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

October 25, 2021

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: Coffeen Power Plant Ash Pond No. 2; IEPA ID # W1350150004-02

Dear Mr. LeCrone:

In accordance with 35 I.A.C. § 845.200, Illinois Power Generating Company (IPGC) is submitting an operating permit application for the Coffeen Power Plant Ash Pond No. 2 (IEPA ID # W1350150004-02). One hardcopy and one digital copy are provided with this submittal.

The permit application was prepared in accordance with 35 I.A.C. § 845.230(d)(2) (Existing, Inactive and Inactive Closed CCR Surface Impoundment that have completed an Agency approved closure before July 30, 2021). This submittal includes the completed permit forms as required by § 845.210.

Sincerely,

Cynthia Vodopivec
SVP-Environmental Health and Safety

Enclosures

Prepared for

Illinois Power Generating Company
1500 Eastport Plaza Drive
Collinsville, Illinois 62234

INITIAL OPERATING PERMIT

COFFEEN ASH POND 2

Prepared by

BURNS McDONNELL

425 South Woods Mill Road, Suite 300
St. Louis, MO 63017

October 25, 2021

TABLE OF CONTENTS

TABLE OF CONTENTS

ATTACHMENTS

1. INTRODUCTION

Illinois Power Generating Company operates the coal-fired Coffeen Power Plant located in Montgomery County, Illinois. The IEPA assigned identification number assigned to this impoundment is: W1350150004-02 for Ash Pond 2. The National Inventory of Dams (NID) number assigned for Ash Pond 2 by the Illinois Department of Natural Resources (IDNR) is IL50714.

This initial operating permit application was developed in accordance with 35 Ill. Admin. Code 845, Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments (Part 845).

This initial operating permit application is for Ash Pond 2.

1.1. Facility Information

Section 845.210(b)(1): All permit applications must contain the name, address, email address and telephone number of the operator, or duly authorized agent, and the property owner to whom all inquiries and correspondence shall be addressed.

Facility:	Coffeen Ash Pond 2 Coffeen Power Plant 134 Cips Lane Coffeen, IL 62017
Owner/Operator:	Illinois Power Generating Company 1500 Eastport Plaza Drive Collinsville, Illinois 62234

1.2. <u>Owner Signatures</u>

> <u>*Section 845.210(b)(2):*</u> *All permit applications must be signed by the owner, operator or a duly authorized agent of the operator.*

The owner of the Coffeen Power Plant is a corporation.

> <u>*Section 845.210(b)(3):*</u> *An application submitted by a corporation must be signed by a principal executive officer of at least the level of vice president, or his or her duly authorized representative, if that representative is responsible for the overall operation of the facility described in the application form..*

The signature of Cynthia Vodopivec on behalf of Illinois Power Generating Company can be found in the permit applications located in Section 3.

1.3. Legal Description

> <u>*Section 845.210(c):*</u> *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 has been developed in compliance with Section 845.210(c) and is included in Attachment A.

1.4. Previous Assessments

> <u>*Section 845.210(d):*</u> *Previous Assessments, Investigations Plans, and Programs*

Previous assessments were performed in accordance with 40 CFR § 257 and are referenced within the permit application and included in the appropriate Attachments.

> <u>*Section 845.210(d)(1):*</u> *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 previous hydrogeologic site investigation or characterization, groundwater monitoring well or system, or groundwater monitoring plan have been completed with a seal from an Illinois Licensed Professional Geologist or Licensed Professional Engineer. However, field investigations have been completed that supplement that work that will be utilized in the following sections of this report.

<u>Section 845.210(d)(2):</u> 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 are provided for 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).

<u>Section 845.210(d)(3):</u> 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 are provided for Section 845.440 (Hazard Potential Classification Assessment), Section 845.450 (Structural Stability Assessment) and Section 845.460 (Safety Factor Assessment).

<u>Section 845.210(d)(4):</u> 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.

No post-closure care plan was previously approved by the Agency.

2. OPERATING PERMIT

2.1. Initial Operating Permit

<u>Section 845.230(d):</u> Initial Operating Permit for Existing, Inactive and Inactive Closed CCR Surface Impoundments

The Coffeen Ash Pond 2 as defined by IEPA is a closed inactive surface impoundment that has not completed post-closure care. Per Part 845, Illinois Power Generating Company is submitting an initial operating permit application to IEPA by October 31, 2021. The following sections contain information or references to documents required for the Operating Permit application (Section 845.230).

2.2. History of Construction

<u>Section 845.230(d)(2)(A):</u> The history of construction specified in Section 845.220(a)(1);

The history of construction prepared in 2016 pursuant to 40 CFR § 257.73(c) is provided in Attachment B.

2.3. Permanent Markers

<u>Section 845.230(d)(2)(E):</u> Evidence of permanent markers required by Section 845.130 have been installed;

Evidence of permanent markers at the Coffeen Ash Pond 2 as required by Section 845.130 is provided in Attachment E.

2.4. Slope Maintenance

<u>Section 845.230(d)(2)(F):</u> Documentation that the CCR surface impoundment, if not incised, will be operated and maintained with one of the forms of slope protection specified in Section 845.430;

The Coffeen Ash Pond 2 is not incised. Documentation of slope protection as required by Section 845.430 is provided in Attachment J.

2.5. Groundwater Monitoring

<u>Section 845.230(d)(2)(I):</u> Groundwater monitoring information:

The groundwater monitoring information for the Coffeen Ash Pond 2 is described in the following sections.

> *Section 845.230(d)(2)(I)(i): Hydrogeologic site characterization (see Section 845.620);*

Hydrogeologic site characterization for the Coffeen Ash Pond 2 is provided in Attachment H.

> *Section 845.230(d)(2)(I)(ii): Design and construction plans of a groundwater monitoring system (see Section 845.630);*

Design and construction plans of a groundwater monitoring system are provided in Attachment I.

> *Section 845.230(d)(2)(I)(iii): A groundwater sampling and analysis program that includes selection of the statistical procedures to be used for evaluating groundwater monitoring data (see Section 845.640); and*

A groundwater sampling and analysis program that meets the requirements of Section 845.640 is provided in Attachment I.

> *Section 845.230(d)(2)(I)(iv): Proposed groundwater monitoring program that includes a minimum of eight independent samples for each background and downgradient well (see Section 845.650(b));*

A proposed groundwater monitoring program that meets the requirements of Section 845.650(b) is provided in Attachment I.

2.6. Initial Post-Closure Care Plan

Section 845.230(d)(2)(K): Initial written post-closure care plan, if applicable (see Section 845.780(d));

The Coffeen Ash Pond 2 closure was completed by capping the CCR in place. The initial post closure care plan was developed in accordance with Section 845.780 and is provided in Attachment K.

2.7. History of Groundwater Exceedances

> *Section 845.230(d)(2)(M): History of known exceedances of the groundwater protection standards in Section 845.600, and any corrective action taken to remediate the groundwater;*

A history of known exceedances and any corrective action taken is provided in Attachment M.

2.8. Financial Assurance Requirements

> <u>*Section 845.230(d)(2)(N):*</u> *A certification that the owner or operator meets the financial assurance requirements of Subpart I;*

A certification meeting the requirement of Section 845.230(d)(2)(N) stating that the Owner meets the financial assurance requirements of *Subpart I* is provided in Attachment N.

3. PERMIT APPLICATION

All permit applications must be made on the forms prescribed by the Agency and must be mailed or delivered to the address designated by the Agency on the forms. The permit applications (CCR-1 and CCR-2OE) are provided below.

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

Bureau of Water ID Number: W1350150004 **CCR Permit Number:** Initial Permit **Facility Name:** Coffeen 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		
	Illinois Power Generating Company - Coffeen Power Plant		
1.2	Illinois EPA CCR Permit Number (if applicable)		
	Initial Permit		
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 134 CIPS Lane		
	County name Montgomery	County code (if known)	
	City or town Coffeen	State IL	Zip Code 62017
1.6	Name of Owner/Operator		
	Illinois Power Generating Company		

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.		
	W1350150004-02 (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
			☐	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: 10/25/2021

Form CCR 2OE

Illinois Environmental Protection Agency

CCR Surface Impoundment Permit Application

Form CCR 2OE – Initial Operating Permit for Existing or Inactive CCR Surface Impoundment Where an Agency-approved Closure Has Been Completed Before July 30, 2021

Bureau of Water ID Number:
W1350150004

CCR Permit Number:
Initial Permit
Initial Permit

Facility Name:
Coffeen Power Plant
Initial Permit

For IEPA Use Only

SECTION 1: CONSTRUCTION HISTORY (35 Ill. Adm. Code 845.220 and 35 Ill. Adm. Code 845.230)

Construction History

1.1	CCR surface impoundment name.
	Ash Pond No. 2
1.2	Identification number of the CCR surface impoundment (if one has been assigned by the Agency).
	W1350150004 - 02
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 B
1.5	How long has the CCR surface impoundment been in operation?
	See Attachment B
1.6	List the types of CCR that have been placed in the CCR surface impoundment.
	See Attachment B
1.7	List the name of the watershed within which the CCR surface impoundment is located.
	See Attachment B
1.8	What is the size in acres of the watershed within which the CCR surface impoundment is located?
	See Attachment B
1.9	Check the corresponding boxes to indicate that you have attached the following:
	✔ A description of the physical and engineering properties of the foundation and abutment materials on which the CCR surface impoundment is constructed.

Construction History		☑	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 surface impoundment.
		☑	A statement of the method of site preparation and construction of each zone of the CCR surface impoundment.
		☑	A statement of the approximate dates of construction of each successive stage of construction of the CCR surface impoundment.
		☑	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.
	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 B	

SECTION 2: ATTACHMENTS

Attachments	2.1	Check the corresponding boxes to indicate that you have attached the following:	
		☑	Evidence that the permanent markers required by 35 Ill. Adm. Code 845.130 have been installed.
		☑	Documentation demonstrating that the CCR surface impoundment, if not incised, will be operated and maintained with one of the forms of slope protection specified in 35 Ill. Adm. Code 845.430.
		☐	Emergency Action Plan and accompanying certification required by 35 Ill. Adm. Code 845.520(e).
		☑	Written post-closure care plan, if applicable (see 35 Ill. Adm. Code 845.780(d)).
		☑	History of known exceedances of the groundwater protection standards in 35 Ill. Adm. Code 845.600, and any corrective action taken to remediate the groundwater.

SECTION 3: GROUNDWATER MONITORING

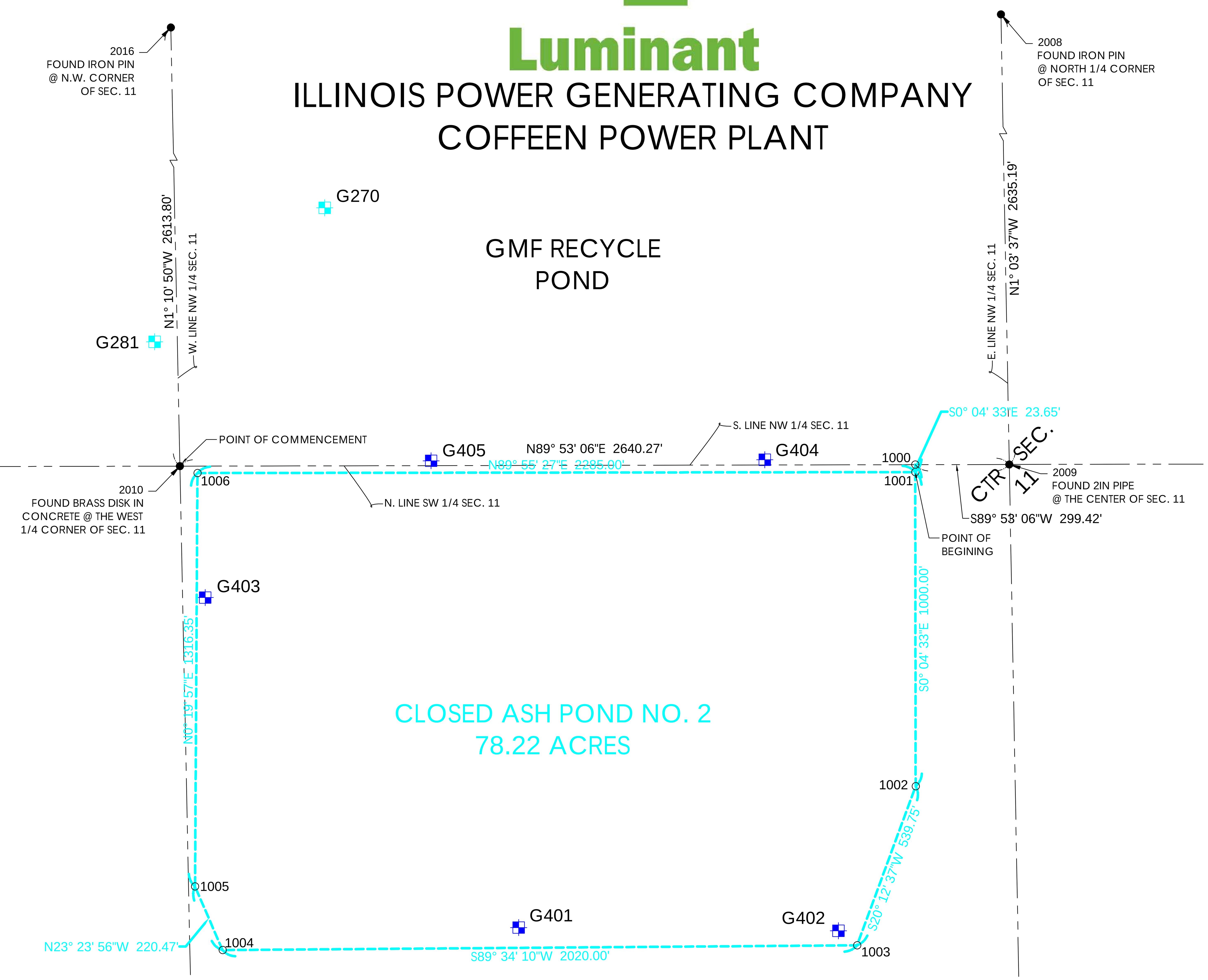
	3.1	Check the corresponding boxes to indicate whether you have attached the following groundwater monitoring information:	
		☑	A hydrogeologic site characterization meeting the requirements of 35 Ill. Adm. Code 845.620.

Groundwater		☑	Design and construction plans of a groundwater monitoring system meeting the requirements of 35 Ill. Adm. Code 845.630.
		☑	A groundwater sampling and analysis program that includes section of the statistical procedures to be used for evaluating groundwater monitoring data, required by 35 Ill. Adm. Code 845.640.
		☑	Proposed groundwater monitoring program that includes a minimum of eight independent samples for each background and downgradient well, required by 35 Ill. Adm. Code 845.650(b).

ATTACHMENT A

Luminant

ILLINOIS POWER GENERATING COMPANY
COFFEEN POWER PLANT



RESTRICTIVE USE BOUNDARY CORNERS SET				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1000	873984.31	2516876.80	604.79	SET MAG NAIL
1001	873960.66	2516876.83	605.28	SET I.P.
1002	872960.66	2516878.16	590.79	SET I.P.
1003	872454.15	2516691.69	605.12	SET I.P.
1004	872438.96	2514671.75	619.64	SET I.P.
1005	872641.31	2514584.19	623.44	SET MAG NAIL
1006	873957.63	2514591.83	624.11	SET MAG NAIL

SURVEY PERFORMED ON APRIL 20, 2021

CONTROL CORNERS AND WELLS				
POINT NO.	NORTHING	EASTING	ELEVATION	DESCRIPTION
2008	876619.65	2517127.46	623.84	FOUND IRON PIN @ NORTH 1/4 CORNER OF SEC. 11
2009	873984.91	2517176.22	614.30	FOUND 2IN PIPE @ THE CENTER OF SEC. 11
2010	873979.62	2514535.96	623.85	FOUND BRASS DISK IN CONCRETE @ THE WEST 1/4 CORNER OF SEC. 11
2016	876592.86	2514482.10	626.44	FOUND IRON PIN @ NW CORNER OF SEC. 11
1122	874802.11	2514996.81	623.89	G270
1104	874375.23	2514455.32	624.36	G281
1115	872511.00	2515614.84	625.62	G401
1118	872500.56	2516632.52	610.64	G402
1106	873561.14	2514616.59	625.24	G403
1110	873999.79	2516397.79	613.61	G404
1107	873996.51	2515335.89	621.43	G405

WELL DATA SURVEY PERFROMED ON APRIL 20, 2021

ASH POND NO. 1

N

0' 200' 400'

LEGEND

SECTION LINE
RESTRICTED USE BOUNDARY
FOUND SURVEY MARKER AS NOTED
SET 5/8" IRON REBAR (UNLESS OTHERWISE NOTED)
BACKGROUND CCR MONITORING WELL
DOWNGRADIENT CCR MONITORING WELL

SURVEY NOTE:
THIS DRAWING AND THE INFORMATION SHOWN HERE ON WAS OBTAINED FROM DATA COLLECTED FROM A FIELD SURVEY MADE BY INGENAE, LLC BETWEEN MARCH 23 THROUGH APRIL 20, 2021. SURVEY COORDINATES, BEARINGS & DISTANCES ARE REFERENCED TO ILLINOIS WEST 1202 STATE PLANE COORDINATE SYSTEM NAD 1983.

Land Description of the Coffeen Power Plant
Closed Ash Pond 2 Restricted Use Area
78.22 Acres

Part of the Southwest Quarter of Section 11, Township 7 North, Range 3 West of the Third Principal Meridian, Montgomery County, Illinois being more particularly described as follows:

Commencing at the Brass Plug in concrete found at the West Quarter Corner of Section 11, from which bears an Iron Pin at the Northwest corner of Section 11 North 1 degree 10 minutes 50 seconds West a distance of 2613.80 feet; thence from said commencement point at the West Quarter Corner of Section 11, North 89 degrees 53 minutes 06 seconds East, along the South line of the Northwest Quarter of Section 11, being the same as the North line of the Southwest Quarter of section 11 a distance of 2640.27 feet to the 2 inch Iron Pipe at the Center of Section 11, from which bears an Iron Pin at the North Quarter Corner of Section 11 North 1 degree 03 minutes 37 seconds West a distance of 2635.19 feet; thence from said 2 inch Iron Pipe at the Center of Section 11 South 89 degrees 53 minutes 06 seconds West back along the North line of the Southwest Quarter of Section 11 a distance of 299.42 feet; thence South 0 degrees 04 minutes 33 seconds East a distance of 23.65 feet to the Point of Beginning of the Tract described herein; thence continuing South 0 degrees 04 minutes 33 seconds East a distance of 1000.00 feet; thence South 20 degrees 12 minutes 37 seconds West a distance of 539.75 feet; thence South 89 degrees 34 minutes 10 seconds West a distance of 2020.00 feet; thence North 23 degrees 23 minutes 56 seconds West a distance of 220.47 feet; thence North 0 degrees 19 minutes 57 seconds East a distance of 1316.35 feet; thence North 89 degrees 55 minutes 27 seconds East a distance of 2285.00 feet to the Point of Beginning and containing 78.22 Acres.

SURVEYOR CERTIFICATE:
THIS IS TO CERTIFY THAT WE, INGENAE, LLC, HAVE AT THE REQUEST OF AND FOR THE EXCLUSIVE USE OF THE OWNERS, 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

Sept 22, 2021

STATE OF ILLINOIS
MICHAEL J. GRAMINSKI
035.002901
PROFESSIONAL LAND SURVEYOR

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	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	

Luminant

Project Name & Location:

COFFEEN
POWER PLANT
134 SIPS LANE
COFFEEN, IL
62017

DO NOT SCALE PLANS
Copying, Printing, Software and other processes required to produce these prints can stretch or shrink the actual paper or layout. Therefore, scaling of this drawing may be inaccurate. Contact IngenAE with any need for additional dimensions or clarifications.

Drawing Name:
CLOSED ASH POND 2 RESTRICTED USE BOUNDARY EXHIBIT

Date: 9/22/2021	Project No.
Type: SITE	Drawing No. 1
Drawn By: CB	
Approved By: MG	
Scale: AS NOTED	

Luminant

ILLINOIS POWER GENERATING COMPANY
COFFEEN POWER PLANT

RESTRICTIVE USE BOUNDARY CORNERS SET				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1000	873984.31	2516876.80	604.79	SET MAG NAIL
1001	873960.66	2516876.83	605.28	SET I.P.
1002	872960.66	2516878.16	590.79	SET I.P.
1003	872454.15	2516691.69	605.12	SET I.P.
1004	872438.96	2514671.75	619.64	SET I.P.
1005	872641.31	2514584.19	623.44	SET MAG NAIL
1006	873957.63	2514591.83	624.11	SET MAG NAIL
SURVEY PERFORMED ON APRIL 20, 2021				

CONTROL CORNERS AND WELLS				
POINT NO.	NORTHING	EASTING	ELEVATION	DESCRIPTION
2008	876619.65	2517127.46	623.84	FOUND IRON PIN @ NORTH 1/4 CORNER OF SEC. 11
2009	873984.91	2517176.22	614.30	FOUND 2IN PIPE @ THE CENTER OF SEC. 11
2010	873979.62	2514535.96	623.85	FOUND BRASS DISK IN CONCRETE @ THE WEST 1/4 CORNER OF SEC. 11
2016	876592.86	2514482.10	626.44	FOUND IRON PIN @ NW CORNER OF SEC. 11
1122	874802.11	2514996.81	623.89	G270
1104	874375.23	2514455.32	624.36	G281
1115	872511.00	2515614.84	625.62	G401
1118	872500.56	2516632.52	610.64	G402
1106	873561.14	2514616.59	625.24	G403
1110	873999.79	2516397.79	613.61	G404
1107	873996.51	2515335.89	621.43	G405
WELL DATA SURVEY PERFROMED ON APRIL 20, 2021				

N

0' 200' 400'

LEGEND

- SECTION LINE
- RESTRICTED USE BOUNDARY
- FOUND SURVEY MARKER AS NOTED
- SET 5/8" IRON REBAR (UNLESS OTHERWISE NOTED)
- BACKGROUND CCR MONITORING WELL
- DOWNGRADIENT CCR MONITORING WELL

SURVEY NOTE:
THIS DRAWING AND THE INFORMATION SHOWN HERE ON WAS OBTAINED FROM DATA COLLECTED FROM A FIELD SURVEY MADE BY INGENAE, LLC BETWEEN MARCH 23 THROUGH APRIL 20, 2021. SURVEY COORDINATES, BEARINGS & DISTANCES ARE REFERENCED TO ILLINOIS WEST 1202 STATE PLANE COORDINATE SYSTEM NAD 1983.

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

Submissions / Revisions:	Date:
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	

Luminant

Project Name & Location:

COFFEEN
POWER PLANT
134 SIPS LANE
COFFEEN, IL
62017

Drawing Name:
CLOSED ASH POND 2
RESTRICTED USE
BOUNDARY EXHIBIT

Date: 9/22/2021	Project No.
Type: SITE	Drawing No.
Drawn By: CB	2
Approved By: MG	
Scale: AS NOTED	

ATTACHMENT B

AECOM

October 2016

Illinois Power Generating Company
134 CIPS Lane
Coffeen, IL 62017

RE: History of Construction
USEPA Final CCR Rule, 40 CFR § 257.73(c)
Coffeen Power Station
Coffeen, Illinois

On behalf of Illinois Power Generating Company, AECOM has prepared the following history of construction for Ash Pond No. 1, Ash Pond No. 2, the GMF Pond, and the GMF Recycle Pond at the Coffeen Power Station in accordance with 40 CFR § 257.73(c).

BACKGROUND

40 CFR § 257.73(c)(1) requires the owner or operator of an existing coal combustion residual (CCR) surface impoundment that either (1) has a height of five feet or more and a storage volume of 20 acre-feet or more, or (2) has a height of 20 feet or more to compile a history of construction by October 17, 2016 that contains, to the extent feasible, the information specified in 40 CFR § 257.73(c)(1)(i)–(xii).

The history of construction presented herein was compiled based on existing documentation, to the extent that it is reasonably and readily available (see 80 Fed. Reg. 21302, 21380 [April 17, 2015]), and AECOM's site experience. AECOM's document review included record drawings, geotechnical investigations, construction specifications, etc. for Ash Pond No. 1, Ash Pond No. 2, the GMF Pond, and the GMF Recycle Pond at the Coffeen Power Station.

HISTORY OF CONSTRUCTION

§ 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.

Owner: Illinois Power Generating Company

Address: 1500 Eastport Plaza Drive
Collinsville, IL 62234

CCR Units: Ash Pond No. 1
Ash Pond No. 2
GMF Pond, IDNR Dam ID No. IL50579
GMF Recycle Pond, IDNR Dam ID No. IL50578

Ash Pond No. 1 and Ash Pond No. 2 do not have a state assigned identification number.

§ 257.73(c)(1)(ii): The location of the CCR unit identified on the most recent USGS 7$^{1}/_{2}$ or 15 minute topographic quadrangle map or a topographic map of equivalent scale if a USGS map is not available.

The locations of Ash Pond No. 1, Ash Pond No. 2, the GMF Pond, and the GMF Recycle Pond have been identified on an USGS 7-1/2 minute topographic quadrangle map in **Appendix A**.

§ 257.73(c)(1)(iii): A statement of the purpose for which the CCR unit is being used.

The following captures the purposes of the CCR units:

- Ash Pond No. 1 is being used to store and dispose of bottom ash and other-non-CCR waste and to clarify recycled process water for plant operations. Ash Pond No. 2 (inactive) was used to store and dispose of bottom ash and fly ash.
- The GMF Pond is being used to store and dispose of gypsum and to clarify recycled process water for plant operations.
- The GMF Recycle Pond was used to store and dispose of gypsum from the plant's scrubber operations prior to the in-service date of the GMF Pond in 2010. The GMF Recycle Pond currently only receives and stores clear process water from the GMF Pond.

Notice of intent to close Ash Pond No. 2 was provided in November, 2015.[1]

[1] This history of construction report was prepared on a facility-wide basis for CCR surface impoundments at the Coffeen Power Station. The inclusion of Ash Pond No. 2 in this history of construction report does not concede and should not be construed to concede that Ash Pond No. 2 is subject to the Design Criteria or all Operating Criteria in the CCR Rule.

§ 257.73(c)(1)(iv): The name and size in acres of the watershed where the CCR unit is located.

Ash Pond No. 1, Ash Pond No. 2, the GMF Pond, and the GMF Recycle Pond are located in the Coffeen Lake Watershed with a 12-digit Hydrologic Unit Code (HUC) of 071402030304 and a drainage area of 11,695 acres (USGS, 2016).

§ 257.73(c)(1)(v): A description of the physical and engineering properties of the foundation and abutment materials on which the CCR unit is constructed.

The foundation and abutment materials of Ash Pond No. 1, Ash Pond No. 2, the GMF Pond, and the GMF Recycle Pond consist of native fine-grained soils of wind-blown origin (loess), with some coarse-grained layers, underlain by glacial till. The physical properties of the fine-grained soils are described as low- to medium-plasticity silty clay, sandy lean clay, or lean clay with sand, often with trace amounts of gravel; or high plasticity fat clay, often with trace amounts of sand. The clay soils vary from soft to very stiff, moist to wet, and brown to gray. The physical properties of the coarse-grained soils are described as clayey sand, silty sand, or fine to coarse sand, with trace amounts of gravel. The sand is wet and varies from loose to dense and brown to gray. A thin layer of native silty or sandy lean clay is located immediately above the glacial till deposits. The clay is very soft to medium stiff, low to medium plasticity, wet, and orange brown to gray. The physical properties of the glacial till are described as lean clay, or silty to sandy lean clay, with trace amounts of fine gravel, hard, low plasticity, moist to wet, and brown to gray. An available summary of the engineering property typical ranges of the foundation and abutment materials is presented in **Table 1** below. The engineering properties are based on previous geotechnical explorations and laboratory testing.

Ash Pond No. 1 and Ash Pond No. 2 are enclosed impoundments with embankments and do not have abutments. The GMF Pond and GMF Recycle Pond were constructed as incised impoundments enclosed by embankments.

Table 1. Summary of Foundation and Abutment Material Engineering Properties

Material	Unit Weight (pcf)	Effective (drained) Shear Strength Parameters		Total (undrained) Shear Strength Parameters	Post-Earthquake Shear Strength
		Cohesion, c′ (psf)	Friction Angle, ϕ’ (deg)	S_u/p'	S_{ur}/p'
Foundation Clay (Under Embankment)	125	0	32	S_u/p' = 0.39-0.45, Min. S_u = 700 psf	Peak Undrained
Foundation Clay (Free Field)	125	0	30	S_u/p' = 0.24-0.28, Min. S_u = 450 psf	Peak Undrained
Soft Foundation Clay	125	0	30	S_u/p' = 0.22-0.28, Min. S_u = 275 psf	S_u/p' = 0.13-0.16, Min. S_{ur} = 200 psf
Glacial Till	135	0	40	S_u/p' = 0.45-0.64, Min. S_u = 700 psf	Peak Undrained

§ 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.

Physical properties for the embankment construction materials for Ash Pond No. 1, Ash Pond No. 2, GMF Pond, and GMF Recycle Pond are described as silty clay, sandy lean clay, or lean clay with sand, with trace amounts of fine gravel. The fill is soft to very stiff in consistency, low to medium plasticity, moist to wet, and brown to gray. Trace amounts of organic material and ash are present. The embankment fill generally appears to be well-compacted. An available summary of the engineering properties of the embankment construction materials is presented in **Table 2** below. The engineering properties are based on previous geotechnical explorations and laboratory testing.

Table 2. Summary of Construction Material Engineering Properties for Embankments

Material	**Unit Weight (pcf)**	**Peak Drained Shear Strength**		**Peak Undrained Shear Strength**	**Post-Earthquake Shear Strength**
		Cohesion, c′ (psf)	Friction Angle, f ’ (deg)	S_u/p'	S_{ur}/p'
Embankment Fill	135	0	31	S_u/p' = 0.60, Min. S_u = 450 psf	Peak Undrained

The GMF Pond and GMF Recycle Pond contain liner systems. The liner system within the GMF Pond consists of a 60-mil textured high density polyethylene (HDPE) geomembrane underlain by a 3-foot thick layer of compacted clay. A typical cross section profile of the GMF Pond liner system is shown on drawing C-10206 (sh. 9) presented in **Appendix B**. An available summary of the engineering properties of the GMF Pond liner construction materials from Hanson (2008) is presented in **Table 3** below. The liner system within the GMF Recycle Pond consists of a 60-mil textured HDPE geomembrane underlain by smooth-drum rolled native soil. A typical cross section profile of the GMF Recycle Pond liner system is shown on drawing C-10206 (sh. 20) presented in **Appendix B**.

Table 3. Summary of Construction Material Engineering Properties for Liner

Material	**Unit Weight (pcf)**	**Effective (drained) Shear Strength Parameters**		**Total (undrained) Shear Strength Parameters**	
		c’ (psf)	**Φ’ (°)**	**c (psf)**	**Φ (°)**
Clay Liner	121.2	0	28.3	1950	0

The method of site preparation and construction of Ash Pond No. 1 and Ash Pond No. 2 is not reasonably and readily available. Site preparation and construction of the GMF Pond and GMF Recycle Pond were completed in accordance with the applicable construction specification (see § 257.73(c)(1)(xi) below).

The approximate dates of construction of each successive stage of construction of Ash Pond No. 1, Ash Pond No. 2, the GMF Pond, and the GMF Recycle Pond are provided in **Table 4** below.

Table 4. Approximate dates of construction of each successive stage of construction.

Date	Event
1964	Construction of Ash Pond No. 1
1971	Construction of Ash Pond No. 2
1978-1979	Installation of internal embankment and new recycle intake structure in Ash Pond No. 1 and abandonment of existing outfall structure
1984-1985	Closure of Ash Pond No. 2 by installing a clay cover
2000	Installation of a sheet pile wall to facilitate construction of drainage flume along the northeast corner of the Ash Pond No. 1
2009	Installation of well dewatering system in Ash Pond No. 2
2008-2010	Construction of the GMF Pond and the GMF Recycle Pond

§ 257.73(c)(1)(vii): At a scale that details engineering structures and appurtenances relevant to the design, construction, operation, and maintenance of the CCR unit, detailed dimensional drawings of the CCR unit, including a plan view and cross sections of the length and width of the CCR unit, showing all zones, foundation improvements, drainage provisions, spillways, diversion ditches, outlets, instrument locations, and slope protection, in addition to the normal operating pool surface elevation and the maximum pool surface elevation following peak discharge from the inflow design flood, the expected maximum depth of CCR within the CCR surface impoundment, and any identifiable natural or manmade features that could adversely affect operation of the CCR unit due to malfunction or mis-operation.

Drawings that contain items pertaining to the requested information for Ash Pond No. 1, Ash Pond No. 2, the GMF Pond, and the GMF Recycle Pond are listed in **Table 5** below. Items marked as "Not Available" are items not found during a review of the reasonably and readily available record documentation.

Table 5. List of drawings containing items pertaining to the information requested in § 257.73(c)(1)(vii).

	Ash Pond No. 1	Ash Pond No. 2	GMF Pond	GMF Recycle Pond
Dimensional plan view (all zones)	B-35, S-44, S-45	B-560, A1000 (sh. 1)	C-10206 (sh. 4, 9, 10)	C-10206 (sh. 4, 19)
Dimensional cross sections	B-35, S-47 to S-50	B-561	C-10206 (sh. 9)	C-10206 (sh. 20)
Foundation Improvements	Not Applicable	Not Applicable	C-10206 (sh. 10)	C-10206 (sh. 20)
Drainage Provisions	Not Applicable	A1000 (sh. 4)	C-10206 (sh. 15, 16, 20)	C-10206 (sh. 21)
Spillways and Outlets	S-8, S-49	W1008 (sh. 2)	C-10206 (sh. 20)	C-10206 (sh. 22)
Diversion Ditches	Not Applicable	A1000 (sh. 1)	Not Applicable	Not Applicable
Instrument Locations	Plate 2, Figure 2A	Figure 2B	Not Applicable	C-10206 (sh. 19)
Slope Protection	S-49	B-561	C-10206 (sh. 9)	C-10206 (sh. 20)
Normal Operating Pool Elevation	S-8, S-49	Not Applicable	C-10201-25	Not Available
Maximum Pool Elevation	S-8	Not Applicable	C-10201-25	Not Available
Approximate Maximum Depth of CCR in 2016	15 feet	28 feet	16 feet	12 feet

All drawings referenced in **Table 5** above can be found in **Appendix B** and **Appendix C**.

Based on the review of the drawings listed above, no natural or manmade features that could adversely affect operation of these CCR units due to malfunction or mis-operation were identified.

§ 257.73(c)(1)(viii): A description of the type, purpose, and location of existing instrumentation.

Existing instrumentation at Ash Pond No. 1 and Ash Pond No. 2 include vibrating-wire and open-standpipe piezometers. The purpose of the piezometers is to measure the phreatic surface within and around the impoundments. Two (2) open-standpipe piezometers (AP-P1 and AP-P2) were installed at Ash Pond No. 2 in 2009 and the locations are presented on Figure 2A in **Appendix C**. Two (2) open-standpipe piezometers (B-2 and B-4) were installed at Ash Pond No. 1 in 2010 and the locations are presented on Plate 2 in **Appendix C**. Twelve (12) open-standpipe and vibrating-wire piezometers were installed at Ash Pond No. 1 and Ash Pond No. 2 in 2015 and the locations are presented on Figure 2A in **Appendix C**.

The GMF Pond does not contain existing instrumentation. Existing instrumentation at the GMF Recycle Pond consists of one (1) ultrasonic level transmitter. The purpose of the ultrasonic level transmitter is to measure the water level within the GMF Recycle Pond. The location of the ultrasonic level transmitter is shown on drawing C-10206 (sh. 19) presented in **Appendix B**.

§ 257.73(c)(1)(ix): Area-capacity curves for the CCR unit.

Area-capacity curves for Ash Pond No. 2 and the GMF Recycle Pond are not reasonably and readily available. The area-capacity curves for Ash Pond No. 1 and the GMF Pond are presented in **Figures 1** and **2**, respectively, below. “Area-capacity curves”, as defined by 40 CFR § 257.53, “means graphic curves which readily show the reservoir water surface area, in acres, at different elevations from the bottom of the reservoir to the maximum water surface, and the capacity or volume, in acre-feet, of the water contained in the reservoir at various elevations.”

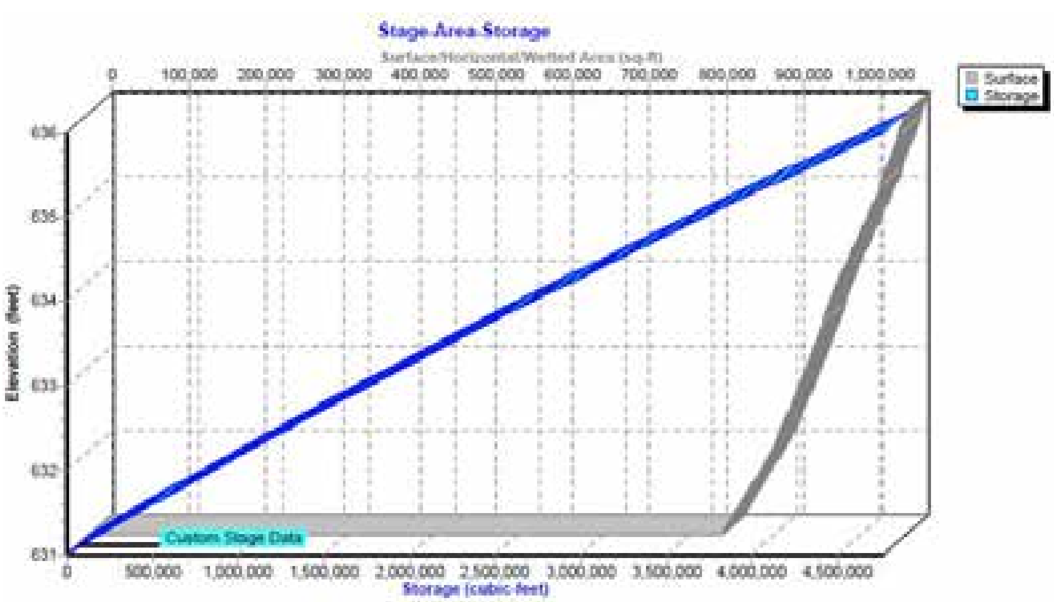


Figure 1. Area-capacity curve for Ash Pond No. 1

AECOM

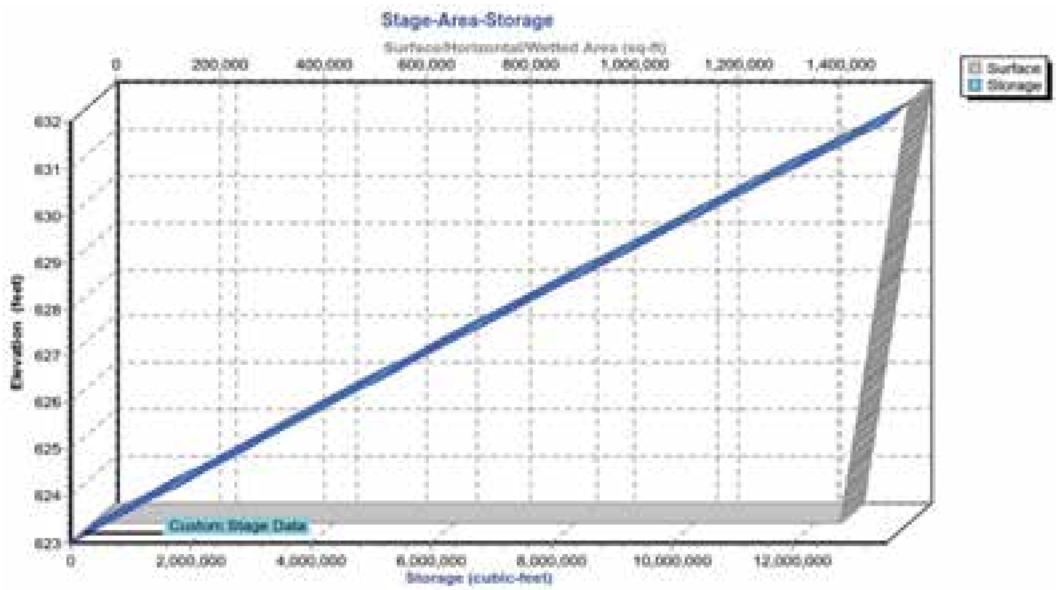


Figure 2. Area-capacity curve for GMF Pond

The area-capacity curves shown were taken from the pond modeling analysis. Actual pond capacity is limited to the approximate berm elevation listed in **Table 6** below. Any information above berm elevation should be disregarded.

§ 257.73(c)(1)(x): A description of each spillway and diversion design features and capacities and calculations used in their determination.

Ash Pond No. 1 contains a concrete intake structure that drains into a 48-inch diameter (dia.) steel pipe. The steel pipe leads to the recycle pump house. In 2016, the discharge capacity of Ash Pond No. 1 was evaluated using HydroCAD 10 software modeling a 1,000-year, 24-hour rainfall event. The results of the HydroCAD 10 analysis are presented below in **Table 6**.

Ash Pond No. 2 was closed in 1984-1985 by installing a clay cover. Non-contact stormwater is collected in ditches along the clay cover and drain off the pond cover via concrete-lined ditch outlets. CCR-contact stormwater collected within the pond is pumped into the GMF Pond via the well dewatering system at the discretion of plant personnel. The capacity of the diversion ditches and well pumps during a model rainfall event has not been evaluated.

The GMF Pond contains a 14-inch high-density polyethylene (HDPE) pipe culvert for normal flow and a weir-like spillway for high water flow. The GMF Pond also contains a 10-inch dia. HDPE siphon pipe used for dewatering. In 2016, the discharge capacity of the GMF Pond was evaluated using HydroCAD 10 software modeling a 1,000-year, 24-hour rainfall event. The results of the HydroCAD 10 analysis are presented below in **Table 6**.

The GMF Recycle Pond contains a decant structure that drains into two (2) 18-inch dia. HDPE pipes that lead to a pump house. The capacity of the decant structure during a model rainfall event has not been evaluated.

Table 6. Results of HydroCAD 10 analyses

	Ash Pond No. 1	GMF Pond
Approximate Minimum Berm Elevation[1] (ft)	635.0	631.0
Approximate Emergency Spillway Elevation[1] (ft)	Not Applicable	624.0
Starting Pool Elevation[1] (ft)	631.0	621.2
Peak Elevation[1] (ft)	632.0	623.8
Time to Peak (hr)	24.4	24.1
Surface Area (ac)	20.4	33.4
Storage[2] (ac-ft)	19.5	88.3

Note: 1. Elevations are based on NAVD88 datum
2. Storage given is from Starting Pool Elevation to Peak Elevation.

§ 257.73(c)(1)(xi): The construction specifications and provisions for surveillance, maintenance, and repair of the CCR unit.

The construction specifications for Ash Pond No. 1 and Ash Pond No. 2 are not reasonably and readily available. The construction specifications for the GMF Pond and the GMF Recycle Pond are located in *Project Specifications, Gypsum Stack and Recycle Pond Construction* presented in **Appendix D**.

The provisions for surveillance, maintenance, and repair of Ash Pond No. 1 are located in *Operation & Maintenance Manual for #1 Ash Pond* presented in **Appendix E**. The provisions for surveillance, maintenance, and repair of Ash Pond No. 2 are not reasonably and readily available. The provisions for surveillance, maintenance, and repair of the GMF Pond and the GMF Recycle Pond are located in *Operation and Maintenance Manual, Gypsum Management Facility* presented in **Appendix F**.

The operations and maintenance plans for the CCR units identified in this report are currently being revised by Illinois Power Generating Company.

§ 257.73(c)(1)(xii): Any record or knowledge of structural instability of the CCR unit.

In March, 2009, shallow sloughing was observed along the eastern embankment of Ash Pond No. 2. The sloughing was inspected by Hanson Professional Services Inc. A dewatering system was installed in Ash Pond No. 2 to lower the phreatic surface within the pond. In December, 2015, additional sloughing was observed on the embankment of Ash Pond No. 2 and on the embankment of Ash Pond No. 1. The sloughing was believed to be caused by recent heavy rains and was repaired. Photos of the 2015 sloughing repair are presented in **Appendix G**.

There is no record or knowledge of structural instability at the GMF Pond and the GMF Recycle Pond at Coffeen Power Station.

LIMITATIONS

The signature of AECOM's authorized representative on this document represents that to the best of AECOM's knowledge, information and belief in the exercise of its professional judgment, it is AECOM's professional opinion that the aforementioned information is accurate as of the date of such signature. Any recommendation, opinion or decisions by AECOM are made on the basis of AECOM's experience, qualifications and professional judgment and are not to be construed as warranties or guaranties. In addition, opinions relating to environmental, geologic, and geotechnical conditions or other estimates are based on available data and that actual conditions may vary from those encountered at the times and locations where data are obtained, despite the use of due care.

Sincerely,

Claudia Prado
Program Manager

Victor Modeer, P.E., D.GE
Senior Project Manager

REFERENCES

Hanson Professional Services Inc. (2008), *Support Document for IDNR/OWR Permit Application, Coffeen Power Generating Station Gypsum Management Facility Montgomery County, Illinois*

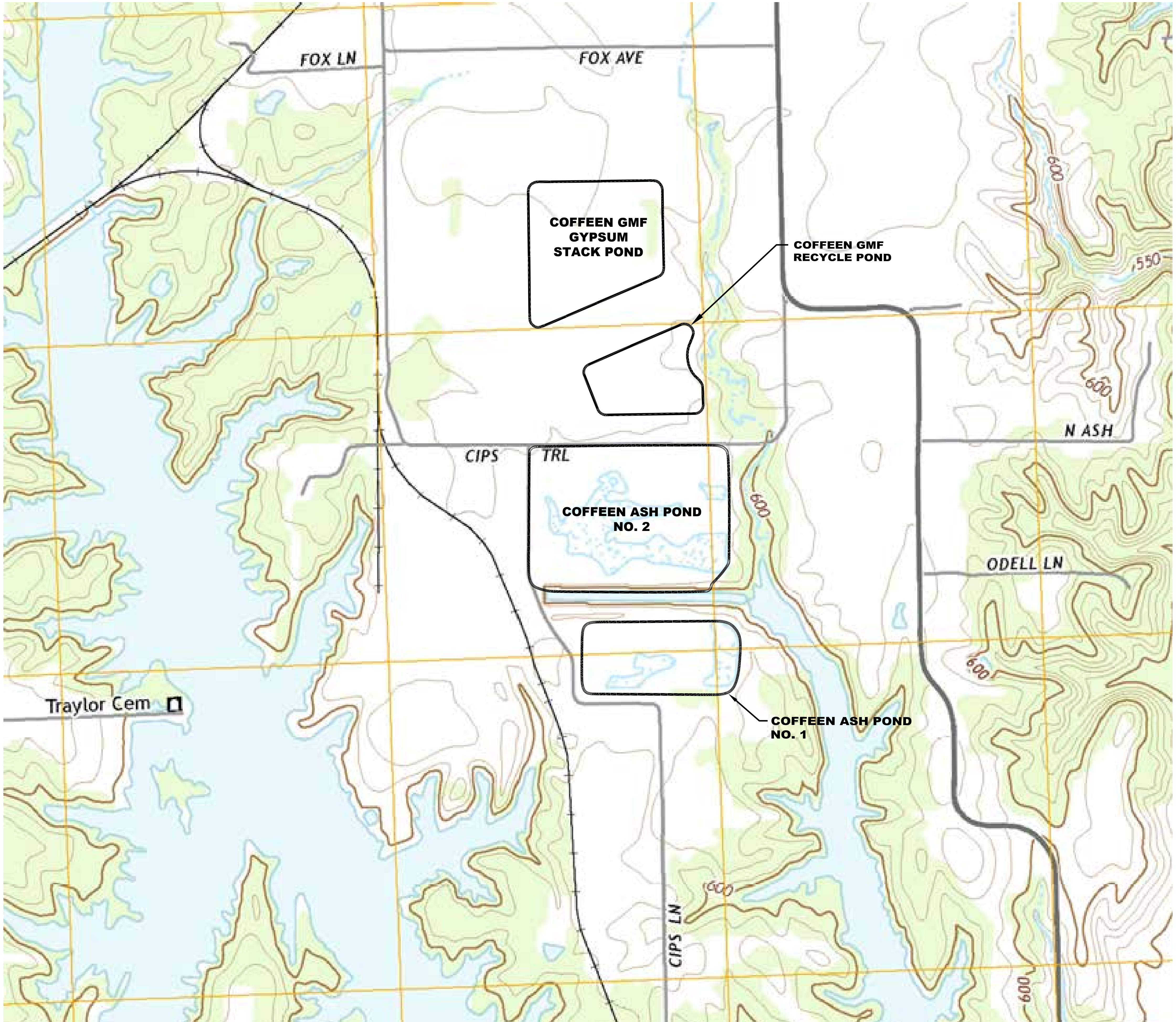
United States Environmental Protection Agency (USEPA). (2015). *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Final Rule.* 40 CFR Parts 257 and 261, 80 Fed. Reg. 21302, 21380 April 17, 2015.

United States Geological Survey (USGS). (2016). The National Map Viewer. http://viewer.nationalmap.gov/viewer/. USGS data first accessed in March of 2016.

APPENDICES

Appendix A: History of Construction Vicinity Map
Appendix B: Coffeen Power Station Drawings
Appendix C: Coffeen Power Station Boring and Piezometer Locations
Appendix D: Project Specifications, Gypsum Stack and Recycle Pond Construction (Hanson 2008)
Appendix E: Operation & Maintenance Manual for #1 Ash Pond
Appendix F: Operation and Maintenance Manual, Gypsum Management Facility Operation (2015)
Appendix G: Photos of 2015 Sloughing Repair

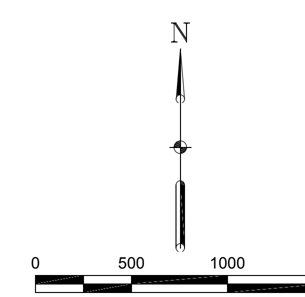
Appendix A: History of Construction Vicinity Map



LEGEND

CCR UNITS

SOURCE:
MAP PROVIDED FROM ELECTRONIC USGS DIGITAL RASTER GRAPHIC 7.5 MINUTE TOPOGRAPHIC MAP OF COFFEEN, ILLINOIS, REVISED 2015.



AECOM
1001 Highlands Plaza Drive, Suite 300
St. Louis, Mo. 63110
314 429-0100 (phone)
314-429-0462 (fax)

ILLINOIS POWER GENERATING COMPANY
134 CIPS Lane
Coffeen, IL 62017

HISTORY OF CONSTRUCTION

COFFEEN POWER STATION
COFFEEN, ILLINOIS

ISSUED FOR BIDDING DATE BY

ISSUED FOR CONSTRUCTION DATE BY

REVISIONS

NO.	DESCRIPTION	DATE
△		
△		
△		
△		
△		

AECOM PROJECT NO:	60489731
DRAWN BY:	DJD
DESIGNED BY:	DJD
CHECKED BY:	MN
DATE CREATED:	2016-04-13
PLOT DATE:	
SCALE:	1" = 500'
ACAD VER:	2014

SHEET TITLE

HISTORY OF CONSTRUCTION VICINITY MAP

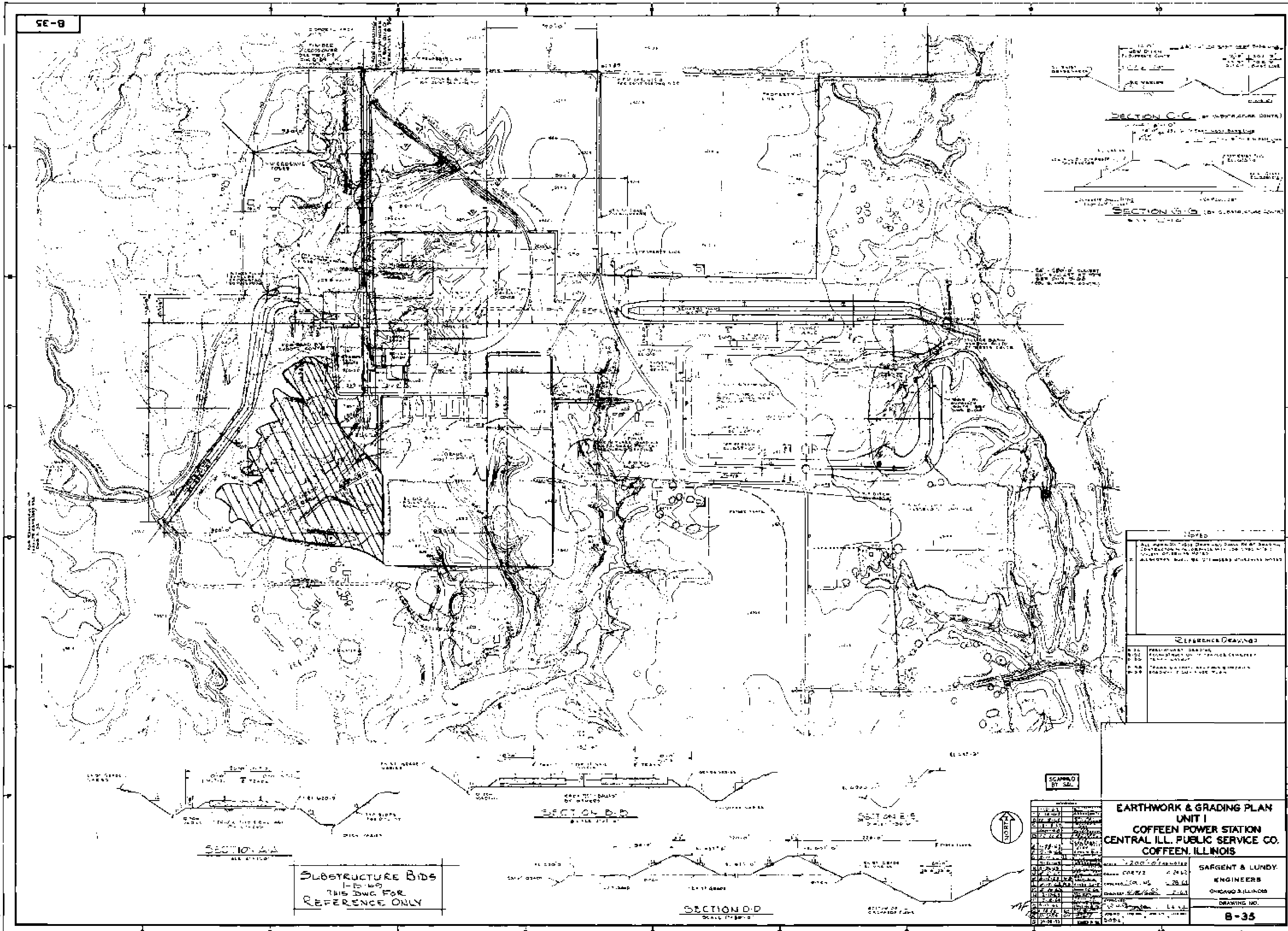
01

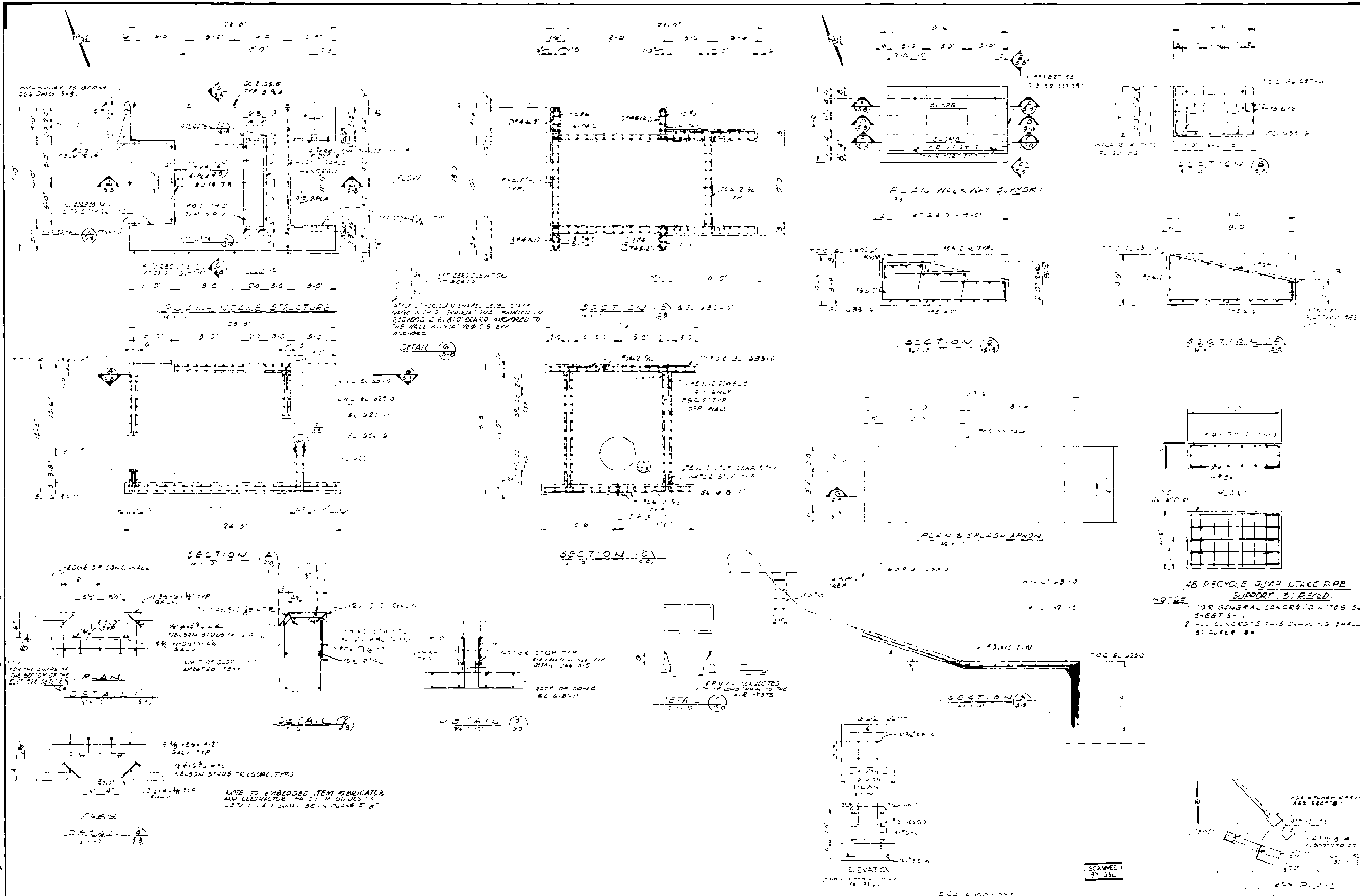
Appendix B: Coffeen Power Station Drawings

1. “Earthwork & Grading Plan”, Drawing No. B-35, Revision S, 8 September, 1995, Sargent & Lundy Engineers.
2. “Concrete Recycle Pump House – Intake Structure”, Drawing No. S-8, Revision 6, 23 February, 1996, Stearns-Roger Incorporated.
3. “Civil Layout & Grading Plan Sheet 4”, Drawing No. S-44, Revision 6, 23 February, 1996, Stearns-Roger Incorporated.
4. “Civil Layout & Grading Plan Sheet 5”, Drawing No. S-45, Revision 9, 23 February, 1996, Stearns-Roger Incorporated.
5. “Civil Miscellaneous Sections and Details, Sheet 2”, Drawing No. S-47, Revision 2, 23 February, 1996, Stearns-Roger Incorporated.
6. “Civil Ash Pond No 1 – Sections and Details”, Drawing No. S-48, Revision 2, 23 February, 1996, Stearns-Roger Incorporated.
7. “Civil Miscellaneous Sections and Details, Sheet 4”, Drawing No. S-49, Revision 4, 23 February, 1996, Stearns-Roger Incorporated.
8. “Civil Miscellaneous Sections and Details”, Drawing No. S-50, Revision 4, 23 February, 1996, Stearns-Roger Incorporated.
9. “Ash Storage Area, Plan”, Drawing No. B-560, Revision A, 9 February, 1971, Sargent & Lundy Engineers.
10. “Ash Storage Area, Sections & Details”, Drawing No. B-561, Revision A, 9 February, 1971, Sargent & Lundy Engineers.
11. “Overall Site Plan, Dewatering System, Ash Pond #2”, Drawing No. A1000 (sh. 1), Revision A, 12 October, 2009, Ameren Energy Resources Generating.
12. “Site Details, Dewatering System, Ash Pond #2”, Drawing No. A1000 (sh. 4), Revision A, 12 October, 2009, Ameren Energy Resources Generating.
13. “Proposed Site Plan, CCB Management Facility”, Drawing No. C-10206 (sh. 4), Revision 0, 5 January, 2011, Ameren Energy Generating.
14. “Groundwater Monitoring & Boring Plan, CCB Management Facility”, Drawing No. C-10206 (sh. 5), Revision 0, 5 January, 2011, Ameren Energy Generating.
15. “Anchor Trench and Liner System, CCB Management Facility”, Drawing No. C-10206 (sh. 9), Revision 0, 5 January, 2011, Ameren Energy Generating.
16. “Cell G1-Foundation Grade & Control Data, CCB Management Facility”, Drawing No. C-10206 (sh. 10), Revision 0, 5 January, 2011, Ameren Energy Generating.
17. “Cell G1-Process Water Recovery System, CCB Management Facility”, Drawing No. C-10206 (sh. 15), Revision 0, 5 January, 2011, Ameren Energy Generating.
18. “Cell G1-PWRS Drain Details, CCB Management Facility”, Drawing No. C-10206 (sh. 16), Revision 0, 5 January, 2011, Ameren Energy Generating.
19. “Recycle Pond Plan & Control Data, CCB Management Facility”, Drawing No. C-10206 (sh. 19), Revision 0, 5 January, 2011, Ameren Energy Generating.
20. “Recycle Pond – Process Water Transfer Channel Details, CCB Management Facility”, Drawing No. C-10206 (sh. 20), Revision 0, 5 January, 2011, Ameren Energy Generating.

Appendix B: Coffeen Power Station Drawings (continued)

21. “Recycle Pond–Process Water Decant Sections & Details, CCB Management Facility”, Drawing No. C-10206 (sh. 21), Revision 0, 5 January, 2011, Ameren Energy Generating.
22. “Recycle Pond – Emergency Spillway Sections & Details, CCB Management Facility”, Drawing No. C-10206 (sh. 22), Revision 0, 5 January, 2011, Ameren Energy Generating.
23. “Ash Pond #2, Drainage Modifications”, Drawing No. W1008 (sh. 2), Ameren Energy Generating.


B-35
SECTION C-C
SECTION B-B
NOTES
REFERENCE DRAWINGS
SECTION A-A
SECTION B-B
SECTION E-E
SECTION D-D
SUBSTRUCTURE BIDS
1-15-69
THIS DWG FOR
REFERENCE ONLY
NORTH
EARTHWORK & GRADING PLAN
UNIT I
COFFEEN POWER STATION
CENTRAL ILL. PUBLIC SERVICE CO.
COFFEEN, ILLINOIS
SARGENT & LUNDY
ENGINEERS
CHICAGO ILLINOIS
DRAWING NO.
B-35



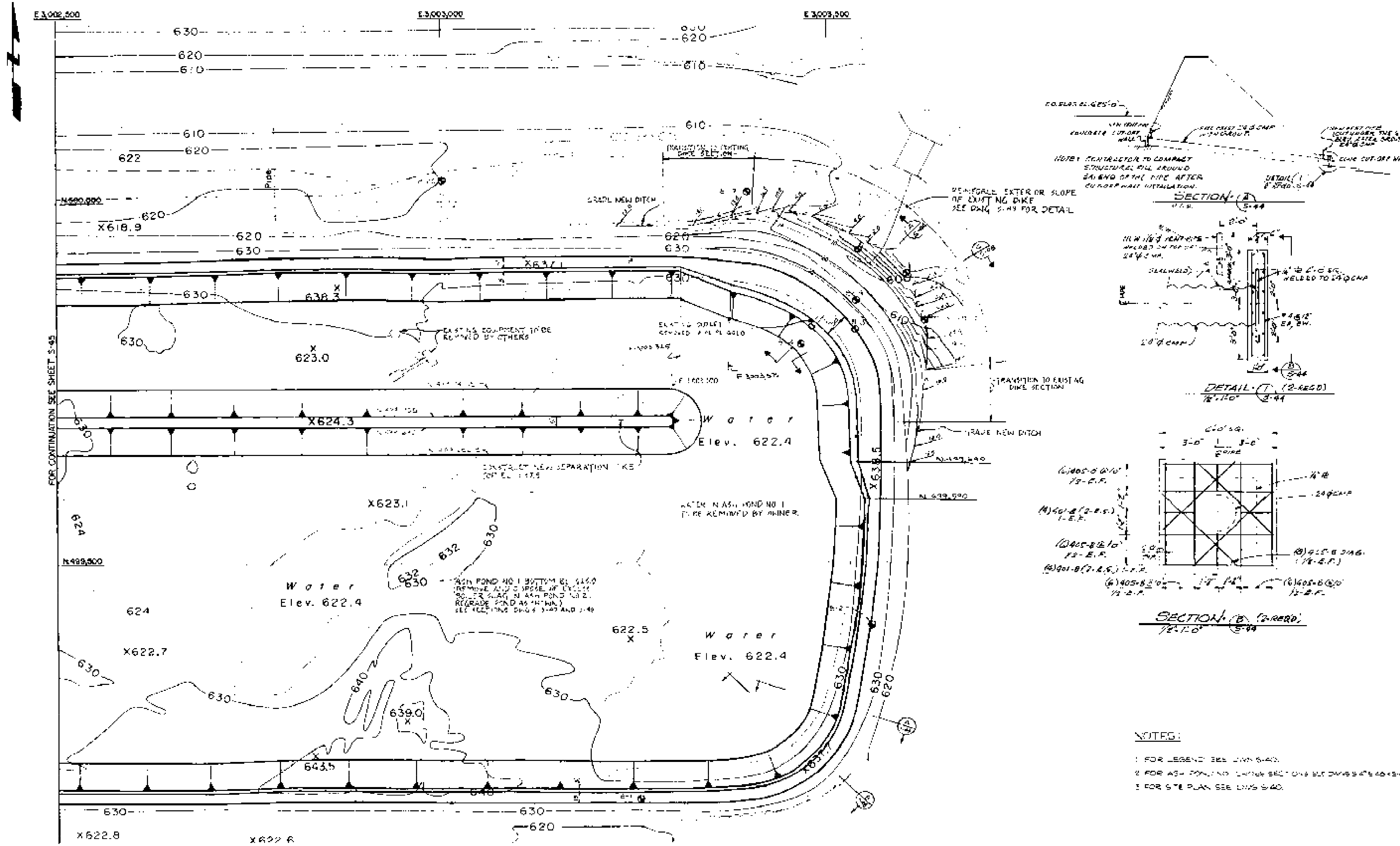
REVISIONS | REFERENCE DRAWINGS | PRINT RECORD | ENG. RECORD | DRAWING STATUS

CONCRETE
RECYCLE PUMP HOUSE INTAKE STRUCTURE
& MISCELLANEOUS FOUNDATIONS

WASTEWATER MANAGEMENT FACILITIES
CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
COFFEEN POWER STATION

Stearns-Roger

C 20062



NOTES:

1. FOR LEGEND SEE DWG S-40.
2. FOR ASH POND NO. 1 DIKE SECTIONS SEE DWGS S-47, S-48 & S-49.
3. FOR SITE PLAN SEE DWG S-40.

