8.30e-08	5.25e-09	0.000155
5.84e-09	4.80e-09	1.20e-07	1.11e-08	0.000440
4.46e-09	4.61e-09	8.95e-08	1.07e-08	0.000440
8.50e-10	5.56e-09	1.75e-08	1.40e-08	0
1.61e-08	9.66e-09	1.38e-08	5.71e-09	0
3.48e-08	9.18e-09	1.38e-08	3.80e-09	0
2.89e-08	5.56e-09	3.18e-08	3.80e-09	0
8.50e-10	5.56e-09	1.75e-08	1.40e-08	0.000105
1.61e-08	9.66e-09	1.38e-08	5.71e-09	0.000105
3.48e-08	9.18e-09	1.38e-08	3.80e-09	0.000105
2.89e-08	5.56e-09	3.18e-08	3.80e-09	0.000205
7.72e-11	3.23e-09	8.42e-08	3.26e-08	0.000105
6.12e-11	3.03e-09	8.25e-08	2.74e-08	0.000105
2.24e-09	6.99e-09	8.45e-08	1.22e-08	0.000105
1.59e-09	6.17e-09	8.28e-08	1.11e-08	0.000105
6.22e-09	8.40e-09	8.38e-08	5.76e-09	0.000105
4.96e-09	8.80e-09	8.27e-08	5.17e-09	0.000105
5.19e-09	4.89e-09	1.03e-07	1.07e-08	0.000205
4.47e-09	5.12e-09	8.42e-08	9.88e-09	0.000205
8.50e-10	5.56e-09	1.75e-08	1.40e-08	0
1.61e-08	9.66e-09	1.38e-08	5.71e-09	0
3.48e-08	9.18e-09	1.38e-08	3.80e-09	0
2.89e-08	5.56e-09	3.18e-08	3.80e-09	0
8.50e-10	5.56e-09	1.75e-08	1.40e-08	0.000255
1.61e-08	9.66e-09	1.38e-08	5.71e-09	0.000255
3.48e-08	9.18e-09	1.38e-08	3.80e-09	0.000255
2.89e-08	5.56e-09	3.18e-08	3.80e-09	0.000800
1.25e-10	4.56e-09	8.62e-08	3.50e-08	0.000255
8.13e-11	3.83e-09	8.32e-08	3.29e-08	0.000255
3.97e-09	1.06e-08	8.64e-08	1.28e-08	0.000255
2.48e-09	8.62e-09	8.41e-08	1.22e-08	0.000255
9.61e-09	1.07e-08	8.49e-08	6.27e-09	0.000255
6.12e-09	9.20e-09	8.35e-08	5.49e-09	0.000255
6.87e-09	4.93e-09	1.43e-07	1.13e-08	0.000800
5.09e-09	4.67e-09	1.02e-07	1.16e-08	0.000800
8.50e-10	5.56e-09	1.75e-08	1.40e-08	0
1.61e-08	9.66e-09	1.38e-08	5.71e-09	0
3.48e-08	9.18e-09	1.38e-08	3.80e-09	0
2.89e-08	5.56e-09	3.18e-08	3.80e-09	0
8.50e-10	5.56e-09	1.75e-08	1.40e-08	0.000155
1.61e-08	9.66e-09	1.38e-08	5.71e-09	0.000155
3.48e-08	9.18e-09	1.38e-08	3.80e-09	0.000155
2.89e-08	5.56e-09	3.18e-08	3.80e-09	0.000440
8.97e-11	3.56e-09	8.50e-08	3.41e-08	0.000155
6.42e-11	3.13e-09	8.27e-08	3.05e-08	0.000155
2.76e-09	8.04e-09	8.53e-08	1.26e-08	0.000155
1.86e-09	6.84e-09	8.32e-08	1.17e-08	0.000155
7.11e-09	8.84e-09	8.43e-08	5.99e-09	0.000155

4.92e-09	8.14e-09	8.30e-08	5.33e-09	0.000155
6.05e-09	4.97e-09	1.21e-07	1.12e-08	0.000440
4.61e-09	4.75e-09	8.96e-08	1.09e-08	0.000440

Hfo_w	Hao_	m_Hfo_wOH	m_Hfo_wOH2+	m_Hfo_wOHSO4-2
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0.00420	0.00330	0.000307	0.000285	2.16e-05
0.00420	0.00330	0.000248	0.000202	2.47e-05
0.00420	0.00330	0.000227	0.000363	1.36e-05
0.00820	0.00168	0.000612	0.000675	4.54e-05
0.00420	0.00330	0.000426	0.000251	3.79e-07
0.00420	0.00330	0.000482	0.000256	3.25e-07
0.00420	0.00330	0.000408	0.000198	7.31e-07
0.00420	0.00330	0.000476	0.000203	6.26e-07
0.00420	0.00330	0.000518	0.000371	6.72e-07
0.00420	0.00330	0.000640	0.000374	5.82e-07
0.00820	0.00168	0.000833	0.000592	1.11e-06
0.00820	0.00168	0.000985	0.000608	9.27e-07
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0.0102	0.0257	0.000745	0.000693	5.24e-05
0.0102	0.0257	0.000601	0.000492	5.99e-05
0.0102	0.0257	0.000552	0.000881	3.30e-05
0.0320	0.00627	0.00239	0.00263	0.000177
0.0102	0.0257	0.000899	0.000552	1.35e-06
0.0102	0.0257	0.00106	0.000572	9.18e-07
0.0102	0.0257	0.000850	0.000445	2.22e-06
0.0102	0.0257	0.00104	0.000474	1.71e-06
0.0102	0.0257	0.00103	0.000835	2.11e-06
0.0102	0.0257	0.00133	0.000868	1.72e-06
0.0320	0.00627	0.00263	0.00219	6.15e-06
0.0320	0.00627	0.00301	0.00227	4.01e-06
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0.00620	0.00726	0.000453	0.000421	3.19e-05
0.00620	0.00726	0.000365	0.000299	3.64e-05
0.00620	0.00726	0.000335	0.000536	2.00e-05
0.0176	0.00429	0.00131	0.00145	9.74e-05
0.00620	0.00726	0.000595	0.000360	6.23e-07
0.00620	0.00726	0.000687	0.000371	4.90e-07
0.00620	0.00726	0.000565	0.000286	1.16e-06

0.00620	0.00726	0.000674	0.000298	9.56e-07
0.00620	0.00726	0.000703	0.000534	1.08e-06
0.00620	0.00726	0.000892	0.000550	9.06e-07
0.0176	0.00429	0.00157	0.00123	2.83e-06
0.0176	0.00429	0.00185	0.00128	2.10e-06
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0.00420	0.00330	0.000306	0.000284	2.18e-05
0.00420	0.00330	0.000247	0.000201	2.51e-05
0.00420	0.00330	0.000226	0.000360	1.39e-05
0.00820	0.00168	0.000610	0.000672	4.60e-05
0.00420	0.00330	0.000426	0.000251	3.78e-07
0.00420	0.00330	0.000483	0.000255	3.25e-07
0.00420	0.00330	0.000408	0.000199	7.25e-07
0.00420	0.00330	0.000476	0.000203	6.23e-07
0.00420	0.00330	0.000518	0.000371	6.67e-07
0.00420	0.00330	0.000640	0.000373	5.82e-07
0.00820	0.00168	0.000834	0.000593	1.11e-06
0.00820	0.00168	0.000986	0.000609	9.27e-07
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0.0102	0.0257	0.000744	0.000691	5.30e-05
0.0102	0.0257	0.000599	0.000489	6.09e-05
0.0102	0.0257	0.000549	0.000874	3.37e-05
0.0320	0.00627	0.00238	0.00262	0.000180
0.0102	0.0257	0.000899	0.000549	1.33e-06
0.0102	0.0257	0.00106	0.000570	9.17e-07
0.0102	0.0257	0.000851	0.000445	2.15e-06
0.0102	0.0257	0.00104	0.000474	1.69e-06
0.0102	0.0257	0.00103	0.000831	2.04e-06
0.0102	0.0257	0.00133	0.000864	1.71e-06
0.0320	0.00627	0.00263	0.00219	6.11e-06
0.0320	0.00627	0.00301	0.00227	4.00e-06
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0.00620	0.00726	0.000452	0.000420	3.22e-05
0.00620	0.00726	0.000364	0.000297	3.70e-05
0.00620	0.00726	0.000334	0.000531	2.05e-05
0.0176	0.00429	0.00131	0.00144	9.87e-05
0.00620	0.00726	0.000595	0.000360	6.20e-07
0.00620	0.00726	0.000687	0.000371	4.90e-07
0.00620	0.00726	0.000566	0.000286	1.15e-06
0.00620	0.00726	0.000675	0.000299	9.51e-07
0.00620	0.00726	0.000703	0.000533	1.07e-06

0.00620	0.00726	0.000892	0.000549	9.05e-07
0.0176	0.00429	0.00158	0.00123	2.82e-06
0.0176	0.00429	0.00186	0.00128	2.10e-06

m_Hfo_wSO4-	m_Hfo_wOSi(OH)3	m_Hfo_wOSiO(OH)2-	m_Hfo_wHCO3	m_Hfo_wCO3-
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
1.01e-05	0.000970	0.000643	0.000924	0.000169
1.01e-05	0.000725	0.000546	0.00118	0.000246
1.09e-05	0.000500	0.000193	0.00203	0.000216
2.51e-05	0.00162	0.000906	0.00266	0.000410
1.12e-07	0.000772	0.000805	0.000795	0.000228
8.64e-08	0.000720	0.000838	0.000727	0.000233
1.79e-07	0.000555	0.000704	0.000931	0.000325
1.34e-07	0.000515	0.000746	0.000820	0.000327
2.42e-07	0.000383	0.000330	0.00148	0.000351
1.71e-07	0.000362	0.000381	0.00126	0.000365
3.97e-07	0.00134	0.00116	0.00235	0.000562
2.87e-07	0.00125	0.00125	0.00211	0.000580
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
2.45e-05	0.00236	0.00156	0.00225	0.000410
2.45e-05	0.00176	0.00133	0.00287	0.000596
2.64e-05	0.00121	0.000469	0.00494	0.000525
9.79e-05	0.00633	0.00354	0.0104	0.00160
4.16e-07	0.00193	0.00193	0.00201	0.000556
2.49e-07	0.00179	0.00204	0.00180	0.000563
5.84e-07	0.00140	0.00165	0.00243	0.000788
3.92e-07	0.00130	0.00175	0.00216	0.000801
8.61e-07	0.000961	0.000729	0.00396	0.000828
5.64e-07	0.000881	0.000833	0.00341	0.000889
2.58e-06	0.00564	0.00417	0.0102	0.00208
1.52e-06	0.00538	0.00440	0.00962	0.00217
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
1.49e-05	0.00143	0.000949	0.00136	0.000249
1.49e-05	0.00107	0.000807	0.00175	0.000363
1.60e-05	0.000738	0.000285	0.00300	0.000319
5.39e-05	0.00348	0.00195	0.00571	0.000879
1.89e-07	0.00116	0.00118	0.00120	0.000336
1.33e-07	0.00108	0.00123	0.00109	0.000341
2.95e-07	0.000837	0.00102	0.00143	0.000479

2.12e-07	0.000776	0.00108	0.00126	0.000484
4.13e-07	0.000574	0.000465	0.00229	0.000512
2.80e-07	0.000533	0.000533	0.00196	0.000539
1.11e-06	0.00301	0.00238	0.00540	0.00117
7.29e-07	0.00284	0.00253	0.00496	0.00122
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
1.02e-05	0.000968	0.000643	0.000926	0.000169
1.03e-05	0.000722	0.000545	0.00118	0.000246
1.11e-05	0.000497	0.000193	0.00204	0.000217
2.54e-05	0.00162	0.000906	0.00266	0.000411
1.12e-07	0.000770	0.000805	0.000794	0.000229
8.63e-08	0.000718	0.000837	0.000726	0.000233
1.77e-07	0.000554	0.000701	0.000930	0.000324
1.33e-07	0.000514	0.000743	0.000820	0.000326
2.40e-07	0.000382	0.000329	0.00148	0.000351
1.70e-07	0.000360	0.000380	0.00125	0.000365
3.96e-07	0.00134	0.00116	0.00235	0.000562
2.87e-07	0.00125	0.00124	0.00211	0.000580
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
2.47e-05	0.00235	0.00156	0.00225	0.000411
2.49e-05	0.00175	0.00132	0.00288	0.000599
2.69e-05	0.00121	0.000468	0.00495	0.000528
9.91e-05	0.00631	0.00353	0.0104	0.00160
4.09e-07	0.00192	0.00194	0.00200	0.000557
2.48e-07	0.00178	0.00204	0.00179	0.000564
5.65e-07	0.00140	0.00165	0.00242	0.000787
3.88e-07	0.00129	0.00175	0.00215	0.000800
8.26e-07	0.000955	0.000729	0.00395	0.000830
5.57e-07	0.000875	0.000833	0.00340	0.000890
2.56e-06	0.00563	0.00416	0.0102	0.00208
1.51e-06	0.00537	0.00439	0.00962	0.00217
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
1.50e-05	0.00143	0.000949	0.00137	0.000250
1.51e-05	0.00107	0.000805	0.00175	0.000364
1.64e-05	0.000734	0.000285	0.00301	0.000321
5.45e-05	0.00347	0.00194	0.00572	0.000882
1.88e-07	0.00115	0.00118	0.00120	0.000337
1.33e-07	0.00108	0.00123	0.00108	0.000341
2.91e-07	0.000834	0.00102	0.00142	0.000478
2.11e-07	0.000774	0.00108	0.00126	0.000483
4.07e-07	0.000571	0.000464	0.00229	0.000512

2.79e-07	0.000531	0.000532	0.00195	0.000539
1.10e-06	0.00300	0.00237	0.00540	0.00117
7.28e-07	0.00283	0.00252	0.00496	0.00122

m_Hfo_wPO4-2	m_Hfo_wHPO4-	m_Hfo_wH2PO4	m_Hfo_sCO3-	m_Hfo_sHCO3
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
2.71e-05	6.04e-05	2.29e-06	1.85e-08	1.01e-07
1.73e-05	3.39e-05	1.13e-06	2.14e-08	1.03e-07
4.50e-05	0.000173	1.12e-05	1.78e-08	1.67e-07
2.63e-05	6.96e-05	3.13e-06	6.66e-08	4.32e-07
3.54e-05	5.02e-05	1.21e-06	1.97e-08	6.85e-08
3.64e-05	4.63e-05	1.00e-06	1.86e-08	5.79e-08
2.39e-05	2.79e-05	5.53e-07	2.04e-08	5.83e-08
2.56e-05	2.62e-05	4.55e-07	1.88e-08	4.72e-08
8.10e-05	0.000139	4.07e-06	1.06e-08	4.46e-08
9.00e-05	0.000126	3.00e-06	7.85e-09	2.70e-08
3.60e-05	6.13e-05	1.78e-06	5.86e-08	2.45e-07
3.92e-05	5.81e-05	1.46e-06	4.97e-08	1.81e-07
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
6.57e-05	0.000147	5.55e-06	4.48e-08	2.45e-07
4.19e-05	8.23e-05	2.74e-06	5.19e-08	2.50e-07
0.000109	0.000419	2.73e-05	4.32e-08	4.07e-07
0.000103	0.000272	1.22e-05	2.60e-07	1.69e-06
8.58e-05	0.000126	3.16e-06	4.83e-08	1.74e-07
9.12e-05	0.000118	2.61e-06	4.54e-08	1.45e-07
5.57e-05	7.00e-05	1.49e-06	4.85e-08	1.50e-07
6.01e-05	6.59e-05	1.23e-06	4.47e-08	1.21e-07
0.000183	0.000357	1.18e-05	2.88e-08	1.38e-07
0.000210	0.000328	8.72e-06	2.40e-08	9.20e-08
0.000126	0.000252	8.57e-06	2.61e-07	1.28e-06
0.000135	0.000244	7.50e-06	2.46e-07	1.09e-06
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
3.99e-05	8.91e-05	3.38e-06	2.72e-08	1.49e-07
2.55e-05	5.00e-05	1.67e-06	3.16e-08	1.52e-07
6.65e-05	0.000255	1.66e-05	2.63e-08	2.47e-07
5.65e-05	0.000149	6.71e-06	1.43e-07	9.28e-07
5.21e-05	7.57e-05	1.87e-06	2.94e-08	1.05e-07
5.44e-05	7.06e-05	1.56e-06	2.77e-08	8.82e-08
3.46e-05	4.19e-05	8.63e-07	3.01e-08	8.96e-08