SCANNED BY S&L

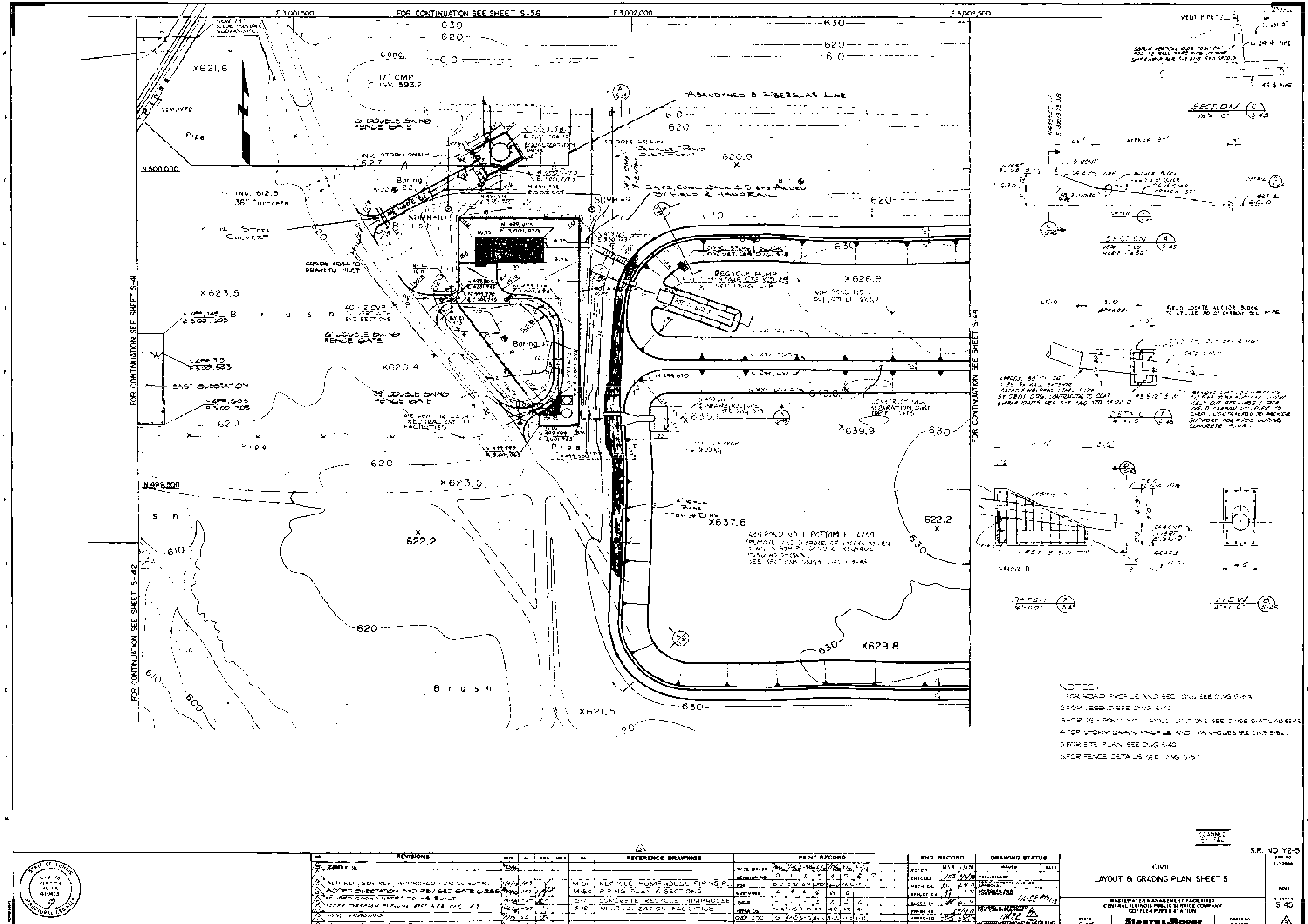
S.R. NO. Y2-4

CIVIL
LAYOUT & GRADING PLAN SHEET 4

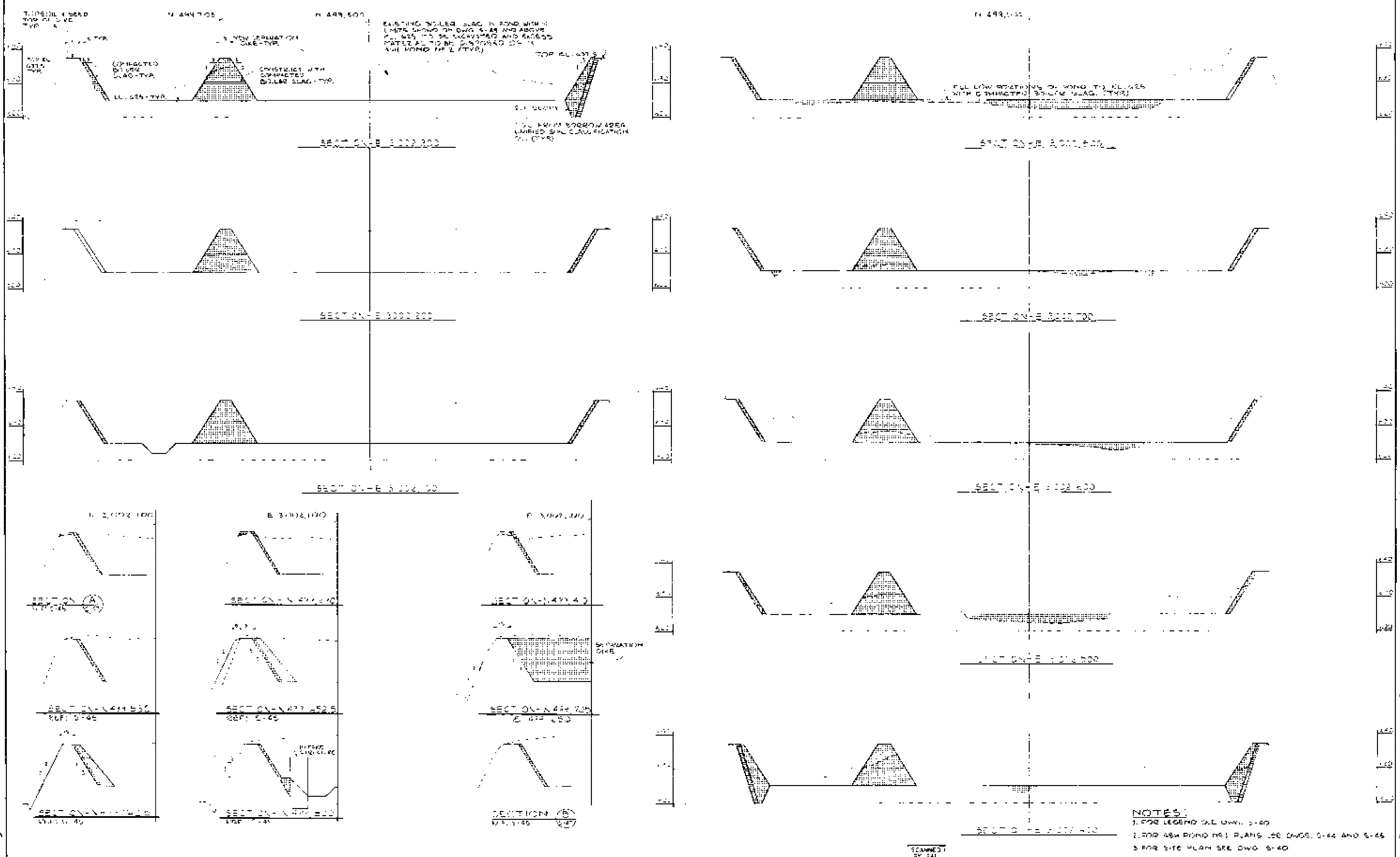
WASTEWATER MANAGEMENT FACILITIES
CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
COFFEEN POWER STATION

Stearns-Roger

S-44



FOR CONTINUATION SEE SHEET S-56
FOR CONTINUATION SEE SHEET S-41
FOR CONTINUATION SEE SHEET S-42
FOR CONTINUATION SEE SHEET S-44
E 3,001,500
E 3,002,000
E 3,002,500
N 500,000
N 499,500
X621.6
Conc.
17" CMP
INV. 593.2
INV. 612.5
36" Concrete
X623.5
X620.4
X623.5
622.2
X621.5
X620.9
X626.9
X639.3
X637.6
622.2
X629.8
Brush
Pipe
Boring 22
Boring 17
SDMH-10
SDMH-9
6' DOUBLE SWING FENCE GATE
24' DOUBLE SWING FENCE GATE
EAST SUBSTATION
ABANDONED & REMOVE LINE
STORM DRAIN
ASH POND NO. 1 BOTTOM EL. 624.0
SECTION C S-45
SECTION A S-45
DETAIL D S-45
DETAIL B S-45
VIEW S-45
NOTES:
FOR ROAD PROFILE AND SECTIONS SEE DWG S-13.
2. FOR LEGEND SEE DWG S-40
3. FOR ASH POND NO. 1 MODIFICATIONS SEE DWGS S-47, S-48 & S-49.
4. FOR STORM DRAIN PROFILE AND MANHOLES SEE DWG S-51.
5. FOR SITE PLAN SEE DWG S-40
6. FOR FENCE DETAILS SEE DWG S-51
S.R. NO Y2-5
REVISIONS
REFERENCE DRAWINGS
PRINT RECORD
ENG RECORD
DRAWING STATUS
CIVIL
LAYOUT & GRADING PLAN SHEET 5
WASTEWATER MANAGEMENT FACILITIES
CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
COFFEEN POWER STATION
Stearns-Roger
S-45



NOTES:

1. FOR LEGEND SEE DWG. S-40
2. FOR ASH POND NO 1 PLANS SEE DWGS. S-44 AND S-45
3. FOR SITE PLAN SEE DWG. S-40

SR NO Y2-7

REVISIONS: APPROVED FOR CONSTRUCTION

REFERENCE DRAWINGS | PRINT RECORD | ENG RECORD | DRAWING STATUS

CIVIL
MISCELLANEOUS SECTIONS AND DETAILS
SHEET 2

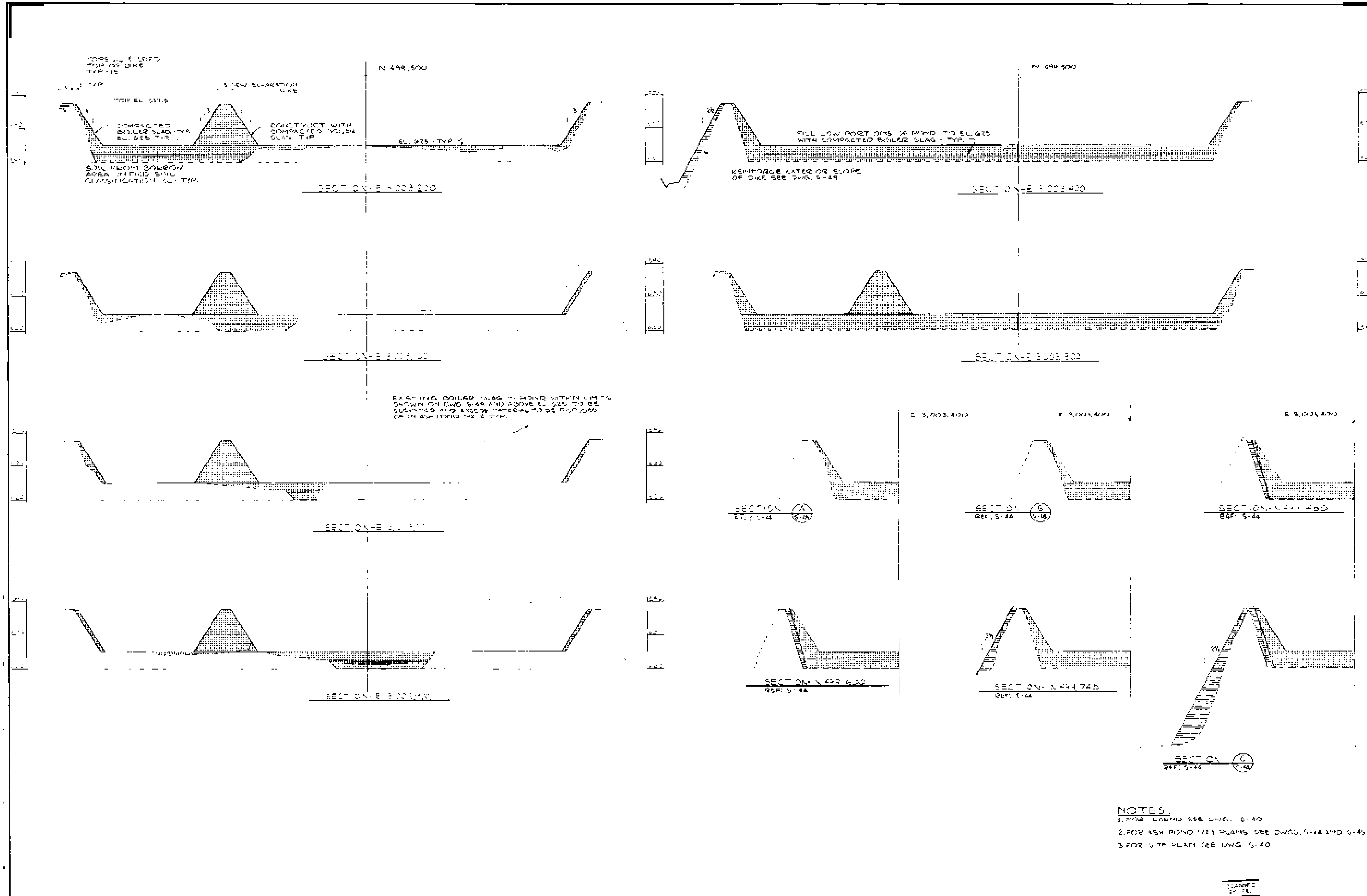
WASTEWATER MANAGEMENT FACILITIES
CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
COFFEEN POWER STATION

SCALE: HORIZ 1"=50' VERT 1"=10'

Stearns-Roger

D-23000

S-47



NOTES.
1. FOR LEGEND SEE DWG. S-40
2. FOR ASH POND NO 1 PLANS SEE DWGS. S-44 AND S-45
3. FOR SITE PLAN SEE DWG S-40

SR NO Y2-8

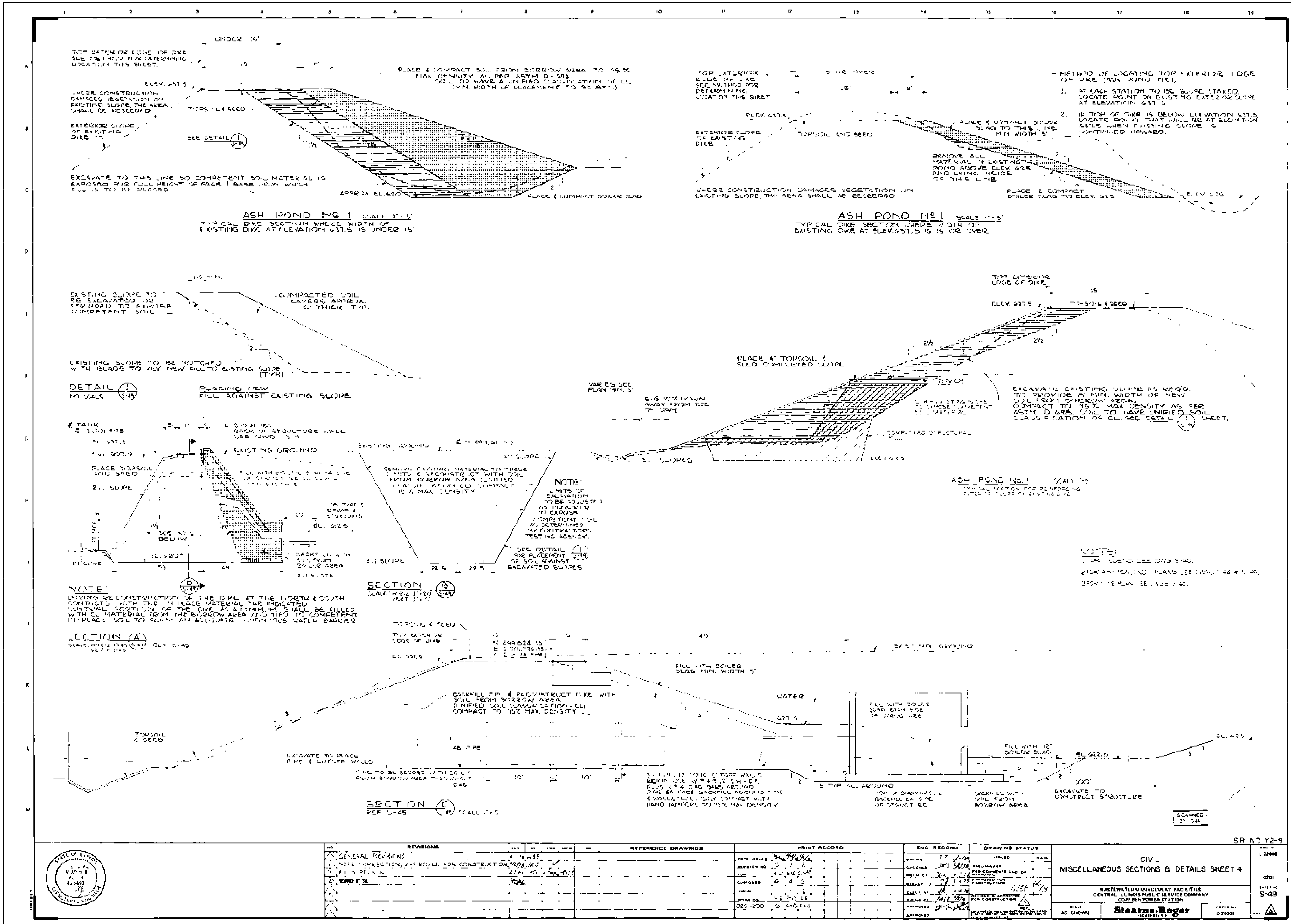
CIVIL
ASH POND NO 1 SECTIONS AND DETAILS

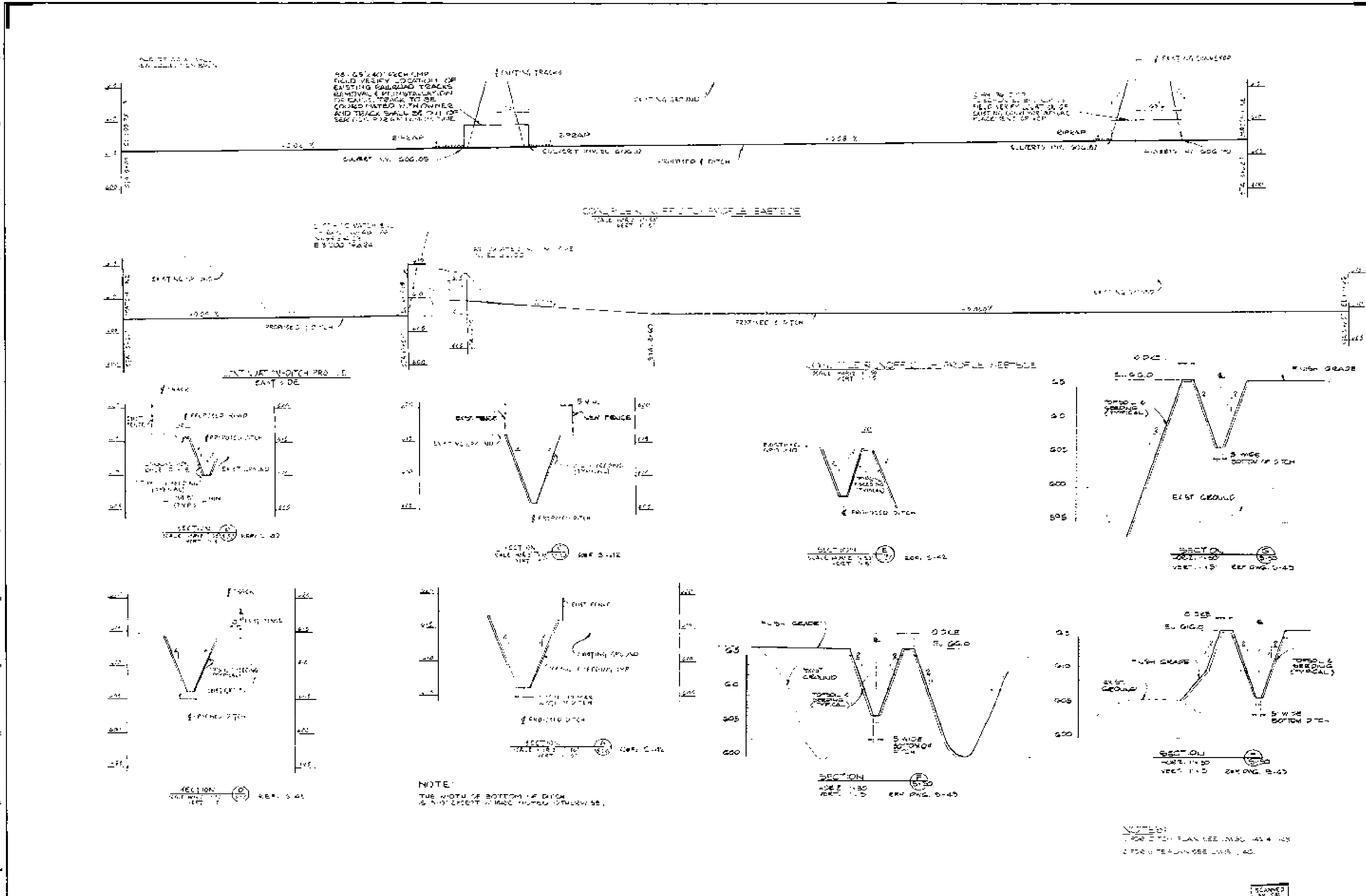
WASTEWATER MANAGEMENT FACILITIES
CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
COFFEEN POWER STATION

HORIZ 1"=50'
VERT 1"=10'

Stearns-Roger

S-48


ASH POND No. 1
TYPICAL DIKE SECTION WHERE WIDTH OF EXISTING DIKE AT ELEVATION 637.5 IS UNDER 15'
ASH POND No. 1
TYPICAL DIKE SECTION WHERE WIDTH OF EXISTING DIKE AT ELEVATION 637.5 IS 15' OR OVER
DETAIL
PLACING NEW FILL AGAINST EXISTING SLOPE
SECTION (A)
SECTION (B)
SECTION (C)
ASH POND No. 1
NOTE:
NOTES:
SR NO Y2-9
SCANNED
CIVIL
MISCELLANEOUS SECTIONS & DETAILS SHEET 4
WASTEWATER MANAGEMENT FACILITIES
CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
COFFEEN POWER STATION
AS SHOWN
Stearns-Roger
S-49



SCANNED BY SGL

S.R. NO. Y2-10

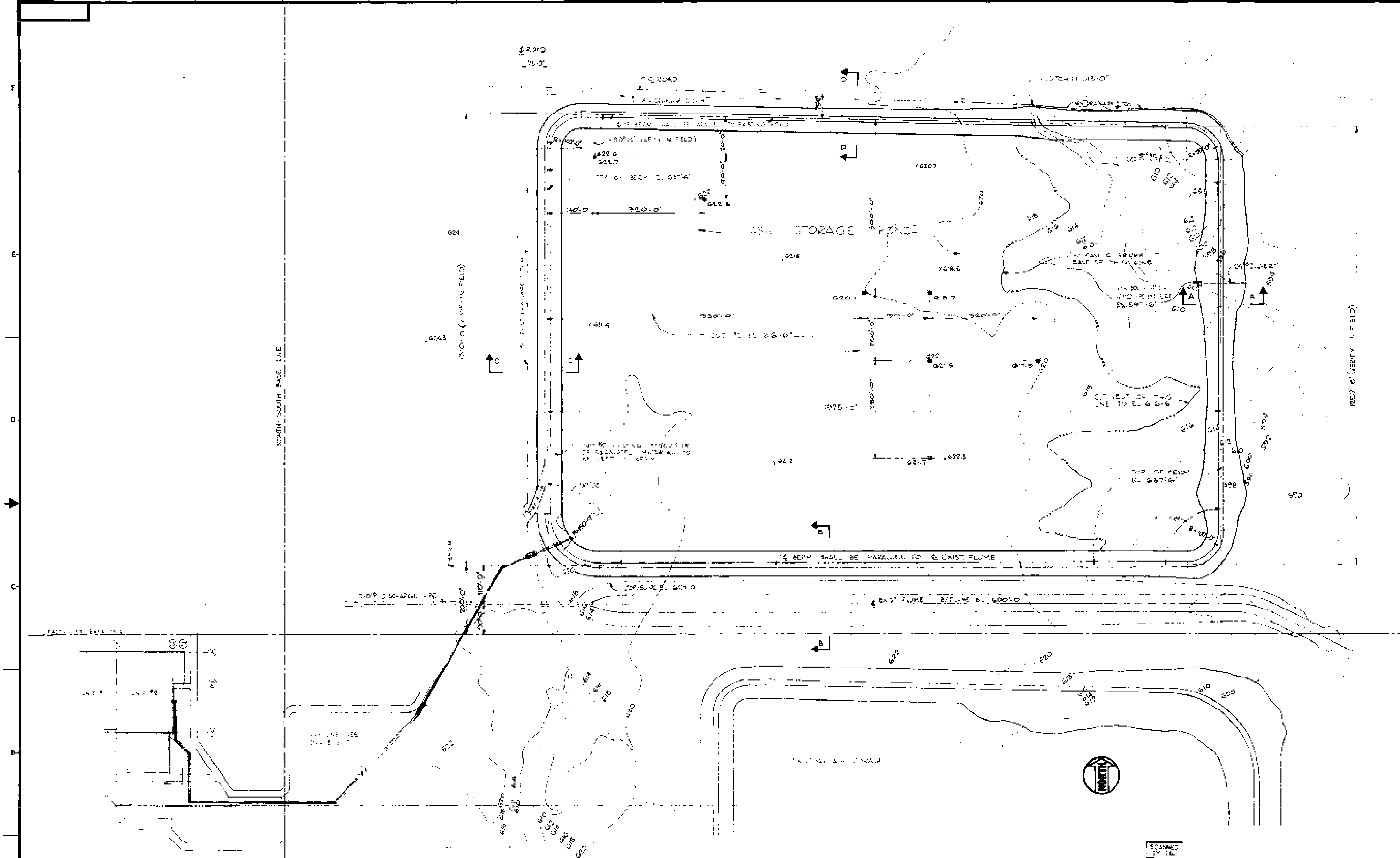
CIVIL
MISCELLANEOUS SECTIONS & DETAILS SHEET

WASTEWATER MANAGEMENT FACILITIES
CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
COFFEEN POWER STATION

SCALE: AS SHOWN

Stearns-Roger

S-50



NOTES

REFERENCE DRAWINGS

ASH STORAGE AREA

PLAN — UNIT 2

COFFEEN POWER STATION — UNIT 2

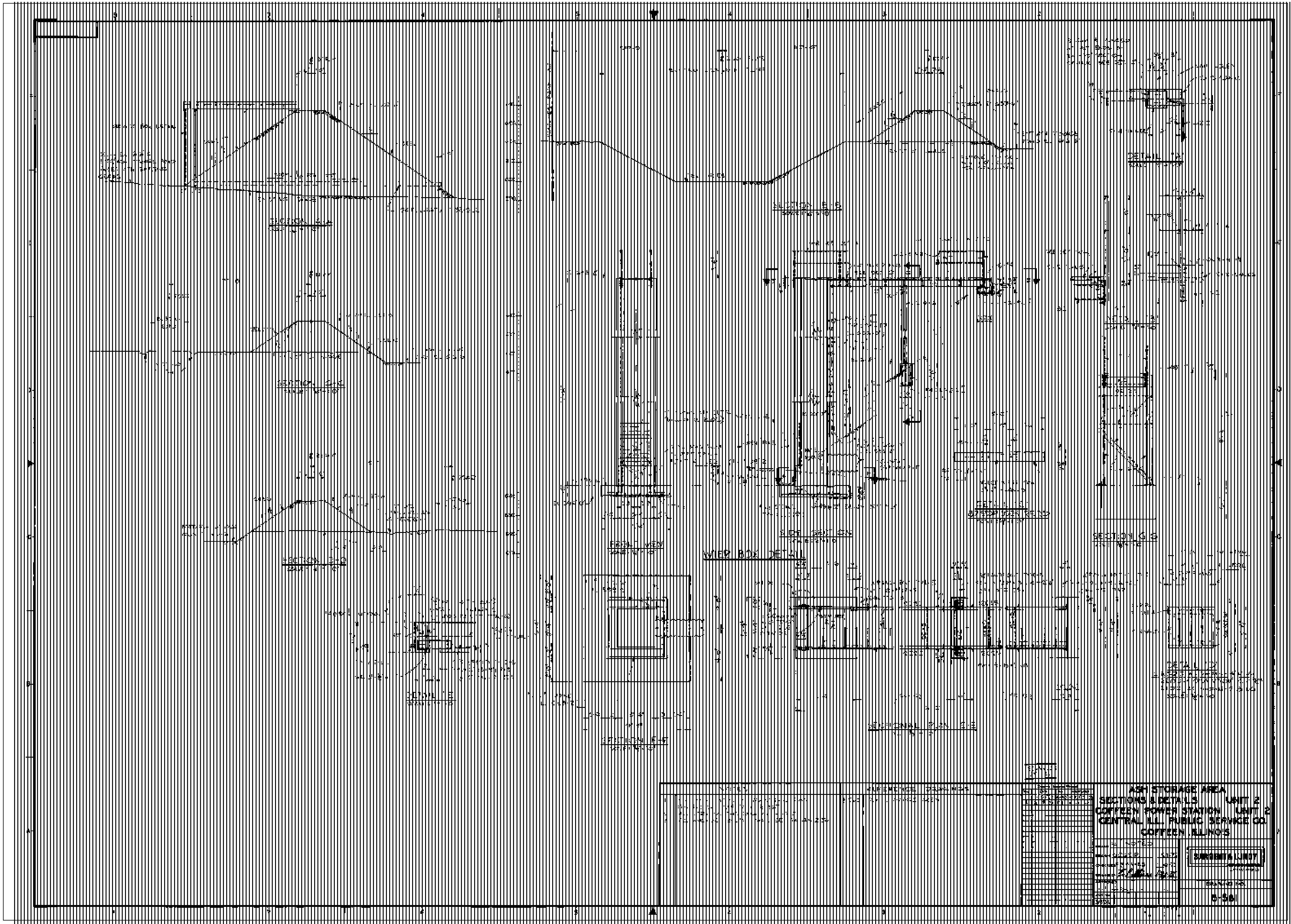
CENTRAL ILL. PUBLIC SERVICE CO.

COFFEEN, ILLINOIS

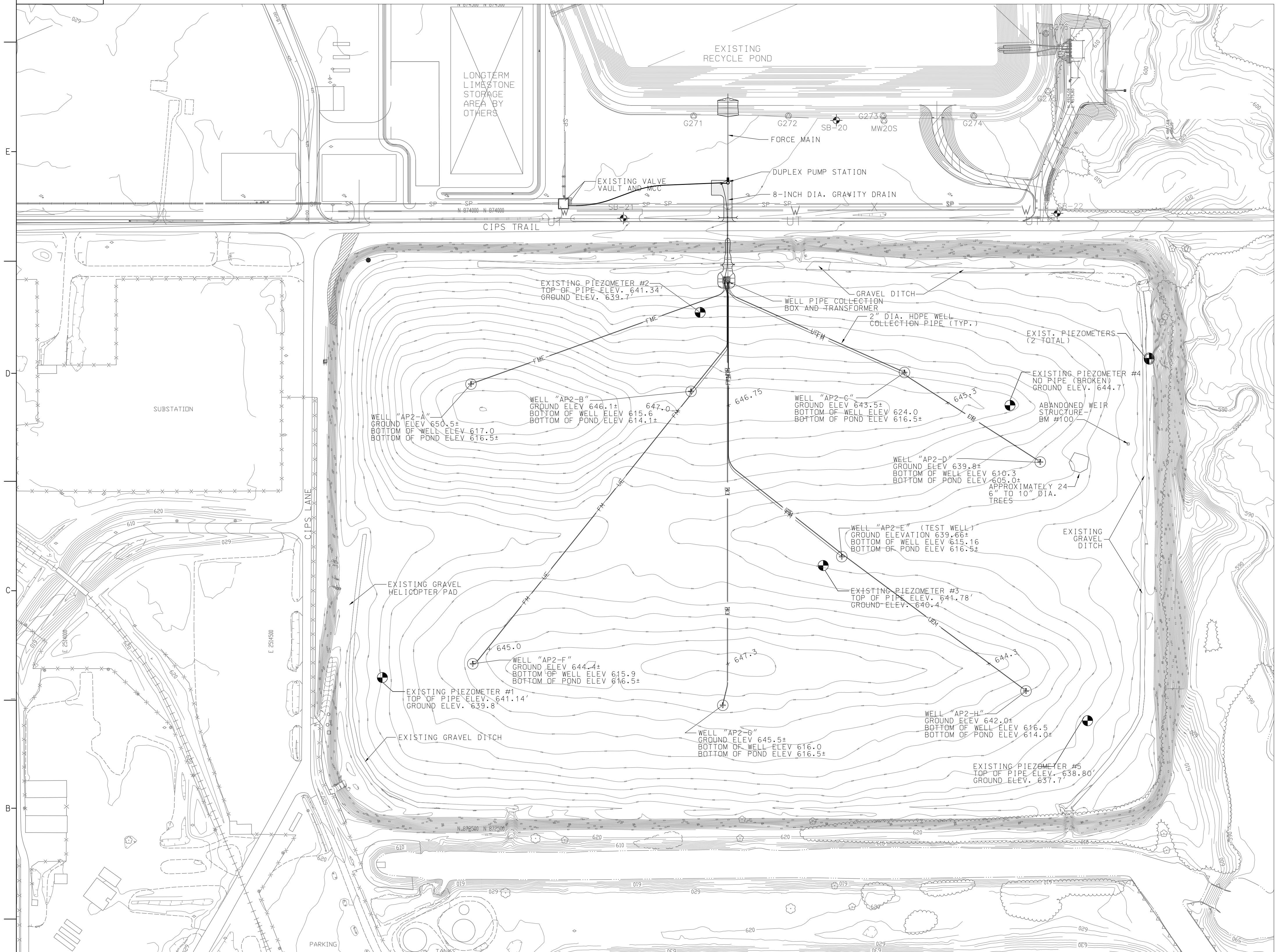
SCALE 1" = 100'-0"

SARGENT & LUNDY

DRAWING NO. B-560



SECTION A-A
SECTION B-B
SECTION C-C
SECTION D-D
DETAIL
FRONT VIEW
WIER BOX DETAIL
SIDE SECTION
SECTION G-G
SECTIONAL PLAN
ASH STORAGE AREA
SECTIONS & DETAILS UNIT 2
COFFEEN POWER STATION UNIT 2
CENTRAL ILL. PUBLIC SERVICE CO.
COFFEEN, ILLINOIS
SARGENT & LUNDY
DRAWING NO.
B-561



NOTES:

1. THE LOCATION, SIZE AND/OR TYPE OF MATERIAL OF EXISTING UNDERGROUND OR OVERHEAD UTILITIES AS MAY BE INDICATED ON THESE CONSTRUCTION PLANS IS NOT REPRESENTED AS BEING ACCURATE, SUFFICIENT OR COMPLETE. THE OWNER AND THE PROJECT ENGINEER HAVE NOT INDEPENDENTLY VERIFIED THIS INFORMATION AND DO NOT ASSUME ANY RESPONSIBILITY WHATSOEVER IN RESPECT TO THE ACCURACY, SUFFICIENCY OR COMPLETENESS OF THE INFORMATION AND GIVE NO EXPRESSED OR IMPLIED GUARANTEE THAT ANY CONDITIONS INDICATED ARE REPRESENTATIVE OF ACTUAL CONDITIONS TO BE ENCOUNTERED.

2. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE ACTUAL LOCATION OF ALL SUCH FACILITIES, INCLUDING SERVICE CONNECTIONS TO UNDERGROUND UTILITIES. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL NOTIFY ALL UTILITY COMPANIES AND AGENCIES OF HIS CONSTRUCTION PLANS AND SHALL OBTAIN FROM EACH PARTY DETAILED INFORMATION AND ASSISTANCE RELATIVE TO THE LOCATION OF ALL UTILITIES AND THE SCHEDULE OF ANY REMOVALS AND ADJUSTMENTS REQUIRED OF THE UTILITY. THE CONTRACTOR SHALL CONTACT J.U.L.I.E. (1-800-892-0123 OR 811) TO ASSIST IN COMPLETING THIS RESPONSIBILITY.

3. THE CONTRACTOR SHALL PROTECT ANY FACILITIES TO THE SATISFACTION OF THE UTILITY OR OWNING-AGENCY WITH THE COST OF ANY REQUIRED PROTECTION TO BE INCIDENTAL TO THE CONTRACT. IN THE EVENT A UTILITY LINE OR SERVICE IS UNEXPECTEDLY ENCOUNTERED DURING CONSTRUCTION, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE OWNER AND THE UTILITY COMPANY OR AGENCY OF JURISDICTION. ANY SUCH UTILITIES DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED TO SERVICE AT ONCE.

LEGEND

- ELECTRICAL SPLICE BOX
- TELEPHONE SPLICE BOX
- GUARDPOST
- EXISTING FENCE
- TREE AREA
- GRAVEL EDGE
- PAVED OUTLET EDGE
- FM — FORCE MAIN
- SS — SANITARY SEWER
- UE — UNDERGROUND ELECTRIC
- GRAVEL SURFACING
- PIEZOMETER
- IRON PIN

N

100' 50' 0 50' 100'
SCALE IN FEET

COORDINATE TABLE

STATE PLANE COORDINATES				DESCRIPTION	PLANT COORDINATES		
POINT	NORTH	EAST	ELEV.		NORTH	EAST	ELEV.
100	873,444.5	2,516,566.2	636.78'	BENCHMK: CHISELED "□" IN N.E. COR. OF WEIR BOX	3610.958	1357.406	616.31'
1	872,940.7900	2,513,222.5010	615.74'	CONTROL PT #1 BRASS MONUMENT NEAR N.W. ENTRANCE	3610.440	2430.490	623.44'
2	872,942.4450	2,514,295.5440	622.92'	CONTROL PT #2 BRASS MONUMENT NEAR EAST PKG AREA	4561.951	2430.945	N/A
3	873,893.9360	2,514,294.3340	624.63'	CONTROL PT #3 BRASS MONUMENT NEAR MAIN ENTRANCE			
5001	873,587.59	2,514,969.63	.	WELL AP2-A			
5002	873,569.87	2,515,503.76	.	WELL AP2-B			
5003	873,615.67	2,516,021.68	.	WELL AP2-C			
5004	873,398.41	2,516,351.29	.	WELL AP2-D			
5005	873,168.81	2,515,869.61	.	WELL AP2-E			
5006	872,908.89	2,514,973.83	.	WELL AP2-F			
5007	872,808.37	2,515,580.73	.	WELL AP2-G			
5008	872,842.91	2,516,316.70	.	WELL AP2-H			

NOTES	REFERENCE DRAWINGS	REV.	DATE	PROJECT NO.	AMEREN SUPV ENGR	DRAFTING DRFTR	DRAFTING CHK'D	DRAFTING SUPV	ENGR APPROVAL AMEREN	ENGR APPROVAL OTHER	DESCRIPTION
		A	10-12-09	W1314	SDB	MJW	SDB	SDB	MJW	—	—

NOTICE OF LIMITED RESPONSIBILITY

THE RESPONSIBILITY OF THE UNDERSIGNED ENGINEER IS LIMITED TO THE DESIGN WORK SHOWN ON PROJECT DRAWINGS AND DOCUMENTS BEARING HIS/HER SEAL, SIGNATURE OR INITIALS. HE/SHE DOES NOT HAVE AUTHORITY OVER THE PROJECT AS A WHOLE. THE UNDERSIGNED DISCLAIMS ANY RESPONSIBILITY FOR WORK DONE UNDER SUBSEQUENT REVISIONS AND ANY OTHER DOCUMENTS ASSOCIATED WITH THE PROJECT WHICH DO NOT BEAR HIS/HER SEAL, SIGNATURE OR INITIALS.

AS BUILT

SCALE —
LOC. NO. —
CLASS —

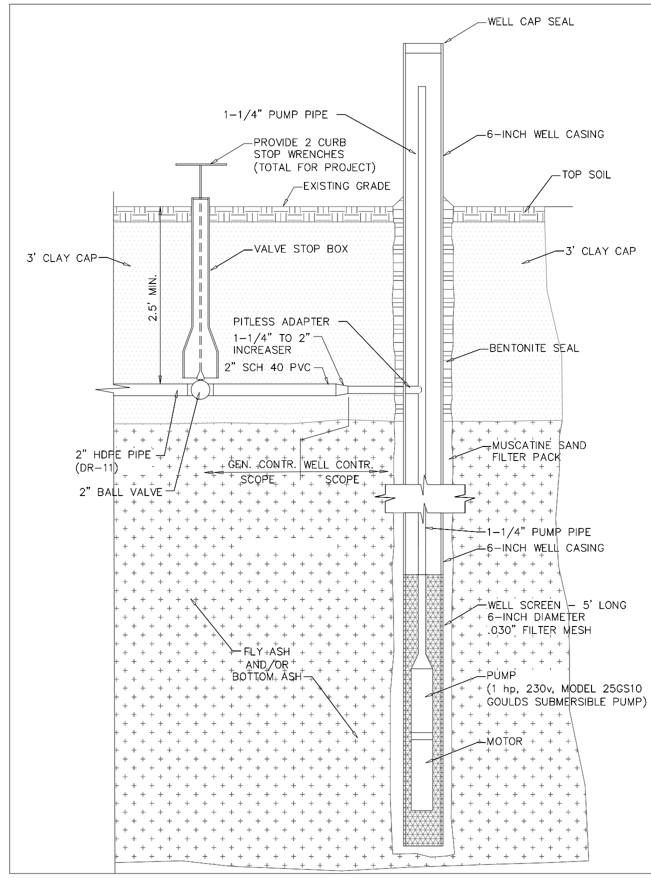
OVERALL SITE PLAN
DEWATERING SYSTEM
ASH POND #2
AMEREN COFFEEN POWER STATION

SITE: ASH POND #2

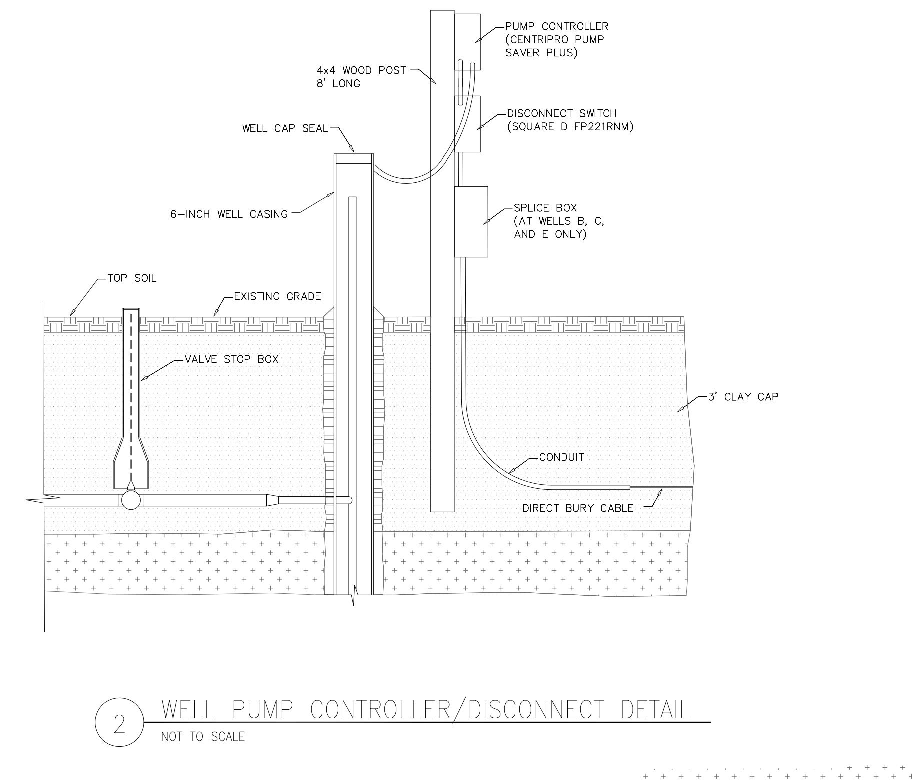
Ameren Energy Resources Generating

DRAWING NO. A1000 REV. 0

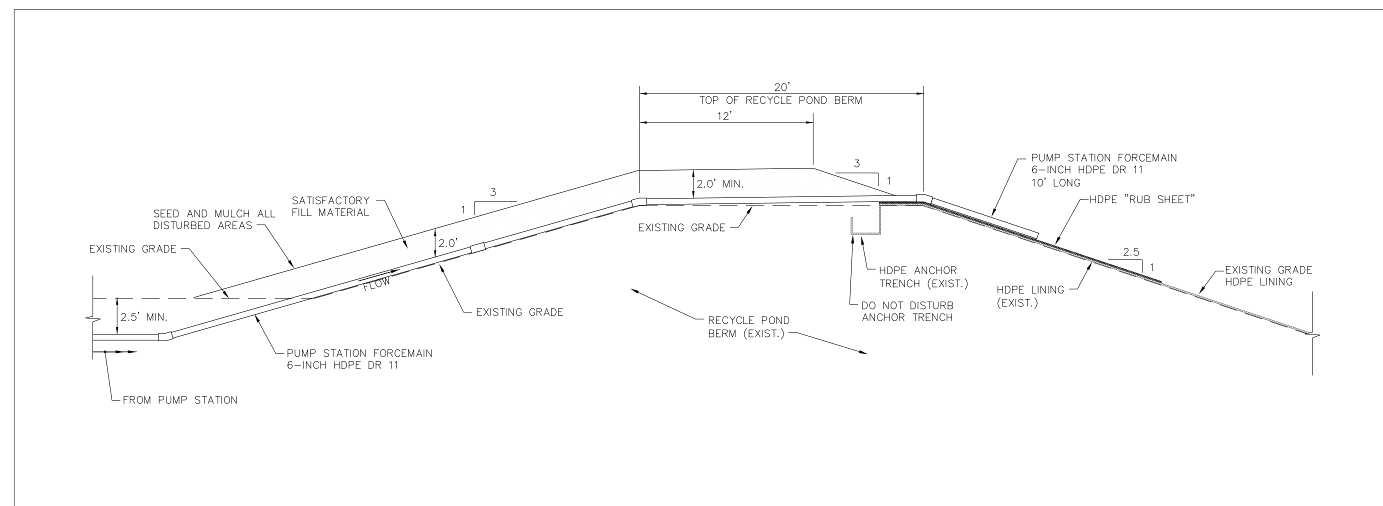
SHEET NO. 1 OF 5



1 WELL PUMP PIPING DETAIL
NOT TO SCALE



2 WELL PUMP CONTROLLER/DISCONNECT DETAIL
NOT TO SCALE



3 FORCE MAIN OUTLET DETAIL
NOT TO SCALE

N

10' 5' 0 5' 10'
SCALE IN FEET

NOTICE OF LIMITED RESPONSIBILITY

THE RESPONSIBILITY OF THE UNDERSIGNED ENGINEER IS LIMITED TO THE DESIGN WORK SHOWN ON PROJECT DRAWINGS AND DOCUMENTS BEARING HIS/HER SEAL, SIGNATURE OR INITIALS. HE/SHE DOES NOT HAVE AUTHORITY OVER THE PROJECT AS A WHOLE. THE UNDERSIGNED DISCLAIMS ANY RESPONSIBILITY FOR WORK DONE UNDER SUBSEQUENT REVISIONS AND ANY OTHER DOCUMENTS ASSOCIATED WITH THE PROJECT WHICH DO NOT BEAR HIS/HER SEAL, SIGNATURE OR INITIALS.

AS BUILT

NOTES

REFERENCE DRAWINGS

DRAWING RECORD

REV.	DATE	PROJECT NO.	AMEREN SUPV ENGR	DRAFTING DRFTR	DRAFTING CHK'D	DRAFTING SUPV	ENGR APPROVAL AMEREN	ENGR APPROVAL OTHER	DESCRIPTION
A	10-12-09	W1314	SDB	MJW	SDB	SDB	MJW	–	-

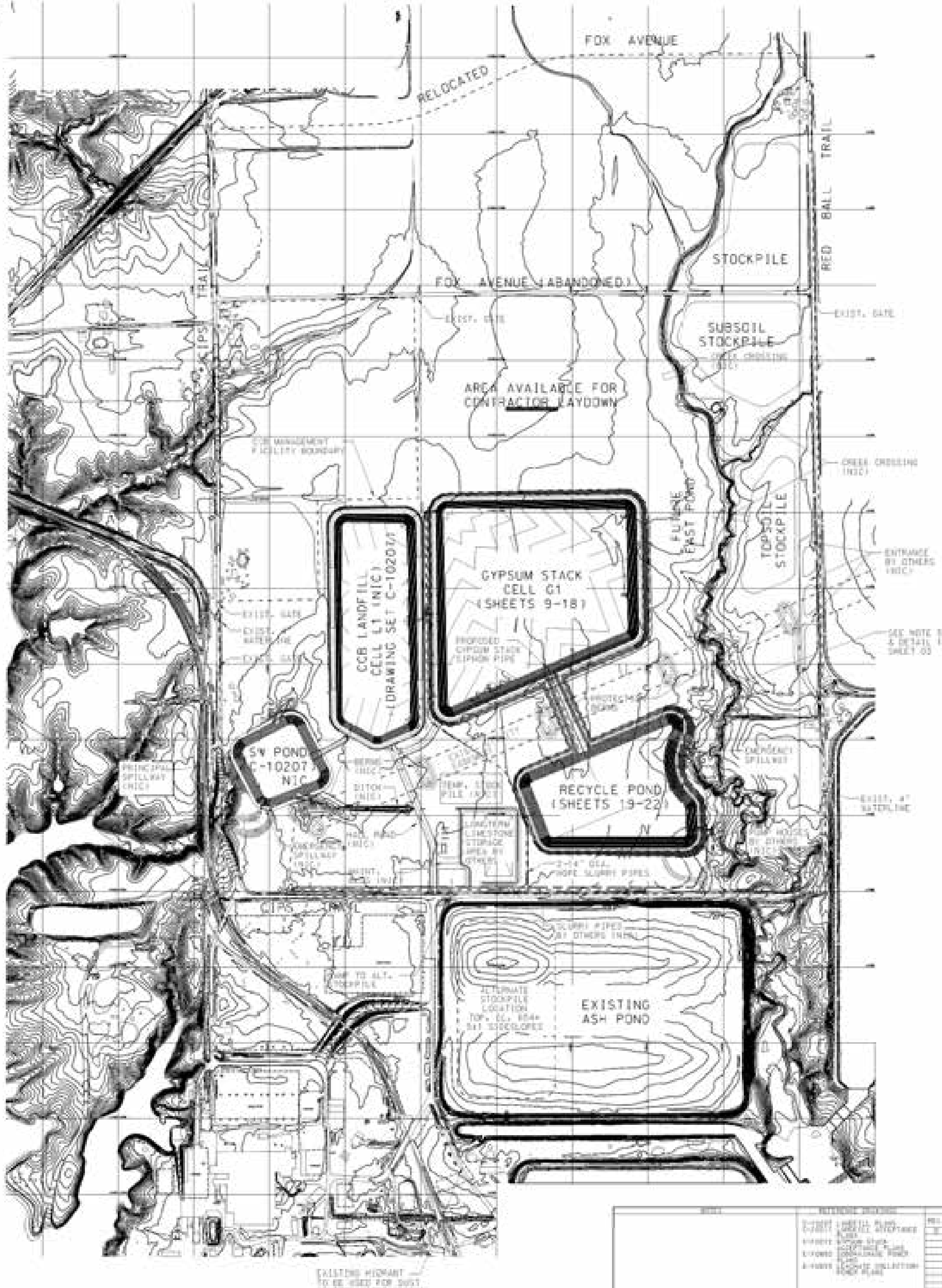
SCALE –
LOC. NO. –
CLASS –

SITE DETAILS
DEWATERING SYSTEM
ASH POND #2
AMEREN COFFEEN POWER STATION

SITE: ASH POND #2

Ameren Energy Resources Generating

DRAWING NO. A1000
REV. 0
SHEET NO. 4 OF 5



STANDARD LEGEND

(ALL SYMBOLS MAY NOT BE USED ON EACH PLAN)

- 650 ORIGINAL CONTOURS
- FENCELINE
- TRANSMISSION TOWERS
- OVERHEAD ELECTRIC
- WATER MAIN
- TELEPHONE LINE
- LIMITS OF VEGETATION
- GRAVEL ROAD
- RAILROAD
- CP-1000 CONTROL POINT - HORIZ. & VERT.
- A — A' GEOLOGICAL CROSS SECTION LINE
- 650 LANDFILL CONTOURS
- SB-55 BORING
- GXXX PREVIOUSLY INSTALLED GROUNDWATER MONITORING WELL
- GXXX GROUNDWATER MONITORING WELL
- MW135 WELLS - NOT PART OF MONITORING PLAN

NOTES:

1. SEE NOTES ON SHEET 2 REGARDING THE RESPONSIBILITY FOR EXISTING UTILITIES.
2. (NIC) INDICATES SITE FEATURES WHICH ARE NOT PART OF THIS CONTRACT. THEY ARE SHOWN FOR INFORMATIONAL PURPOSES ONLY.
3. HORIZONTAL AND VERTICAL CONTROL ARE BASED ON NAD 83, ILLINOIS STATE PLANE COORDINATE SYSTEM WEST ZONE, NAVD 88, US SURVEY FEET AND THE FOLLOWING PROJECT CONTROL POINTS WERE ESTABLISHED BY HANSON PROFESSIONAL SERVICES:

HORIZONTAL CONTROL

POINT	NORTHING	EASTING	ELEV.	DESCRIPTION
CP-1000	873598.37	2515534.11	620.81	#8 REBAR IN 8" DIA. CONCRETE MONUMENT
CP-1001	873965.17	2513180.44	621.96	#8 REBAR IN 8" DIA. CONCRETE MONUMENT
CP-1002	877937.14	2514559.34	623.15	#8 REBAR IN 8" DIA. CONCRETE MONUMENT
CP-1003	877949.62	2514685.49	622.10	#8 REBAR IN 8" DIA. CONCRETE MONUMENT

0' 300' 600'

SCALE: 1" = 300'

PROPOSED SITE PLAN

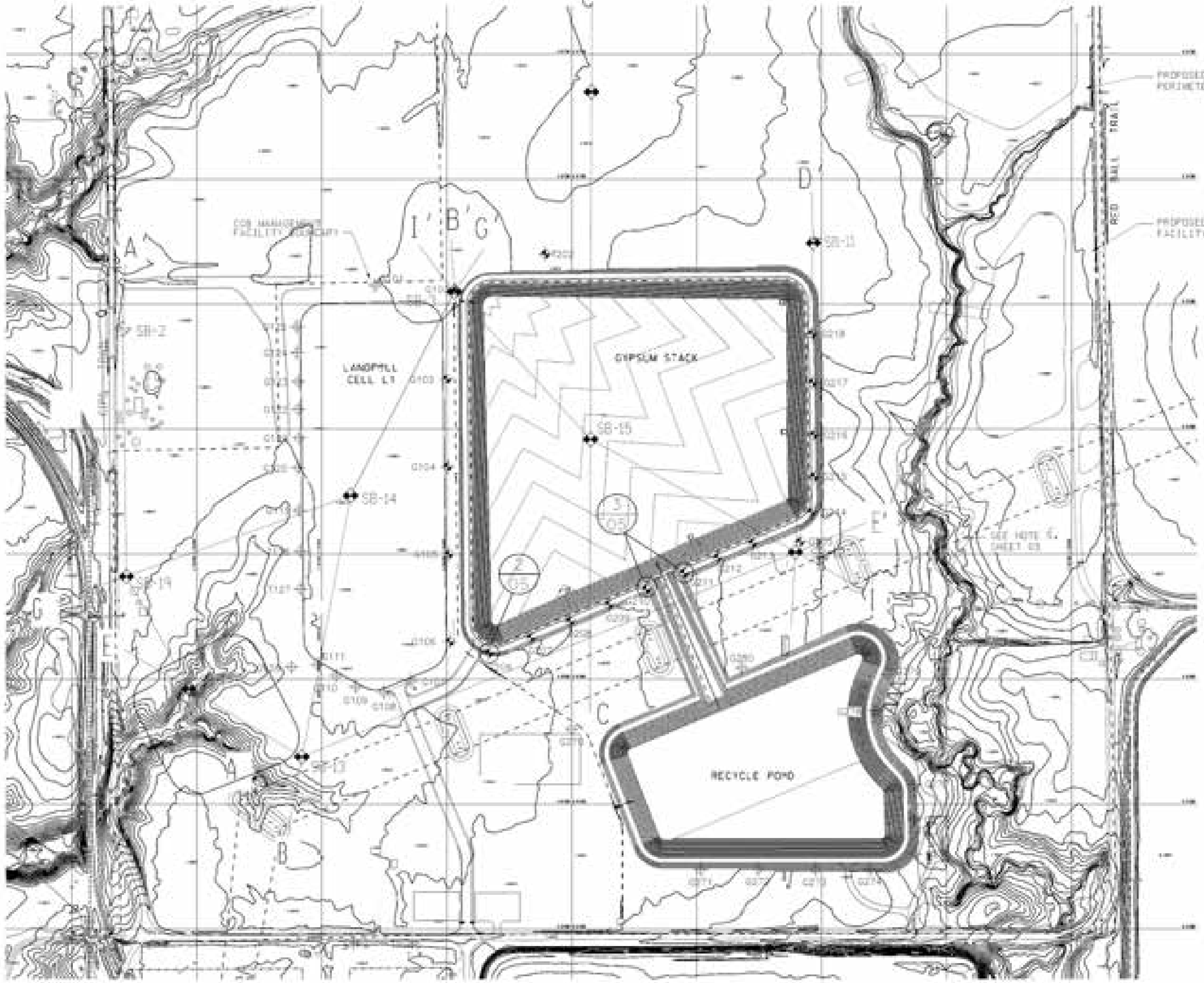
CCB MANAGEMENT FACILITY

COFFEEN

Ameren Energy Generating

DRAWING NO. C-10206 REV. 0

SHEET NO. 04



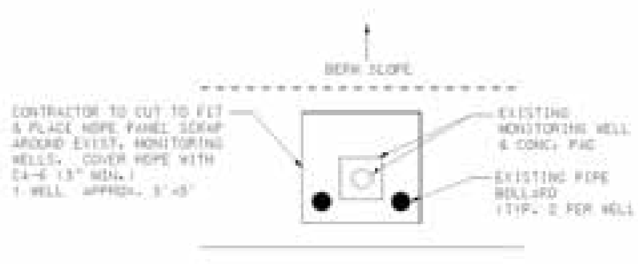
STANDARD LEGEND

(ALL SYMBOLS MAY NOT BE USED ON EACH PLAN)

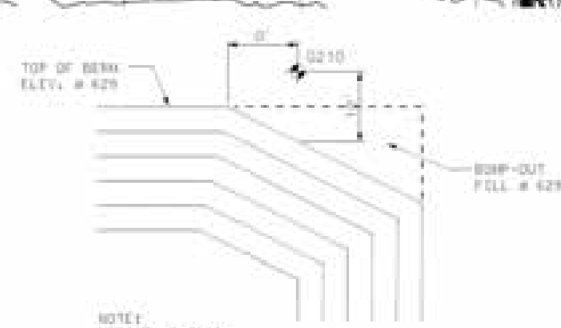
- ORIGINAL CONTOURS
- FENCELINE
- TRANSMISSION TOWERS
- OVERHEAD ELECTRIC
- WATER MAIN
- TELEPHONE LINE
- LIMITS OF VEGETATION
- GRAVEL ROAD
- RAILROAD
- CP-1000 CONTROL POINT - HORIZ. & VERT.
- A — A' GEOLOGICAL CROSS SECTION LINE
- LANDFILL CONTOURS
- SB-55 BORING
- GXXX GYPSUM STACK GROUNDWATER MONITORING WELL
- GXXX OTHER MONITORING WELL

NOTES:

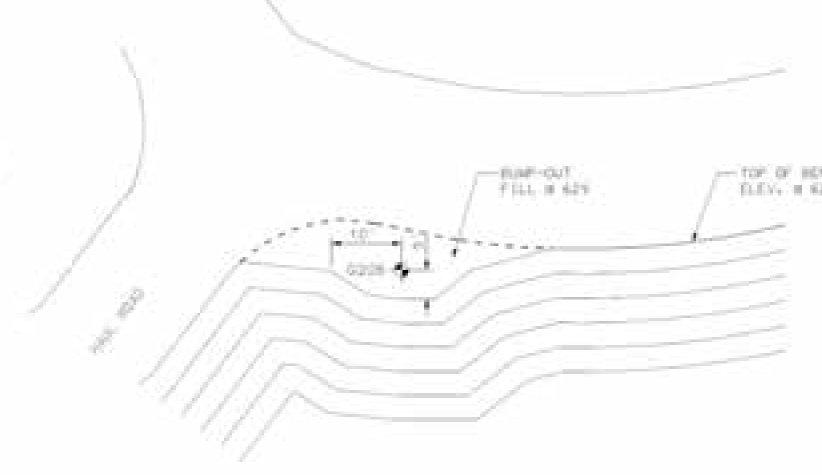
1. CONTOURS SHOWN IN GYPSUM STACK ARE TOP OF CLAY LINER. (NOTE: THE UPPER PORTION OF THE PROCESS WATER RECOVERY SYSTEM LINER WAS ELIMINATED AS PART OF THE CLEAN CLOSURE REVISION)
2. THE PROPERTY IS LOCATED IN SECTIONS 10 & 11, TOWNSHIP 7 NORTH, RANGE 3 WEST, 3RD P.M., MONTGOMERY COUNTY, ILLINOIS
3. THE DESIGN ELEMENTS INCLUDED IN THESE DRAWINGS WERE BASED UPON EXISTING AERIAL MAPPING AS OBTAINED FROM AMEREN.
4. ALL DISTURBED AREAS, INCLUDING THE CREST AND EXTERIOR FACE OF BOTH DAMS WILL BE SEEDED AND MULCHED WITH IDOT CLASS 1A SEED MIXTURE.
5. FILL MATERIAL FOR DAM EMBANKMENT WILL BE PLACED IN MAXIMUM UNCOMPACTED LIFTS OF 8-INCHES AND COMPACTED TO 95% OF THE STANDARD PROCTOR DENSITY.
6. SURFICIAL CONTOURS WERE DEVELOPED USING AERIAL PHOTOGRAMMETRIC METHODS WITH PHOTOGRAPHS TAKEN BY SURDEX.
7. CURRENT SURFACE TOPOGRAPHY MAY DIFFER FROM THAT SHOWN DUE TO ON GOING OPERATIONS AT THE SITE.
8. FOR CLARITY, NOT ALL EXISTING SITE FEATURES ARE SHOWN ON THIS DRAWING.



1/05 WEED CONTROL AT EXIST. SINGLE MONITORING WELLS



3/05 MONITORING WELL BUMP-OUT NEAR TRANSFER CHANNEL



2/05 MONITORING WELL BUMP-OUT AT HAUL ROAD

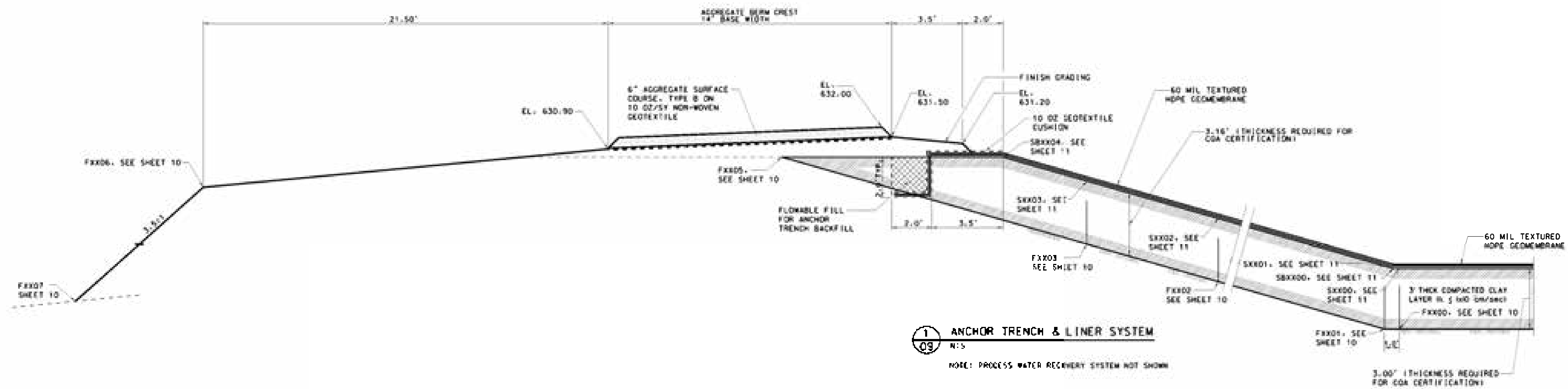
SCALE: 1" = 200'

GROUNDWATER MONITORING & BORING PLAN

CCR MANAGEMENT FACILITY

Ameren Energy Generating

C-10206 REV. 0



1 / 09 ANCHOR TRENCH & LINER SYSTEM

N.T.S

NOTE: PROCESS WATER RECOVERY SYSTEM NOT SHOWN

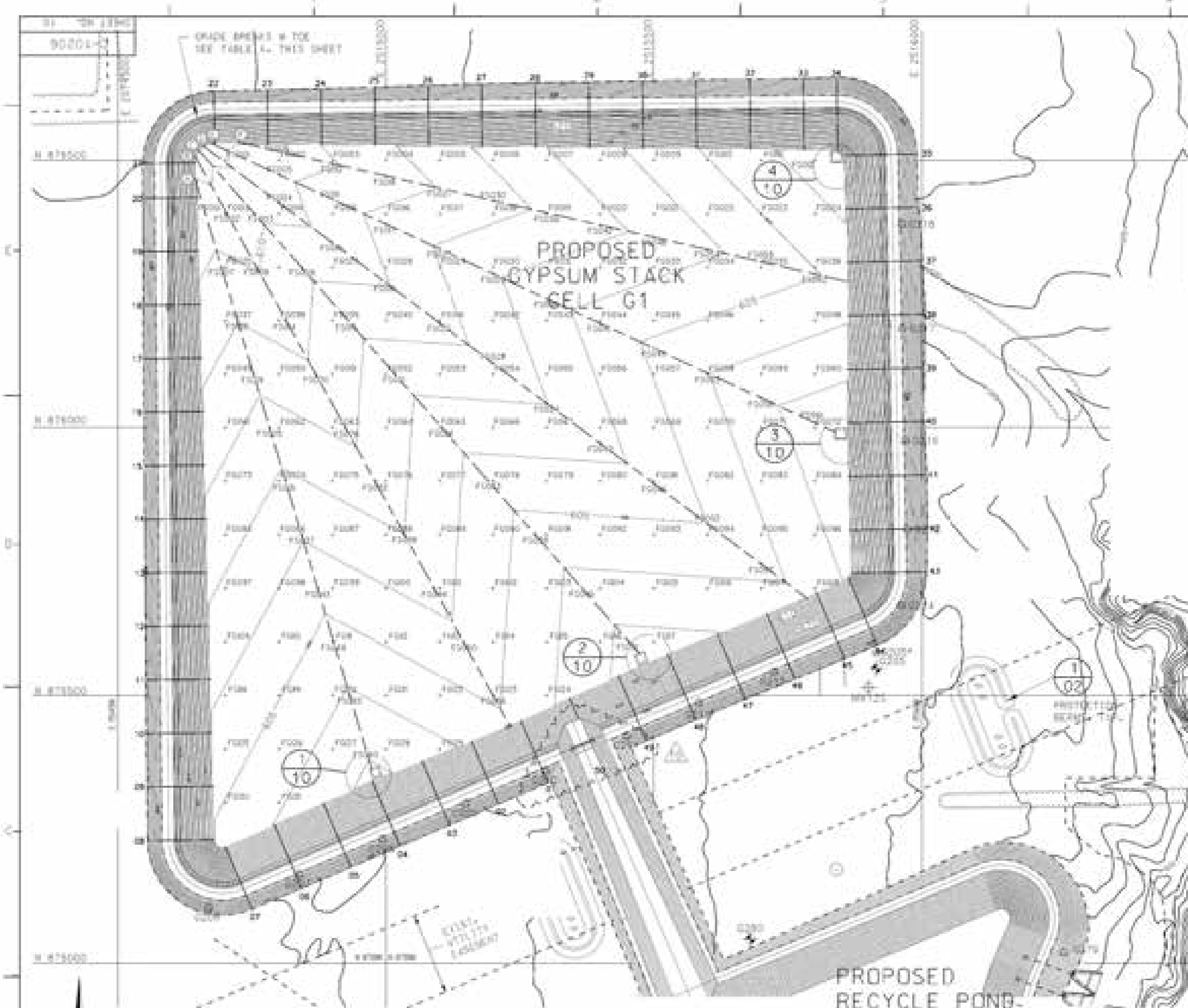
ANCHOR TRENCH AND LINER SYSTEM

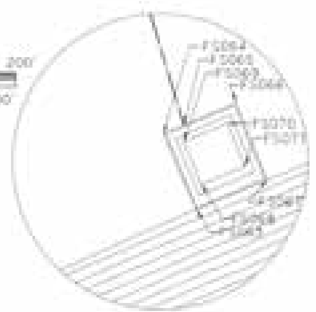
CCR MANAGEMENT FACILITY

Ameren Energy Generating

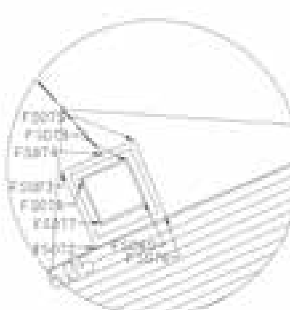
C-10206

0

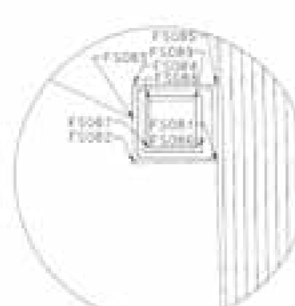




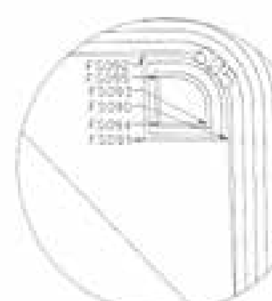
(1/10) SUMP DETAIL



(2/10) SUMP DETAIL



(3/10) SUMP DETAIL



(4/10) SUMP DETAIL

NOTE: SEE OTHER PLAN SHEETS FOR LEGEND

TYPICAL POINT NUMBER LOCATION

FB 00
- GRID POINT NUMBER
- FOUNDATION GRADE (BREAK POINT)

FS 00
- GRID POINT NUMBER
- FOUNDATION GRADE (SUMP GRADING)

FG 00
- GRID POINT NUMBER
- FOUNDATION GRADE

F 00 00
- POINT NUMBER (SEE POINT NUMBERING DETAIL)
- CONTROL LINE NUMBER
- FOUNDATION GRADE

CELL G1-FOUNDATION GRADE & CONTROL DATA

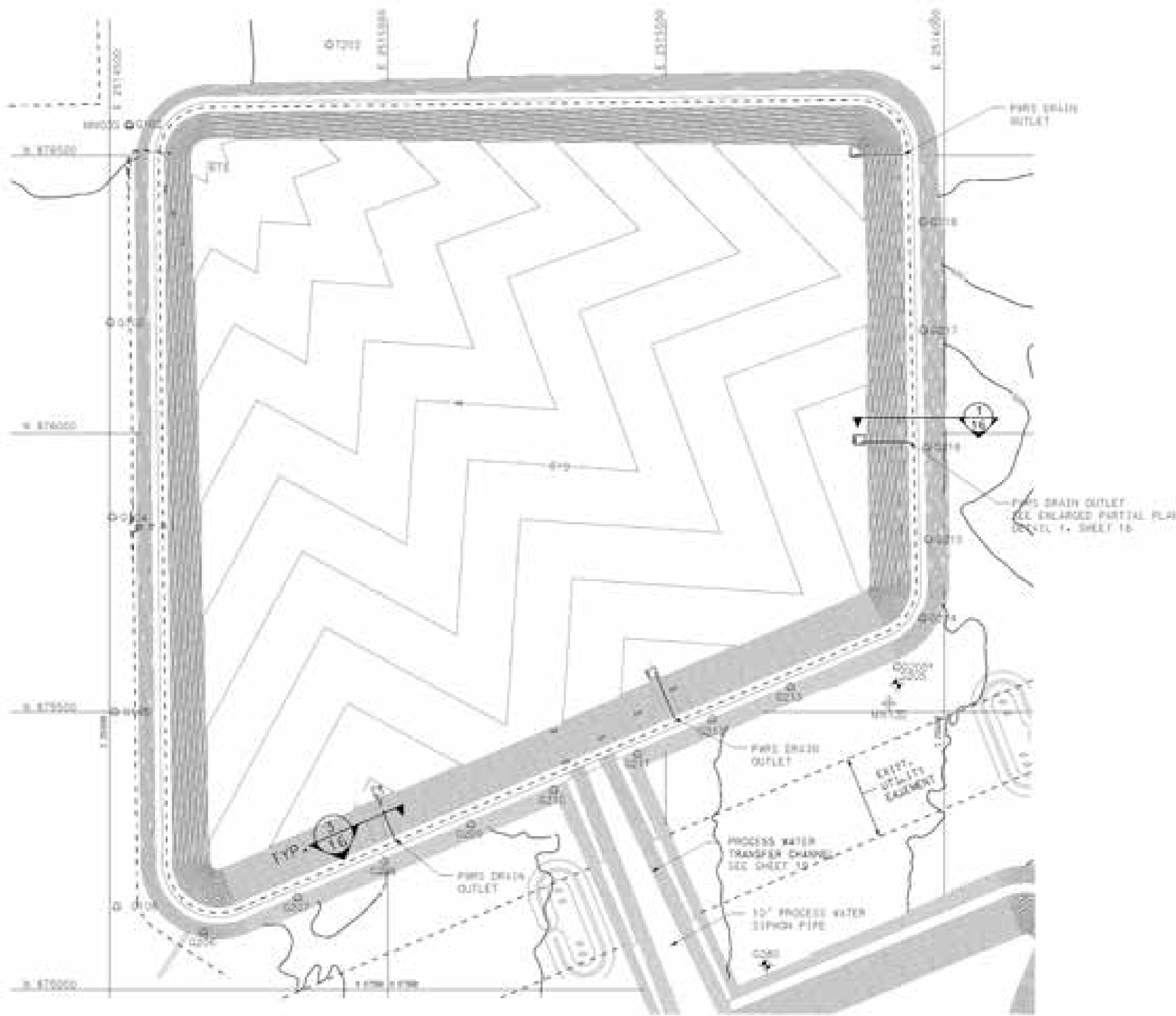
CCR MANAGEMENT FACILITY

SITE: JOPPEN

Ameren Energy Generating

DRAWING NO. C-10206

REV. 0



SCALE: 1" = 100'

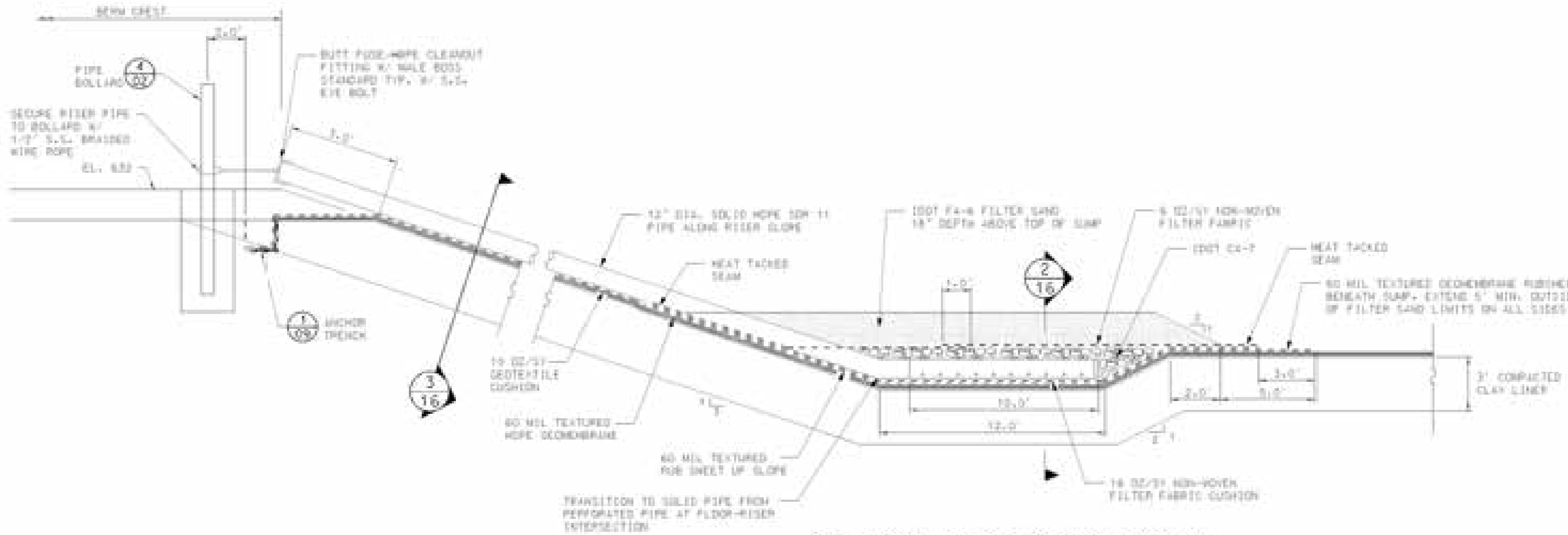
CELL U1-PROCESS WATER RECOVERY SYSTEM

CCR MANAGEMENT FACILITY

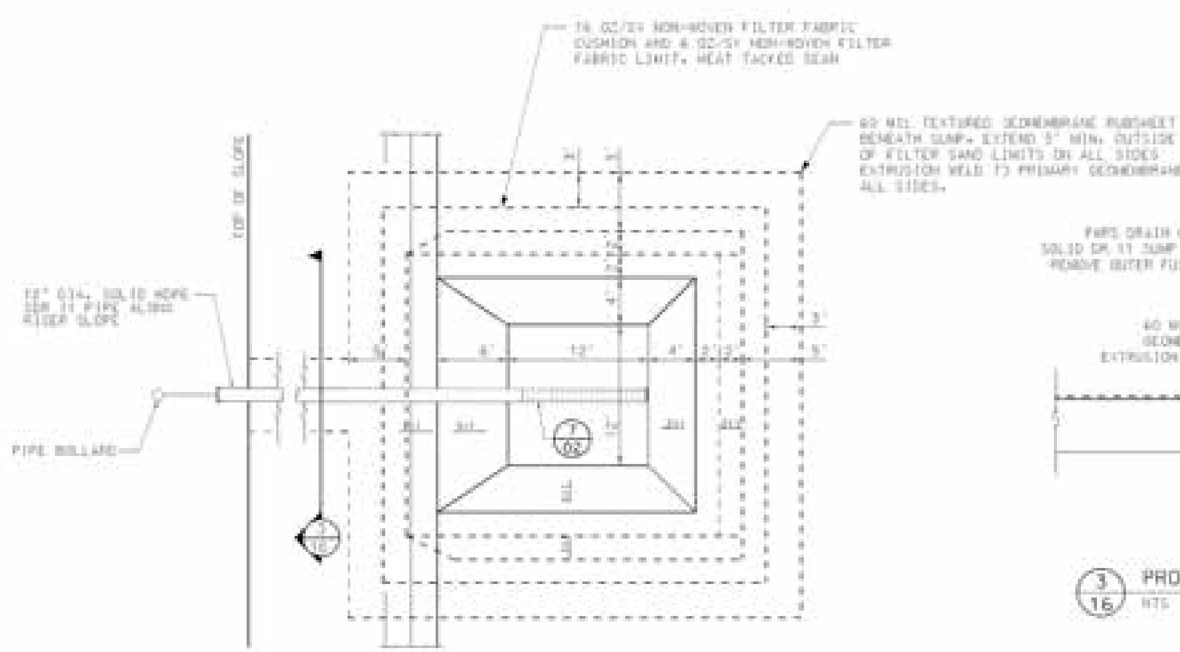
Ameren Energy Generating

DRAWING NO. C-10206 REV. 0

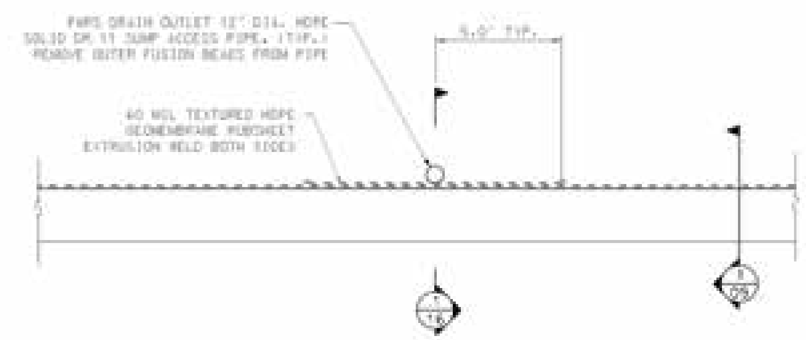
C-10206



1/16 TYPICAL PROCESS WATER SUMP SECTION
NTS



2/16 PWRS SUMP PLAN
NTS



3/16 PROCESS WATER RECOVERY PIPE UP SIDESLOPE
NTS

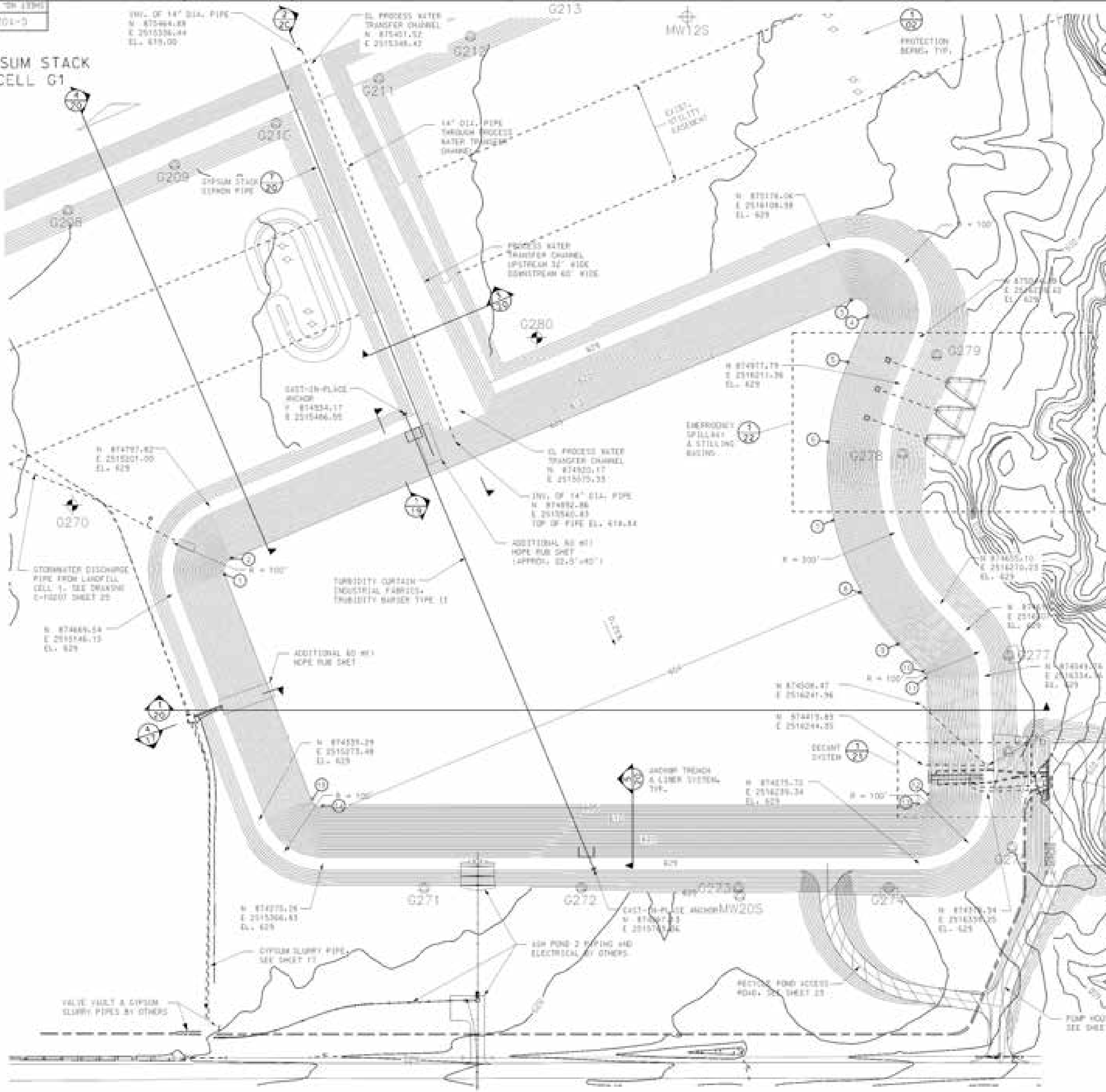
NOTE:
ALL SIDE SLOPE PIPES TO BE SOLID WALL

CELL G1-PWRS DRAIN DETAILS

CCR MANAGEMENT FACILITY

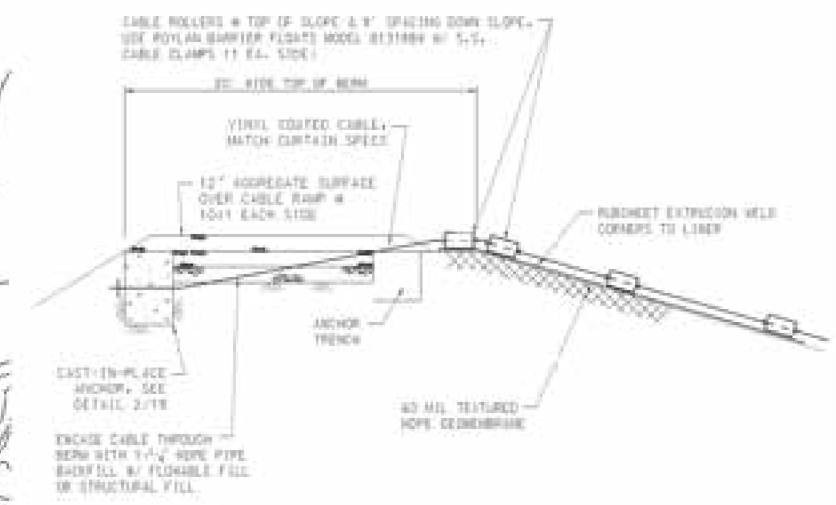
Ameren Energy Generating

DRAWING NO. C-10206 REV. 0



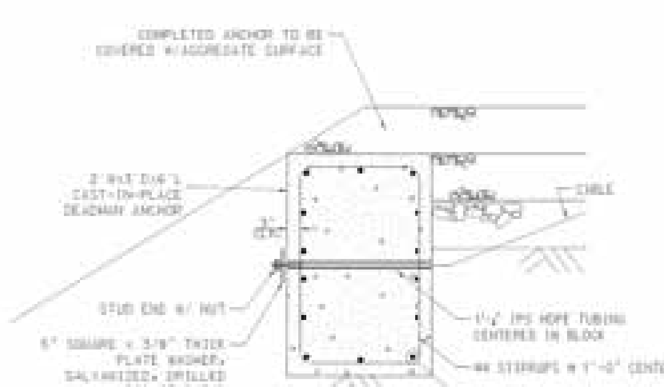
RECYCLE POND - INTERIOR TOE			
POINT	N	E	ELEV.
1	874706.91	2515227.14	603.24
2	874723.71	2515241.70	603.02
3	875055.81	2516132.23	603.00
4	875069.31	2516155.88	604.92
5	875005.91	2516132.91	604.93
6	874909.21	2516101.54	604.91
7	874811.81	2516106.37	604.93
8	874717.51	2516125.35	604.23
9	874633.41	2516175.61	604.17
10	874550.34	2516246.12	604.22
11	874548.61	2516249.01	604.07
12	874377.99	2516248.77	602.44
13	874365.11	2516237.06	604.00
14	874359.91	2515366.65	604.25
15	874372.61	2515351.72	604.49

SCALE: 1" = 60'



1/19 TURBIDITY CURTAIN ANCHOR/CONNECTION
NTS

NOTE:
ALL CABLE CONNECTIONS SHALL BE 316 S.S. WITH A STRENGTH RATING GREATER THAN CABLE.



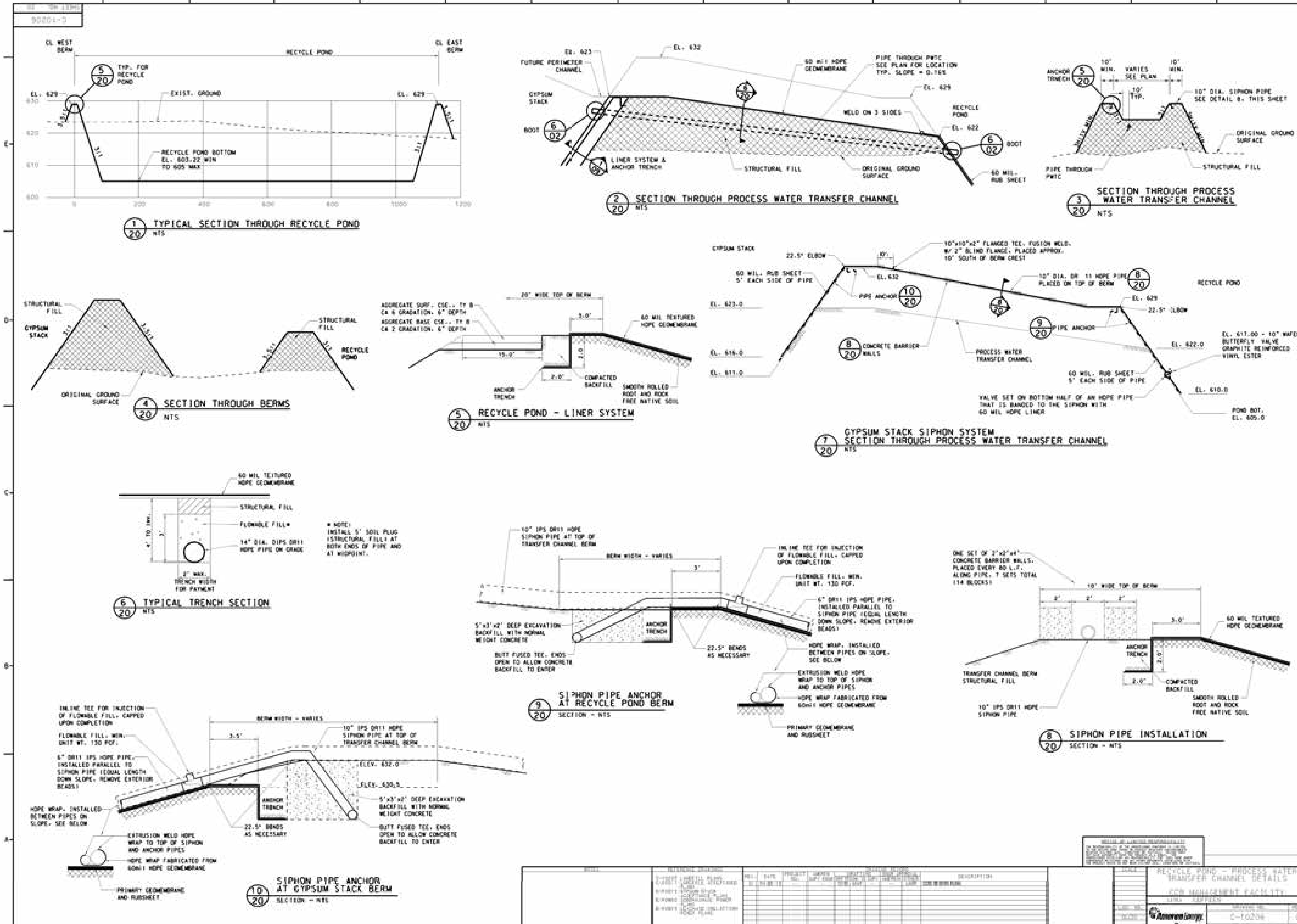
2/19 CAST-IN-PLACE ANCHOR
NTS

RECYCLE POND PLAN & CONTROL DATA

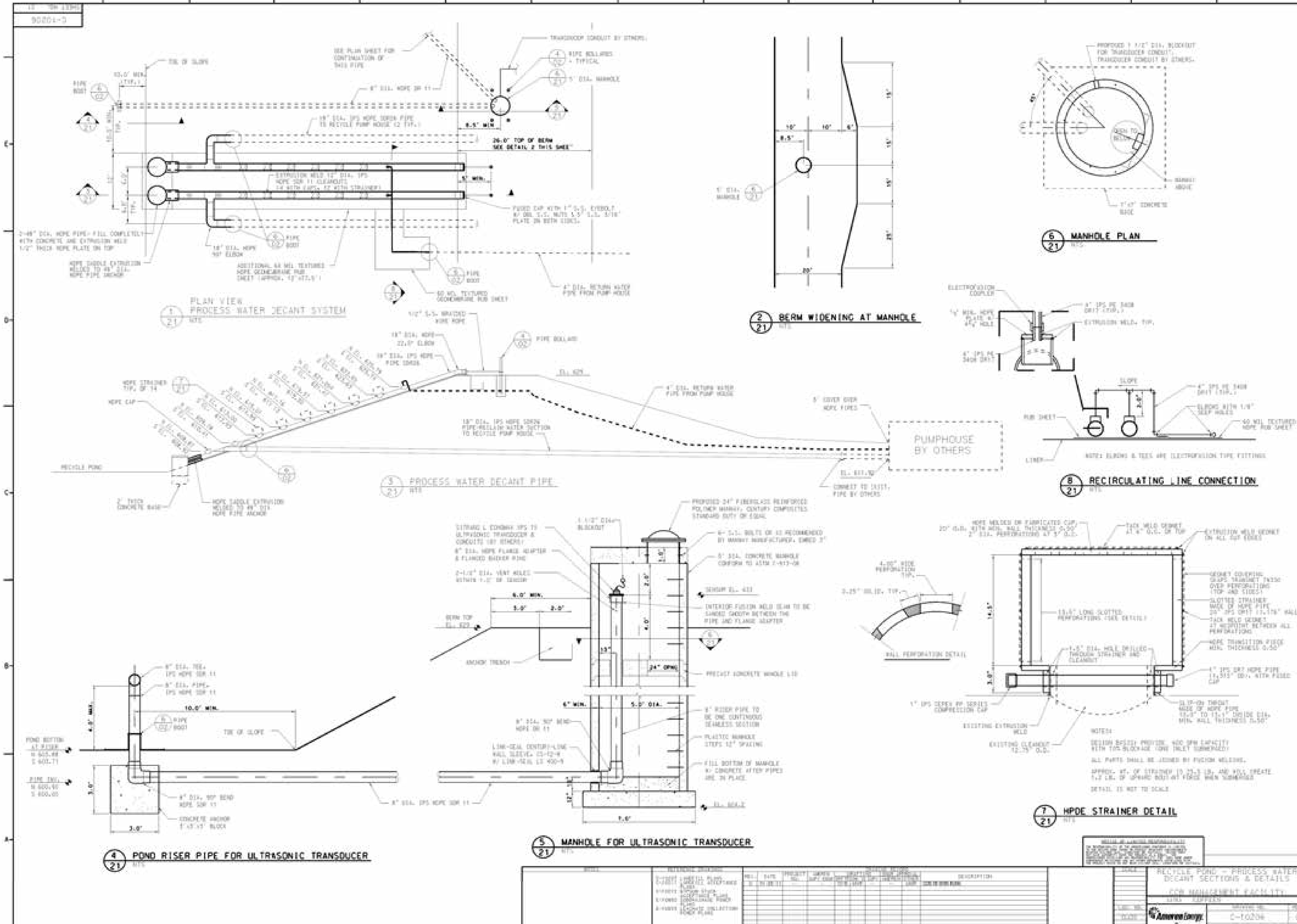
CCR MANAGEMENT FACILITY

Ameren Energy Generating

DRAWING NO. C-10206 REV. 0

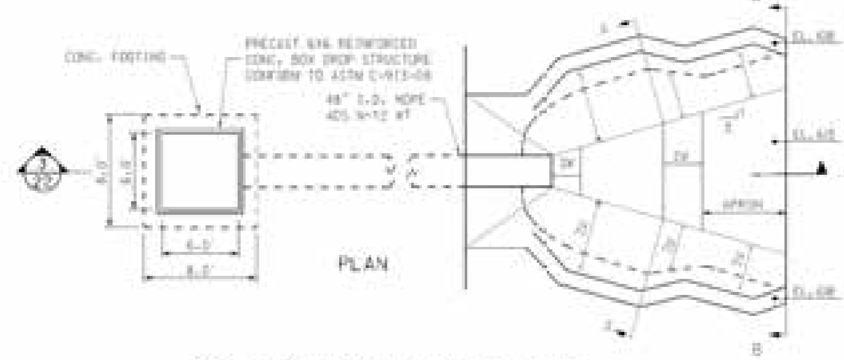


C-10206
CL WEST BERM
RECYCLE POND
CL EAST BERM
TYP. FOR RECYCLE POND
EL. 629
EXIST. GROUND
RECYCLE POND BOTTOM EL. 603.22 MIN TO 605 MAX
3:1
1 TYPICAL SECTION THROUGH RECYCLE POND
NTS
EL. 623
EL. 632
FUTURE PERIMETER CHANNEL
GYPSUM STACK
BOOT
60 mil HDPE GEOMEMBRANE
PIPE THROUGH PWTC SEE PLAN FOR LOCATION TYP. SLOPE = 0.16%
WELD ON 3 SIDES
RECYCLE POND
EL. 622
LINER SYSTEM & ANCHOR TRENCH
STRUCTURAL FILL
ORIGINAL GROUND SURFACE
60 MIL. RUB SHEET
2 SECTION THROUGH PROCESS WATER TRANSFER CHANNEL
NTS
ANCHOR TRENCH
10' MIN.
VARIES SEE PLAN
10' TYP.
10" DIA. SIPHON PIPE SEE DETAIL 8, THIS SHEET
ORIGINAL GROUND SURFACE
PIPE THROUGH PWTC
3 SECTION THROUGH PROCESS WATER TRANSFER CHANNEL
NTS
STRUCTURAL FILL
GYPSUM STACK
ORIGINAL GROUND SURFACE
4 SECTION THROUGH BERMS
NTS
AGGREGATE SURF. CSE., TY B CA 6 GRADATION, 6" DEPTH
AGGREGATE BASE CSE., TY B CA 2 GRADATION, 6" DEPTH
20' WIDE TOP OF BERM
3.0'
60 MIL TEXTURED HDPE GEOMEMBRANE
15.0'
2.0'
ANCHOR TRENCH
COMPACTED BACKFILL
SMOOTH ROLLED ROOT AND ROCK FREE NATIVE SOIL
5 RECYCLE POND - LINER SYSTEM
NTS
GYPSUM STACK
22.5° ELBOW
10"x10"x2" FLANGED TEE, FUSION WELD, W/ 2" BLIND FLANGE, PLACED APPROX. 10' SOUTH OF BERM CREST
60 MIL. RUB SHEET 5' EACH SIDE OF PIPE
EL. 632
PIPE ANCHOR
10" DIA. DR 11 HDPE PIPE PLACED ON TOP OF BERM
RECYCLE POND
EL. 629
22.5° ELBOW
EL. 623.0
EL. 616.0
EL. 611.0
CONCRETE BARRIER WALLS
PROCESS WATER TRANSFER CHANNEL
PIPE ANCHOR
EL. 622.0
EL. 617.00 - 10" WAFER BUTTERFLY VALVE GRAPHITE REINFORCED VINYL ESTER
60 MIL. RUB SHEET 5' EACH SIDE OF PIPE
EL. 610.0
VALVE SET ON BOTTOM HALF OF AN HDPE PIPE THAT IS BANDED TO THE SIPHON WITH 60 MIL HDPE LINER
POND BOT. EL. 605.0
7 GYPSUM STACK SIPHON SYSTEM SECTION THROUGH PROCESS WATER TRANSFER CHANNEL
NTS
60 MIL TEXTURED HDPE GEOMEMBRANE
STRUCTURAL FILL
FLOWABLE FILL*
14" DIA. DIPS DR11 HDPE PIPE ON GRADE
4' TO 8MW.
3'
2' MAX. TRENCH WIDTH FOR PAYMENT
* NOTE: INSTALL 5' SOIL PLUG (STRUCTURAL FILL) AT BOTH ENDS OF PIPE AND AT MIDPOINT.
6 TYPICAL TRENCH SECTION
NTS
10" IPS DR11 HDPE SIPHON PIPE AT TOP OF TRANSFER CHANNEL BERM
BERM WIDTH - VARIES
3'
INLINE TEE FOR INJECTION OF FLOWABLE FILL, CAPPED UPON COMPLETION
FLOWABLE FILL, MIN. UNIT WT. 130 PCF.
6" DR11 IPS HDPE PIPE, INSTALLED PARALLEL TO SIPHON PIPE (EQUAL LENGTH DOWN SLOPE), REMOVE EXTERIOR BEADS)
5'x3'x2' DEEP EXCAVATION BACKFILL WITH NORMAL WEIGHT CONCRETE
ANCHOR TRENCH
BUTT FUSED TEE, ENDS OPEN TO ALLOW CONCRETE BACKFILL TO ENTER
22.5° BENDS AS NECESSARY
HDPE WRAP, INSTALLED BETWEEN PIPES ON SLOPE, SEE BELOW
EXTRUSION WELD HDPE WRAP TO TOP OF SIPHON AND ANCHOR PIPES
HDPE WRAP FABRICATED FROM 60mil HDPE GEOMEMBRANE
PRIMARY GEOMEMBRANE AND RUBSHEET
9 SIPHON PIPE ANCHOR AT RECYCLE POND BERM
SECTION - NTS
ONE SET OF 2'x2'x4' CONCRETE BARRIER WALLS, PLACED EVERY 80 L.F. ALONG PIPE, 7 SETS TOTAL (14 BLOCKS)
10' WIDE TOP OF BERM
2' 2' 2'
3.0'
60 MIL TEXTURED HDPE GEOMEMBRANE
ANCHOR TRENCH
2.0'
TRANSFER CHANNEL BERM STRUCTURAL FILL
COMPACTED BACKFILL
SMOOTH ROLLED ROOT AND ROCK FREE NATIVE SOIL
10" IPS DR11 HDPE SIPHON PIPE
8 SIPHON PIPE INSTALLATION
SECTION - NTS
INLINE TEE FOR INJECTION OF FLOWABLE FILL, CAPPED UPON COMPLETION
FLOWABLE FILL, MIN. UNIT WT. 130 PCF.
6" DR11 IPS HDPE PIPE, INSTALLED PARALLEL TO SIPHON PIPE (EQUAL LENGTH DOWN SLOPE, REMOVE EXTERIOR BEADS)
BERM WIDTH - VARIES
3.5'
10" IPS DR11 HDPE SIPHON PIPE AT TOP OF TRANSFER CHANNEL BERM
ELEV. 632.0
ELEV. 630.5
HDPE WRAP, INSTALLED BETWEEN PIPES ON SLOPE, SEE BELOW
ANCHOR TRENCH
5'x3'x2' DEEP EXCAVATION BACKFILL WITH NORMAL WEIGHT CONCRETE
22.5° BENDS AS NECESSARY
BUTT FUSED TEE, ENDS OPEN TO ALLOW CONCRETE BACKFILL TO ENTER
EXTRUSION WELD HDPE WRAP TO TOP OF SIPHON AND ANCHOR PIPES
HDPE WRAP FABRICATED FROM 60mil HDPE GEOMEMBRANE
PRIMARY GEOMEMBRANE AND RUBSHEET
10 SIPHON PIPE ANCHOR AT GYPSUM STACK BERM
SECTION - NTS
NOTES
REFERENCE DRAWINGS
DESCRIPTION
RECYCLE POND - PROCESS WATER TRANSFER CHANNEL DETAILS
CCR MANAGEMENT FACILITY
Ameren Energy Generating
C-10206

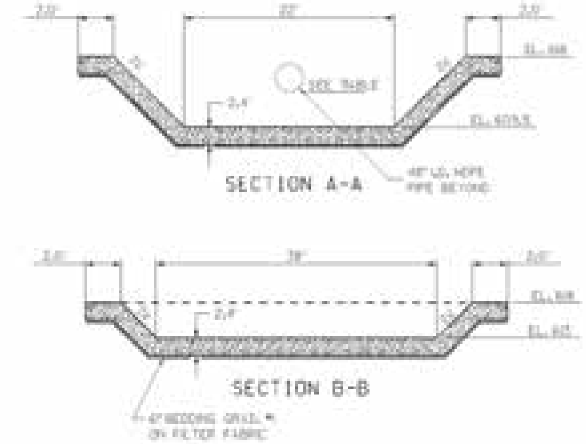


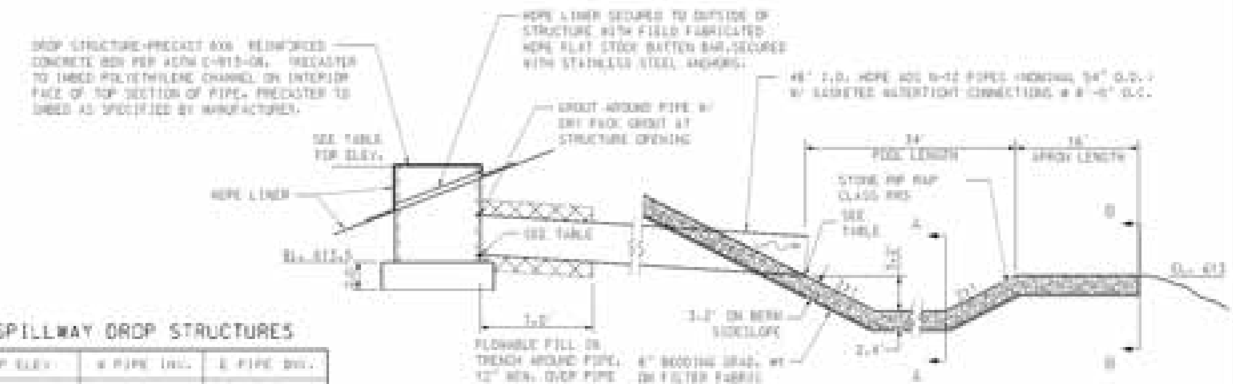
PLAN VIEW
PROCESS WATER DECANT SYSTEM
NTS
BERM WIDENING AT MANHOLE
NTS
MANHOLE PLAN
NTS
PROCESS WATER DECANT PIPE
NTS
RECIRCULATING LINE CONNECTION
NTS
PUMPHOUSE BY OTHERS
NOTE: ELBOWS & TEES ARE ELECTROFUSION TYPE FITTINGS
POND RISER PIPE FOR ULTRASONIC TRANSDUCER
NTS
MANHOLE FOR ULTRASONIC TRANSDUCER
NTS
HPDE STRAINER DETAIL
NTS
WALL PERFORATION DETAIL
NOTES:
DETAIL IS NOT TO SCALE
RECYCLE POND - PROCESS WATER DECANT SECTIONS & DETAILS
CCR MANAGEMENT FACILITY
Ameren Energy Generating
C-10206
0

(1/22) STILLING BASIN PLAN AT EMERGENCY SPILLWAY
NTS



(2/22) RIPRAP STILLING BASIN PLAN
NTS

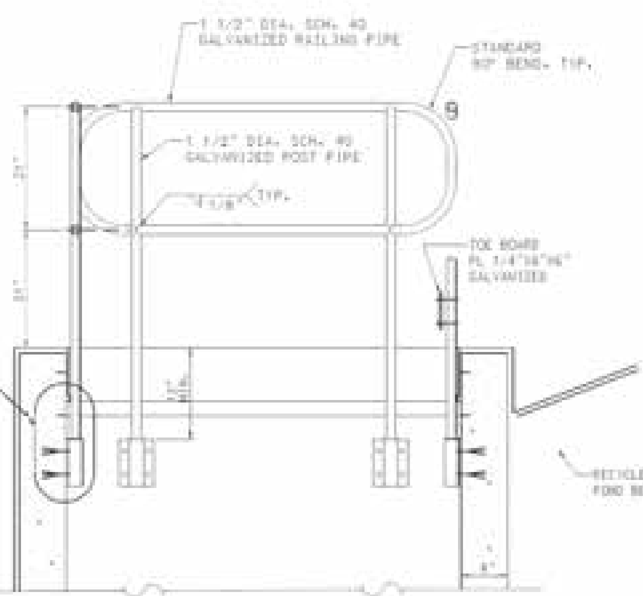




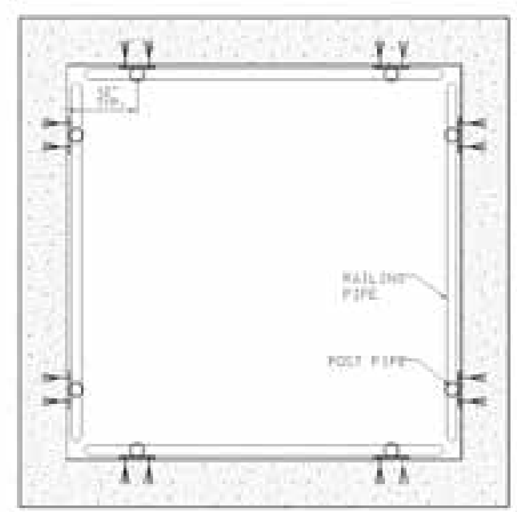
EMERGENCY SPILLWAY DROP STRUCTURES

STRUCTURE	TOP ELEV.	W PIPE INV.	E PIPE INV.
NORTH	624.13	614.93	612.94
MIDDLE	624.15	614.95	613.00
SOUTH	624.17	614.03	613.06

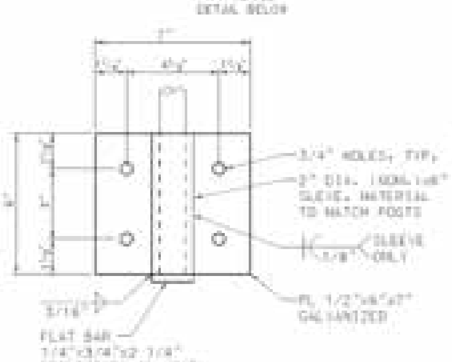
(3/22) RIPRAP STILLING BASIN SECTION
NTS



(4/22) DROP INLET HANDRAIL DETAIL
NTS



(5/22) DROP INLET HANDRAIL PLAN
NTS



WALL FLANGE FITTING
NTS

HANDRAIL NOTES

GT-1 COPE ALL INTERSECTIONS OF RAILS AND POSTS. WELD JOINTS. AND GRIND SMOOTH TO A PLEASING APPEARANCE, TAKING CARE TO NOT REMOVE EXCESSIVE AMOUNT OF WELDED MATERIALS.

GT-2 BUTT WELD END-TO-END JOINTS, OR USE WELDING CONNECTIONS.

GT-3 CLEAN WELDED AREAS USING A WIRE BRUSH TO REMOVE SLAG AND LOOSE PARTICULATE. WIPE AWAY DUST WITH A CLEAN DRY RAG AND CLEAN THE WELDED SUFACE IN ACCORDANCE WITH SSPC-SP 1.

GT-4 TREAT ALL WELD ZONES WITH TWO COATS OF COLD GALVANIZING COMPOUND.

GT-5 COAT THE WELDED HANDRAIL ASSEMBLY PER THE FOLLOWING:
1 – 4 MIL COAT OF KRYLON INDUSTRIAL GALVANIZED METAL PRIMER
2 – 3 MIL COATS OF KRYLON INDUSTRIAL RUST TOUGH DTM ALKYD ENAMEL – COLOR: OHSA SAFETY YELLOW

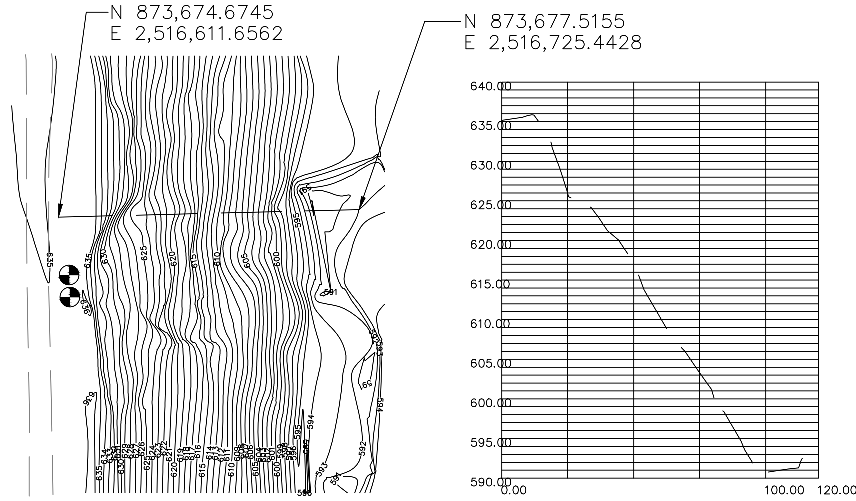
RECYCLE POND – EMERGENCY SPILLWAY SECTIONS & DETAILS

CCR MANAGEMENT FACILITY

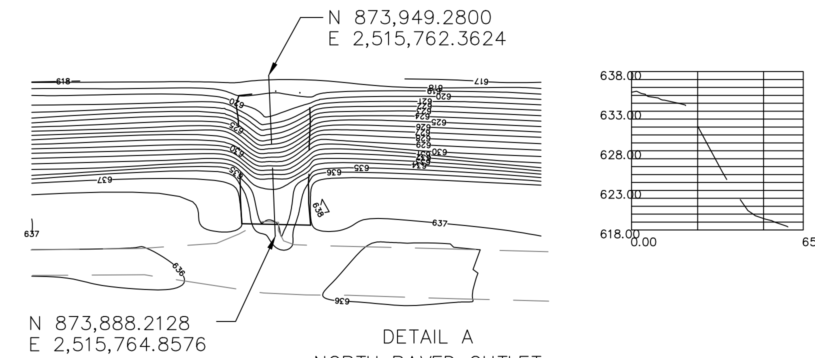
DRAWING NO. C-10206 REV. 0

SHEET NO. 22

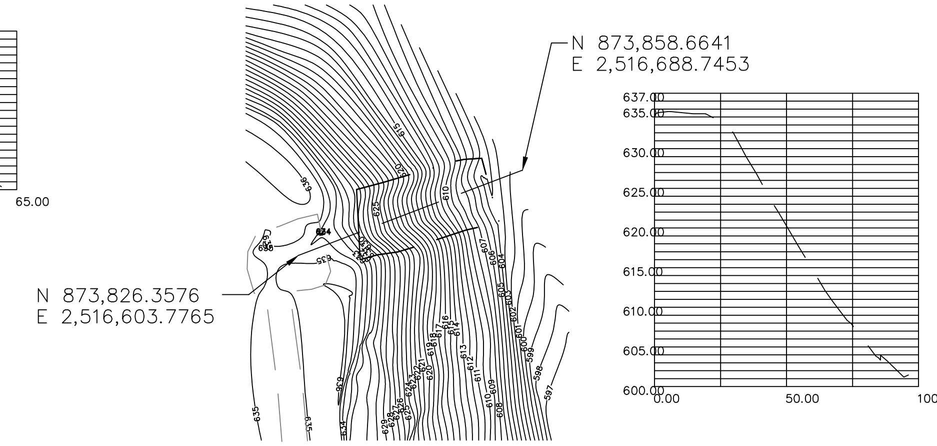
COFFEEN POWER STATION CLOSED ASH POND TOPO SURVEY



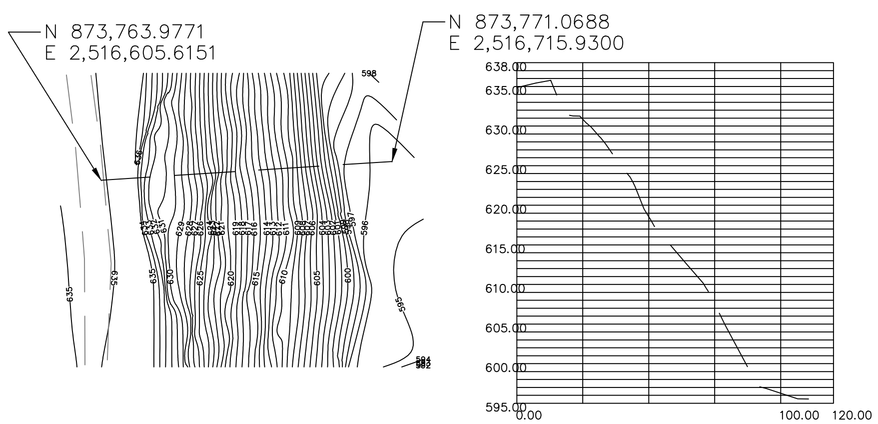
DETAIL G
EAST ERODED SLIDE AREA



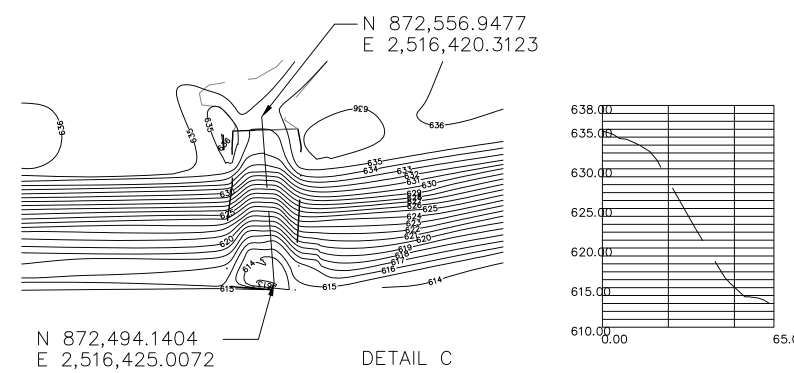
DETAIL A
NORTH PAVED OUTLET



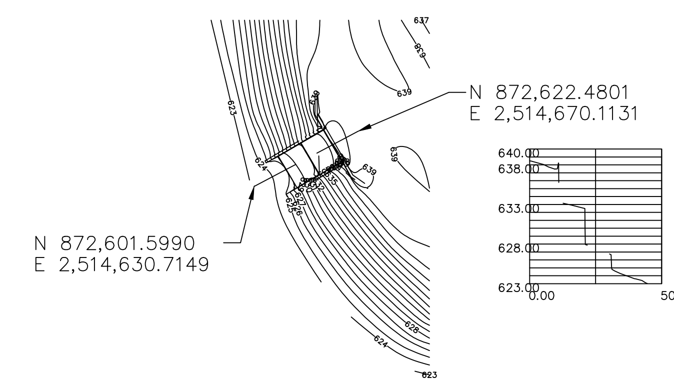
DETAIL B
NORTHEAST PAVED OUTLET



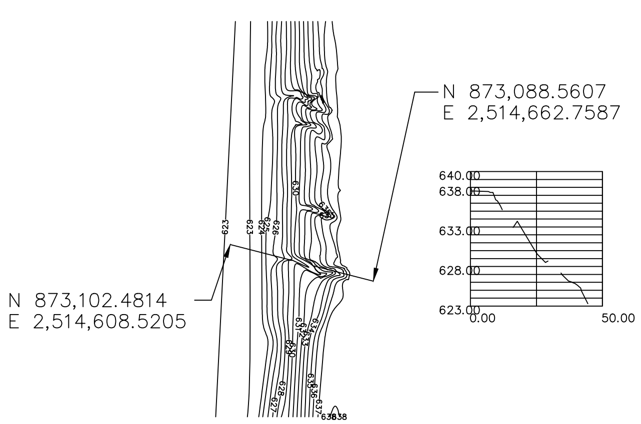
DETAIL H
NEW ERODED SLIDE AREA



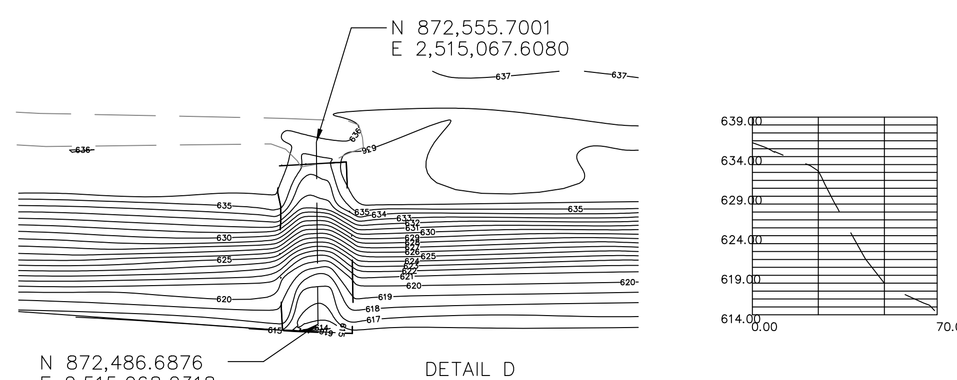
DETAIL C
SOUTHEAST PAVED OUTLET



DETAIL E**
CONCRETE DAM



DETAIL F
WEST ERODED SLIDE AREA



DETAIL D
SOUTHWEST PAVED OUTLET

LEGEND

- GRAVEL DITCH EDGE
- PAVED OUTLET EDGE
- CROSS SECTION LINE
- PIEZOMETER

N

30' 15' 0 15' 30'
SCALE IN FEET

BASIS OF BEARINGS –
BEARINGS ARE BASED ON THE IL. STATE PLANE COORDINATE SYSTEM. NAD 1983 WEST ZONE.

McDonough–Whitlow, P.C.
Consulting Engineers & Land Surveyors
138 East Wood Street
Hillsboro, IL 62049
Phone: 217.532.9233
Fax: 217.532.6300
PROFESSIONAL DESIGN No. 184-002754

TONY HARD
2953
PROFESSIONAL LAND SURVEYOR
STATE OF ILLINOIS
HILLSBORO, ILLINOIS

(License Expires: 11/30/06)

THIS IS TO CERTIFY TO AMEREN ENERGEY THAT A TOPOGRAPHIC SURVEY SHOWN HEREON HAS BEEN PERFORMED BY ME OR UNDER MY SUPERVISION AND THIS PLAT IS A REPRESENTATION OF MY PROFESSIONAL OPINION OF SAID SURVEY.

ILLINOIS PROFESSIONAL LAND SURVEYOR NO. 035–2953 DATE

FIELD WORK FOR THIS SURVEY WAS COMPLETED ON MAY 28, 2009

NOTES	REFERENCE DRAWINGS

DRAWING RECORD

REV.	DATE	PROJECT NO.	AMEREN SUPV ENGR	DRAFTING DRFTR	DRAFTING CHK'D	DRAFTING SUPV	ENGR APPROVAL AMEREN	ENGR APPROVAL OTHER	DESCRIPTION
–	–	–	–	–	–	–	–	–	–

NOTICE OF LIMITED RESPONSIBILITY

THE RESPONSIBILITY OF THE UNDERSIGNED ENGINEER IS LIMITED TO THE DESIGN WORK SHOWN ON PROJECT DRAWINGS AND DOCUMENTS BEARING HIS/HER SEAL, SIGNATURE OR INITIALS. HE/SHE DOES NOT HAVE AUTHORITY OVER THE PROJECT AS A WHOLE. THE UNDERSIGNED DISCLAIMS ANY RESPONSIBILITY FOR WORK DONE UNDER SUBSEQUENT REVISIONS AND ANY OTHER DOCUMENTS ASSOCIATED WITH THE PROJECT WHICH DO NOT BEAR HIS/HER SEAL, SIGNATURE OR INITIALS.

AS BUILT

SCALE 1" = 30'

COFFEEN POWER STATION
ASH POND #2
DRAINAGE MODIFICATIONS

SITE: AMEREN CLOSED ASH POND

LOC. NO. –
CLASS –

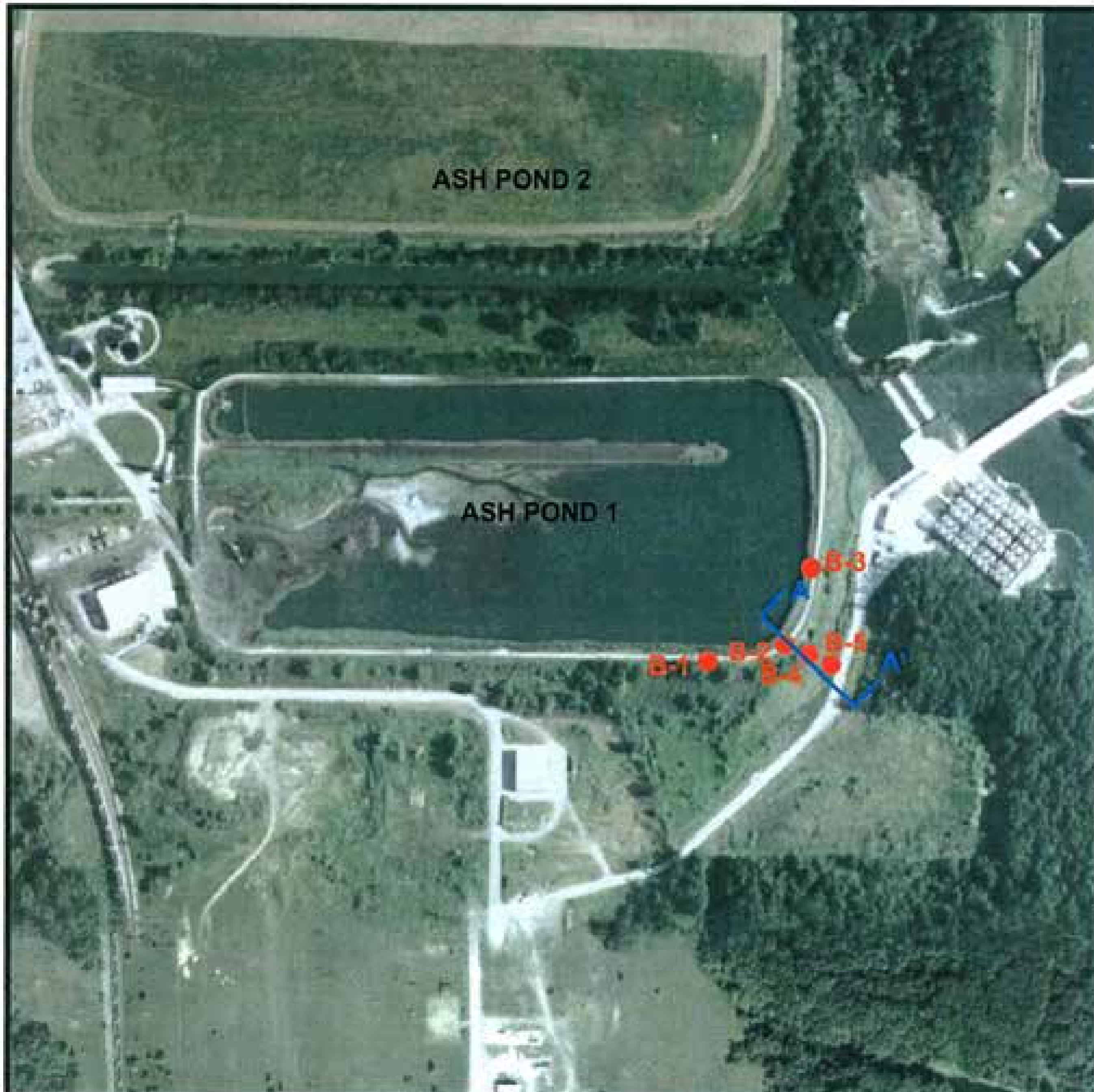
AmerenEnergy Generating

DRAWING NO.	REV.
W1008	––

SHEET NO. 2 OF 2

AECOM

Appendix C: Coffeen Power Station Boring and Piezometer Locations



NOTES

1. Plan adapted from an aerial photograph courtesy of Google Earth.

LEGEND

● Boring Location

— Slope Stability Cross Section

0 200 400 800

SCALE IN FEET

N

Drawn By: SLC	Ck'd By: SLC	App'vd By: DJF
Date: 11-04-10	Date: 12/21/10	Date: 1/4/11

GEOTECHNOLOGY INC

FROM THE GROUND UP

Coffeen Power Station
Coffeen, Illinois

AERIAL PHOTOGRAPH OF SITE AND BORING LOCATIONS

Project Number J017150.01	PLATE 2

XXX-X### — EXPLORATION METHOD (B=BORING, C=CPT, P=PIEZOMETER); ID NUMBER; STATION ABBREVIATION

LEGEND

PIEZOMETER LOCATION

CCR UNIT BERM ALIGNMENT

0 200

APPROXIMATE SCALE FEET

N

SOURCE:
MAP PROVIDED BY GOOGLE EARTH PRO 2015

Illinois Power Generating Company		PROJECT NO. 60440742
AECOM		
DRN. BY: djd October 2015 DSGN. BY: eg CHKD. BY: eg	Coffeen Ash Pond No.1 Piezometer Locations	FIG. NO. 2A

LEGEND

AECOM PIEZOMETER LOCATION

HISTORICAL PIEZOMETER LOCATION

CCR UNIT BERM ALIGNMENT

SOURCE:
MAP PROVIDED BY GOOGLE EARTH PRO 2015

0 200
APPROXIMATE SCALE FEET

N

Illinois Power Generating Company

PROJECT NO.
60440742

AECOM

DRN. BY: djd October 2015
DSGN. BY: eg
CHKD. BY: eg

Coffeen Ash Pond No.2
Piezometer Locations

FIG. NO.
2B

File: P:\PROJECTS\GEOTECH\60428794_DYNEGYCCR\04TASKS\00 PROGRAM TASKS\1.0 TASK 1 INITIAL UNIT ASSESSMENT\CCR FACT SHEETS\SITE MAPS\FIGURE 2A PIEZOMETER LOCATION PLAN (COFFEEN).DWG Last edited: NOV. 04, 15 @ 3:03 p.m. by: david_deguire

Appendix D: Project Specifications, Gypsum Stack and Recycle Pond Construction (Hanson 2008)

PROJECT SPECIFICATIONS
GYPSUM STACK AND RECYCLE POND CONSTRUCTION
GYPSUM MANAGEMENT FACILITY
COFFEEN POWER STATION
MONTGOMERY COUNTY, ILLINOIS

Prepared For:

AMEREN ENERGY GENERATING COMPANY

Prepared By:

HANSON PROFESSIONAL SERVICES INC.
1525 South Sixth Street
Springfield, Illinois 62703

January 2008

GYPSUM STACK AND RECYCLE POND CONSTRUCTION
GYPSUM MANAGEMENT FACILITY
COFFEEN POWER STATION
MONTGOMERY COUNTY, ILLINOIS

TABLE OF CONTENTS

PART 1. GENERAL

1.01 DESCRIPTION

A. This section pertains to the construction and maintenance of temporary erosion control systems to control erosion and sediment damage to adjacent properties and water resources, and the removal of erosion control devices when they are no longer required.

1.02 RELATED SECTIONS

The following sections contain items which are related to the work in this section:

02936 - Topsoil, Seeding, and Mulching.

1.03 REFERENCES

The following reference, or cited portions thereof, governs the work:

Illinois Department of Transportation (IDOT): Standard Specifications for Road and Bridge Construction, adopted January 1, 2007.

1.04 SUBMITTALS

A. Submittals shall follow the provisions of Section 01010.

B. Preconstruction Submittals: A storm water best management practices (BMP) plan shall be submitted that includes the following items:

1. Site drawing showing anticipated locations of structural erosion controls, areas of disturbed soils, and drainage patterns;
2. Inspection and record-keeping procedures; and
3. Maintenance procedures for erosion controls.

PART 2. PRODUCTS

2.01 EROSION CONTROL SYSTEMS

Materials for erosion control systems shall be in accordance with Article 280.02 of the IDOT Standard Specifications.

PART 3. EXECUTION

3.01 EXAMINATION

The site shall be examined to determine the extent of work required.

3.02 PRECONSTRUCTION JOBSITE INSPECTION

A. The person who shall be at the jobsite during construction and who shall be responsible for insuring that erosion control work is completed in a timely manner shall be identified at the preconstruction meeting.

B. A jobsite inspection shall be conducted with the Owner's Representative to review and designate the locations and types of erosion protection to be placed. The inspection shall be scheduled at the preconstruction conference and carried out on the job site before beginning any work that will disturb existing drainage or potentially create erodible conditions.

3.03 CONSTRUCTION

A. Temporary erosion control systems shall be constructed in accordance with IDOT Standard 280001 and Article 280.04 of the Standard Specifications and as directed by the Owner's Representative. Erosion control devices shall be in place and approved by the Owner's Representative prior to beginning other work.

B. Incorporate permanent erosion control features into the project at the earliest practicable time to minimize the need for temporary erosion controls.

3.04 MAINTENANCE

A. Temporary erosion control systems shall be maintained in accordance with Article 280.05 of the Standard Specifications, except that measurement and payment provisions shall not apply.

B. Temporary erosion control systems for unprotected disturbed areas shall be cleaned of trapped sediment and repaired immediately prior to project close out.

C. Temporary seeding shall be applied to all disturbed areas except the gypsum stack excavation and the future fill and topsoil stockpiles.

3.05 REMOVAL AND DISPOSAL

When the Owner's Representative deems that temporary erosion control systems are no longer needed, they shall be removed and properly disposed, and silt deposits shall be removed or regarded as directed by the Owner's Representative, and the area seeded. Non-biodegradable temporary erosion control materials shall be disposed of off site. Biodegradable erosion control devices may be disposed of in spoil areas designated by the Owner's Representative. All laws and regulations in disposing of the materials shall be obeyed.

END OF SECTION 01356

I:\05jobs\05s3004A\Gypsum Stacking\IDNR Dam Safety Permit Application\Specs\S01356_Storm Water Pollution Prevention Measures.doc

PART 1. GENERAL

1.01 DESCRIPTION

This section pertains to stripping of topsoil and vegetation from areas of the site that are to be excavated.

1.02 RELATED SECTIONS

No related sections.

PART 2. PRODUCTS

No products used.

PART 3. EXECUTION

3.01 EXAMINATION

The Contractor shall examine the site to determine the extent of work required.

3.02 SITE PREPARATION - STRIPPING

A. All vegetation and topsoil encountered within the Gypsum Stack grading limits shall be stripped. Topsoil shall be kept clean and free of all foreign material, and stored in separate stockpiles from vegetation and common excavations. Stockpiles shall be located as indicated on the drawings or as directed by the Owner's Representative.

B. Payment for stripping shall be based upon removal of 24 inches of topsoil in areas that require stripping.

3.03 DISPOSAL

All materials resulting from site preparation operations shall be stockpiled in the designated spoil area. Contractor shall obey all laws and regulations when disposing of the materials.

END OF SECTION 02100

PART 1. GENERAL

1.01 DESCRIPTION

This section pertains to excavation, fill, and backfill required for foundation preparation, construction of low-permeability soil layer, anchor trench construction, miscellaneous site grading and berm construction.

1.02 RELATED SECTIONS

A. The following sections contain items which are related to the work in this section:

1. 01356 – Storm Water Pollution Prevention Measures
2. 02100 - Site Preparation
3. 02373 – Geotextiles
4. 02936 - Topsoil, Seeding, and Mulching

1.03 REFERENCES

The following references, or cited portions thereof, govern the work:

1. Illinois Department of Transportation (IDOT): Standard Specifications for Road and Bridge Construction, adopted January 1, 2007
2. Department of Sustainable Natural Resources, Soil Survey Standard Test Method, Unified Soil Classification System: Field Method (USCS).

1.04 MEASUREMENT AND PAYMENT

A. The Contractor shall be responsible for estimating the extent of excavation and fill required to complete the work, including, but not limited to, excavation to required elevations; loading, transporting, placing, and compacting low permeability soil; excavation and backfill of anchor trench; and miscellaneous site grading and berm construction. The Contractor shall include the dollar amount associated with all earthwork in his Lump Sum Bid amount.

B. Removal and replacement of unsuitable foundation material and subgrade stabilization measures directed by the Owner's Representative will be paid for on a time and material basis.

1.06 COORDINATION

Existing utilities or other plant facilities shall not be interrupted, except when permitted in writing by the Owner's Representative and then only after acceptable temporary services have been provided. A minimum 48-hour notice shall be provided prior to proceeding with an approved temporary interruption.

1.08 SUBMITTALS

A. Materials Handling Plan.

A materials handling plan shall be submitted for construction and protection of the low permeability soil liner. The plan shall describe the following:

1. Processing and placement of the low permeability soil type, model number, weight, and critical dimensions of equipment to be used for soil processing, compaction, scarification, and smooth rolling;
2. Method of protecting low permeability soil from changes in moisture content and freezing after placement.

B. Construction Access Ramp Layout.

Layout drawings shall be submitted showing alignment, profile, and typical section of the construction access ramps from the haul road into the bottom of the Gypsum Management Facility excavation. The minimum width of the ramp shall be 50 ft., and the longitudinal grade shall not exceed 8 percent.

PART 2. PRODUCTS

2.01 MATERIALS

A. Earth Fill Material

Earth Fill Material shall consist of a mixture of clay, silt, sand, and gravel-sized particles obtained from previously constructed subsoil stockpiles. These materials can be used separately or mixed as required for best results. When placed, Embankment Material shall have a USCS classification of SM, ML, or CL and shall be uniform. This material shall be free of ice, snow, organic matter, rubbish, and debris. Coarse-grained particles shall be well dispersed to prevent the development of segregated pockets or zones with insufficient fine material to fill the interstices.

B. Soil Liners

The Soil Liner for the Gypsum Management Facility is considered a Clay Liner, and shall be soil classification CL, CL-ML, or CH. The material shall be free of roots, debris, organic or frozen material, and shall have a maximum clod size no greater than the length of the compactor foot for the compaction equipment proposed by the Contractor. When compacted, the material shall have a hydraulic conductivity of less than 1×10^{-4} cm/sec.

C. Soil Stabilizers and Moisture Conditioning Agents

Additives to accelerate drying or to improve stability and workability of soil shall not be permitted unless approved in writing by the Owner's Representative.

2.02 EQUIPMENT

A. Compaction Equipment

1. Tamping foot rollers

Compaction equipment shall consist of tamping foot rollers which have a minimum weight of 40,000 pounds. At least one tamping foot shall be provided for each 110 square in. of drum surface. The length of each tamping foot, measured from the outside surface of the drum, shall be at least 1 in. longer than the loose lift thickness.

2. Steel-Wheeled Rollers

Equipment used to produce a smooth compacted surface shall be a smooth, non-vibratory steel wheeled roller weighing not less than 1,000 lb. per lineal ft.

B. Scarification Equipment

Discs, rotor tillers, or other equipment used to scarify the surface shall be capable of uniformly disturbing the upper 6 in. of surface to provide good bonding between lifts.

C. Mixing and Spreading Equipment

Discs, harrows, and motor graders or other similar equipment shall be available at the site for use in spreading, mixing, and drying Compacted Subsoil Stockpile Material.

PART 3. EXECUTION

3.01 PREPARATION

A. Control of Work

Benchmarks, monuments, and other reference points shall be maintained throughout the work area.

B. Utility Location

Before starting excavation, the location and extent of underground utilities in the work area shall be established.

3.02 EXCAVATION

A. General

Excavation consists of removal and redistribution of material encountered when establishing required grade and subgrade elevations. The Contractor shall be responsible for dewatering, protection, shoring, and disposal of excavated materials as necessary to complete the excavation.

B. Procedures

Excavation may be accomplished by any method and by use of any equipment that is suitable to the work, except that blasting will not be permitted. Based on previous construction experience at the site, it is recommended that excavation to the foundation grade be completed as far in advance of low permeability soil placement as possible to allow the foundation surface to dry and form a "crust" capable of sustaining compactive effort.

C. Overexcavation

All excavation shall be performed to the lines and grades indicated on the plans. Any overexcavation or excess excavation not requested by the Owner's Representative shall be at the expense of the Contractor.

D. Disposal of Excavated Materials

Contractor shall utilize excavated material as stockpile materials for future use as specified in paragraph E.

E. Stockpile Requirements

1. Excavated clay and silty clay materials are to be stockpiled in the short-term subsoil stockpile area.
2. Excess excavated materials are to be stockpile in the areas designated on the drawings.
3. Materials not suitable for use as fill or backfill shall be disposed of onsite in the locations specified by the Owner's Representative.
4. Spread fill material for use by others, topsoil, and low permeability soil are to be stockpiled in layers not to exceed 1 ft loose thickness.
5. Tops of stockpiles are to be graded to ensure positive drainage. Side slopes for stockpiles shall be no steeper than 3H:1V.
6. Perimeter ditches are to be excavated to intercept runoff flowing toward stockpile areas and to route it to outlet locations approved by the Owner's Representative.

3.03 SUBGRADE PREPARATION

A. Areas to receive fill shall be proof rolled under the observation of the Owner's Representative. Soft, loose, weak, or wet materials shall be removed and replaced with compacted fill or stabilized with geotechnical fabric or geogrid as directed by the Owner's Representative. Joints, fractures, and moisture seeps shall be repaired, and local sand deposits, if present at foundation grade, shall be removed and backfilled with compacted fill material as directed by the Owner's Representative.

B. The Owner's Representative may recommend additional drying time for soft, wet subgrade that has not been exposed long enough to permit "crust" formation. If approved by the Owner's Representative, the Contractor may install, at his own expense, geotechnical fabric or geogrid to stabilize the wet subgrade and expedite construction.

C. No fill shall be placed until the subgrade has been examined and approved.

3.04 GENERAL FILL

A. Placement

1. Unless otherwise indicated on the plans, all fill shall be composed of Earth Fill Material.
2. Fill materials used in embankment construction shall normally be placed in lanes parallel to the embankment axis and shall be placed in conformance with the lines, grades, and slopes as indicated on the plans. Placement of fill materials in lanes which are not parallel to the embankment will be allowed only where working room is too restricted for normal placement as determined by the Owner's Representative.
3. Fill shall be spread in approximately flat layers in such a manner as to obtain lifts of relatively uniform thickness without spaces between successively deposited loads. Segregation shall be prevented during placing and spreading. Hauling equipment shall be routed across the fill in such a way as to promote uniform compaction and to prevent the formation of ruts.
4. The maximum compacted thickness of each lift shall not exceed 8 in. where heavy compaction equipment will be used. The maximum compacted thickness shall not exceed 3 in. where power tampers or similar smaller equipment will be used. It may be necessary to reduce the thickness of lifts in order to obtain the required minimum density.
5. Where compacted earth fill is to be placed against existing slopes, each lift shall be keyed into existing slope by removing existing slope material in steps as each new lift is placed.
6. The surface of the fill shall be kept reasonably smooth. The fill surface shall be sloped transverse to the axis of the embankments to allow drainage. If the compacted surface is, in the opinion of the Owner's Representative, too smooth or too dry to bond properly with the

succeeding lift, it shall be roughened by scarifying, light discing, or other acceptable means, and it shall be sprinkled before the succeeding lift is placed thereon. If the surface becomes rutted or uneven subsequent to compaction, it shall be flattened and leveled before placing the next lift. This extra work shall be at the Contractor's expense.

7. Fill operations shall be suspended during periods of extended wet weather. Upon resuming operations, all fill materials that are excessively wet or soft shall be reprocessed in place or removed and stockpiled for reprocessing. The removal of soft material shall be carried to such depth as is necessary to expose firm materials. Fill shall not be placed on frozen surfaces.
8. When filling operations at any section will be suspended for any period in excess of 12 hours or in wet weather, the surface of the fill shall be rolled smooth to seal it against excessive absorption of moisture and to facilitate runoff. Prior to resuming fill placement and compaction, the fill surface shall be scarified and/or disced and moisture conditioned as required.
9. The Contractor will receive no additional compensation for any removal, reprocessing, stockpiling, recompaction, wasting, or similar operation related to suspensions or conditions due to weather or other causes unless caused by the Owner.
10. Earth fill access ramps shall not be constructed within the limits of the compacted embankments without prior approval. When such ramps are approved, they shall be constructed of low permeability soil (in-board of the perimeter berm) or compacted fill (out-board of the perimeter berm).

B. Compaction -

1. Fill materials shall be compacted to a dry density equal to or greater than the following:

   a. The Gypsum Management Facility: 95 percent of the maximum dry density obtained from the Standard Proctor Test, ASTM D698.

   In order to insure uniform coverage and to facilitate construction inspection and control, the compaction of each layer shall proceed in a systematic, orderly, and continuous manner. Rolling shall be parallel to the embankment axis, except where there is insufficient working room for such operations.

2. The moisture content of all earth fill materials shall be as uniform as practicable throughout each lift. Fill shall be compacted at a moisture content that is no more than 2 percent below and no more than 2 percent above optimum moisture content.
3. Moisture conditioning of fill materials shall be performed by discing, harrowing, plowing, blading, or other suitable means prior to excavation. Moisture conditioning where the fill is placed shall be limited to minor adjustments prior to compaction. Addition of moisture shall be by using a

pressure spray bar mounted in front of or to one side of a water tanker so that water will not collect in the tracks of the truck.

4. Compaction of fill materials shall not commence if the moisture content is not within the specified limits. Any materials that are placed but not compacted prior to drying out or becoming too wet shall be removed and replaced or reprocessed at the Contractor's expense.
5. No admixtures as drying agents or to improve the workability of the soil will be allowed.

3.05 SOIL LINERS

A. Sources

The Soil Liners for the Gypsum Management Facility shall be constructed from Soil Liner Material as described in paragraph 2.01(B) above.

B. Test Liner

A compacted low permeability soil test liner of the actual full scale liner shall be constructed in accordance with the following requirements:

1. Test liner will be constructed from the same soil material sources, to the same design specifications, and with similar equipment and procedures as are proposed for the full scale liner.
2. Test liner will be at least four times the width of the widest piece of equipment to be used.
3. Test liner will be no less than 100 ft long to allow equipment to reach normal operating speed before reaching a central 40-ft test area.
4. Test liner will be constructed with maximum 8-in. compacted lifts for a total liner thickness of 3 ft.
5. Test liner will be tested by the Owner's Testing Consultant as described below for each of the following physical properties:

   a. Multiple two-stage Boutwell permeameter tests will be used on the test liner to determine the hydraulic conductivity. The two-stage field hydraulic conductivity test is a falling head infiltration test conducted in a cased borehole, typically 4 in. in diameter. The test is cited in the U.S. EPA Technical Guidance Document: Quality Assurance and Quality Control for Waste Containment Facilities, September 1993 (EPA/600/R-93/182).
   b. Undisturbed samples (Shelby tubes) will be tested in the laboratory for hydraulic conductivity to determine if there is a statistical correlation to the field testing results.
   c. Other engineering parameters including, but not limited to, particle size analysis, liquid limits, plasticity, water content, and in-place density that are needed to evaluate the full scale liner will be determined.

6. Additional test fills will be constructed for each new soil type or for each change in equipment or procedures.

C. Full Scale Liner Construction:

1. Full scale liner construction shall not be commenced until the results of the in-place compaction testing and Boutwell permeameter tests on the test liner confirm that the construction procedures and specified compaction requirements produce a in-situ hydraulic conductivities as specified in Section 2.01(B) above.
2. The liner shall be constructed according to the placement and compaction requirements for general fill, except the material shall be compacted to a density of no less than 95 percent of maximum dry density at a moisture content between 100 percent and 105 percent of optimum. The same compaction procedures, such as number of passes, speed, and compaction equipment used on construction of the test liner shall be used. Grade stakes shall not be driven into the clay liner.
3. The completed liner shall be smooth rolled to limit moisture loss and promote run-off of surface water. Moisture content shall be maintained within the specified range and erosion or other damage that occurs in the soil liner shall be repaired as directed by the Owner's Representative until the geosynthetic liner is placed.
4. Repair of any rutting or other damage caused by the installation of the geosynthetic liner will be paid for on a time and material basis.
5. Voids created in the clay barrier layer during construction (including, but not limited to, penetrations for test samples, and other penetrations necessary for construction) shall be repaired by removing material that does not meet the requirements for low permeability soil, placing low permeability soil backfill, granular or pelletized bentonite, or a mixture of bentonite and low permeability soil in lifts no thicker than 2 in. and tamping each lift with a steel rod. Each lift shall be tamped a minimum of 25 times altering the location of the rod within the void for each blow. Other ruts and depressions in the surface of the lifts shall be scarified, filled, and then compacted to grade.

3.06 CUSHION DIRT

Cushion Dirt to be placed beneath the upper High Density Polyethylene (HDPE) Geomembrane is to be placed to the specifications for General Fill in Section 3.04 above, except fill materials for Cushion Dirt shall be compacted to a dry density equal to or greater than 90 percent of the maximum dry density obtained from the Standard Proctor Test, ASTM D698.

3.07 ANCHOR TRENCH CONSTRUCTION

A. Gypsum Management Facility

1. A ledge at the bottom of the anchor trench elevation shall be excavated. Low permeability soil shall be placed and compacted on the ledge as shown on the anchor trench details in the plans.

2. The anchor trench shall be excavated to the depth and width shown on the anchor trench details. The front edge of the trench shall be rounded to eliminate any sharp corners that could cause excessive stress to the geosynthetic liners. Loose soil shall be removed or compacted into the floor of the trench.

3. Subsequent to Geosynthetic Clay Liner (GCL), Bottom HDPE Geomembrane and Geotextile Cushion installation, it shall be verified that the liners cover the entire trench floor, but do not extend up the back of the trench wall. After the liner installation in the trench has been inspected and approved by the Owner's Representative, the trench shall be backfilled with 1 ft. of low permeability soil. The backfill shall be deposited and compacted according to the requirements for general fill in such a manner as to prevent damage to the GCL and liner materials.

4. Subsequent to installation of separation geotextile on top of drainage layer, it shall be verified that the fabric extends across the top of the initial 1 ft layer of trench backfill, but does not extend up the back of the trench wall. After the fabric installation in the trench has been inspected and approved by the Owner's Representative, the trench shall be backfilled with 1 ft of low permeability soil. The backfill shall be deposited and compacted according to the requirements for general fill in such a manner as to prevent damage to the geotextile fabric.

5. Subsequent to installation of the upper HDPE Geomembrane, verify that the liner extends across the top of the initial 1 ft layer of trench backfill, but does not extend up the back of the trench wall. After the liner installation in the trench has been inspected and approved by the Owner's Representative, backfill the remainder of the trench to the top of the low permeability soil layer. Deposit and compact the backfill according to the requirements for general fill in such a manner as to prevent damage to the HDPE Geomembrane.

3.08 TESTING

A. Construction Quality Assurance (CQA) compaction and permeability tests will be made by the Owner's Testing Consultant during the progress of the work as indicated in Appendix 2. The Contractor shall cooperate with the Testing Consultant and allow such tests to be performed.

B. If tests indicate that an area of fill or low permeability soil liner does not meet the specified requirements, additional tests shall be performed to determine the extent of non-compliance. The Contractor shall moisture condition and recompact that area until a passing test result is obtained.

3.08 FINISH GRADING

All excavated and filled areas shall be fine graded and leveled to provide a smooth finish free of debris, foreign matter, objectionable stones, clods, lumps, pockets, or high spots, properly drained and true to indicated elevations. Finish grading shall be only near completion of work or when requested. Any portions of the berm damaged by construction shall be restored. The berm ditch shall be finished to design grade, and the ditch side slopes shaped and trimmed to provide a uniform ditch cross section.

3.09 CONSTRUCTION TOLERANCES

A. The foundation grade and finished earthwork grades shall be no more than 0.4 ft below and not above plan grade.

B. The minimum thickness of low permeability soil layer shall be 3 ft.

END OF SECTION 02200

I:\05jobs\05x3004A\Gypsum Stacking\IDNR Dam Safety Permit Application\Specs\S02200_Earthwork.doc

PART 1. GENERAL

1.01 DESCRIPTION

This section pertains to the placement of riprap for erosion control.

1.02 RELATED SECTIONS

The following section contains items which are related to the work in this section:

02200 - Earthwork

1.03 REFERENCES

Specified references or cited portions thereof, current at date of bidding documents unless otherwise specified, govern the work.

A. Illinois Department of Transportation (IDOT): Standard Specifications for Road and Bridge Construction, adopted January 1, 2007.

1.04 SUBMITTALS

Product Data: Provide quarry name and material type prior to delivery.

PART 2. PRODUCTS

2.01 MATERIALS

A. Stone Riprap and Bedding materials according to Article 1005.01 of the Illinois Standard Specifications for Road and Bridge Construction.

B. Filter Fabric material for Stone Riprap according to Article 1080.03, with an AOS (Apparent Opening Size) as indicated on the plans.

C. Supplier shall be listed on the current IDOT Approved Aggregate Source List.

D. Gradation as indicated in the drawings. Quality shall be Class A.

PART 3. EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

A. Stone Riprap and Bedding shall be installed in accordance with Section 281 of the Illinois Standard Specifications for Road and Bridge Construction for the placement of Stone Riprap. Measurement and payment provisions of Section 281 shall not apply.

B. Filter Fabric for Stone Riprap shall be installed in accordance with Section 282 of the Illinois Standard Specifications for Road and Bridge Construction.

C. The Owner's Representative shall be allowed to visually inspect Riprap for compliance with specifications prior to placement.

END OF SECTION 02275

PART 1. GENERAL

1.01 DESCRIPTION

A. Gypsum Management Facility

This section pertains to the following:

1. Furnishing and placing granular drainage materials for the drainage layer and leachate collection system.
2. Furnishing and placing coarse aggregate for encasement of the ring drain collection piping.
3. Furnishing and installing materials for roadbed construction related to the Gypsum Management Facility access roads and the McKinley Road relocation.
4. Recycle Pond Drain.

1.02 RELATED SECTIONS

The following sections contain items which are related to the work in this section:

1. 02300 - Earthwork
2. 02373 – Geotextiles
3. 02640 - HDPE Piping

1.03 REFERENCES

The following references, or cited portions thereof, govern the work:

1. Illinois Department of Transportation (IDOT): Standard Specifications for Road and Bridge Construction, adopted January 1, 2007.
2. American Society for Testing and Materials (ASTM):

   a. ASTM D 75 (2003) Practice for Sampling Aggregates.
   b. ASTM D 422 (1963; R 2002) Test Method for Particle-Size Analysis of Soils.
   c. ASTM D 2434 (1968, R 2000) Test Method for Permeability of Granular Soils (Constant Head).
   d. ASTM D 3042 (2003) Test Method for Insoluble Residue in Carbonate Aggregates.
   e. ASTM C 1260 (2005) Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method).

3. American Geological Institute (AGI). Geoscience Handbook AGI Data Sheets, 4th Edition.

1.04 MEASUREMENT AND PAYMENT

The Contractor shall be responsible for estimating the extent of granular materials required to complete the work including, but not limited to, construction of drainage layer, encasement of leachate collection piping, and road-bed construction. The Contractor shall include the dollar amount associated with furnishing and placing all granular materials in his Lump Sum Bid amount.

1.05 COORDINATION

A. The geosynthetic liner shall be covered with granular materials as soon as practicable after a section of liner has been approved by the Owner's Representative.

1.06 SUBMITTALS

A. Product Data:

1. Aggregate source list: Submit a list of proposed aggregate sources.

2. Shipping Tickets: Submit shipping tickets for the granular materials delivered to the site. Shipping tickets shall be according to paragraph 1004.01f of the IDOT Standard Specifications.

B. Test Reports.

1. Submit results of grain size analysis (ASTM D422) and hydraulic conductivity testing (ASTM D2434) for gradations established by the Contractor that provide the specified hydraulic conductivity. Test results are required for each proposed source and gradation. Submit test results for each source demonstrating compliance with reactivity, soundness, and abrasion requirements specified herein.

C. Samples:

1. Submit one sample per source for each gradation proposed for use on the project. Samples shall be at least one pound and shall be obtained and shipped according to ASTM D75. Submit samples at least 15 days prior to starting construction of the drainage layer and coarse aggregate encasement for leachate piping.

1.07 STORAGE AND HANDLING

A. Storage and handling of granular materials shall be according to paragraph 1004.01e of the IDOT Standard Specifications.

1.01

PART 2. PRODUCTS

2.01 MATERIALS

A. General

1. Unless otherwise approved by the Owner's Representative, granular materials shall be obtained from sources listed on the current IDOT Approved Aggregate Source List (www.dot.il.gov\materials\approvedaggregatesources.pdf).
2. Coarse Granular materials shall be meet the Description of Gravel, as described in Section 1004.01(a)(1) of the IDOT Standard Specifications, and shwll be spherical to sub-discoidal, sub-rounded to well rounded particles as defined by AGI Data Sheet, 4th Edition, Sheet 8.4 – Comparison Charts for Estimating Roundness and Sphericity.
3. Granular materials shall experience no more than 15 percent carbonate loss per ASTM D3042.
4. Granular materials shall be free of deleterious material, and shall meet the Na_2SO_4 soundness and Los Angeles Abrasion Specifications for Class B quality aggregate per paragraph 1004.01 of the IDOT Standard Specifications.
5. All material shall pass the 2 in. sieve, and no greater than 5 percent shall be retained on the No. 200 sieve.
6. Granular materials shall be innocuous to alkali-silica reactivity, and shall exhibit internal expansions of less than 0.10 percent at 16 days after casting as determined by ASTM C 1260.

B. Gypsum Management Facility Granular Materials

1. Granular Materials for Drainage Layer

   Gradation for granular material for drainage layer shall be as required to provide a minimum hydraulic conductivity (ASTM D2434) of 1 x 10^{-3} cm/sec.

2. Coarse Aggregate around Ring Drain Collection Piping

   Coarse Aggregate used to encase the ring drain collection piping shall be IDOT Gradation CA 7 material as outlined in Article 1004.01 of the IDOT Standard Specifications for Road and Bridge Construction.

3. Filter Sand

   Filter Sand used for protective cover over the ring drain collection system shall be IDOT Gradation FA 1, Class B or better according to Article 1003 of the IDOT Standard Specifications for Road and Bridge Construction.

4. Aggregate Base Course, Type B

   Aggregate Base Course, Type B used for base material for all new access roads and shall be IDOT Gradation CA 2, in accordance with Section 1004.04 of the IDOT Standard Specifications for Road and Bridge Construction. The material shall originate from an IDOT approved source. The Na_2SO_4 soundness and Los Angeles Abrasion Specifications for Class B quality aggregate per paragraph 1004.01 of the IDOT Standard Specifications shall not apply.

5. Aggregate Surface Course, Type B

   Aggregate Surface Course, Type B used for surface material for all new access roads and the McKinley Road relocation shall be IDOT Gradation CA 6, in accordance with Section 1004.04 of the IDOT Standard Specifications for Road and Bridge Construction. The material shall originate from an IDOT approved source. The Na_2SO_4 soundness and Los Angeles Abrasion Specifications for Class B quality aggregate per paragraph 1004.01 of the IDOT Standard Specifications shall not apply.

2.02 EQUIPMENT

Equipment for spreading and compacting granular materials shall be low ground pressure equipment to prevent damage to the underlying geosynthetic liners.

PART 3. EXECUTION

3.01 PROTECTION OF GEOSYNTHETICS

A. Protection of the geosynthetic liners is critically important. Approved geosynthetic liner shall be covered by granular material as soon as practicable. Granular material shall be placed to a minimum thickness of 1 ft before any heavy equipment or loaded trucks are allowed on the lined area.

B. No equipment will be permitted directly on the geosynthetic liner.

C. Any damage to the geosynthetic liner system shall be repaired, as directed by the Owner's Representative, at the expense of the Contractor.

3.02 GRANULAR DRAINAGE LAYER (GYPSUM MANAGEMENT FACILITY)

A. Placement on Cell Floor

1. The granular material shall be back-dumped on the geotextile cushion fabric in a sequence of operations beginning at the perimeter of the liner on the cell floor.
2. Placement of material on the fabric shall be accomplished by spreading dumped material off of previously placed material with a bulldozer blade or endloader, in such a manner as to prevent tearing or shoving of the cloth. Dumping of material directly on the fabric will only be permitted to establish an initial working platform. No vehicles or construction equipment shall be allowed on the fabric prior to placement of the granular blanket to a minimum thickness of 1 ft.

B. Placement on Cell Side Slopes

1. Placement of granular material on cell side slopes shall be accomplished using methods and equipment similar to that specified for placement of material on cell floor.
2. The Contractor may place gypsum underlain with separation geotextile fabric to buttress the granular material on the slope:

   a. The Construction Quality Assurance (CQA) survey to certify thickness of drainage material shall be completed within the footprint of the gypsum stack before gypsum placement.

b. Separation geotextile fabric shall extend beyond the toe of gypsum buttress a sufficient distance to prevent contamination of the granular drainage layer. See Sections 02373 and 02320 for construction of separation geotextile fabric and gypsum, respectively.

3.04 COARSE AGGREGATE FOR ENCASEMENT OF RING DRAIN COLLECTION PIPING (GYPSUM MANAGEMENT FACILITY)

A. The geotextile filter fabric for encasement of leachate collection piping shall be placed on the approved cushion geotextile fabric according to Section 02373 – Geotextiles.

B. The coarse aggregate shall be placed on the encasement fabric to the width shown on the plans to the level of the bottom of the ring drain collection piping.

C. Course aggregate shall be placed and tamped along the pipe during pipe installation. The coarse aggregate shall be placed longitudinally along the pipe in lifts not to exceed 8 in. thick to a height of at least the center of the pipe. The aggregate shall be maintained at equal elevation on each side of the pipe, and the first lift of material shall be mechanically tamped to ensure that the space under the pipe is completely filled. The top of pipe shall not be covered until the CQA survey certifies leachate piping grade has been completed.

C. After the CQA survey has been completed, coarse aggregate material shall continue to be placed in lifts not to exceed 8 in. thick, as specified in the previous paragraph until the minimum cover height shown in the plans is attained.

D. The running of trucks or heavy equipment over leachate piping shall be avoided until there is at least a 12 in. cover of Filter Sand over the completed geotextile envelop. Temporary ramps no steeper than 10H:1V transverse to the piping shall be provided for temporary equipment crossings until the first lift of gypsum is placed.

3.03 ROADWAY CONSTRUCTION

A. Prepare the roadway subgrade as shown on the plans, in accordance with Section 02200 – Earthwork.

B. Furnish Geotechnical Fabric for Ground Stabilization in accordance with Section 02373 – Geotextiles.

C. Furnish Aggregate Base Course, Type B in accordance with Article 351 of the IDOT Standard Specifications for Road and Bridge Construction.

D. Furnish Aggregate Surface Course, Type B in accordance with Article 402 of the IDOT Standard Specifications for Road and Bridge Construction.

3.04 TESTING

A. CQA gradation and permeability tests will be made by the Owner's Testing Consultant during the progress of the work as indicated in Appendix 2. The Contractor shall cooperate with the Testing Consultant and allow such tests to be performed.

B. If tests indicate that an area of granular material or coarse aggregate does not meet the specified requirements, then the Contractor shall remove the material and replace it with suitable material.

3.05 FINISH GRADING

The granular drainage layer shall be fine graded to provide a smooth finish before a CQA survey of the completed portion of the drainage layer is requested. Ruts or erosion damage shall be repaired before placement of the separation geotextile fabric.

3.06 CONSTRUCTION TOLERANCES

The minimum thickness of drainage layer shall be 1 ft.

END OF SECTION 02315

PART 1. GENERAL

1.01 DESCRIPTION

This section pertains to furnishing and installing geotextile fabrics on prepared surfaces.

1.02 RELATED SECTIONS

The following sections contain items which are related to the work in this section:

1. 02300 - Earthwork
2. 02315 - Granular Materials
3. 02800 – HDPE Geomembrane

1.03 REFERENCES

The following references, or cited portions thereof, govern the work:

1. Illinois Department of Transportation (IDOT): Standard Specifications for Road and Bridge Construction, adopted January 1, 2007.
2. American Society for Testing and Materials (ASTM):

    a. ASTM 3776 (1996; R 2002) Standard Test Method for Mass per Unit Area (Weight) of Fabric;
    b. ASTM D 3786 (2001) Test Method for Hydraulic Bursting Strength of Textile Fabrics – Diaphragm Bursting Strength Tester Method;
    c. ASTM D 4533 (2004) Test Method for Trapezoid Tearing Strength of Geotextiles;
    d. ASTM D 4632 (1991; R 2003) Test Method for Grab Breaking Load and Elongation of Geotextiles;
    e. ASTM D 4751 (2004) Test Method for Determining Apparent Opening Size of Geotextile;
    f. ASTM D 4833 (2000) Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products;
    g. ASTM D 4873 (2002) Guide for Identification, Storage, and Handling of Geosynthetic Rolls;
    h. ASTM D 4884 (1996; R 2003) Test Method for Strength of Sewn or Thermally Bonded Seams of Geotextiles;
    i. ASTM D5261-92(2003) Standard Test Method for Measuring Mass per Unit Area of Geotextiles

j. ASTM D6241-04 Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe

1.04 MEASUREMENT AND PAYMENT

A. The Contractor shall be responsible for estimating the extent of geotextile fabric required to complete the work including fabric for laps, anchorage, repairs, and samples for Construction Quality Assurance (CQA) testing. The Contractor shall include the dollar amount associated with all geotextile construction in his Lump Sum Bid amount, except as specified in paragraph B.

B. Geotextile fabric for ground stabilization, when directed by the Owner's Representative, will be paid for on a time and materials basis.

C. No additional payment will be made for geotextile fabric for ground stabilization installed at the Contractor's discretion.

1.05 SUBMITTALS

A. Product Data

1. The manufacturer's list of guaranteed properties for each geotextile fabric or geogrid proposed for use on the project shall be submitted.
2. The manufacturer's installation guidelines shall be submitted.

B. Samples

Samples of geotextile fabrics shall be submitted for CQA prequalification testing. Sample size and sampling frequency are specified in Appendix 2.

C. Inventory

A copy of the roll inventory that identifies, as a minimum, manufacturer or supplier, product or style number, roll number, width, and length of roll as identified on the roll label shall be submitted.

1.06 STORAGE AND HANDLING

Geotextiles shall be stored and handled according to ASTM D4873.

PART 2. PRODUCTS

2.01 MATERIALS

A. Geotextile Fabric for Liner System

Geotextile fabrics for use in the cell liner system shall consist of non-woven filaments of polypropylene, polyester, or polyethylene. Stabilizers and/or inhibitors shall be added to the base polymer if necessary to make the filaments resistant to deterioration caused by ultraviolet light and heat exposure. Reclaimed or recycled fibers or polymer shall not be added to the formulation. Non-woven fabric may be needle-punched, heat-bonded, or a combination thereof. The filaments shall be dimensionally stable (i.e., filaments shall maintain their relative position with respect to each other) and resistant to delamination. The edges of the geotextile shall be finished to prevent the outer fiber from pulling away from the geotextile. The filaments shall be free from any chemical treatment or coating that might significantly reduce porosity and permeability.