3.71e-05	3.94e-05	7.11e-07	2.78e-08	7.24e-08
0.000116	0.000211	6.54e-06	1.68e-08	7.54e-08
0.000131	0.000193	4.85e-06	1.34e-08	4.87e-08
7.25e-05	0.000136	4.32e-06	1.37e-07	6.29e-07
7.86e-05	0.000130	3.67e-06	1.24e-07	5.05e-07
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
2.72e-05	6.05e-05	2.29e-06	1.83e-08	1.00e-07
1.74e-05	3.40e-05	1.13e-06	2.12e-08	1.02e-07
4.54e-05	0.000173	1.12e-05	1.75e-08	1.64e-07
2.65e-05	6.98e-05	3.13e-06	6.61e-08	4.28e-07
3.56e-05	5.03e-05	1.21e-06	1.94e-08	6.75e-08
3.66e-05	4.64e-05	1.00e-06	1.83e-08	5.70e-08
2.40e-05	2.80e-05	5.56e-07	1.98e-08	5.66e-08
2.57e-05	2.63e-05	4.58e-07	1.83e-08	4.59e-08
8.15e-05	0.000140	4.08e-06	1.01e-08	4.24e-08
9.05e-05	0.000127	3.01e-06	7.46e-09	2.56e-08
3.61e-05	6.15e-05	1.78e-06	5.75e-08	2.41e-07
3.94e-05	5.83e-05	1.47e-06	4.86e-08	1.77e-07
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
6.60e-05	0.000147	5.56e-06	4.45e-08	2.43e-07
4.22e-05	8.26e-05	2.75e-06	5.14e-08	2.47e-07
0.000110	0.000421	2.73e-05	4.25e-08	3.98e-07
0.000103	0.000273	1.22e-05	2.58e-07	1.67e-06
8.63e-05	0.000127	3.15e-06	4.75e-08	1.71e-07
9.17e-05	0.000119	2.60e-06	4.47e-08	1.42e-07
5.60e-05	7.03e-05	1.50e-06	4.67e-08	1.44e-07
6.04e-05	6.62e-05	1.23e-06	4.31e-08	1.16e-07
0.000185	0.000358	1.18e-05	2.72e-08	1.29e-07
0.000212	0.000329	8.70e-06	2.27e-08	8.67e-08
0.000127	0.000253	8.60e-06	2.57e-07	1.26e-06
0.000136	0.000245	7.53e-06	2.42e-07	1.07e-06
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
4.01e-05	8.93e-05	3.38e-06	2.71e-08	1.48e-07
2.57e-05	5.02e-05	1.67e-06	3.13e-08	1.50e-07
6.71e-05	0.000256	1.66e-05	2.58e-08	2.42e-07
5.68e-05	0.000150	6.72e-06	1.42e-07	9.19e-07
5.24e-05	7.59e-05	1.87e-06	2.90e-08	1.03e-07
5.46e-05	7.07e-05	1.56e-06	2.73e-08	8.67e-08
3.47e-05	4.21e-05	8.67e-07	2.91e-08	8.68e-08
3.73e-05	3.96e-05	7.15e-07	2.69e-08	7.01e-08
0.000117	0.000212	6.55e-06	1.60e-08	7.15e-08

0.000131	0.000194	4.86e-06	1.28e-08	4.62e-08
7.28e-05	0.000136	4.34e-06	1.34e-07	6.17e-07
7.89e-05	0.000131	3.69e-06	1.22e-07	4.95e-07

m_Hfo_sHPO4-	m_Hfo_sH2BO3	m_Hfo_sH2PO4	m_Hfo_sOSi(OH)3	m_Hfo_sOSiO(OH)2-
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
6.60e-09	5.51e-11	2.50e-10	1.06e-07	7.03e-08
2.95e-09	4.00e-11	9.83e-11	6.31e-08	4.76e-08
1.42e-08	1.15e-12	9.24e-10	4.11e-08	1.59e-08
1.13e-08	6.47e-11	5.08e-10	2.63e-07	1.47e-07
4.33e-09	1.87e-11	1.04e-10	6.65e-08	6.94e-08
3.69e-09	1.91e-11	7.97e-11	5.74e-08	6.68e-08
1.75e-09	1.98e-11	3.46e-11	3.48e-08	4.41e-08
1.51e-09	1.96e-11	2.62e-11	2.97e-08	4.29e-08
4.19e-09	8.89e-13	1.22e-10	1.15e-08	9.92e-09
2.71e-09	1.05e-12	6.46e-11	7.77e-09	8.20e-09
6.39e-09	3.13e-11	1.85e-10	1.40e-07	1.21e-07
4.98e-09	3.47e-11	1.25e-10	1.07e-07	1.07e-07
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
1.60e-08	1.34e-10	6.07e-10	2.58e-07	1.71e-07
7.16e-09	9.72e-11	2.39e-10	1.53e-07	1.16e-07
3.45e-08	2.79e-12	2.24e-09	9.99e-08	3.86e-08
4.41e-08	2.53e-10	1.98e-09	1.03e-06	5.75e-07
1.10e-08	5.11e-11	2.75e-10	1.67e-07	1.68e-07
9.54e-09	4.70e-11	2.10e-10	1.44e-07	1.64e-07
4.31e-09	5.31e-11	9.20e-11	8.64e-08	1.02e-07
3.68e-09	5.11e-11	6.87e-11	7.26e-08	9.78e-08
1.24e-08	1.79e-12	4.11e-10	3.34e-08	2.53e-08
8.86e-09	1.74e-12	2.35e-10	2.38e-08	2.25e-08
3.16e-08	1.12e-10	1.08e-09	7.08e-07	5.23e-07
2.78e-08	1.09e-10	8.53e-10	6.11e-07	5.00e-07
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
9.74e-09	8.14e-11	3.69e-10	1.57e-07	1.04e-07
4.35e-09	5.91e-11	1.45e-10	9.31e-08	7.02e-08
2.10e-08	1.70e-12	1.36e-09	6.07e-08	2.34e-08
2.43e-08	1.39e-10	1.09e-09	5.65e-07	3.16e-07
6.61e-09	2.81e-11	1.63e-10	1.01e-07	1.03e-07
5.73e-09	2.74e-11	1.26e-10	8.78e-08	1.00e-07
2.63e-09	3.01e-11	5.43e-11	5.26e-08	6.41e-08

2.26e-09	2.95e-11	4.08e-11	4.45e-08	6.20e-08
6.95e-09	1.15e-12	2.15e-10	1.89e-08	1.53e-08
4.81e-09	1.23e-12	1.21e-10	1.33e-08	1.33e-08
1.58e-08	6.24e-11	5.03e-10	3.51e-07	2.77e-07
1.33e-08	6.38e-11	3.74e-10	2.89e-07	2.57e-07
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
6.55e-09	5.45e-11	2.48e-10	1.05e-07	6.96e-08
2.92e-09	3.93e-11	9.72e-11	6.20e-08	4.69e-08
1.39e-08	1.12e-12	9.04e-10	4.00e-08	1.55e-08
1.12e-08	6.38e-11	5.03e-10	2.60e-07	1.46e-07
4.28e-09	1.84e-11	1.03e-10	6.54e-08	6.84e-08
3.65e-09	1.87e-11	7.86e-11	5.64e-08	6.58e-08
1.71e-09	1.93e-11	3.39e-11	3.37e-08	4.27e-08
1.47e-09	1.90e-11	2.56e-11	2.88e-08	4.16e-08
4.01e-09	8.46e-13	1.17e-10	1.09e-08	9.42e-09
2.59e-09	1.00e-12	6.16e-11	7.36e-09	7.78e-09
6.29e-09	3.06e-11	1.82e-10	1.37e-07	1.19e-07
4.90e-09	3.38e-11	1.23e-10	1.05e-07	1.05e-07
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
1.59e-08	1.32e-10	6.02e-10	2.55e-07	1.69e-07
7.10e-09	9.55e-11	2.36e-10	1.51e-07	1.14e-07
3.39e-08	2.71e-12	2.19e-09	9.71e-08	3.77e-08
4.38e-08	2.49e-10	1.96e-09	1.01e-06	5.68e-07
1.08e-08	5.02e-11	2.69e-10	1.64e-07	1.65e-07
9.39e-09	4.62e-11	2.06e-10	1.41e-07	1.62e-07
4.17e-09	5.15e-11	8.89e-11	8.30e-08	9.79e-08
3.57e-09	4.97e-11	6.64e-11	6.98e-08	9.43e-08
1.17e-08	1.68e-12	3.86e-10	3.13e-08	2.39e-08
8.40e-09	1.65e-12	2.22e-10	2.23e-08	2.12e-08
3.12e-08	1.10e-10	1.06e-09	6.94e-07	5.13e-07
2.74e-08	1.07e-10	8.40e-10	5.99e-07	4.90e-07
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
9.68e-09	8.05e-11	3.66e-10	1.55e-07	1.03e-07
4.32e-09	5.80e-11	1.43e-10	9.15e-08	6.92e-08
2.06e-08	1.65e-12	1.33e-09	5.90e-08	2.29e-08
2.41e-08	1.37e-10	1.08e-09	5.58e-07	3.12e-07
6.53e-09	2.77e-11	1.61e-10	9.94e-08	1.01e-07
5.66e-09	2.69e-11	1.24e-10	8.62e-08	9.85e-08
2.57e-09	2.93e-11	5.29e-11	5.08e-08	6.20e-08
2.21e-09	2.87e-11	3.98e-11	4.31e-08	6.00e-08
6.63e-09	1.09e-12	2.05e-10	1.78e-08	1.45e-08

4.60e-09	1.17e-12	1.15e-10	1.26e-08	1.26e-08
1.56e-08	6.10e-11	4.96e-10	3.43e-07	2.71e-07
1.31e-08	6.23e-11	3.68e-10	2.82e-07	2.52e-07

m_Hfo_sOHSO4-2	m_Hfo_sSO4-	m_Hao_SO4-	m_Hao_OHSO4-2	m_Hao_H2BO3
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
2.36e-09	1.10e-09	4.42e-14	0.000460	0.00219
2.15e-09	8.80e-10	3.99e-14	0.000341	0.00247
1.12e-09	8.94e-10	2.19e-13	0.000949	0.000386
7.37e-09	4.08e-09	4.28e-14	0.000264	0.000952
3.26e-11	9.68e-12	5.19e-15	0.000381	0.00221
2.59e-11	6.89e-12	4.06e-15	0.000368	0.00223
4.58e-11	1.12e-11	4.78e-15	0.000326	0.00243
3.61e-11	7.71e-12	3.74e-15	0.000330	0.00240
2.02e-11	7.28e-12	1.65e-14	0.000844	0.000521
1.25e-11	3.67e-12	1.06e-14	0.000810	0.000651
1.16e-10	4.14e-11	4.70e-15	0.000222	0.00101
7.96e-11	2.46e-11	3.19e-15	0.000208	0.00106
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
5.73e-09	2.67e-09	3.45e-13	0.00359	0.0170
5.21e-09	2.14e-09	3.11e-13	0.00266	0.0193
2.71e-09	2.17e-09	1.71e-12	0.00740	0.00301
2.88e-08	1.59e-08	1.59e-13	0.000985	0.00355
1.17e-10	3.61e-11	4.97e-14	0.00319	0.0170
7.39e-11	2.01e-11	3.56e-14	0.00307	0.0170
1.37e-10	3.59e-11	4.27e-14	0.00256	0.0192
9.54e-11	2.19e-11	3.15e-14	0.00252	0.0191
7.34e-11	2.99e-11	1.78e-13	0.00707	0.00315
4.64e-11	1.52e-11	1.16e-13	0.00691	0.00329
7.72e-10	3.23e-10	2.84e-14	0.000885	0.00361
4.55e-10	1.72e-10	1.96e-14	0.000835	0.00368
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
3.48e-09	1.62e-09	9.72e-14	0.00101	0.00481
3.17e-09	1.30e-09	8.77e-14	0.000750	0.00544
1.65e-09	1.32e-09	4.81e-13	0.00209	0.000850
1.58e-08	8.75e-09	1.09e-13	0.000674	0.00243
5.44e-11	1.65e-11	1.25e-14	0.000862	0.00482
3.98e-11	1.08e-11	9.51e-15	0.000831	0.00485
7.31e-11	1.86e-11	1.12e-14	0.000715	0.00538

5.49e-11	1.22e-11	8.56e-15	0.000715	0.00534
3.56e-11	1.36e-11	4.22e-14	0.00192	0.000987
2.26e-11	6.98e-12	2.77e-14	0.00186	0.00112
3.30e-10	1.29e-10	1.58e-14	0.000594	0.00249
2.14e-10	7.42e-11	1.10e-14	0.000563	0.00256
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
2.36e-09	1.10e-09	4.43e-14	0.000459	0.00218
2.16e-09	8.82e-10	4.00e-14	0.000340	0.00246
1.12e-09	8.91e-10	2.18e-13	0.000948	0.000376
7.39e-09	4.08e-09	4.29e-14	0.000264	0.000945
3.21e-11	9.50e-12	5.19e-15	0.000384	0.00220
2.55e-11	6.78e-12	4.07e-15	0.000370	0.00223
4.41e-11	1.08e-11	4.77e-15	0.000330	0.00242
3.49e-11	7.47e-12	3.75e-15	0.000334	0.00239
1.91e-11	6.87e-12	1.63e-14	0.000850	0.000511
1.19e-11	3.49e-12	1.05e-14	0.000816	0.000641
1.14e-10	4.05e-11	4.71e-15	0.000224	0.00101
7.78e-11	2.41e-11	3.20e-15	0.000210	0.00106
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
5.74e-09	2.67e-09	3.46e-13	0.00358	0.0170
5.23e-09	2.14e-09	3.12e-13	0.00265	0.0192
2.71e-09	2.16e-09	1.70e-12	0.00739	0.00293
2.88e-08	1.59e-08	1.60e-13	0.000985	0.00352
1.14e-10	3.49e-11	4.93e-14	0.00321	0.0170
7.26e-11	1.96e-11	3.55e-14	0.00309	0.0170
1.28e-10	3.35e-11	4.19e-14	0.00258	0.0191
9.13e-11	2.09e-11	3.13e-14	0.00255	0.0190
6.66e-11	2.70e-11	1.72e-13	0.00712	0.00307
4.37e-11	1.42e-11	1.14e-13	0.00696	0.00321
7.54e-10	3.16e-10	2.84e-14	0.000893	0.00359
4.46e-10	1.69e-10	1.96e-14	0.000843	0.00366
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
3.49e-09	1.63e-09	9.75e-14	0.00101	0.00479
3.18e-09	1.30e-09	8.80e-14	0.000747	0.00541
1.65e-09	1.31e-09	4.79e-13	0.00208	0.000827
1.59e-08	8.75e-09	1.09e-13	0.000674	0.00241
5.34e-11	1.62e-11	1.24e-14	0.000867	0.00481
3.92e-11	1.06e-11	9.51e-15	0.000837	0.00483
7.00e-11	1.78e-11	1.12e-14	0.000723	0.00535
5.30e-11	1.18e-11	8.56e-15	0.000723	0.00532
3.34e-11	1.27e-11	4.15e-14	0.00193	0.000964