Fabric shall have the following physical properties:

Physical Properties(1)	**4 oz. (Separation)**	**6 oz. (PWRS)**	**16 oz. (CA Envelope)**
Mass/Unit Area (oz./yd^2) ASTM D5261	4.0	6.0	16.0
Grab Tensile Strength (lb.) ASTM D4632	115	160	380
Grab Elongation (%) ASTM D4632	50	50	50
Puncture Strength (lb.) ASTM D4833	65	85	240
Puncture (CBR) Strength (lb.) ASTM D6241	310	410	1025
Mullen Burst Strength (psi) ASTM D3786	210	280	750
Trapezoidal Tear Strength (lb.) ASTM D4533	50	60	150
Width (ft.)	15	15	15
Apparent Opening Size (AOS) Max. US Std. Sieve No. ASTM D4751	70	70	100
UV Resistance(2) (%) ASTM D4355	70	70	70
Roll Width (ft.)	15	15	15

Notes:

(1) All Values listed are Minimum Average Roll Values (MARV) unless otherwise noted, calculated as the typical minus two standard deviations..

(2) UV Resistance is a minimum value and not a MARV. Evaluation to be on 2.0 inch strip tensile specimens after 500 hours exposure.

A. Cushion Geotextile Fabric.

Cushion geotextile fabric shall consist of non-woven filaments of polypropylene, polyester, or polyethylene. Stabilizers and/or inhibitors shall be added to the base polymer if necessary to make the filaments resistant to deterioration caused by ultraviolet light and heat exposure. Reclaimed or recycled fibers or polymer shall not be added to the formulation. Non-woven fabric may be needle-punched, heat-bonded, or a combination thereof. The filaments shall be dimensionally stable (i.e., filaments shall maintain their relative position with respect to each other) and resistant to delamination. The edges of the geotextile shall be finished to prevent the outer fiber from pulling away from the geotextile. The filaments shall be free from any chemical treatment or coating that might significantly reduce porosity and permeability.

Fabric shall have the following physical properties:

Physical Properties[1]	**10 oz. (Cushion)**
Mass per unit area (oz/yd^2) ASTM D5261	10
Grab Tensile Strength (lb.) ASTM D4632	230
Grab Tensile Elongation (%) ASTM D4632	50
Trapezoidal Tear Strength (lb.) ASTM D4533	95
Puncture (CBR) Strength (lb.) ASTM D6241	700
Puncture (CBR) Elongation (in.) ASTM D6241	1.5
UV Resistance[2] (%) ASTM D4355	70
Apparent Opening Size (Max.) (AOS) Sieve No. - ASTM D4751	---
Roll Width (ft.)	15

Notes:

(1) All Values listed are Minimum Average Roll Values (MARV) unless otherwise noted, calculated as the typical minus two standard deviations..

(2) UV Resistance is a minimum value and not a MARV. Evaluation to be on 2.0 inch strip tensile specimens after 500 hours exposure.

B. Geotechnical Fabric for Ground Stabilization

Geotechnical fabric for ground stabilization shall conform to Article 1080.02 of the IDOT Standard Specifications for Road and Bridge Construction.

C. Thread for Seams

High strength thread should be used such that seam test should conform to ASTM D4884. The thread shall meet the chemical, ultraviolet, and physical requirements of the geotextile, and the color shall be different from that of the geotextile.

D. Securing Devices

Pins, staples, and other devices that project through the geotextile fabric are not permitted for fabrics installed above the geomembrane. Sandbags, stone, or other appropriate means approved by the Owner's Representative shall be used to prevent movement of the geotextile.

2.02 EQUIPMENT

A. Equipment for spreading and compacting granular materials shall be low ground pressure equipment to prevent damage to the underlying geosynthetic liners.

PART 3. EXECUTION

3.01 SAMPLES FOR CQA TESTING

A. Geotextile fabric samples shall be obtained, identified and packaged from rolls designated by the Owner's Representative according to ASTM D4873.

B. Samples shall be 3 ft. wide by the full roll width.

3.02 BASE PREPARATION

A. Surface on which the geotextile will be placed shall be prepared to a relatively smooth surface condition, and shall be free from obstruction, debris, depressions, erosion features, or any irregularities that would prevent continuous, intimate contact of the geotextile with the entire surface. Rills, gullies, and ruts must be graded out of the surface before geotextile placement. Areas on which geotextile are to be placed shall be graded and/or dressed in accordance with Section 02200 – Earthwork and Section 02315 – Granular Drainage Materials. Immediately prior to placing the geotextile, the prepared base will be inspected by the Owner's Representative, and no material shall be placed thereon until that area has been approved.

B. Geotextile cushion fabric will be installed directly on the geosynthetic liner. Jointly inspect the liner with the Owner's Representative before commencing fabric installation each day. Notify the Owner's Representative promptly of any damage or defects observed in the liner as fabric installation progresses. Do not place fabric in the damaged or defective area until the liner has been repaired and approved by the Owner's Representative. Submit a daily inspection report identifying the area of fabric placement and certifying that there were no visible defects in the area of fabric placement.

C. Do not run heavy vehicle traffic directly on the geosynthetic liner or cushion geotextile. Use vehicles and equipment as specified in paragraph 2.02 to transport and deploy fabric on the liner. Operate the equipment with care, and place protective cover over the geomembrane, if necessary, to avoid damaging the liner. Route traffic and personnel over installed cushion fabric and use the installed fabric as a working platform to the greatest extent possible.

3.03 INSTALLATION

A. General Requirements:

1. Geotextile fabric shall be unrolled and laid out following these requirements to the greatest extent practical:

a. Orient panels with the longest dimension parallel to the slope.
b. Minimize the number of seams in corners and odd-shaped areas.
c. Extend panels on slopes a minimum of 5 ft onto a horizontal surface.

Geotextile panels shall be unrolled using methods that will not damage the fabric and will protect underlying surface from damage. While unrolling, the geotextile fabric shall be visually inspected for imperfections and faulty or suspect areas marked. Ballast shall be placed on fabric to prevent wind uplift. Expansion and contraction should be allowed for by leaving slack.

Heavy vehicle traffic shall not be run directly on geotextile fabric. Fabric in areas of heavy traffic shall be protected with protective cover over the fabric.

2. Laps

Individual panels of geotextile fabric shall be lapped according to manufacturer's instructions and as specified herein. Provide a minimum overlap of 3 in. unless otherwise specified herein or in the plans. Shingle overlaps so that water or other material cannot run down the slope between the two layers of fabric.

3. Field Seams

Continuously sew all laps on slopes steeper than 10H:1V. This requirement does not apply to the heavy geotextile fabric for envelopment of coarse aggregate around leachate piping.

4. Defects and Repairs

Examine the installed geotextile fabric for defects, holes discontinuous seams, puckered or separated laps, etc. Repair defective laps and seams. Patch holes and defects according to manufacturer's recommendations and as directed by the Owner's Representative. Do not cover suspect or patched areas until they have been inspected and approved by the Owner's Representative.

B. Geotextile Fabric for Separation

1. Use low ground pressure equipment to avoid rutting the granular material.
2. Horizontal seams (parallel to top of slope) will be permitted on cell side slopes to facilitate staged construction of the drainage layer on the side slope.
3. Extend separation geotextile fabric into and across the bottom of the anchor trench and complete backfill of the trench according to Section 02200.

C. Geotextile Fabric for Coarse Aggregate Envelope

1. Geotextile for coarse aggregate envelope will be installed directly on the cushion fabric. Remove any foreign materials from the cushion fabric within the footprint of the coarse aggregate leachate piping encasement before installing the geotextile envelope. Place sufficient width to completely envelop the coarse aggregate and provide a longitudinal lap of at least 6 in.
2. After the coarse aggregate encasement has been completed, according to Section 02315, wrap the geotextile around the mounded aggregate, and cover the lap with at least 6 in. of material before permitting vehicle or equipment on the fabric.
3. Any ballast material other than coarse aggregate, according to Section 02315, that is placed within the envelope will require removal during coarse aggregate construction.

D. Geotechnical Fabric for Ground Stabilization

1. Install Geotechnical Fabric for Ground Stabilization in accordance with Section 210 of the IDOT Standard Specifications for Road and Bridge Construction.

2. If approved by the Owner's Representative, the Contractor may, at his own expense, install geotextile or geogrid for ground stabilization outside the limits designated by the Owner's Representative.
3. Submit as-built drawings that clearly delineate limits and type of ground stabilization.

3.04 PROTECTION

A. Protect installed fabric until it is covered by at least 1 ft. of overlying material.

B. Any damage to the geotextile during its installation or during placement of overlying materials shall be replaced by the Contractor at no cost to the Owner. Unless otherwise noted, the work shall be scheduled so that the covering of the geotextile with a layer of the specified material is accomplished within 14 calendar days after placement of the geotextile. Failure to comply shall require replacement of geotextile. The geotextile shall be protected from damage prior to and during the placement of overlying materials. Before placement of overlying materials, the Contractor shall demonstrate that the placement technique will not cause damage to the geotextile.

3.05 TESTING AND INSPECTION

A. Prequalification Testing

Geotextiles are subject to CQA testing by the Owner's Testing Consultant to verify conformance with the manufacturer's list of guaranteed properties according to Appendix 2. The Contractor shall provide samples as specified herein. If tests indicate nonconformance to the list of guaranteed properties, provide additional samples as directed by the Owner's Representative to determine the extent of the non-conformance. Any fabric that does not conform to the list of guaranteed properties shall be removed from the site.

B. Installed fabric shall be inspected by the Owner's Representative. No material shall be placed on the fabric, other than ballast, until the installation has been approved by the Owner's Representative. Ballast shall not obscure seams or significant length of unseamed laps. The Owner's Representative may require removal of ballast to inspect suspect areas.

C. If the Owner's Representative suspects that completed work has been damaged by construction methods that do not conform to the specifications, he may require removal of completed work to verify the integrity of the underlying materials. The Contractor shall bear the cost of removal and subsequent repair as directed by the Owner's Representative.

END OF SECTION 02373

PART 1. GENERAL

1.01 DESCRIPTION

A. This section covers furnishing and installation of a reinforced needlepunched Geosynthetic Clay Liner (GCL) at the Gypsum Management Facility and the CCB Management Facility.

B. The work includes furnishing all equipment and materials, providing all labor, supervision, administration and management necessary to perform the work as specified herein and as shown on the plans.

1.02 RELATED SECTIONS

None.

1.03 REFERENCES

The following references, or cited portions thereof, govern the work

1. American Society for Testing and Materials (ASTM):

   a. ASTM D 4632 (1991; R 2003), Standard Test Method for Grab Breaking Load and Elongation of Geotextiles;
   b. ASTM D 4643 (2000), Test Method for Determination of Water (Moisture) Content of Soil by the Microwave Oven Method;
   c. ASTM D 5084 (2003), Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter;
   d. ASTM D 5261 (1992; R 2003), Test Method for Measuring Mass Per Unit Area of Geotextiles;
   e. ASTM D 5321 (2002), Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method;
   f. ASTM D 5887 (2004), Test Method for Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter;
   g. ASTM D 5888 (1995; R 2002), Practice for Storage and Handling of Geosynthetic Clay Liners;
   h. ASTM D 5889 (1997; R 2003), Practice for Quality Control of Geosynthetic Clay Liners;

i. ASTM D 5890 (2002), Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners;
j. ASTM D 5891 (2002), Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners.

1.04 SUBMITTALS

A. With the bid, the Contractor shall furnish the following information:

1. Conceptual description of the proposed plan for placement of the GCL panels over the areas of installation.
2. GCL Manufacturer's Quality Control (MQC) Plan for documenting compliance with Sections 2.01 and 2.02 of these specifications.
3. GCL manufacturer's historical data for reinforced GCL of a) 10,000-hour creep shear testing per Section 2.01 D, and b) seam flow data at 2 psi confining pressure per Section 2.01 E.
4. A copy of GCL manufacturer's International Standards Organization (ISO) Quality Certificate of Registration.
5. Statement of experience from the proposed GCL supplier.
6. Statement of experience from the proposed GCL installer.

B. At the Owner Representative's or Owner's request, the Contractor shall furnish:

1. A representative sample of the GCLs.
2. A project reference list for the GCL(s) consisting of the principal details of at least ten projects totaling at least 10 million sq. ft (100,000 sq. meters) in size.

C. Upon shipment, the Contractor shall furnish:

1. The GCL manufacturer's Quality Assurance/Quality Control (QA/QC) certifications to verify that the materials supplied for the project are in accordance with the requirements of this specification.
2. Inventory of materials received.

D. As installation proceeds, the Contractor shall submit certificates of subgrade acceptance, signed by the Contractor and Construction Quality Assurance (CQA) Inspector (see Sections 1.06 and 3.03) for each area that is covered by the GCL.

E. Warranty

After construction, the contractor shall submit material and installation warranty certificates.

1.05 QUALIFICATIONS

A. GCL Manufacturer must have produced at least 10 million sq. ft. (1 million sq. meters) of GCL, with at least 8 million sq. ft. (800,000 sq. meters) installed.

B. The GCL Installer must either have installed at least 1 million sq. ft. (100,000 sq. meters) of GCL, **or** must provide to the Engineer satisfactory evidence, through similar experience in the installation of other types of geosynthetics, that the GCL will be installed in a competent, professional manner.

1.06 CONSTRUCTION QUALITY ASSURANCE (CQA)

A. The Owner shall provide a third-party inspector for CQA of the GCL installation. The inspector shall be an individual or company who is independent from the manufacturer and installer and who shall be responsible for monitoring and documenting activities, related to the CQA of the GCL throughout installation.

B. Testing of the GCL as necessary to support the CQA effort shall be performed by a third party laboratory retained by the Owner and independent from the GCL manufacturer and installer.

WARRANTY

The geomembrane material shall be warranted, on a pro-rata basis against manufacturer's defects for a period of five (5) years from the date of liner installation. The installation shall be warranted against defects in workmanship for a period of (1) year from the date of liner completion.

PART 2. PRODUCTS

2.01 MATERIALS

A. Acceptable products for the GCL are GCL Bentomat® SDN, as manufactured by CETCO, 1350 West Shure Drive, Arlington Heights, Illinois 60004 USA (847-392-5800), or an engineer-approved reinforced needlepunched GCL material equal to Bentomat SDN.

B. The delineation of areas to receive GCL shall be agreed by the Installer and the Engineer prior to installation.

C. The GCL and its components shall have the properties shown in the GCL Certified Properties table at the end of this section.

D. The reinforced GCL shall have 10,000 hour test data for large-scale constant-load (creep) shear testing for related products under hydrated conditions. The displacement shall be 0.13 in. (3.3 mm) or less at a constant shear load of 250 psf (12 kPa) and a normal load of 500 psf (24 kPa).

E. The reinforced GCL shall have seam test data from an independent laboratory showing that the seam flow with a grooved cut in one of the nonwoven geotextiles is less than 1×10^{-8} $m^3/m^2/s$ at 2 psi hydraulic pressure.

F. The minimum acceptable dimensions of full-size GCL panels shall be 150 ft. (45.7 m) in length. Short rolls [(those manufactured to a length greater than 70 ft. (21 meters) but less than a full-length roll)] may be supplied at a rate no greater than three (3) per truckload or three (3) rolls every 36,000 sq. ft. (3,500 sq. meters) of GCL, whichever is less.

G. A 6-inch (150 mm) overlap guideline shall be imprinted on both edges of the upper geotextile component of the GCL as a means for providing quality assurance of the overlap dimension. Lines shall be printed in easily visible, non-toxic ink.

2.02 PRODUCT QUALITY DOCUMENTATION

The GCL manufacturer shall provide the Contractor or other designated party with manufacturing QA/QC certifications for each shipment of GCL. The certifications shall be signed by a responsible party employed by the GCL manufacturer and shall include:

A. Certificates of analysis for the bentonite clay used in GCL production demonstrating compliance with the swell index and fluid loss parameters shown in the GCL Certified Properties tables.

B. Manufacturer's test data for finished GCL product(s) of bentonite mass/area, GCL tensile strength and GCL peel strength (reinforced only) demonstrating compliance with the index parameters shown in the GCL Certified Properties tables.

C. GCL lot and roll numbers supplied for the project (with corresponding shipping information).

2.03 PRODUCT LABELING

A. Prior to shipment, the GCL manufacturer shall label each roll, identifying:

1. Product identification information (Manufacturer's name and address, brand product code).
2. Lot number and roll number.
3. Roll length, width and weight.

2.04 PACKAGING

A. The GCL shall be wound around a rigid core whose diameter is sufficient to facilitate handling. The core is not necessarily intended to support the roll for lifting but should be sufficiently strong to prevent collapse during transit.

B. All rolls shall be labeled and bagged in packaging that is resistant to photodegradation by ultraviolet (UV) light.

2.05 ACCESSORY BENTONITE

A. The granular bentonite sealing clay used for overlap seaming, penetration sealing and repairs shall be made from the same natural sodium bentonite as used in the GCL and shall be as recommended by the GCL manufacturer. Seaming of GCLs shall be conducted in accordance with the manufacturer's guidelines for each particular GCL. Please refer to the installation guidelines for Bentomat /Claymax GCLs.

PART 3. EXECUTION

3.01 SHIPPING AND HANDLING

A. The rolls of GCL shall be packaged and shipped by appropriate means to prevent damage to the material and to facilitate off-loading.

B. The Installation Supervisor shall be present during delivery and unloading of the GCL. A visual inspection of each roll should be made during unloading to identify if any packaging has been damaged. Rolls with damaged packaging should be marked and set aside for further inspection. The packaging should be repaired prior to being placed in storage. The Installation Supervisor shall prepare and submit an inventory that includes lot and roll number for materials received.

C. The Installer is responsible for unloading the GCL. The Owner will make available equipment and operators employed at the site to assist with unloading. The Installer shall coordinate with the Owner to determine equipment availability and should contact the Manufacturer prior to shipment to ascertain the appropriateness of the proposed unloading methods and equipment.

3.02 STORAGE

A. Storage of the GCL rolls shall be the responsibility of the Installer. A dedicated storage area shall be provided by the Owner at the job site. Submit storage area requirements (size and preferred location) with bid documents.

B. Rolls should be stored in a manner that prevents sliding or rolling from the stacks and may be accomplished by the use of chock blocks. Rolls should be stacked at a height no higher than that at which the lifting apparatus can be safely handled (typically no higher than four).

C. All stored GCL materials and the accessory bentonite must be covered with a plastic sheet or tarpaulin until their installation.

D. The integrity and legibility of the labels shall be preserved during storage.

3.03 EARTHWORK

A. The low permeability soil layer upon which the GCL is installed shall be prepared and compacted prior to installation. The surface shall be smooth, firm, and unyielding, and free of:

1. Vegetation.
2. Construction debris.
3. Sticks.
4. Sharp rocks.
5. Void spaces.
6. Ice.
7. Abrupt elevation changes.
8. Standing water.
9. Cracks larger than 0.25 in. (6 mm) in width.
10. Any other foreign matter that could contact the GCL.

B. Immediately prior to GCL deployment, the low permeability soil layer shall be final-graded by the contractor to fill in all voids or cracks and then smooth-rolled to provide the best practicable surface for the GCL. At completion of this activity, no wheel ruts, footprints or other irregularities shall exist in the subgrade. Furthermore, all protrusions extending more than 0.5 in. (12 mm) from the surface shall either be removed, crushed or pushed into the surface with a smooth-drum compactor.

C. On a continuing basis, the project CQA inspector shall certify acceptance of the subgrade before GCL placement.

D. It shall be the Installer's responsibility thereafter to indicate to the Owner's Representative any change in the condition of the low permeability soil layer that could cause the subgrade to be out of compliance with any of the requirements listed in this Section. The Installation Supervisor shall certify in the daily report that no GCL was placed over visibly defective low permeability soil surface.

E. At the top of sloped areas of the job site, an anchor trench for the GCL shall be excavated by the contractor in accordance with the project plans. The trench shall be excavated and approved by the CQA Inspector prior to GCL placement. No loose soil shall be allowed at the bottom of the trench and no sharp corners or protrusions shall exist anywhere within the trench.

3.04 GCL PLACEMENT

A. GCL rolls shall be delivered to the working area of the site in their original packaging. Immediately prior to deployment, the packaging shall be carefully removed without damaging the GCL. The orientation of the GCL (i.e., which side faces up) shall be in accordance with the Owner Representative's recommendations.

B. Equipment which could damage the GCL, shall not be allowed to travel directly on it. If the installation equipment causes rutting of the subgrade, the subgrade must be restored to its originally accepted condition before placement continues.

C. Care must be taken to minimize the extent to which the GCL is dragged across the subgrade in order to avoid damage to the bottom surface of the GCL. A temporary geosynthetic subgrade covering commonly known as a slip sheet or rub sheet may be used to reduce friction damage during placement.

D. The GCL panels shall be placed parallel to the direction of the slope.

E. All GCL panels shall lie flat on the underlying surface, with no wrinkles or folds, especially at the exposed edges of the panels.

F. Only as much GCL shall be deployed as can be covered at the end of the working day with soil, a geomembrane, or a temporary waterproof tarpaulin. The GCL shall not be left uncovered overnight. If the GCL is hydrated when no confining stress is present, the Installer shall remove and replace the hydrated material as directed by the Owner Representative.

3.05 ANCHORAGE

A. As directed by the project drawings and specifications, the end of the GCL roll shall be placed in an anchor trench at the top of the slope. The front edge of the trench shall be rounded so as to eliminate any sharp corners. Loose soil shall be removed from the floor of the trench. The GCL shall cover the entire trench floor, but shall not extend up the rear trench wall.

3.06 SEAMING

A. The GCL seams shall be constructed by overlapping their adjacent edges according to the manufacturer's recommendations. Care should be taken to ensure that the overlap zone is not contaminated with loose soil or other debris.

B. The minimum dimension of the longitudinal overlap should be 6 in. (150 mm) for Bentomat SDN. If the GCL is manufactured with a grooved cut in the nonwoven geotextile that allows bentonite to freely extrude into the longitudinal overlap then no bentonite-enhanced seam is required for this overlap. If the GCL does not have a grooved cut in one of the nonwoven geotextiles in the longitudinal overlap, then bentonite-enhanced seams are required as described below.

C. End-of-roll overlapped seams shall be constructed with a minimum overlap of 24 in. (600 mm) for Bentomat SDN. Seams at the ends of the panels should be constructed such that they are shingled in the direction of the grade to prevent the potential for runoff flow to enter the overlap zone. End-of-roll overlapped seams for all reinforced GCL seams require bentonite-enhanced seams as described below.

D. Bentonite-enhanced seams shall be constructed between the overlapping adjacent panels as follows. The underlying edge of the longitudinal overlap is exposed and then a continuous bead of granular sodium bentonite is applied along a zone defined by the edge of the underlying panel and the 6-inch (150 mm) line. The granular bentonite shall be applied at a minimum application rate of one quarter pound per lineal ft. (0.4 kg/m). A similar bead of granular sodium bentonite is applied at the end-of-roll overlap.

3.07 DETAIL WORK

A. There shall be no penetrations through the GCL.

B. Cutting the GCL should be performed using a sharp utility knife. Frequent blade changes are recommended to avoid damage to the geotextile components of the GCL during the cutting process.

3.08 DAMAGE REPAIR

A. If the GCL is damaged (torn, punctured, perforated, etc.) during installation, it may be possible, if approved by the Owner's Representative, to repair it by cutting a patch to fit over the damaged area. The patch shall be obtained from a new GCL roll and shall be cut to size such that a minimum overlap of 12 in. (300 mm) is achieved around all of the damaged area. Granular bentonite or bentonite mastic shall be applied around the damaged area prior to placement of the patch. It may be desirable to use an adhesive to affix the patch in place so that it is not displaced during cover placement. Patching shall be observed and approved by the Owner's Representative.

GCL CERTIFIED PROPERTIES

MATERIAL PROPERTY	TEST METHOD	TEST FREQUENCY $ft^2(m^2)$	REQUIRED VALUES
Bentonite Swell Index[1]	ASTM D 5890	1 per 50 tonnes	24 mL/2g min.
Bentonite Fluid Loss[1]	ASTM D 5891	1 per 50 tonnes	18 mL max.
Bentonite Mass/Area[2]	ASTM D 5993	40,000 ft^2 (4,000 m^2)	0.75 lb/ft^2 (3.6 kg/m^2) min
GCL Grab Strength[3]	ASTM D 6768	200,000 ft^2 (20,000 m^2)	30 lbs/in (53 N/cm) MARV
GCL Peel Strength[3]	ASTM D 6496	40,000 ft^2 (4,000 m^2)	2.5 lbs/in (4.4 N/cm) min
GCL Index Flux[4]	ASTM D 5887	Weekly	1×10^{-8} m^3/m^2/sec max
GCL Hydraulic Conductivity[4]	ASTM D 5887	Weekly	5×10^{-9} cm/sec max
GCL Hydrated Internal Shear Strength[5]	ASTM D 5321 ASTM D 6243	Periodic	500 psf (24 kPa) typ @ 200 psf

Notes

[1] Bentonite property tests performed at a bentonite processing facility before shipment the manufacturer's production facilities.

[2] Bentonite mass/area reported at 0 percent moisture content.

[3] All tensile strength testing is performed in the machine direction using ASTM D 6768. All peel strength testing is performed using ASTM D 6496. Upon request, tensile and peel results can be reported per modified ASTM D 4632 using 4 inch grips.

[4] Index flux and permeability testing with deaired distilled/deionized water at 80 psi (551kPa) cell pressure, 77 psi (531 kPa) headwater pressure and 75 psi (517 kPa) tailwater pressure. Reported value is equivalent to 925 gal/acre/day. This flux value is equivalent to a permeability of 5×10^{-9} cm/sec for typical GCL thickness. Actual flux values vary with field condition pressures. The last 20 weekly values prior the end of the production date of the supplied GCL may be provided.

[5] Peak values measured at 200 psf (10 kPa) normal stress for a specimen hydrated for 48 hours. Site-specific materials, GCL products, and test conditions must be used to verify internal and interface strength of the proposed design.

END OF SECTION 02376

PART 1. GENERAL

1.01 DESCRIPTION

This section pertains to construction of the HDPE (High Density Polyethylene) Piping at the Gypsum Management Facility and the CCB Management Facility.

1.02 RELATED SECTIONS

None.

1.03 REFERENCES

The following references, or cited portions thereof, govern the work

A. American Society of Testing and Materials:

1. ASTM D 2683 (2004); Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.
2. ASTM D 3261 (2003); Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
3. ASTM D 3350 (2005); Specification for Polyethylene Plastics Pipe and Fittings Materials.
4. ASTM F 412 (2001a); Terminology Relating to Plastic Piping System.
5. ASTM F 1055 (1998); Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing.
6. ASTM F 1056 (2004); Specification for Socket Fusion Tools for Use in Socket Fusion Joining Polyethylene Pipe or Tubing and Fittings.

1.04 SUBMITTALS

A. Qualifications

Submit qualifications of the Welding Supervisor who will be responsible for construction quality control of the pipe joining process.

B. Material Certifications

Submit manufacturer certifications that the pipe provided complies with the requirements herein.

C. Product Data

1. Submit product data and operating instructions for pipe joining equipment.
2. Submit pipe manufacturer's recommended procedures for storing, handling, and installing pipe and fittings.

1.05 QUALIFICATIONS

A. The Contractor or Subcontractor performing the work under this section shall have in his employ a Welding Supervisor who has completed a minimum of 1,000 ft of pipe joining work using the type of equipment proposed for use in this work. The Welding Supervisor shall be on site at all times during pipe line installation, and shall provide direct supervision over other employees.

1.06 WARRANTY

A. The pipe and fittings shall be warranted, on a pro-rata basis, against manufacturer's defects for a period of five (5) years from the date of pipe installation. The installation shall be warranted against defects in workmanship for a period of one (1) year from the date of completion of the leachate collection piping system.

PART 2. PRODUCTS

2.01 MATERIALS

A. Pipe

1. Pipe material shall be High Density Polyethylene (HDPE) PE 3408, according to ASTM F412, with a cell class designation of 345464C, according to ASTM D3350. Iron pipe size (IPS) and standard dimension ratio (SDR) shall be as indicated in the plans.
2. Size and spacing of holes in perforated pipe shall be as indicated in the plans.

B. Fittings

1. Fittings shall be made of the same material, and shall have a pressure rating no less than 160 psi. Butt fusion, socket, or electrofusion fittings, according to ASTM D3261, ASTM D2683, and ASTM F1055, respectively, are acceptable.

2.02 EQUIPMENT

A. Butt Fusion Machine

The butt fusion machine shall include the following features:

1. Facer with rotating planer block design.
2. Heater faces coated by the manufacturer to prevent molten plastic from adhering to the heater face.
3. Hydraulic-operated jaws suitable for use with the pipe sizes indicated in the plans.

B. Socket Fusion Equipment

Socket fusion heating tools and depth gauges shall be of the same manufacturer, unless they are all marked F1056, indicating compliance with ASTM F1056.

C. All equipment shall conform to any requirements specified in the pipe and socket manufacturer's installation instructions, and shall be approved by the Owner's Representative.

PART 3. EXECUTION

3.01 MATERIAL DELIVERY, STORAGE, AND HANDLING

A. HDPE pipe and fittings shall be packaged and shipped by appropriate means to prevent damage to the material and to facilitate off-loading. The Owner will provide an on-site storage site. Storage site requirements (size and preferred location) shall be submitted with the bid documents.

B. Storage and handling shall be according to manufacturer's recommendations.

3.02 BASE PREPARATION

All HDPE piping shall be installed on a layer of coarse aggregate placed by the Contractor in accordance with the plans. The grade of the coarse aggregate base shall be verified before installing the piping.

3.03 INSTALLATION

All pipe and fittings shall be installed according to the manufacturer's recommendations. Removal of weld beads is not required. Contractor shall place coarse aggregate along the pipe to provide lateral stability. Welds shall not be obscured until they have been approved by the Owner's Representative, the top of pipe shall not be covered until the Construction Quality Assurance (CQA) survey has been completed to verify conformance with specified tolerances.

3.04 INSPECTIONS

A. The Owner's Representative shall shall be visually inspect pipe materials to verify that each pipe material is properly stamped (by the manufacturer) for ASTM acceptance before installation. Defective or damaged materials shall be removed from the site.

B. Each weld and connection shall be visually inspected by the Owner's Representative. Defective welds shall be repaired as directed by the Owner's Representative and according to manufacturer's recommendations. Welds and connections shall not be covered until they have been approved by the Owner's Representative.

3.05 TOLERANCES

A. HDPE piping shall be located within 0.5 ft. of plan location, and elevation shall be within 0.1 ft. of plan elevation with no adverse slopes.

END OF SECTION 02936

PART 1. GENERAL

1.01 DESCRIPTION

A. This section includes manufacturing, furnishing, and installing High Density Polyethylene (HDPE) Geomembranes for the Gypsum Management Facility and the Gypsum Management Facility Recycle Pond.

B. The work includes furnishing all equipment and materials and providing all labor, supervision, administration and management necessary to perform the work as shown on the plans.

1.02 RELATED SECTIONS

A. The following sections contain items which are related to the work in this section:

1. 02373 – Geotextiles
2. 02376 – Geosynthetic Clay Liner

1.03 REFERENCES

A. The following references, or cited portions thereof, govern the work:

1. American Society for Testing and Materials (ASTM):

   a. D 638, Standard Test Method for Tensile Properties of Plastics.
   b. D 751, Standard Test Methods for Coated Fabrics.
   c. D 792, Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
   d. D 1004, Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
   e. D 1204, Standard Test Method for Linear Dimensional Changes of Non Rigid Thermoplastic Sheeting or Film at Elevated Temperature.
   f. D 1238, Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.
   g. D 1505, Standard Test Method for Density of Plastics by Density-Gradient Technique.
   h. D 1603, Standard Test Method for Carbon Black in Olefin Plastics.
   i. D 3895, Test Method for Oxidative Induction Time of Polyolefins by Thermal Analysis.
   j. D 4218, Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique.

k. D 4437, Standard Practice for Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes.
l. D 4833, Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products.
m. D 5199, Standard Test Method for Measuring Nominal Thickness of Smooth Geomembranes.
n. D 5397, Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefins using Notched Constant Tensile Load Test.
o. D 5596, Standard Practice for Microscopical Examination of Pigment Dispersion in Plastic Compounds.
p. D 5641, Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber.
q. D 5721, Practice for Air-Oven Aging of Polyolefin Geomembranes.
r. D 5820, Test Method for Air Testing.
s. D 5885, Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High Pressure Differential Scanning Calorimetry.
t. D 5994, Standard Test Method for Measuring Nominal Thickness of Textured Geomembranes
u. D 6365, Standard Practice for the Nondestructive Testing of Geomembrane Seams using The Spark Test

2. Geosynthetic Research Institute (GRI):

a. GRI GM 6, Pressurized Air Channel Test for Dual Seamed Geomembranes
b. GRI GM 9, Cold Weather Seaming of Geomembranes
c. GRI GM 10, Specification for Stress Crack Resistance of HDPE Geomembrane Sheet
d. GRI GM 13, Test Properties, Testing Frequency and Recommended Warranty for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes
e. GRI GM 14, Test Frequencies for Destructive SeamTesting

1.04 SUBMITTALS

A. Submit the following to the Engineer or Owner, for review and approval, within a reasonable time so as to expedite shipment or installation of the Geomembrane:

1. Documentation of manufacturer's qualifications as specified in subsection 1.05A of this Section.
2. Manufacturer's Quality Control program manual or descriptive documentation.
3. A material properties sheet, including at a minimum all properties specified in GRI GM 13, including test methods used.
4. Sample of the material.

5. Documentation of Installer's qualifications, as specified below and in subsection 1.05B of this Section.
   a. Submit a list of at least ten completed facilities. For each name and type of facility; its location; the date of installation; number of contact at the facility; type and thickness of geomembrane and; surface area of the installed geomembrane.
   b. Submit resumes or qualifications of the Installation Supervisor, Master Seamer and Technicians to be assigned to this project.
   c. Quality Control Program.
6. Example Material Warranty and Liner Installation Warranty complying with subsections 1.07 and 1.08 of this Section.
7. Resin Supplier's name, resin production plant identification, resin brand name and number, production date of the resin, resin Manufacturer's quality control certificates, and certification that the properties of the resin meet the requirements

B. Shop Drawings

1. Submit copies of shop drawings for engineer's approval within a reasonable time so as not to delay the start of geomembrane installation. Shop drawings shall show the proposed panel layout identifying seams and details. Seams should generally follow direction of the slope. Butt seams or roll-end seams should not occur on a slope unless approved by the Owner's Representative. Butt seams on a slope, if allowed, should be staggered.
2. Placement of geomembrane will not be allowed to proceed until Owner's Representative has received and approved the shop drawings.

C. Additional Submittals (In-Progress and at Completion)

1. Manufacturer's warranty (refer to subsection 1.08).
2. Geomembrane installation warranty (refer to subsection 1.09).
3. Daily written acceptance of subgrade surface (refer to subsection 3.01.C).
4. Low-temperature seaming procedures if applicable (refer to subsection 3.03.A)
5. Prequalification test seam samples (refer to subsection 3.05.A.6).
6. Field seam non-destructive test results (refer to subsection 3.05.B.1).
7. Field seam destructive test results (refer to subsection 3.05.C.6).
8. Daily field installation reports (refer to subsection 3.05.G).
9. Installation record drawing, as discussed in subsection 3.05.G).

1.05 QUALITY CONTOL

A. Manufacturer's Qualifications:

The manufacturer of geomembrane of the type specified or similar product shall have at least five years experience in the manufacture of such geomembrane. In addition, the geomembrane manufacturer shall have manufactured at least

10,000,000 sq. ft. of the specified type of geomembrane or similar product during the last five years.

B. Installer's Qualifications:

1 The Geomembrane Installer shall be the Manufacturer, approved Manufacturer's Installer or a contractor approved by the Owner's Representative to install the geomembrane.

2 The Geomembrane Installer shall have at least three years experience in the installation of the specified geomembrane or similar. The Geomembrane Installer shall have installed at least 10 projects involving a total of 5,000,000 sq. ft. of the specified type of geomembrane or similar during the last three years.

3 Installation shall be performed under the direction of a field Installation Supervisor who shall be responsible throughout the geomembrane installation, for geomembrane panel layout, seaming, patching, testing, repairs, and all other activities of the Geomembrane Installer. The Field Installation Supervisor shall have installed or supervised the installation and seaming of a minimum of 10 projects involving a total of 5,000,000 sq. ft. of geomembrane of the type specified or similar product.

4 Seaming shall be performed under the direction of a Master Seamer (who may also be the Field Installation Supervisor or Crew Foreman) who has seamed a minimum of 3,000,000 sq. ft. of geomembrane of the type specified or similar product, using the same type of seaming apparatus to be used in the current project. The Field Installation Supervisor and/or Master Seamer shall be present whenever seaming, patching, other welding operations, and testing is performed.

5 All seaming, patching, other welding operations, and testing shall be performed by qualified technicians employed by the Geomembrane Installer.

1.06 DELIVERY, STORAGE AND HANDLING

A. Each roll of geomembrane delivered to the site shall be labeled by the manufacturer. The label shall be firmly affixed and shall clearly state the manufacturer's name, product identification, material thickness, roll number, roll dimensions and roll weight.

B. Geomembrane shall be protected from mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions.

C. Rolls shall be stored away from high traffic areas. Continuously and uniformly support rolls on a smooth, level prepared surface.

D. Rolls shall not be stacked more than three high.

1.07 PROJECT CONDITIONS

Geomembrane shall not be installed in the presence of standing water, while precipitation is occurring, during excessive winds, or when material temperatures are outside the limits specified in Section 3.03.

1.08 MATERIAL WARRANTY

As required by specification, or as required in GRI GM 13 (attachment A)

1.09 GEOMEMBRANE INSTALLATION WARRANTY

The Geomembrane Installer shall guarantee the geomembrane installation against defects in the installation and workmanship for 1 year commencing with the date of final acceptance.

1.10 GEOMEMBRANE PRE-CONSTRUCTION MEETING

A. Geomembrane Pre-Construction Meeting shall be held at the site prior to installation of the geomembrane. At a minimum, the meeting shall be attended by the Geomembrane Installer, Owner, Owner's representative (Engineer and/or CQA Firm), and the General Contractor.

B. Topics for this meeting shall include:
   1. Responsibilities of each party.
   2. Lines of authority and communication. Resolution of any project document ambiguity.
   3. Methods for documenting, reporting and distributing documents and reports.
   4. Procedures for packaging and storing archive samples.
   5. Review of time schedule for all installation and testing.
   6. Review of panel layout and numbering systems for panels and seams including details for marking on geomembrane.
   7. Procedures and responsibilities for preparation and submission of as-built panel and seam drawings.
   8. Temperature and weather limitations. Installation procedures for adverse weather conditions. Defining acceptable subgrade, geomembrane, or ambient moisture and temperature conditions for working during liner installation.
   9. Subgrade conditions, dewatering responsibilities and subgrade maintenance plan.
   10. Deployment techniques including allowable subgrade for the geomembrane.
   11. Plan for controlling expansion/contraction and wrinkling of the geomembrane.
   12. Covering of the geomembrane and cover soil placement.
   13. Measurement and payment schedules.
   14. Health and safety.

C. The meeting shall be documented by the Owner's Representative and minutes shall be transmitted to all parties.

PART 2. PRODUCTS

2.01 SOURCE QUALITY CONTROL

Manufacturing Quality Control

A. The test methods and frequencies used by the manufacturer for quality control/quality assurance of the above geomembrane prior to delivery, shall be in accordance with GRI GM 13, or modified as required for project specific conditions.

B. The manufacturer's geomembrane quality control certifications, including results of quality control testing of the products, as specified in subsection 2.01.C of this Section, must be supplied to the Owner's Representative. The certification shall be signed by a responsible party employed by the manufacturer, such as the QA/QC Manager, Production Manager, or Technical Services Manager. Certifications shall include lot and roll numbers and corresponding shipping information.

C. The Manufacturer will provide Certification that the geomembrane and welding rod supplied for the project have the same base resin and material properties.

2.02 GEOMEMBRANE

A. The geomembrane shall consist of new, first quality products designed and manufactured specifically for the purpose of this work which shall have been satisfactorily demonstrated by prior testing to be suitable and durable for such purposes. The geomembrane rolls shall be seamless, high density polyethylene (HDPE- Density >0.94g/cm) containing no plasticizers, fillers or extenders and shall be free of holes, blisters or contaminants, and leak free verified by 100% in line spark or equivalent testing. The geomembrane shall be supplied as a continuous sheet with no factory seams in rolls. The geomembrane will meet the property requirements as shown in Table A. (GRI GM 13)

B. Material shall be reviewed for conformance to the project specifications by the Owner's Representative

C. The geomembrane seams shall meet the property requirements as shown in Table 2, (Attachment B).

PART 3. EXECUTION

3.01 SUBGRADE PREPARATION

A. Geomembrane installed over geosynthetic clay liner (GCL).

The area of GCL to be covered with geomembrane shall be jointly inspected daily with the Owner's Representative before commencing geomembrane installation for the day, and the condition of the GCL shall be continuously observed as geomembrane installation progresses. Rocks, stones, sticks, sharp objects and debris of any kind shall be removed from the surface of the GCL. The Owner's Representative shall be notified of any discontinuities, premature hydration, or otherwise defective GCL. Geomembrane shall not be placed over suspect areas until they have been repaired to the satisfaction of the Owner's Representative. The Installation Supervisor shall certify daily in writing that the GCL surface was acceptable at the time of geomembrane installation.

B. Geomembrane installed over cushion dirt.

The area of cushion dirt to be covered with geomembrane shall be prepared in accordance with the Section 02200 – Earthwork. The surface shall be smooth and free of ruts and holes, rocks, stones, sticks, sharp objects and debris of any kind.

C. The Geomembrane installer shall provide daily written acceptance for the surface to be covered by the geomembrane in that day's operations. The surface shall be maintained in a manner, during geomembrane installation, to ensure subgrade suitability.

D. All subgrade damaged by construction equipment and deemed unsuitable by the Owner's Representative for geomembrane deployment shall be repaired prior to placement of the geomembrane. All repairs shall be reviewed by the Owner's Representative and approved by the Geomembrane Installer. This damage, repair, and the responsibilities of the contractor and Geomembrane Installer shall be defined in the preconstruction meeting.

3.02 GEOMEMBRANE PLACEMENT

A. No geomembrane shall be deployed until the applicable certifications and quality control certificates listed in subsection 1.04 of this Section are submitted to and approved by the Owner's Representative. Should geomembrane material be deployed prior to approval by the Owner's Representative it will be at the sole risk of the Geomembrane Installer and/or Contractor. If the material does not meet project specifications it shall be removed from the work area at no cost to the owner.

B. The geomembrane shall be installed to the limits shown on the project drawings and essentially as shown on approved panel layout drawings.

C. No geomembrane material shall be unrolled and deployed if the material temperatures are lower than 0 degrees C (32 degrees F). Temperature limitations should be defined in the preconstruction meeting. Typically, only the quantity of geomembrane that will be anchored and seamed together in one day should be deployed.

D. No vehicular traffic shall travel on the geomembrane other than an approved low ground pressure All Terrain Vehicle or equivalent.

E. Sand bags or equivalent ballast shall be used as necessary to temporarily hold the geomembrane material in position under the foreseeable and reasonably - expected wind conditions. Sand bag material shall be sufficiently close- knit to prevent soil fines from working through the bags and discharging on the geomembrane.

F. Geomembrane placement shall not be done if moisture prevents proper subgrade preparation, panel placement, or panel seaming. Moisture limitations should be defined in the preconstruction meeting.

G. Damaged panels or portions of the damaged panels which have been rejected shall be marked and their removal from the work area recorded.

H. The geomembrane shall not be allowed to "bridge over" voids or low areas in the subgrade. In these areas, the subgrade shall be prepared to allow the geomembrane to rest in intimate contact with the subgrade.

I. Wrinkles caused by panel placement or thermal expansion should be minimized in accordance with section 1.10 B. 11.

J. Considerations on Site Geometry: In general, seams shall be oriented parallel to the line of the maximum slope. In corners and odd shaped geometric locations, the total length of field seams shall be minimized. Seams shall not be located at low points in the subgrade.

K. Overlapping: The panels shall be overlapped prior to seaming to whatever extent is necessary to effect a good weld and allow for proper testing. In no case shall this overlap be less than 75mm (3 in.).

3.03 SEAMING PROCEDURES

A. Cold weather installations should follow guidelines as outlined in GRI GM9.

B. No geomembrane material shall be seamed when liner temperatures are less than 0 degrees C (32 degrees F).

C. No geomembrane material shall be seamed when the sheet temperature is above 75 degrees C (170 degrees F) as measured by an infrared thermometer or surface thermocouple.

D. Seaming shall primarily be performed using automatic fusion welding equipment and techniques. Extrusion welding shall be used where fusion welding is not possible such as at pipe penetrations, patches, repairs and short (less than a roll width) runs of seams.

E. Fishmouths or excessive wrinkles at the seam overlaps, shall be minimized and when necessary cut along the ridge of the wrinkles back into the panel so as to effect a flat overlap. The cut shall be terminated with a keyhole cut (nominal 10 mm (1/2 in) diameter hole) so as to minimize crack/tear propagation. The overlay shall subsequently be seamed. The key hole cut shall be patched with an oval or round patch of the same base geomembrane material extending a minimum of 150 mm (6 in.) beyond the cut in all directions.

3.04 PIPE AND STRUCTURE PENETRATION SEALING SYSTEM

A. Provide penetration sealing system as shown in the Project Drawings.

B. Penetrations shall be constructed from the base geomembrane material, flat stock, prefabricated boots and accessories as shown on the Project Drawings. The pre-fabricated or field fabricated assembly shall be field welded to the geomembrane as shown on the Project Drawings so as to prevent leakage. This assembly shall be tested as outlined in section 3.05.B. Alternatively, where field non destructive testing can not be performed, attachments will be field spark tested by standard holiday leak detectors in accordance with ASTM 6365 Spark testing should be done in areas where both air pressure testing and vacuum testing are not possible.

1. Equipment for Spark testing shall be comprised of but not limited to: A

hand held holiday spark tester and conductive wand that generates a high voltage.

2. The testing activities shall be performed by the Geomembrane Installer by placing an electrically conductive tape or wire beneath the seam prior to welding. A trial seam containing a non welded segment shall be subject to a calibration test to ensure that such a defect (non welded segment) will be identified under the planned machine settings and procedures. Upon completion of the weld, enable the spark tester and hold approximately 25mm (1 in) above the weld moving slowly over the entire length of the weld in accordance with ASTM 6365. If there is no spark the weld is considered to be leak free.
3. A spark indicates a hole in the seam. The faulty area shall be located, repaired and retested by the Geomembrane Installer.
4. Care should be taken if flammable gases are present in the area to be tested.

3.05 FIELD QUALITY CONTROL

The Owner's Representative shall be notified prior to all pre qualification and production welding and testing, or as agreed upon in the pre construction meeting.

A. Prequalification Test Seams

1. Test seams shall be prepared and tested by the Geomembrane Installer to verify that seaming parameters (speed, temperature and pressure of welding equipment) are adequate.
2. Test seams shall be made by each welding technician and tested in accordance with ASTM D 4437 at the beginning of each seaming period. Test seaming shall be performed under the same conditions and with the same equipment and operator combination as production seaming. The test seam shall be approximately 3.3 meters (10 feet) long for fusion welding and 1 meter (3 feet) long for extrusion welding with the seam centered lengthwise. At a minimum, tests seams should be made by each technician 1 time every 4–6 hours; additional tests may be required with changes in environmental conditions.
3. Two 25 mm (1 in) wide specimens shall be die-cut by the Geomembrane Installer from each end of the test seam. These specimens shall be tested by the Geomembrane Installer using a field tensiometer testing both tracks for peel strength and also for shear strength. Each specimen shall fail in the parent material and not in the weld, "Film Tear Bond"(F.T.D. failure). Seam separation equal to or greater than 10% of the track width shall be considered a failing test.
4. The minimum acceptable seam strength values to be obtained for all specimens tested are listed in Subsection 3.05.C.4 of this Section. All four specimens shall pass for the test seam to be a passing seam.
5. If a test seam fails, an additional test seam shall be immediately conducted. If the additional test seam fails, the seaming apparatus shall be rejected and not used for production seaming until the deficiencies are

corrected and a successful test seam can be produced.

6. A sample from each test seam shall be labeled. The label shall indicate the date, geomembrane temperature, number of the seaming unit, technician performing the test seam and pass or fail description. The sample shall then be given to the Owner's Representative for archiving.

B. Field Seam Non-destructive Testing

1. All field seams shall be non-destructively tested by the Geomembrane Installer over the full seam length before the seams are covered. Each seam shall be numbered or otherwise designated. The location, date, test unit, name of tester and outcome of all non-destructive testing shall be recorded and submitted to the Owner's Representative.
2. Testing should be done as the seaming work progresses, not at the completion of all field seaming. All defects found during testing shall be numbered and marked immediately after detection. All defects found should be repaired, retested and remarked to indicate acceptable completion of the repair.
3. Non-destructive testing shall be performed using vacuum box, air pressure or spark testing equipment.
4. Non-destructive tests shall be performed by experienced technicians familiar with the specified test methods. The Geomembrane Installer shall demonstrate to the Owner's Representative all test methods to verify the test procedures are valid.
5. Extrusion seams shall be vacuum box tested by the Geomembrane Installer in accordance with ASTM D 4437 and ASTM D 5641 with the following equipment and procedures:
   a. Equipment for testing extrusion seams shall be comprised of but not limited to: a vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft rubber gasket attached to the base, port hole or valve assembly and a vacuum gauge; a vacuum pump assembly equipped with a pressure controller and pipe connections; a rubber pressure/vacuum hose with fittings and connections; a plastic bucket; wide paint brush or mop; and a soapy solution.
   b. The vacuum pump shall be charged and the tank pressure adjusted to approximately 35 kPa (5 psig).
   c. The Geomembrane Installer shall create a leak tight seal between the gasket and geomembrane interface by wetting a strip of geomembrane approximately 0.3m (12 in) by 1.2m (48 in) (length and width of box) with a soapy solution, placing the box over the wetted area, and then compressing the box against the geomembrane. The Geomembrane Installer shall then close the bleed valve, open the vacuum valve, maintain initial pressure of approximately 35 kPa (5 psig) for approximately 5 seconds. The geomembrane should be continuously examined through the viewing window for the presence of soap bubbles, indicating a leak. If no bubbles appear after 5 seconds, the area shall be

considered leak free. The box shall be depressurized and moved over the next adjoining area with an appropriate overlap and the process repeated.

d. All areas where soap bubbles appear shall be marked, repaired and then retested.

e. At locations where seams cannot be non destructively tested, such as pipe penetrations, alternate nondestructive spark testing (as outlined in section 3.04.B) or equivalent should be substituted.

f. All seams that are vacuum tested shall be marked with the date tested, the name of the technician performing the test and the results of the test.

6. Double Fusion seams with an enclosed channel shall be air pressure tested by the Geomembrane Installer in accordance with ASTM D 5820 and ASTM D 4437 and the following equipment and procedures:

a. Equipment for testing double fusion seams shall be comprised of but not limited to: an air pump equipped with a pressure gauge capable of generating and sustaining a pressure of 210 kPa (30 psig), mounted on a cushion to protect the geomembrane; and a manometer equipped with a sharp hollow needle or other approved pressure feed device.

b. The Testing activities shall be performed by the Geomembrane Installer. Both ends of the seam to be tested shall be sealed and a needle or other approved pressure feed device inserted into the tunnel created by the double wedge fusion weld. The air pump shall be adjusted to a pressure of 210 kPa (30 psig), and the valve closed,. Allow 2 minutes for the injected air to come to equilibrium in the channel, and sustain pressure for 5 minutes. If pressure loss does not exceed 28 kPa (4 psig) after this five minute period the seam shall be considered leak tight. Release pressure from the opposite end verifying pressure drop on needle to ensure testing of the entire seam. The needle or other approved pressure feed device shall be removed and the feed hole sealed.

c. If loss of pressure exceeds 28 kPa (4 psig) during the testing period or pressure does not stabilize, the faulty area shall be located, repaired and retested by the Geomembrane Installer.

d. Results of the pressure testing shall be recorded on the liner at the seam tested and on a pressure testing record.

C. Destructive Field Seam Testing

1. One destructive test sample per 150 linear m (500 linear ft) seam length or another predetermined length in accordance with GRI GM 14 shall be taken by the Geomembrane Installer from a location specified by the Owner's Representative. The Geomembrane Installer shall not be informed in advance of the sample location. In order to obtain test results prior to completion of geomembrane installation, samples shall be cut by the Geomembrane Installer as directed by the Owner's Representative as seaming progresses.

2. All field samples shall be marked with their sample number and seam number. The sample number, date, time, location, and seam number shall be recorded. The Geomembrane Installer shall repair all holes in the geomembrane resulting from obtaining the seam samples. All patches shall be vacuum box tested or spark tested. If a patch cannot be permanently installed over the test location the same day of sample collection, a temporary patch shall be tack welded or hot air welded over the opening until a permanent patch can be affixed.
3. The destructive sample size shall be 300 mm (12 in) wide by 1 m (36 in) long with the seam centered lengthwise. The sample shall be cut into three equal sections and distributed as follows: one section given to the Owner's Representative as an archive sample; one section given to the Owner's Representative for laboratory testing as specified in paragraph 5 below; and one section retained by the Geomembrane Installer for field testing as specified in paragraph 4 below.
4. For field testing, the Geomembrane Installer shall cut 10 identical 25 mm (1 in) wide replicate specimens from his sample. The Geomembrane Installer shall test five specimens for seam shear strength and five for peel strength. Peel tests will be performed on both inside and outside weld tracks. To be acceptable, 4 of 5 test specimens must pass the stated criteria in section 2.02 with less than 10% separation. If 4 of 5 specimens pass, the sample qualifies for testing by the testing laboratory if required.
5. If independent seam testing is required by the specifications it shall be conducted in accordance with ASTM 5820 or ASTM D4437 or GRI GM 6.
6. Reports of the results of examinations and testing shall be prepared and submitted to the Owner's Representative.
7. For field seams, if a laboratory test fails, that shall be considered as an indicator of the possible inadequacy of the entire seamed length corresponding to the test sample. Additional destructive test portions shall then be taken by the Geomembrane Installer at locations indicated by the Engineer, typically 3 m (10 ft) on either side of the failed sample and laboratory seem tests shall be performed. Passing tests shall be an indicator of adequate seams. Failing tests shall be an indicator of non-adequate seams and all seams represented by the destructive test location shall be repaired with a cap-strip extrusion welded to all sides of the capped area. All cap-strip seams shall be non-destructively vacuum box tested until adequacy of the seams is achieved. Cap strip seams exceeding 50 M in length (150 FT) shall be destructively tested.

D. Identification of Defects

1. Panels and seams shall be inspected by the Installer and Owner's Representative during and after panel deployment to identify all defects, including holes, blisters, undispersed raw materials and signs of contamination by foreign matter.

E. Evaluation of Defects: Each suspect location on the liner (both in geomembrane seam and non-seam areas) shall be non-destructively tested using one of the methods described in Section 3.05.B. Each location which fails non-destructive testing shall be marked, numbered, measured and posted on the daily "installation" drawings and subsequently repaired.

1. If a destructive sample fails the field or laboratory test, the Geomembrane Installer shall repair the seam between the two nearest passed locations on both sides of the failed destructive sample location.
2. Defective seams, tears or holes shall be repaired by reseaming or applying a extrusion welded cap strip.
3. Reseaming may consist of either:
   a. Removing the defective weld area and rewelding the parent material using the original welding equipment; or
   b. Reseaming by extrusion welding along the overlap at the outside seam edge left by the fusion welding process.
4. Blisters, larger holes, and contamination by foreign matter shall be repaired by patches and/or extrusion weld beads as required. Each patch shall extend a minimum of 150 mm (6 in) beyond all edges of the defects.
5. All repairs shall be measured, located and recorded.

F. Verification of Repairs on Seams: Each repair shall be non-destructively tested using either vacuum box or spark testing methods. Tests which pass the non-destructive test shall be taken as an indication of a successful repair. Failed tests shall be reseamed and retested until a passing test results. The number, date, location, technician and test outcome of each patch shall be recorded.

G. Daily Field Installation Reports: At the beginning of each day's work, the Installer shall provide the Engineer with daily reports for all work accomplished on the previous work day. Reports shall include the following:
1. Total amount and location of geomembrane placed;
2. Total length and location of seams completed, name of technicians doing seaming and welding unit numbers;
3. Drawings of the previous day's installed geomembrane showing panel numbers, seam numbers and locations of non-destructive and destructive testing;
4. Results of pre-qualification test seams;
5. Results of non-destructive testing; and
6. Results of vacuum testing of repairs.

H. Destructive test results shall be reported prior to covering of liner or within 48 hours.

3.06 LINER ACCEPTANCE

A. Geomembrane liner will be accepted by the Owner's Representative when:

1. The entire installation is finished or an agreed upon subsection of the installation is finished;

2. All Installer's QC documentation is completed and submitted to the owner
3. Verification of the adequacy of all field seams and repairs and associated geomembrane testing is complete.

3.07 ANCHOR TRENCH

A. Construct as specified on the project drawings.

3.08 DISPOSAL OF SCRAP MATERIALS

A. On completion of installation, the Geomembrane Installer shall dispose of all trash and scrap material in a location approved by the Owner, remove equipment used in connection with the work herein, and shall leave the premises in a neat acceptable manner. No scrap material shall be allowed to remain on the geomembrane surface.

PART 4. GRI GM13 SPECIFICATIONS

Geosynthetics Research Institute (GRI) Test Method GM13 – "Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes", Revision 8, Dated July 10, 2006.

ATTACHMENT A:

Minimum Average Weld Properties for Smooth and Textured HDPE Geomembranes (English units)									
Property	**Test Method**	**30 mil**	**40 mil**	**50 mil**	**60 mil**	**80 mil**	**100 mil**	**120 mil**
Peel strength (fusion & extrusion) lb/in.	ASTM 4437	39	52	65	78	104	130	156
Shear strength (fusion & extrusion) lb/in.	ASTM 4437	60	80	100	120	160	200	239

END OF SECTION 02800

PART 1. GENERAL

1.01 DESCRIPTION

This section pertains to seeding and placing mulch or erosion control blanket over seeded areas.

1.02 RELATED SECTIONS

A. Specified elsewhere:

1. 02200 - Earthwork

1.03 REFERENCES

The following reference or cited portions thereof, current at date of bidding documents unless otherwise specified, governs the work.

A. Illinois Department of Transportation (IDOT): Standard Specifications for Road and Bridge Construction, adopted January 1, 2007.

1.04 SPECIFICATIONS

A. Work shall conform to the applicable requirements of Sections 250 and 251 of Standard Specifications for Road and Bridge Construction and to the requirements hereinafter specified.

B. Exceptions: All references in the IDOT specifications to methods of measurement and payment shall not apply.

1.05 WARRANTY

A. Warranty for one (1) year plus one growing season from date of substantial completion shall be provided.

PART 2. PRODUCTS

2.01 MATERIALS

A. Seed: Seed shall conform to Article 1081.04 of the IDOT Standard Specifications. The composition of the Ameren Energy Resources Generating hay seeding mix shall be as follows:

Seed Type	Pounds/Acre
Vernal Alfalfa	12
Wrangler Alfalfa	8
Medium Red Clover	6
Timothy	4

B. Mulch Material and Erosion Control Blanket: Mulch material shall conform to Article 1081.06 and the excelsior blanket/knitted straw mat shall conform to Article 1081.10 of the IDOT Standard Specifications.

C. Fertilizer and agricultural ground limestone will not be permitted.

PART 3. EXECUTION

3.01 CONSTRUCTION

A. Seed bed preparation and seeding methods shall conform to Section 250 of the IDOT Specifications. Seeding of areas disturbed by construction activities after September 30, 2008 may be deferred until Spring 2009.

B. Seed shall be applied to the perimeter berm ditch, to disturbed portions of the perimeter berm, and to all disturbed earth surfaces outside of the existing perimeter berm. IDOT seeding mixture 7 shall be used on stockpiles. IDOT seeding mixture 1A shall be used on the gypsum stack perimeter earthen berm, the recycle pond dam embankment and on slopes that are 4H:1V or steeper. The Ameren hay seed mix shall be used on slopes flatter that 4H:1V.

C. Application rates for IDOT seed mixtures shall be as specified in Section 250 of the IDOT Specifications. The application rate for the Ameren Energy Resources Generating's seed mix shall be as specified in the Ameren Energy Resources Generating's hay seeding mix.

D. Seeded areas shall be mulched in accordance with Article 251.03. The Contractor may use either Method 2 or Method 3.

3.02 MAINTENANCE OF COMPLETED WORK

A. All areas seeded by the Contractor shall be maintained by the Contractor during the period between completion of such work and final completion and acceptance of the Contractor's work by the Owner. This maintenance shall be such that the completed work, at time of acceptance, complies in all respects with the requirements herein specified.

B. The areas seeded will be required to germinate. If the seed does not germinate, the Contractor will be required to regrade and reseed at no additional cost.

END OF SECTION 02936

PART 1. GENERAL

1.01 WORK INCLUDES

A. The complete installation of the formwork for cast-in-place concrete, with shoring, bracing and anchorage, openings for other work, form accessories, form stripping.

1.02 RELATED SECTIONS

A. Section 03200 - Concrete Reinforcement.

B. Section 03300 - Cast-In-Place Concrete.

C. Section 03400 – Concrete Embedment Liner.

1.03 REFERENCES

A. ACI 347 - Recommended Practice For Concrete Formwork.

B. ACI 301 - Specifications For Structural Concrete For Buildings.

1.04 DESIGN REQUIREMENTS

A. Design, engineer and construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 347 and 301.

1.06 REGULATORY REQUIREMENTS

A. Conform to applicable code for design, fabrication, erection and removal of formwork.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store off ground in ventilated and protected manner to prevent deterioration from moisture.

1.08 COORDINATION

A. Coordinate this Section with other Sections of work which require attachment of components of formwork.

B. If formwork is placed which results in insufficient concrete cover over reinforcement, request instructions from Owner's Representative before proceeding.

PART 2. PRODUCTS

2.01 WOOD FORM MATERIALS

A. Softwood Plywood: 3/4 in. PS 1-83 "B-B" (concrete form) plywood, Class I, exterior grade or better, mill-oiled and edge sealed with each piece bearing legible inspection trademark.

B. Architectural Plywood: 3/4 in. PS 1-83 "B-B" plyform, Class I, with High Density smooth overlay, 1 surface, edge sealed with each piece bearing legible inspection trademark.

2.02 MANUFACTURERS - PREFABRICATED FORMS

A. Weyerhauser Concrete Form.

B. Georgia Pacific, G-P Exterior Soft Wood Plywood Product.

C. Plywood and Door Corporation's Finn-Form.

2.03 PREFABRICATED FORMS

A. Preformed Steel Forms: Minimum 16 gage matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

B. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

2.04 FORMWORK ACCESSORIES

A. Form Ties: Snap-off type, galvanized metal, adjustable length, 1 in. back break dimension, free of defects that could leave holes larger than 1 in. in concrete surface; Dayton-Sure Grip snap-in-form ties, as manufactured by Dayton Superior

Corp., Symons Ties as manufactured by Symons Corporation, Snap-Tys as manufactured by Richmond Corporation. Ties shall be removed after forms are removed, and holes filled with mortar that matches the adjacent surfaces.

B. Form Release Agent: Colorless mineral oil which will not stain concrete, or absorb moisture; by Magic Kote manufactured by Symons Manufacturing Co., Form Coat manufactured by Concrete Services Co., Formcel manufactured by Lambert Corp.

C. Corners: Chamfered, wood strip type; 3/4 x 3/4 in. size on all exterior corners, 3 x 3 in. size where shown on the drawings; maximum possible lengths.

D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

E. Concrete Embedment Liner, where required, shall be installed in accordance with Section 03400 – Concrete Embedment Liner.

PART 3. EXECUTION

3.01 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 EARTH FORMS

A. Earth forms are not permitted, except for footings.

3.03 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301. Metal forms shall be installed in strict accordance with manufacturer's directions and specifications.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

D. Align joints and make watertight. Keep form joints to a minimum.

E. Obtain approval before framing openings in structural members which are not indicated on drawings.

3.04 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings which are affected by agent.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in or passing through concrete work.

B. Locate and set in place items which will be cast directly into concrete.

C. Coordinate work of other Sections in forming and placing openings, slots, reglets, recesses, chases, sleeves, bolts, anchors, and other inserts.

D. Install accessories in accordance with manufacturer's instructions, straight, level, and plumb. Ensure items are not disturbed during concrete placement.

E. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

F. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.06 FORM CLEANING

A. Clean and remove foreign matter within forms as erection proceeds.

B. Clean formed cavities of debris prior to placing concrete.

C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts or water to clean out forms. Use compressed air or other means to remove foreign matter.

3.07 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 301.

3.08 FIELD QUALITY CONTROL

A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

B. Do not reuse wood formwork more than three times for concrete surfaces to be exposed to view. Do no patch formwork.

3.09 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finished concrete surfaces scheduled for exposure to view.

C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

END OF SECTION 03100

PART 1. GENERAL

1.01 WORK INCLUDES

A. The complete installation of the reinforcing steel bars and accessories for cast-in-place concrete.

1.02 RELATED SECTIONS

A. Section 03100 - Concrete Formwork.

B. Section 03300 - Cast-in-Place Concrete.

1.03 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.

B. ACI 318 - Building Code Requirements For Reinforced Concrete.

C. ACI SP-66 - American Concrete Institute - Detailing Manual.

D. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

E. CRSI - Concrete Reinforcing Steel Institute Manual of Practice.

1.04 SUBMITTALS

A. Submit under provisions of Section 01010.

B. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel, and bending and cutting schedules. Contract drawings shall not be reproduced as the basis for shop drawings.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with CRSI Manual of Standard Practice.

B. Submit certified copies of mill test report of reinforcement materials analysis.

1.06 COORDINATION

A. Coordinate with placement of formwork, formed openings and other work.

PART 2. PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: ASTM A615, 60 ksi yield grade; deformed billet steel bars.

2.02 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gage, annealed steel wire, epoxy coated when used with epoxy-coated reinforcement.

B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions.

C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic coated steel type; size and shape as required.

2.03 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI Manual of Standard Practice and ACI SP-66.

B. Splice reinforcement on at locations indicated on drawings. Indicate location of splices on shop drawings.

PART 3. EXECUTION

3.01 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position. Clean reinforcement of foreign particles or coatings.

B. Accommodate placement of formed openings.

C. Conform to ACI 318 code for concrete cover over reinforcement.

3.02 FIELD QUALITY CONTROL

A. Contractor shall notify the Owner's Representative at least 24 hrs. in advance of concrete placement. Placement of reinforcing shall occur in such sequence that the Owner's Representative has sufficient time to inspect the correctness of the reinforcing within the placement area. The Owner's Representative retains the right to require necessary revisions be made before concrete is placed.

END OF SECTION 03200

PART 1. GENERAL

1.01 WORK INCLUDES

A. The complete installation of cast-in-place concrete structures, including joint sealants.

1.02 RELATED SECTIONS

A. Section 03100 - Concrete Formwork: Formwork and accessories.

B Section 03200 - Concrete Reinforcement.

C. Section 03400 – Concrete Embedment Liner

1.03 REFERENCES

A. ACI 301 – Structural Concrete for Buildings.

B. ACI 302 - Guide for Concrete Floor and Slab Construction.

C. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

D. ACI 305R - Hot Weather Concreting.

E. ACI 306R - Cold Weather Concreting.

F. ACI 308 - Standard Practice for Curing Concrete.

G. ACI 318 - Building Code Requirements for Reinforced Concrete.

H. ASTM C31 - Concrete Test Specimens.

I. ASTM C33 - Concrete Aggregates.

J. ASTM C94 - Ready-Mixed Concrete.

K. ASTM C150 - Portland Cement.

L. ASTM C260 - Air Entraining Admixtures for Concrete.

M. ASTM C494 - Chemical Admixtures for Concrete.

1.04 SUBMITTALS

A. Product Data: Provide data on joint devices, attachment accessories, admixtures.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

B. Acquire cement and aggregate from same source for all work.

C. Conform to ACI 305R when concreting during hot weather.

D. Conform to ACI 306R when concreting during cold weather.

1.06 COORDINATION

A. Coordinate this Section with other Sections which require embedment of components in cast-in-place concrete.

1.07 PRODUCT DATA

A. Submit proposed mix design to Owner's Representative for review prior to commencement of work. Identify source and provide material certificates for cement, fine and coarse aggregates. Provide recent laboratory gradation for fine and coarse aggregates and mix design information in accordance with ACI 301.

B. Submit Construction joint plan.

PART 2. PRODUCTS

2.01 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I - Normal Portland Type, Gray Color.

B. Fine and Coarse Aggregates: ASTM C33.

C. Water: Potable.

2.02 ADMIXTURES

A. Air Entrainment: ASTM C260.

B. Chemical: ASTM C494. Maximum 0.05% Chloride Ion Contents.

C. The use of calcium chloride in any concrete is not permitted.

2.03 ACCESSORIES

A. Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.

B. Curing Compound: Dress and Seal No. 18 by L&M Construction Chemicals, MB-429 by Master Builders, or Sikagard Cure/Hard by the Sika Corporation.

C. Epoxy Grouted Adhesive Anchors: Hilti, Red Head, Simpson, or Rawl.

2.04 CONCRETE MIX

A. Mix concrete in accordance with ACI 304. Deliver concrete in accordance with ASTM C94.

B. Select proportions for normal weight concrete in accordance with ACI 301.

C. Provide normal weight concrete of the following characteristics:

1. Compressive strength at 28 days: 4,000 psi.

2. Slump: 4 in. - A tolerance of up to 1 in. above the maximum shall be allowed for one batch in any five consecutive batches tested.

3. Water/cement ratios: 0.4 (max).

D. Use accelerating admixtures in cold weather only when approved by Owner's Representative. Use of admixtures will not relax cold weather placement requirements.

E. Use set-retarding admixtures during hot weather only when approved by Owner's Representative.

F. Water-reducing admixtures may be used in all concrete except footings and in strict compliance with the manufacturer's directions.

G. Add air-entraining agent to concrete mix for air content of 6% (± 1%).

PART 3. EXECUTION

3.01 EXAMINATION

A. Verify requirements for concrete cover over reinforcement.

B. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.02 PLACING CONCRETE

A. Place concrete in accordance with ACI 301.

B. Notify Owner's Representative minimum of 24 hours prior to commencement of operations.

C. Ensure reinforcement, inserts, and embedded parts are not disturbed during concrete placement.

D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

E. Place concrete continuously between predetermined expansion, control, and construction joints.

F. When air temperature is between 80°F and 90°F, reduce the mixing and delivery time specified in ASTM C94 from 1-1/2 hours to 75 minutes. When the air temperature is above 90°F, reduce the mixing and delivery time to 60 minutes.

G. Cold weather concreting. Comply with ACI 306 except as follows:

1. In freezing weather, provide suitable means for maintaining concrete temperature at a minimum of 70°F for three days, or 50°F for five days after placing.

2. Cooling of concrete to outside temperature: Not faster than 1° per hour for first day and 2° per hour thereafter until outside temperature is reached.

3. Maximum temperature of concrete produced with heated aggregated, heated water, or both, at any time during its production or transportation: 90°F.

4. Do not mix chemicals or other foreign materials in concrete to prevent freezing or to accelerate hardening of concrete, unless approved in writing by Owner's Representative.

H. Hot weather concreting. Comply with ACI 305R.

1. ACI recommendations shall be observed when any combination of high air temperature, low relative humidity and wind velocity tend to impair the quality of fresh or hardened concrete.

2. Retarding and water reducing admixtures shall be approved in writing for each concrete mix design prior to placement.

3.03 CONCRETE FINISHING

A. Provide exterior concrete formed surfaces to be left exposed with smooth rubbed finish in accord with ACI 301. All other formed surfaces shall have fins, projections and offsets removed.

B. Provide Class A tolerances to exterior concrete slabs according to ACI 301.

1. Broom finish all exterior slabs. Broom out all tool marks.

C. Pitch slabs to drain.

3.04 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for a period necessary for hydration of cement and hardening of concrete in accordance with ACI 308.

C. Cure and protect finished concrete slabs in accordance with ACI 308.

3.05 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed in accordance with ACI 301 and under provisions of Section 01010, paragraph 8.0.

B. Testing firm will take cylinders, perform slump and air entrainment tests in accordance with ACI 301.

C. Provide free access to Work and cooperate with appointed firm.

D. Submit proposed concrete mix design to Owner's Representative firm for review 14 days prior to commencement of Work.

E. Testing frequency shall be as specified in Section 01010, paragraph 8, except that one additional test cylinder will be taken during cold weather concreting, cured on job site under same conditions as concrete it represents.

3.06 PATCHING

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

B. Repair or replacement of defective concrete will be determined by Owner's Representative and performed by the Contractor at no additional cost to the project.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Owner's Representative for each individual area.

END OF SECTION 03300

PART 1. GENERAL

1.01 WORK INCLUDES

A. Specifications and guidelines for manufacturing and installing high-density polyethylene embedment liners.

1.02 RELATED SECTIONS

A. Section 03100 - Concrete Formwork.

B. Section 03300 - Cast-in-Place Concrete.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. D 1505 Test Method for Density of Plastics by the Density-Gradient Technique
2. D 1603 Test Method for Carbon Black in Olefin Plastics
3. D 5199 Standard Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes
4. D 5596 Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics
5. D 6693 Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes
6. D 1204 Standard Test Method for Linear Dimensional Changes of Nongrid Thermoplastic Sheeting or Film at Elevated Temperature
7. D 696 Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C With a Vitreous Silica Dilatometer
8. D 746 Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
9. D 570 Standard Test Method for Water Absorption of Plastics
10. E 96 Standard Test Method for Water Vapor Transmission of Material

1.04 SUBMITTALS

A. All work for and in connection with the installation of the lining, field seaming and welding joints shall be completed in strict conformity with all applicable instructions and recommendations of the liner manufacturer.

B. Included with the shipment of liner, submit certified test reports that the liner and material are manufactured in accordance with standards specified herein.

1.05 QUALIFICATIONS

A. The HDPE liner specified in this section shall be furnished by a manufacturer who is fully experienced, reputable and qualified in the manufacturing of the materials. The manufacturer must at least 10 years of manufacturing experience.

B. Locking devices must be extruded to the sheet as a one step process.

C. Liner shall be GSE StudLiner as manufactured by GSE Lining Technology, Inc.

D. Liner shall be 8 feet in width.

E. Liner shall demonstrate a minimum pull-out strength of 14,000 psf.

1.06 COORDINATION

A. Coordinate with placement of formwork, formed openings and other work.

PART 2. PRODUCTS

2.01 ROLL DIMENSIONS

A. Embedment sheets shall be produced in rolls that are 8.0 ft (2.4 m) in width and a thickness range of 80 mils (2.0 mm) to 200 mils (5.0 mm) in thickness. Roll lengths vary according to thickness.

B. Locking studs of the same material as that of the liner shall be integrally extruded with the sheet. Stud spacing shall be on approximate 1.25 in (30 mm) centers, such that there are approximately 110 studs per square foot (1200 per square meter).

2.02 MATERIAL PROPERTIES

A. The material used in the embedment liner and in all welding strips shall be made from 97-98% virgin high density polyethylene and 1.5-3% carbon black or pigmentation for the purpose of an otherwise specified color.

B. Plasticizer shall not be added to the resin formulation.

C. Embedment sheet and welding strips shall be free of holes, pinholes, bubbles, blisters, excessive contamination by foreign matter, and nicks and cuts on roll edges.

D. The HDPE cap strips shall be made from HDPE, have good impact resistance and have an elongation sufficient to bridge up to 1/4 inch settling cracks.

E. Cap strips shall be approximately 4 inches wide or greater and shall be equivalent to that of the liner.

F. Material shall maintain a repairable state through it's lifecycle by methods approved and recommended by the manufacturer.

G. Embedment sheets shall have the following physical properties when tested in accordance with Table 1.

H. Raw resin shall have the following properties when tested in accordance with Table 2.

Table 1: Material Properties

Property	Test Method	Nominal Value				Testing Frequency
Thickness, mm (mil)	ASTM D 5199	2.00 (80)	3.00 (120)	4.00 (160)	5.00 (200)	Every 5th roll
Density, g/cm^3	ASTM D 1505	0.94	0.94	0.94	0.94	1/100,000 ft^2
Tensile Properties Strength@Yield,lb/in^2 (MPa) Elongation @ Break, %	ASTM D 6693 Type IV, Dumbell G.L.= 2.0in.	2,200 (14.5) 500	2,200 (14.5) 500	2,200 (14.5) 500	2,200 (14.5) 500	1/100,000 ft^2
Stud Pull-Out Strength[1], lb/ft^2 (kN/m^2)		>14,000 (669.89)	>14,000 (669.89)	>14,000 (669.89)	>14,000 (669.89)	1/ product
Carbon Black Content/ Pigment Content, % Black Liner Gray Liner	ASTM D 1603, mod. ASTM D 5630, mod.	2-3 1.5 – 2.5	2-3 1.5 – 2.5	2-3 1.5 – 2.5	2-3 1.5 – 2.5	1/100,000 ft^2
Carbon Black Dispersion[2]	ASTM D 5596	Note 2	Note 2	Note 2	Note 2	1/100,000 ft^2
Notched Constant Tensile Load, hours	ASTM D 5397	400	400	400	400	1/ formulation
Coefficient of Linear Thermal Expansion, per °C	ASTM D 696	1.20E-04	1.20E-04	1.20E-04	1.20E-04	1/ product
Low Temperature Brittleness, °C	ASTM D 746	-77	-77	-77	-77	1/ product
Dimensional Stability, % (each direction)	ASTM D 1204	$\pm$ 1.0	$\pm$ 1.0	$\pm$ 1.0	$\pm$ 1.0	1/ product
Water Absorption, %	ASTM D 570	0.1	0.1	0.1	0.1	1/ product
Water Vapor Transmission, (g/m^2/day)	ASTM E 96	<0.01	<0.01	<0.01	<0.01	1/ product

[1]Note: Concrete must have a compressive strength of at least 5,000 lb/in^2 (34,500 kPa).
[2]Note: Dispersion only applies to near spherical agglomerates. 9 of 10 views shall be Category 1 or 2. No more than 1 view for category 3.

Table 2: Raw Material Properties

Property	Test Method	Value	Testing Frequency
Density, g/cm3	ASTM D 1505	0.932	1/ resin lot
Melt Flow, g/10 min	ASTM D 1238 (190/2.16)	$\leq$ 1.0	1/ resin lot
OIT, minutes	ASTM D 3895 (1atm/200°C)	100	1/ formulation

2.03 MATERIAL SUPPLY

A. Embedment sheets shall be supplied in roll form, sheets, pre-fabricated tubes or panels.

B. Cap strips shall be supplied in 4 inch widths or greater.

PART 3. EXECUTION

3.01 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position. Clean reinforcement of foreign particles or coatings.

B. Accommodate placement of formed openings.

C. Conform to ACI 318 code for concrete cover over reinforcement.

3.02 FIELD QUALITY CONTROL

A. Contractor shall notify the Owner's Representative at least 24 hrs. in advance of concrete placement. Placement of the Concrete Embedment Liner shall occur in such sequence that the Owner's Representative has sufficient time to inspect the correctness of the placement within the concrete formwork area. The Owner's Representative retains the right to require necessary revisions be made before concrete is placed.

END OF SECTION 03200

AECOM

Appendix E: Operation & Maintenance Manual for #1 Ash Pond

Coffeen Power Station

Operational Procedure

x-xxx-xxxx--xxx

Operation & Maintenance Manual for #1 Ash Pond

(Bottom Ash Recycle Pond)

Effective Date: xx/xx/xxxx

Reason for Change: New Procedure

Approved By: *x* Date: xx/xx/xxxx

x
John Romang

Responsible Department: Coffeen Power Station, Technical Services Department

- ☐ This entire document shall be in the field during procedure performance.
- ☐ The following portions of this procedure shall be in the field during procedure performance: ____________________
- ☐ __________ from this procedure shall be in the field during procedure performance.
- ☐ No part of this procedure is required to be in the field during procedure performance.

Table of Contents

1.0 Purpose

1.1 This procedure is intended to ensure the safe and environmentally responsible operation and use of the #1 Ash Pond (Bottom Ash Recycle Pond) at the Coffeen Power Station. The primary purpose of the #1 Ash Pond is for the removal of bottom ash by settling and the recirculation of slag tank water. The pond is used to supply water to the Unit 1 and Unit 2 ash handling systems via the recycle pumps.

2.0 Scope

2.1 This procedure applies to all onsite personnel and the Dam Safety Group staff.

3.0 Responsibilities

3.1 Outside Unit Operator – Checks the pond level and screens once a shift. Operates the facilities as described in this Operational Procedure. Reports any conditions noted during routine activities to the Shift Supervisor and Chemistry Department. Writes job requests if a problem is identified.

3.2 Shift Supervisor (SS) - Calls the Chemistry Department when structural concerns or overflow conditions are reported. Make entries into the shift electronic log book (e-log) indicating the concern and actions taken.

3.3 Dam Safety Inspector - Conducts weekly detailed dam safety inspections and provides a report with findings and recommendations. Make entries in e-log indicating the concern and actions taken.

4.0 Historical Information

4.1 The #1 Ash Pond was initially constructed to be a mixed ash deposition pond and was put in service in the mid-1960's. It is located east of the Main Building. It is a 23 acre pond with a maximum outer berm height of 41.5 feet above ground surface level (approximately elevation 637.5'). The pond overflow was located on the north east corner of the pond and discharged into the flume.

4.2 The #1 Ash Pond was converted to act as a closed loop system in the late 1970's when the dewatering bins were installed. The mixed ash was removed and deposited into the #2 ash pond during the closure of #2 pond. The #1 Ash Pond berms were modified and an inner berms was added to the pond to aid in dropping out bottom ash solids. Exterior berm elevation is approximately 637.5 feet.

4.3 The #1 Ash Pond was equipped with an emergency overflow at the outlet structure. When the pond level reaches approximately 6.5 feet from the top of the berm, it will overflow into the flume. Overflow will be reported to the EPA. In 2011 there was an assessment of the overflow pipe which showed no obstructions or damage.

4.4 In 2006, the bottom ash system was modified to directly sluice bottom ash into the pond, bypassing the retired dewatering bins. Bottom Ash is removed from the pond via an outside contractor on an as needed (typically daily) basis.

5.0 Water Supply

All water inlets to the pond are located on the west side of the pond.

The ash sluice lines (from the valve house) discharge to the pond. These lines are used to convey ash from the slag handling system to the #1 Ash Pond. These lines are the southern most of the pond inlets. HPSW system is routed to the pond (valve house sparger valves, floor drains at Unit 1 cyclone level).

The Slag Tank Overflow sump pumps discharge into the pond at the concrete culvert located directly east of the of the lime/soda ash silo. Also in this area, a small stainless line extends thru the concrete. This is the discharge of the sludge pumps at the Waste Treatment System in the Recycle Pump House building.

The recycle pump flow control valves discharge to the pond through a line located at the northwest corner of the pond. Also in the vicinity of this line is the discharge pipe of the recycle pump house sump pumps.

Water from the Unit 1 and Unit 2 oil water separators are typically routed to the pond via the Slag Tank Overflow Pump (STOP) House sumps. Water entering these sumps are floor and roof drains in the plant and the yard area immediately to the north of the main building.

6.0 Operations Requirements

Pond Level - Plant personnel shall monitor the level of the #1 Ash Pond on a daily basis. Pond level is maintained at approximately 1.0’ to 1.5’ at the water level staff gauge located on the pond side of the screens. The staff gauge has elevation 629.0’ as the 0 elevation.

At 2.0’ water level (elevation 631.0 feet), the pond overflows resulting in a sampling and analysis requirement for Total Suspended Solids and Oil and Grease with reporting of the results to the IEPA. If the pond is found at or above 2.0’ on the pump side staff gauge, contact Chemistry immediately.

Water can be added to the pond from either the Unit 1 or Unit 2 Low Pressure Service Water (LPSW) headers via piping that discharges to the slag tank overflow trench.

Water can be drained from the pond via the water supply pipe to the dewatering bins. Opening this valve drains water from the recycle header which will remove water from the #1 Ash Pond.

Recycle Pump Intake Structure – Suction to the recycle pumps is supplied from the intake structure located at the west end of the north leg of the pond. This is the only water discharge point from the pond. Water level staff gauges are located upstream and downstream of the trash screens for determination of the screen differential. At 0.5’ differential, the screens should be cleaned. Level sensors are also installed upstream and downstream of the screens. Digital displays of the upstream and downstream levels are located along the north side of the catwalk leading out to the screen enclosure. These level sensors will generate a high screen differential alarm in the Control Room DCS. Check screen differential (should clean screens at 6 inches differential.) When the screens become plugged, suction to the recycle pumps is reduced. Call shift supervisor to report if screens needs to be cleaned.

Oil Boom – Plant personnel shall monitor the oil boom that is provided upstream of the intake structure. Check condition of oil booms across pond, at discharge, and across pond inlet. Booms should be replaced when they become oil saturated or damaged. Also check that booms have not come unattached from one another. Write JR to change out booms or to reconnect booms when required.

Emergency Conditions – If a condition arises where there is a possibility of an embankment failure, then the following procedures will be followed:

1. Notify the Supervising Engineer Dam Safety immediately.

7.0 Dam Safety Requirements

7.1 Dam Safety Inspections - The plant’s impoundment and flood prevention structures shall be inspected and maintained in a manner to ensure safe and environmentally responsible operations. A regular maintenance program shall be performed and shall consist of the following inspection items:

1. Earth embankments: Walk the crest, side slopes, and downstream toe of the dam concentrating on surface erosion, seepage, cracks, settlement, slumps, slides, and animal burrows. Frequency of inspection: Weekly.
2. Vegetation: Grass should be a thick vigorous growth to stabilize the earth embankment soils and prevent erosion form occurring. There should be NO trees on the earth embankment and none within a minimum of 20 feet of the embankment toe or other structures. Mowing frequency: Semiannually.
3. Well Readings: Record level of wells on the crest and toe of the berm. Frequency: Quarterly.
4. Special Inspections – Special inspections of the levees and ash pond berms shall be performed after earthquakes, floods, water level exceedance in the ponds, or heavy rainfall events. Inspection and report shall be equal to an annual inspection level of detail. Water level in the pond should be noted after a heavy rainfall. Dam Safety staff shall accompany plant personnel on special inspections. Frequency: As required.

8.0 Maintenance Log

8.1 Dam & Berm Inspector shall enter on e-log under the Dam Safety tab all weekly inspections, any usual occurrences, and maintenance performed.

9.0 Contact Numbers

Plant Environmental Supervisor: John Romang / 217-534-7629
Plant Dam & Berm Inspector: Vito Passariello/ 217-534-7664
Plant Control Room: 217-534-7668 / 217-534-7669
Supervising Engineer Dam Safety: Steve Bluemner / 314-554-6298
Dam Safety Staff Contact: Mike Wagstaff / 314-554-6296

10.0 References

Appendix F: Operation and Maintenance Manual, Gypsum Management FacilityOperation (2015)

Operation and Maintenance Manual
Coffeen Energy Center
Gypsum Management Facility
Montgomery County, Illinois

IDNR Permit # DS2014019
Dam Permit # IL50578 & IL50579

Prepared For:

ILLINOIS POWER GENERATING COMPANY
Coffeen Energy Center
134 CIPS Lane
Coffeen, Illinois 62017

Prepared By:

HANSON PROFESSIONAL SERVICES INC.
1525 South Sixth Street
Springfield, Illinois 62703

Amended By:

DYNEGY OPERATING COMPANY
1500 Eastport Plaza Drive
Collinsville, Illinois 62234

Original: February 2008
Amended: March 2015

OPERATION AND MAINTENANCE MANUAL
COFFEEN ENERGY CENTER
GYPSUM MANAGEMENT FACILITY
MONTGOMERY COUNTY, ILLINOIS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

SECTION 1.0
GENERAL

This operation and maintenance (O&M) manual outlines objectives, proposed policies, responsibilities, and procedures for Coffeen Energy Center personnel who are responsible for the management of the Coffeen Energy Center Gypsum Management Facility (GMF). The GMF incorporates two reservoirs, the Gypsum Pond and the Recycle Pond, for processing and storing gypsum.

1.1 REASONS FOR DEVELOPMENT AND DISSEMINATION OF THE O&M MANUAL

The State of Illinois Rivers, Lakes and Streams Act, (615 ILCS 5) Paragraph 23a includes the statement "The Department is authorized to carry out inspections of any dam within the State, and to establish standards and issue permits for the safe construction of new dams and the reconstruction, repair, operation and maintenance of all existing dams." (emphasis added).

Part 3702 of Section 17 of the Illinois Administrative Code, Chapter I entitled the "Construction and Maintenance of Dams" details the requirements to obtain a permit for the construction, operation, and maintenance of a dam. Section 3702.40 b) includes the following statements:

> "4) An applicant for a Class I or II dam shall submit an operational plan specifying the method and schedule for the operation of the dam and the routine operating procedures to keep the dam in good working order, including an emergency warning plan." and

> "5) As a condition of each permit, the dam owner shall submit a maintenance plan detailing the procedures and schedules to be followed to maintain the dam and its appurtenances in a reasonable state of repair."

Thus, it is a requirement of all dam owners who have dams which fall under the jurisdiction of the Illinois Department of Natural Resources Office of Water Resources (IDNR-OWR) to operate and maintain them safely.

As a dam owner, Illinois Power Generating Company (IPGC) Coffeen Energy Center is responsible for the safety of the public and for maintaining the structures at the facility for both safety and economy. The overall public interest is served by providing a document to serve as a basis for the safe and economical operation and maintenance of the dam during both emergency and day-to-day conditions.

1.2 GENERAL RESPONSIBILITIES CONCERNING DAMS

IPGC is responsible for the operation and maintenance of the Gypsum Pond Dam and the Recycle Pond Dam. These responsibilities include general maintenance (mowing, removing debris from decants, placing riprap where needed, etc.), operation, inspection and emergency action decisions.

SECTION 2.0
DEFINITIONS

Appurtenant Works - The structures or machinery auxiliary to dams which are built to operate and maintain dams; such as outlet works, spillways, gates, valves, channels, etc.

Boil - A stream of water discharging from the ground surface downstream of the dam carrying with it a volume of soil which is distributed around the hole formed by the discharging water.

Berm - A horizontal step or bench in the sloping profile of an embankment dam.

Breach - A break, gap, or opening (failure) in a dam which releases impoundment water.

Dam - A barrier built for impounding or diverting the flow of water.

Dike (Levee) - An embankment, usually applied to embankments or structures built to protect land from flooding.

Drain, Layer or Blanket - A layer of pervious material in a dam to facilitate the drainage of the embankment including such items as a toe drain, a weephole, and a chimney drain.

Drawdown - The resultant lowering of the water surface level due to the release of water from the impoundment.

Embankment - Fill material, usually rock or earth, placed with sloping sides.

Earthen Dam - Any dam constructed of excavated natural materials.

Emergency Action Plan - A predetermined plan of action to be taken to reduce the potential for property damage and loss of lives.

Failure - An incident resulting in the uncontrolled release of water from the dam.

Freeboard - The vertical distance between a stated water level and the top of the dam.

Gate or Valve - In general, a device in which a leaf or member is moved across the waterway to control or stop the flow.

Groin - The junction of the upstream or downstream face of the dam with the valley wall.

Maintenance - The upkeep, involving labor and materials, necessary for efficient operation of dams and their appurtenant works.

Operation - The administration, management, and performance needed to operate the dam and appurtenant works.

Operation and Maintenance Inspection - Inspections conducted by the dam operator. These inspections are frequent visual "Walk-around" inspections of the dam surface and appurtenant works.

Outlet - An opening through which water can freely discharge for a particular purpose from an impoundment.

Phreatic Surface - The upper surface of saturation in an embankment.

Piping - The progressive development of internal erosion by seepage, appearing downstream as a hole or seam, discharging water that contains soil particles.

Riprap - A layer of large stones, broken rock or precast blocks placed in a random fashion usually on the upstream slope of an embankment dam, on a reservoir shore, or on the sides of a channel as a protection against wave and ice action.

Silt/Sediment - Soil particles and debris in an impoundment.

Slump/Slide Area - A portion of earth embankment which moves downslope, sometimes suddenly, often with cracks developing.

Spillway System - A structure or structures over or through which flows are discharged. If the flow is controlled by gates, it is considered a controlled spillway. If the elevation of the spillway crest is the only control of the flows, it is considered an uncontrolled spillway.

Emergency Spillway - A spillway designed to operate very infrequently, only during exceptionally large floods, usually constructed of materials expected to erode slowly.

Principal Spillway - The main spillway which controls both normal and flood flows and is usually constructed of non-erodable materials.

Auxiliary Spillway - A spillway which works in conjunction with the principal spillway to control flood flows and is usually constructed of non-erodable materials.

Stilling Basin - A basin constructed to dissipate the energy of fast flowing water, such as from a spillway, and to protect the streambed from erosion.

Toe of Embankment - The junction of the face of the dam with the ground surface in the floodplain upstream or downstream of the dam.

SECTION 3.0
INFORMATION ABOUT THE DAMS

3.1 LOCATION

The Gypsum Pond Dam and Recycle Pond Dam are located in the NW 1/4 of Section 11, Township 7 North, Range 3 West of the Third Principal Meridian in Montgomery County, Illinois. More specifically, the dams are located approximately 1.5 miles south of Coffeen, Illinois. A map showing the location of the dams is included in Appendix A.

3.2 DESCRIPTION OF DAM AND APPURTENANCES

The gypsum pond perimeter earthen dam, the gypsum pond "gypsum" dam, and the recycle pond dam will all be regulated in accordance with 17 Illinois Administrative Code (IAC) Part 3702, Construction and Maintenance of Dams. The gypsum pond perimeter earthen dam, which will be lined with a dual high density polyethylene (HDPE) geomembrane system, will have a maximum embankment height of 13 ft and a maximum impounding capacity of 442 acre-ft (measured at the top of earthen dam elevation 632 ft). There will be an additional 123 acre-ft of incised storage. The total volume of gypsum stored within the completed gypsum pond dams will be approximately 2,478 acre-ft.

The dam for the recycle pond, which will be lined with a 60 mil HDPE geomembrane, will have a maximum embankment height of 16 ft and a maximum impounding capacity of 243 acre-ft (measured at the top of dam elevation 629 ft). There will be an additional 99 acre-ft of incised storage.

The gypsum pond will be divided into two sub-cells for the containment of scrubber sludge (gypsum). Discharges to the site will switch back and forth between the two sub-cells so that one sub-cell can be dewatered and raised while the other is in use. There will be two fixed decant pipes constructed in the gypsum stack – one for each sub-cell - which will discharge to stilling wells located adjacent to the perimeter ditches. The control elevation on the decant pipes will be maintained 5.0 ft below the lowest point on the stack cell crest. The decant pipes will enable the cells to be dewatered after storm events so that a minimum of 5.0 ft of freeboard will be maintained in each cell. A minimum of 4.7 ft of freeboard is required above the decant inlet to contain the Probable Maximum Flood (PMF) storm event in addition to peak wind generated waves.

The gypsum pond dam perimeter ditches will be located on the interior sides of the earthen dam. Runoff from the stack will be conveyed through the ditches to a transfer channel which will discharge into the recycle pond. The ditches will be trapezoidal in shape with a 15 ft bottom width, a maximum depth of 9 ft and a longitudinal slope of 0.0005 ft/ft. Side slopes will be 3H:1V. During operation, the ditches will be monitored for erosion. If erosion of the designed ditch geometry occurs, a geogrid will be used for stabilization.

The transfer channel between the gypsum pond dam and the recycle pond have a trapezoidal cross-section with 3H:1V side slopes will be lined with HDPE. The 500 ft long transfer channel will transition from a 32-ft bottom width at an invert elevation of 623.0 ft at the upstream end to a 60-ft bottom width at an invert elevation of 622.0 ft at the downstream end. The transfer channel will be fitted with stop logs capable of raising the discharge control elevation to 625.0 ft. To prevent degradation of the HDPE liner due to flow velocities, the transfer channel and a portion of the recycle pond dam will incorporate an additional sacrificial layer of HDPE.

The emergency spillway for the recycle pond will consist of three 6 ft by 6 ft precast reinforced concrete risers (drop inlets) with a top elevation of 624 ft (5 ft below the top of the dam). The recycle pond's HDPE liner will attach to the exterior sides of each riser. A 4-ft diameter HDPE outlet conduit will be constructed at each riser with an upstream invert of 615.0 ft and a downstream invert of 613.0 ft. Assuming a normal pool elevation of 624 ft (control elevation of the risers), the emergency spillway has been designed to pass the 24-hour PMF storm event with adequate freeboard to prevent overtopping of the recycle pond crest by wind generated waves. The emergency spillway has been provided in the event of accident or catastrophic rainfall only. It is not expected to be activated during the life of the facility. As designed, all discharges from the system will be through the pump house located on the southeast corner of the recycle pond.

3.3 SIZE AND HAZARD CLASSIFICATION

If a worst case failure of the gypsum pond dam were to occur, and the entire volume of the stack is released easterly into Coffeen Lake, the Coffeen Lake reservoir has adequate freeboard to accept this additional volume without overtopping the dam during flood events up to and including the 60 percent PMF. However, the power plant and several residences could potentially be impacted if the gypsum stack dam were to fail in a westerly direction. Considering the regulatory criteria established in Part 3702, the gypsum stack perimeter earthen dam and the gypsum stack "gypsum" dam are classified as intermediate-size Class I (high hazard potential) dams.

A failure of the recycle pond dam would discharge water to Coffeen Lake but it is not anticipated to result in loss of life or any significant economic damage. Breach analyses indicate that a failure of the recycle pond dam during a PMF event would be expected to result in an increase in the Coffeen Lake water surface elevation of not more than ½ inch. Accordingly, the recycle pond dam is classified as a small-size Class III (low hazard potential) dam.

3.4 PURPOSE OF THE DAMS

The dams will be used to dewater, store and dispose of flue gas desulphurization sludge (gypsum) from the Coffeen Power Station (the Plant). Gypsum will be transported to the Gypsum Pond Dam in slurry form (approximately 20 percent solids) and allowed to settle. Clarified process water will then be decanted to the recycle pond and returned to the Plant for reuse via a pipeline.

3.5 PERTINENT DATA

Pertinent data about the dams, appurtenant works, and reservoirs are presented in Table 3-1 and Table 3-2.

Table 3-1 Pertinent Data for the Gypsum Pond Earthen Dam
(Based on the Construction of 2 Gypsum Cells)

Perimeter Ditches		
Bottom Width	15.00	feet
Top Width	73.50	feet
Depth	9.00	feet
Outer Side Slope	3:1	H:V
Inner Side Slope	3:1	H:V
Upstream Invert	624.85	feet
Downstream Invert	623.00	feet
Ditch slope	0.00050	ft/ft
Bank Full Cross-sectional Area	378.00	sf
Length of Each Ditch (Centerline)	3710.00	feet
Bank Full Volume of Each Ditch	32.19	acre-ft
Total Ditch length (Centerline)	7420.00	feet
Total Ditch Bank Full Volume	64.39	acre-ft

Transfer Channel		
Bottom Width	32.00	feet
Top Width	86.00	feet
Depth	9.00	feet
Upstream Invert	623.00	feet
Downstream Invert	622.00	feet
Weir Elevation	625.00	feet
Weir Length (at 2 ft height)	44.00	feet

Dam		
Top of Dam Elevation	632	feet
Reservoir Surface Area	77.29	acres
Total Watershed Area	77.29	acres
Dam Length	7720	feet
Dam Height	13	feet

1.0 PMF Storm Event		
Storm Duration	24	hours
Peak Outflow Discharge	1100.7	cfs
Total Discharge Volume	228.83	acre-ft
Peak WSEL in Perimeter Ditches	629.89	feet
Freeboard over Max WSEL	2.11	feet
Wave Runup/Wind Setup	2.06	feet
Adequate Freeboard?	**YES**	

0.5 PMF Storm Event		
Storm Duration	24	hours
Peak Outflow Discharge	541.1	cfs
Total Discharge Volume	122.41	acre-ft
Peak WSEL in Perimeter Ditches	628.23	feet
Freeboard over Max WSEL	3.77	feet
Wave Runup/Wind Setup	2.06	feet
Adequate Freeboard?	**YES**	

100-yr Storm Event - Critical Duration		
Storm Duration	12	hours
Peak Outflow Discharge	92.6	cfs
Total Discharge Volume	50.91	acre-ft
Peak WSEL in Perimeter Ditches	626.07	feet
Freeboard over Max WSEL	5.93	feet
Wave Runup/Wind Setup	2.06	feet
Adequate Freeboard?	**YES**	

100-yr Storm Event - 24 Hour Duration		
Storm Duration	24	hours
Peak Outflow Discharge	62.9	cfs
Total Discharge Volume	57.01	acre-ft
Peak WSEL in Perimeter Ditches	625.84	feet
Freeboard over Max WSEL	6.16	feet
Wave Runup/Wind Setup	2.06	feet
Adequate Freeboard?	**YES**	

Note: The Critical Storm Duration is the duration of the rainfall event which produces the highest reservoir water surface elevation in the Gypsum Stack Perimeter Ditches for the given storm frequency. In each case, the starting normal pool elevation of the Recycle Pond is considered to be at elevation 624 ft.

Table 3-2 Pertinent Data for the Recycle Pond Dam
(Based on the Construction of 2 Gypsum Cells)

Dam		
Top of Dam Elevation	629	feet
Invert of Reservoir Elevation	605	feet
Reservoir Area at Invert	11.55	acres
Reservoir Area at Top of Dam	17.07	acres
Total Reservoir Volume	341.91	acre-ft
Volume at Elevation 624 ft	259.60	acre-ft
Total Watershed Area	94.36	acres
Dam Length	3600	feet
Dam Height	16	feet

3 Spillways- 6ft x 6ft inlet w/ 4ft dia outlet pipe		
Weir Length	22	feet
Weir Elevation	624.00	feet
Outlet Conduit Length	120	feet
Outlet Conduit Diameter (Inside)	48	inch
Upstream Invert	615	feet
Downstream Invert	614	feet
Outlet Conduit Slope	0.00833	

1.0 PMF Storm Event - Normal Pool at Elev. 624 ft		
Storm Duration	24	hours
Peak Inflow	1261.6	cfs
Peak Outflow	586.9	cfs
Peak Storage	315.47	acre-ft
Peak WSEL (HEC-HMS)	627.45	feet
Freeboard over Peak WSEL	1.55	feet
Wave Runup/Wind Setup	1.20	feet
Adequate Freeboard?	**YES**	

1.0 PMF Storm Event - Normal Pool at Elev. 609 ft		
Critical Storm Duration	24	hours
Peak Inflow	1261.6	cfs
Peak Outflow	289.7	cfs
Peak Storage	280.65	acre-ft
Peak WSEL (HEC-HMS)	625.34	feet
Freeboard over Peak WSEL	3.66	feet
Wave Runup/Wind Setup	1.20	feet
Water Released from Dam?	**YES**	

0.5 PMF Storm Event - Normal Pool at Elev. 624 ft		
Storm Duration	24	hours
Peak Inflow	608.4	cfs
Peak Outflow	413.6	cfs
Peak Storage	286.48	acre-ft
Peak WSEL (HEC-HMS)	625.69	feet
Freeboard over Peak WSEL	3.31	feet
Wave Runup/Wind Setup	1.20	feet
Adequate Freeboard?	**YES**	

0.5 PMF Storm Event - Normal Pool at Elev. 613 ft		
Critical Storm Duration	24	hours
Peak Inflow	608.4	cfs
Peak Outflow	0	cfs
Peak Storage	255.83	acre-ft
Peak WSEL (HEC-HMS)	623.75	feet
Freeboard over Peak WSEL	5.25	feet
Wave Runup/Wind Setup	1.20	feet
Water Released from Dam?	**NO**	

100-yr Storm Event - Normal Pool at Elev. 624 ft		
Critical Storm Duration	12	hours
Peak Inflow	113.2	cfs
Peak Outflow	95.8	cfs
Peak Storage	269.36	acre-ft
Peak WSEL (HEC-HMS)	624.63	feet
Freeboard over Peak WSEL	4.37	feet
Wave Runup/Wind Setup	1.20	feet
Adequate Freeboard?	**YES**	

100-yr Storm Event - Normal Pool at Elev. 619 ft		
Critical Storm Duration	24	hours
Peak Inflow	76.6	cfs
Peak Outflow	0	cfs
Peak Storage	258.48	acre-ft
Peak WSEL (HEC-HMS)	623.94	feet
Freeboard over Peak WSEL	5.06	feet
Wave Runup/Wind Setup	1.20	feet
Water Released from Dam?	**NO**	

Note: The above variation in normal pool elevations for the Recycle Pond is for the purpose of documenting the water surface elevation which must be maintained in the recycle pond in order to prevent the release of water from the GMF for the above described storm events.

SECTION 4.0
OPERATIONS ACTIVITIES

4.1 INTRODUCTION

The operations plan describes the proposed operation of the Coffeen Gypsum Management Facility (GMF) which includes the gypsum pond and the recycle pond.

4.2 SITE OPERATIONS AND PERSONNEL

4.2.1 Site Operations

The GMF will receive gypsum slurry 24 hours per day, seven days per week. Routine facility maintenance and construction activities will generally be conducted during day shift hours. The crest widths for both the gypsum stack earthen dam and the recycle pond dam are 20 ft. In addition, multi-directional ramps are being provided for both structures so that they are readily accessible by inspection, maintenance and gypsum recovery equipment.

The Plant is a restricted access location. Additional fencing around the perimeter of the active sedimentation cells of the gypsum stack and the recycle pond will be erected to prevent unauthorized access to the GMF, which is also under surveillance by security personnel.

4.2.2 Personnel

The proposed GMF will be owned and operated by Ameren Energy Generating Company (Ameren). Corporate offices are located in St. Louis, Missouri. Overall responsibility for the GMF operation lies with Ameren management personnel.

4.3 GYPSUM MANAGEMENT FACILITY STARTUP

The major components of the proposed GMF consist of:

- The gypsum stack dam/impoundment;
- The recycle pond;
- The earthen transfer channel that connects the two structures and through which process water will be decanted from the gypsum stack into the recycle pond; and
- The recycle pond decant and pumphouse through which process water will be returned to the Plant for reuse.

Both the recycle pond and the gypsum stack dam will be constructed before gypsum is placed within the gypsum stack dam/impoundment.

Upon startup, it is likely that the gypsum stack impoundment will have no more than a few feet of water in the bottom to prevent the high density polyethylene (HDPE) geomembrane from moving. The gypsum slurry (approximately 20 percent solids) will be pumped from the

Plant to the gypsum stack via piping. The piping will be HDPE with a suitable pressure rating for the intended hydraulic and static head. The HDPE pipe will discharge the slurry into the impoundment, and gypsum will settle by gravity.

It will take approximately 10 months before the gypsum stack impoundment is filled to elevation 623 ft, the point where process water may begin flowing into the recycle pond via the HDPE-lined earthen channel connecting the two structures. As soon as water begins to fill the recycle pond, it will be pumped back to the Plant for reuse.

4.4 WATER BALANCE

The capacity of the recycle pond has been designed to accommodate all precipitation runoff from the entire gypsum pond/recycle pond area during a 2-week complete maintenance outage at the Coffeen Power Station (the Plant) followed by a 12-week outage of one of the two units. The runoff and excess water accumulated during this time can be stored within the recycle pond without discharging. The design is based on the maximum 3.5 month precipitation that has occurred in the area since 1950. This occurred in April, May, June and half of July, 1957 and consisted of 28.83 inches of rainfall.

The water balance has been carried out for the expected life of the Site. During the first nine or ten months of operation, the water balance is positive, meaning that there is more water entering the gypsum stack/recycle pond system through process water and precipitation than is leaving the system through process water return and evaporation. However, there is 15 ft of freeboard between the pump discharge and the emergency spillway. With proper water-level management, the water surface will remain well below discharge elevation. After this initial startup period, the water balance is negative, meaning that other water sources will need to be continually added to the process water makeup stream to maintain the volume necessary for transport of the gypsum slurry.

The water balance is of particular concern since the entire system is designed to be a closed loop with no discharges. *(As previously noted, the recycle pond has been designed with an emergency spillway, but this is only to protect the structures in the event of an unforeseen accident or catastrophic rainfall event.)* Table 3.5-2 lists the maximum water surface elevation allowed in the recycle pond in order to prevent the discharge of water for the 100-year storm event and the 0.5 PMF storm event.

4.5 GYPSUM MANAGEMENT FACILITY OPERATION

4.5.1 Routine Operations

Gypsum slurry will initially be discharged at the southwestern corner of the gypsum pond impoundment. Settled gypsum will gradually create a plane of material sloping gently towards the north end of the impoundment. Depending on the slope of the settled gypsum, the discharge pipe may be moved to other corners of the impoundment to evenly distribute the material. Care must be taken during the initial filling period so to ensure that the sand layer covering the ring drains is not disturbed. If necessary, the sand may be armored with larger washed aggregate or the impoundment may be gradually filled with water to cover the sand prior to the discharge of gypsum slurry into the impoundment.

Once the gypsum plane reaches approximately elevation 627 ft (5 ft below the earthen dam crest), a track excavator or similar piece of equipment will be used to create the first gypsum berm and to form the perimeter ditch. Each gypsum berm will be approximately 10 ft in height and will effectively create a two-compartment impoundment within its perimeter. Gypsum for construction of the gypsum berm will be obtained from the settled material on the inside of the berm, creating an inner ditch. Gypsum slurry will then be discharged alternately into the inner ditch of each compartment. Gypsum will settle out into the inner ditch and clarified process water will flood the compartment to a depth of several feet. This water will be decanted to the perimeter ditch by way of an HDPE decant pipe which will discharge to a stilling well located at the toe of the gypsum stack.

As each compartment fills with settled gypsum, the discharge piping will be moved to the alternate compartment. The compartment, or sub-cell, that is not in service will be allowed to dewater and another gypsum berm will be constructed on top of the previous gypsum berm, effectively raising the gypsum stack another 10 ft. This alternating cycle of gypsum discharge, compartment dewatering and berm construction will continue. Gypsum will be deposited in the stack with an average dry density of approximately 74 $lb/ft^{3.}$ Drawing No. C-10201-25 provides a visual description of this process.

<u>4.5.2</u> <u>Piezometer Installation and Monitoring</u>

The side slopes of the gypsum pond will be constructed with 3:1 side slopes. After consolidation of the settled gypsum over time, the final slopes should approach 3.75:1. The stability of each gypsum pond slope is <u>critically dependent</u> on the location of the phreatic surface which is anticipated to develop within the stack. Ring drains are intended to lower the phreatic surface so that it is located an adequate distance from the surface of the slope in order to maintain slope stability. In order to monitor the phreatic surface within the stack, piezometers will be installed on each side of the gypsum pond. The piezometers will be installed every 15 vertical feet up the slope (45 horizontal feet based on 3:1 side slopes) and will extend to a depth of at least 15 feet below the anticipated phreatic water surface elevation as shown in Figure 4-1. At the time of installation, each piezometer will be labeled with the "critical elevation" corresponding to the anticipated phreatic surface elevation at that location. The anticipated phreatic surface elevation is the water surface elevation which was used in the slope stability analysis of the gypsum pond. The water level in each piezometer will be read and recorded on a monthly basis. If at any time a reading is recorded higher than "critical elevation" for that specific peizometer, the design engineer must be contacted immediately for evaluation of the reading. Any readings above the "critical elevation" may be indicative of improper ring drain function and/or slope instability which could lead to a failure of the gypsum stack. Therefore, it is critical that the piezometers are installed in accordance with the construction plans and specifications and monitored in accordance with this manual. It may be necessary to install additional subdrainage to maintain the phreatic surface at the desired level within the gypsum stack.

Figure 4-1 Anticipated Phreatic Surface in Gypsum Pond

Refer to figure at the end of the report text.

4.6 DAM INSPECTIONS

The inspection program includes two types of dam inspections. The first is regularly conducted by the dam operator and is referred to as an Operation and Maintenance Inspection. The second type of inspection, referred to as the Engineering Inspection, is conducted by a qualified engineer approved by IPGC. All engineering inspection reports must be signed and sealed by an Illinois Registered Professional Engineer.

The dam operator will perform monthly Operation and Maintenance Inspections of the gypsum pond perimeter earthen dam and the gypsum berms and side slopes during the operating life of the structure. During these inspections, the gypsum stack ditches and the transfer channel will also be examined for signs of erosion and liner degradation. The "operating life of the structure" will be considered to cease upon covering of the gypsum with an HDPE/soil cover. Engineering Inspections will be conducted on an annual basis during the operating life of the structure and will continue after covering of the gypsum pond until authorization to abandon the structure is received from IDNR/OWR.

4.6.1 Operation and Maintenance Inspection

Occasional "walk-around" inspections of the dams and appurtenant works are to be made by the dam operator. During these inspections, a checklist of items to be maintained and items to be observed should be recorded. Appendix A provides an example of the Operation and Maintenance Inspection Checklist to be utilized for these inspections. **If any of the following items are found to be unusual or are cause for concern, the Shift Supervisor should be notified and the Emergency Action Plan should be immediately consulted for guidance on an appropriate course of action.**

Frequency: Operation and maintenance inspections will be performed by the dam operator on a monthly basis and also during and after unusual events such as heavy rainfall or an earthquake.

Inspection Items: During each inspection the following items should be noted in particular.

1. Water Level - Maximum reservoir levels as a result of heavy rainfall should be recorded.

2. Earth Embankment - Walk the crest, side slopes and downstream toe of the dam concentrating on surface erosion, seepage, cracks, settlement, slumps, slides, and animal burrows. These are described as follows:

   - Surface Erosion - Removal of vegetative cover by water action or pedestrian or vehicle usage forming deep ruts or gullies.

   - Seepage - The passage of water through and/or underneath the earth embankment abutment and natural groundline or at the contact between the embankment and outlet works. It can be indicated by cattails or other wet environmental vegetation, erosion, channelization, or slumping on the embankment face.

- Cracks - Deep cracks usually indicate the movement of the dam and/or the foundation and can be in either the longitudinal (along the length of the dam) or transverse (across the dam) directions. Cracking can be an indicator of the beginning of slumps. Shallow cracks may develop during the summer when the surface soils of the embankment become severely dried and are usually of no concern in regard to the safety of the dam.

- Settlement - Settlement is indicated by depressions or low spots and can be signs of consolidation of the dam or foundation or the loss of material beneath the settlement area.

- Slumps/Slides - A slow or sudden movement of the earth embankment slope on either face toward the toe of the dam.

- If seepage indicates the presence of soil particles, or if deep cracks, settlement, slumps, or slides are noticed, a qualified engineer should be contacted immediately for consultation.

- Animal Burrows - Animal burrows result in a loss of earth embankment material and can provide seepage paths for water through the embankment.

3. Gypsum Embankment - Walk the crest, side slopes and downstream toe of the dam concentrating on surface erosion, seepage, cracks, settlement, slumps, slides and animal burrows. The descriptions for these are the same as for earth embankment.

4. Vegetation - Grass should be a thick vigorous growth to stabilize the earth embankment soils and prevent erosion from occurring. Note the height of the grass; if greater than 1 foot a mowing of the area should be scheduled before the next inspection. There should be NO trees on the earth embankment and NONE within a minimum of 20 feet of the embankment toes or other structures. The gypsum embankment will not be seeded and is not expected to have any vegetation.

5. Gypsum Stack piezometers should be inspected for any damage or loss of function. Damaged piezometers must be promptly repaired or replaced since their function is critical to ensuring stability of the gypsum stack.

6. The water level in each Gypsum Stack piezometer must be measured and recorded during each monthly inspection. If the water level in any piezometer is above the "critical elevation" as discussed in Section 4.5.2 of this plan, the Ameren Technical Services Superintendent should be notified and the **Emergency Action Plan should be immediately consulted for guidance on an appropriate course of action**.

7. Gypsum Pond LD/LCRS Drains - The change in location or amount of flows discharging from the Leak Detection/Leachate Collection Recovery System (LD/LCRS) should be recorded. If a significant change has occurred, a qualified engineer should be contacted for consultation.

8. Gypsum Stack Ring Drains - The change in location or amount of flows discharging from the Ring Drains should be recorded. If a significant change has occurred, a qualified engineer should be contacted for consultation.

9. Gypsum Stack Fixed Decant – Check the alignment and supports for the pipe. Record the amount of flows discharging from the pipe and any erosion or scour around the discharge point.

10. Gypsum Stack Perimeter Ditch – The perimeter ditch should have a consistent prismatic shape for the entire length. Inspect the perimeter ditch for evidence of erosion, sediment deposition and irregularity in channel geometry, especially in the vicinity of siphon, decant or ring drain outfall structures. If irregularities are noted, repairs should be scheduled and completed.

11. Drawdown Facilities - Check to make sure that the drawdown stop logs in the transfer ditch are undamaged, operating well and allowing for the free flow of water over them. Confirm during inspections the valves are opened and closed at least quarterly.

12. Transfer Channel - Check for any debris or other obstructions which may block or restrict the free flow of water. Check for any pools or undulation of the floor of the channel.

13. Recycle Pond Decant - Check for any debris or other obstructions around the Recycle Pond decant which may block or restrict the free flow of water. The emergency dewatering valve should be lubricated. If there is no return water in the pipe, the emergency dewatering valve should be exercised. Record the physical and operating conditions of the system.

14. Recycle Pond Drop Inlet Spillways - Check for any debris or other obstructions around the inlet crest and at the bottom of the drop inlet which may block or restrict the free flow of water. Check for the development of any rusty areas on the concrete, and seepage, cracking, breaking, or spalling of the concrete. Check for settlement or cracking of the crest. Check for any debris in the pipes which may restrict the flow of water. Check for any tears or leaks in the HDPE liner covering the concrete.

15. Recycle Pond Rip Rap Basin - Check for any debris or other obstructions in the riprap basin which may block or restrict the free flow of water. Check to make sure that the rip rap is remaining in a uniform position. Freeze/thaw action or flow over the rip rap may tend to lift or fracture, thus requiring replacement or leveling to maintain the necessary level of protection. NO trees or woody vegetation should be growing through the rip rap.

16. Fences - Check for damage, accumulated debris, operation of gates and locks, and adequacy of locations (this may change with time as people access the area or development occurs in the area).

17. Perimeter - Check the perimeter of the dams for a distance of at least 100 feet beyond the toe for signs of seepage or boils.

18. HDPE Liner – Wherever exposed, the HDPE Liner should be inspected for tears, gouges, protrusions under the liner and abrasion.

Records: A log book of activities occurring at the dam is to be kept current by the dam operator. The log book should be reviewed during the Engineering Inspection. This book should contain at the least the following documentation:

1. Completed operation and maintenance inspection checklists
2. Readings from all piezometers on the Gypsum Stack
3. Additional visual observations
4. A list of maintenance performed
5. A list of any unusual occurrences at the dam
6. Copies of the engineering inspection reports

4.6.2 Engineering Inspection

The engineering inspection is to be conducted by a qualified engineer approved by Ameren. The inspection will provide a thorough evaluation of the dam condition and appurtenances. Appendix B is an example of the inspection report form which is to be utilized for these inspections.

Frequency: The Gypsum Pond Dam is a Class I, High Hazard Potential dam and is to be inspected by an Illinois Registered Professional Engineer at least once per year. The Recycle Pond Dam is classified as a Class III, Low Hazard Potential dams and is to be inspected by an Illinois Registered Professional Engineer at least once every five years.

Inspection Items: The engineer will thoroughly inspect all of the items noted in Section 4.6.1 Operation and Maintenance Inspection.

Records: The Dam Inspection Report form from IDNR-OWR “Guidelines and Forms for Inspection of Illinois Dams” (a copy of which is included in Appendix B), will be completed by the inspecting engineer and will be signed and sealed by an Illinois Registered Professional Engineer. This report will document problem areas and deficiencies; recommend remedial actions for problem areas; and establish time requirements for dealing with the problems. The original report will be retained in Dynegy Operating Company (DOC) files, and a copy of the report will be submitted to the Illinois Department of Natural Resources, Office of Water Resources.

4.6.3 Review of Emergency Action Plan

The emergency action plan should be reviewed annually to assure that all contacts, addresses and telephone numbers are current. Changes in the adjacent land use should also be noted and may dictate the need for revisions to the plan. Changes to the plan should be made as appropriate but only with the concurrence of the Montgomery County Emergency Services and Disaster Agency and of the Illinois Department of Natural Resources, Office of Water Resources. Copies of any revisions should also be forwarded to all personnel and known emergency responders that possess previous versions the plan.

SECTION 5.0
MAINTENANCE ACTIVITIES

Timely repairs are a must after problem areas have been identified. The dam operator is to perform the work required to correct items noted in the operation and maintenance inspections and engineering inspections. Such items include repairing erosion of the gypsum slopes, mowing, seeding, tree and brush removal, replacing rip rap, repairing fences and locks, clearing debris, etc. The maintenance activities specified in the following sections are minimum requirements. NOTE: NO alterations or repairs to structural elements should be made without the assistance of the Ameren Chief Dam Safety Engineer and the concurrence of the Illinois Department of Natural Resources, Office of Water Resources.

Debris: Remove all trash, logs and other debris which may obstruct flow into the principal spillway pipes and drop inlets, or block passage from their discharge channels.

Rip Rap: Replenish rip rap as needed to provide adequate protection against erosion.

Vegetation Control

1. Maintain a good grass cover on the embankment by seeding, fertilizing and mulching areas which are refilled, barren, or thinly vegetated. Seeding mixtures used for maintenance reseeding shall result in a cover compatible with adjacent cover. The seeding mixture specified at the time of the dam's construction was IDOT Standard Specifications Class 1A (Salt Tolerant Lawn Mixture) as follows:

   <u>IDOT Class 1A Salt Tolerant Lawn Mixture</u>
   Bluegrass ....60 lb/acre
   Perennial Ryegrass ....20 lb/acre
   Dawsons Red Fescue.......20 lb/acre
   Scaldis Hard Fescue ....20 lb/acre
   Fults Salt Grass ....60 lb/acre

2. Grassed areas such as the embankment and the areas beyond the embankment toes for a distance of at least 20 feet should be mowed at least twice annually or at any time the height of the grass exceeds 1 foot.

3. All erosion areas will be filled and compacted, reseeded, fertilized and mulched to establish a thick erosion resistant cover.

4. Remove all trees and brush growing on the dam embankment to prevent development of a root system which could provide seepage paths. Herbicides utilized for tree and brush control are discussed in Appendix D.

5. Keep the riprap basin clear of weeds, brush, and trees.

6. Clear all brush and trees for a distance of approximately 20 feet beyond the toe of each dam.

Animal Damage: Fill rodent holes and other animal burrows with compacted clayey soil and reseed. If rodents become a nuisance, an effective rodent control program as approved by the Illinois Department of Natural Resources District Wildlife Biologist should be implemented.

Signs: All warning signs shall be maintained (repaired, painted, or replaced) as needed.

Gypsum Slopes: Erosion of the gypsum slopes will be evident with the presence of erosion rills. Erosion rills should be filled with additional gypsum material and graded to conform with the design slope.

Piezometers: All piezometers on the gypsum stack shall be inspected for signs of damage or displacement. Non-functioning piezometers shall immediately be replaced.

APPENDIX A
LOCATION MAP

APPENDIX B
OPERATION AND MAINTENANCE INSPECTION CHECKLIST

OPERATION AND MAINTENANCE INSPECTION CHECKLIST

Dam Name (circle one): Gypsum Pond Dam Recycle Pond Dam

Date: ____________________ Time: ____________________

Name of Inspector: ______________________________

Reservoir Elevation: ____________ feet

ITEM	NO	YES	IF YES
Record Piezometer Readings for Gypsum Stack. Are any readings above the critical level? (see section 4.5.2 of O&M Manual)			Contact Manager, Environment & Chemistry and notify Hanson Professional Services
Note the condition of the Piezometers on the Gypsum Stack. Any damage?			Contact Manager, Environment & Chemistry
Deep Surface Cracks			Contact Manager, Environment & Chemistry
Slump or Slide on the upstream or downstream face			Contact Manager, Environment & Chemistry
Erosion from runoff, wave action or traffic			Repair and stabilize
Embankment, abutment or spillway seepage			Contact Manager, Environment & Chemistry
Seepage or flows of muddy water			Contact Manager, Environment & Chemistry
Uneven settlement			Contact Manager, Environment & Chemistry
Trees, brush or burrow holes on the embankment or in the riprap basin			Remove trees and brush, fill holes
Transfer channel or Spillway pipes blocked			Clear immediately
Damage to stop logs			Repair or replace
Damage to HDPE Liner			Repair and schedule engineer inspection
Settlement or displacement of Gypsum Pond fixed decant pipes or outlets			Schedule engineer inspection
Discharge from Gypsum Pond LD/LCRS Drains?			Record discharge rate for each outlet (time to fill bucket)
Discharge from Gypsum Pond Ring Drains?			Record discharge rate for each outlet (time to fill bucket)
Gypsum Stack Perimeter Ditch erosion			Schedule repair
Problems with Recycle Pond spillways			Contact Manager, Environment & Chemistry
Problems with Recycle Pond decant			Contact Manager, Environment & Chemistry
Height of grass (inches)		inches	If more than 1 foot, schedule mowing
Damage to fencing, gates and locks or other access restriction measures			Contact Manager, Environment & Chemistry
Confirm drawdown facilities are opened and closed at least quarterly.			Contact Manager, Environment & Chemistry

Comments: ____

____

APPENDIX C
ENGINEERING INSPECTION FORMS

Dam Inspection Report

Name of Dam ____________________ Dam Identification Number ____________________

Permit Number ____________________ Class of Dam ____________________

Location NW 1/4 Section 11 Township 7N Range 3W 3rd P.M.

Owner ____________________ ____________________
Name Telephone Number (Day)

____________________ ____________________
Street Telephone Number (Night)

____________________ County Montgomery
City Zip Code

Type of Dam ____________________

Type of Spillway ____________________

Date(s) Inspected ____________________

Weather When Inspected ____________________

Temperature When Inspected ____________________

Pool Elevation When Inspected ____________________

Tailwater Elevation When Inspected ____________________

Inspection Personnel:

____
Name Title

____
Name Title

____
Name Title

____
Name Title

Professional Engineer's Seal

The Department of Natural Resources is requesting information that is necessary to accomplish the statutory purpose as outlined under the River, Lakes and Streams Act, 615 ILCS 5 (1994 State Bar Edition). Submittal of this information is REQUIRED. Failure to provide the required information could result in the initiation of non-compliance procedures as outlined in Section 702.160 of the "Rules for Construction and Maintenance of Dams". This form has been approved by the State Forms Management Center.

CONDITION CODES

EC	**-**	**Emergency Condition. A serious dam safety condition exists that needs immediate action. Emergency measures implemented as instructed by Chief Dam Safety Engineer; such as, pool draw down, work stoppage, plant stoppage.**
NE	**-**	**No evidence of a problem**
GC	**-**	**Good condition**
MM	**-**	**Item needing minor maintenance and/or repairs within the year, the safety or integrity of the item is not yet imperiled**
IM	**-**	**Item needing immediate maintenance to restore or ensure its safety or integrity. Remediation should be completed within 1 month.**
EC	**-**	**Emergency condition which if not immediately repaired or other appropriate measures taken could lead to failure of the dam**
OB	**-**	**Condition requires regular observation to ensure that the condition does not become worse**
NA	**-**	**Not applicable to this dam**
NI	**-**	**Not inspected - list the reason for non-inspection under deficiencies**
EC	**-**	**Emergency Condition. A serious dam safety condition exists that needs immediate action. Emergency measures implemented as instructed by Chief Dam Safety Engineer; such as, pool draw down, work stoppage, plant stoppage.**

GYPSUM STACK - EARTH EMBANKMENT

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Surface Cracks			
Vertical and Horizontal Alignment of Crest			
Unusual movement or Cracking at or Beyond Toe			
Sloughing or Erosion of Outer Embankment Slopes			
Upstream Face Slope Protection (HDPE Liner)			
Seepage			
Animal Damage			

GYPSUM STACK - EARTH EMBANKMENT

(Continued)

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Vegetative Cover			

GYPSUM STACK - GYPSUM EMBANKMENT

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Surface Cracks			
Vertical and Horizontal Alignment of Crest			
Unusual movement or Cracking at or Beyond Toe			
Sloughing or Erosion of **Outside** Embankment Slopes			
Sloughing or Erosion of **Inside** Embankment Slopes			
Seepage			
Animal Damage			

GYPSUM STACK - GYPSUM EMBANKMENT

(Continued)

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Condition of Piezometers on Gypsum Stack			
Piezometer Readings on Gypsum Stack Above Critical Level?			

GYPSUM STACK – PERIMETER DITCH

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Ditch Geometry (15 ft bottom width, 3:1 slopes, 8-9 ft depth)			
Concrete Apron at ring drain outlets			
Ring Drain Discharge Pipes			
Stilling Wells for Fixed Decants			

TRANSFER CHANNEL - (between gypsum stack and recycle pond)

☐ Drop Inlet Structure ☒ Overflow Spillway Structure ☐ Gated

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Debris			
Side Slope Stability			
HPDE Liner			
HDPE Liner Welds			
Stop Logs			
Differential Settlement			

RECYCLE POND - EMBANKMENT

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Surface Cracks			
Vertical and Horizontal Alignment of Crest			
Unusual movement or Cracking at or Beyond Toe			
Sloughing or Erosion of Outer Embankment Slopes			
Upstream Face Slope Protection (HDPE Liner)			
Seepage			
Animal Damage			

RECYCLE POND - EMBANKMENT
(Continued)

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Vegetative Cover			

RECYCLE POND - PRINCIPAL SPILLWAY (Left, Looking Downstream)

[X] Drop Inlet Structure [ ] Overflow Spillway Structure [ ] Gated

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Alignment of Structure Walls			
Construction Joints			
Differential Settlement			
Erosion, Spalling, Cavitation			
Joint Separation			
Seepage Around or into Conduit			
Surface Cracks			

RECYCLE POND - PRINCIPAL SPILLWAY (Left, Looking Downstream)

(Continued)

☒ Drop Inlet Structure ☐ Overflow Spillway Structure ☐ Gated

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Structural Cracks			

RECYCLE POND - PRINCIPAL SPILLWAY (Center)

[X] Drop Inlet Structure   [ ] Overflow Spillway Structure   [ ] Gated

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Alignment of Structure Walls			
Construction Joints			
Differential Settlement			
Erosion, Spalling, Cavitation			
Joint Separation			
Seepage Around or into Conduit			
Surface Cracks			

<u>RECYCLE POND - PRINCIPAL SPILLWAY (Center)</u>

(Continued)

[X] Drop Inlet Structure [ ] Overflow Spillway Structure [ ] Gated

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Structural Cracks			

RECYCLE POND - PRINCIPAL SPILLWAY (Right, Looking Downstream)

[X] Drop Inlet Structure   [ ] Overflow Spillway Structure   [ ] Gated

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Alignment of Structure Walls			
Construction Joints			
Differential Settlement			
Erosion, Spalling, Cavitation			
Joint Separation			
Seepage Around or into Conduit			
Surface Cracks			

RECYCLE POND - PRINCIPAL SPILLWAY (Right, Looking Downstream)

(Continued)

[X] Drop Inlet Structure   [ ] Overflow Spillway Structure   [ ] Gated

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Structural Cracks			

RECYCLE POND - ENERGY DISSIPATOR

☒ Principal Spillway ☐ Outlet Works Type: FHWA HEC-14, Riprap Basin

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Riprap			
Outlet Channel			
Debris			

RECYCLE POND - DECANT STRUCTURE

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Alignment			
Connection to Bollard			
Debris in Inlets			
Condition of Pipe			
Condition of Liner Beneath Pipe			
Connection to Ballast			
Connection of Pipe Boot to Liner			

<u>RECYCLE POND - DECANT STRUCTURE</u>

(continued)

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE
Seepage Around or into Conduit			

RECYCLE POND – WATER LEVEL GAGE STRUCTURE

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES & SCHEDULE

APPENDIX D
HERBICIDES

HERBICIDES

Site personnel should check with the Illinois Department of Natural Resources, Regional Fisheries Biologist and the Regional Wildlife Biologist before using any herbicide. Read the product label prior to use and follow the use directions and precautions accordingly.

On March 1, 1979 the U.S. Environmental Protection Agency (U.S.E.P.A.) halted the use of the herbicide 2, 4, 5-T in parks and recreation areas. The use of silvex (2, 4, 5-TP) around water has also been banned.

The Agronomy Department at the University of Illinois and the Aquatic Biology Section of the Department of Natural Resources, Office of Scientific Research and Analysis indicate that the herbicides containing the 2, 4-D or 2, 4-DP are legal for use in parks and recreation areas and effective for controlling brush and woody growth. Some examples of approved herbicides are:

1. Tordon RTU by DOW Chemical. (Can be obtained with blue dye.)
2. WEEDONE 170 by Union Carbide
3. WEEDONE, 2, 4-DP by Union Carbide
4. A 1% to 2% solution of ROUNDUP
5. Garlon by DOW Chemical
6. Banvel by Sandoz

Your distributor may carry brand name herbicides other than those listed above. Be certain that the product does not contain the ingredients 2, 4, 5-T or 2, 4, 5-TP. An example of an unacceptable product is ESTERON 2, 4, 5 by DOW Chemical.

APPENDIX E
CONSTRUCTION DRAWINGS

AECOM

Appendix G: Photos of 2015 Sloughing Repairs

Figure G.1. Photo of 2015 sloughing prior to repairs.

Figure G.2. Photo of 2015 sloughing prior to repairs.

Figure G.3. Photo of 2015 sloughing area after repairs.

Figure G.4. Photo of 2015 sloughing area after repairs.

ATTACHMENT E


COFFEEN ASH
POND NO. 2
ID #: W1350150004-02
ILLINOIS POWER
GENERATING COMPANY

ATTACHMENT H

Natural Resource Technology
AN OBG COMPANY

OBG | There's a Way

November 21, 2017

Mr. Rick Diericx
Managing Director – Environmental Compliance Group
Dynegy Operating Company
1500 Eastport Plaza Drive
Collinsville, IL 62234-6135

Subject: Response to IEPA Comments – Coffeen Station Inactive Ash Pond No. 2
Closure and Post-Closure Care Plan for the Coffeen Ash Pond No. 2
NRT Project No. 2380

Dear Mr. Diericx:

Natural Resource Technology, Inc., an OBG Company (NRT) is providing this letter to Dynegy Operating Company (Dynegy) in response to comments received from the Illinois Environmental Protection Agency (IEPA) dated October 27, 2017 regarding the *Closure and Post-Closure Care Plan for the Coffeen Ash Pond No. 2* (Closure Plan; AECOM, January, 2017) at Illinois Power Generating Company Coffeen Power Station, in Coffeen, IL.

This Response to Comments will serve as Addendum 1 to the Closure Plan dated January 2017. For ease of review, IEPA comments are presented below in italics, followed by responses. Supplemental information to support the responses, when required, is included as Attachments 1-3. This document provides responses to all IEPA comments numbered 1 - 8.

Comment 1

It is mentioned multiple times in the closure and post-closure care plans that there are coal mines in the vicinity at depth. Please provide additional information on the locations and depths of the coal mines in the vicinity of Ash Pond No. 2.

Response: The Truax-Traer Coal Company and the Consolidation Coal Company extracted coal underlying Ash Pond No. 2 from 1964 to 1983 (Attachment 1 – Mine Index 871). The mine was originally known as the "Hillsboro" Mine and after Consolidation Coal Company took over the mining operation it was renamed "Consolidation No. 63, Hillsboro". Herrin No. 6 Coal was mined from depths of 500-510 feet below ground surface. The coal seam was 5.8-7.1 feet thick and an estimated 26,800,000 tons of coal were removed from the mine during the operational period (see Reference 1) with an extraction ratio of approximately 25% based on an estimate of volume removed from the recorded mine maps. A Mine Workings Map dated 1969 is overlaid on an aerial of Ash Pond No. 2 and included in Attachment 1 (Figure 1 – Overlay of Historic Mine). Comparison of the mine extents from 1969 with the extent of the mine included in Reference 1and shown on the Coal Mines in Illinois, Coffeen Quadrangle map included in Attachment 1 indicates there was no additional mining below Ash Pond No. 2 between 1969 and 1983 when the mine closed. As stated in Mine Index 871 (Attachment 1) the Coal Section of the Illinois State Geologic Survey (ISGS) has been assured that the extents included in Reference and Attachment 1 are final and complete.

Comment 2

The Agency requests the addition of a groundwater monitoring well on the east side of Inactive Ash Pond No. 2.

Response: NRT has evaluated the site conditions in the area east of Ash Pond No. 2 and has determined that there is no feasible access to install a monitoring well outside of the embankment because of steep slopes, heavy vegetation, and the presence of wetlands. In addition, several borings along the east side of Ash Pond No. 2 (B403A, P010, and G402) did not encounter the uppermost aquifer during drilling. Given significant access concerns and the limited nature of the aquifer NRT does not recommend installation of a monitoring well.

However, if required or deemed necessary in the future by the IEPA, a boring could be advanced through the berm following completion of closure construction activities to determine if the uppermost aquifer (Hagarstown) is present. Assuming the uppermost aquifer is present, a well could be installed through the berm if requested.

Comment 3

The two new groundwater monitoring wells to the west of the Inactive Ash Pond No. 2 are approved.

Response: A schedule for installation of the wells will be developed following approval of this Closure Plan. Appropriate documentation will be submitted to the IEPA upon completion of installation.

Comment 4

Will changes need to be made to the NPDES permit as part of the implementation of the closure plan?

Response: Yes, an application to modify the Coffeen NPDES permit (IL0000108) is being prepared to authorize the discharge of "dewatering" wastewaters from Ash Pond No. 2 to Coffeen Lake. The application will include an Antidegradation Assessment for Coffeen Lake in support of that modification request.

Comment 5

Calibration of the MODFLOW model was completed using only November 2016 groundwater elevations. Further calibration using more groundwater elevation data over a larger span of time should be completed.

Response: November 2016 groundwater elevations were used to calibrate the MODFLOW model because this was the first and only complete data set available for model development that included groundwater elevations from monitoring wells set in the uppermost aquifer, including wells G406 and G407 installed in August 2016. In order to address IEPA concerns about the efficacy of the groundwater elevation data range used for the model calibration, a comparison of observed versus predicted groundwater elevation values and groundwater flow directions will be provided in post-closure annual reports to assess model performance. If the predictive model does not adequately represent groundwater elevation and flow directions, the model will be recalibrated using available groundwater elevation data collected after November 2016. Similarly, post-closure groundwater quality data will be compared to transport model predictions to assess model performance in post-closure annual reports.

Comment 6

In the Application for a GMZ, it is noted that the problem with groundwater was identified via sampling in 2015. The Agency notes that the Coffeen Power Station received a Violation Notice in 2012 for groundwater standards violations in groundwater around Inactive Ash Pond No. 2.

Response: The GMZ application was revised to include reference to Violation Notice W-2012-00064 (Attachment 2).

Comment 7

Also in the GMZ application, no other remedies to groundwater violations are considered other than to state they are not deemed practical or cost effective. Please discuss other remedies considered and why they are not practical for mitigation relative to the nature of the subsurface or cost-effective.

Response: The GMZ Application was revised to include the following text (Attachment 2):

> "Previous experience at similar sites developing and evaluating alternative remedial options and determining costs indicates capping is often the most cost-effective and cost-efficient remedy. Therefore, dewatering and capping were initially evaluated. Based on the results of the evaluation and predictive modeling, the selected remedy successfully mitigates groundwater impacts. Groundwater monitoring will continue to be performed to evaluate the effectiveness of the remedy. If the selected remedy is not demonstrated as successful through collection of data and comparison to predictive values and applicable groundwater quality standards, then other remedial options will be evaluated."

Comment 8

All monitoring wells must be sampled for the parameters listed in 35 IAC 620.410 (a) and (d), with the exception of perchlorate. Statistical analysis for each well's parameters using approved methods listed in 40 CFR 257 should be included.

Response: Tables 2 - 5 of the Groundwater Monitoring Plan, which was included as Appendix B of the Closure Plan, have been revised to include all parameters of 35 IAC 620.410 (a) and (d) with the exception of perchlorate. Revised tables are included in Attachment 3. Note these tables also include aluminum and proposed changes to groundwater standards which are included in IEPA's Proposed Changes to 35 IAC Part 620.

Please don't hesitate to contact us if you have any questions regarding these responses to comments and associated attachments provided herein.

Sincerely,
NRT | An OBG Company

Nathaniel R. Keller

Nathaniel R. Keller, PG
Hydrogeologist

Stuart J. Cravens

Stu J. Cravens, PG
Principal Hydrogeologist

Attachments:

Attachment 1: Comment 1 – Historic Mine Documentation
Attachment 2: Comment 2 – Revised GMZ Application
Attachment 3: Comment 8 – Revised Tables 2,3,4, and 5 from Appendix B: Groundwater Monitoring Plan

cc: Ms. Amy Zimmer – IEPA, Hydrogeology and Compliance Unit
Mr. Tom Davis, PE - Dynegy, Inc.
Mr. Jason Frierdich, PE – Dynegy, Inc.
Mr. Matt Ballance, PE – Dynegy, Inc.
Mr. Vic Modeer, PE – Dynegy, Inc.
Mr. John Romang, - Illinois Power Generating Company

References:

1 Obrad, Jennifer M., 2011. Directory of Coal Mines in 7.5-Minute Quadrangle Series, Coffeen Quadrangle Montgomery and Bond Counties. The Board of Trustees of the University of Illinois.

Attachment 1

Comment 1-
Historic Mine Documentation

Mine Index 871
Consolidation Coal Company, Hillsboro Mine (Consolidation No. 63 Mine)

Type: Underground Total mined-out acreage shown: 4,841

SHAFT, SLOPE, DRIFT or TIPPLE LOCATIONS

Type	County	Township-Range	Section	Quarters-Footage
Man shaft	Montgomery	7N 3W	14	SW NE NW
Air shaft	Montgomery	7N 2W	18	SE NE NE
Hoist & air shaft	Montgomery	7N 3W	14	NE NW NW

GEOLOGY

Seam(s) Mined	Depth (ft)	Thickness (ft) Min	Max	Ave	Mining Method
Herrin	500-510			5.83-7.17	RPP

Geologic Problems Reported: Roof problems were widespread, the sites characterized by slickensided fault planes that cut irregularly through the roof shales and claystones. Small clay dikes were also associated with this small-scale faulting. Floor heaving was slight, but had been a larger problem in the past.

PRODUCTION HISTORY

Company	Mine Name	Years	Production (tons)
Truax-Traer Coal Company	Hillsboro	1964-1970	5,605,812
Consolidation Coal Company	Consolidation No. 63, Hillsboro	1971-1983	21,173,542
			26,779,354

Last reported production: July 1983

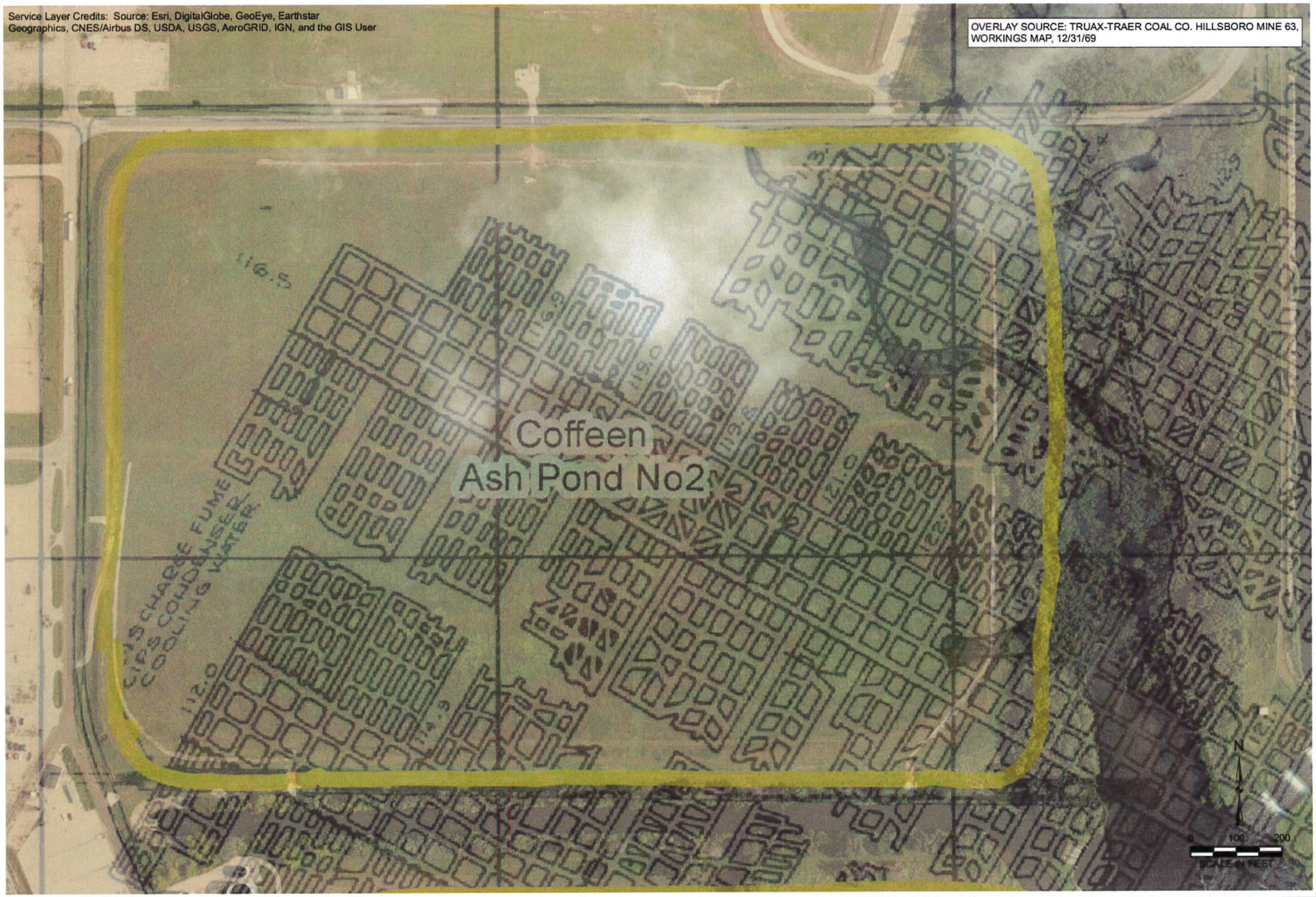
SOURCES OF DATA

Source Map	Date	Original Scale	Digitized Scale	Map Type
Company, Coal Section files	2-1-1983	1:12000	1:2170	Final *

* The map date is before mine closure, but the Coal Section has been assured that the workings shown on the map are indeed final. The mined area shown on the accompanying map is the approximate size expected for the reported production. This suggests that the mine outline is complete.

Annotated Bibliography (data source, brief description of information)

Coal Reports - Production, ownership, years of operation, mine type, depth, thickness.
Directory of Illinois Coal Mines (Montgomery County) - Mine names, mine index, ownership, years of operation.
Mine notes (Montgomery County) - Shaft location, seam, depth, thickness, geologic problems.
Company map, Coal Section files, 1983 Line Project - Shaft locations, mine outline, mining method.



DRAWN BY/DATE:
SDS 11/8/17
REVIEWED BY/DATE:
NRK 11/8/17
APPROVED BY/DATE:
SJC 11/10/17

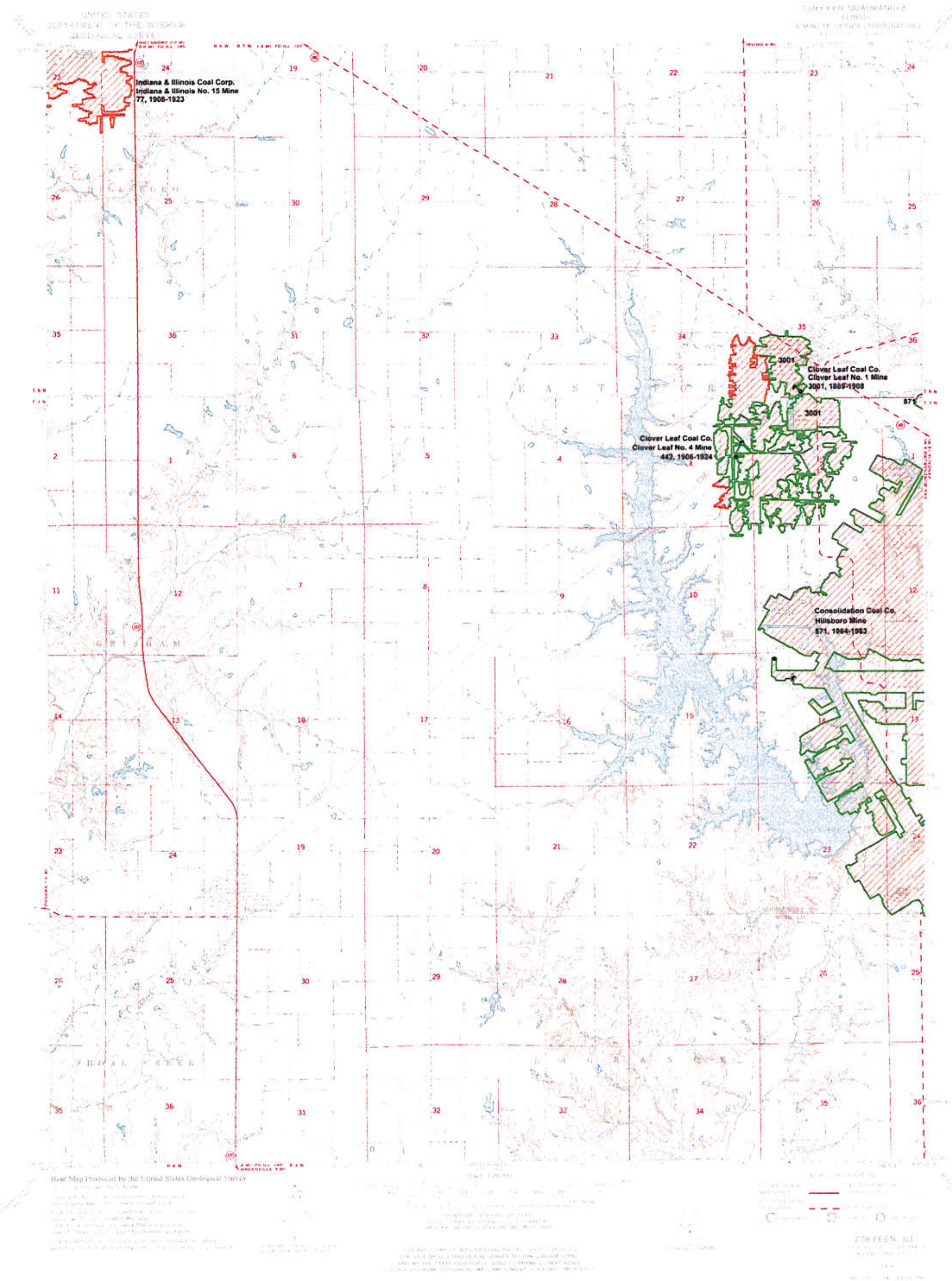
OVERLAY OF HISTORIC MINE

RESPONSE TO IEPA COMMENTS - CLOSURE AND POST-CLOSURE CARE PLAN FOR THE COFFEEN ASH POND NO. 2
COFFEEN POWER STATION
COFFEEN, ILLINOIS

PROJECT NO: 2380

FIGURE NO: 1

Natural Resource Technology
AN OBG COMPANY



Coal Mines in Illinois
Coffeen Quadrangle
Montgomery & Bond Counties, Illinois

This map accompanies the Coal Mines Directory for the Coffeen Quadrangle. Consult the directory for a complete explanation of the information shown on this map.

Mining Method
- Room & Pillar (RP)
- Room & Pillar Basic (RPB)
- Modified Room & Pillar (MRP)
- Room & Pillar Panel (RPP)
- Blind Room & Pillar (BRP)
- Checkerboard Room & Pillar (CRP)
- High Extraction Retreat (HER)
- Longwall (LW)
- Underground, Method Unknown
- Strip Mine
- Auger Mine
- General Area of Mining

Source of Mine Outline
- Final Mine Map
- Not Final Mine Map
- Undated Mine Map
- Incomplete Mine Map
- Secondary Source Map

Tipple, Shaft, Slope, Drift Locations
- Strip Mine Tipple - Active
- Strip Mine Tipple - Abandoned
- Mine Shaft - Active
- Mine Shaft - Abandoned
- Mine Slope - Active
- Mine Slope - Abandoned
- Mine Drift - Active
- Mine Drift - Abandoned
- Air Shaft
- Uncertain Location
- Uncertain Type of Opening

Mine Annotation
(space permiting)
Company
Mine Name
ISGS Index No., Years of Operation

Location

Disclaimer
Please check the Coal Section at the Illinois State Geological Survey's web site at http://www.isgs.illinois.edu for the most up-to-date version of these products.

Note that each quadrangle scale mined-out area map requires the use of the associated text directory for full explanation of map features and mine attributes. Also note that some quadrangles have multiple seams of mining and therefore more than one map may be available for a particular quadrangle. Please take care to check for multiple maps, as extensive mining may exist in the other seams.

The maps and digital files used for these studies were compiled from data obtained from a variety of public and private sources and have varying degrees of completeness and accuracy. This compilation map presents reasonable interpretation of the geology of the area and is based on available data. Locations of some mine features may be offset by 500 feet or more due to errors in the original source maps, the compilation process, digitizing, or a combination of these factors. These data are not intended for use in site-specific screening or decision-making. Use of these documents does not eliminate the need for detailed studies to fully understand the geology of a specific site. The Illinois State Geological Survey, Institute of Natural Resource Sustainability, or the University of Illinois make no guarantee, expressed or implied, regarding the correctness of the interpretations presented in this data set and accept no liability for the consequences of decisions made by others on the basis of the information presented here.

These maps were designed for use at 1:24,000. Enlarging the map may reduce accuracy, as the original scale of the source maps used to compile the outlines shown varies from 1:400 to 1:150,000, and some mine locations are known only from text descriptions. See the accompanying mine directory for the original scale of the source map used for a specific mine to check accuracy of a given portion of the map. Areas with no mines shown may still be undermined: see the unlocated mines list at the back of each mine directory.

The image of the U.S.G.S. topographic base map was projected from the original UTM to Lambert Conformal Conic.

ILLINOIS
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Institute of Natural Resource Sustainability
Illinois State Geological Survey
615 E. Peabody Dr.
Champaign, IL 61820

Mine Outlines Compiled by
Jennifer M. Obrad

November 21, 2011

Attachment 2

Comment 2 – Revised GMZ Application

Title 35, Illinois Admin. Code, Part 620 – APPENDIX D
Confirmation of an Adequate Corrective Action Pursuant to 35 Ill. Adm. Code 620.250(a)(2)

Pursuant to 35 Ill. Adm. Code 620.250(a) if an owner or operator provides a written confirmation to the Agency that an adequate corrective action, equivalent to a corrective action process approved by the Agency, is being undertaken in a timely and appropriate manner, then a groundwater management zone may be established as a three-dimensional region containing groundwater being managed to mitigate impairment caused by the release of contaminants from a site. This document provides the form in which the written confirmation is to be submitted to the Agency.

Note 1. Parts I and II are to be submitted to IEPA at the time that the facility claims the alternative groundwater standards. Part III is to be submitted at the completion of the site investigation. At the completion of the corrective process, a final report is to be filed which includes the confirmation statement included in Part IV.

Note 2. The issuance of a permit by IEPA's Division of Air Pollution Control or Water Pollution Control for a treatment system does not imply that the Agency has approved the corrective action process.

Note 3. If the facility is conducting a cleanup of a unit which is subject to the requirements of the Resource Conservation and Recovery Act (RCRA) or the 35 Ill. Adm. Code 731 regulations for Underground Storage Tanks, this confirmation process is not applicable and cannot be used.

Note 4. If the answers to any of these questions require explanation or clarification, provide such in an attachment to this document.