2.14e-11	6.62e-12	2.74e-14	0.00187	0.00110
3.22e-10	1.26e-10	1.59e-14	0.000599	0.00248
2.09e-10	7.26e-11	1.10e-14	0.000569	0.00254

m_Hao_H3BO4-	Ferrihydrite	d_Ferrihydrite	Gibbsite	d_Gibbsite
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
1.06e-10	0.0210	0	0.100	0
9.89e-11	0.0210	0	0.100	0
7.85e-12	0.0210	0	0.100	0
2.75e-11	0.0410	0	0.0510	0
7.58e-10	0.0210	1.99e-06	0.100	8.73e-07
9.47e-10	0.0210	1.99e-06	0.100	8.48e-07
7.76e-10	0.0210	1.99e-06	0.100	8.91e-07
9.93e-10	0.0210	1.99e-06	0.100	8.64e-07
1.25e-10	0.0210	2.00e-06	0.100	9.07e-07
2.32e-10	0.0210	1.99e-06	0.100	8.77e-07
2.23e-10	0.0410	1.99e-06	0.0510	9.08e-07
3.24e-10	0.0410	1.99e-06	0.0510	8.85e-07
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
8.29e-10	0.0510	0	0.780	0
7.71e-10	0.0510	0	0.780	0
6.12e-11	0.0510	0	0.780	0
1.02e-10	0.160	0	0.190	0
5.12e-09	0.0510	1.99e-06	0.780	8.90e-07
6.87e-09	0.0510	1.99e-06	0.780	8.61e-07
5.37e-09	0.0510	1.99e-06	0.780	9.08e-07
7.17e-09	0.0510	1.99e-06	0.780	8.82e-07
5.85e-10	0.0510	2.01e-06	0.780	9.23e-07
9.13e-10	0.0510	1.99e-06	0.780	8.98e-07
5.27e-10	0.160	1.99e-06	0.190	9.28e-07
7.35e-10	0.160	1.99e-06	0.190	9.13e-07
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
2.34e-10	0.0310	0	0.220	0
2.18e-10	0.0310	0	0.220	0
1.73e-11	0.0310	0	0.220	0
7.01e-11	0.0880	0	0.130	0
1.56e-09	0.0310	1.99e-06	0.220	8.81e-07
1.98e-09	0.0310	1.99e-06	0.220	8.54e-07
1.60e-09	0.0310	1.99e-06	0.220	8.99e-07

2.09e-09	0.0310	1.99e-06	0.220	8.73e-07
2.10e-10	0.0310	2.00e-06	0.220	9.15e-07
3.53e-10	0.0310	1.99e-06	0.220	8.87e-07
4.37e-10	0.0880	1.99e-06	0.130	9.20e-07
6.12e-10	0.0880	1.99e-06	0.130	9.02e-07
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
1.05e-10	0.0210	0	0.100	0
9.77e-11	0.0210	0	0.100	0
7.66e-12	0.0210	0	0.100	0
2.72e-11	0.0410	0	0.0510	0
7.61e-10	0.0210	1.99e-06	0.100	8.73e-07
9.48e-10	0.0210	1.99e-06	0.100	8.48e-07
7.82e-10	0.0210	1.99e-06	0.100	8.91e-07
9.97e-10	0.0210	1.99e-06	0.100	8.64e-07
1.25e-10	0.0210	2.00e-06	0.100	9.07e-07
2.32e-10	0.0210	1.99e-06	0.100	8.77e-07
2.23e-10	0.0410	1.99e-06	0.0510	9.08e-07
3.24e-10	0.0410	1.99e-06	0.0510	8.85e-07
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
8.23e-10	0.0510	0	0.780	0
7.62e-10	0.0510	0	0.780	0
5.97e-11	0.0510	0	0.780	0
1.01e-10	0.160	0	0.190	0
5.17e-09	0.0510	1.99e-06	0.780	8.90e-07
6.92e-09	0.0510	1.99e-06	0.780	8.61e-07
5.50e-09	0.0510	1.99e-06	0.780	9.08e-07
7.26e-09	0.0510	1.99e-06	0.780	8.82e-07
5.93e-10	0.0510	2.01e-06	0.780	9.23e-07
9.12e-10	0.0510	1.99e-06	0.780	8.98e-07
5.28e-10	0.160	1.99e-06	0.190	9.27e-07
7.35e-10	0.160	1.99e-06	0.190	9.13e-07
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
2.32e-10	0.0310	0	0.220	0
2.15e-10	0.0310	0	0.220	0
1.68e-11	0.0310	0	0.220	0
6.94e-11	0.0880	0	0.130	0
1.57e-09	0.0310	1.99e-06	0.220	8.81e-07
1.99e-09	0.0310	1.99e-06	0.220	8.53e-07
1.62e-09	0.0310	1.99e-06	0.220	8.99e-07
2.10e-09	0.0310	1.99e-06	0.220	8.72e-07
2.10e-10	0.0310	2.00e-06	0.220	9.15e-07

3.51e-10	0.0310	1.99e-06	0.220	8.86e-07
4.38e-10	0.0880	1.99e-06	0.130	9.20e-07
6.12e-10	0.0880	1.99e-06	0.130	9.02e-07

Barite	d_Barite	Calcite	d_Calcite	Dolomite(ordered)
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0.100	0	0
0	0	0.100	0	0
0	0	0.100	0	0
0	0	10.0	0	0
4.10e-07	4.10e-07	0.0997	-2.76e-04	0
7.95e-07	3.85e-07	0.0996	-1.70e-04	0
3.93e-07	3.93e-07	0.0996	-3.68e-04	0
7.73e-07	3.80e-07	0.0994	-2.23e-04	0
4.14e-07	4.14e-07	0.0995	-4.90e-04	0
8.06e-07	3.92e-07	0.0992	-2.79e-04	0
4.04e-07	4.04e-07	10.00	-5.23e-04	0
7.85e-07	3.81e-07	10.00	-3.23e-04	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0.100	0	0
0	0	0.100	0	0
0	0	0.100	0	0
0	0	10.0	0	0
4.84e-07	4.84e-07	0.0996	-3.88e-04	0
8.94e-07	4.10e-07	0.0994	-2.18e-04	0
4.26e-07	4.26e-07	0.0995	-5.17e-04	0
8.14e-07	3.88e-07	0.0992	-3.06e-04	0
4.66e-07	4.66e-07	0.0993	-7.09e-04	0
8.89e-07	4.23e-07	0.0989	-4.10e-04	0
4.52e-07	4.52e-07	10.00	-9.25e-04	0
8.26e-07	3.75e-07	10.00	-5.55e-04	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0.100	0	0
0	0	0.100	0	0
0	0	0.100	0	0
0	0	10.0	0	0
4.30e-07	4.30e-07	0.0997	-3.19e-04	0
8.18e-07	3.88e-07	0.0995	-1.89e-04	0
4.02e-07	4.02e-07	0.0996	-4.29e-04	0

7.82e-07	3.79e-07	0.0993	-2.58e-04	0
4.31e-07	4.31e-07	0.0994	-5.79e-04	0
8.28e-07	3.97e-07	0.0991	-3.31e-04	0
4.27e-07	4.27e-07	10.00	-7.17e-04	0
8.05e-07	3.78e-07	10.00	-4.43e-04	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0.100	0	0
0	0	0.100	0	0
0	0	0.100	0	0
0	0	10.0	0	0
4.09e-07	4.09e-07	0.0997	-2.75e-04	0
7.94e-07	3.85e-07	0.0996	-1.69e-04	0
3.92e-07	3.92e-07	0.0996	-3.66e-04	0
7.72e-07	3.80e-07	0.0994	-2.22e-04	0
4.12e-07	4.12e-07	0.0995	-4.88e-04	0
8.04e-07	3.92e-07	0.0992	-2.78e-04	0
4.04e-07	4.04e-07	10.00	-5.22e-04	0
7.85e-07	3.81e-07	10.00	-3.22e-04	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0.100	0	0
0	0	0.100	0	0
0	0	0.100	0	0
0	0	10.0	0	0
4.80e-07	4.80e-07	0.0996	-3.86e-04	0
8.89e-07	4.09e-07	0.0994	-2.16e-04	0
4.16e-07	4.16e-07	0.0995	-5.12e-04	0
8.03e-07	3.86e-07	0.0992	-3.03e-04	0
4.54e-07	4.54e-07	0.0993	-7.01e-04	0
8.75e-07	4.21e-07	0.0989	-4.06e-04	0
4.51e-07	4.51e-07	10.00	-9.20e-04	0
8.26e-07	3.75e-07	10.00	-5.54e-04	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0.100	0	0
0	0	0.100	0	0
0	0	0.100	0	0
0	0	10.0	0	0
4.28e-07	4.28e-07	0.0997	-3.17e-04	0
8.16e-07	3.88e-07	0.0995	-1.88e-04	0
3.99e-07	3.99e-07	0.0996	-4.27e-04	0
7.79e-07	3.79e-07	0.0993	-2.57e-04	0
4.27e-07	4.27e-07	0.0994	-5.75e-04	0

8.24e-07	3.97e-07	0.0991	-3.29e-04	0
4.27e-07	4.27e-07	10.00	-7.14e-04	0
8.05e-07	3.78e-07	10.00	-4.42e-04	0

d_Dolomite(ordered)	Gypsum	d_Gypsum	si_Ferrihydrite	si_Gibbsite
0	0	0	0.783	1.21
0	0	0	0.905	1.01
0	0	0	1.39	0.854
0	0	0	0.851	0.818
0	0	0	0.783	1.21
0	0	0	0.905	1.01
0	0	0	1.39	0.854
0	0	0	0.851	0.818
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0.783	1.21
0	0	0	0.905	1.01
0	0	0	1.39	0.854
0	0	0	0.851	0.818
0	0	0	0.783	1.21
0	0	0	0.905	1.01
0	0	0	1.39	0.854
0	0	0	0.851	0.818
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0.783	1.21
0	0	0	0.905	1.01
0	0	0	1.39	0.854
0	0	0	0.851	0.818
0	0	0	0.783	1.21
0	0	0	0.905	1.01
0	0	0	1.39	0.854
0	0	0	0.851	0.818
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0.792	1.22
0	0	0	0.908	1.01
0	0	0	1.41	0.857
0	0	0	0.854	0.819
0	0	0	0.792	1.22
0	0	0	0.908	1.01
0	0	0	1.41	0.857
0	0	0	0.854	0.819
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0.792	1.22
0	0	0	0.908	1.01
0	0	0	1.41	0.857
0	0	0	0.854	0.819
0	0	0	0.792	1.22
0	0	0	0.908	1.01
0	0	0	1.41	0.857
0	0	0	0.854	0.819
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0.792	1.22
0	0	0	0.908	1.01
0	0	0	1.41	0.857
0	0	0	0.854	0.819
0	0	0	0.792	1.22
0	0	0	0.908	1.01
0	0	0	1.41	0.857
0	0	0	0.854	0.819
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

si_Barite	si_Calcite	si_Dolomite(ordered)	si_Gypsum
0.477	-3.35e-01	-5.70e-01	-5.88e-01
0.438	-4.09e-01	-9.39e-01	-8.24e-01
0.484	-4.30e-01	-1.02e+00	-7.74e-01
0.546	-5.15e-01	-1.17e+00	-7.63e-01
0.477	-3.35e-01	-5.70e-01	-5.88e-01
0.438	-4.09e-01	-9.39e-01	-8.24e-01
0.484	-4.30e-01	-1.02e+00	-7.74e-01
0.546	-5.15e-01	-1.17e+00	-7.63e-01
0	0	-2.37e-01	-2.35e+00
0	0	-2.98e-01	-2.47e+00
0	0	-4.47e-01	-2.30e+00
0	0	-4.42e-01	-2.43e+00
0	0	-3.70e-01	-2.20e+00
0	0	-3.94e-01	-2.37e+00
0	0	-5.10e-01	-2.19e+00
0	0	-5.15e-01	-2.35e+00
0.477	-3.35e-01	-5.70e-01	-5.88e-01
0.438	-4.09e-01	-9.39e-01	-8.24e-01
0.484	-4.30e-01	-1.02e+00	-7.74e-01
0.546	-5.15e-01	-1.17e+00	-7.63e-01
0.477	-3.35e-01	-5.70e-01	-5.88e-01
0.438	-4.09e-01	-9.39e-01	-8.24e-01
0.484	-4.30e-01	-1.02e+00	-7.74e-01
0.546	-5.15e-01	-1.17e+00	-7.63e-01
0	0	-1.90e-02	-2.17e+00
0	0	-1.18e-01	-2.40e+00
0	0	-2.59e-01	-2.17e+00
0	0	-3.62e-01	-2.35e+00
0	0	-1.82e-01	-2.03e+00
0	0	-2.47e-01	-2.24e+00
0	0	-4.81e-01	-1.95e+00
0	0	-5.39e-01	-2.20e+00
0.477	-3.35e-01	-5.70e-01	-5.88e-01
0.438	-4.09e-01	-9.39e-01	-8.24e-01
0.484	-4.30e-01	-1.02e+00	-7.74e-01
0.546	-5.15e-01	-1.17e+00	-7.63e-01
0.477	-3.35e-01	-5.70e-01	-5.88e-01
0.438	-4.09e-01	-9.39e-01	-8.24e-01
0.484	-4.30e-01	-1.02e+00	-7.74e-01
0.546	-5.15e-01	-1.17e+00	-7.63e-01
0	0	-1.68e-01	-2.29e+00
0	0	-2.56e-01	-2.45e+00
0	0	-4.02e-01	-2.25e+00

0	0	-4.51e-01	-2.40e+00
0	0	-3.08e-01	-2.14e+00
0	0	-3.67e-01	-2.33e+00
0	0	-4.80e-01	-2.07e+00
0	0	-5.33e-01	-2.27e+00
0.489	-3.28e-01	-5.57e-01	-5.79e-01
0.457	-3.99e-01	-9.17e-01	-8.09e-01
0.509	-4.15e-01	-9.93e-01	-7.53e-01
0.561	-5.06e-01	-1.16e+00	-7.51e-01
0.489	-3.28e-01	-5.57e-01	-5.79e-01
0.457	-3.99e-01	-9.17e-01	-8.09e-01
0.509	-4.15e-01	-9.93e-01	-7.53e-01
0.561	-5.06e-01	-1.16e+00	-7.51e-01
0	0	-2.33e-01	-2.35e+00
0	0	-2.95e-01	-2.47e+00
0	0	-4.40e-01	-2.31e+00
0	0	-4.40e-01	-2.43e+00
0	0	-3.62e-01	-2.21e+00
0	0	-3.90e-01	-2.37e+00
0	0	-5.06e-01	-2.20e+00
0	0	-5.13e-01	-2.35e+00
0.489	-3.28e-01	-5.57e-01	-5.79e-01
0.457	-3.99e-01	-9.17e-01	-8.09e-01
0.509	-4.15e-01	-9.93e-01	-7.53e-01
0.561	-5.06e-01	-1.16e+00	-7.51e-01
0.489	-3.28e-01	-5.57e-01	-5.79e-01
0.457	-3.99e-01	-9.17e-01	-8.09e-01
0.509	-4.15e-01	-9.93e-01	-7.53e-01
0.561	-5.06e-01	-1.16e+00	-7.51e-01
0	0	-8.10e-03	-2.18e+00
0	0	-1.11e-01	-2.40e+00
0	0	-2.41e-01	-2.19e+00
0	0	-3.50e-01	-2.36e+00
0	0	-1.60e-01	-2.05e+00
0	0	-2.35e-01	-2.25e+00
0	0	-4.74e-01	-1.95e+00
0	0	-5.35e-01	-2.20e+00
0.489	-3.28e-01	-5.57e-01	-5.79e-01
0.457	-3.99e-01	-9.17e-01	-8.09e-01
0.509	-4.15e-01	-9.93e-01	-7.53e-01
0.561	-5.06e-01	-1.16e+00	-7.51e-01
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0.457	-3.99e-01	-9.17e-01	-8.09e-01
0.509	-4.15e-01	-9.93e-01	-7.53e-01
0.561	-5.06e-01	-1.16e+00	-7.51e-01
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0	0	-2.52e-01	-2.45e+00
0	0	-3.92e-01	-2.26e+00
0	0	-4.46e-01	-2.40e+00
0	0	-2.96e-01	-2.14e+00

0	0	-3.61e-01	-2.33e+00
0	0	-4.74e-01	-2.07e+00
0	0	-5.30e-01	-2.27e+00

APPENDIX B
DRAWINGS AND MATERIALS SPECIFICATIONS FOR SELECTED REMEDY

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CORRECTIVE ACTION PERMIT-LEVEL DESIGN

FLY ASH POND SYSTEM

BALDWIN POWER PLANT, BALDWIN IL

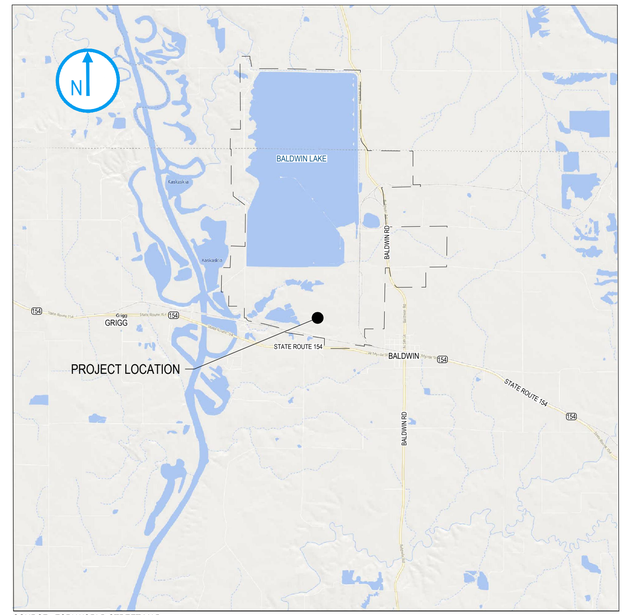
GROUNDWATER MANAGEMENT SYSTEM

AERIAL IMAGERY: ESRI WORLD IMAGERY

LOCATION MAP

1000' 0 1000'

SCALE: 1"=1000'



SOURCE: ESRI WORLD STREET MAP

VICINITY MAP

5000' 0 5000'

SCALE: 1"=5000'

DYNEGY MIDWEST GENERATION, LLC
BALDWIN ENERGY COMPLEX
10901 BALDWIN ROAD BALDWIN, IL 62217
APRIL 2025

RAMBOLL

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

INDEX OF DRAWINGS

SHEET INDEX NO.	SHEET TITLE
GENERAL	
G-000	COVER
CIVIL	
C-101	OVERALL SITE PLAN
C-201	GROUNDWATER MANAGEMENT SYSTEM - ENLARGED PLAN AND PROFILE 1
C-202	GROUNDWATER MANAGEMENT SYSTEM - ENLARGED PLAN AND PROFILE 2
C-203	GROUNDWATER MANAGEMENT SYSTEM - ENLARGED PLAN AND PROFILE 3
C-204	GROUNDWATER MANAGEMENT SYSTEM - ENLARGED PLAN AND PROFILE 4
C-205	GROUNDWATER MANAGEMENT SYSTEM - ENLARGED PLAN AND PROFILE 5
C-401	COMPRESSOR SHED DETAIL
C-501	TRENCH AND COLLECTION SUMP DETAILS
C-502	TRENCH SPOILS CONSOLIDATION AREA
PROCESS MECHANICAL	
P-001	SYSTEM PROCESS FLOW DIAGRAM

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1940110241-005

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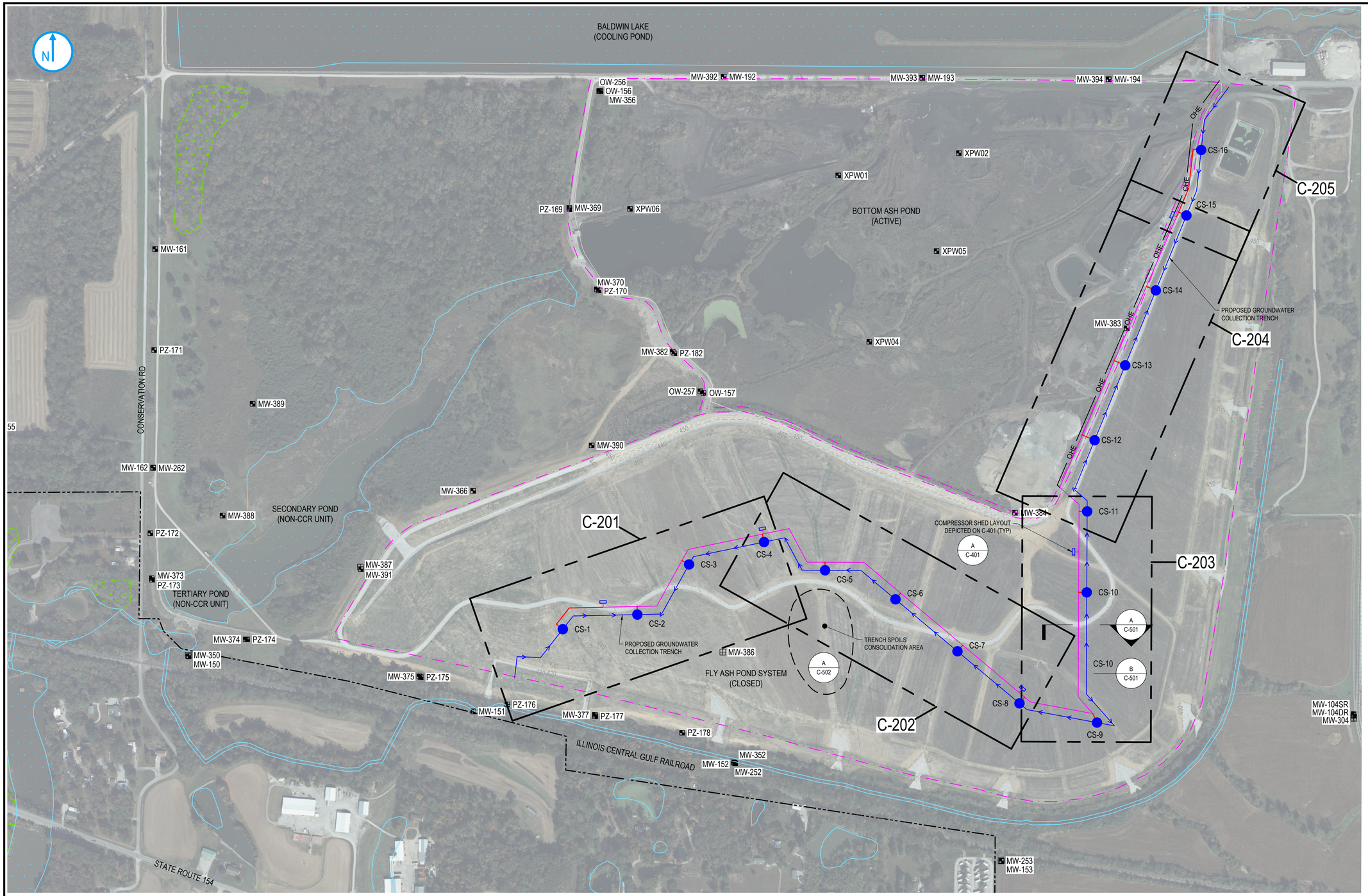

LEGEND

EXISTING

360	MAJOR CONTOUR
	MINOR CONTOUR
	APPROXIMATE SITE BOUNDARY
	CCR UNIT BOUNDARY
	WETLANDS
	BODY OF WATER (LAKE, POND, RAVINE, ETC.)
	RAILROAD
MW-194	MONITORING WELL

CORRECTIVE ACTION CONSTRUCTION

	GROUNDWATER COLLECTION TRENCH
	COLLECTION SUMP
OHE	OVERHEAD ELECTRIC
	WATER AND AIR CONVEYANCE PIPING
	ELECTRICAL CONDUIT AND WATER AND AIR CONVEYANCE PIPING
	STRUCTURE
	TRENCH SPOILS CONSOLIDATION AREA

NOTES:

1. FLY ASH POND SYSTEM CONTOURS ARE FROM CLOSURE CONSTRUCTION DRAWINGS COMPLETED BY INGENAE, OCTOBER 2020.
2. WETLANDS REPRESENTED AS PER ILLINOIS NATIONAL WETLANDS INVENTORY.
3. HORIZONTAL DATUM: ILLINOIS STATE PLANE (NAD83, IN US FEET).
   VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88, IN US FEET).
4. AERIAL IMAGERY IS TAKEN FROM "LUMINANT, DYNEGY MIDWEST GENERATION, LLC, BALDWIN ENERGY COMPLEX, DECEMBER 2020 TOPOGRAPHY", DATED MAY 20, 2021, BY INGENAE, LLC (2020 INGENAE SURVEY).
5. ALL WATER BODY LIMITS WERE CROPPED WHERE THEY OVERLAP EXISTING CCR UNITS AND NON-CCR UNITS.
6. THE GROUNDWATER MANAGEMENT SYSTEM DESIGN WILL BE FURTHER REFINED AS PART OF FINAL DESIGN ACTIVITIES THAT WILL BE INITIATED AFTER A CORRECTIVE ACTION CONSTRUCTION PERMIT HAS BEEN ISSUED FOR THE FLY ASH POND SYSTEM. THESE ACTIVITIES MAY INCLUDE, BUT ARE NOT LIMITED TO, THE COLLECTION OF ADDITIONAL SITE SURVEY AND/OR SUBSURFACE INVESTIGATION DATA, MORE REFINED DESIGN EVALUATIONS, ADDITIONAL ENGINEERING ANALYSES, AND/OR PERMIT-RELATED CONSIDERATIONS. SPECIFIC ELEMENTS OF THE GROUNDWATER MANAGEMENT SYSTEM DESIGN THAT MAY BE REFINED INCLUDE, BUT ARE NOT LIMITED TO, THE LIMITS OF DISTURBANCE, THE DIMENSIONS AND GEOMETRY OF THE WORK PAD, AND THE DEPTH OF GROUNDWATER COLLECTION TRENCH.
7. CONSTRUCTION ENTRANCES, ACCESS ROADS, STAGING AREAS, AND OTHER LOGISTICAL ELEMENTS WILL BE DEFINED DURING FINAL DESIGN.
8. STORMWATER BEST MANAGEMENT PRACTICES (BMPS) WILL BE DEFINED DURING FINAL DESIGN IN ACCORDANCE WITH A SITE-SPECIFIC STORMWATER POLLUTION PREVENTION PLAN (SWPP) THAT WILL BE OBTAINED AS PART OF FINAL DESIGN ACTIVITIES.
9. CCR-CONTACT CONSTRUCTION STORMWATER WILL BE DISCHARGED IN ACCORDANCE WITH APPLICABLE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT(S) THAT WILL BE OBTAINED AS PART OF FINAL DESIGN ACTIVITIES.

OVERALL SITE PLAN

300 0 300

SCALE: 1"=300'

NO.	REV DATE	REVISION	INT.

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Project Details **DYNEGY MIDWEST GENERATION, LLC** FLY ASH POND SYSTEM BALDWIN ENERGY COMPLEX 10901 BALDWIN ROAD BALDWIN, IL 62217	Drawing Title **OVERALL SITE PLAN**			RAMBOLL **RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.**	
Location: BALDWIN, IL	Designer / Professional Engineer Responsible: J. BOND				
Project Number: **1940110241-005**	Designed by C. GLIDDEN	Drawn by B. LEMMON	Checked by J. BOND	Approved by	Date APRIL 2025
Project Status: CORRECTIVE ACTION PERMIT-LEVEL DESIGN	Drawing Number **C-101**			Scale AS NOTED	Sc x / Rev. x

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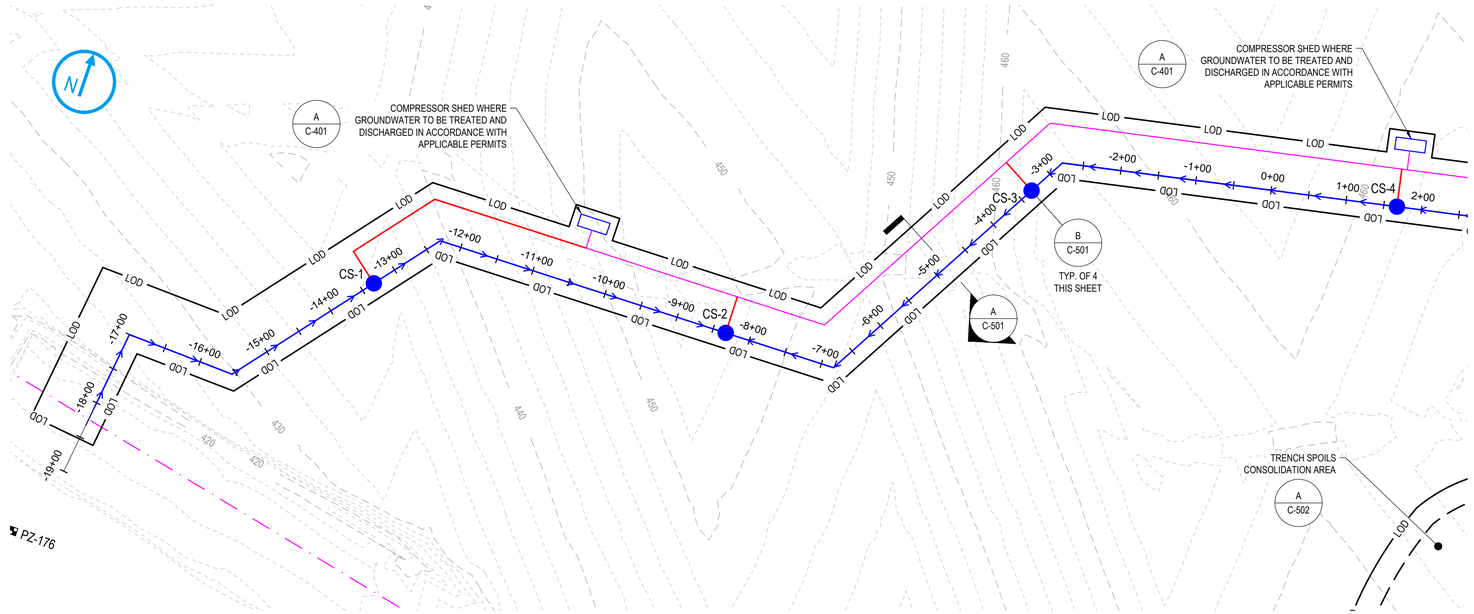
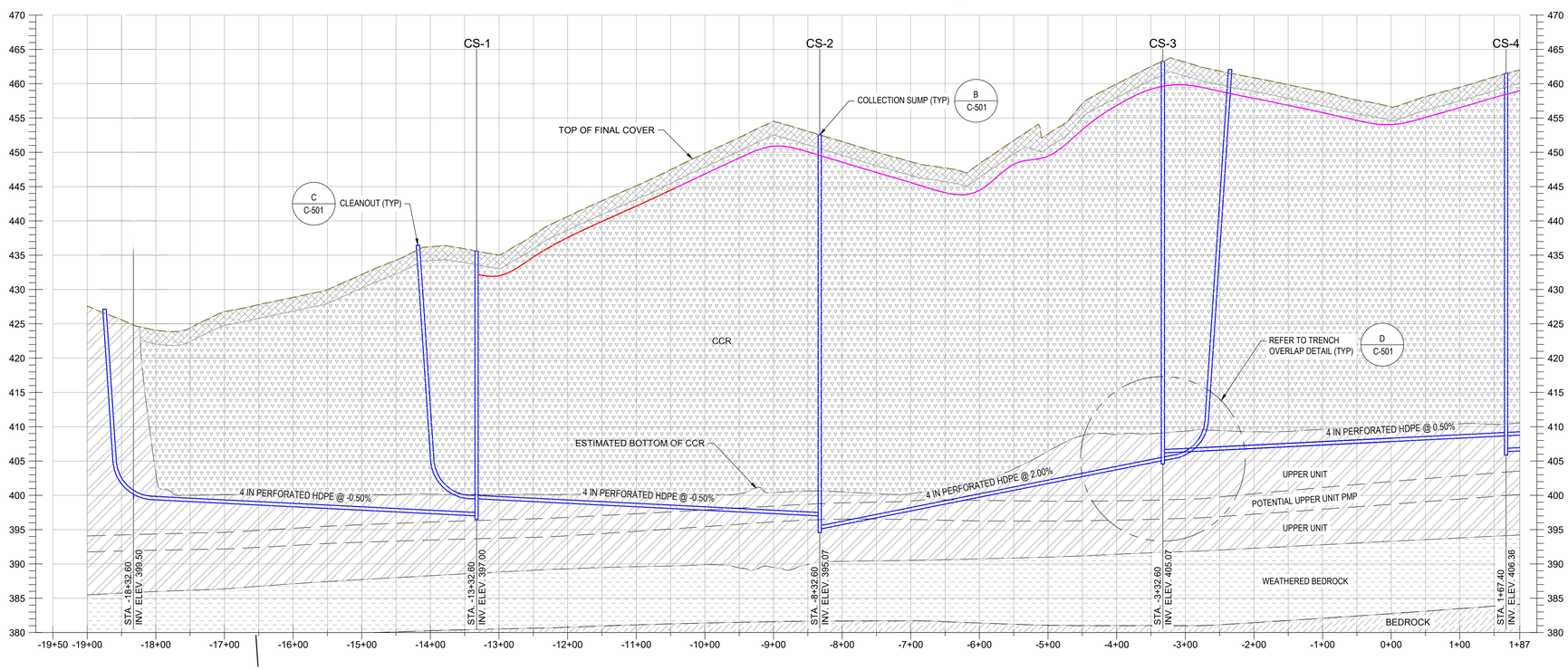