Information provided in the following technical documents is referenced within this form:

- AECOM, 2016c. Revised 30% Closure Design Package for Coffeen Power Station Ash Pond No. 2. April 16, 2016.
- Natural Resource Technology, Inc., 2016a. Hydrogeologic Characterization Report. Coffeen Ash Pond No. 2, Illinois Power Generating Company Coffeen Power Station, Coffeen, IL.
- Natural Resource Technology, Inc., 2016b. Groundwater Monitoring Plan. Coffeen Ash Pond No. 2, Illinois Power Generating Company Coffeen Power Station, Coffeen, IL.
- Natural Resource Technology, Inc., 2016c. Groundwater Model Report. Coffeen Ash Pond No. 2, Illinois Power Generating Company Coffeen Power Station, Coffeen, IL.
- Natural Resource Technology, Inc., 2016d. Hydrostatic Modeling Report. Coffeen Ash Pond No. 2, Illinois Power Generating Company Coffeen Power Station, Coffeen, IL.

A legal description and map of the proposed GMZ is provided in Appendix A of this GMZ Application. The GMZ will extend vertically through all water-bearing strata through the Hagarstown Member and upper weathered portions of the Vandalia Till Member at an estimated elevation ranging from approximately 604 to 608 ft MSL.

Part I. Facility Information

Facility Name Coffeen Power Station

Facility Address 134 CIPS Lane, Coffeen, IL 62017

County Montgomery

Standard Industrial Code (SIC) 4911

1. Provide a general description of the type of industry, products manufactured, raw materials used, location and size of the facility. ***Electric power generation and coal combustion residual (CCR) disposal. Ash Pond 2 is located within the Coffeen Power Station which encompasses approximately 4,000 acres including a 1,100-acre lake.***

2. What specific units (operating or closed) are present at the facility which are or were used to manage waste, hazardous waste, hazardous substances or petroleum?

	YES	NO
Landfill	X	
Surface Impoundment	X	
Land Treatment		X
Spray Irrigation		X
Waste Pile		X
Incinerator		X
Storage Tank (above ground)	X	
Storage Tank (underground)	X	
Container Storage Area	X	
Injection Well	X	
Water Treatment Units	X	
Septic Tanks	X	
French Drains	X	
Transfer Station		X
Other Units (please describe)		

3. Provide an extract from a USGS topographic or county map showing the location of the site and a more detailed scaled map of the facility with each waste management unit identified in Question 2 or known/suspected source clearly identified. Map scale must be specified and the location of the facility must be provided with respect to Township, Range and Section. ***Facility is located in Sections 10 and 11, Tier 7 N, Range 3 W, of the 3rd PM. Figure 1 has the facility located on a USGS topographic map (7½ minute).***

4. Has the facility ever conducted operations which involved the generation, manufacture, processing, transportation, treatment, storage or handling of "hazardous substances" as defined by the Illinois Environmental Protection Act? Yes ☒ No ☐
If the answer to this question is "yes" generally describe these operations. ***Storage and handling of anhydrous ammonia, sulfuric acid, 50% sodium hydroxide, and chlorine gas.***

5. Has the facility generated, stored or treated hazardous waste as defined by the Resource Conservation and Recovery Act? Yes ☒ No ☐
If the answer to this question is "yes" generally describe these operations. ***Small quantity TSD.***

6. Has the facility conducted operations which involved the processing, storage or handling of petroleum? Yes ☒ No ☐ If the answer to this question is "yes" generally describe these operations. ***Store, load, and unload diesel fuel and kerosene.***

7. Has the facility ever held any of the following permits?

   a. Permits for any waste storage, waste treatment or waste disposal operation. Yes ☒ No ☐
   If the answer to this question is "yes", identify the IEPA permit numbers. ***IL0000108 and 1998-289- UIC.***

   b. Interim Status under the Resources Conservation and Recovery Act (filing of a RCRA Part A application). Yes ☐ No ☒
   If the answer to this question is "yes", attach a copy of the last approved Part A application.

   c. RCRA Part B Permits. Yes ☐ No ☒
   If the answer to this question is "yes", identify the permit log number.

8. Has the facility ever conducted the closure of a RCRA hazardous waste management unit? Yes ☐ No ☒

9. Have any of the following State or federal government actions taken place for a release at the facility?

   a. Written notification regarding known, suspected or alleged contamination on or emanating from the property (e.g., a Notice pursuant to Section 4(q) of the Environment Protection Act)? Yes ☒ No ☐
   If the to this question is "yes", identify the caption and date of issuance. ***Violation Notice No. W-2012-00064 was issued on June 27, 2012 for boron, manganese, sulfate, and total dissolved solids concentrations which exceeded Class I GW Standards at APW-2/G402.***

   b. Consent Decree or Order under RCRA, CERCLA, EPAct Section 22.2 (State Superfund), or EPAct Section 21(f) (State RCRA). Yes ☐ No ☒

   c. If either of Items a. or b. were answered by checking "yes", is the notice, order or decree still in effect? Yes ☒ No ☐ ***Concentrations remain above Class I GW Standards which is why this GMZ is being requested.***

10. What groundwater classification will the facility be subject to at the completion of the remediation?

    Class I ☒ Class II ☐ Class III ☐ Class IV ☐

    If more than one Class applies, please explain.

11. Describe the circumstances which the release to groundwater was identified. ***Groundwater sampling at Ash Pond 2 was initiated in 2015. Exceedances of Class I groundwater quality standards in monitoring wells associated with Ash Pond 2 include the parameters arsenic, boron, lead, manganese, sulfate, and total dissolved solids.***

Based on my inquiry of those persons directly responsible for gathering the information, I certify that the information submitted is, to the best of my knowledge and belief, true and accurate.

Coffeen Power Station	
Facility Name	Signature of Owner/Operator
134 CIPS Lane, Coffeen, IL 62017	**Illinois Power Generating Company**
Location of Facility	Name of Owner/Operator
1358030005	
Illinois EPA Identification Number	Date

PART II: Release Information

1. Identify the chemical constituents release to the groundwater. Attach additional documents as necessary.

Chemical Description	Chemical Abstract No.
Arsenic	*7440-38-2*
Boron	*7440-42-8*
Lead	*7439-92-1*
Manganese	*7439-96-5*
Sulfate	*14808-79-8*
Total Dissolved Solids	*10052*

2. Describe how the site will be investigated to determine the source or sources of the release. ***Ash Pond 2 has been investigated as described in the Hydrogeologic Characterization Report (Natural Resource Technology, Inc. [NRT], 2016a).***

3. Describe how groundwater will be monitored to determine the rate and extent of the release. ***The monitoring network to monitor the rate and extent of the release is described in the Groundwater Monitoring Plan (NRT, 2016b).***

4. Has the release been contained on-site at the facility? ***The release is contained within the facility boundary. Migration of CCR constituents is limited by Coffeen Lake, which acts as a groundwater discharge area and hydraulic barrier.***

5. Describe the groundwater monitoring network and groundwater and soil sampling protocols in place at the facility. ***The groundwater monitoring network and sampling protocols are described in the Groundwater Monitoring Plan (NRT, 2016b).***

6. Provide the schedule for investigation and monitoring. ***The site investigation is complete and groundwater monitoring will continue for the required/permitted frequency and monitoring period as described in the Groundwater Monitoring Plan Section 4.2: Sampling Schedule (NRT, 2016b).***

7. Describe the laboratory quality assurance program utilized for the investigation. ***Laboratory quality assurance is described in the Groundwater Monitoring Plan Sections 4.4: Laboratory Analysis and 4.5: Quality Assurance (NRT, 2016b). The quality assurance/quality control procedures described in the Groundwater Monitoring Plan will be supplemented by the selected Illinois EPA-approved laboratory's QA Manual.***

8. Provide a summary of the results of available soil testing and groundwater monitoring associated with the release at the facility. The summary or results should provide the following information: dates of sampling; types of samples taken (soil or water); locations and depths of samples; sampling and analytical methods; analytical laboratories used; chemical constituents for which analyses were performed; analytical detection limits; and concentrations of chemical constituents in ppm (levels below detection should be identified as "ND"). ***A narrative summary of the results of groundwater monitoring is discussed in the Hydrogeologic Characterization Report Section 3: Groundwater Quality (NRT, 2016a). Analytical data summary tables and graphs are available in the Hydrogeologic Characterization Report Appendix F: Groundwater Quality Data and Appendix G: Water Quality Trend Graphs (NRT, 2016a). Lab reports for all monitoring events have previously been submitted to the Agency.***

PART II: Release Information (Continued)

Based on my inquiry of those persons directly responsible for gathering the information, I certify that the information submitted is, to the best of knowledge and belief, true and accurate and confirm that the actions identified herein will be undertaken in accordance with the schedule set forth herein.

Coffeen Power Station	
Facility Name	Signature of Owner/Operator
134 CIPS Lane, Coffeen, IL 62017	**Illinois Power Generating Company**
Location of Facility	Name of Owner/Operator
1358030005	
Illinois EPA Identification Number	Date

Part III: Remedy Selection Information

1. Describe the selected remedy. ***The remedy includes ash dewatering, relocating/reshaping the CCR within Ash Pond 2 to achieve acceptable grades, construction of a geomembrane cover system and establishing a vegetative cover to minimize long-term erosion (AECOM, 2016).***

2. Describe other remedies which were considered and why they were rejected. ***Previous experience at similar sites developing and evaluating remedial alternatives and costs indicate capping is often the most cost effective and cost-efficient. Therefore, dewatering and capping were initially evaluated. Based on the results of the evaluation and modeling, the selected remedy successfully mitigates groundwater impacts. If the selected remedy is not shown successful through collection of data and comparison to predictive values, then other remedial options will be evaluated.***

3. Will waste, contaminated soil or contaminated groundwater be removed from the site in the course of this remediation? Yes ☐ No ☒
   If the answer to this question is "yes", where will the contaminated material be taken?

4. Describe how the selected remedy will accomplish the maximum practical restoration of beneficial use of groundwater. ***The dewatering and installation of a geomembrane cover system will control the potential for water infiltration into the closed CCR unit and will allow drainage of surface water off of the cover system. These actions will reduce leachate generation and migration and groundwater quality will improve over time, as described in the Groundwater Model Report (NRT, 2016c).***

5. Describe how the selected remedy will minimize any threat to public health or the environment. ***The currently defined extent of the release does not threaten public health. As discussed in the Hydrogeologic Characterization Report Section 2.5 (NRT, 2016a), there are currently no impairments to groundwater usage on the Coffeen Power Station property or surrounding properties associated with Ash Pond 2. No impairments to groundwater usage resulting from establishment of the proposed GMZ are anticipated. CCR dewatering and the geomembrane cover system will reduce leachate generation and migration from Ash Pond 2 and minimize CCR constituents entering the environment, as described in the Groundwater Model Report (NRT, 2016c).***

6. Describe how the selected remedy will result in compliance with the applicable groundwater standards. ***The in place closure of Ash Pond 2, as proposed, will result in a reduction of leachate production, decreasing CCR constituent concentrations and contraction of the groundwater plume. A Groundwater Model Report (NRT, 2016c), included in Appendix D of AECOM 2016, suggests that the geosynthetic cover system will control recharge and subsequent leachate generation within the limits of the Site and reduce concentrations of boron below Class I standards. Concentration reductions are expected to begin approximately one year after completion of the cover system.***

7. Provide a schedule for design, construction and operation of the remedy, including dates for the start and completion. ***A schedule for implementing the remedies is included in Section 1.3 in AECOM, 2016.***

8. Describe how the remedy will be operated and maintained. ***The operation and maintenance of the remedy is described in Section 3: Post-Closure Care Plan (AECOM, 2016).***

9. Have any of the following permits been issued for the remediation?

   a. Construction or Operating permit from the Division of Water Pollution Control. Yes ☐ No ☒

   b. Land treatment permit from the Division of Water Pollution Control. Yes ☐ No ☒
      If the answer to this question is "yes", identify the permit number.

   c. Construction or Operating permit from the Division of Air Pollution Control. Yes ☐ No ☒

If the answer to this question is "yes", identify the permit number.

10. How will groundwater at the facility be monitored following completion of the remedy to ensure that the groundwater standards have been attained? ***Groundwater monitoring procedures are described in Section 4 of the Groundwater Monitoring Plan (NRT, 2016b).***

Based on my inquiry of those persons directly responsible for gathering the information, I certify that the information submitted is, to the best of my knowledge and belief, true and accurate and confirm that the actions identified herein will be undertaken in accordance with the schedule set forth herein.

Coffeen Power Station	
Facility Name	Signature of Owner/Operator
134 CIPS Lane, Coffeen, IL 62017	**Illinois Power Generating Company**
Location of Facility	Name of Owner/Operator
1358030005	
Illinois EPA Identification Number	Date

Attachment 3

Comment 8 – Revised Tables 2,3,4, and 5 from Appendix B: Groundwater Monitoring Plan

Table 2. Proposed Monitoring Well Network and Analyses
Groundwater Monitoring Plan
Coffeen Power Station - Ash Pond 2

Boring/ Well ID	Ground Surface at Time of Install	Measuring Point Elevation (2015)	Top of Screen Elevation	Bottom of Screen Elevation	Screen length	Screen Top	Screen Bottom	Proposed Analyses for IEPA Monitoring	Additional Monitoring Programs Performed at Well	Other Analyses (USEPA CCR Rule or IEPA)
G270	622.92	625.92	609.79	605	5	16.1	20.9	IEPA 620.410 (a), and (d), no perchlorate[3]	Ash Pond 2 & GRP - CCR	40 CFR 257 - Appendix III and Appendix IV Parameters, Groundwater Elevation
G281	623.82	626.36	608.31	603.66	5	18.1	22.7		Ash Pond 2 CCR	
G401	623.03	625.57	608.67	604.24	4	16.9	21.3			
G402	610.56	613.37	600.60	590.6	10	12.8	22.8			
G403	623.81	626.47	610.70	606.03	5	15.8	20.4			
G404	613.10	615.67	606.68	601.93	5	9.0	13.7			
G405	620.90	623.63	611.89	607.14	5	11.7	16.5			
G406	621.86	621.86	608.30	603.49	5	13.6	18.4		None	None
G407	618.35	621.32	604.57	599.74	5	16.8	21.6			
G410[1]	TBD	TBD	TBD	TBD	TBD	TBD	TBD			
G411[1]	TBD	TBD	TBD	TBD	TBD	TBD	TBD			
G154	623.52	626.35	609.26	604.76	5	17.1	21.6		SW Pond - IEPA	IEPA Approved Parameters
G279	629.19	632.04	606.79	602.40	4	25.3	29.6		GRP - IEPA and CCR	40 CFR 257 - Appendix III and Appendix IV Parameters, Groundwater Elevation
G280	622.95	625.85	610.16	605.32	5	15.7	20.5			

Notes:
[1] Proposed wells to be installed upon approval of Closure Plan and GMZ application
[2] Field parameters include: pH, oxidation -reduction potential, specific conductance, temperature, and dissolved oxygen
[3] Groundwater samples collected for metals analyses will be field filtered.
Groundwater quality analyses including methods and sampling details are included in Table 4.

Natural Resource Technology
AN OBG COMPANY

Table 3. Background Groundwater Quality and Applicable Groundwater Quality Standards
Groundwater Monitoring Plan
Coffeen Power Station - Ash Pond 2

Parameters (totals)[6]	Sampling Program	IL Class I Std[1] (mg/L)	Background Concentration[2] for IEPA (mg/L)	Applicable Groundwater Standard[3] for IEPA (mg/L)	Maximum[5] (mg/L)	Minimum[5] (mg/L)
Aluminum (d) [4]	IEPA	3.5	**tbd**	**tbd**	0.1	<0.005
Antimony	CCR, IEPA	0.006	**tbd**	**tbd**	<0.003	<0.003
Arsenic	CCR, IEPA	0.01	**tbd**	**tbd**	**0.25**	<0.001
Barium	CCR, IEPA	2.0	**tbd**	**tbd**	0.24	0.014
Beryllium	CCR, IEPA	0.004	**tbd**	**tbd**	0.0018	<0.001
Boron	CCR, IEPA	2.0	**tbd**	**tbd**	**17**	<0.01
Calcium	CCR	NS	**tbd**	**tbd**	450	<0.1
Cadmium	CCR, IEPA	0.005	**tbd**	**tbd**	0.008	<0.001
Chloride	CCR, IEPA	200	**tbd**	**tbd**	160	1.5
Chromium	CCR, IEPA	0.1	**tbd**	**tbd**	0.034	<0.004
Cobalt	CCR, IEPA	1, 0.002[4]	**tbd**	**tbd**	0.28	<0.001
Copper (d)	IEPA	0.65, 0.2[4]	**tbd**	**tbd**	0.021	<0.001
Cyanide	IEPA	0.2	**tbd**	**tbd**	<0.005	<0.003
Fluoride	CCR, IEPA	4	**tbd**	**tbd**	1.06	0.031
Iron (d)	IEPA	5	**tbd**	**tbd**	**13**	<0.005
Lead	CCR, IEPA	0.0075	**tbd**	**tbd**	**0.220**	<0.001
Lithium	CCR	NS	**tbd**	**tbd**	0.057	<0.01
Manganese(d)	IEPA	0.15	**tbd**	**tbd**	**1.02**	<0.018
Mercury	CCR, IEPA	0.002	**tbd**	**tbd**	0.00093	<0.0002
Molybdenum	CCR, IEPA	NS	**tbd**	**tbd**	0.043	<0.001
Nickel (d)	IEPA	0.1	**tbd**	**tbd**	0.035	<0.003
Nitrate-N	IEPA	10	**tbd**	**tbd**	8.8	<0.01
Selenium	CCR, IEPA	0.05	**tbd**	**tbd**	0.027	<0.001
Silver (d)	IEPA	0.05	**tbd**	**tbd**	<0.005	<0.003
Sulfate	CCR, IEPA	400	**tbd**	**tbd**	**2,500**	2.3
Thallium	CCR, IEPA	0.002	**tbd**	**tbd**	0.0013	<0.001
TDS (d)	CCR, IEPA	1,200	**tbd**	**tbd**	**3,900**	320
Vanadium (d)	IEPA	0.049, 0.00049[4]	**tbd**	**tbd**	**0.025**	<0.003
Zinc (d)	IEPA	5	**tbd**	**tbd**	0.59	<0.002
Field pH	CCR, IEPA	6.5 - 9.0	**tbd**	**tbd**	8.03	**5.80**
Radium 226/228[*]	CCR, IEPA	20/20, 5[4]	**tbd**	**tbd**	4.46	0.185

Notes:
All parameters are totals unless noted. Standards apply to dissolved or total concentrations
(d) Dissolved
tbd = To Be Determined for Illinois EPA monitoring program; CCR Appendix III and IV parameters based on future monitoring , started in November 2015
Bold = Background Concentration exceeds Class I Groundwater Standard
Red = Exceeds Applicable Groundwater Standard
NS = No Class II Groundwater Standard
USEPA (t) = background concentration for parameter [total] required under USEPA program (40 CFR Part 257)
[1] IPCB 620 Class I: Potable Resource Groundwater Standard
[2] Background Concentration to be calculated following 8 sampling events at all wells in accordance with 40 CFR 257
[3] Applicable Groundwater Standard is the higher of the Background Concentration and the Class I Groundwater Standard (or the lower if compared to the pH lower limit)
[4] Standards listed are proposed changes to 35 Ill. Adm. Code Part 620 by Illinois EPA
[5] Groundwater concentrations based on historical results for wells in the proposed sampling program
[6] Groundwater samples collected for metals analysis as required by IL620.410 will be field filtered

Natural Resource Technology
AN OBG COMPANY

Table 4. Sampling and Analysis Summary
Groundwater Monitoring Plan
Coffeen Power Station - Ash Pond 2

Parameter	Analytical Method[5]	Number of Samples	Field Duplicates[1]	Field Blanks[2]	Equipment Blanks[2]	MS/MSD[3]	Total	Container Type	Minimum Volume[4]	Preservation (Cool to 4 °C for all samples)	Sample Hold Time from Collection Date
Metals - Appendix III [(1)]											
Boron (total and dissolved)	6020	14	2	0	0	1	17	plastic	600 mL	HNO_3 to pH<2	6 months
Calcium	6020	7	1	0	0	1	9	plastic	600 mL	HNO_3 to pH<3	6 months
Metals - Appendix IV [(2)] and Additional Metals											
Other Metals [(3)] (total and dissolved)	6020	14	2	0	0	1	17	plastic	600 mL	HNO3 to pH<2	6 months
Manganese (d)	6020	14	2	0	0	1	17	plastic	600 mL	HNO3 to pH<2	6 months
Lithium	6020	7	1	0	0	1	9	plastic	600 mL	HNO3 to pH<2	6 months
Mercury	7470A or 6020	14	2	0	0	1	17	plastic	400 mL	HNO_3 to pH<2	28 days
Inorganic Parameters - Appendix III [(1)] and Other Inorganic Parameters											
Cyanide	SM 4500-CN or C – EPA 335.4	14	2	0	0	1	17	amber	50 mL	NaOH, Cool to 4 °C	14 days
Fluoride	9214	14	2	0	0	1	17	plastic	300 mL	Cool to 4 °C	28 days
Chloride	9251	14	2	0	0	1	17	plastic	100 mL	Cool to 4 °C	28 days
Nitrate-N	EPA 300.0	14	2	0	0	1	17	plastic	10 mL	Cool to 4 °C	48 hours
Sulfate	9036	14	2	0	0	1	17	plastic	50 mL	Cool to 4 °C	28 days
Total Dissolved Solids	SM 2540 C	14	2	0	0	1	17	plastic	200 mL	Cool to 4 °C	7 days
Radium - Appendix IV [(2)]											
Radium 226	9315 or EPA 903	14	0	0	0	1	15	plastic	1000 mL	HNO3 to pH<2	6 months
Radium 228	9320 or EPA 904	14	0	0	0	1	15	plastic	1000 mL	HNO_3 to pH<2	6 months
Field Parameters											
pH [(1)]	SM 4500-H+ B	14	NA	NA	NA	NA	14	flow-through cell	NA	none	immediately
Dissolved Oxygen	SM 4500-O/405.1	14	NA	NA	NA	NA	14	flow-through cell	NA	none	immediately
Temperature	SM 2550	14	NA	NA	NA	NA	14	flow-through cell	NA	none	immediately
Oxidation/Reduction Potential	SM 258O B	14	NA	NA	NA	NA	14	flow-through cell	NA	none	immediately
Specific Conductivity	SM 2510 B	14	NA	NA	NA	NA	14	flow-through cell	NA	none	immediately
Turbidity [(4)]	SM 2130 B	14	NA	NA	NA	NA	14	flow-through cell or hand-held turbidity meter	NA	none	immediately

Notes:

[(1)] USEPA Appendix III Parameters (boron, calcium, chloride, fluoride, pH, sulfate, total dissolved solids (TDS))

[(2)] USEPA Appendix IV Parameters
(antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, fluoride, lead, lithium, mercury, molybdenum, selenium, thallium, radium 226 and 228 combined)

[(3)] Other Metals = aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, molybdenum, nickel, silver, selenium, thallium, vanadium, zinc

[(4)] If turbidity exceeds 10 NTUs, a duplicate sample filtered through a .45 micron filter may be collected for metals analysis in addition to the unfiltered sample. Both samples would be submitted for analysis.

NA = not applicable
HNO_3 = nitric acid
°C = degrees Celsius
mL = milliliter

1. Field duplicates will be collected at a frequency of one per group of 10 or fewer investigative water sample. Field duplicates will not be collected for radium analysis.
2. 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.
3. 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.
4. Sample volume is estimated and will be determined by the laboratory.
5. Analytical method numbers are from SW-846 unless otherwise indicated. Analytical methods may be updated with more recent versions as apropriate.

Natural Resource Technology
AN OBG COMPANY

Table 5. Summary of Detection Limits for Proposed Monitoring Program Class I Groundwater Standards
Groundwater Monitoring Plan
Coffeen Power Station - Ash Pond 2

Constituent	Unit	Analytical Methods [1]	USEPA MCL [2] (ug/L)	IL Class I Std [7] (ug/L)	RL [4] (ug/L)	MDL [4] (ug/L)
Metals[8]						
Aluminum (d)	µg/L	6020	200 [3]	3500	10	0.85
Antimony	µg/L	6020	6	6	1	0.25
Arsenic	µg/L	6020	10	10	1	0.25
Barium	µg/L	6020	2000	2000	1	0.4
Beryllium	µg/L	6020	4	4	1	0.5
Boron	µg/L	6020	NS	2000	25	10
Boron(d)	µg/L	6020	NS	2000	2.3	10
Cadmium	µg/L	6020	5	5	1	0.25
Calcium	µg/L	6020	NS	NS	125	100
Chromium	µg/L	6020	100	100	1	0.3
Cobalt	µg/L	6020	NS	1000, 2	1	0.25
Copper (d)	µg/L	6020	NS	650, 200	3	0.025
Cyanide	µg/L	4500	200	200	5	0.85
Iron (d)	µg/L	6010	300 [3]	5,000	10	0.88
Lead	µg/L	6020	NS	7.5	1	0.25
Lithium	µg/L	6020	NS	NS	1	0.5
Manganese (d)	µg/L	6020	50 [3]	150	1	0.055
Mercury	µg/L	6020 or 7470A	2	2	0.2	0.051
Molybdenum	µg/L	6020	NS	NS	1	0.25
Nickel (d)	µg/L	6020	NS	100	5	0.075
Nitrate- N	µg/L	300	10000	10000	30	8
Selenium	µg/L	6020	50	50	1	0.9
Silver (d)	µg/L	6020	100 [3]	50	55	0.028
Thallium	µg/L	6020	2	2	1	0.25
Vanadium (d)	µg/L	6020	NS	49, 0.49	5	0.27
Zinc (d)	µg/L	6020	5000 [3]	5	6	0.495
Inorganics						
Fluoride	mg/L	9214	4	4	0.1	0.05
Chloride	mg/L	9251	250 [3]	200	5	1
Sulfate	mg/L	9036	250 [3]	400	10	5
Total Dissolved Solids	mg/L	SM 2540 C	500 [3]	1200	20	10
Other						
Combined Radium 226/228	pCi/L	9315/9320 or EPA 903/904	5	20/20, 5	-- [5]	-- [6]
Field						
pH	SU	SM 4500-H+ B	NS	6.5-9.0	NA	NA
Oxidation/Reduction Potential	mV	SM 2580 B	NS	NS	NA	NA
Dissolved Oxygen	mg/L	SM 4500-O/405.1	NS	NS	NA	NA
Temperature	°C	SM 2550	NS	NS	NA	NA
Specific Conductivity	µS/cm	SM 2510 B	NS	NS	NA	NA
Turbidity	NTU	SM 2130 B	NS	NS	NA	NA

Notes:

NS = No standard
ug/L = micrograms per liter
mg/L = milligrams per liter
pCi/L = picoCuries per liter
µS/cm = microSiemens per centimeter
NTU = nephelometric turbidity unit
(d) = dissolved analysis

RL = Reporting limit as established by the laboratory
MDL = Method detection limit as established by the laboratory
SM = Standard Methods for the Examination of Water and Wastewater

1. Analytical method numbers are from SW-846 unless otherwise indicated.
2. USEPA MCL = United States Environmental Protection Agency Maximum Contaminant Level.
3. USEPA SMCL = United States Environmental Protection Agency Secondary Maximum Contaminant Level.
4. Reporting limits and method detection limits will vary depending on the laboratory performing the work.
5. All radium results will be reported (values may be positive or negative) and will include uncertainty and the calculated MDC.
6. Laboratories calculate a minimum detectable concentration (MDC) based on the sample.
7. 35 IAC 620.410 standards are listed including proposed changes submitted to the IL Pollution Control Board

SMARTER SOLUTIONS

EXCEPTIONAL SERVICE

VALUE

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT

Ash Pond 2
Coffeen Power Station
Coffeen, Illinois

January 24, 2017

NATURAL RESOURCE TECHNOLOGY

ENVIRONMENTAL CONSULTANTS

NATURAL RESOURCE TECHNOLOGY
ENVIRONMENTAL CONSULTANTS

234 W. FLORIDA STREET, FIFTH FLOOR
MILWAUKEE, WISCONSIN 53204
(P) 414.837.3607
(F) 414.837.3608

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT

ASH POND 2
COFFEEN POWER STATION
COFFEEN, ILLINOIS

Project No. 2380

Prepared For:

Illinois Power Generating Company
Coffeen Power Station
134 Cips Lane
Coffeen, IL 62107

Prepared By:

Natural Resource Technology, Inc.
234 W. Florida Street, Fifth Floor
Milwaukee, Wisconsin 53204

January 24, 2017

Stuart J. Cravens, PG
Principal Hydrogeologist

LICENSED PROFESSIONAL GEOLOGIST
Stuart J. Cravens
196-000106
ILLINOIS

Nathaniel R. Keller, PG
Hydrogeologist

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

1 INTRODUCTION

1.1 Overview

This Hydrogeologic Site Characterization Report was prepared by Natural Resource Technology, Inc. (NRT) in support of a Closure Plan for Ash Pond 2 located at the Coffeen Power Station (CPS, Site) which is owned by Illinois Power Generating Company (IPGC). This report and the Closure Plan will apply specifically to this Coal Combustion Residuals (CCR) surface impoundment (Ash Pond 2), and not to any of the other impoundments present on the Site which include the following: Ash Pond 1, Ash Landfill, Gypsum Stack Pond, and Recycle Pond. However, information gathered to evaluate these other CCR units regarding geology, hydrogeology, and groundwater quality is included, where appropriate.

Numerous hydrogeologic investigations have been performed concerning the CCR Units located at the Site. The information presented in this site characterization report includes recent data collected to comply with the Federal CCR Rule (40 CFR Part 257) as well as comprehensive data collection and evaluations from prior hydrogeologic investigation reports (recent to oldest), including, but not limited to, the following:

- ***Corrective Action Plan. Hanson, April 16, 2016.*** A plan to remediate groundwater exceedances around Ash Pond 2 and other units. Proposed plan includes reduction in leachate within Ash Pond 2, enhanced cover system on Ash Pond 2, and a Groundwater Management Zone (GMZ).

- ***Revised 30% Closure Design Package for Coffeen Power Station Ash Pond No. 2. AECOM, April 2016.*** A 30% design package for closure of Ash Pond 2 including the design basis and summary in addition to preliminary construction costs and schedule.

- ***Uppermost Aquifer Considerations. Hanson, April 2016.*** A discussion of the construction of the gyspum pond and relation to the uppermost aquifer in the vicinity of the site.

- ***Addendum to the 30% Design Data Package for Dynegy Coffeen Power Station; GMF Gypsum Stack Pond. AECOM, January 27, 2016.*** A geotechnical program consisting of CPT soundings to obtain information for compliance with requirements of the federal CCR Rule.

- ***30% Design Data Package for Dynegy Coffeen Power Station; Ash Ponds Nos. 1 and 2 CCR Units. AECOM, January 14, 2016.*** A geotechnical program consisting of installation of auger borings, CPT soundings, piezometers and soil testing to obtain information for compliance with requirements of the federal CCR Rule.

- ***G153 Assessment. Hanson, January 15, 2015.*** An investigation and evaluation of elevated concentrations of sulfate and manganese near the Southwest Storm Water Detention Pond (SW Pond).

- ***Phase 1 Hydrogeological Assessment Report, Coffeen Energy Center, Montgomery County, IL. Natural Resource Technology, inc., March 2013.*** An investigation and assessment of the potential for impacts to water quality from unlined impoundments at the Coffeen Power Station. Included a survey to identify wells within 2,500 feet of the Site.

- ***Section_3 Hydrogeologic Report. Hanson, August, 2009,*** A summary of the geology and hydrogeology in the area of the proposed Ash Landfill, Gypsum Stack Pond, and Recycle Pond.

In conjunction with this report, a Groundwater Monitoring Plan and a Groundwater Management Zone Application are being prepared to support the closure of Ash Pond 2. In addition, a groundwater flow and transport model was developed to evaluate the effect of various ash pond closure scenarios on groundwater quality and to predict the fate and transport of CCR leachate components. Modeling has also been conducted to enable estimation of the time required for hydrostatic equilibrium of groundwater to be achieved beneath Ash Pond 2.

1.2 Site Location and Background

Ash Pond 2 is one of five CCR units at the CPS, located approximately 2 miles south of the City of Coffeen in Montgomery County, Illinois (Figure 1). The power plant and the CCR Units are situated on a peninsula between two lobes of Coffeen Lake which was created in 1963 by damming a portion of the East Fork of Shoal Creek (IDNR, 2014). The lake covers approximately 1,100 acres and provides cooling water for the CPS.

Ash Pond 2 is located within Section 11 Township 7 North and Range 7 East. The city of Coffeen is approximately 2 miles north of the CPS and the city of Hillsboro, IL is about 8 miles to the northwest. The CPS is located in an agricultural area. Historically, several coal mines were operated at depth in the vicinity of the site as well as a US Minerals processing facility located to the north. The CPS property is bordered by Coffeen Lake on the west, east, and south, and by agricultural land to the north.

Ash Pond 2 was first investigated in 2010, as requested by the Illinois Environmental Protection Agency(Illinois EPA). Results of the investigation (NRT, 2013) indicated the presence of CCR constituents in groundwater in the vicinity of Ash Pond 1 and 2 as well as exceedances of Class I Groundwater Standards for arsenic, boron, lead, sulfate, manganese, iron,sulfate, total dissolved solids, and pH. Additional wells were installed in 2015 to comply with the Federal CCR Rule (40 CFR Part 257), and define the extent of Class I exceedances associated with Ash Pond 2. Based on the groundwater results of wells installed in 2015, Hanson submitted a Corrective Action Plan (CAP, Hanson, 2016a) to define the proposed remedy. Ash Pond 2 will be closed by leaving CCR in place using an alternative geomembrane cover system, following partial dewatering of the pond. This design will control the potential for slope failure and water infiltration into the closed CCR unit and will allow for drainage of surface water off of the cover system (AECOM, 2016a).

Illinois EPA responded to Dynegy regarding the CAP with a draft letter including comments and Dynegy and Illinois EPA met on July 20, 2016 to discuss the CAP and proposed remedy. Following the discussion, Illinois EPA in a letter dated August 9, 2016 provided the following comments (summarized):

1. Investigation may be required to define the source and extent of exceedances from Ash Pond 2.
2. A vertical component is required for the GMZ.
3. The GMZ contains portions of CCR units not proposed to close, GMZ must be revised to include only areas where CAP for Ash Pond 2 will mitigate impacts.
4. Hydraulic conductivity of foundation layer needs to be evaluated to determine if CAP is appropriate.
5. A groundwater monitoring plan,specific to Ash Pond 2 must be submitted with CAP.
6. Modeling is required to demonstrate corrective action will be successful, and at what point in the future.
7. Evaluate the impacts of the corrective action on Coffeen Lake, with respect to applicable surface water standards.

The Closure Plan, to which this Hydrogeologic Characterization Report, the Groundwater Monitoring Plan, Groundwater Model Report, and Hydrostatic Model Report are attached, provide the information necessary to address these comments and justify the selected corrective action.

1.3 Site History

CPS began operation in 1972 and CCR from the coal fired units was disposed of in Ash Pond 1. Ash Pond 2 was also utilized in the early 1970’s and Ash Pond 1 was reconstructed in 1978. Both of these units were used until the mid-1980’s. Currently, two coal fired units at Coffeen generate 945 MW of electricity with CCR being handled and filled in Ash Pond 1, the Ash Landfill, the Gypsum Stack Pond, and the Recycle Pond.

Ash Pond 2, which is the sublect of this closure, has a surface area of approximately 60 acres with berms up to 47 feet higher than the surrounding land surface. Ash Pond 2 was removed from service and capped in the mid 1980’s. Prior to capping, this pond was identified as Outfall 004 in the facility NPDES operating permit, IL0000108. A 2-foot clay and soil cap was placed on the surface of the pond with contouring and drainage provided to direct storm water to four engineered revetment down drain structures (NRT, 2013).

Other CCR units (not the subject of this Closure Plan) at CPS include the following:

- Ash Pond 1 (active unlined impoundment) covers an area of approximately 23 acres, has berms up to 41 feet above the surrounding land surface, and a volume of 300 acre-feet. It primarily receives bottom ash and low volume wastes from floor drains in the main power block building. Several years ago, air heater wash and boiler chemical cleaning wastes were directed to Ash Pond 1 but this practice was discontinued. This impoundment (also known as the Bottom Ash/ Recycle Pond) is a reclaimed ash pond that was reconstructed utilizing the existing earthen berms with reinforcement, as provided by Water Pollution Control Permit 1978-EA-389 issued by the Agency on May 26, 1978. The bottom ash is periodically removed for beneficial uses by a third-party contractor.

- A Gypsum Management Facility (GMF), consisting of a 77-acre Gypsum Stack Pond and 17-acre Recycle Pond, receives blowdown from the air emission scrubbers and has been in operation since 2010. Construction of the GMF was in accordance with Water Pollution Control Permit 2008-EA-4661 and features a composite HDPE liner with 3-feet of recompacted soil at 1 x 10^{-7} cm/s. Both GMF ponds have a groundwater underdrain system. The Gypsum Stack Pond system was actively pumped during construction, but is currently not used. The Recycle Pond underdrain is a passive, gravity drained system.

- Fly ash is managed in a composite lined landfill constructed in 2010. The Ash Landfill has an active groundwater underdrain system that is currently being actively pumped. Additionally, the Ash Landfill leachate collection system is restricted by rule to no more than 1 foot of leachate on the composite liner.

- An Illinois EPA groundwater monitoring program is in effect for the GMF (under Bureau of Water) and Ash Landfill (under Bureau of Land).

- The SW Pond is not a CCR unit; it manages stormwater from around the Ash Landfill. It is managed under NPDES Permit #2011-EB-1289.

2 GEOLOGY AND HYDROGEOLOGY

Since 2010, several site investigations have been completed in the vicinity of the CCR units. The initial site investigation near Ash Pond 2 (Geotechnology, 2010) included the installation of one well near the southeast corner of the unit. Significant investigation has been completed north of the unit prior to permitting of the Ash Landfill, Gypsum Stack Pond, and Recycle Pond. Following promulgation of the Federal CCR Rule (40CFR 257), additional investigation was completed by AECOM (2016a, 2016b)) to obtain geotechnical information and NRT (2013) to install additional wells for groundwater monitoring. The most recent investigation was completed in 2016 by NRT to better define the vertical and horizontal extent of impacts and refine the GMZ proposed in the CAP. The data collected from recent investigations as well as historical work is incorporated in this report to develop an accurate site conceptual model.

2.1 Regional Geology

2.1.1 Unlithified Deposits

Pleistocene deposits of unlithified glacial diamictons, lacustrine/alluvial deposits, and windblown loess overlie Pennsylvanian-age bedrock throughout central Illinois. The most extensive glacial deposits are those from the Illinoian Stage which cover much of the state and are present at the Site. Diamictons deposited by glacial activity during the more recent Wisconsian Stage does not extend into the Coffeen area. Windblown (aeolian) deposits, the Peoria and Roxana Silts, cover the glacial deposits over a majority of the state. These units are fine-grained deposits blown from river valleys by prevailing winds. The Quaternary units are described briefly below (Hensel and Johnson, 1996), and in detail later in this section.

The Illinois State Geologic Survey has mapped loess thickness at the CPS at less than 5 ft. The Peoria Silt is generally classified and described as light yellow-tan to gray, fine sandy silt. The Roxana Silt is predominately silt-sized material, but can be sandier in localized areas and the base of this unit is often colluvium of silt, and sand (Hensel and Johnson, 1996).

Till members of the Glasford Formation include the Smithboro Member, the Mulberry Grove Member, the Vandalia Member, and the Hagarstown Member (oldest to youngest). The Smithboro Member is described as a gray, compact, silty till. The Smithboro is bounded below by the Yarmouth Soil. The Mulberry Grove Member is intermittent at the Site, and is described as a calcareous gray silt and fine sand containing some fossil mollusks. The Vandalia Member is described as a sandy till with thin lenticular bodies of silt, sand, and gravel. It is calcareous, except where weathered, generally gray, and moderately compact. The Hagarstown Member is bounded at the top by the Sangamon Soil. The member consists of gravelly till, poorly sorted gravel, well sorted gravel, and sand (Willman and Frey, 1970).

2.1.2 Bedrock

The site and surrounding areas are underlain by rocks belonging to the Pennsylvanian Bond Formation (Kolata, 2005). Detailed descriptions of the Pennsylvanian strata of Illinois were published by Willman et al. (1975). The Bond Formation includes all strata from the base of the Shoal Creek Limestone Member or the LaSalle Limestone Member to the top of the Millersville Limestone Member or the Livingstone Limestone Member. It is overlain by the Mattoon Formation and underlain by the Modesto Formation. It varies from less than 150 feet thick in eastern Illinois to over 300 feet thick in southeastern Illinois, averaging about 250 feet. The Bond Formation is characterized by a high percentage of limestone and calcareous clays and shales. It is bound by thick limestone members (up to 50 feet), the thickest and purest limestones in the Pennsylvanian System of Illinois. Gray shales constitute the greatest part of the formation, although thick channel sandstones are developed locally.

The elevation of the bedrock surface in the area ranges from 450 to 500 feet above mean sea level (Herzog et al., 1994). The bedrock surface slopes gently towards the west into a minor bedrock valley that runs north-south. Well logs indicate that the lithology of the uppermost bedrock is predominantly shale (Zeizel, 1959).

2.2 Site Geology

Quaternary deposits in the Coffeen area consist mainly of glacial diamictons and outwash deposits that were deposited during Illinoian and Pre-Illinoian glaciations. A hydrogeologic investigation was conducted in 2006 and 2007 by Hanson to characterize the site geology as part of an application for an Initial Facility Report and Operating (Subpart B) Permit, and Hanson issued a Hydrogeologic Report as part of those applications in 2009. The following geologic descriptions are based on the findings of these investigations and supplemented with data near Ash Pond 2 collected from recent investigations performed to meet requirements of the CCR Rule.

Figure 3 and Table 1 display and summarize the monitoring wells present on site, and Appendix A includes boring logs and well construction logs used for this report. Appendix B includes reports for both laboratory and field hydraulic conductivity tests for recent testing completed in 2015 and 2016 in addition to test results from piezometers within the Ash Pond. The major unconsolidated materials present at the site include the following (listed from ground surface down).

2.2.1 Ash/Fill

Ash is present within Ash Pond 2 at thicknesses up to approximately 36 feet as measured in OW-4, but ash is generally only 24 to 29 feet thick as shown in the boring logs for OW1, OW-2, OW-3, and OW-5 (Appendix A). A majority of Ash Pond 2 overlies the Loess/ Silt unit which comprises the Upper Confining Unit (next Subsection). The remaining areas of Ash Pond 2 overlie the Vandalia Till where former drainage features were present prior to construction and filling (Figure 4). Field hydraulic conductivity tests from piezometers screened within the ash (Appendix B2) resulted in a geometric mean of 1.5 x10^{-3} cm/sec indicating a relatively permeable ash unit.

2.2.2 Roxana Silt / Peoria Silt (Loess Unit)

The Roxana Silt and Peoria Silt are stratigraphically distinct units, but are difficult to differentiate in the area of the Coffeen Power Station. In this report, the combined silts will be called the Loess Unit. The Loess Unit extends from beneath the topsoil, which is derived from the loess, to the the top of the Hagarstown (Beds) Member. Thicknesses range from a minimum of <1.0 ft as observed in G401 and G403 located adjacent to and west/southwest of Ash Pond 2, to a maximum of <6 feet as measured in a boring advanced within the footprint of the landfill prior to construction (MW14S). Actual thickness of the Loess Unit is difficult to evaluate due to the illuviation of the model soil horizon. Around Ash Pond 2, the thickness is presumed to be less than four feet. The loess has been variously classified as silt or clayey silt, with minor amounts of sand. The loess often exhibits mottling, concretions, and some fracturing and may be saturated, dependent on the seasonal variation in groundwater levels.

The Loess Unit is generally considered unsaturated and the upper-most aquifer is recharged by precipitation that percolates through this unit. The laboratory tests from recent geotechnical analysis reported vertical hydraulic conductivity values ranging from 1.3 x 10^{-8} to 5.0 x 10^{-7} cm/sec, with a geometric mean of 1.0 x 10^{-7} cm/sec (Table 2). This unit was likely removed from within the footprint of Ash Pond 2 either through erosion or based on ash pond design grades of 616.5 ft. Construction of the landfill and GMF units required the excavation and removal of this layer.

2.2.3 Hagarstown Member

The Hagarstown Member (consisting of gravelly clay till and sandy materials in contact with the Vandalia, (also referred to as Hagarstown Beds) has been separated into two units for this discussion; the first unit, consisting of the gravelly clay till and the second consisting of sandy material overlying the Vandalia Member. The clay till portion had varying thicknesses ranging from 1.9 feet (G404) to over 12 feet as observed in the borings for G401 and G403, located adjacent to, south and west of the Pond. This unit underlies 95% of the pond and in general the clayey portion is at least 9 feet thick (Figure 4). The thickness of the sandy portion of the Hagarstown is generally less than 3 feet, and near Ash Pond 2 it is generally 1 to 2 feet thick as seen in borings for G401, G404, and G405. The composition of the sandy portion of the Hagarstown unit varies across the site and was classified as gravelly till, poorly sorted gravel, well sorted gravel, sand and silty sand. The elevation of the top of the Hagarstown is mapped in Figure 5 and the general thicknesses are illustrated on Figure 6. As displayed in Figure 5, the elevation of the top of the Hagarstown generally declines as the unit approaches Coffeen Lake or other topographic drainage features.

The elevation of the bottom of the discharge channel south of Ash Pond 2 is approximately 600 ft, based on the Ash Pond design drawing. This implies that the channel intersects and cuts through the Hagarstown along the southern side of the Ash Pond. Along the eastern edge, the creek is at an elevation of ~594 to ~590, indicating that the Hagarstown is also exposed. along the ravine slope.

During construction of the Ash Landfill, the Gypsum Pond, and the Recycle Pond, the Loess Unit and the Hagarstown Beds were excavated to facilitate construction by limiting groundwater flow into excavations. The excavations were backfilled with structural fill and an underdrain system was installed to mitigate inward hydraulic pressure and potential liner uplift damage before the CCR units were filled. The Ash Landfill underdrain system remains active. The Recycle Pond is a gravity drain system, and the Gypsum Pond remains in place, but the system is inactive.

The hydraulic characteristics of the Hagarstown Member indicate the unit has a moderate hydraulic conductivity. The results of single-well field permeability tests have hydraulic conductivity values ranging from 3.1×10^{-5} to 1.6×10^{-3} cm/sec, with a geometric mean of 2.9×10^{-4} cm/sec (Table 3). In several locations (i.e., G402, G403, and G404) this unit is very thin, or was not observed in the boring as shown on the boring logs (Appendix A); however, field hydraulic conductivities are similar to those measured in wells screened across the Hagarstown Beds, indicating that at these locations the upper Vandalia is hydraulically similar to the Hagarstown Beds and is likely connected to and continuous with the Hagarstown. The hydraulic conductivity values measured within wells screened across the Hagarstown Beds are significantly higher than both the overlying Roxana/Peoria Silts and lower Vandalia (Till) Member.

2.2.4 Vandalia Member

The Vandalia (Till) Member is a sandy/silty till with thin, discontinuous lenses of silt, sand, and gravel. The Vandalia Till was encountered in all borings advanced at the site. The Vandalia Till ranged in thickness from 11.7 ft in SB-10 (drilled near MW10S) in the northern portion of the CPS, to 31.0 ft in SB-12 (near MW12S between the Gypsum Stack Pond and the Recycle Pond). Based on Borings G45D and G46D, the Vandalia Till is approximately 7 feet thick in the southeast corner (G46D) to 18 feet thick along the northern edge of the Ash Pond 2 (G45D).The elevation of the top of the Vandalia Till is depicted in Figure 7. Below Ash Pond 2 the elevation ranges from approximately 608.5 to 598 ft. Similar to the observed top elevation of the Hagarstown Beds, the top of the Vandalia unit declines in elevation near Coffeen Lake and topographic drainage features. This unit is relatively thick throughout the site, with an average thickness of of over 15 feet (Hanson 2009).

Results from laboratory tests completed for vertical hydraulic conductivity indicate the Vandalia unit has a very low vertical hydraulic conductivity. The laboratory tests reported hydraulic conductivity values ranging from 6.8×10^{-9} to 4.5×10^{-6} cm/sec, with a geometric mean of 4.9×10^{-8} cm/sec (Table 2). Field hydraulic conductivity tests completed in temporary piezometers (T408 and T409) indicate horizontal conductivities of 9.0×10^{-7} and 3.4×10^{-5} cm/sec, respectively (Table 3). The maximum value was measured in a sand seam within the Vandalia Till, but likely is not representative of the diamicton because sand seams are infrequent and discontinuous.

2.2.5 Mulberry Grove Member

The Mulberry Grove (Silt) Member typically consists of a thin, lenticular unit of gray sandy silt (Willman et al., 1975). It represents the interval between the retreat of the glacier that deposited the Smithboro Member and the advance of the glacier that deposited the Vandalia Member. At the site, the Mulberry Grove Member is represented by pockets (generally less than 2 ft thick) of gray sandy silt. This unit was absent in many borings through the central portion of the site from south to north. Where sampled, the Mulberry Grove Member ranged in thickness from 0.5 ft in Borings SB-12 (MW12D) to 4.9 ft in Boring SB-11 (MW11D), both of which are located near the Gypsum Pond (Hanson 2009). The Mulberry Grove Silt was not encountered in the two deep borings, G45D and G46D, advanced near Ash Pond 2.

The laboratory tests reported vertical hydraulic conductivity values of 1.6×10^{-6} and 1.9×10^{-6} cm/sec, with a geometric mean of 1.7×10^{-6} cm/sec. These silts appear to be deposited in depressions found in the surface of the underlying Smithboro Member.

2.2.6 Smithboro Member

The Smithboro (Till) Member is described as a gray, compact, silty, clayey diamicton. The Smithboro Member ranges in thickness from 6.7 ft in Boring SB-05 (near MW05S) to 21.2 ft in Boring SB-02 (near MW02S) located northwest of the landfill. Figure 8 displays the top elevation of the Smithboro Till. As shown on the figure the top of the unit ranges in elevation from 596 to 590 ft below Ash Pond 2. Borings advanced in the vicinity of Ash Pond 2 did not did not penetrate the full thickness of the Smithboro Till.

Laboratory and field conductivity testing indicate the Smithboro Member has a low hydraulic conductivity. Laboratory test reported vertical hydraulic conductivity values ranging from 1.1×10^{-9} to 1.0×10^{-7} cm/sec with a geometric mean of 1.3×10^{-8} cm/sec (Table 2). Horizontal hydraulic conductivities calculated from single well tests performed in wells G45D and G46D were 4.0×10^{-8} and 4.9×10^{-7} cm/sec, respectively (Table 3).

2.2.7 Yarmouth Soil

The Yarmouth was not encountered in the area of Ash Pond 2 as borings did not extend through the Smithboro. Historical borings in the northern portion of the site which encountered the Yarmouth were summarized previously (Hanson 2009). The Yarmouth Soil is described as the weathered zone on the

Kansan drift, but in some places it consists of accretionary deposits of fine sediment and organic material that accumulated in poorly drained areas on the surface of the Kansan deposits. The Yarmouth Soil was absent in Borings SB-18 and SB-04. Where encountered, the Yarmouth Soil ranged in thickness from 0.8 ft in Boring SB-13 to 5.1 ft in Boring SB-08.

The Yarmouth Soil (considered the deep water-bearing zone) possesses a moderate to moderately low hydraulic conductivity. The single-well permeability tests conducted by Hanson (2009) reported moderate hydraulic conductivity values ranging from 1.3×10^{-4} to 1.7×10^{-3} cm/sec, with a geometric mean of 4.4×10^{-4} cm/sec.

2.2.8 Lierle Clay Member

The Lierle Clay was not encountered in the areas of Ash Pond 2 because borings were terminated in the Smithboro Till. Historical borings in other portions of the CPS which encountered the Lierle were summarized previously (Hanson 2009). The Lierle Clay Member is the upper-most member of the Kansan Stage Banner Formation. It is described as an accretion-gley with clay, silt and some sand. It was encountered by Hanson (2009) in all but a few borings on site (i.e., SB-02 and SB-11), and was the target formation for completion ofsome boreholes. No boring penetrated the full thickness of the Lierle Clay.

The Lierle Clay has a very low hydraulic conductivity. The laboratory tests reported very low vertical hydraulic conductivity values ranging from 3.4×10^{-9} to 1.3×10^{-8} cm/sec, with a geometric mean of 3.6×10^{-9} cm/sec.

2.2.9 Bedrock

The site is underlain by the Pennsylvanian-age Bond Formation, which is characterized by Willman et al., (1975) as having a high percentage of limestone and calcareous clays and shales. Bedrock was not encountered in any borings advanced onsite so site specific information is not available.

2.3 Hydrogeology

One monitoring well was initially installed in 2010 near Ash Pond 2: however, a significant number of wells were installed around the CCR Units prior to and following their construction. In 2015 additional wells and piezometers were installed within and around Ash Pond 2 to meet requirements of the CCR Rule. This discussion focuses on Ash Pond 2 but utilizes historical results from wells at surrounding units, where appropriate, to evaluate the sitewide hydrogeology.

A summary of the current monitoring well networks and construction details is included in Table 1, and recent AECOM piezometers are summarized in Table 4. Since 2006 the hydrogeology of the site has been characterized and described through multiple investigations. This section discusses recently collected information, focusing on the existing well network and piezometers installed in 2015 and 2016 around Ash Pond 2 as well as appropriate historical data from other units onsite.

2.3.1 Groundwater Occurrence and Elevations

Leachate is present within the ash, and groundwater is present within all geologic units at the CPS; however, the Hagarstown Beds are considered the uppermost aquifer (groundwater monitoring unit or Illinois EPA aquifer) at the site. Hydraulic conductivities of the Hagarstown Beds are generally one to two orders of magnitude higher that the surrounding materials and support the designation of the Hagarstown Beds (and in areas the Upper Vandalia Till) as the Uppermost Aquifer (groundwater monitoring unit). Near Ash Pond 2 (i.e., G402 and G403) the Hagerstown was either very thin or not observed in the boring; however, hydraulic conductivity tests in these wells indicate similar hydraulic conductivities to the Hagarstown Member, indicating that the weathered Upper Vandalia Member is likely part of the Uppermost Aquifer and hydraulicly connected in these areas.

Measured groundwater elevations typically range from about 602 ft near discharge zones along the edges of Coffeen Lake and the Unnamed Creek, to 623 ft in upgradient wells along an approximate center line of the site between the two lobes of the lake (i.e., groundwater divide). Based on the elevation of Coffeen Lake (normal pool elevaton of 590 ft), Unnamed Creek (~590 ft), southern discharge channel (~604 ft) and lowest observed elevation of the Hagarstown Beds (602.6 ft) it is likely that groundwater seeps exist along the shoreline of the lake and slopes near these drainage features. Groundwater elevations are generally consistent and appear to be controlled by discharge as seeps along the shoreline of Coffeen Lake. Geologic cross-sections illustrate the occurrence of the Hagarstown Beds in Figures 9 to 11.

A summary of groundwater elevations from existing wells is included in Table 5 and hydrographs for representative well locations are included in Appendix C. Table 6 summarizes water elevations from piezometers located within and adjacent to Ash Pond 2 and Ash Pond 1. Table 6 also includes elevations from AECOM piezometer (P012) which is screened below the impoundment in the Hagarstown Beds.

Ash leachate is present within Ash Pond 2 and the elevations within the impoundment are significantly above groundwater elevations measured outside the impoundment in the Hagarstown Beds (i.e., observation wells [OW] versus monitoring wells G401 to G405. Within the impoundment, measurements collected from OW-1 through OW-5 indicate the CCR porewater elevation ranges between 635 and 637 (Table 7), while wells outside and below the impoundment range from approximately 604 ft (G402) to 625 ft (P012), indicating the groundwater elevation in the Hagarstown Beds is generally 10 to 15 feet lower than those measured within the impoundment. The leachate appears to be perched above the lower permeability Loess Unit and/or Hagarstown Member gravelly clay till, which locally acts as an aquitard. Leachate head elevations decrease significantly across the impoundment berms and seeps observed on the berms are likely derived from flow along the ash/aquitard interface. These seeps have been observed adjacent to well locations G404 and G405 along the north impoundment berm and G406 at the southwest corner of Ash Pond 2. The presence of a surface water control channel adjacent to and along the north berm, the ravine to the east, and the southern discharge channel all limit the lateral extent of ash leachate movement.

2.3.2 Groundwater Flow

Potentiometric surface maps prepared from elevation data measured in monitoring wells indicate groundwater elevations can be variable but flow directions are generally consistent. Groundwater generally flows from the center of the site both to the east to the Unnamed Creek, and westward towards Coffeen Lake. Near Ash Pond 1 flow appears to be radial based on mounding created by that unit. In the vicinity of Ash Pond 2 there appears to be a component of radial flow due to water elevations within the ash pond. However, flow within the underlying Hagarstown Beds appears to be east to the Unnamed Creek and south to the discharge flume (water elevation of approximately 604 ft). As shown in Figure 4, ash is in contact with the Hagarstown Member in two areas on the eastern side of the impoundement. Given the elevated heads measured in Ash Pond 2, the predominant flow of water from the ash into the Hagarstown Member likely occurs in these former ravines and migrates within the Hagarstown eastward, beneath the constructed berms, and discharges through seeps into the Unnamed Creek. As previously noted, seeps were also observed along the north and south sides of Ash Pond 2. The horizontal gradient between wells G405 and G404, as measured in May 2016 and November 2016, is 0.007. Representative potentiometric surface maps are shown in Figure 12 and Figure 13.

Construction of the Ash Landfill, Gypsum Stack Pond, and Recycle Pond required removal of the Hagarstown Beds, in effect removing the aquifer beneath the footprint of these units (Hanson 2016b). The groundwater flow dynamics beneath/around the Ash Landfill and GMF Units is affected by several factors, including: removal of the Hagarstown Member from beneath the Units; presence of the construction dewatering systems around the units; and the lateral variability of lithology within the Hagarstown Member. It is uncertain whether these constructed units significantly limit lateral groundwater flow, either by creating no flow zones or by capturing groundwater via their dewatering systems. Potentiometric contours included in Figures 12 and 13 project flow beneath the units.

2.3.3 Vertical Groundwater Gradients

Nested monitoring wells G405D / T408 / G45D and G406 / T409 / G46D were installed in August 2016 to determine the vertical extent of impacts near Ash Pond 2. Based on the water elevations measured in these wells in November 2016, vertical gradients are upward between the Vandalia and Hagarstown Beds and range from 0.009 to 0.42 ft/ft. Between the Vandalia and Smithboro Tills vertical gradients are significantly downward, ranging from 1.46 to 2.44 ft/ft. A summary of vertical gradients is included in Table 8.

2.3.4 Groundwater Discharge to Coffeen Lake and the Unnamed Creek

The flow of groundwater to both the Unnamed Creek and Coffeen Lake (via the discharge flume) was estimated using a number of general conservative assumptions regarding creek flow and lake levels. Calculations are included in Appendix D, and the results are summarized as follows:

- Flow from Ash Pond 2 through the Hagarstown along the eastern edge of the impoundment is approximately 0.034 cubic feet per second (cfs), or 2 cubic feet per minute (cfm); and estimated flow in the Unnamed Creek based on its geometry is approximately 43.3 cfs (2,600 cfm).
- Flow from Ash Pond 2 from the Hagarstown into the discharge channel along the southern edge is approximately 0.032 cfs (1.9 cfm), and flow in the discharge channel based on average daily flow (based on the NPDES permit) is approximately 773 cfs (46,400 cfm).

2.4 Conceptual Site Model

The geology and hydrogeology described above is summarized and grouped into the following hydrostratigraphic units for the remaining discussion in this report:

- Ash Unit – Saturated CCR within the various CCR Units
- Upper Confining Unit – Low permeability clays and silts, including the Loess Unit and the upper clayey till portion of the Hagarstown Member
- Uppermost Aquifer (Groundwater Monitoring Zone) – Thin (generally less than 3 feet), moderate permeability sand, silty sand, and sandy silt/clay units which include the Hagarstown Member and the upper Vandalia Member (where weathered).
- Lower Confining Unit – Thick (generally greater that 15 feet), very low permeability sandy silt till or clay till that includes the unweathered lower Vandalia Member, Mulberry Grove Member (discontinous), and Smithboro Member.

Mounding of water within saturated ash in the impoundment creates a component of radial flow. The extent of this groundwater movement appears to be limited, as the elevated heads overlying the Upper Confining Unit dissipate across the Ash Pond 2 berms. Potentially impacted water from the seeps observed along the berms may partially infiltrate through the Upper Confining Unit and/or run off toward the Lake or Unnamed Creek.

The Uppermost Aquifer underlying Ash Pond 2 consists of the Hagarstown Member and the weathered (upper) portions of the Vandalia Member, which is being monitored to define the extent of CCR constituents derived from Ash Pond 2. The Uppermost Aquifer is confined except where the Hagarstown Member is exposed along the eastern side of the impoundment within the former ravine (Figure 4). Based on hydraulic conductivity values (10^{-3} to 10^{-4} cm/sec) measured in the monitoring wells screened in the Hagarstown Member, groundwater at CPS has previously been classified as Class I in accordance with 35 IAC 620 (Hanson, 2009).

CCR within Ash Pond 2 is underlain by the Upper Confining Unit beneath the majority of the impoundment footprint. However, in former drainage features present prior to construction the saturated ash is in contact with the Hagarstown Beds and underlain by the Vandalia Member. Given the relatively high permeability of the Hagarstown Beds, leachate from Ash Pond 2 infiltrates into this unit, migrates through/under the eastern berm (where the Hagarstown Member is continuous below the berm) and discharges along the slope, as evidenced by the observation of seeps (Figure 4).

Groundwater within the Hagarstown Beds beyond the boundary of Ash Pond 2 flows predominantly to the east and south. Both the southern discharge flume and the Unnamed Creek intersect and cutoff the Hagarstown unit, eliminating further migration of potentially impacted groundwater. Impacted groundwater may also migrate to the north and northwest in the Hagarstown, potentially under the influence of the passive (gravity drain) underdrain system associated with the Recycle Pond and active underdrain system associated with the Landfill.

2.5 Potable Water Well Inventory

A potable water well inventory was completed in 2013 during the Phase I Hydrogeological Assessment (NRT, 2013). Public records were searched to identify water supply wells located within 2,500 feet of the unlined impoundments. The Coffeen property boundary is located in Township 7 North, Range 8 West, and the unlined impoundments are located in the southwest quarter of Section 11. The 2,500 foot boundary spans across Sections 10, 11, 14, and 15. All wells within Sections 10, 11, 14, and 15 are shown on Figure E1 and tabulated in Appendix E.

The following sources of information were queried to identify well locations.

- Illinois State Geological Survey’s Illinois Water Well (ILWATER) Internet Map Service
- Illinois State Water Survey Domestic Well Database
- Illinois EPA’s web-based Geographic Information System (GIS) files

Twenty-six water well records were identified within the four sections surrounding the unlined impoundments, and are numbered 1 through 26 on Figure E1. Based on state records there are two non-community water supply (NCWS) wells, one industrial/commercial well, ten monitoring wells (associated with the White and Brewer facility), and 13 farm/domestic water wells within the four section search area (Appendix E). The Coffeen Power Station does not have a water supply well. The two NCWS wells, points 25 and 26, are located within Sections 10 and 15 and outside of the 2,500 feet boundary of the impoundments (Figure E1 and Appendix E). There are no maximum setback zones (as defined by 35 IAC 671) for these two NCWS wells.

All except one of the wells identified in the well search are east or west of Coffeen Lake, which is a hydraulic divide for potentially impacted groundwater. The only water well located between the east and west branches of the lake is well 22, which was reportedly installed in 1981 and completed in sand and gravel at a depth of 39 feet. This well was observed during the original Hydrogeologic Investigation and removed by the Contractor during construction of the Recycle Pond (Rhonald Hasenyager, Hanson Professional Services, Inc.; personal communication).

Public water supply (PWS) wells within a ten mile radius of the Coffeen CCP impoundments were identified via a search of the Illinois State Water Survey's Illinois Water Inventory Program (IWIP) database (not available on-line) by RAPPS (2009). Three wells belonging to the Village of Fillmore are located within the search radius, the closest one is approximately eight miles northeast of the impoundments.

3 GROUNDWATER QUALITY

3.1 Summary of Groundwater Monitoring

Groundwater monitoring at the Coffeen Power Station was initiated in 2006 prior to construction of the Gypsum Management Facilty and Landfill; however, consistent data collection near Ash Pond 2 began in November 2015 to comply with the CCR Rule. There are currently no IEPA monitoring requirements for Ash Pond 2. The following discussion presents an analysis of historical data collected from 2010 to 2012 (in well G402, formerly APW-2) and recent CCR data from November 2015 to 2016. Limited data from monitoring wells near the Landfill, Gypsum Stack Pond and Gypsum Recycle Pond are also included to evaluate historical trends. Groundwater data from monitoring wells near Ash Pond 1 are not included in this analysis.

Groundwater monitoring around Ash Pond 2 that was initiated in November 2015 included seven well locations. Sampling is conducted quarterly at 2 background wells and 5 downgradient wells for the following parameters:

Metals (totals)			
Antimony	Boron	Cobalt	Molybdenum
Arsenic	Cadmium	Lead	Selenium
Barium	Calcium	Lithium	Thallium
Beryllium	Chromium	Mercury	
Inorganics (totals)			
Fluoride	Chloride	Sulfate	Total Dissolved Solids
Field			
pH	Dissolved Oxygen	Specific Conductivity	Turbidity
Oxidation/Reduction Potential	Temperature		

In August 2016, four additional wells (G406, G407, G45D, G46D) were installed to further define the extent of impacts from Ash Pond 2 and refine the GMZ proposed in the CAP. Groundwater samples were collected in August and November, 2016 and results are included in this analysis. Data for the expanded parameter list for the federal CCR sampling will be reported in accordance with the groundwater monitoring plan included with the Closure Plan for Ash Pond 2.

3.2 Groundwater Monitoring Results and Analysis

Analytical results for Ash Pond 2 wells from 2010 (APW-2) through October 2016, and from 2008 to 2016 for select wells around the SW Pond and Recycle Pond are summarized in Appendix F. Statistics showing the minimum and maximum concentrations detected in the groundwater samples is included for each well in Table 9. Table 9 also includes a comparison of groundwater data from wells to the Groundwater Quality Standards for Class I: Potable Groundwater. The well locations are shown on Figure 3. Note these results include both dissolved and total analytes, and are compared to 35 IAC 620 Class I Standards. Where possible, emphasis is placed on dissolved analyses, but totals are used when no dissolved analysis was available.

Parameters that have been detected in groundwater at concentrations exceeding the Class I groundwater quality standards include the following: arsenic, boron, lead, manganese, sulfate, and total dissolved solids (reported as residue on evapoaration or ROE). A summary of recent exceedances in 2015 and 2016 follows for the parameters of concern. Time-series graphs for each of the groundwater parameters at the 7 monitoring wells around Ash Pond 2 and select wells around the SW Pond and Recycle Pond are included in Appendix F including all historical results for these locations.

Arsenic

Arsenic exceeded the Class I standard (0.010 mg/L) in well G405 (November 2015), and G402 (November 2015, and February and May 2016) which are located at the toe of Ash Pond 2 on the north and southeast side, respectively. Results from other wells on-site are either non-detect or at concentrations well below the standard. However, arsenic is naturally occurring in Illinois groundwater. State agencies (IDNR, IDPH & IEPA, 2001) have noted that “arsenic concentrations that vary dramatically over a relatively short distance indicates that local conditions dictate arsenic concentration in groundwater, and it is difficult to make regional generalizations.” Therefore, it is equally dificcult to make large-scale source determinations because of the concentration variations over these reported short distances.

Boron

Boron exceeded the 2 mg/L Class I standard during all events at wells G401 and G405, located south and north of Ash Pond 2, respectively. Exceedances were also measured in G402, southeast of the unit and G404 and the nearby Recycle Pond well G275, located northeast of the unit. Recently installed deep wells (G45D and G46D) did not exceed the Class I standard, indicating the impacts do not extend vertically through the Vandalia Till. West of the unit, G403 exhibits very low concentrations of CCR parameters which may be related to the relatively thin Hagarstown unit at this location (~0.2 ft). The groundwater elevation at G403 is also the highest measured value around Ash Pond 2, implying the impacted water does not flow toward this location. The highest concentrations of boron in groundwater have been detected in G405 and range from 15 to 17 mg/L. This concentration is significantly higher than other wells located adjacent to the Pond, and may be related to the shallow depth and increased thickness of the Hagarstown Beds observed at this location. As discussed previously it is unclear if the seeps along the northern berm are infiltrating and resulting in localized increases in concentration.

Ash Pond 2 was closed/capped in the mid-1980's and it is expected that groundwater has reached equilibrium with respect to Ash Pond 2 (both concentrations and heads). Long term data collection at G402 (APW-2) supports this conclusion as boron concentrations have remained relatively stable (Appendix F). Results from sampling at G275 indicate highly variable concentrations of boron which may be related to the well's proximity to the Unnamed Creek, which exhibits significant seasonal fluctuations in discharge. Increasing trends are visible in results from G271, G273, and G274 (located north of the unit between the Recycle Pond and Ash Pond 2), although concentrations are significantly below the standard. The slight increases in concentration at these locations may be attributed to the construction of the Recycle Pond. As discussed in Subsection 2.3.2, construction of the Recycle Pond has likely impacted the groundwater flow dynamics in the area. The removal of the Hagarstown Member and the installation of the passive dewatering system may be allowing the northerly migration of contaminants toward the Recycle Pond monitoring system wells. Additional data is necessary to establish long term trends in boron concetrations at other monitoring wells near Ash Pond 2.

Lead

Lead was detected above standard (0.0075 mg/L) adjacent to Ash Pond 2 in G402 and G405. Concentrations above standard were also reported in G275, G276, G278, and G280 near the GRP. However, with the exception of G402, additional samples collected at these locations did not contain elevated lead concentrations, suggesting exceedances at these locations were anomalous and likely related to turbidity.

Sulfate

Sulfate, like boron, is a primary indicator of CCR leachate, and exceeded the 400 mg/L Class I standard at Ash Pond 2 wells G401, G402, G405, G406 (located around the perimeter of the Pond) and G407 (located approximately 1,000 feet west of the Pond). It also exceeds the standard at G271, G273, G275 and G279 adjacent to the Recycle Pond and north of Ash Pond 2, and G153 adjacent to the SW Pond and northwest of Ash Pond 2. At well G274 exceedances occurred in December 2012 and January 2013, but recent results indicate concentrations are below the standard. Sulfate, when present with elevated boron concentrations, is presumed to be indicative of potential impacts from a CCR unit. The highest concentrations of sulfate are detected in G401, which is located on the south side of Ash Pond 2. Sulfate concentrations generally correlate with boron concentrations with the exception of G271, G273, G279, and G407 where elevated sulfate is present without a significant boron presence. Increasing trends of boron in G71, G273, and G279 suggest that sulfate concentrations may be partially in response to effects from Ash Pond 2, but limited data from G407 (installed in August 2016) does not allow a similar analysis.

Current data does not suggest wells G153 and G407 are impacted by Ash Pond 2; however, without more data a definitive source of the sulfate in G153 and G407 cannot be determined.

Increasing trends are apparent at wells G153, G271, and G272. As discussed previously, increasing concentrations in G271 and G272 may be naturally occurring background in conjunction with changes in groundwater flow and geochemical conditions following construction of the Recycle Pond. It is unclear why sulfate concentrations are increasing in G153; it may be due to similar effects following construction of the Landfill and SW Pond. Sulfate concentrations in this well have been elevated since it was installed in 2011. Background well G270 had increased concentrations following installation in 2008 until December 2014; however, since then the concentration has stabilized and declined. Remaining wells exhibit stable concentration trends, although more data is needed for CCR wells installed in 2015 (G401 to G405).

Manganese

Manganese concentrations exceeded the Class I standard of 0.15 mg/L at monitoring wells G402, G404, G405, and G406 during 2015 and 2016. Wells G401, G402, and G403 are part of the CCR Rule monitoring program and have not been sampled for manganese (not an Appendix III or Appendix IV parameter). Wells around the SW Pond G151, G152, and G153 have exceeded the standard at least once during 2015-2016 and concentrations of manganese around the Recycle Pond are highly variable, however only G270 has exceeded the standard during 2015-2016. In locations where elevated manganese concentrations are present with both elevated boron and sulfate, it is likely related to effects of the impoundment(i.e. changes in geochemical conditions) but not necessarily directly from the CCR leachate. However, in some cases (i.e. G151, G152, G153, G270, and G407) the lack of elevated concentrations of boron (and in some cases sulfate, i.e. G151, G152, and G270) in groundwater indicates that the elevated manganese concentrations may be primarily associated with with changing geochemical factors (following construction of nearby CCR units and only secondarily related to the impoundment. Time concentration plots indicate decreasing manganese trends in groundwater from G270 and G273, no other trends are apparent in monitoring wells evaluated for this analysis.

Total Dissolved Solids

TDS concentrations regularly exceed the Class I standard of 1,200 mg/L at wells G401, G402, G405, G406, and G407 around Ash Pond 2 and also adjacent to the SW Pond (G153) and the GRP (G273 and G275). TDS reflects concentrations of major ions in groundwater and in the wells listed above sulfate concentrations make up the largest component of the TDS exceedances. TDS concentrations mirror trends observed in sulfate concentrations, with slightly increasing trends observed in G153, G271, and G272.

pH

The pH measured in G401 (south of the unit) fell below the lower limit (6.5 standard units, SU) during sampling in 2015 and 2016. Groundwater in this well appears to be impacted (based on boron and sulfate concentrations) and results from recent surface and source water sampling indicates the CCR leachate is slightly acidic, and is likely the source of acidity causing low pH values in groundwater. Monitoring well G402, also located south of the unit, exhibits simalr pH measurements but does not exceed the lower pH standard.

3.3 Impacted Groundwater Discharge to Surface Water

Based on the groundwater discharge calculations discussed in 2.3.4, and maximum concentrations of boron and sulfate detected in groundwater, the concentration of boron and sulfate loading into Coffeen Lake and the Unnamed Creek were calculated to determine if they exceed surface water standards. Calculations are included in Appendix D, and indicate that approximately 12.5 kg of boron are discharged to the creek each day, resulting in a calculated concentration of 0.115 mg/L. The estimated sulfate concentration is 1.9 mg/L.

In the discharge channel to the south, approximately 1.6 kg of boron is discharged via groundwater baseflow each day, resulting in a calculated concentration of 0.01 mg/L; the concentration of sulfate in the discharge flume is estimated at 50.1 mg/L. In both discharge areas the resulting concentrations are significantly below standards. Recent surface water sampling (Table 10) also confirms that Coffeen Lake is not impacted by Ash Pond 2 because measured concentrations of sulfate (~55 mg/L) and boron (≤280 ug/L) are well below standards and similar to background groundwater concentrations measured elsewhere onsite (i.e., at background wells G200 and R201).

4 CONCLUSIONS

Based on extensive site investigation and monitoring, the site has been characterized and a detailed site conceptual model has been developed. In conjunction with the hydrogeologic investigation, a groundwater model has also been developed to predict the effect of ash pond closure via capping on groundwater quality. The groundwater model report is being submitted under separate cover.

CPS and Ash Pond 2 overlie a significant thickness of glacially-derived deposits. The unlithified deposits which occur at Ash Pond 2 include the following hydrstratigraphic/geologic units:

- Ash Unit – Saturated CCR wIthin the various CCR Units
- Upper Confining Unit – Low permeability clays and silts, including the Loess Unit and the upper clayey till portion of the Hagarstown Member
- Uppermost Aquifer (Groundwater Monitoring Zone) – Thin (generally less than 3 feet), moderate to high permeability sand, silty sand, and sandy silt/clay units which include the Hagarstown Member and the upper Vandalia Member (where weathered).
- Lower Confining Unit – Thick (generally greater that 15 feet), very low permeability sandy, silt till, or clay till that include the unweathered Vandalia Member , Mulberry Grove Member (discontinous), and Smithboro Member.

CCR is underlain by the Upper Confining Unit in the majority of the Ash Pond 2 footprint and mounding of water within saturated ash in the impoundment creates a component of radial flow. However, the extent of this groundwater movement appears to be limited, as the elevated heads overlying the Upper Confining Unit dissipate across the Ash Pond 2 berms. Leachate seeps observed along the berms may partially infiltrate through the Upper Confining Unit and/or run off with surface water toward the Lake or Unnamed Creek. In localized areas on the east side of Ash Pond 2, former drainage features that ocurr within the pond footprint eroded through the Upper Confining Unit such that the CCR is in contact with the permeable portions of the Hagarstown Beds. In these areas, CCR leachate appears to migrate in the Hagarstown Beds and discharge through seeps along the ravine into the Unnamed Creek to the east.

The uppermost aquifer underlying Ash Pond 2 consists of the Hagarstown Member and the weathered portions of the Vandalia Member, which is being monitored to define the extent of CCR constituents derived from Ash Pond 2. Groundwater at CPS has previously been classified as Class I Potable Resource Groundwater. The uppermost aquifer is confined except where the Hagarstown Member is exposed along the eastern-side of the impoundment within the former ravine.

Groundwater within the Hagarstown Beds beyond Ash Pond 2 flows predominantly to the east and south. There is limited groundwater flow from Ash Pond 2 toward the west due to a thinning or lower hydraulic conductivity of the Hagarstown Beds. Based on hydraulic conductivities and vertical gradients, horizontal groundwater flow in the overlying clays and underlying tills are negligible. Groundwater flow occurs primarily in the more permeable zones within the Hagarstown Beds. However, migration of impacts is limited to the east and south by the presence of the Unnamed Creek, Coffeen Lake and a surface water discharge flume, all three of which are areas of groundwater discharge and act as hydraulic barriers and/or groundwater divides.

Exceedances of Class I groundwater quality standards are present in monitoring wells at several locations around Ash Pond 2 for arsenic. boron, lead, manganese, sulfate, and total dissolved solids. The exceedances of Class I groundwater quality standards for arsenic, lead, manganese, sulfate, and TDS at several locations may be only partially attributed to Ash Pond 2, and are primarily a result of natural geochemical variations or background concentrations, specifically in wells where boron concentrations are low. The concurrent detection of elevated boron and sulfate concentrations are key indicators of the presence of CCR constituents related to Ash Pond 2.