GROUNDWATER MANAGEMENT SYSTEM - ENLARGED PLAN 1

100 0 100
SCALE: 1"=100'



PROFILE STATION -18+33 TO 1+67

100' 0 100'
SCALE HORZ. 1" = 100'

10' 0 10'
SCALE: VERT. 1"=10'

LEGEND

EXISTING

- MAJOR CONTOUR
- MINOR CONTOUR
- CCR UNIT BOUNDARY
- CLAY
- WEATHERED BEDROCK
- BEDROCK

CORRECTIVE ACTION CONSTRUCTION

- LIMITS OF DISTURBANCE
- GROUNDWATER COLLECTION TRENCH
- COLLECTION SUMP
- WATER AND AIR CONVEYANCE PIPING
- ELECTRICAL CONDUIT AND WATER AND AIR CONVEYANCE PIPING
- STRUCTURE
- TRENCH SPOILS CONSOLIDATION AREA

NOTES:
1. THE FLY ASH POND SYSTEM BOTTOM OF ASH WAS ESTIMATED USING A 1967-68 HISTORICAL TOPOGRAPHIC MAP.
2. SUBSURFACE INTERFACES BETWEEN DIFFERENT UNITS ARE APPROXIMATE AND BASED ON DATA FROM 2023 HYDROGEOLOGIC SITE CHARACTERIZATION REPORT AND MODEL LAYERS DESCRIBED IN GROUNDWATER MODELING TECHNICAL MEMORANDUM.
3. FINAL COVER SYSTEM THICKNESSES AND LIMITS ARE APPROXIMATE.
4. LIMITS OF DISTURBANCE ARE APPROXIMATE AND WILL BE UPDATED DURING FINAL DESIGN.

NO.	REV DATE	REVISION	INT.

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Project Details **DYNEGY MIDWEST GENERATION, LLC** FLY ASH POND SYSTEM BALDWIN ENERGY COMPLEX 10901 BALDWIN ROAD BALDWIN, IL 62217	Drawing Title **GROUNDWATER MANAGEMENT SYSTEM - ENLARGED PLAN AND PROFILE 1**			RAMBOLL **RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.**	
Location: BALDWIN, IL	Designer / Professional Engineer Responsible: J. BOND				
Project Number **1940110241-005**	Designed by C. GLIDDEN	Drawn by B. LEMMON	Checked by J. BOND	Approved by	Date APRIL 2025
Project Status CORRECTIVE ACTION PERMIT-LEVEL DESIGN	Drawing Number **C-201**			Scale AS NOTED	Sc. x / Rev. x

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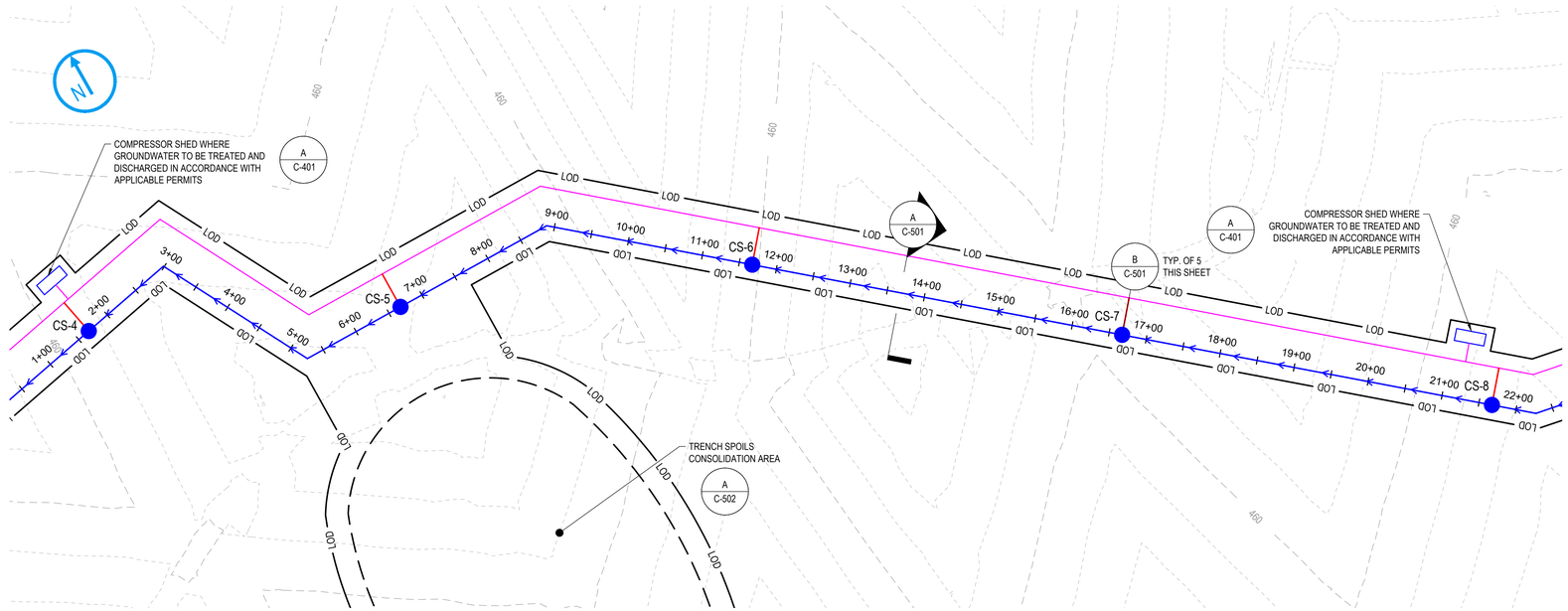


GROUNDWATER MANAGEMENT SYSTEM - ENLARGED PLAN 2

100 0 100
SCALE: 1"=100'

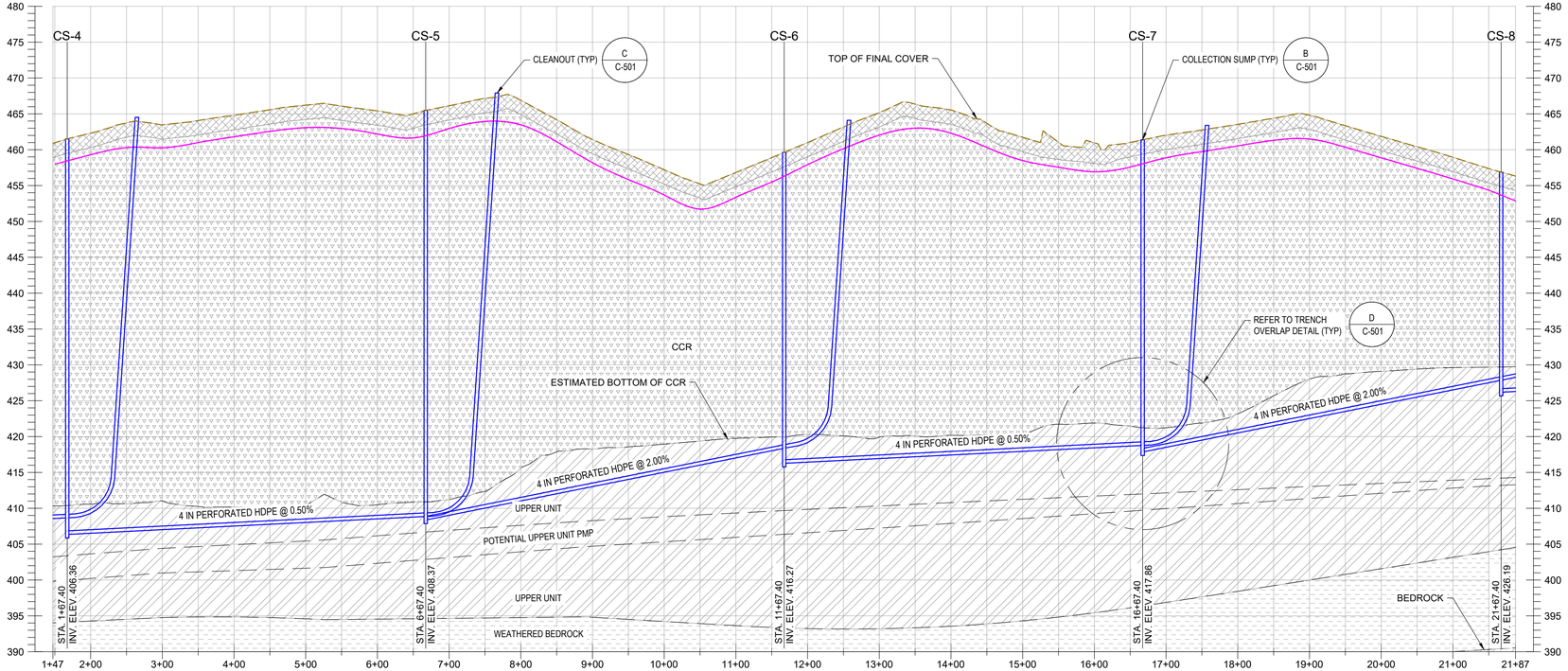
LEGEND

EXISTING

- 360 — MAJOR CONTOUR
- MINOR CONTOUR
- MW-194 — MONITORING WELL
- CLAY
- WEATHERED BEDROCK
- BEDROCK

CORRECTIVE ACTION CONSTRUCTION

- LOD — LIMITS OF DISTURBANCE
- GROUNDWATER COLLECTION TRENCH
- COLLECTION SUMP
- WATER AND AIR CONVEYANCE PIPING
- ELECTRICAL CONDUIT AND WATER AND AIR CONVEYANCE PIPING
- STRUCTURE
- TRENCH SPOILS CONSOLIDATION AREA



PROFILE STATION 1+67 TO 21+67

100' 0 100'
SCALE HORZ. 1" = 100'

10' 0 10'
SCALE: VERT. 1"=10'

NOTES:
1. THE FLY ASH POND SYSTEM BOTTOM OF ASH WAS ESTIMATED USING A 1967-68 HISTORICAL TOPOGRAPHIC MAP.
2. SUBSURFACE INTERFACES BETWEEN DIFFERENT UNITS ARE APPROXIMATE AND BASED ON DATA FROM 2023 HYDROGEOLOGIC SITE CHARACTERIZATION REPORT AND MODEL LAYERS DESCRIBED IN GROUNDWATER MODELING TECHNICAL MEMORANDUM.
3. FINAL COVER SYSTEM THICKNESSES AND LIMITS ARE APPROXIMATE.
4. LIMITS OF DISTURBANCE ARE APPROXIMATE AND WILL BE UPDATED DURING FINAL DESIGN.

NO.	REV DATE	REVISION	INT.

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Project Details **DYNEGY MIDWEST GENERATION, LLC** FLY ASH POND SYSTEM BALDWIN ENERGY COMPLEX 10901 BALDWIN ROAD BALDWIN, IL 62217	Drawing Title **GROUNDWATER MANAGEMENT SYSTEM - ENLARGED PLAN AND PROFILE 2**			RAMBOLL **RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.**	
Location: BALDWIN, IL	Designer / Professional Engineer Responsible: J. BOND				
Project Number **1940110241-005**	Designed by C. GLIDDEN	Drawn by B. LEMMON	Checked by J. BOND	Approved by	Date APRIL 2025
Project Status CORRECTIVE ACTION PERMIT-LEVEL DESIGN	Drawing Number **C-202**			Scale AS NOTED	Sc x / Rev. x

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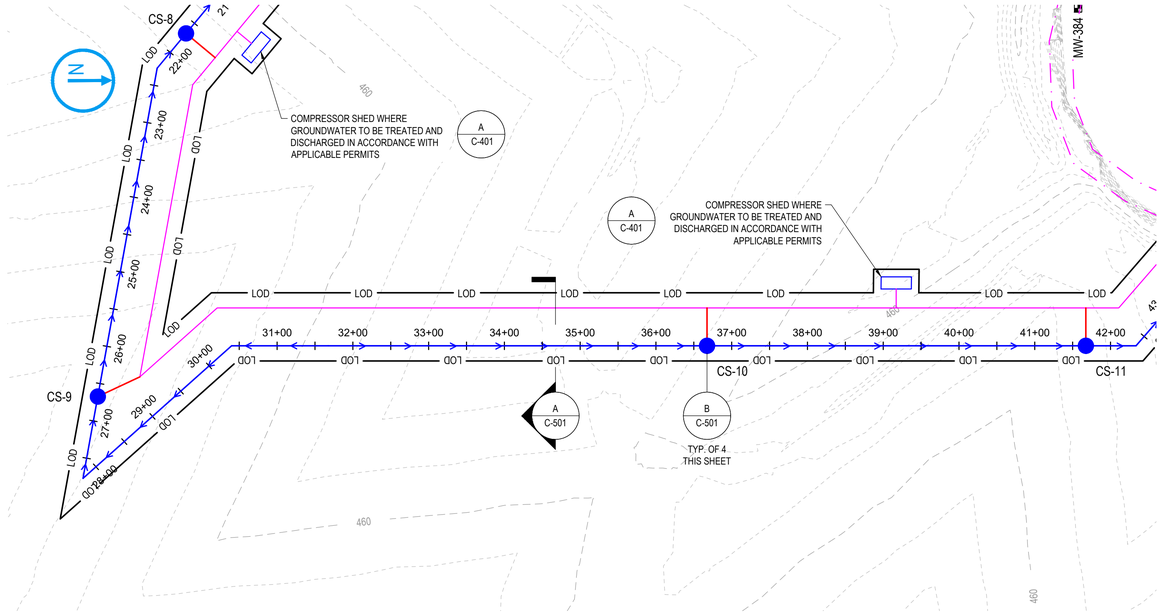
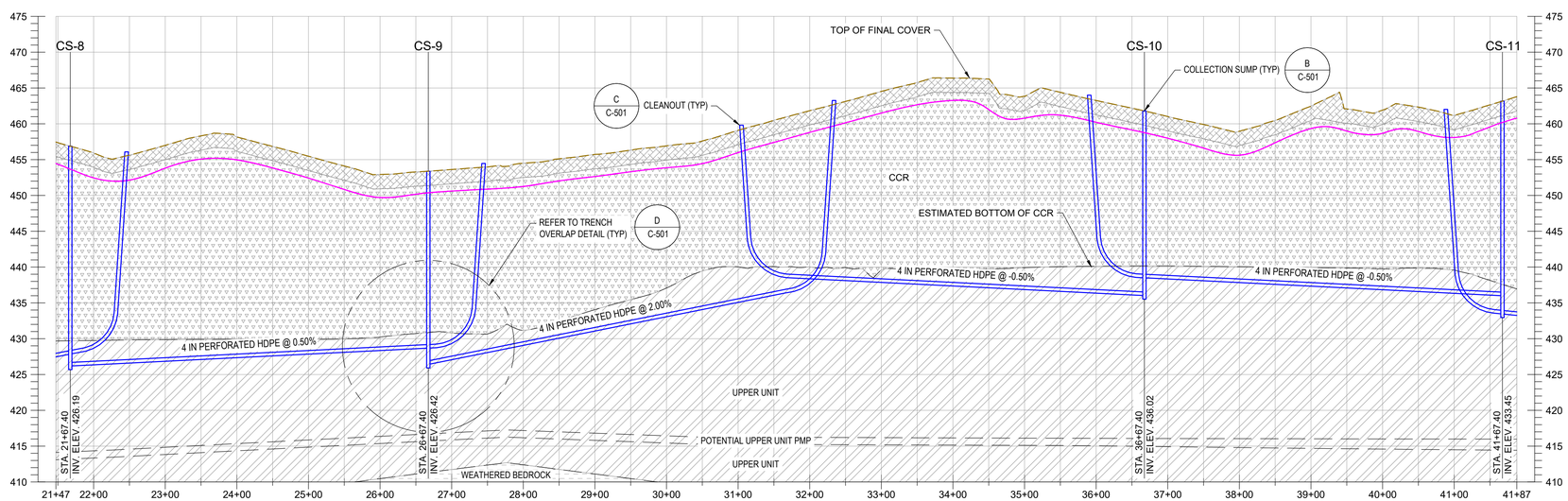


GROUNDWATER MANAGEMENT SYSTEM - ENLARGED PLAN 3

100 0 100
SCALE: 1"=100'



PROFILE STATION 21+67 TO 41+67

100' 0 100'
SCALE HORZ. 1" = 100'

10' 0 10'
SCALE: VERT. 1"=10'

LEGEND

EXISTING

- 360 — MAJOR CONTOUR
- MINOR CONTOUR
- CCR UNIT BOUNDARY
- MW-194 — MONITORING WELL
- CLAY
- WEATHERED BEDROCK

CORRECTIVE ACTION CONSTRUCTION

- LOD — LIMITS OF DISTURBANCE
- GROUNDWATER COLLECTION TRENCH
- COLLECTION SUMP
- WATER AND AIR CONVEYANCE PIPING
- ELECTRICAL CONDUIT AND WATER AND AIR CONVEYANCE PIPING
- STRUCTURE

NOTES:

1. THE FLY ASH POND SYSTEM BOTTOM OF ASH WAS ESTIMATED USING A 1967-68 HISTORICAL TOPOGRAPHIC MAP.
2. SUBSURFACE INTERFACES BETWEEN DIFFERENT UNITS ARE APPROXIMATE AND BASED ON DATA FROM 2023 HYDROGEOLOGIC SITE CHARACTERIZATION REPORT AND MODEL LAYERS DESCRIBED IN GROUNDWATER MODELING TECHNICAL MEMORANDUM.
3. FINAL COVER SYSTEM THICKNESSES AND LIMITS ARE APPROXIMATE.
4. LIMITS OF DISTURBANCE ARE APPROXIMATE AND WILL BE UPDATED DURING FINAL DESIGN.

NO.	REV DATE	REVISION	INT.

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Project Details: DYNEGY MIDWEST GENERATION, LLC FLY ASH POND SYSTEM BALDWIN ENERGY COMPLEX 10901 BALDWIN ROAD BALDWIN, IL 62217	Drawing Title: GROUNDWATER MANAGEMENT SYSTEM - ENLARGED PLAN AND PROFILE 3				RAMBOLL RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.
Location: BALDWIN, IL	Designer / Professional Engineer Responsible: J. BOND				
Project Number: 1940110241-005	Designed by C. GLIDDEN	Drawn by B. LEMMON	Checked by J. BOND	Approved by	Date APRIL 2025
Project Status: CORRECTIVE ACTION PERMIT-LEVEL DESIGN	Drawing Number: C-203			Scale AS NOTED	Sc x / Rev. x

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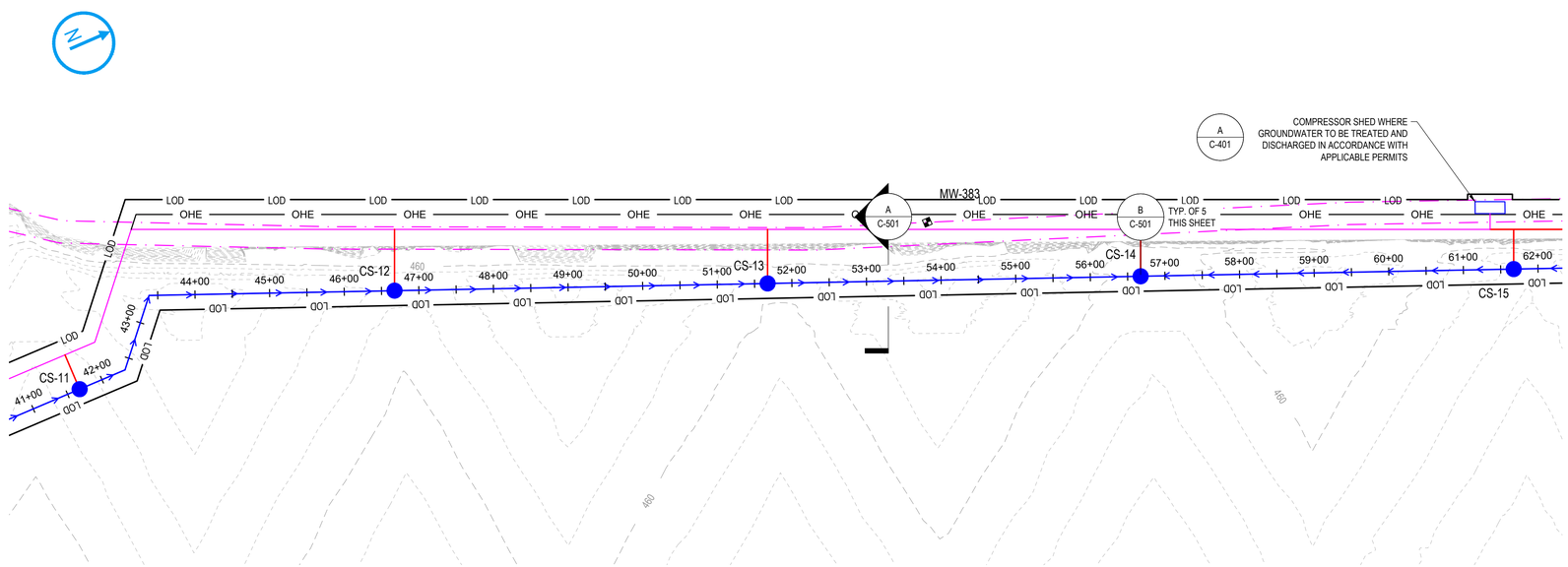


GROUNDWATER MANAGEMENT SYSTEM - ENLARGED PLAN 4

100 0 100
SCALE: 1"=100'

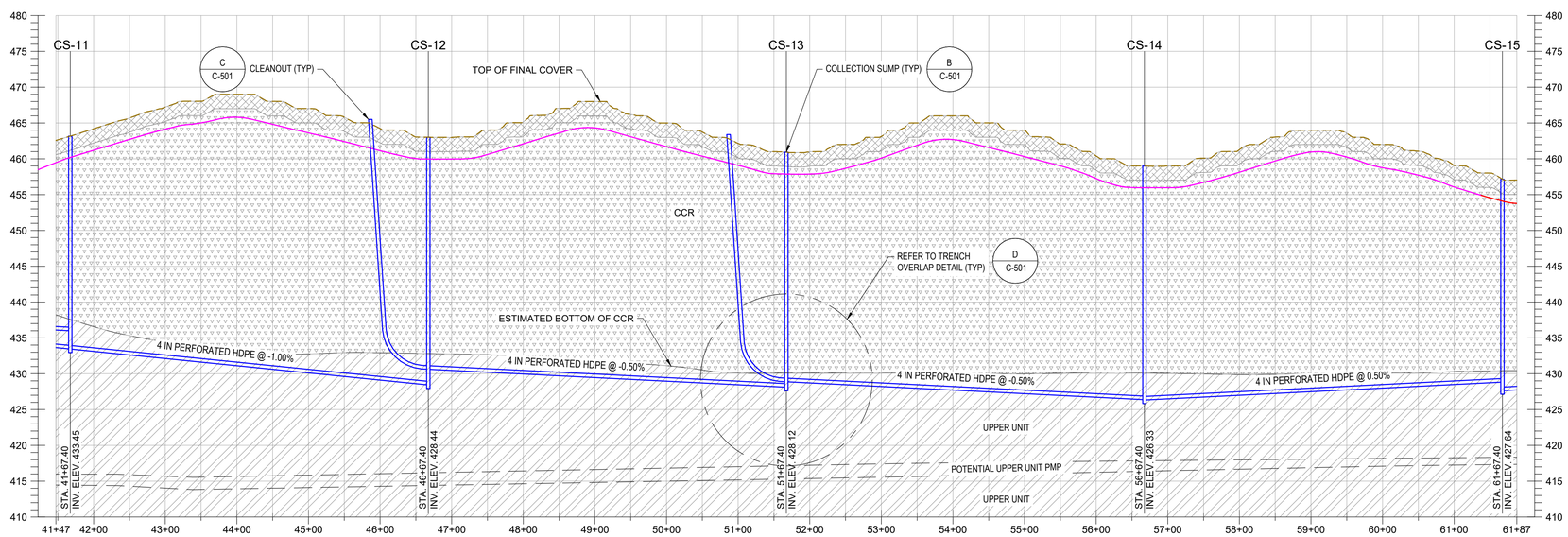
LEGEND

EXISTING

- 360 — MAJOR CONTOUR
- MINOR CONTOUR
- CCR UNIT BOUNDARY
- MW-194 — MONITORING WELL
- CLAY

CORRECTIVE ACTION CONSTRUCTION

- LOD — LIMITS OF DISTURBANCE
- GROUNDWATER COLLECTION TRENCH
- COLLECTION SUMP
- OHE — OVERHEAD ELECTRIC
- WATER AND AIR CONVEYANCE PIPING
- ELECTRICAL CONDUIT AND WATER AND AIR CONVEYANCE PIPING
- STRUCTURE



PROFILE STATION 41+67 TO 61+67

100' 0 100'
SCALE HORZ. 1" = 100'

10' 0 10'
SCALE: VERT. 1"=10'

NOTES:
1. THE FLY ASH POND SYSTEM BOTTOM OF ASH WAS ESTIMATED USING A 1967-68 HISTORICAL TOPOGRAPHIC MAP.
2. SUBSURFACE INTERFACES BETWEEN DIFFERENT UNITS ARE APPROXIMATE AND BASED ON DATA FROM 2023 HYDROGEOLOGIC SITE CHARACTERIZATION REPORT AND MODEL LAYERS DESCRIBED IN GROUNDWATER MODELING TECHNICAL MEMORANDUM.
3. FINAL COVER SYSTEM THICKNESSES AND LIMITS ARE APPROXIMATE.
4. LIMITS OF DISTURBANCE ARE APPROXIMATE AND WILL BE UPDATED DURING FINAL DESIGN.

NO.	REV DATE	REVISION	INT.

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Project Details: **DYNEGY MIDWEST GENERATION, LLC** FLY ASH POND SYSTEM BALDWIN ENERGY COMPLEX 10901 BALDWIN ROAD BALDWIN, IL 62217	Drawing Title: **GROUNDWATER MANAGEMENT SYSTEM - ENLARGED PLAN AND PROFILE 4**			RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.
Location: BALDWIN, IL	Designer / Professional Engineer Responsible: J. BOND			
Project Number: **19401102 41-005**	Designed by: C. GLIDDEN	Drawn by: B. LEMMON	Checked by: J. BOND	Approved by:
Project Status: CORRECTIVE ACTION PERMIT-LEVEL DESIGN	Drawing Number: **C-204**	Scale: AS NOTED	Sc: X	Rev.: X

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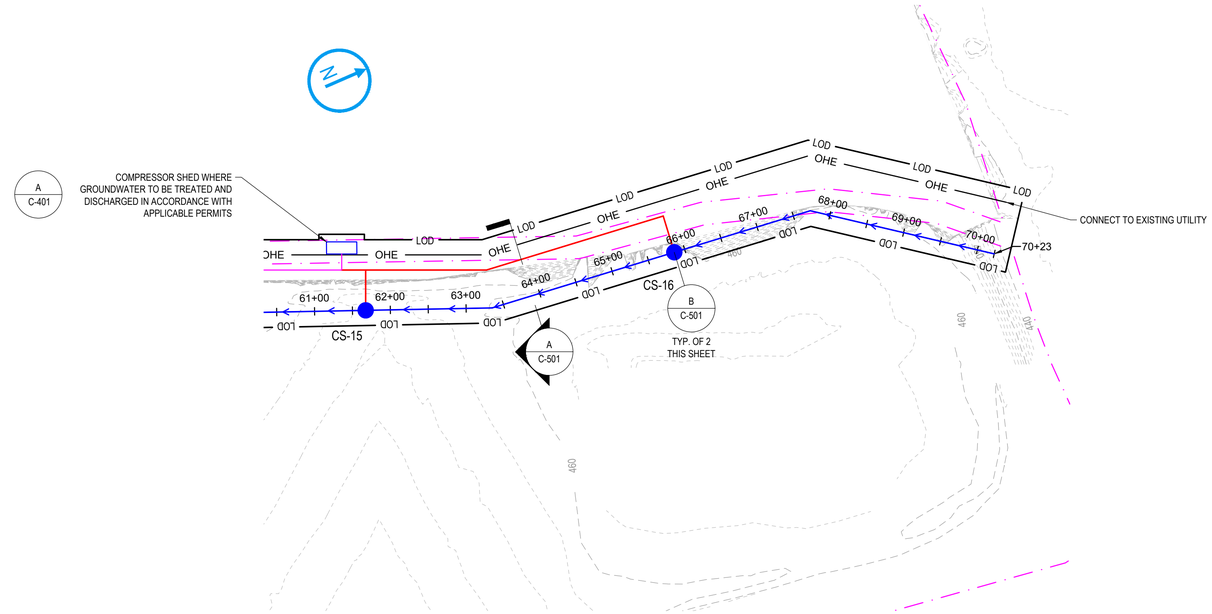


GROUNDWATER MANAGEMENT SYSTEM - ENLARGED PLAN 5

100 0 100
SCALE: 1"=100'