Boron concentrations are generally stable with the exception of wells G271, G272, and G274 (located between Ash Pond 2 and the Recycle Pond), which have shown slight increases. However, concentrations remain significantly below the standard (2 mg/L). Increasing trends measured at these wells are attributed to the construction of the GRP north of the wells and the reduction of unimpacted groundwater flow towards these wells, or increased flow from Ash Pond 2, due to the underlying drainage system at the GRP.

Given the current groundwater data and Site information, groundwater quality is expected to improve following closure, as capping will reduce the infiltration of water and leachate generation from Ash Pond 2. Because CCR will remain in Ash Pond 2, a groundwater monitoring plan is being submitted with this Closure and Post-closure Care Plan. l.

5 REFERENCES

AECOM, 2016a. Revised 30% Closure Design Package for Coffeen Power Station, GMF Gypsum Stack Pond. 1/27/2016.

AECOM, 2016b. 30% Design Data Report for Dynegy Coffeen Power Station; Ash Ponds Nos. 1 and 2 CCR Units.1/12/2016.

AECOM, 2016c. Revised 30% Closure Design Package for Coffeen Power Station Ash Pond No. 2. April 16, 2016.

Hanson, 2016a. Corrective Action Plan. Coffeen Power Station, Illinois Power Generating Company, Coffeen, Montgomery County, IL. April 19, 2016.

Hanson 2016b. 40 CFR 257.60 Uppermost Aquifer Considerations, Gypsum Pond, Illinois Power Holdings LLC, Coffeen Energy Center, Montgomery County, Illinois, April 2016.

Hanson, 2015. Ash Landfill Storm Water Runoff Pond - G153 Assessment. Hanson Professional Services, Inc. January 15, 2015.

Hanson, 2014. G153 Assessment. WPC Permit No. 2011-EB-1289, Coffeen Power Station, Illinois Power Generating Company, Coffeen, Montgomery County, Illinois, December 19, 2014.

Hanson, 2009. Section 3: Hydrogeologic Investigation. Initial Facility Report, Hanson Professional Services, Inc. August 2009.

Herzog, B.L., B.J. Stiff, C.A. Chenoweth, K.L. Warner, J.B. Sieverling, and C. Avery, 1994, Buried Bedrock Surface of Illinois: Illinois State Geological Survey map, scale 1:500,000.

IDNR, 2014. Coffeen Lake State Fish and Wildlife Area Park Brochure. DNR – 06/14 • IOCI 0625-14

Kolata, D.R., 2005, Bedrock Geology of Illinois: Illinois State Geological Survey map, scale 1:500,000.

Natural Resource Technology, Inc., 2013. Phase I Hydrogeological Assessment Report. CoalCombustion Product Impoundments, Coffeen Energy Center, Montgomery County, IL.

Rapps Engineering & Applied Science, November, 2009. Site Characterization and Groundwater Monitoring Plan For CCP Impoundments, Ameren Energy Generating Company, Coffeen Power Station, Montgomery County, Illinois.

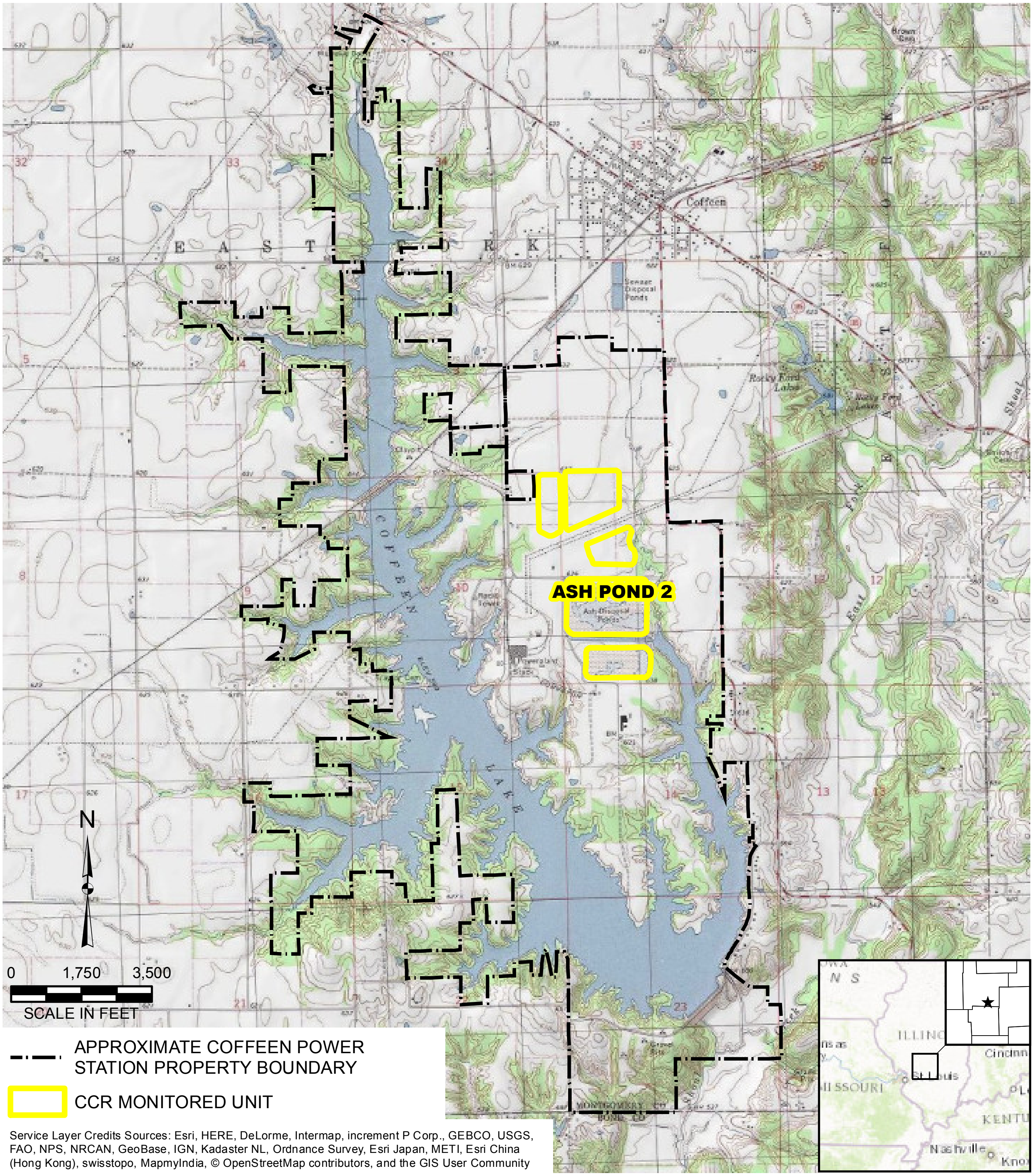
Willman, H.B., and J.C. Frye, 1970, Pleistocene Stratigraphy of Illinois: Illinois State Geological Survey, Bulletin 94, 204 p.

Willman, H.B., J.C. Frye, J.A. Simon, K.E. Clegg, D.H. Swann, E. Atherton, C. Collinson, J.A. Lineback, T.C. Buschbach, and H.B. Willman, 1967, Geologic Map of Illinois: Illinois State Geological Survey map, scale 1:500,000.

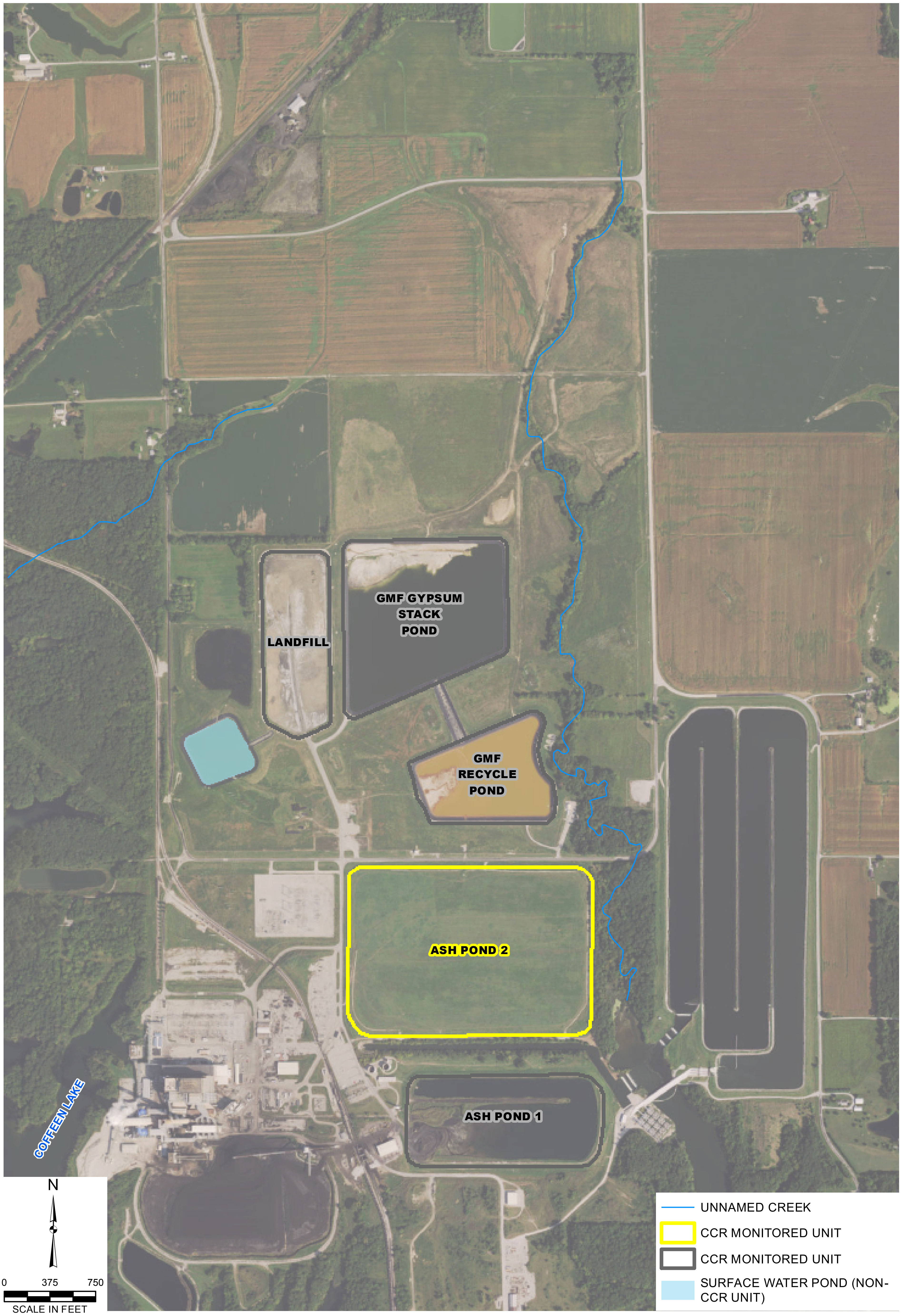
Willman, H.B., E. Atherton, T.C. Buschbach, C. Collinson, J.C. Frye, M.E. Hopkins, J.A. Lineback, and J.A. Simon, 1975, Handbook of Illinois Stratigraphy: Illinois State Geological Survey, Bulletin 95, 261 p.

Zeizel, A.J., 1959, Geologic Report on the Ground-Water Geology at Fillmore, Sections 23 and 26, T8N., R2W., Montgomery County: Illinois State Geological Survey, Open File Report

FIGURES



DRAWN BY/DATE: SDS 12/21/16 REVIEWED BY/DATE: NRK 12/21/16 APPROVED BY/DATE: SJC 12/21/16	SITE LOCATION MAP HYDROGEOLOGIC CHARACTERIZATION REPORT ASH POND 2 COFFEEN POWER STATION COFFEEN, IL	PROJECT NO: 2380 FIGURE NO: 1 Natural Resource Technology



Y:\Mapping\Projects\23\2380\MXD\HGCR\Figure 2_CCR Management Units.mxd Author: sstolz; Date/Time: 12/20/2016, 3:17:41 PM

DRAWN BY/DATE: SDS 12/5/16
REVIEWED BY/DATE: NRK 12/5/16
APPROVED BY/DATE: SJC 12/20/16

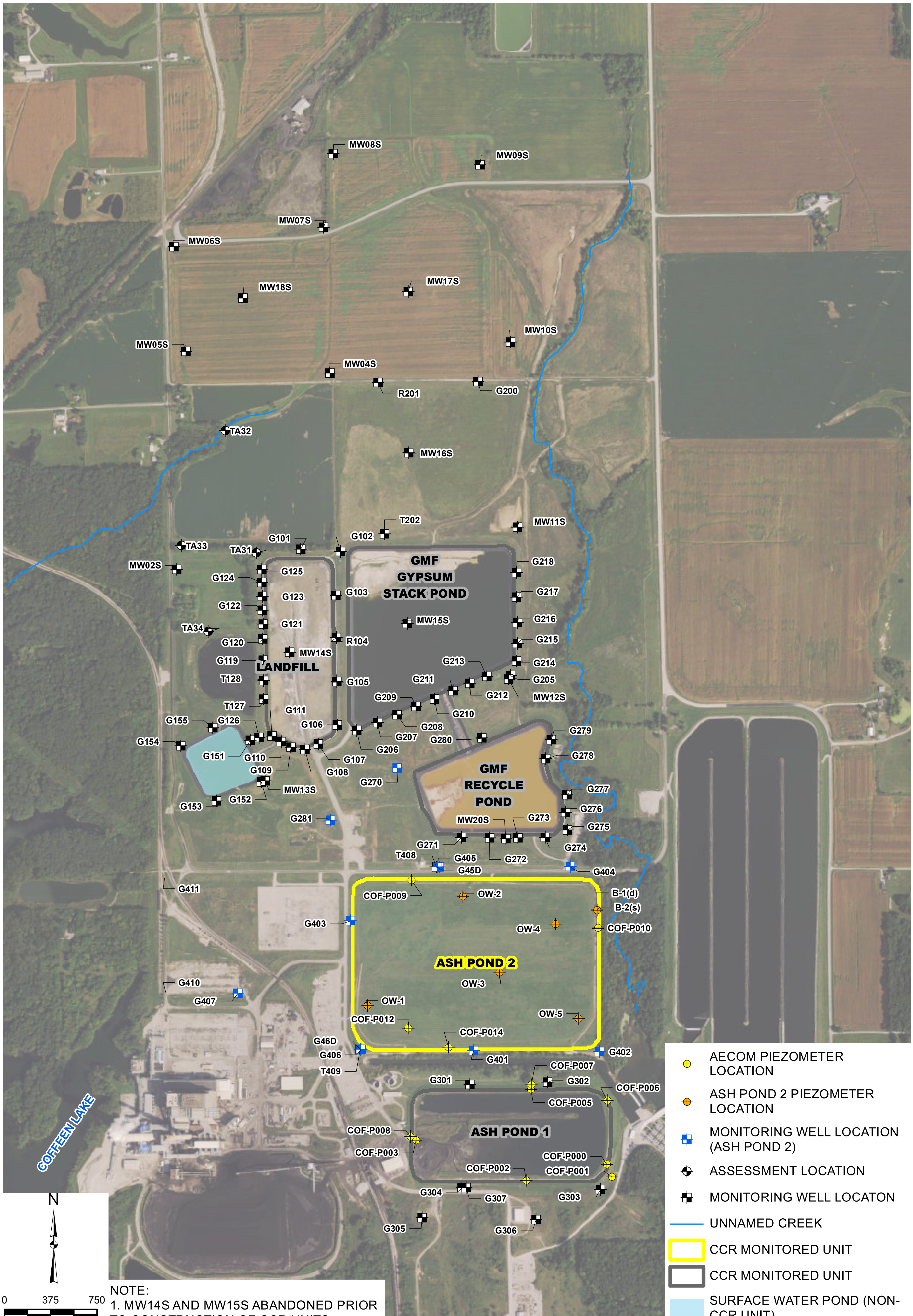
CCR MANAGEMENT UNITS

HYDROGEOLOGIC CHARACTERIZATION REPORT
ASH POND 2
COFFEEN POWER STATION
COFFEEN, IL

PROJECT NO: 2380

FIGURE NO: 2

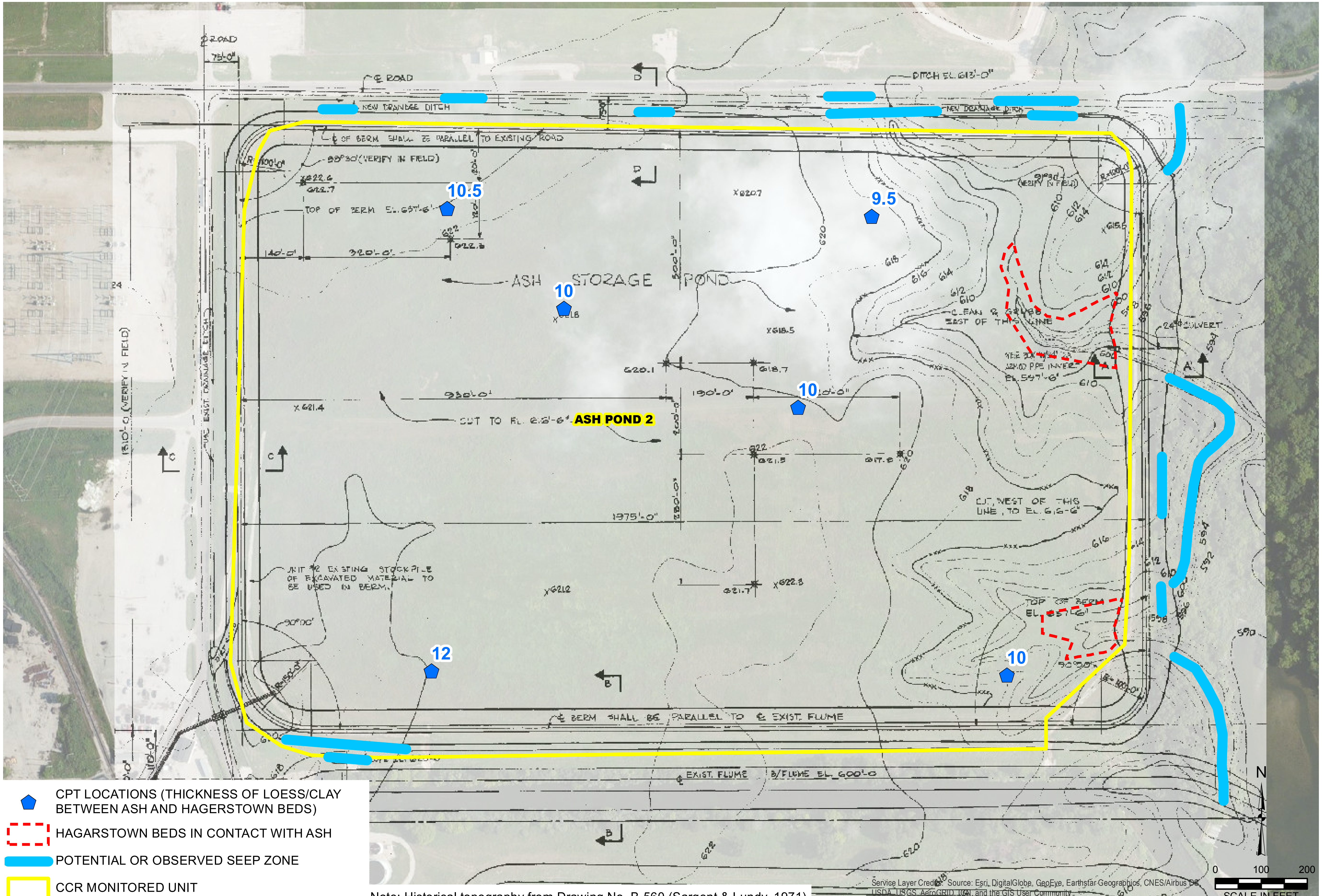
Natural Resource Technology



NOTE:
1. MW14S AND MW15S ABANDONED PRIOR TO CONSTRUCTION OF CCR UNITS

Y:\Mapping\Projects\23\2380\MXD\HGCR\Figure 3_MW Location Map.mxd Author: toushman; Date/Time: 12/22/2016, 2:45:35 PM

DRAWN BY/DATE: SDS 12/8/16 REVIEWED BY/DATE: NRK 12/8/16 APPROVED BY/DATE: SJC 12/20/16	MONITORING WELL LOCATION MAP HYDROGEOLOGIC CHARACTERIZATION REPORT ASH POND 2 COFFEEN POWER STATION COFFEEN, IL	PROJECT NO: 2285 FIGURE NO: 3 Natural Resource Technology



Y:\Mapping\Projects\23\2380\MXD\HGCR\Figure 4_Thickness of Loess Clay.mxd Author: tcushman; Date/Time: 12/22/2016, 2:50:01 PM

DRAWN BY/DATE: SDS 12/05/16
REVIEWED BY/DATE: NRK 12/05/16
APPROVED BY/DATE: SJC 12/20/16

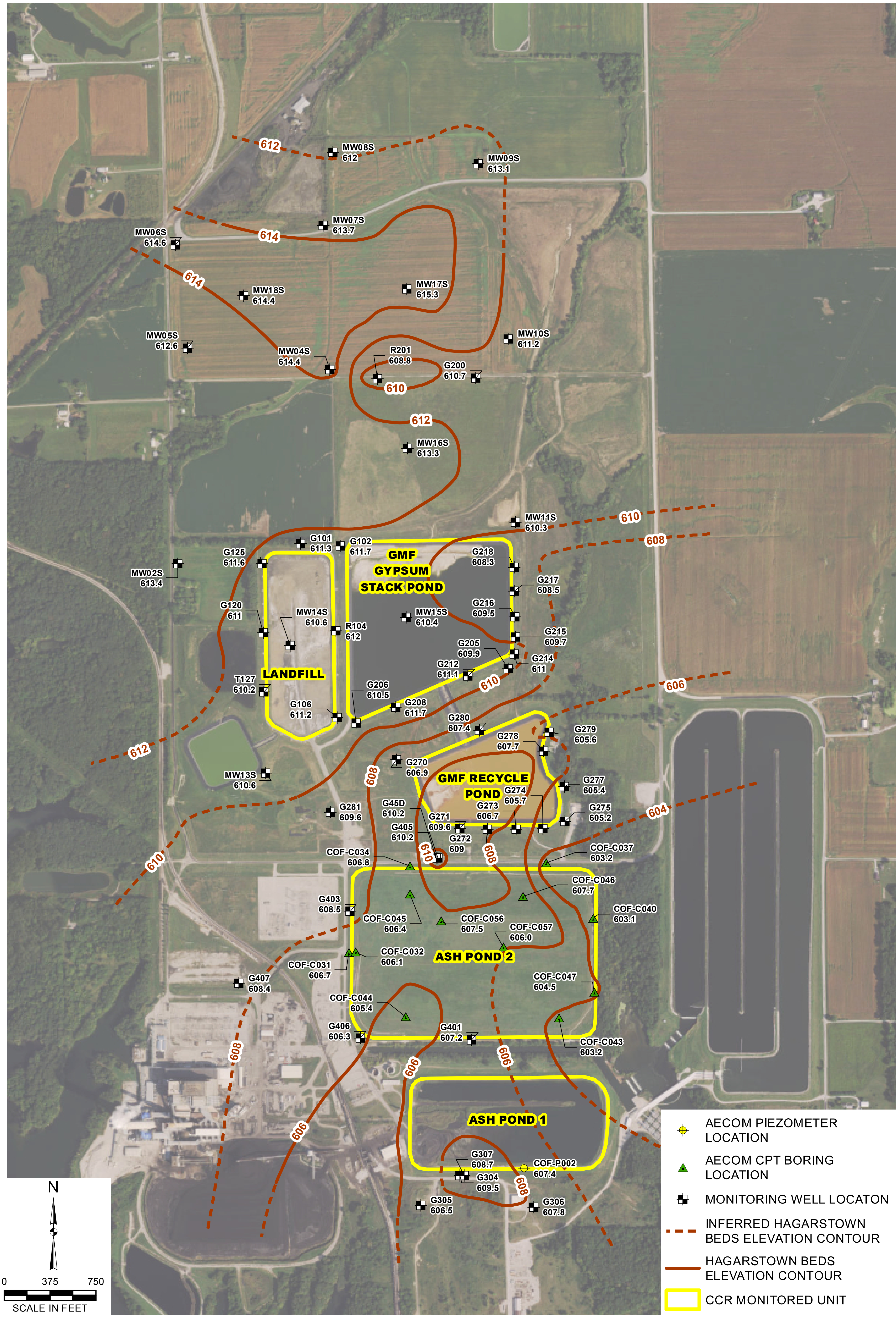
THICKNESS OF LOESS / CLAY BELOW ASH POND 2

HYDROGEOLOGIC CHARACTERIZATION REPORT
ASH POND 2
COFFEEN POWER STATION
COFFEEN, IL

PROJECT NO: 2380

FIGURE NO: 4

Natural Resource Technology



DRAWN BY/DATE: SDS 11/3/16
REVIEWED BY/DATE: JJW 11/3/16
APPROVED BY/DATE: SJC 12/20/16

STRUCTURAL CONTOUR MAP
TOP OF HAGARSTOWN MEMBER

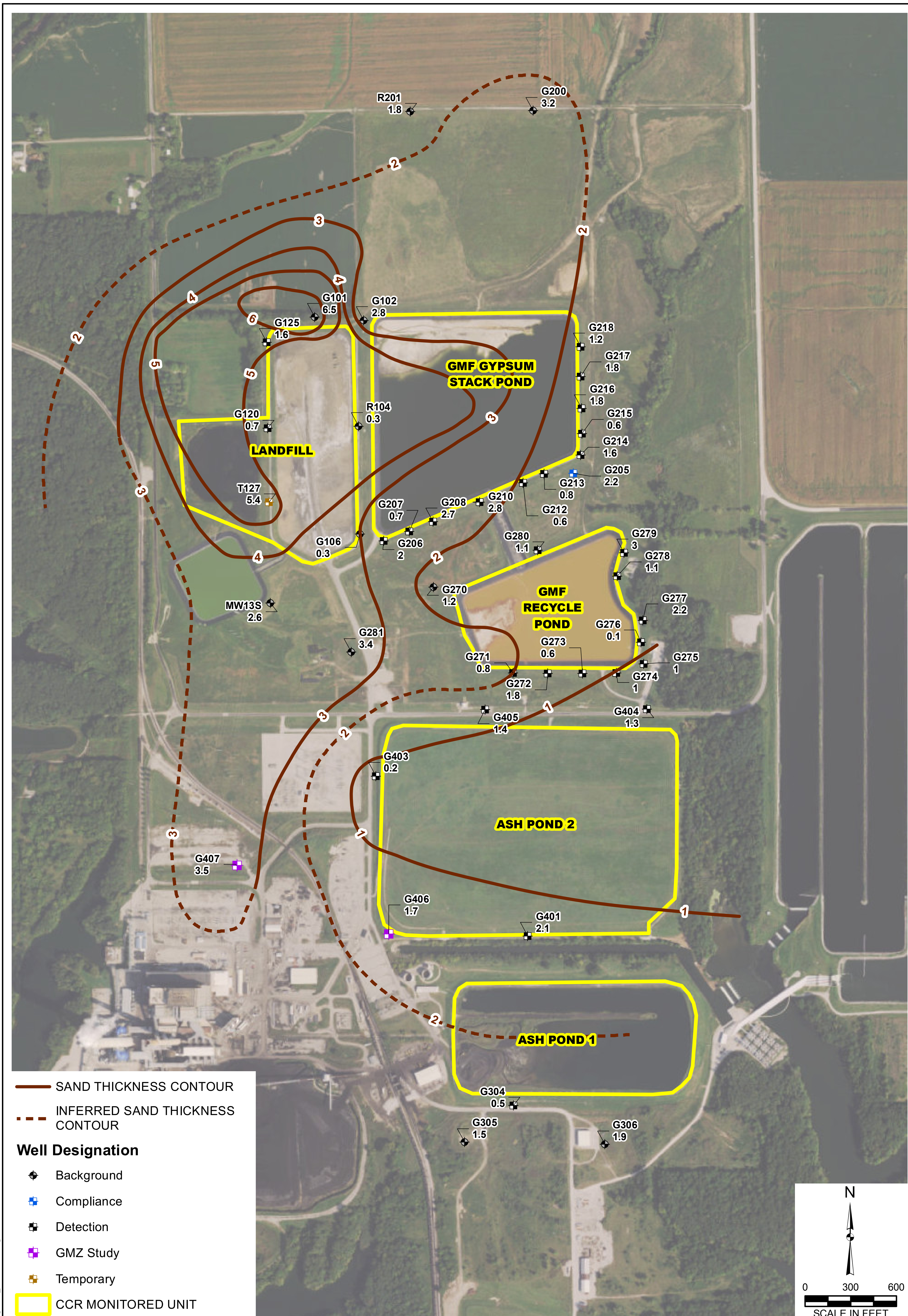
HYDROGEOLOGIC CHARACTERIZATION REPORT
ASH POND 2
COFFEEN POWER STATION
COFFEEN, IL

PROJECT NO: 2380

FIGURE NO: 5

Natural Resource Technology

Y:\Mapping\Projects\23\2380\MXD\HCR\Figure 5_Coffeen Hagarstown.mxd Author: sstolz; Date/Time: 12/20/2016, 3:27:16 PM



DRAWN BY/DATE:
MDM 10/11/16
REVIEWED BY/DATE:
JJW 10/13/16
APPROVED BY/DATE:
SJC 12/20/16

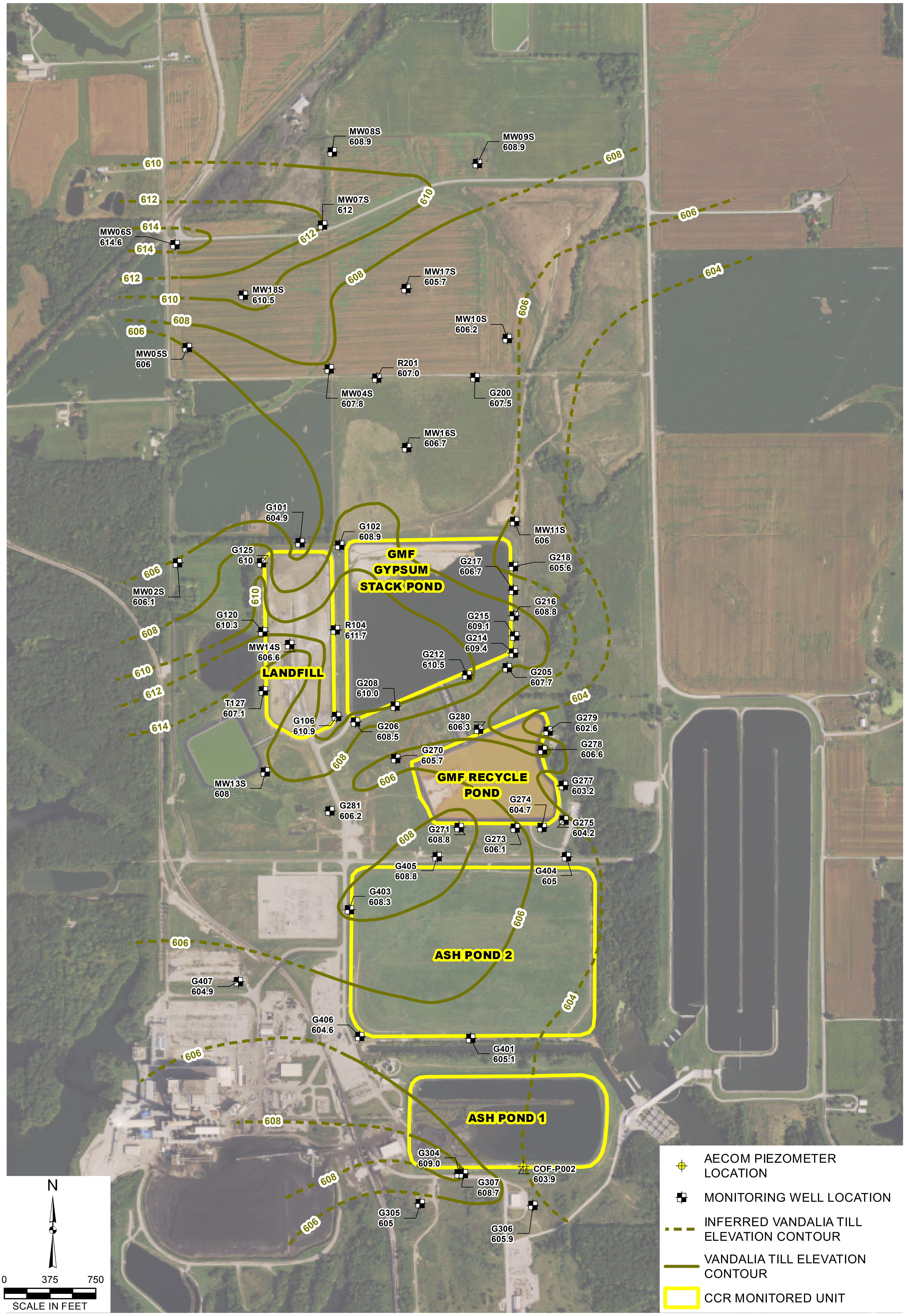
THICKNESS OF HAGARSTOWN MEMBER SAND UNIT

HYDROGEOLOGIC CHARACTERIZATION REPORT
ASH POND 2
COFFEEN POWER STATION
COFFEEN, IL

PROJECT NO: 2285

FIGURE NO: 6

Natural Resource Technology



Y:\Mapping\Projects\23\2380\MXD\HGCR\Figure 7_Coffeen Vandalia.mxd Author: sstolz; Date/Time: 12/20/2016, 3:30:52 PM

DRAWN BY/DATE:
SDS 11/3/16
REVIEWED BY/DATE:
JJW 11/3/16
APPROVED BY/DATE:
SJC 12/20/16

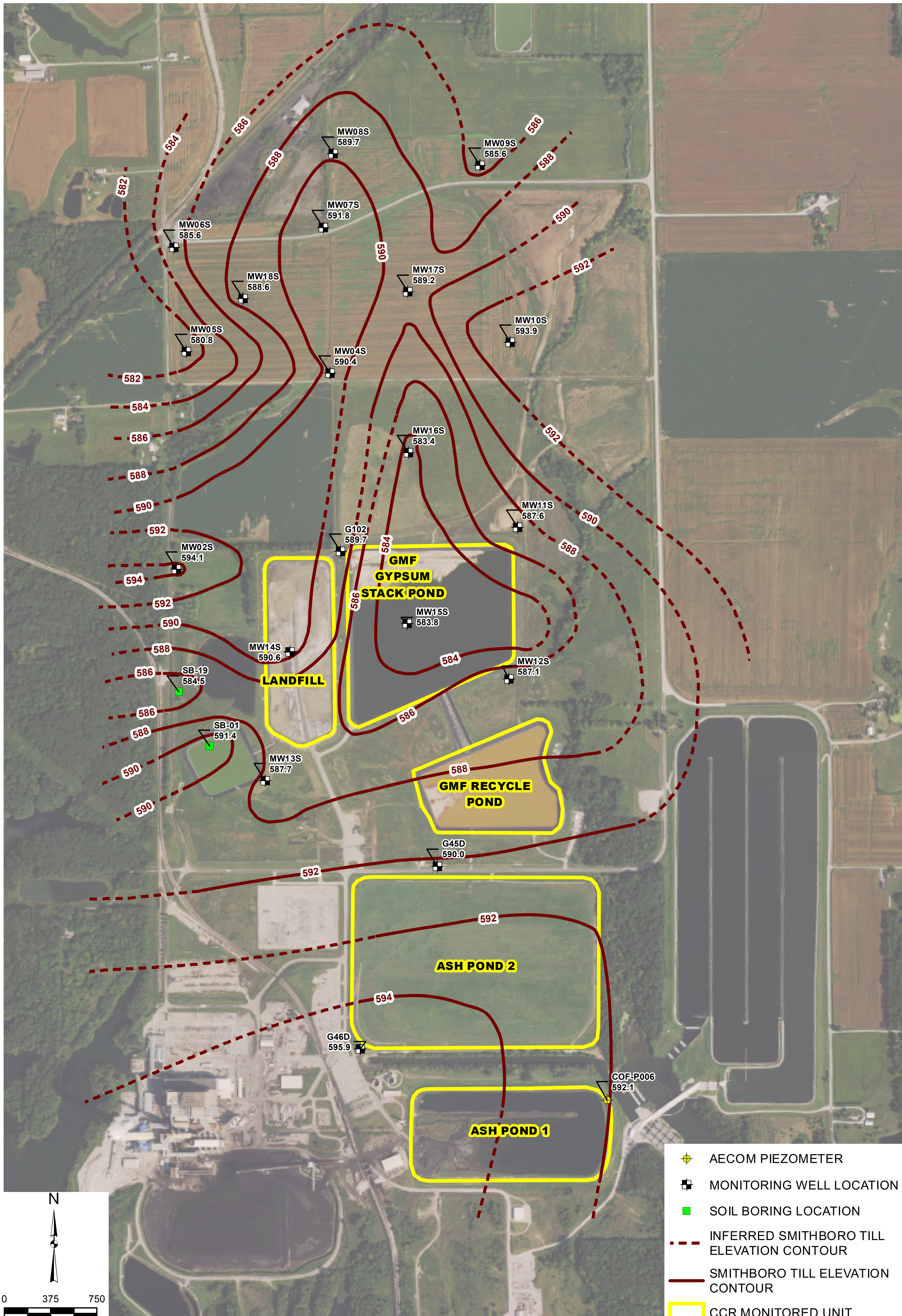
STRUCTURAL CONTOUR MAP
TOP OF VANDALIA TILL

HYDROGEOLOGIC CHARACTERIZATION REPORT
ASH POND 2
COFFEEN POWER STATION
COFFEEN, IL

PROJECT NO: 2380

FIGURE NO: 7

Natural Resource Technology



DRAWN BY/DATE: SDS 11/3/16
REVIEWED BY/DATE: JJW 11/3/16
APPROVED BY/DATE: SJC 12/20/26

STRUCTURAL CONTOUR MAP
TOP OF SMITHBORO TILL

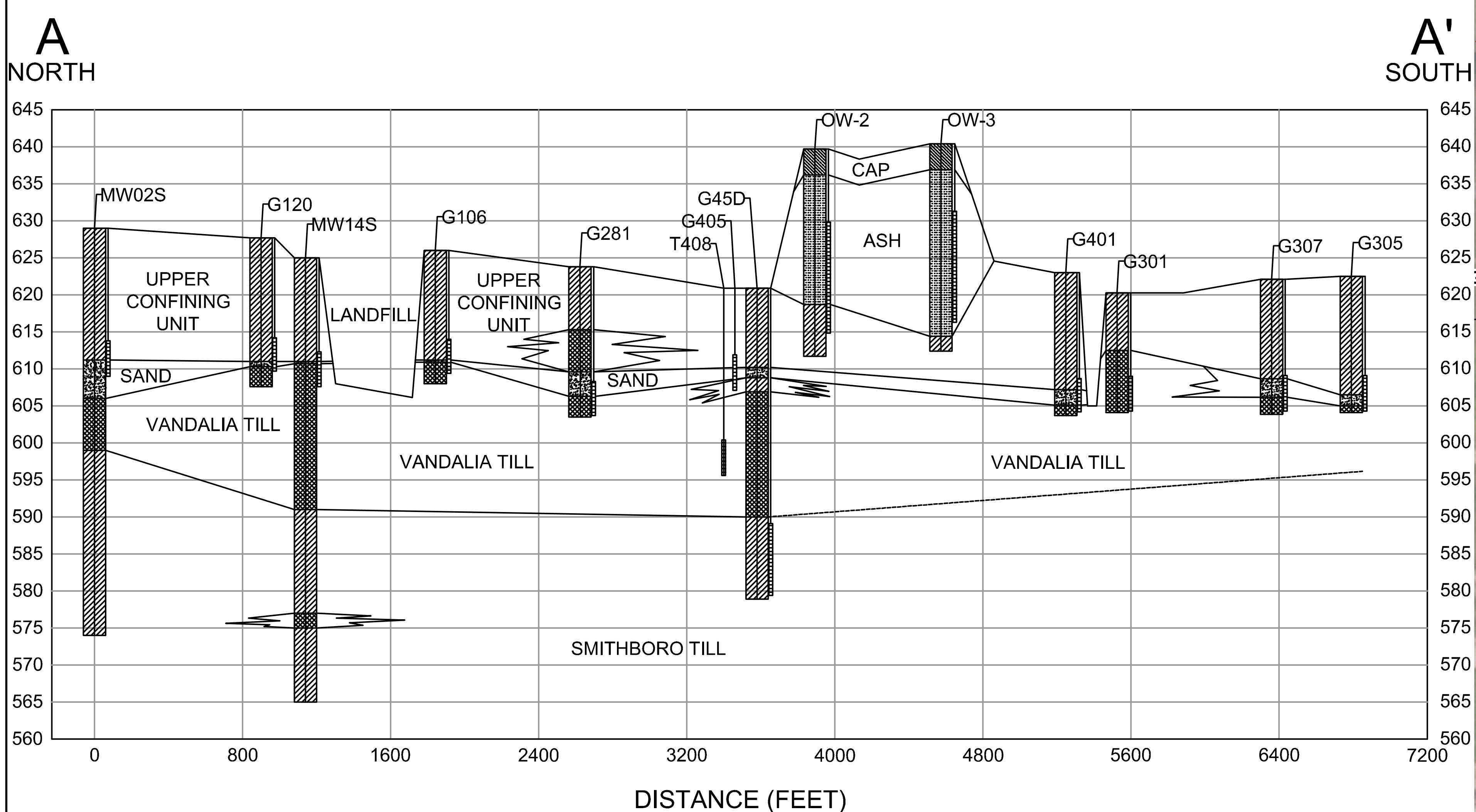
HYDROGEOLOGIC CHARACTERIZATION REPORT
ASH POND 2
COFFEEN POWER STATION
COFFEEN, IL

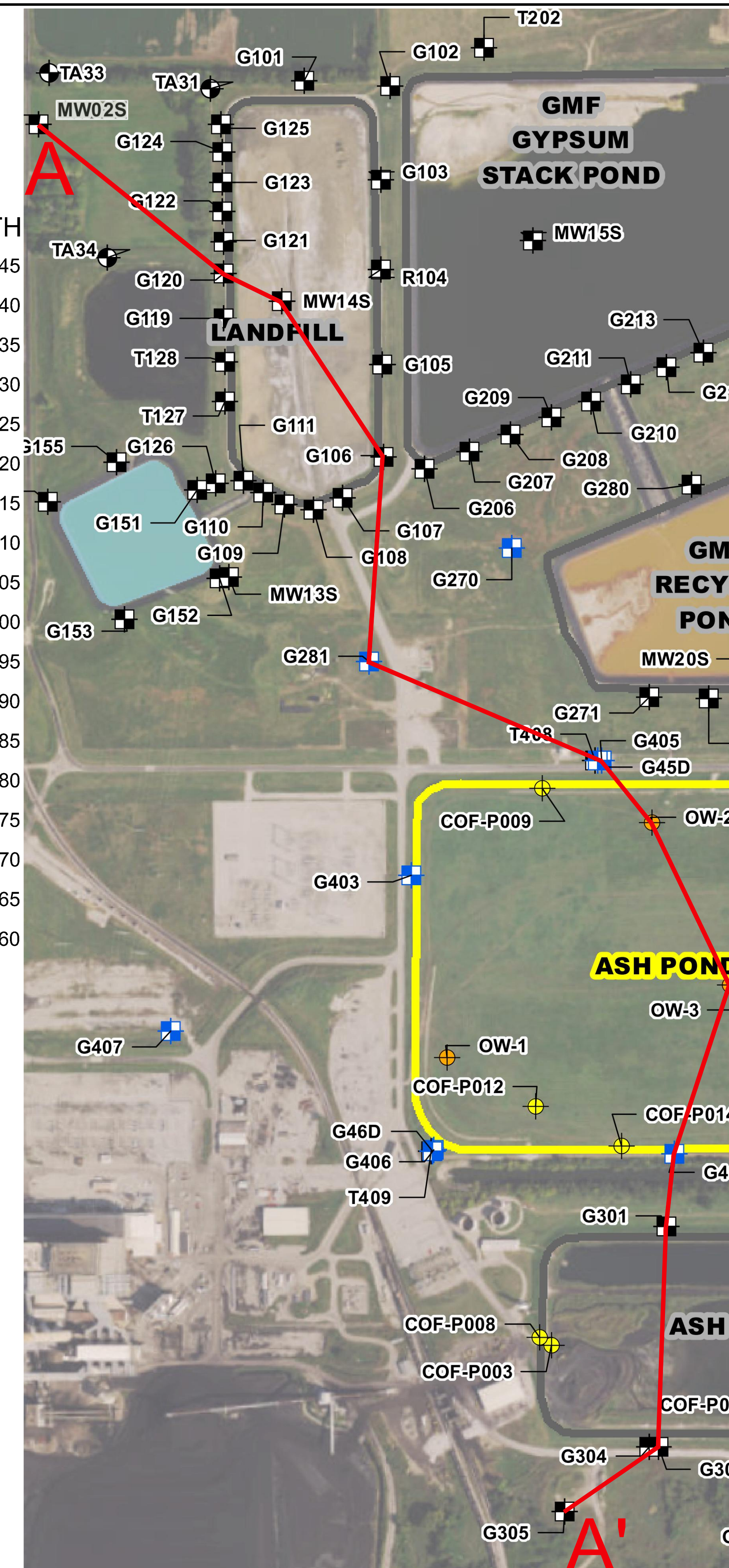
PROJECT NO: 2380

FIGURE NO: 8

Natural Resource Technology

Y:\Mapping\Projects\23\2380\MXD\HGCR\Figure 8_Coffeen Smithboro Till.mxd Author: sstolz; Date/Time: 12/20/2016, 3:31:20 PM





VERTICAL SCALE IN FEET

20

800

HORIZONTAL SCALE IN FEET

VERTICAL EXAGGERATION =40

B—B' CROSS-SECTION TRANSECT

CLAY

SOIL

SAND

SILT

ASH

WELL SCREEN

DRAWN BY: AGC	DATE: 12/6/16
CHECKED BY: NRK	DATE: 12/20/16
APPROVED BY: SJC	DATE: 12/20/16
DRAWING NO: Fig 9_Geologic Cross-Section A-A'	
REFERENCE: SEE INFO BLOCK	

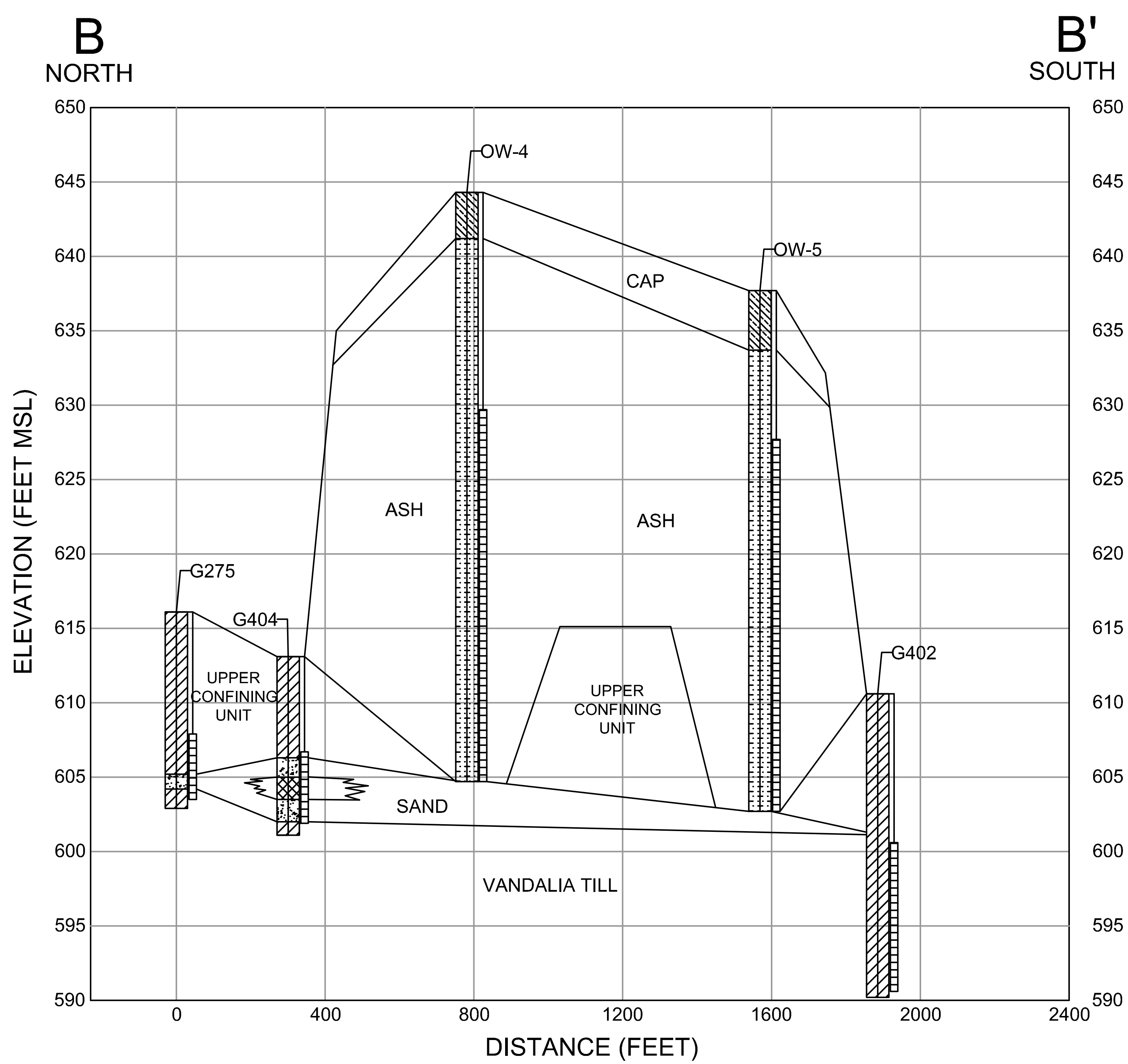
GEOLOGIC CROSS-SECTION A-A'

HYDROGEOLOGIC CHARACTERIZATION REPORT
ASH POND 2
COFFEEN POWER STATION
COFFEEN, IL

NATURAL RESOURCE TECHNOLOGY

PROJECT NO.
2380/2.0

FIGURE NO.
9

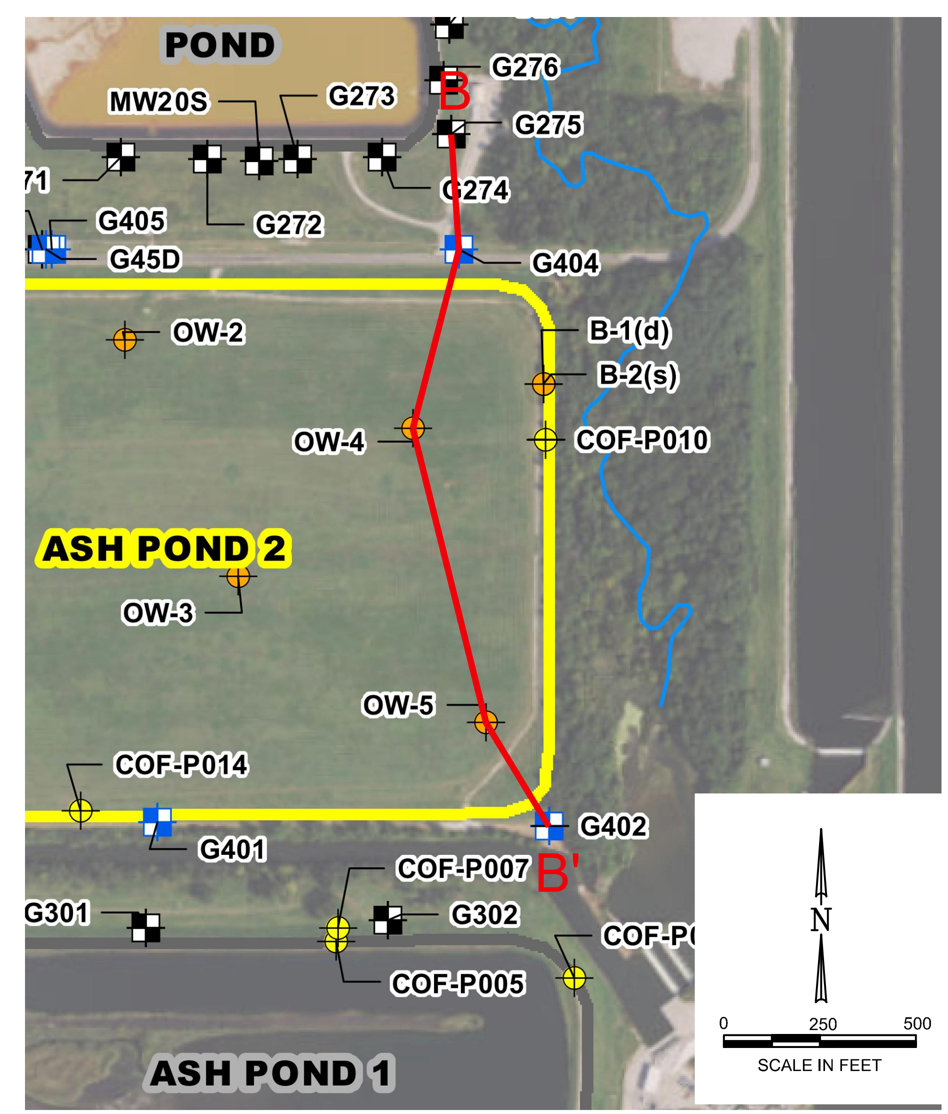


VERTICAL SCALE IN FEET 10

400 HORIZONTAL SCALE IN FEET

VERTICAL EXAGGERATION =40

B — B'	CROSS-SECTION TRANSECT
	CLAY
	SOIL
	SAND
	SILT
	ASH
	WELL SCREEN



DRAWN BY: AGC	DATE: 11/30/16
CHECKED BY: NRK	DATE: 12/20/16
APPROVED BY: SJC	DATE: 12/20/16
DRAWING NO: Fig 10_Geologic Cross-Section B-B'	
REFERENCE: SEE INFO BLOCK	

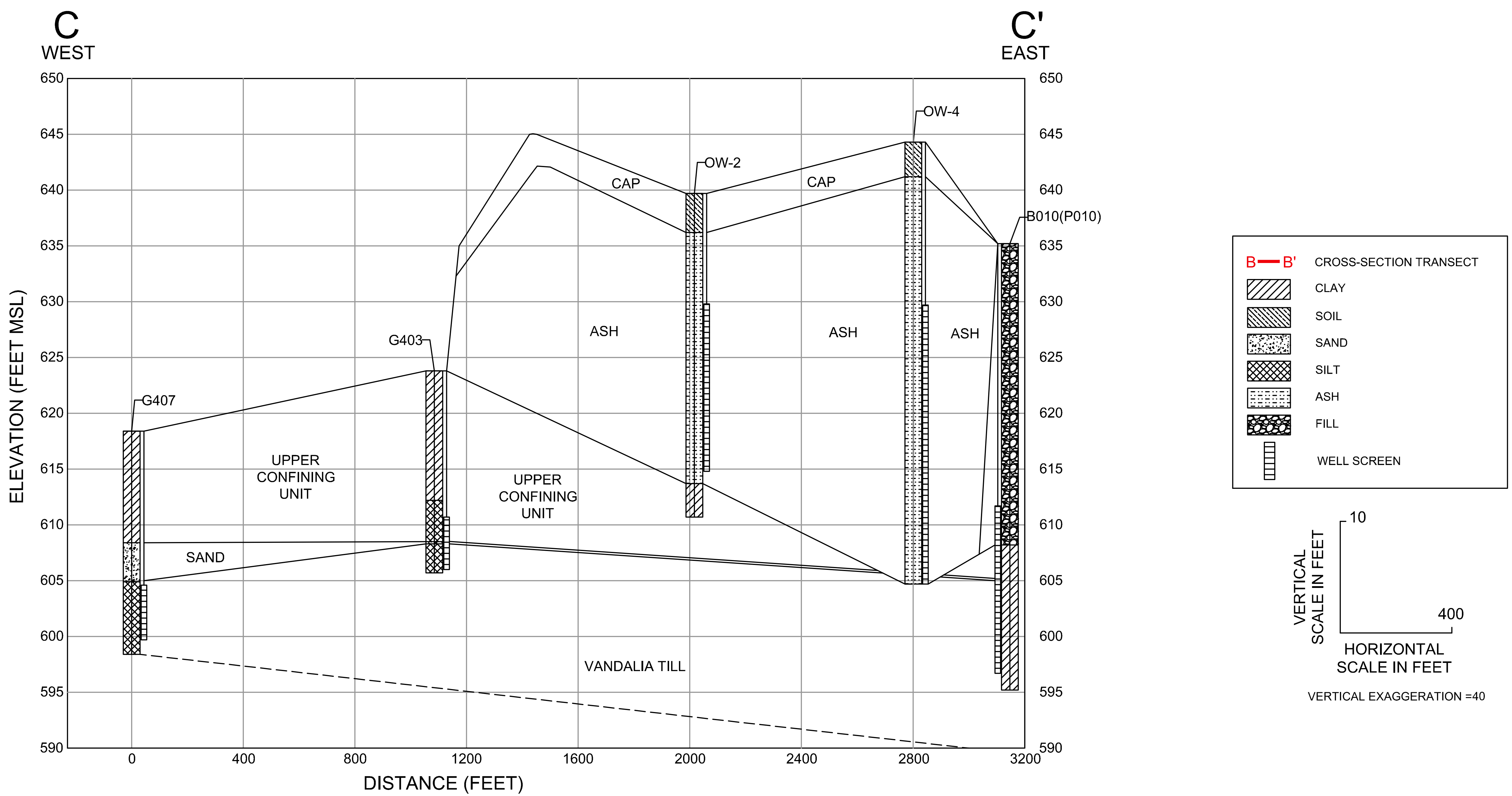
GEOLOGIC CROSS-SECTION B-B'

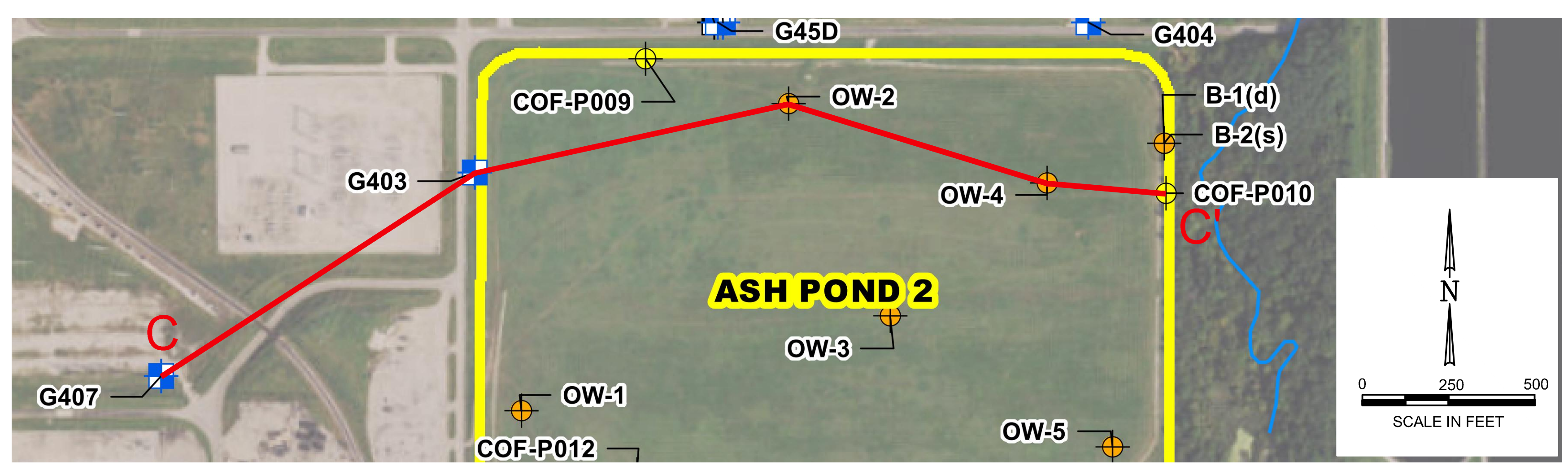
HYDROGEOLOGIC CHARACTERIZATION REPORT
ASH POND 2
COFFEEN POWER STATION
COFFEEN, IL

NATURAL RESOURCE TECHNOLOGY

PROJECT NO.
2380/2.0

FIGURE NO.
10





DRAWN BY: AGC DATE: 12/1/16
CHECKED BY: NRK DATE: 12/20/16
APPROVED BY: SJC DATE: 12/20/16
DRAWING NO: Fig 11_Geologic Cross-Section C-C'
REFERENCE: SEE INFO BLOCK

GEOLOGIC CROSS-SECTION C-C'

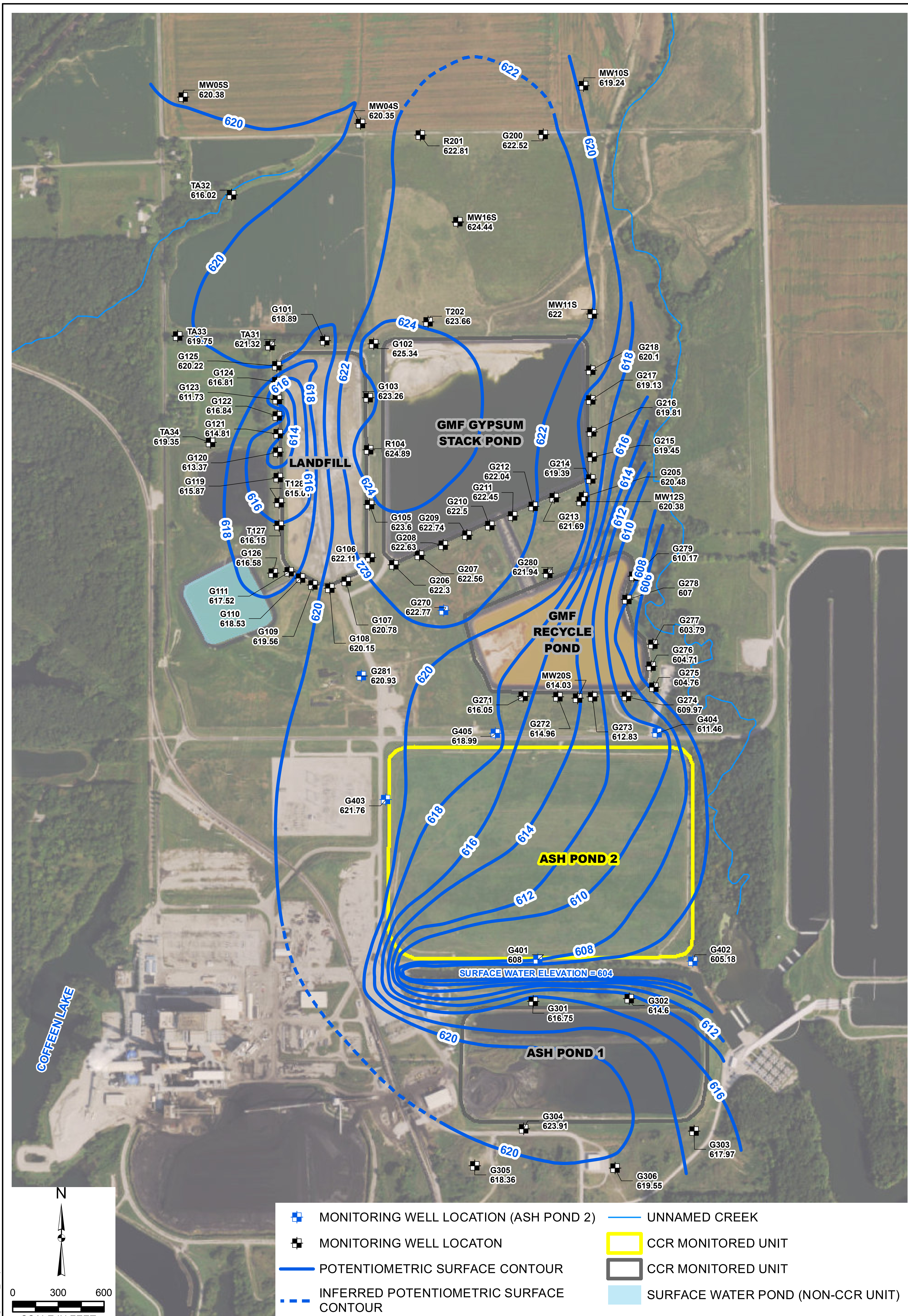
HYDROGEOLOGIC CHARACTERIZATION REPORT
ASH POND 2
COFFEEN POWER STATION
COFFEEN, IL

NATURAL RESOURCE TECHNOLOGY

PROJECT NO.
2380/2.0

FIGURE NO.
11

Dec 21, 2016 12:13pm PLOTTED BY: amillspaugh SAVED BY: accwrse Layout1
Y:\Mapping\Projects\23\2380\CAD\2-0\Figure 11_Geologic Cross-Section C-C'.dwg
IMAGES:
XREFS:



DRAWN BY/DATE: SDS 11/30/16
REVIEWED BY/DATE: NRK 11/30/16
APPROVED BY/DATE: SJC 12/21/16

POTENTIOMETRIC SURFACE MAP
MAY 2016

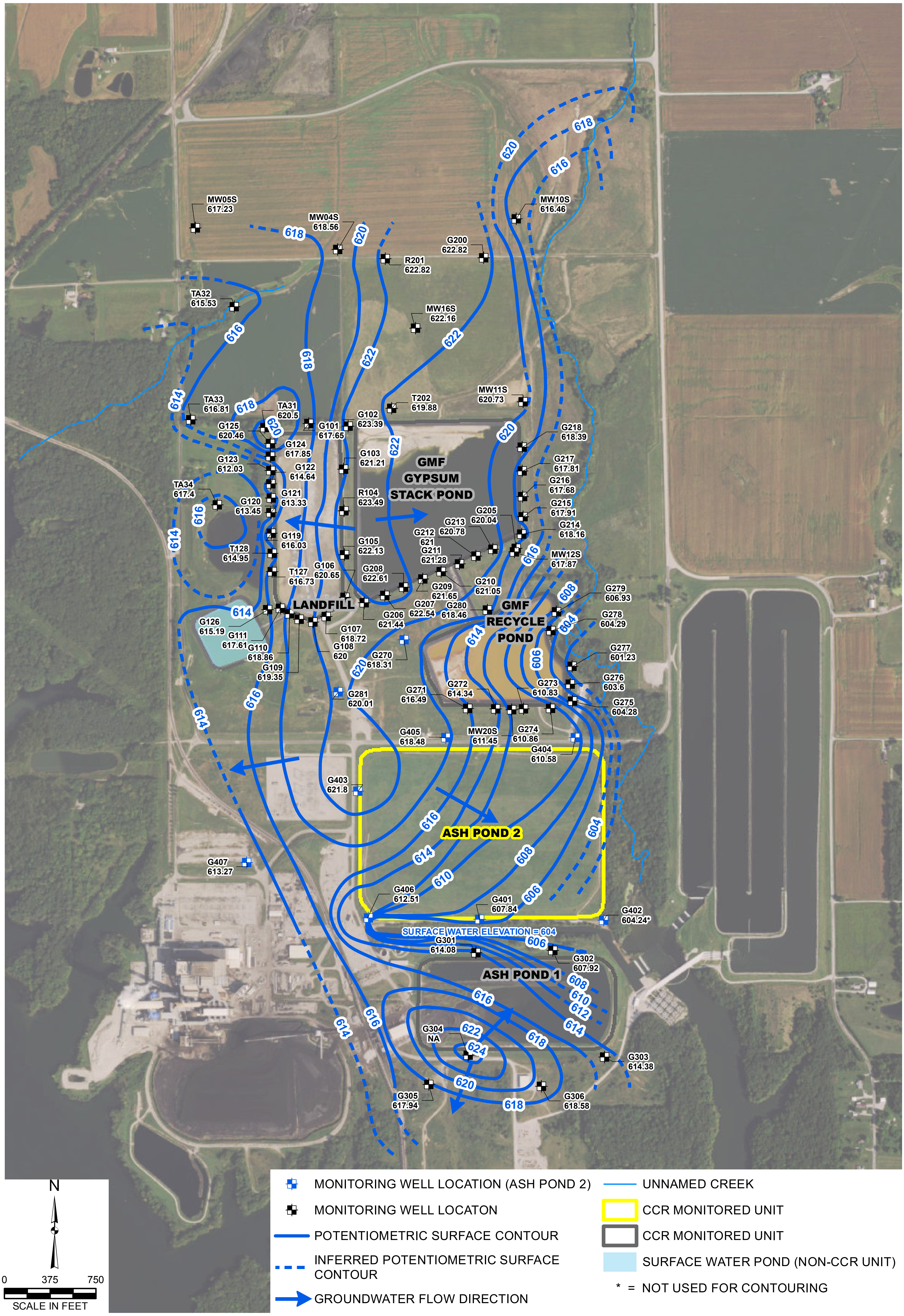
HYDROGEOLOGIC CHARACTERIZATION REPORT
ASH POND 2
COFFEEN POWER STATION
COFFEEN, IL

PROJECT NO: 2380

FIGURE NO: 12

Natural Resource Technology

Y:\Mapping\Projects\23\2380\MXD\HGCR\Figure 12_May 2016 Potentiometric.mxd Author: tcushman; Date/Time: 12/22/2016, 2:54:35 PM



DRAWN BY/DATE: SDS 11/30/16
REVIEWED BY/DATE: NRK 11/30/16
APPROVED BY/DATE: SJC 12/21/16

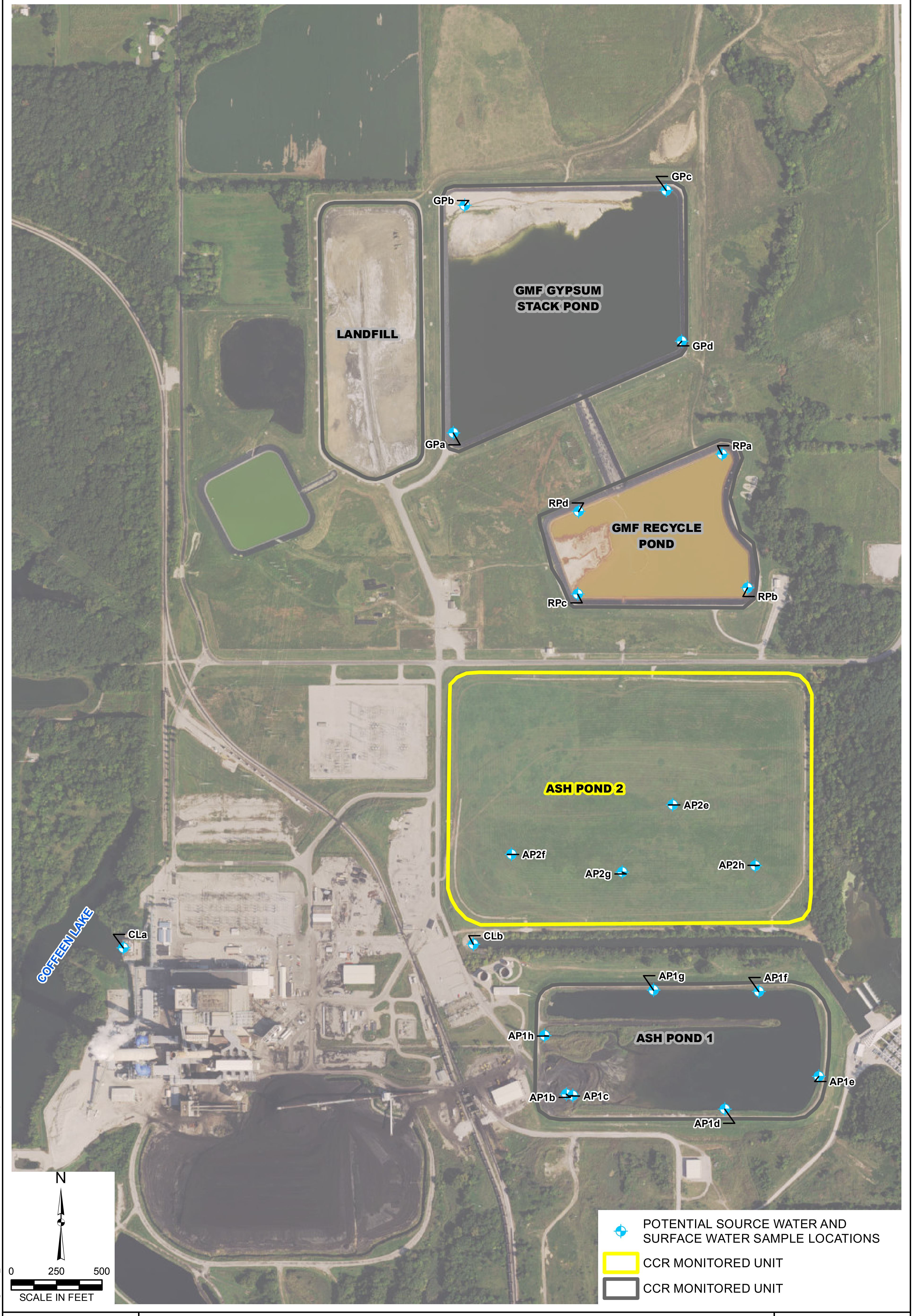
POTENTIOMETRIC SURFACE MAP
NOVEMBER 2016

HYDROGEOLOGIC CHARACTERIZATION REPORT
ASH POND 2
COFFEEN POWER STATION
COFFEEN, IL

PROJECT NO: 2380
FIGURE NO: 13

Natural Resource Technology

Y:\Mapping\Projects\23\2380\MXD\HGCR\Figure 13_Nov 2016 Potentiometric.mxd Author: tcushman; Date/Time: 12/22/2016, 2:56:22 PM



Y:\Mapping\Projects\23\2380\MXD\HGCR\Figure 14_Potential Source Water And Surface Water Sample Locations.mxd Author: tcushman; Date/Time: 12/22/2016, 2:59:50 PM

DRAWN BY/DATE: SDS 12/21/16
REVIEWED BY/DATE: NRK 12/21/16
APPROVED BY/DATE: SJC 12/22/16

POTENTIAL SOURCE WATER AND SURFACE WATER SAMPLE LOCATIONS

HYDROGEOLOGIC CHARACTERIZATION REPORT
ASH POND 2
COFFEEN POWER STATION
COFFEEN, IL

PROJECT NO: 2380

FIGURE NO: 14

Natural Resource Technology

TABLES

Table 1
Summary of Existing Monitoring Well Networks
Hydrogeologic Characterization Report
Coffeen Energy Center - Ash Pond 2

Well ID	Easting	Northing	Surface Elevation (ft MSL)	TOC Elevation (ft MSL)	Predecessor or prior name	Unit	Well Type	Top of Screen Elevation	Bottom of Screen Elevation	Interpreted Screened Unit	Comments
G301	2,515,582.97	872,234.82	620.27	622.65			MW	609.0	604.3	Upper Vandalia Till	
G302	2,516,214.19	872,252.95	617.95	620.04			MW	604.7	600.1	Upper Vandalia Till	
G303	2,516,639.65	871,382.14	619.10	622.02	AP-3		MW	609.1	599.1	Hagarstown/Vandalia Till Contact	No continuous soil sampling
G304	2,515,519.74	871,397.69	623.46	626.72	AP-4	Ash Pond 1	MW	613.5	603.5	Hagarstown Beds	
G305	2,515,199.36	871,156.33	622.54	625.55			MW	609.1	604.3	Hagarstown Beds	
G306	2,516,120.41	871,140.98	622.84	625.72			MW	609.8	605.2	Hagarstown Beds	
G307	2,515,553.26	871,398.55	622.08	624.47			MW	609.1	604.3	Hagarstown Beds	
G281	2,514,455.48	874,375.37	623.82	626.36			MW	608.31	603.66	Hagarstown Beds	
G401	2,515,614.84	872,510.57	623.03	625.57			MW	608.67	604.24	Hagarstown Beds	
G402	2,516,632.46	872,500.49	610.56	613.37	AP-2		MW	600.6	590.6	Upper Vandalia Till	
G403	2,514,616.63	873,561.34	623.81	626.47			MW	610.7	606.03	Hagarstown Beds	
G404	2,516,397.82	873,999.91	613.10	615.67			MW	606.68	601.93	Hagarstown Beds	
G405	2,515,335.67	873,996.63	620.90	623.63			MW	611.89	607.14	Hagarstown Beds	
G406	2,514,702.38	872,521.34	621.86	621.86			MW	608.3	603.49	Hagarstown Beds	
G407	2,513,705.87	872,973.39	618.35	621.32			MW	604.57	599.74	Hagarstown Beds	
T408	2,515,314.91	873,999.36	621.09	624.08			PZ (Hyd. conductivity only)	600.43	595.6	Vandalia Till	
T409	2,514,693.89	872,517.79	621.85	625.01		Ash Pond 2	PZ (Hyd. conductivity only)	600.06	595.26	Vandalia Till (Sand Seam)	
G45D	2,515,322.23	873,998.03	620.94	623.81	G405D		PZ	589.06	579.42	Smithboro Till	
G46D	2,514,697.78	872,519.70	621.91	625.24	G406D		PZ	580.3	570.65	Smithboro Till	
OW-1	2,514,754.56	872,875.48	639.80	641.14			Ash Pond PZ	634.74	619.74	Ash	
OW-2	2,515,525.87	873,761.43	639.70	641.34			Ash Pond PZ	629.84	614.84	Ash	
OW-3	2,515,824.43	873,147.40	640.40	641.78			Ash Pond PZ	631.28	616.28	Ash	
OW-4	2,516,277.90	873,535.97	644.70	damaged			Ash Pond PZ	629.7	604.7	Ash	
OW-5	2,516,466.21	872,770.83	637.70	638.8			Ash Pond PZ	627.7	602.7	Ash	
B-2(s)	2,516,615.41	873,650.85		639.44			PZ			Fill	in east-side berm
B-1(d)	2,516,615.78	873,647.93		638.7			PZ			Fill	in east-side berm
G101	2,514,215.00	876,575.00	625.27	627.6			MW	609.59	604.95	Hagarstown Beds	
G102	2,514,537.00	876,554.00	625.70	630.96	MW03S		MW	613.68	608.92	Hagarstown Beds	
G103	2,514,500.93	876,200.00	630.99	633.8			MW	615.11	610.32	Hagarstown Beds	
R104	2,514,503.40	875,857.80	629.03	632.84	G104		MW	614.44	609.71	Hagarstown Beds	
G105	2,514,509.03	875,500.00	629.26	632.08			MW	613.15	608.36	Hagarstown Beds	
G106	2,514,513.08	875,150.00	628.39	631.15			MW	614.02	609.43	Hagarstown Beds	
G107	2,514,358.30	874,994.07	627.79	630.23			MW	613.92	609.29	Hagarstown Beds	
G108	2,514,248.46	874,948.69	627.50	630.22			MW	610.68	606	Hagarstown Beds (Silt)	
G109	2,514,137.80	874,970.13	627.20	629.76			MW	611.81	607.27	Hagarstown Beds	
G110	2,514,057.93	875,015.38	627.02	629.65			MW	611.97	607.43	Hagarstown Beds	
G111	2,513,981.89	875,058.47	627.24	629.9			MW	612.63	608.09	Hagarstown Beds	
G119	2,513,910.00	875,675.00	628.85	631.55			MW	611.56	607.02	Hagarstown Beds	
G120	2,513,905.81	875,845.00	629.30	631.87		Landfill	MW	614.2	609.68	Hagarstown Beds	
G121	2,513,910.00	875,965.00	629.57	632.83			MW	612.78	608.1	Hagarstown Beds	
G122	2,513,905.00	876,080.00	629.86	632.69			MW	613.35	608.81	Hagarstown Beds	
G123	2,513,905.00	876,190.00	630.13	632.96			MW	609.19	604.67	Hagarstown Beds	
G124	2,513,900.48	876,305.00	630.42	633.39			MW	614.44	609.91	Hagarstown (Silt)/Vandalia Till Contact	
G125	2,513,900.00	876,410.00	630.68	633.51			MW	613.65	609.12	Hagarstown Beds	
G126	2,513,878.29	875,049.31	622.96	625.39			MW	610.07	605.53	Hagarstown Beds (Sandy clay)	
T127	2,513,915.00	875,360.00	628.07	630.96			MW	610.54	606	Hagarstown Beds	
T128	2,513,915.00	875,510.00	628.44	630.93			MW	611.91	607.4	Hagarstown Beds	
TA31	2,513,856.77	876,542.25	623.89	626.55			MW	608.8	604.32	Hagarstown Beds	
TA32	2,513,605.19	877,532.57	618.93	621.42			MW	607.62	603.25	Hagarstown Beds	
TA33	2,513,248.73	876,605.45	622.51	625.27			MW	610.28	605.62	Hagarstown Beds	
TA34	2,513,466.73	875,906.10	624.10	626.52			MW	613.18	608.69	Hagarstown Beds	

G151	2,513,805.90	875,023.70	622.82	625.93			MW	607.48	602.98	Hagarstown Beds	
G152	2,513,894.50	874,687.50	623.06	626.52			MW	609.47	604.97	Hagarstown Beds	
G153	2,513,532.70	874,532.70	623.30	626.35		SW Pond	MW	607.4	602.96	Hagarstown Beds	
G154	2,513,243.10	874,978.40	623.52	626.35			MW	609.26	604.76	Hagarstown Beds	
G155	2,513,501.80	875,127.70	622.89	625.86			MW	607.8	603.31	Hagarstown Beds	
G200	2,515,650.00	877,930.60	624.20	625.94			MW	612.01	607.22	Hagarstown Beds	
R201	2,514,842.00	877,925.30	624.02	626.34	G201		MW	611.75	607.36	Hagarstown Beds	
T202	2,514,895.00	876,699.40	626.22	628.63			MW	613.95	609.57	Hagarstown Beds	
G205	2,515,914.90	875,550.20	622.15	624.45			MW	612.11	607.62	Hagarstown Beds	
G206	2,514,669.20	875,103.90	630.54	632.82			MW	613.03	608.62	Hagarstown Beds	
G207	2,514,837.90	875,166.40	630.61	633.21			MW	612.37	607.84	Hagarstown Beds	
G208	2,514,993.60	875,231.50	630.57	633.16			MW	613.04	608.51	Hagarstown Beds	
G209	2,515,149.60	875,298.20	630.57	632.91			MW	612.83	608.29	Hagarstown Beds	Low recovery in interval with Hagarstown
G210	2,515,299.00	875,359.70	630.48	632.99		Gypsum Stack	MW	611.09	606.55	Hagarstown Beds	
G211	2,515,449.10	875,424.50	630.31	632.64			MW	612.97	608.43	Hagarstown (Sandy Clay)/Vandalia Till Contact	
G212	2,515,583.00	875,486.50	630.59	632.89			MW	613.85	609.3	Hagarstown Beds	
G213	2,515,723.50	875,544.40	630.34	632.81			MW	613.59	609.05	Hagarstown Beds	
G214	2,515,960.80	875,668.00	630.39	632.85			MW	612.64	608.25	Hagarstown Beds	
G215	2,515,971.60	875,810.20	630.48	633.06			MW	611.07	606.68	Hagarstown Beds	
G216	2,515,968.50	875,976.10	630.28	632.76			MW	610.24	605.86	Hagarstown Beds	
G217	2,515,963.00	876,185.60	630.67	633.1			MW	610.18	605.79	Hagarstown Beds	
G218	2,515,962.20	876,380.90	630.64	633.11			MW	610.31	605.87	Hagarstown Beds	
MW02S	2,513,210.04	876,408.86	624.10	sealed			MW	613.76	608.98		paired with deep well
MW04S	2,514,450.58	877,999.73	622.40	625.79			MW	612.57	608.14	Hagarstown Beds	
MW05S	2,513,285.49	878,175.59	622.60	625.8			MW	609.94	605.19	Hagarstown Beds	paired with deep well
MW06S	2,513,189.40	879,021.15	623.10	626.14			MW	612.06	607.48	Hagarstown Beds	paired with deep well
MW07S	2,514,397.54	879,181.12	624.50	627.54			MW	614.59	610.71	Hagarstown Beds	paired with deep well
MW08S	2,514,478.83	879,776.62	624.70	627.9			MW	613.19	608.7	Hagarstown Beds	paired with deep well
MW09S	2,515,666.24	879,684.90	624.60	627.46			MW	613.39	608.98	Hagarstown Beds	paired with deep well
MW10S	2,515,914.37	878,250.50	621.20	624.22		Hydrogeologic Characterization Report (historical)	MW	609.92	605.44	Hagarstown Beds	paired with deep well
MW11S	2,515,971.16	876,749.44	622.00	625.08			MW	613.11	608.37	Hagarstown Beds	paired with deep well
MW12S	2,515,900.54	875,520.08	622.20	625.21			MW	611.59	607.02	Hagarstown Beds	paired with deep well
MW13S	2,513,925.29	874,695.66	622.70	625.89			MW	611.27	606.47	Hagarstown Beds	paired with deep well
MW14S	2,514,125.95	875,737.78	624.60	sealed			MW	612.34	607.58	Hagarstown Beds	
MW15S	2,515,076.27	875,971.13	623.80	sealed			MW	609.39	604.64	Hagarstown Beds	paired with deep well
MW16S	2,515,087.98	877,355.14	626.10	629.37			MW	611.51	606.69	Hagarstown Beds	paired with deep well
MW17S	2,515,084.76	878,658.54	627.10	630.47			MW	613.08	603.54	Hagarstown Beds	paired with deep well
MW18S	2,513,745.20	878,604.67	625.60	628.66			MW	614.29	609.81	Hagarstown Beds	
MW20S	2,515,876.50	874,228.00		622.84			MW				
G270	2,514,996.84	874,801.92	622.92	625.92			MW	609.79	605	Hagarstown Beds	
G271	2,515,517.12	874,239.38	622.89	625.57			MW	612.93	608.58	Hagarstown Beds	
G272	2,515,744.99	874,234.83	620.72	623.81			MW	611.61	606.74	Hagarstown Beds (Silt)	
G273	2,515,975.49	874,235.24	620.17	623.02			MW	611.09	605.61	Hagarstown Beds	
G274	2,516,195.60	874,239.25	621.67	624.04			MW	608.77	604	Hagarstown Beds	
G275	2,516,375.86	874,298.94	616.14	618.26		Recycle Pond	MW	607.92	603.52	Hagarstown Beds	
G276	2,516,358.83	874,438.60	629.14	632.			MW	606.73	601.92	Hagarstown Beds	Very thin sand
G277	2,516,370.51	874,581.80	620.79	623.08			MW	606.5	602.02	Hagarstown Beds	
G278	2,516,200.66	874,875.37	628.85	631.19			MW	609.92	605.15	Hagarstown Beds	
G279	2,516,245.60	875,028.06	629.19	632.04			MW	606.79	602.4	Hagarstown Beds	
G280	2,515,679.48	875,045.11	622.95	625.85			MW	610.16	605.32	Hagarstown Beds	

[O:RJH 9/2016, C: NRK 10/10/2016, O: NRK 11/8/2016, C: JJW 11/10/2016]

Notes:

Ground surface elevations based on information included on boring logs when the well was installed, and top of PVC elevations based on survey completed in Fall 2015.