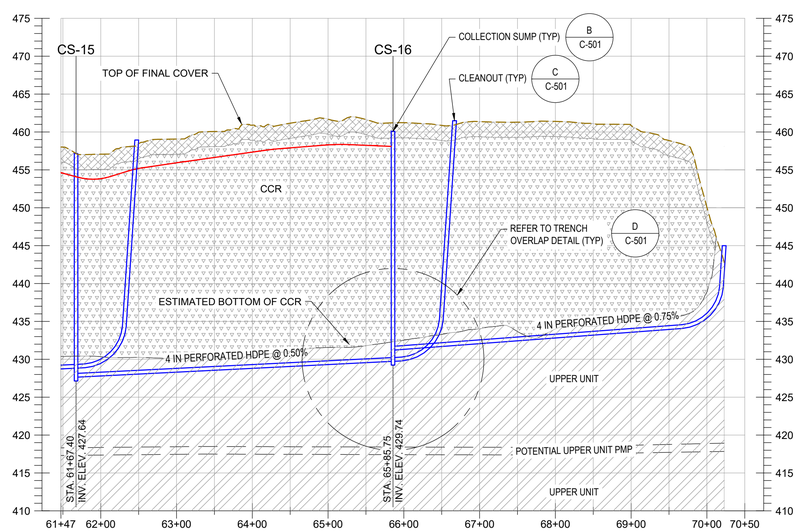
LEGEND

EXISTING

360	MAJOR CONTOUR
	MINOR CONTOUR
	APPROXIMATE SITE BOUNDARY
	CCR UNIT BOUNDARY
MW-194	MONITORING WELL
	CLAY

CORRECTIVE ACTION CONSTRUCTION

LOD	LIMITS OF DISTURBANCE
	GROUNDWATER COLLECTION TRENCH
	COLLECTION SUMP
OHE	OVERHEAD ELECTRIC
	WATER AND AIR CONVEYANCE PIPING
	ELECTRICAL CONDUIT AND WATER AND AIR CONVEYANCE PIPING
	STRUCTURE



PROFILE STATION 61+67 TO 70+23

100' 0 100'
SCALE HORZ. 1" = 100'

10' 0 10'
SCALE: VERT. 1"=10'

NOTES:
1. THE FLY ASH POND SYSTEM BOTTOM OF ASH WAS ESTIMATED USING A 1967-68 HISTORICAL TOPOGRAPHIC MAP.
2. SUBSURFACE INTERFACES BETWEEN DIFFERENT UNITS ARE APPROXIMATE AND BASED ON DATA FROM 2023 HYDROGEOLOGIC SITE CHARACTERIZATION REPORT AND MODEL LAYERS DESCRIBED IN GROUNDWATER MODELING TECHNICAL MEMORANDUM.
3. FINAL COVER SYSTEM THICKNESSES AND LIMITS ARE APPROXIMATE.
4. LIMITS OF DISTURBANCE ARE APPROXIMATE AND WILL BE UPDATED DURING FINAL DESIGN.

NO.	REV DATE	REVISION	INT.

IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS ACTING UNDER THE DIRECTION OF A LICENSED ENGINEER, TO ALTER THIS DOCUMENT. THIS DRAWING WAS PREPARED AT THE SCALE INDICATED. INACCURACIES IN THE STATED SCALE MAY BE INTRODUCED WHEN DRAWINGS ARE REPRODUCED BY ANY MEANS. USE THE GRAPHIC SCALE BAR TO DETERMINE THE ACTUAL SIZE. DRAWING IS NOT SCALABLE IF NO SCALE BAR IS PRESENT.

Project Details: DYNEGY MIDWEST GENERATION, LLC FLY ASH POND SYSTEM BALDWIN ENERGY COMPLEX 10901 BALDWIN ROAD BALDWIN, IL 62217	Drawing Title: GROUNDWATER MANAGEMENT SYSTEM - ENLARGED PLAN AND PROFILE 5				RAMBOLL RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.
Location: BALDWIN, IL	Designer / Professional Engineer Responsible: J. BOND				
Project Number: 1940110241-005	Designed by: C. GLIDDEN	Drawn by: B. LEMMON	Checked by: J. BOND	Approved by	Date: APRIL 2025
Project Status: CORRECTIVE ACTION PERMIT-LEVEL DESIGN	Drawing Number: C-205			Scale: AS NOTED	Sc: x / Rev.: x

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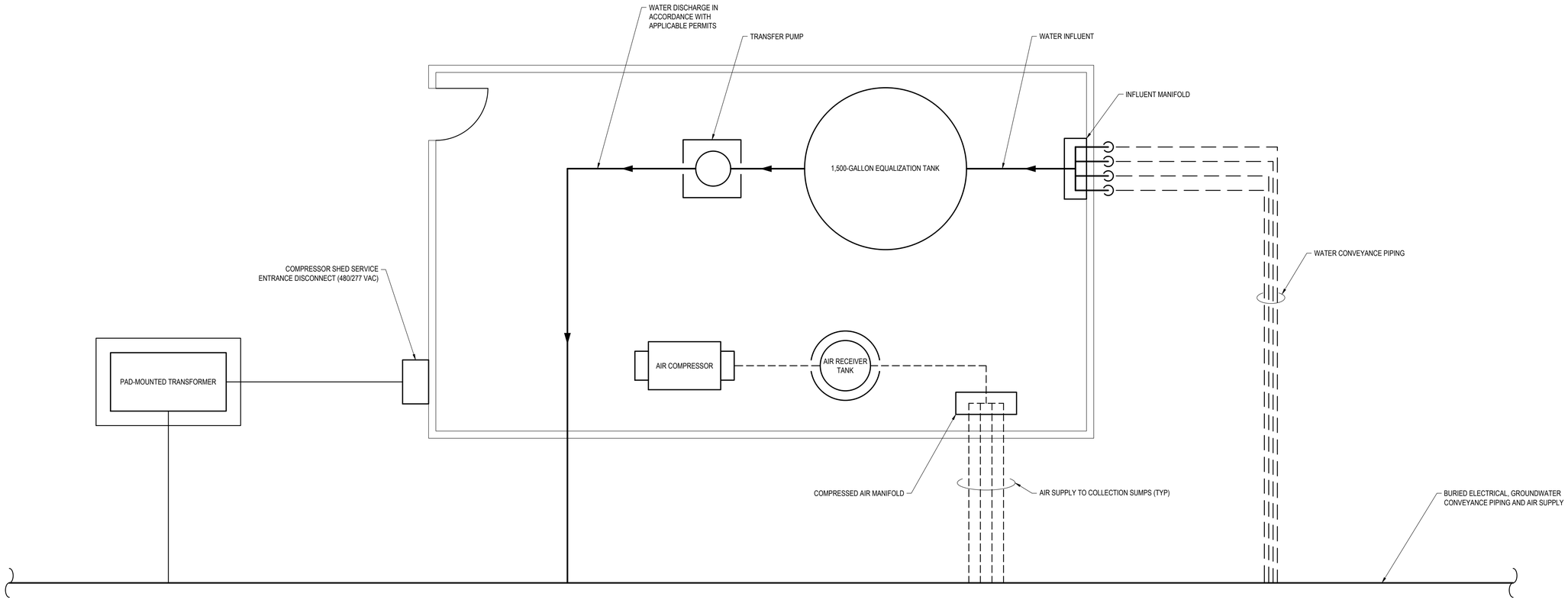

A COMPRESSOR SHED DETAIL

NOT TO SCALE

NO.	REV DATE	REVISION	INT.

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Project Details **DYNEGY MIDWEST GENERATION, LLC** FLY ASH POND SYSTEM BALDWIN ENERGY COMPLEX 10901 BALDWIN ROAD BALDWIN, IL 62217	Drawing Title **COMPRESSOR SHED DETAIL**			RAMBOLL **RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.**	
Location: BALDWIN, IL	Designer / Professional Engineer Responsible: J. BOND				
Project Number **1940110241-005**	Designed by C. GLIDDEN	Drawn by B. LEMMON	Checked by J. BOND	Approved by	Date APRIL 2025
Project Status CORRECTIVE ACTION PERMIT-LEVEL DESIGN	Drawing Number **C-401**			Scale AS NOTED	Sc. x / Rev. x

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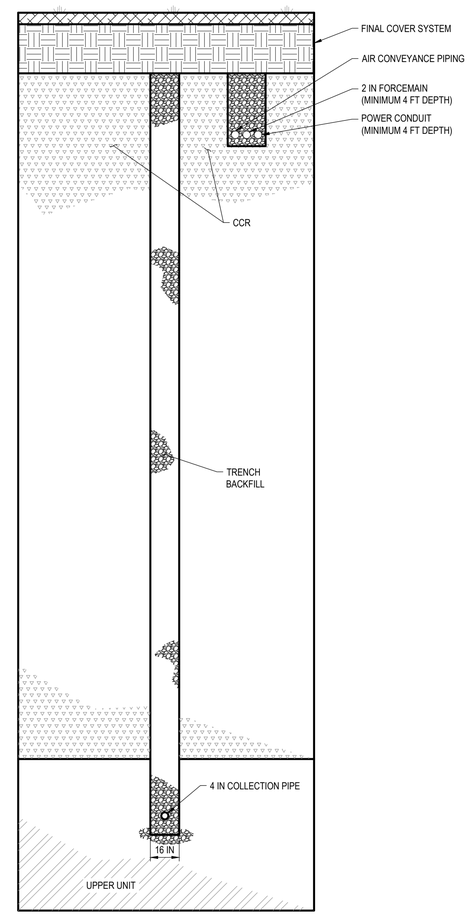
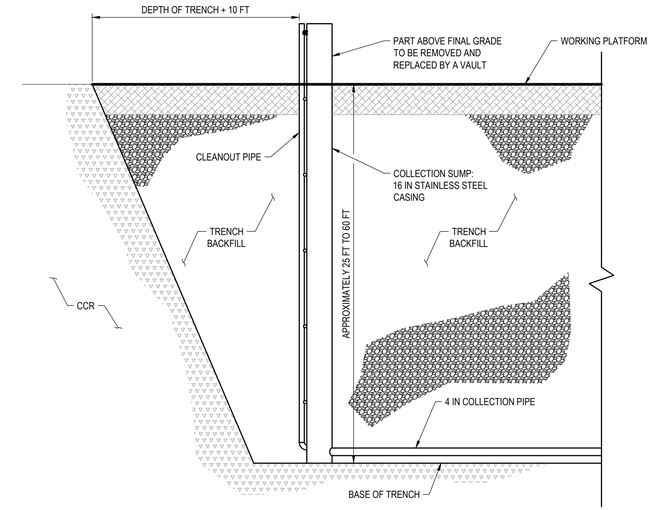
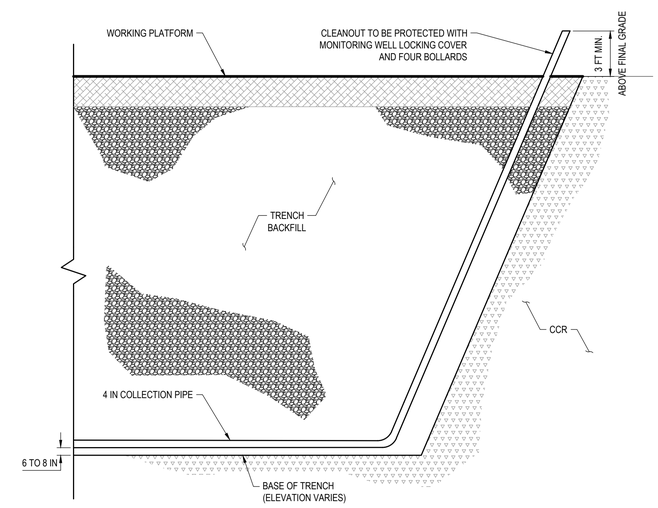


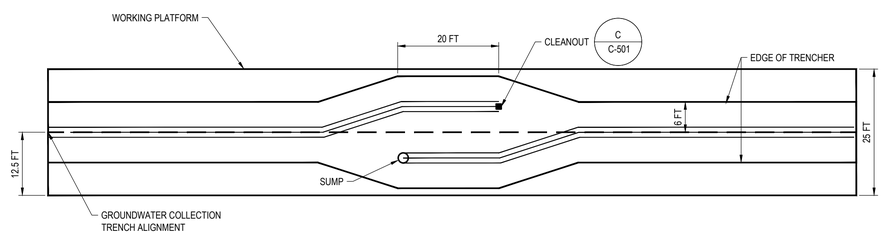
A GROUNDWATER COLLECTION TRENCH
NOT TO SCALE



B COLLECTION SUMP
NOT TO SCALE



C CLEANOUT
NOT TO SCALE



D TRENCH OVERLAP
NOT TO SCALE

NOTES:

1. COLLECTION PIPE IS TO BE 4" DIAMETER IRON PIPE SIZING (IPS) STANDARD DIMENSION RATIO (SDR) 11 0.020 MILLED SLOTTED PERFORATED HIGH DENSITY POLYETHYLENE PIPING WITH PE4710 PRESSURE RATING OF 200 PSI AND MINIMUM WALL THICKNESS OF 0.409 INCHES. SUMP RISER PIPE IS TO BE 16" DIAMETER, SCHEDULE 40, 304 STAINLESS STEEL (S.S.) RISER CASING.
2. CLEANOUT PIPE IS TO BE 4" DIAMETER IRON PIPE SIZING (IPS) STANDARD DIMENSION RATIO (SDR) 11 HIGH DENSITY POLYETHYLENE PIPING WITH PE4710 PRESSURE RATING OF 200 PSI AND MINIMUM WALL THICKNESS OF 0.409 INCHES.
3. FORCED MAIN PIPE IS TO BE 2" DIAMETER IRON PIPE SIZING (IPS) STANDARD DIMENSION RATIO (SDR) 11 HIGH DENSITY POLYETHYLENE PIPING WITH PE4710 PRESSURE RATING OF 200 PSI AND MINIMUM WALL THICKNESS OF 0.216 INCHES.
4. ELECTRICAL CONDUIT IS TO BE 2" DIAMETER SCHEDULE 40 POLYVINYL CHLORIDE (PVC) DUCT BANK CONDUIT WITH DUCT BANK SPACERS.
5. BEDDING SAND USED BELOW PIPE BEDDING IS TO BE WELL-GRADED, CLEAN, AND FREE OF CONTAMINANTS, TYPICALLY CONFORMING TO ASTM C33 GRADATION FOR CONCRETE SANDS WITH ADDITIONAL LIMITS ON FINES.
6. PUMPS IS TO BE 4" DIAMETER PNEUMATIC BOTTOM LOADING QED AUTOPUMP AP4 ULTRA STYLE PUMPS, OR ENGINEERING EQUIVALENT, CONSTRUCTED OF 316-GRADE STAINLESS STEEL (S.S.).
7. TRENCH BACKFILL IS TO BE A HOMOGENEOUS MIXTURE OF APPROXIMATELY 60% IDOT FINE AGGREGATE NO. 1 AND 40% OF IDOT COARSE AGGREGATE NO. 13. SAMPLES OF THE MIX ARE TO BE PROVIDED TO THE CQA OFFICER THREE WEEKS IN ADVANCE OF MOBILIZATION FOR GRAIN SIZE TESTING AND APPROVAL.
8. ALL PORTIONS OF THE FINAL COVER SYSTEM DAMAGED OR OTHERWISE IMPACTED DURING TRENCH CONSTRUCTION ARE TO REPLACED AFTER THE TRENCH IS CONSTRUCTED. ALL REPLACEMENT FINAL COVER MATERIALS, INCLUDING VEGETATIVE SOIL COVER AND SOIL COVER, ARE TO BE CONSTRUCTED TO THE SAME GRADES, THICKNESSES, AND SPECIFICATIONS AS THE EXISTING FINAL COVER SYSTEM THAT WAS COMPLETED IN 2020. THIS INCLUDES, BUT IS NOT LIMITED TO, ALL ENGINEERING MATERIAL PROPERTIES SUCH AS MATERIAL CLASSIFICATION AND HYDRAULIC CONDUCTIVITY AND CONSTRUCTION SPECIFICATIONS.

NO.	REV DATE	REVISION	INT.

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Project Details **DYNEGY MIDWEST GENERATION, LLC** FLY ASH POND SYSTEM BALDWIN ENERGY COMPLEX 10901 BALDWIN ROAD BALDWIN, IL 62217	Drawing Title **TRENCH AND COLLECTION SUMP DETAILS**			RAMBOLL **RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.**	
Location: BALDWIN, IL	Designer / Professional Engineer Responsible: J. BOND				
Project Number **1940110241-005**	Designed by C. GLIDDEN	Drawn by B. LEMMON	Checked by J. BOND	Approved by	Date APRIL 2025
Project Status CORRECTIVE ACTION PERMIT-LEVEL DESIGN	Drawing Number **C-501**			Scale AS NOTED	Sc. x / Rev. x

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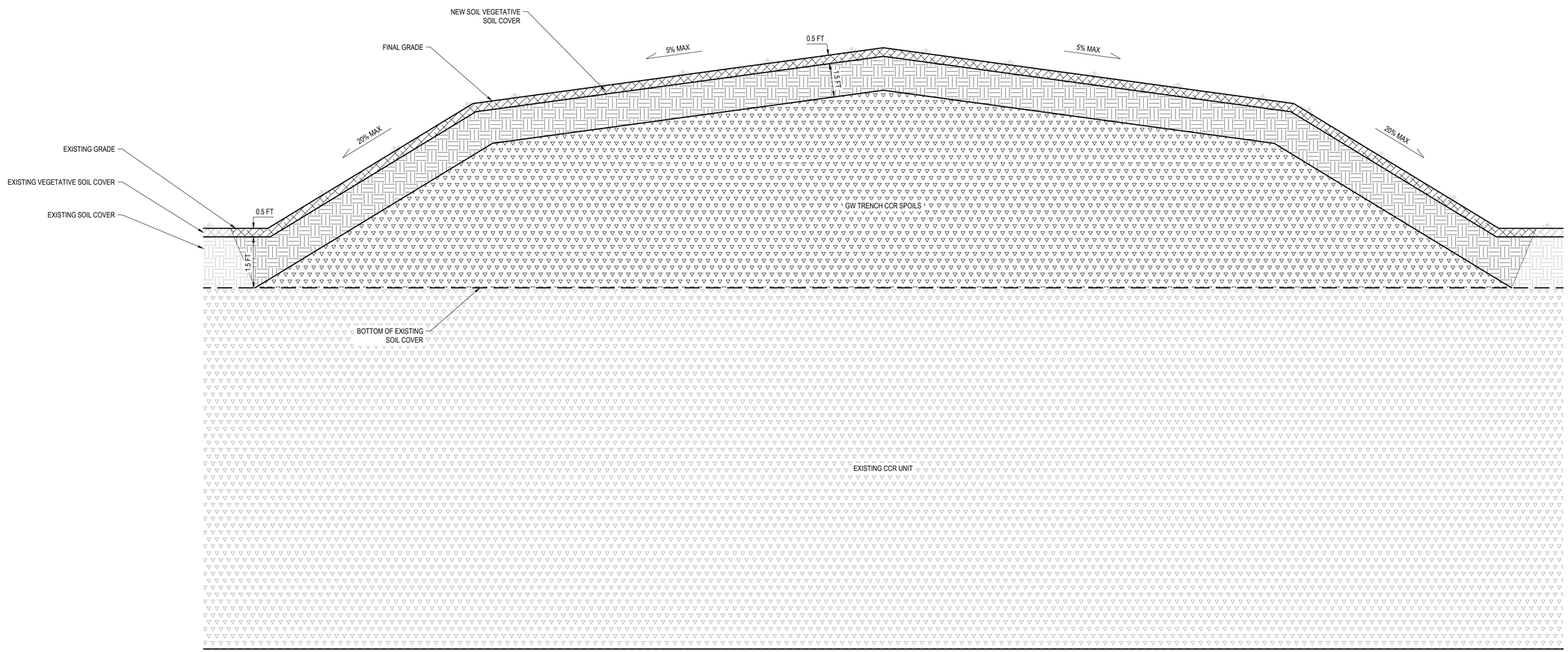

A

TRENCH SPOILS CONSOLIDATION AREA

NOT TO SCALE

NOTES:

1. GEOMETRY OF THE TRENCH SPOILS CONSOLIDATION AREA IS APPROXIMATE AND WILL BE REFINED DURING FINAL DESIGN, BASED ON REVISED ESTIMATES OF SPOIL VOLUME. FEATURES THAT MAY BE REFINED INCLUDE, BUT ARE NOT LIMITED TO, EXTENTS OF THE CONSOLIDATION AREA, SLOPES, ELEVATIONS, AND STORMWATER MANAGEMENT FEATURES.
2. FINAL COVER SYSTEM SOILS ARE TO BE REMOVED AND STOCKPILED PRIOR TO PLACING TRENCH SPOILS IN THE CONSOLIDATION AREA.
3. TRENCH SPOILS ARE TO BE MOISTURE-CONDITIONED AND COMPACTED PRIOR TO PLACEMENT.
4. THE FINAL COVER SYSTEM IS TO BE REPLACED OVER THE TOP OF THE TRENCH SPOILS CONSOLIDATION AREA AFTER SPOILS HAVE BEEN PLACED. ALL FINAL COVER MATERIALS, INCLUDING VEGETATIVE SOIL COVER AND SOIL COVER, ARE TO BE CONSTRUCTED TO THE SAME THICKNESSES AND SPECIFICATIONS AS THE EXISTING FINAL COVER SYSTEM THAT WAS COMPLETED IN 2020. THIS INCLUDES, BUT IS NOT LIMITED TO, ALL ENGINEERING MATERIAL PROPERTIES SUCH AS MATERIAL CLASSIFICATION AND HYDRAULIC CONDUCTIVITY AND CONSTRUCTION SPECIFICATIONS.

NO.	REV DATE	REVISION	INT.

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Project Details **DYNEGY MIDWEST GENERATION, LLC** FLY ASH POND SYSTEM BALDWIN ENERGY COMPLEX 10901 BALDWIN ROAD BALDWIN, IL 62217	Drawing Title **TRENCH SPOILS CONSOLIDATION AREA**			RAMBOLL **RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.**	
Location: BALDWIN, IL	Designer / Professional Engineer Responsible: J. BOND				
Project Number **1940110241-005**	Designed by C. GLIDDEN	Drawn by B. LEMMON	Checked by J. BOND	Approved by	Date APRIL 2025
Project Status CORRECTIVE ACTION PERMIT-LEVEL DESIGN	Drawing Number **C-502**			Scale AS NOTED	Sc x / Rev. x

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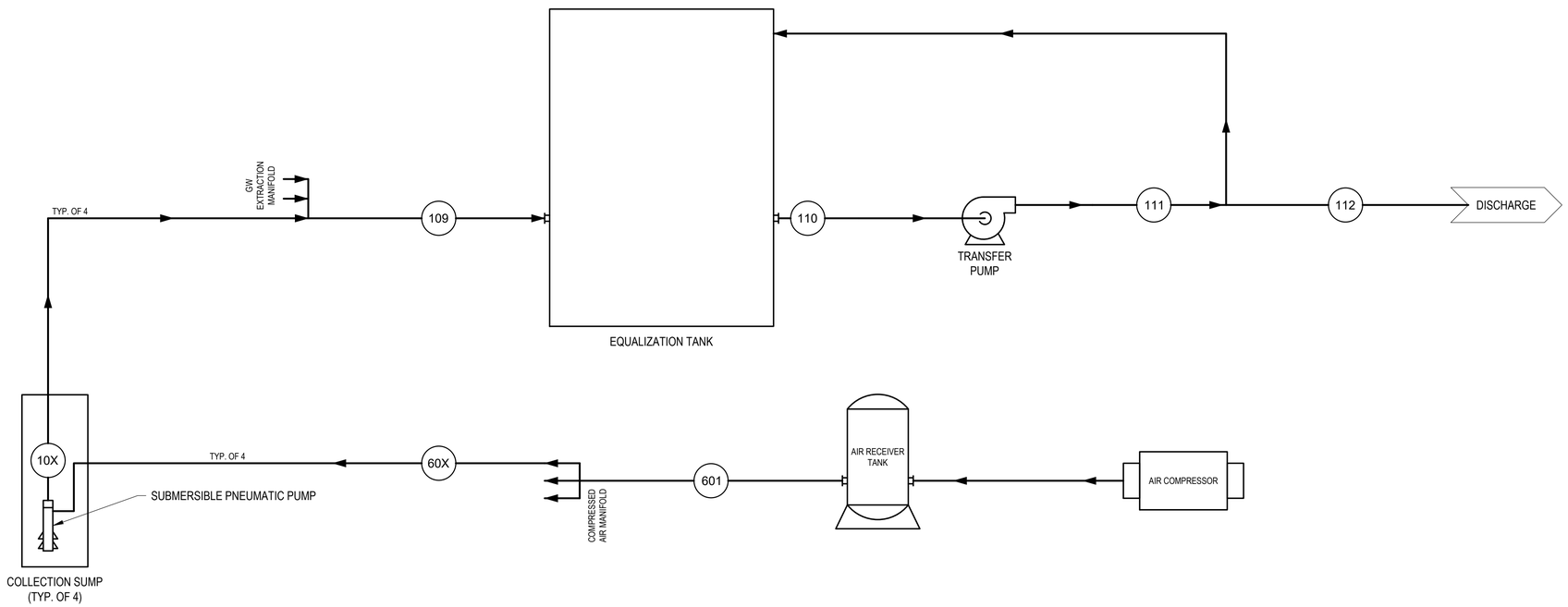
NOTE:

SYSTEM EQUIPMENT CONFIGURATION, FLOW RATE, AND OTHER DETAILS MAY CHANGE ONCE THE HYDRAULIC MODEL IS UPDATED.

GPM = GALLONS PER MINUTE
GW = GROUNDWATER



STREAM ID	10X	109	110	111	112	60X	601
DESIGN FLOW (GPM)	1-10	1-10	1-10	1-10	1-10	NA	NA
DESIGN FLOW (SCFM)	NA	NA	NA	NA	NA	2.5	10

NO.	REV DATE	REVISION	INT.

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Project Details:
DYNEGY MIDWEST GENERATION, LLC
FLY ASH POND SYSTEM
BALDWIN ENERGY COMPLEX
10901 BALDWIN ROAD BALDWIN, IL 62217

Drawing Title:
SYSTEM PROCESS FLOW DIAGRAM

RAMBOLL
RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

Location: BALDWIN, IL
Designer / Professional Engineer Responsible: J. BOND

Project Number	Designed by	Drawn by	Checked by	Approved by	Date
1940110241-005	C. GLIDDEN	B. LEMMON	J. BOND		APRIL 2025

Project Status	Drawing Number	Scale	Sc	Rev.
CORRECTIVE ACTION PERMIT-LEVEL DESIGN	**P-001**	AS NOTED	x	x

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APPENDIX H
PUBLIC NOTIFICATION AND PUBLIC MEETING CERTIFICATION (845.220(a)(9))

Phil Morris
Dynegy Midwest Generation, LLC
1500 Eastport Plaza Drive
Collinsville, IL 62234

April 1, 2025

Illinois Environmental Protection Agency
DWPC – Permits MC # 15
ATTN: Part 845 Coal Combustion Residual Rule Submittal
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276

Re: 35 IAC 845.220(a)(9) Certification Statement
Baldwin Power Plant Fly Ash Pond System (IEPA ID# W1578510001-01-02-03)

Dear Mr. Darin LeCrone:

For the above-refenced CCR surface impoundment and in accordance with 35 IAC 845.220(a)(9), Illinois Power Resources Generating, LLC certifies that the public notification and public meetings required under 35 IAC 845.240 were completed. Please find enclosed both the public meeting summary and listserv.

Sincerely,
Dynegy Midwest Generation, LLC

Phil Morris
Sr. Director, Environmental

Baldwin Public Meeting Summary, March 20, 2025

On February 18, 2025, Dynegy Midwest Generation, LLC made available to the public its proposed plans to implement corrective action at the previously closed Fly Ash Pond System (FAPS) located at the Baldwin Power Plant. On Thursday, March 20, 2025 Dynegy Midwest Generation, LLC held in-person public meetings at 3:00 pm and 5:00 pm at the Holiday Inn Express Conference Center in Sparta, IL to present its decision-making process. A discussion of the corrective measures assessment and corrective action alternatives analysis, including an objective comparison of pros and cons and projected groundwater impacts for each of the alternatives, was presented at these meetings. During the question-and-answer portion of the meetings, the public asked questions relating to the proposed remedial measures which the company addressed. As required by Section 845.240(g), this document provides a general summary of the issues or comments raised by the public relating to the closure, a summary of the company's responses to those issues or comments, and a summary of any revisions or changes made to the proposed corrective action as a result of issues and comments raised by the public. All questions asked during the meeting were addressed. No additional questions were submitted.

Issue/Topic		Summary of Response Provided at Meeting	Additional Written Response
1.	Closure Method	The purpose of the current public meeting is to discuss the corrective action evaluation for groundwater remediation at the Fly Ash Pond System. The Fly Ash Pond System was previously closed and capped in 2020. A previous meeting conducted in 2023 discussed the proposed closure in place method for Baldwin's Bottom Ash Pond. Dynegy is awaiting a closure permit from Illinois Environmental Protection Agency.	
2.	Groundwater Impacts and Monitoring	A risk assessment evaluated water quality data collected from both the groundwater and river and concluded that current conditions do not present a risk to human health and the environment. Off-site groundwater quality evaluations shows the presence of a limited plume, at only one off-site monitoring well location southwest of the Fly Ash Pond System. Three additional monitoring wells were installed off-site, which demonstrated no exceedances observed at these offsite locations. No potable water wells are impacted.	

		The corrective action will reduce to the maximum extent feasible further releases and minimize further off-site migration of CCR-derived constituents in groundwater until the groundwater quality standards are achieved. Adaptive site management action will be taken if the remedy performance does not correspond with the expected performance. Groundwater is required to be monitored quarterly for a minimum of 30 years beginning after closure to ensure conditions are as anticipated. Groundwater monitoring will continue until groundwater quality standards are met. Multiple monitoring wells are placed at varying, appropriate depths to ensure monitoring at all water-bearing layers and the uppermost aquifer.	
3.	More Information	Additional information about the items discussed in this Public Meeting can be found online. Data and documents for compliance with the Illinois CCR Rule: www.luminant.com/ccr/illinois-ccr/	

In accordance with 845.240(f)(4), a list of people who requested to be added to the IEPA Listserv from the Baldwin public meeting held on March 20, 2025, is as follows:

Name	Email address
Mike Silver	mikesilver@uccenvironmental.com

APPENDIX I
CONTRACTOR TRAINING CERTIFICATION
(45 ILCS 5/22.59(b)(4))

Phil Morris
Dynegy Midwest Generation, LLC
1500 Eastport Plaza Drive
Collinsville, IL 62234

April 22, 2025

Illinois Environmental Protection Agency
DWPC – Permits MC # 15
ATTN: Part 845 Coal Combustion Residual Rule Submittal
1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276

Re: 415 ILCS 5/22.59(b)(4) Certification Statement
Baldwin Power Plant Fly Ash Pond System (IEPA ID# W1578510001-01-02-03)

Dear Mr. Darin LeCrone:

For the above-referenced CCR surface impoundment and in accordance with 415 ILCS 5/22.59(b)(4), Dynegy Midwest Generation, LLC certify that all contractors, subcontractors, and installers utilized to construct, install, modify, or close a CCR surface impoundment will be participants in a training program that is approved by and registered with the US Department of Labor's Employment and Training Administration and that includes instruction in the following: erosion control, environmental remediation, operation of heavy equipment and excavation.

Sincerely,
Dynegy Midwest Generation, LLC

Phil Morris, P.E.
Senior Director, Environmental