Table 2

Summary of Laboratory Hydraulic Conductivity in Confining Units

Hydrogeologic Characterization Report

Coffeen Energy Center - Ash Pond 2

Laboratory Tests			
Well/ Soil Boring ID	**Approximate Sample Elevation (ft)**	**Hydraulic Conductivity (cm/sec)**	**Interpreted Unit**
COF-B001	613.0	1.3E-08	Loess - Upper Confining Unit
COF-B003	606.5	2.2E-07	
COF-B004	610.5	5.0E-07	
COF-B007	615.0	7.0E-08	
	Geometric Mean	**1.0E-07**	
G46D	599.2	4.5E-06	Vandalia Till
T408	597.6	1.5E-07	
SB-12	577.7-572.7	6.8E-09	
SB-13	598-593	7.0E-09	
SB-18	603.5-603	8.8E-09	
	Geometric Mean	**4.9E-08**	
SB-09	598.5-598	1.9E-06	Mulberry Grove Silt
SB-16	589-588.5	1.6E-06	
	Geometric Mean	**1.7E-06**	
G45D	586.4	1.0E-07	Smithboro Till
G46D	578.9	2.1E-08	
SB-07	572-571.5	1.1E-09	
	Geometric Mean	**1.3E-08**	
SB-19	569-564	3.4E-09	Deep Confining Unit
SB-16	548-547.5	1.3E-08	
	Geometric Mean	**6.6E-09**	

[O:NRK 10/26/2016]

Table 3
Summary of Field Hydraulic Conductivity Tests
Hydrogeologic Characterization Report
Coffeen Energy Center - Ash Pond 2

Well ID	Unit	Method (fh)	Method (rh)	K (fh)	K (rh)	Well Geometric Mean	Approximate Screened Elevation (ft)	Interpreted Unit
Upper-most Aquifer								
R104	Landfill	KGS	B-R	7.0E-05	2.8E-04	1.4E-04	614.4-609.7	Hagarstown Beds
G105	Landfill	KGS	KGS	1.5E-04	5.7E-05	9.2E-05	613.2-608.4	Hagarstown Beds
G106	Landfill	B-R	B-R	4.0E-05	7.4E-04	1.7E-04	614.0-609.4	Hagarstown Beds
G107	Landfill	KGS	KGS	6.3E-05	8.9E-05	7.5E-05	613.9-609.3	Hagarstown Beds
G110	Landfill	KGS	KGS	4.7E-05	2.0E-05	3.1E-05	612.0-607.4	Hagarstown Beds
G119	Landfill	KGS	KGS	8.6E-05	8.2E-05	8.4E-05	611.6-607	Hagarstown Beds
G120	Landfill	low water elevation; no test conducted					614.2-609.7	Hagarstown Beds
G125	Landfill	KGS	KGS	4.8E-05	4.1E-05	4.4E-05	613.7-609.1	Hagarstown Beds
T127	Landfill	KGS	KGS	1.2E-03	1.7E-05	1.4E-04	610.5-606	Hagarstown Beds
			Unit Geometric Mean			8.5E-05		
T202	Gypsum Pond	KGS	KGS	4.5E-04	5.5E-04	5.0E-04	614.0-609.6	Hagarstown Beds
G206	Gypsum Pond	B-R	KGS	3.0E-04	1.6E-04	2.2E-04	613.0-608.6	Hagarstown Beds
G208	Gypsum Pond	KGS	KGS	6.0E-05	2.1E-05	3.5E-05	613.0-608.5	Hagarstown Beds
G209	Gypsum Pond	KGS	KGS	2.0E-04	1.6E-04	1.8E-04	612.8-608.3	Hagarstown Beds
G210	Gypsum Pond	KGS	KGS	5.0E-04	4.8E-04	4.9E-04	611.1-606.6	Hagarstown Beds
G212	Gypsum Pond	KGS	KGS	1.3E-04	1.8E-04	1.5E-04	613.9-609.3	Hagarstown Beds
G215	Gypsum Pond	KGS	KGS	5.0E-04	3.5E-04	4.2E-04	611.1-606.7	Hagarstown Beds
G218	Gypsum Pond	KGS	KGS	4.1E-04	4.1E-04	4.1E-04	610.3-605.9	Hagarstown Beds
			Unit Geometric Mean			2.3E-04		
G270	Recycle Pond	KGS	KGS	5.5E-04	4.8E-04	5.1E-04	609.8-605.0	Hagarstown Beds
G271	Recycle Pond	KGS	KGS	1.6E-04	1.1E-03	4.2E-04	612.9-608.6	Hagarstown Beds
G273	Recycle Pond	KGS	KGS	1.0E-03	8.3E-04	9.1E-04	611.1-605.6	Hagarstown Beds
G276	Recycle Pond	low water					606.7-601.9	Hagarstown Beds, v. thin
G279	Recycle Pond	KGS	KGS	1.7E-03	1.5E-03	1.6E-03	606.8-602.4	Hagarstown Beds
G280	Recycle Pond	KGS	KGS	1.3E-03	1.3E-03	1.3E-03	610.2-605.3	Hagarstown Beds
G281	Recycle Pond	KGS	KGS	2.1E-03	8.9E-04	1.4E-03	608.3-603.7	Hagarstown Beds
			Unit Geometric Mean			9.0E-04		
G301	Ash Pond 1	KGS	KGS	2.7E-04	5.0E-04	3.7E-04	609-604.3	Upper Vandalia Till
G302	Ash Pond 1	KGS	KGS	4.9E-04	6.3E-04	5.6E-04	604.7-600.1	Upper Vandalia Till
G303	Ash Pond 1	KGS	KGS	5.6E-05	3.1E-05	4.2E-05	609.1-599.1	Hagarstown/Vandalia Till Contact
G304	Ash Pond 1	KGS	KGS	8.9E-04	1.0E-03	9.4E-04	613.5-603.5	Hagarstown Beds
			Unit Geometric Mean			3.0E-04		
G401	Ash Pond 2	B-R	B-R	1.8E-04	2.8E-04	2.2E-04	608.7-603.7	Hagarstown Beds
G402	Ash Pond 2	KGS	KGS	4.5E-04	1.9E-04	2.9E-04	600.6-590.6	Upper Vandalia Till
G403	Ash Pond 2	KGS	KGS	4.3E-05	7.2E-05	5.6E-05	610.7-606.0	Hagarstown Beds, v. thin
G404	Ash Pond 2	KGS	KGS	4.2E-04	3.8E-04	4.0E-04	606.7-601.9	Hagarstown Beds
G405	Ash Pond 2	KGS	KGS	9.8E-04	9.7E-04	9.7E-04	611.9-607.1	Hagarstown Beds
			Unit Geometric Mean			2.7E-04		
G153	SW Pond	KGS	KGS	2.5E-04	5.4E-04	3.7E-04	607.5-603.0	Hagarstown Beds
			Unit Geometric Mean			3.7E-04		
MW03S	2009 Hydrogeo. Invest.	B-R	B-R	6.0E-04	1.1E-03	8.1E-04	613.7-608.6	Hagarstown Beds
MW04S	2009 Hydrogeo. Invest.	B-R	B-R	1.3E-03	8.0E-04	1.0E-03	612.6-607.6	Hagarstown Beds
MW10S	2009 Hydrogeo. Invest.	B-R	B-R	8.0E-04	8.0E-04	8.0E-04	610.9-604.9	Hagarstown Beds
MW13S	2009 Hydrogeo. Invest.	B-R	B-R	1.0E-03	2.0E-04	4.5E-04	611.3-606.1	Hagarstown Beds
MW14S	2009 Hydrogeo. Invest.	B-R	B-R	1.0E-03	5.0E-04	7.1E-04	612.4-607.2	Hagarstown Beds
MW15S	2009 Hydrogeo. Invest.	B-R	B-R	1.5E-04	8.1E-05	1.1E-04	609.3-604.2	Hagarstown Beds
MW16S	2009 Hydrogeo. Invest.	B-R	B-R	6.0E-04	4.5E-04	5.2E-04	611.5-606.3	Hagarstown Beds
MW17S	2009 Hydrogeo. Invest.	B-R	B-R	5.8E-04	5.5E-04	5.6E-04	613.1-603	Hagarstown Beds
			Unit Geometric Mean			5.4E-04		

Lower Confining Unit (Vandalia and Smithboro Till)								
T408	Ash Pond 2	KGS	KGS	2.15E-06	7.50E-08	9.02E-07	600.4-595.2	Vandalia Till
T409	Ash Pond 2	KGS	KGS	3.6E-05	3.20E-05	3.41E-05	600.1-594.9	Vandalia Till (sand seam)
G405D	Ash Pond 2	KGS	KGS			4.90E-07	589.1-579	Smithboro Till
G406D	Ash Pond 2	KGS	KGS			4.00E-08	580.3-570.3	Smithboro Till
			Unit Geometric Mean			5.55E-06		

Notes: [O:RJH 9/2016, C: KLT 12/2016)

fh = Falling head test

rh = Rising head test

Hydraulic Conductivity tests analyzed using Aqtesolv® Pro version 4.50 (HydroSOLVE, Inc.)

Test Methods

B-R Bouwer and Rice, 1976. "A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifer with Completely or Partially Penetrating Wells", Water Resources Research v.12, no. 3. American Geophysical Union, Washington, DC. pp. 423-428.

KGS Hyder, Z., J.J. Butler, C.D. McElwee, and W. Liu, 1974. "Slug tests in partially penetrating wells", Water Resources Research, v. 30, no. 11. American Geophysical Union, Washington, DC. pp. 2945-2957.

Table 4
Summary of AECOM Piezometer Construction
Hydrogeologic Characterization Report
Coffeen Energy Center - Ash Pond 2

Well ID	Unit	Coordinates		Ground Surface Elevation (ft)	Location	Well Type	Top of PVC Elevation (ft)	Total Depth (ft)	Top of Screened Inteval (ft bgs)	Bottom of Screeed Interval (ft bgs)	Screened Interval
		Northing	Easting								
COF-P000	Ash Pond 1	871590	2516694	634.9	Crest	PZ	639.3	27.9	619.9	609.9	Fill and Loess/Clay
COF-P001		871488	2516735	615.6	Toe	VWP	VWP	12.0	603.6	603.6	Clay/ Silt
COF-P002		871459	2516042	635.4	Crest	PZ	639.2	39.3	609.9	599.9	Hagarstown Beds
COF-P003		871786	2515150	635.7	Crest	PZ	640.3	48.0	607.2	592.2	Hagarstown Beds
COF-P005		872198	2516077	635.0	Crest	PZ	639.6	23.2	620.0	615.0	Fill/ Clay Contact
COF-P006		872106	2516696	635.1	Crest	PZ	639.7	47.4	605.1	590.1	Hagarstown Beds
COF-P007		872235	2516081	617.5	Toe	VWP	VWP	15.0	602.5	602.5	Hagerstown Beds
COF-P008		871814	2515103	625.1	Toe	VWP	VWP	19.0	606.1	606.1	Hagerstow Beds
COF-P009	Ash Pond 2	873894	2515111	638.0	Crest	PZ	642.6	33.0	618.0	608.0	Clay/ Hagarstown Beds
COF-P010		873505	2516621	635.2	Crest	PZ	639.1	41.5	611.7	596.7	Clay/ Hagarstown Beds
COF-P012		872691	2515086	642.2	Interior (ash)	PZ	646.4	43.3	609.7	599.7	Hagarstown Beds
COF-P014		872538	2515412	635.0	Crest	PZ	639.5	45.4	606.5	596.5	Hagarstown Beds

[O:AECOM, 2016]

Notes:
1. For standpipe piezometers, stickup and WL measurement referenced to top edge of yellow protector cover with hinged cap open.
2. Total Depth = Approx. bottom of screen for standpipe piezometers, or installed depth for VWPs.
3. VWP = vibrating wire peizometer installed at locations not accessible with drill rig.
4. Piezometers COF-P004, -P011, and -P013 were planned but not installed due to access issues.

Table 5
Groundwater Elevations in Monitoring Wells: 2015 - 2016
Hydrogeologic Characterization Report
Coffeen Energy Center - Ash Pond 2

Date	G101	G102	G103	G105	G106	G107	G108	G109	G110	G111	G119	G120	G121	G122	G123	G124	G125	G126	G151	G152
January-15	614.48	619.18	620.82	621.95	620.45	619.23	618.42	617.78	616.76	615.93	615.64	612.75	613.63	610.79	610.84	615.27	617.83	615.22	NM	NM
April-15	618.87	622.06	622.58	623.73	622.19	620.85	620.31	619.71	618.60	617.48	615.86	613.43	614.63	615.94	612.41	617.85	620.45	616.45	NM	NM
July-15	618.53	622.12	621.70	622.72	621.43	620.15	621.22	620.41	619.55	618.03	616.55	613.47	614.09	615.26	612.76	618.25	620.71	616.34	615.43	616.47
October-15	617.15	622.02	620.69	621.65	620.50	619.10	618.92	618.12	617.70	616.79	615.31	612.94	613.31	614.39	611.89	617.27	619.66	614.13	614.86	614.06
November-15	612.95	618.96	NM	NM	619.32	NM	NM	NM	616.55	NM	NM	612.37	NM	NM	NM	NM	614.60	NM	NM	NM
February-16	618.46	624.04	NM	NM	621.55	NM	NM	NM	617.88	NM	NM	613.06	NM	NM	NM	NM	619.95	NM	614.88	616.61
February-16	617.62	623.35	621.29	622.73	621.68	620.70	619.16	618.58	617.25	616.62	616.00	612.89	613.65	615.17	611.58	616.22	619.30	615.80	NM	NM
May-16	618.89	625.34	NM	NM	622.11	NM	NM	NM	618.53	NM	NM	613.37	NM	NM	NM	NM	620.22	NM	615.58	617.37
May-16	618.79	625.33	623.42	623.62	622.00	620.74	620.15	619.58	618.57	617.44	615.85	613.17	614.86	616.82	611.76	616.78	620.21	616.54	NM	NM
June-16	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
July-16	618.44	623.92	NM	NM	620.62	NM	NM	NM	617.64	NM	NM	612.87	NM	NM	NM	NM	621.53	NM	NM	NM

Date	G153	G154	G155	G200	G205	G206	G207	G208	G209	G210	G211	G212	G213	G214	G215	G216	G217	G218	G270	G271
January-15	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
April-15	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
July-15	615.93	614.85	614.45	623.35	NM	621.87	622.31	622.76	622.37	621.88	621.79	621.77	621.55	618.83	618.43	NM	618.10	618.82	618.88	616.57
October-15	614.45	612.24	613.51	621.05	NM	620.69	620.72	620.62	620.56	619.83	619.00	620.76	620.21	617.56	616.56	NM	616.71	616.93	616.07	614.12
November-15	NM	NM	NM	621.66	NM	619.27	NM	NM	620.06	NM	NM	618.54	NM	NM	616.38	NM	NM	617.11	621.06	613.77
February-16	615.93	615.65	614.77	623.29	NM	621.92	622.18	622.06	622.26	621.68	622.03	621.99	621.21	617.95	618.31	618.61	618.20	619.05	622.94	615.87
February-16	NM	NM	NM	622.93	620.32	622.36	NM	NM	622.44	NM	NM	621.85	NM	NM	618.08	NM	NM	619.15	622.67	615.49
May-16	616.90	617.11	615.79	622.52	620.48	622.30	622.55	622.63	622.74	622.41	622.39	622.04	621.59	619.25	619.45	619.62	619.03	620.10	622.77	616.05
May-16	NM	NM	NM	623.13	NM	NM	NM	NM	622.69	NM	NM	622.08	NM	NM	619.27	NM	NM	620.01	623.02	616.19
June-16	NM	NM	NM	NM	NM	620.51	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
July-16	NM	NM	NM	622.82	NM	621.71	NM	NM	621.52	NM	NM	620.89	NM	NM	617.10	NM	NM	618.01	617.73	616.62

Date	G272	G273	G274	G275	G276	G277	G278	G279	G280	G281	G301	G302	G303	G304	G305	G306	G307	G401	G402	G403
January-15	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
April-15	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
July-15	614.62	611.18	611.08	604.26	604.00	NM	NM	607.48	618.68	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
October-15	612.56	610.41	610.06	NM	NM	NM	NM	608.14	614.54	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
November-15		611.82		NM	603.25	NM	NM	607.80	618.45	619.56	616.51	610.74	616.70	623.78	NM	NM	NM	607.82	604.02	621.81
February-16	614.68	613.26	610.14	604.66	603.71	NM	606.40	609.16	621.37	621.21	NM	NM	NM	NM	NM	NM	NM	608.14	604.90	621.78
February-16		612.59		NM	603.77	NM	NM	609.01	621.15	NM	617.21	613.14	617.87	624.07	618.35	619.55	NM	NM	NM	NM
May-16	615.21	612.83	610.49	605.12	604.71	603.84	607.02	610.17	621.94	620.93	616.75	614.60	617.97	623.91	NM	NM	NM	608.00	605.18	621.76
May-16	NM	613.18	NM	NM	604.72	NM	NM	610.21	621.95	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
June-16	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	616.28	615.11	NM	NM	NM	NM
July-16	NM	611.27	NM	NM	604.92	NM	NM	606.94	618.21	620.30	614.65	608.16	614.92	626.72	618.12	619.07	624.42	608.47	604.33	622.16

Date	G404	G405	R104	R201	T127	T128
January-15	NM	NM	623.03	NM	615.65	614.73
April-15	NM	NM	624.77	NM	616.04	614.89
July-15	NM	NM	624.06	623.27	616.04	615.40
October-15	NM	NM	621.69	619.94	615.66	614.67
November-15	611.67	618.85	621.34	622.44	615.91	NM
February-16	611.58	618.90	624.11	623.40	616.04	614.91
February-16	NM	NM	622.37	623.14	615.96	NM
May-16	611.46	618.99	624.89	622.81	616.15	NM
May-16	NM	NM	623.95	623.39	616.12	614.99
June-16	NM	NM	NM	NM	NM	NM
July-16	611.67	618.51	623.65	622.36	615.96	NM

Notes:
NM= Not measured

Table 6
Groundwater Elevations in Piezometers: 2015 - 2016
Hydrogeologic Characterization Report
Coffeen Energy Center - Ash Pond 2

Water Elevation (feet)												
PZ ID	**COF-P000**	**COF-P001**	**COF-P002**	**COF-P003**	**COF-P005**	**COF-P006**	**COF-P007**	**COF-P008**	**COF-P009**	**COF-P010**	**COF-P012**	**COF-P014**
Date	**Ash Pond 1**								**Ash Pond 2**			
8/29/2015	616.97	614.30	624.90	620.38	620.62	612.94	611.40	622.55	621.50	605.62	625.43	613.57
10/5/2015	618.17	- -	624.69	619.93	621.42	612.90	- -	- -	621.40	607.22	624.91	613.29
10/30/2015	617.95	613.29	624.68	619.82	622.15	612.72	610.32	622.11	620.73	607.99	624.53	613.07
11/23/2015	619.15	614.66	625.80	621.06	622.60	612.81	612.14	623.32	623.02	608.98	624.95	613.31
12/23/2015	619.57	614.77	626.19	622.30	622.50	613.22	614.21	623.80	624.31	609.18	625.82	614.08
1/18/2016	619.64	615.03	625.89	620.74	621.89	612.56	614.60	623.27	622.76	610.59	626.04	613.86

Notes:
- - No data available

[O:AECOM, 2016]

Natural Resource Technology

Table 7
Ash Pond 2 Leachate Elevations in 2009
Hydrogeologic Characterization Report
Coffeen Energy Center - Ash Pond 2

Well ID	Leachate Elevations (ft)					
	Date					
	4/1/2009[1]	5/29/2009	6/6/2009	8/6/2009	9/21/2009	11/9/2009
OW-1	619.83	636.87	636.59	635.48	635.10	636.15
OW-2	615.14	636.62	636.69	635.24	634.92	635.98
OW-3	616.68	636.57	636.43	635.26	634.90	635.90
OW-4	- -	638.47	- -	- -	- -	- -
OW-5	609.05	636.48	635.81	635.18	634.85	635.77

Notes: [O:Hanson, 2016]

[1] Measurement collected after pumping of Ash Pond 2.

- - No leachate elevation data

NATURAL RESOURCE TECHNOLOGY

Table 8
Summary of Vertical Hydraulic Gradients
Hydrogeologic Characterization Report
Coffeen Energy Center - Ash Pond 2

Well ID	Date	Screen Elev. (ft)[1]	Formation	Groundwater Elevation (ft MSL)	Vertical Gradient [2]
G405	11/12/2016	609.515	Hagarstown Beds	618.48	-0.009
T408	11/12/2016	598.015	Vandalia Till	618.58	
T408	11/12/2016	598.015	Vandalia Till	618.58	2.44
G45D	11/12/2016	584.24	Smithboro Till	584.91	
G406	11/12/2016	605.895	Hagarstown Beds	612.51	-0.42
T409	11/12/2016	597.66	Vandalia Till	615.98	
T409	11/12/2016	597.66	Vandalia Till	615.98	1.46
G46D	11/12/2016	575.475	Smithboro Till	583.59	

Notes: [O:NRK, 12/2016, C:JJW 12/2016]

1. Center of screen
2. Based on dates when both wells were sampled, **negative** vaues indicate upward gradients while **positive** indicate downward gradients

Table 9
Statistical Summary of Groundwater Monitoring Parameters
Hydrogeologic Characterization Report
Coffeen Energy Center

BORON (dissolved - mg/L)

Monitoring Well Number	Number of Data Points	Mean	Median	Maximum	Minimum	Standard Deviation	Percent Non-Detects	Sen Slope Trend
APW-2 (G402)	8	7.245	7.18	8.10	6.30	0.626	0.0%	0.27
G151	16	0.016	0.012	0.052	0.003	0.013	50.0%	0
G152	16	0.047	0.041	0.11	0.015	0.025	0.0%	0.01
G153	16	0.028	0.027	0.058	0.012	0.012	0.0%	-0.01
G154	16	0.036	0.037	0.045	0.021	0.008	0.0%	0
G270	34	0.029	0.012	0.125	0.005	0.034	47.1%	0
G271	29	0.281	0.260	0.610	0.130	0.128	0.0%	**0.05**
G272	29	0.019	0.005	0.27	0.005	0.050	86.2%	0
G273	29	0.224	0.18	0.62	0.019	0.176	6.9%	**0.06**
G274	29	0.295	0.18	0.97	0.005	0.302	27.6%	**0.13**
G275	25	3.176	3.50	4.60	0.91	1.04	0.0%	0.1

BORON (total - mg/L)

Monitoring Well Number	Number of Data Points	Mean	Median	Maximum	Minimum	Standard Deviation	Percent Non-Detects	Sen Slope Trend
G151	3	0.0183	0.019	0.026	0.010	0.008	0%	-0.03
G152	3	0.038	0.036	0.047	0.032	0.008	0%	-0.03
G153	3	0.044	0.036	0.064	0.031	0.018	0%	-0.07
G154	3	0.030	0.031	0.038	0.021	0.009	0%	0.01
G270	38	0.021	0.005	0.125	0.005	0.026	68%	0.00
G271	33	0.309	0.240	0.980	0.110	0.190	0%	**0.03**
G272	29	0.014	0.005	0.060	0.005	0.017	69%	0.00
G273	33	0.208	0.200	0.480	0.016	0.137	9%	**0.05**
G274	29	0.264	0.160	0.740	0.005	0.253	24%	**0.11**
G275	25	3.336	3.600	4.600	1.200	0.965	0%	0.04
G401	4	3.575	3.450	4.100	3.300	0.359	0%	0.79
G402	4	6.500	6.450	7.400	5.700	0.707	0%	1.83
G403	4	0.036	0.033	0.064	0.014	0.021	0%	-0.03
G404	4	2.075	1.850	3.200	1.400	0.806	0%	0.40
G405	4	16.25	16.500	17.000	15.000	0.957	0%	-1.96

MANGANESE (dissolved - mg/L)

Monitoring Well Number	Number of Data Points	Mean	Median	Maximum	Minimum	Standard Deviation	Percent Non-Detects	Sen Slope Trend
APW-2 (G402)	8	0.432	0.414	0.730	0.130	0.166	0%	0.01
G151	16	0.131	0.092	0.560	0.011	0.131	0%	0.00
G152	16	0.294	0.180	0.927	0.034	0.277	0%	0.07
G153	16	0.235	0.175	1.020	0.024	0.249	0%	-0.12
G154	16	0.062	0.035	0.462	0.003	0.112	0%	0.00
G270	34	0.094	0.045	0.470	0.003	0.108	0%	**-0.02**
G271	29	0.015	0.001	0.220	0.001	0.045	62%	0.00
G272	29	0.011	0.001	0.230	0.001	0.043	76%	0.00
G273	29	0.042	0.028	0.330	0.001	0.059	0%	**-0.01**
G274	29	0.003	0.001	0.046	0.001	0.009	69%	0.00
G275	25	0.051	0.019	0.340	0.001	0.086	8%	0.00

Notes:
- Sen Slope Trend is in milligrams per Liter per year; negative value (-) is downward trend; positive value is upward trend, **BOLD** indicates statistical significance (Mann Kendall 95%).Mann Kendall tests not performed on wells with less than 8 data ponts.
- Sample results below the method detection limit (MDL) for that parameter have been replaced by the detection limit.

(shaded cell) Wells with groundwater exceeding Class 1 groundwater standard for the given parameter in 2015 or 2016.

Table 9
Statistical Summary of Groundwater Monitoring Parameters
Hydrogeologic Characterization Report
Coffeen Energy Center

MANGANESE (total - mg/L)

Monitoring Well Number	Number of Data Points	Mean	Median	Maximum	Minimum	Standard Deviation	Percent Non-Detects	Sen Slope Trend
G151	3	0.225	0.23	0.36	0.086	0.137	0%	0.56
G152	3	0.32	0.31	0.37	0.27	0.050	0%	0.12
G153	3	0.67	0.51	1.30	0.21	0.563	0%	-2.21
G154	3	0.16	0.16	0.16	0.15	0.006	0%	0.02
G270	34	0.146	0.083	0.62	0.021	0.134	0%	**-0.03**
G271	29	0.058	0.021	0.27	0.001	0.075	0%	-0.01
G272	29	0.029	0.011	0.15	0.002	0.040	0%	0.00
G273	29	0.06	0.043	0.19	0.019	0.043	0%	**-0.01**
G274	29	0.05	0.02	0.37	0.003	0.087	0%	0.00
G275	25	0.17	0.09	0.78	0.01	0.203	0%	0.01

SULFATE (dissolved - mg/L)

Monitoring Well Number	Number of Data Points	Mean	Median	Maximum	Minimum	Standard Deviation	Percent Non-Detects	Sen Slope Trend
APW-2 (G402)	8	805.375	840	1100	500	173.11	13%	5.17
G151	16	112	110	140	100	11.21	0%	**4.8**
G152	16	161	135	300	107.0	61.15	0%	**26.3**
G153	16	1824	1800	2100	1500	206.55	0%	**184.5**
G154	16	110	105	175	82	23.60	0%	**-12.0**
G270	34	54	43	140	2	50.37	0%	**15.7**
G271	29	354	360	520	220	87.45	0%	**35.8**
G272	29	264	270	380	140	63.00	0%	**28.1**
G273	29	524	520	700	46	131.06	0%	9.0
G274	29	340	350	400	240	41.75	0%	0.0
G275	25	678	720	920	280	183.63	0	30.3

SULFATE (total - mg/L)

Monitoring Well Number	Number of Data Points	Mean	Median	Maximum	Minimum	Standard Deviation	Percent Non-Detects	Sen Slope Trend
G151	3	104.333	98	120	95	13.65	0%	6.09
G152	3	120	120	130	110	10	0%	20.3
G153	3	1633	1500	1900	1500.0	231	0%	0.0
G154	3	99	93	110	93	10	0%	34.5
G270	38	59	65	140	2	50	0%	**15.6**
G271	33	357	350	540	230	87	0%	**28.3**
G272	29	253	250	380	120	69	0%	**30.5**
G273	33	530	520	750	340	106	0%	6.5
G274	29	337	330	460	230	55	0%	6.7
G275	25	684	720	990	310	213	0%	0.8
G281	4	330	325	370	300	32	0%	68.7
G401	4	2275	2250	2500	2100	171	0%	-390.6
G402	4	1013	980	1200	890	133	0%	-392.5
G403	4	18	14	35	10	12	0%	-30.9
G404	4	165	165	190	140.0	23.8	0%	-12.3
G405	4	1700	1700	1800	1600.0	81.7	0%	-71.6

Notes:
- Sen Slope Trend is in milligrams per Liter per year; negative value (-) is downward trend; positive value is upward trend, **BOLD** indicates statistical significance (Mann Kendall 95%).Mann Kendall tests not performed on wells with less than 8 data ponts.
- Sample results below the method detection limit (MDL) for that parameter have been replaced by the detection limit.

Wells with groundwater exceeding Class 1 groundwater standard for the given parameter in 2015 or 2016.

Table 9
Statistical Summary of Groundwater Monitoring Parameters
Hydrogeologic Characterization Report
Coffeen Energy Center

TOTAL DISSOLVED SOLIDS (mg/L)

Monitoring Well Number	Number of Data Points	Mean	Median	Maximum	Minimum	Standard Deviation	Percent Non-Detects	Sen Slope Trend
APW-2 (G402)	8	1651.25	1600	1810	1600	78.456	0%	0
G151	17	551	560	660	500	44	0%	0.0
G152	17	677	620	1,100	494	156	0%	**73**
G153	17	3,362	3,300	3,900	2,800	341	0%	**42.5**
G154	17	476	460	624	410	52	0%	17
G270	37	454	460	550	340	53	0%	11
G271	31	862	860	1,000	710	96	0%	**29**
G272	27	703	680	840	570	69	0%	**25.5**
G273	31	1,085	1,100	1,300	840	140	0%	0
G274	27	863	870	980	770	64	0%	**-16.1**
G275	24	1,388	1,500	2,000	840	270	0%	0.0
G281	4	770	760	820	740	38	0%	-28.7
G401	4	2,925	2,950	3,000	2,800	96	0%	-185.3
G402	4	1,600	1,600	1,700	1,500	115	0%	-346
G403	4	325	320	340	320	10	0%	0.0
G404	4	555	570	620	460	68	0%	-14
G405	4	2,325	2,300	2,500	2,200	150	0%	-347

Notes: [O: NRK 12/2016, C: SJC 12/2016]

- Sen Slope Trend is in milligrams per Liter per year; negative value (-) is downward trend; positive value is upward trend, **BOLD** indicates statistical significance (Mann Kendall 95%).Mann Kendall tests not performed on wells with less than 8 data ponts.
- Sample results below the method detection limit (MDL) for that parameter have been replaced by the detection limit.

Wells with groundwater exceeding Class 1 groundwater standard for the given parameter in 2015 or 2016.

NATURAL RESOURCE TECHNOLOGY

Table 10
Potential Source Water and Surface Water Sampling Results - October 24, 2016
Hydrogeologic Characterization Report
Coffeen Energy Center

Sample ID	Sample Location	Alkalinity, bicarbonate mg/L	Alkalinity, carbonate mg/L	Antimony, Total ug/L	Arsenic, Total ug/L	Barium, Total ug/L	Beryllium, Total ug/L	Boron, Total ug/L	Cadmium, Total ug/L	Calcium, Total mg/l	Chloride, Total mg/L	Chromium, Total ug/L	Cobalt, Total ug/L	Fluoride, Total mg/L	Lithium, Total ug/L	Magnesium, Total mg/L	Mercury, Total ug/L	Molybdenum, Total ug/L	pH	Potassium, Total mg/L	Selenium, Total ug/L	Sodium, Total mg/l	Solids - total dissolved solids (TDS) mg/L	Sulfate, Total mg/L	Thallium, Total ug/L
AP1a	Ash Pond 1	90	< 2.0	3.1	7.2	130	< 1.0	3800	< 1.0	380	3.2	< 4.0	< 2.0	< 0.250	39	67	< 0.20	47	6.99	7.3	3.0	33	1800	1500	< 1.0
AP1b		120	< 2.0	3.3	17	100	< 1.0	3100	< 1.0	320	13	< 4.0	< 2.0	0.977	47	52	< 0.20	100	7.01	18	6.9	53	1600	1300	< 1.0
AP1c		80	< 2.0	< 3.0	18	130	< 1.0	2900	< 1.0	390	13	< 4.0	< 2.0	0.614	51	49	< 0.20	81	7.05	18	3.1	59	1900	1600	< 1.0
AP1d		90	< 20	< 3.0	2.0	200	< 1.0	2000	< 1.0	210	18	< 4.0	< 2.0	1.08	55	35	< 0.20	31	7.21	26	1.5	83	980	1000	< 1.0
AP1e		80	< 2.0	< 3.0	1.4	160	< 1.0	2100	< 1.0	200	18	< 4.0	< 2.0	1.00	55	34	< 0.20	30	7.12	26	1.2	80	1200	960	< 1.0
AP1f		110	< 20	< 3.0	1.5	150	< 1.0	2100	< 1.0	200	17	< 4.0	< 2.0	1.00	57	35	< 0.20	31	7.20	26	1.2	82	1200	1000	< 1.0
AP1g		75	< 2.0	< 3.0	1.3	140	< 1.0	2100	< 1.0	210	17	< 4.0	< 2.0	1.00	56	32	< 0.20	29	7.21	26	1.4	100	1200	970	< 1.0
AP1h		90	< 20	< 3.0	1.5	180	< 1.0	2200	< 1.0	230	17	< 4.0	< 2.0	0.980	55	30	< 0.20	31	7.41	27	1.2	110	1200	1000	< 1.0
AP2e	Ash Pond 2	55	< 20	< 3.0	23	26	< 1.0	5300	< 1.0	210	< 5.0	< 4.0	< 2.0	0.438	190	40	< 0.20	90	6.49	27	< 1.0	25	1700	1500	< 1.0
AP2f		100	< 20	< 3.0	1.2	22	< 2.0	2000	< 1.0	170	< 5.0	< 4.0	< 2.0	0.398	130	33	< 0.20	3.2	6.42	21	< 1.0	14	1700	1500	< 1.0
AP2g		4.0	< 2.0	< 3.0	5.5	20	< 2.0	4300	4.6	410	< 5.0	< 4.0	< 2.0	0.506	180	51	< 0.20	41	6.46	29	< 1.0	27	2400	2300	< 1.0
AP2h		140	< 2.0	< 3.0	75	23	< 1.0	14000	< 1.0	310	1.7	< 4.0	< 2.0	0.406	120	29	< 0.20	570	7.17	40	< 1.0	39	1500	1300	< 1.0
CLa	Coffeen Lake	80	< 2.0	< 3.0	1.8	54	< 1.0	270	< 1.0	23	23	< 4.0	< 2.0	0.443	< 10	12	< 0.20	5.0	7.22	7.4	< 1.0	19	190	55	< 1.0
CLb		80	< 2.0	< 3.0	1.8	52	< 1.0	280	< 1.0	23	22	< 4.0	< 2.0	0.425	< 10	11	< 0.20	4.9	7.52	7.8	< 1.0	19	180	56	< 1.0
CLc		75	< 2.0	< 3.0	1.8	56	< 1.0	280	< 1.0	23	22	< 4.0	< 2.0	0.426	< 10	12	< 0.20	4.7	7.62	7.4	< 1.0	19	160	54	< 1.0
CLd		80	< 2.0	< 3.0	1.8	54	< 1.0	270	< 1.0	23	23	< 4.0	< 2.0	0.421	< 10	12	< 0.20	4.8	7.30	7.5	< 1.0	20	170	54	< 1.0
GPa	Gypsum Stack Pond	4.0	< 2.0	< 3.0	4.7	120	2.6	59000	40	450	1900	< 4.0	52	42.7	300	1500	< 0.80	130	7.16	210	890	620	17000	17000	< 1.0
GPb		10	< 2.0	8.6	92	1100	< 20	97000	67	1400	2600	150	110	69.4	480	2500	27	140	6.65	360	1500	1000	28000	27000	< 4.0
GPc		5.5	< 2.0	< 6.0	4.4	110	2.6	72000	41	570	1800	< 4.0	54	49.2	300	1500	< 0.80	120	6.73	260	890	650	17000	20000	< 1.0
GPd		6.0	< 2.0	< 3.0	4.2	110	< 20	66000	38	560	1900	< 4.0	52	51.3	300	1500	< 0.80	120	6.73	230	800	660	16000	19000	< 1.0
RPa	Gypsum Recycle Pond	< 2.0	< 2.0	< 3.0	3.3	89	2.3	60000	37	380	1600	< 4.0	44	47.0	310	1200	< 0.20	63	6.70	190	840	450	16000	17000	< 1.0
RPb		< 2.0	< 2.0	< 3.0	2.8	90	2.1	56000	33	380	1800	< 4.0	45	44.4	310	1200	< 0.40	64	6.49	210	780	470	16000	18000	< 1.0
RPc		< 2.0	< 2.0	< 3.0	3.1	88	2.2	59000	37	380	2000	< 4.0	43	45.0	310	1200	< 0.20	64	6.32	200	830	440	16000	20000	< 1.0
RPd		< 2.0	< 2.0	< 3.0	3.4	89	2.4	59000	36	400	1600	< 4.0	45	51.2	310	1300	< 0.20	66	6.32	200	860	460	17000	16000	< 1.0

[O:MDM 12/2016, NRK 12/2016]

NATURAL RESOURCE TECHNOLOGY

APPENDIX A

BORING LOGS AND WELL CONSTRUCTION DETAILS

APPENDIX A1

ASH POND 2

FIELD BORING LOG

HANSON

CLIENT: Natural Resource Technology, Inc.
Site: Coffeen Energy Center
Location: Coffeen, Illinois
Project: 15E0030
DATES: Start: 9/14/2015
Finish: 9/14/2015
WEATHER: Sunny, hi 60's

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: D-50 Turbo Tracked MST 800ATV
Drilling Method: Hollow Stem Auger (3¼"overdrill / 4¼")
FIELD STAFF: Driller: D. Crump
Helper: D. Groves
Eng/Geo: R. Hasenyager

BOREHOLE ID: G401
Well ID: G401
Surface Elev: 623.03 ft. MSL
Completion: 19.30 ft. BGS
Station: 2,515,614.84N
872,510.57E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	16/24 *67%*	SS	*2-2 3-7* N=5	17			0–1.0	Dark grayish brown (10YR4/2), moist, soft, CLAY with little silt and trace very fine- to fine-grained sand - FILL.		
							1.0–2.5	Yellowish brown (10YR5/6) moist, medium, CLAY with some silt and trace very fine- to coarse-grained sand - FILL.	622	
2A	21/24 *88%*	SS	*8-11 8-9* N=19	17		*1.80*	2.5–3.2	Dark gray (10YR4/1), moist, stiff, SILT with little clay and trace very fine-grained sand.	620	
2B				25			3.2–4.0	Yellowish brown (10YR5/6), moist, stiff, CLAY with some silt and trace very fine- to fine-grained sand.		
3A	23/24 *96%*	SS	*3-4 7-8* N=11	23		*2.50*	4.0–7.5	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, medium, CLAY with some silt and trace very fine- to fine-grained sand.	618	
4A	24/24 *100%*	SS	*8-9 12-14* N=21	21		*3.30*			616	
4B				19		*2.80*	7.5–8.0	Gray (10YR5/1) with 30% yellowish brown (10YR5/8) mottles, moist, stiff, SILT and very fine-grained SAND with trace clay.		
5A	24/24 *100%*	SS	*2-3 4-5* N=7	21		*1.30*	8.0–15.0	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, medium, CLAY with some silt and trace very fine- to fine-grained sand.	614	
6A	24/24 *100%*	SS	*2-4 5-6* N=9	17		*2.50*			612	
7A	24/24 *100%*	SS	*9-7 8-9* N=15	21		*1.40*			610	
8A	24/24 *100%*	SS	*2-3 2-4* N=5	17		*1.30*	15.0–16.0	Gray (10YR6/1), moist soft, CLAY with very fine- to fine-grained sand and little silt.	608	
8B				19			16.0–16.8	Yellowish brown (10YR5/6), wet, loose, very fine- to fine-grained SAND with trace silt.		
9A	20/24 *83%*	SS	*5-4 5-10* N=9	21			16.8–17.3	Yellowish brown (10YR5/6), wet medium, SILT with some very fine-grained sand and little clay.	606	
9B				16			17.3–18.0	Yellowish brown (10YR5/6), wet, loose, very fine- to medium-grained SAND with trace silt.		
10A	12/16 *75%*	SS	*23-41 50/4"*	6		*4.50*	18.0–19.3	Gray (10YR5/1), moist, very hard, SILT with few clay and little very fine- to very coarse sand.	604	

End of boring = 19.3 feet

NOTE(S): G401 installed in borehole.

Surface Elevation: 610.56

Datum msl

Completion Date: 8/27/10

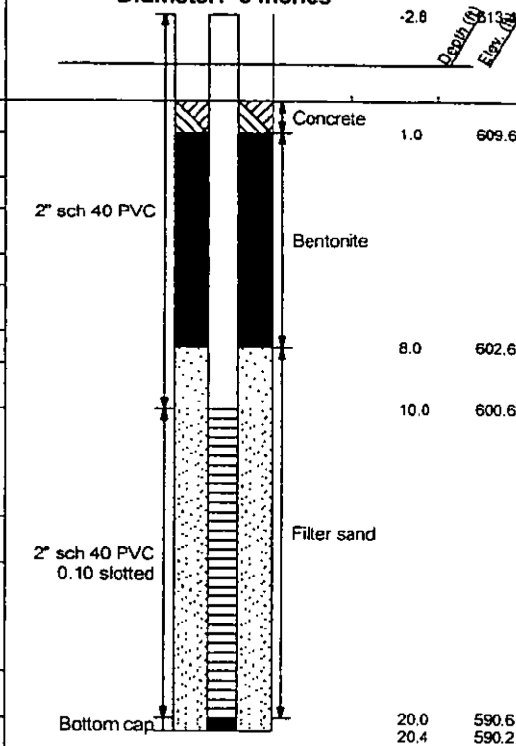
Northing: 872502.26

Easting: 2516632.59

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
0	Medium stiff, brown, silty CLAY - CL			
			6-3-3	SS1
			1-2-4	SS2
5	Medium stiff, gray, silty CLAY, trace sand - CL			
7	∇		1-2-5	SS3
8	Hard to stiff, brown to gray, silty CLAY, trace sand seams - CL (TILL)			
			9-22-28	SS4
10				
15			1-6-12	SS5
			3-4-9	SS6
20	Boring terminated at 20 feet.			
25				
30				
35				

WELL DIAGRAM

Stickup Diameter: 6 inches



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT 7 FEET ∇

DRILLING DATA

___ AUGER 4 1/4" HOLLOW STEM

WASHBORING FROM ___ FEET

MVU DRILLER SWG LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by: DTK	App'vd. by: KRB
Date: 9/10/10	Date: 1-4-11	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren-Coffeen Ash Pond Evaluation

LOG OF BORING: APW-2

G402

Project No. J017150.01

FIELD BORING LOG

HANSON

CLIENT: Natural Resource Technology, Inc.
Site: Coffeen Energy Center
Location: Coffeen, Illinois
Project: 15E0030
DATES: Start: 9/11/2015
Finish: 9/11/2015
WEATHER: Raining, hi 60's

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: D-50 Turbo Tracked MST 800ATV
Drilling Method: Hollow Stem Auger (3¼"overdrill / 4¼")

FIELD STAFF: Driller: D. Crump
Helper: D. Groves
Eng/Geo: K. Theesfeld

BOREHOLE ID: G403
Well ID: G403
Surface Elev: 623.81 ft. MSL
Completion: 18.15 ft. BGS
Station: 2,514,616.63N
873,561.34E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 15.00 - During Drilling
▼ =
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
1A	19/24 *79%*	SS	*2-2 2-2* N=4	25		*0.80*
2A	22/24 *92%*	SS	*2-2 3-4* N=5	29		
2B				26		*1.50*
3A	8/24 *33%*	SS	*2-3 4-4* N=7	25		*1.50*
4A	21/24 *88%*	SS	*8-7 8-7* N=15	20		*1.30*
5A	20/24 *83%*	SS	*2-2 3-3* N=5	22		*0.70*
6A	24/24 *100%*	SS	*2-2 3-4* N=5	23		*1.40*
7A	21/24 *88%*	SS	*5-5 6-5* N=11	20		*0.90*
8A	24/24 *100%*	SS	*3-2 3-6* N=5	17		
9A	19/24 *79%*	SS	*8-12 21-25* N=33	8		*4.50*
	0/2 *0%*	BD				

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
	Very dark brown (10YR2/2) grading to dark grayish brown (10YR4/2), moist, medium, SILT with some clay, trace roots and grass.	
2	Very dark brown (10YR2/2) grading to dark grayish brown (10YR4/2), moist , stiff, SILT with some clay, trace wood.	622
	Yellowish brown (10YR5/4) with 10% very dark brown (10YR2/2) mottles, moist, stiff, CLAY with little silt, trace very fine-grained sand seams (<1/16" thick).	
4	Yellowish brown (10YR5/4), moist, stiff, CLAY with little silt and trace very fine-grained sand.	620
6	Grayish brown (10YR5/2) with 15% yellowish brown (10YR5/6) and 5% very dark grayish brown (10YR3/2) mottles, moist, stiff, CLAY with little silt and trace very fine-grained sand.	618
8	Grayish brown (10YR5/2) with 5% yellowish brown (10YR5/6) mottles, moist, medium, CLAY with little silt and trace very fine-grained sand.	616
10	Grayish brown (10YR5/2) with 30% yellowish brown (10YR5/6) mottles, moist, very stiff, CLAY with little silt, few very fine- to medium-grained sand, and trace gravel.	614
12	Grayish brown (10YR5/3) with 45% yellowish brown (10YR5/6) and 5% dark brown (10YR3/3) mottles, moist, stiff, SILT with some clay, few very fine- to coarse-grained sand, and trace gravel.	612
14	Grayish brown (10YR5/3) with 40% yellowish brown (10YR5/6) mottles, moist, medium, SILT with little clay, few very fine- to coarse-grained sand, and trace gravel.	610
	Yellowish brown (10YR5/6) with 30% grayish brown (10YR5/2) mottles, moist, medium, SILT with little clay, few very fine- to coarse-grained sand, and trace gravel.	
16	Yellowish brown (10YR5/6), wet, loose, SAND with some clay and few silt.	608
	Yellowish brown (10YR5/6) with 30% grayish brown (10YR5/2) mottles, moist, stiff, SILT with few clay, very fine- to coarse-grained sand, and gravel.	
	Yellowish brown (10YR5/6), moist, very stiff, SILT with some clay and few sand and gravel.	606
18	Very dark grayish brown (10YR3/2), dry, hard, SILT with little clay and few very fine- to coarse-grained sand and gravel.	

End of boring = 18.15 feet

Borehole Detail | Remarks

NOTE(S): G403 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Energy Center
Location: Coffeen, Illinois
Project: 15E0030
DATES: Start: 5/1/2007
Finish: 5/1/2007
WEATHER: Partly sunny, warm

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-550 ATV Drill
Drilling Method: 4¼" Hollow stem auger with split spoon sampler
FIELD STAFF: Driller: A. Rachford
Helper: M. Brown
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB22
Well ID: G404
Surface Elev: 613.10 ft. MSL
Completion: 12.00 ft. BGS
Station: 873,999.77N
2,516,397.85E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 2.07 - 05/10/2007
▼ =
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type
1A	19/24 *79%*	SS		26		0.85 B
1B				26		
2A	19/24 *79%*	SS		16		2.47 B
3A	18/24 *75%*	SS		19		2.18 B
3B				18		2.33 B
4A	24/24 *100%*	SS		23		0.58 B
4B				18		
5A	23/24 *96%*	SS		10		
5B				19		
6A	19/24 *79%*	SS		19		
6B				11		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0 – 1.8	Black (10YR2/1), moist, firm, clayey SILT (TOPSOIL)	612	
1.8 – 5	Gray (10YR5/1) with 35% dark yellowish brown (10YR4/6) mottles, moist, firm, clayey SILT with sand and trace gravel	610	
5 – 6.1	Gray (10YR6/1) with 20% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and trace gravel	608	
6.1 – 6.8	Yellowish brown (10YR5/8), moist, soft, sandy CLAY with slight trace gravel		
6.8 – 8.1	Yellowish brown (10YR5/8), very moist to wet, very soft, clayey, very fine- to medium-grained SAND with trace gravel	606	
8.1 – 9.6	Yellowish brown (10YR5/4) with 30% yellowish brown (10YR5/8) mottles, moist, hard, clayey SILT with sand and trace gravel	604	
9.6 – 11.1	Yellowish brown (10YR5/6), wet, loose, very fine- to medium-grained SAND with coarse-grained sand and slight trace gravel		
11.1 – 12	Dark yellowish brown (10YR4/6) with 40% yellowish brown (10YR5/8) mottles, moist, very hard, very silty CLAY with sand and gravel	602	

End of Boring = 12.0 ft. BGS

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Energy Center
Location: Coffeen, Illinois
Project: 15E0030
DATES: Start: 5/1/2007
Finish: 5/1/2007
WEATHER: Partly sunny, warm

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-550 ATV Drill
Drilling Method: 4¼" Hollow stem auger with split spoon sampler
FIELD STAFF: Driller: A. Rachford
Helper: M. Brown
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB21
Well ID: G405
Surface Elev: 620.90 ft. MSL
Completion: 14.21 ft. BGS
Station: 873,996.79N
2,515,335.70E

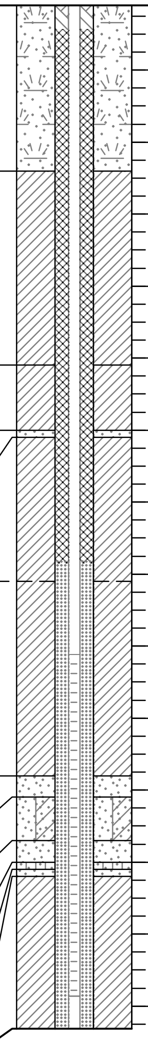
TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 1.28 - 05/10/2007
▼ =
▽ =

SAMPLE			TESTING			
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type
1A	19/24 *79%*	SS		43		0.78 B
1B				26		1.94 B
2A	12/12 *100%*	SS		27		2.52 BSh
3A	24/24 *100%*	SS		24		3.92 BSh
3B				24		2.33 BSh
4A	24/24 *100%*	SS		20		2.33 BSh
5A	24/24 *100%*	SS		24		1.55 BSh
	24/24 *100%*	SS				
6A				19		
6B				18		
7A	24/24 *100%*	SS		9		7.42 BSh

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
	Black (10YR2/1), moist, soft, clayey SILT (TOPSOIL)	620	
2	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY	618	
4		616	
	Gray (10YR6/1), moist, firm, silty CLAY slight trace sand		
6	Gray (10YR5/1), very moist, soft, clayey, very fine- to fine-grained SAND		
	Gray (10YR6/1) with 25% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and trace gravel	614	
8	Yellowish brown (10YR5/8) with 40% gray (10YR6/1) mottles, moist, firm, silty CLAY with sand and trace gravel	612	
10			
	Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND	610	
	Dark brown (10YR3/3), very moist, soft, clayey, fine- to very coarse-grained SAND with slight trace gravel		
12	Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND		
	Dark yellowish brown (10YR4/4), moist, soft, sandy SILT with trace gravel	608	
	Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND		
14	Gray (10YR5/1), moist, very hard, very silty CLAY with sand and gravel		

Borehole Detail



End of Boring = 14.2 ft. BGS

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/16/2016
Finish: 8/17/2016
WEATHER: Cloudy, rain, (hi-70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger
FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: G405D
Well ID: G45D
Surface Elev: 620.94 ft. MSL
Completion: 42.00 ft. BGS
Station: 873,998.03N
2,515,322.23E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = 16.00 - During Drilling
▼ =
▽ =

SAMPLE: Number	SAMPLE: Recov / Total (in) / *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* / N - Value / **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft³)	TESTING: Qu (tsf) *Qp (tsf)* / Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
	0/60 *0%*	BD					0–2.3	Black (10YR2/1), moist, soft, clayey SILT (TOPSOIL)		620	
							2.3–5.0	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY		618	
	0/60 *0%*	BD					5.0–5.9	Gray (10YR6/1), moist, firm, silty CLAY slight trace sand		616	
							5.9–6.1	Gray (10YR5/1), very moist, soft, clayey, very fine- to fine-grained SAND			
							6.1–8.0	Gray (10YR6/1) with 25% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and trace gravel		614	
							8.0–10.7	Yellowish brown (10YR5/8) with 40% gray (10YR6/1) mottles, moist, firm, silty CLAY with sand and trace gravel		612	
	0/48 *0%*	BD					10.7–11.0	Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND		610	
							11.0–11.7	Dark brown (10YR3/3), very moist, soft, clayey, fine- to very coarse-grained SAND with slight trace gravel			
							11.7–12.0	Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND			
							12.0–12.1	Dark yellowish brown (10YR4/4), moist, soft, sandy SILT with trace gravel		608	
							12.1–12.2	Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND			
							12.2–14.0	Gray (10YR5/1), moist, very hard, very silty CLAY with sand and gravel			
1A	24/24 *100%*	SS	*6-23 37-44* N=60	11		*1.50*	14.0–18.0	Dark gray (10YR4/1), moist, hard, SILT with few fine- to coarse-grained sand, little clay and trace small gravel.		606	
2A	23/24 *96%*	SS	*14-32 41-45* N=73	7		*4.50*	▼ 16			604	
3A	14/17 *82%*	SS	*16-47 50/5"*	7		*4.50*	18.0–20.0	Dark gray (10YR4/1), dry, hard, SILT with few fine- to coarse-grained sand, little clay and trace small gravel.		602	

NOTE(S): G45D installed in boring.
Boring was blind drilled to 14.0 feet bgs. Blind drill lithologies from boring G405.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/16/2016
Finish: 8/17/2016
WEATHER: Cloudy, rain, (hi-70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger

FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: G405D
Well ID: G45D
Surface Elev: 620.94 ft. MSL
Completion: 42.00 ft. BGS
Station: 873,998.03N
2,515,322.23E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = 16.00 - During Drilling
▼ =
▽ =

SAMPLE / TESTING

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type
4A	19/24 *79%*	SS	*15-36 32-36* N=68	8		*4.50*
5A	19/24 *79%*	SS	*10-18 30-33* N=48	8		*4.50*
6A	11/24 *46%*	SS	*22-42 34-36* N=76	8		*4.50*
7A	11/24 *46%*	SS	*28-26 23-26* N=49	11		*4.50*
8A	23/24 *96%*	SS	*7-11 16-25* N=27	10		*4.50*
9A	17/24 *71%*	SS	*7-14 12-12* N=26	16		
9B				14		
9C				9		
10A	24/24 *100%*	SS	*2-5 8-13* N=13	15		*3.25*
11-1	22/24 *92%*	SH				
11-2				15		
11-3						
11-4						
12A	24/24 *100%*	SS	*2-5 8-10* N=13	16		*2.00*
13A	22/24 *92%*	SS	*2-5 7-8* N=12	16		*2.00*

Lithologic Description

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
	Dark gray (10YR4/1), dry, hard, SILT with few fine- to coarse-grained sand, little clay and little small gravel.	
	Dark gray (10YR4/1), moist, dense, fine- to coarse-grained SAND.	600
22		
	Dark gray (10YR4/1), dry, hard, SILT with few fine- to coarse-grained sand, little clay and little small gravel.	598
24		596
26	Dark gray (10YR4/1) with 5% light brownish gray (10YR6/2) mottles, dry, hard, SILT with few fine- to coarse-grained sand, little clay and little small gravel.	594
28	Dark gray (10YR4/1) with 5% light brownish gray (10YR6/2) and dark greenish gray (10YR4/2) mottles, dry, hard, SILT with few fine- to coarse-grained sand, little clay and little small gravel.	592
30	Dark gray (10YR4/1), dry, hard, SILT with few fine- to coarse-grained sand, little clay and little small gravel.	
	Dark gray (10YR4/1), dry, very stiff, SILT with some very fine-grained SAND.	590
	Very dark gray (10YR3/1), moist, very stiff, CLAY with few silt and little medium-grained sand.	
32	Very dark gray (10YR3/1), moist, very stiff, CLAY with little silt and little medium-grained sand.	588
34		586
36	Very dark gray (10YR3/1), moist, very stiff, CLAY with little silt, little medium-grained sand, and trace small gravel.	584
38	Very dark gray (10YR3/1) with 5% black (10YR2/1) mottles, moist, very stiff, CLAY with little silt, little medium-grained sand, and trace small gravel.	582
40		

Borehole Detail | Remarks

NOTE(S): G45D installed in boring.
Boring was blind drilled to 14.0 feet bgs. Blind drill lithologies from boring G405.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/16/2016
Finish: 8/17/2016
WEATHER: Cloudy, rain, (hi-70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger

FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: G405D
Well ID: G45D
Surface Elev: 620.94 ft. MSL
Completion: 42.00 ft. BGS
Station: 873,998.03N
2,515,322.23E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = 16.00 - During Drilling
▼ =
▽ =

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
14A	23/24 *96%*	SS	*1-3* *7-7* N=10	16		*3.50*	42	Very dark gray (10YR3/1) with 5% black (10YR2/1) mottles, moist, very stiff, CLAY with little silt, little medium-grained sand, and trace small gravel. *[Continued from previous page]*		580	

End of Boring = 42.0 ft. BGS

NOTE(S): G45D installed in boring.
Boring was blind drilled to 14.0 feet bgs. Blind drill lithologies from boring G405.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/19/2016
Finish: 8/19/2016
WEATHER: Sunny, (mid-70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger

FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: G406
Well ID: G406
Surface Elev: 621.86 ft. MSL
Completion: 18.75 ft. BGS
Station: 872,521.34N
2,514,702.38E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Dark brown (10YR3/3), moist, stiff, SILT with few clay and trace organics.			
							2	Brown (10YR5/3) with 10% dark brown (10YR3/3) mottles, SILT with some clay and trace small gravel.		620	
								Brown (10YR5/3) with 10% dark brown (10YR3/3) mottles, SILT with some clay.			
							4	Grayish brown (10YR5/2) with 5% dark yellowish brown (10YR4/6) mottles, moist, stiff, CLAY with few silt and little fine-grained sand.		618	
								Very pale brown (10YR7/4) with 25% yellowish brown (10YR5/6) mottles, moist, medium, CLAY with trace silt.			
							6	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with little silt and trace fine- to medium-grained sand.		616	
							8	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with little silt, little fine- to medium-grained sand and trace small gravel.		614	
							10	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with few fine- to medium-grained sand, little silt, and trace small gravel.		612	
							12	Gray (10YR6/1) with 25% brownish yellow (10YR6/8) and 5% strong brown (7.5YR4/6) mottles, moist, stiff, CLAY with few fine- to medium-grained sand, little silt, and trace small gravel.		610	
							14	Gray (10YR6/1) with 10% brownish yellow (10YR6/8) and 5% strong brown (7.5YR4/6) mottles, moist, stiff, CLAY with some fine- to medium-grained sand, little silt, and trace small gravel.		608	
							16	Gray (10YR6/1) with 5% brownish yellow (10YR6/6) mottles, wet, loose, fine-grained SAND with some clay.		606	
								Gray (10YR6/1) with 5% brownish yellow (10YR6/6) mottles, moist, loose, fine-grained SAND with some clay.			
							18	Gray (10YR5/1), dry, hard, SILT with few clay, few fine- to coarse-grained sand and trace small gravel.		604	

End of Boring = 18.75 ft. BGS

NOTE(S): G406 installed in boring.
Boring was blind drilled adjacent to G406D.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/19/2016
Finish: 8/19/2016
WEATHER: Sunny, (mid-70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger

FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: G406D
Well ID: G46D
Surface Elev: 621.91 ft. MSL
Completion: 52.00 ft. BGS
Station: 872,519.70N
2,514,697.78E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE			TESTING			
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type
1A	18/24 *75%*	SS	*4-3 4-6* N=7	11		*1.50*
1B				15		*3.00*
2A	12/24 *50%*	SS	*4-6 3-3* N=9	12		*2.50*
2B				18		*2.00*
3A	3/24 *13%*	SS	*3-3 4-7* N=7	24		
4A	20/24 *83%*	SS	*2-3 4-5* N=7	21		*1.25*
5A	19/24 *79%*	SS	*1-3 4-6* N=7	18		*1.75*
6A	23/24 *96%*	SS	*2-2 4-5* N=6	18		*2.50*
7A	21/24 *88%*	SS	*1-3 4-5* N=7	16		*1.00*
8A	23/24 *96%*	SS	*1-2 2-2* N=4	18		*0.75*
8B				17		*0.75*
9A	22/24 *92%*	SS	*4-13 27-23* N=40	8		
9B				8		
10A	17/24 *71%*	SS	*13-31 33-42* N=64	7		*4.50*

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
	Dark brown (10YR3/3), moist, stiff, SILT with few clay and trace organics.	
2	Brown (10YR5/3) with 10% dark brown (10YR3/3) mottles, SILT with some clay and trace small gravel.	620
	Brown (10YR5/3) with 10% dark brown (10YR3/3) mottles, SILT with some clay.	
4	Grayish brown (10YR5/2) with 5% dark yellowish brown (10YR4/6) mottles, moist, stiff, CLAY with few silt and little fine-grained sand.	618
	Very pale brown (10YR7/4) with 25% yellowish brown (10YR5/6) mottles, moist, medium, CLAY with trace silt.	
6	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with little silt and trace fine- to medium-grained sand.	616
8	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with little silt, little fine- to medium-grained sand and trace small gravel.	614
10	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with few fine- to medium-grained sand, little silt, and trace small gravel.	612
12	Gray (10YR6/1) with 25% brownish yellow (10YR6/8) and 5% strong brown (7.5YR4/6) mottles, moist, stiff, CLAY with few fine- to medium-grained sand, little silt, and trace small gravel.	610
14	Gray (10YR6/1) with 10% brownish yellow (10YR6/8) and 5% strong brown (7.5YR4/6) mottles, moist, stiff, CLAY with some fine- to medium-grained sand, little silt, and trace small gravel.	608
16	Gray (10YR6/1) with 5% brownish yellow (10YR6/6) mottles, wet, loose, fine-grained SAND with some clay.	606
	Gray (10YR6/1) with 5% brownish yellow (10YR6/6) mottles, moist, loose, fine-grained SAND with some clay.	
18	Gray (10YR5/1), dry, hard, SILT with few clay, few fine- to coarse-grained sand and trace small gravel.	604
20		602

Borehole Detail | Remarks

NOTE(S): G46D installed in boring.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/19/2016
Finish: 8/19/2016
WEATHER: Sunny, (mid-70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger

FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: G406D
Well ID: G46D
Surface Elev: 621.91 ft. MSL
Completion: 52.00 ft. BGS
Station: 872,519.70N
2,514,697.78E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE / TESTING

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
11-1	3/3 *100%*	SH				
	8/24 *33%*	DS				
12-1						
13-1						
13-2	24/24 *100%*	DS				
13-3						
13-4						
14A				19		
14B	21/21 *100%*	SS	*7-30 32-20* N=62	7		
14C				8		*4.50*
15A	12/24 *50%*	SS	*15-16 10-11* N=26	10		*4.50*
16A	17/24 *71%*	SS	*2-5 7-11* N=12	16		*3.00*
17A	17/24 *71%*	SS	*2-5 7-12* N=12	15		*2.50*
18A	12/24 *50%*	SS	*3-7 12-20* N=19	17		*2.50*
19A	23/24 *96%*	SS	*4-4 6-9* N=10	25		*1.00*
20A	22/24 *92%*	SS	*2-2 5-7* N=7	17		*1.00*
21A	24/24 *100%*	SS	*2-3 4-6* N=7	17		*1.00*

Lithologic Description

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
to 24.4	Gray (10YR5/1), dry, hard, SILT with few clay, few fine- to coarse-grained sand and trace small gravel. *[Continued from previous page]*	600 (at 22), 598 (at 24)
24.4 – 24.7	Pale brown (10YR6/3), wet, loose, fine-grained SAND.	
24.7 – 25.2	Pale brown (10YR6/3), wet, loose, fine-grained SAND and small GRAVEL.	
25.2 – 26	Gray (10YR5/1), dry, hard, SILT with some clay, trace fine- to coarse-grained sand and trace small gravel.	596 (at 26)
26 – 28	Dark gray (10YR4/1), dry, hard, CLAY with some silt, trace fine- to coarse-grained sand and trace small gravel.	594 (at 28)
28 – 31.7	Dark gray (10YR4/1), moist, very stiff, CLAY with few silt, trace fine- to coarse-grained sand and trace small gravel.	592 (at 30)
31.7 – 32.4	Dark gray (10YR4/1), moist, very stiff, CLAY with few silt, trace fine- to coarse-grained sand and trace small to large gravel.	590 (at 32)
32.4 – 34	Dark gray (10YR4/1), moist, very stiff, CLAY with few silt, trace fine- to coarse-grained sand and trace small gravel.	588 (at 34)
34 – 35.8	Dark gray (10YR4/1) with 5% very dark gray (10YR3/1) and brown (10YR5/3) mottles, moist, very stiff, CLAY with few silt, trace fine- to coarse-grained sand and trace small gravel.	586 (at 36)
35.8 – 36.9	Gray (10YR5/1) with 5% very dark gray (10YR3/1) and brown (10YR5/3) mottles, moist, very stiff, CLAY with few silt, trace fine- to coarse-grained sand and trace small gravel.	
36.9 – 40	Dark gray (10YR4/1), moist, very stiff, CLAY with few silt, trace fine- to coarse-grained sand and trace small gravel.	584 (at 38), 582 (at 40)

Borehole Detail | Remarks

NOTE(S): G46D installed in boring.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/19/2016
Finish: 8/19/2016
WEATHER: Sunny, (mid-70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger

FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: G406D
Well ID: G46D
Surface Elev: 621.91 ft. MSL
Completion: 52.00 ft. BGS
Station: 872,519.70N
2,514,697.78E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE Number	Recov / Total (in) % Recovery	Type	TESTING Blows / 6 in N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
22A	24/24 *100%*	SS	*1-3 5-6* N=8	17		*1.50*	42	Dark gray (10YR4/1), moist, very stiff, CLAY with few silt, trace fine- to coarse-grained sand and trace small gravel. *[Continued from previous page]*		580	
23-1 23-2 23-3 23-4	24/24 *100%*	SH		16			44			578	
24A	24/24 *100%*	SS	*3-4 6-7* N=10	17		*1.50*	46			576	
25A	24/24 *100%*	SS	*2-2 5-7* N=7	18		*1.25*	48			574	
26A	24/24 *100%*	SS	*2-5 6-8* N=11	17		*1.75*	50			572	
27A	23/24 *96%*	SS	*2-3 9-12* N=12	15		*3.50*	52			570	

End of Boring = 52.0 ft. BGS

NOTE(S): G46D installed in boring.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/16/2016
Finish: 8/16/2016
WEATHER: Rain, (mid-70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger

FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: G407
Well ID: G407
Surface Elev: 618.35 ft. MSL
Completion: 20.00 ft. BGS
Station: 872,973.39N
2,513,705.87E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 10, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = 16.00 - During Drilling
▼ =
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
							0	Very dark gray (10YR3/1), wet, medium, SILT with some organics. [Fill]	618	
1A	12/24 *50%*	SS	*4-3 3-3* N=6	14		*3.50*		Gray (10YR6/1), wet, loose, SAND with some gravel and little clay. [Fill]		
2A	20/24 *83%*	SS	*2-2 4-4* N=6	18		*1.50*	2	Yellowish brown (10YR5/6) with 5% dark yellowish brown (10YR3/6) mottles, moist, very stiff, SILT with some clay and trace very fine- to fine-grained sand.	616	
								Brown (10YR5/3) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, SILT with some clay, little fine- to coarse-grained sand, and trace small gravel.		
3A	23/24 *96%*	SS	*1-2 3-4* N=5	19		*1.75*	4	Brown (10YR5/3) with 25% yellowish brown (10YR5/6) mottles, moist, stiff, CLAY with some silt, trace fine-grained sand and trace small gravel.	614	
4A	24/24 *100%*	SS	*1-3 3-5* N=6	19		*1.50*	6	Brown (10YR5/3) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, CLAY with some silt, little fine- to coarse-grained sand and trace small gravel.	612	
5A	21/24 *88%*	SS	*1-2 4-4* N=6	19		*0.50*	8	Yellowish brown (10YR5/6) with 25% brown (10YR5/3) mottles, moist, medium, CLAY with few silt, few fine-grained sand, and trace small gravel.	610	
6A	22/24 *92%*	SS	*1-2 2-1* N=4	17			10	Yellowish brown (10YR5/8) with 5% gray (10YR5/1) mottles, moist, very loose, fine-grained SAND with some clay and trace small gravel.	608	
7A	24/24 *100%*	SS	*7-29 33-17* N=62	8			12	Gray (10YR5/1) with 25% yellowish brown (10YR5/8) mottles, moist, very dense, fine-grained SAND	606	
								Brown (10YR5/3), moist, hard, SILT with some clay and little fine- to coarse-grained sand.		
8A	24/24 *100%*	SS	*3-7 12-17* N=19	12		*4.50*	14	Yellowish brown (10YR5/4) with 5% yellowish brown (10YR5/6) and 5% black (10YR2/1) mottles, SILT with some clay and little fine- to coarse-grained sand.	604	
9A	24/24 *100%*	SS	*4-9 14-20* N=23	13		*4.00*	▼ 16	Yellowish brown (10YR5/4) with 5% yellowish brown (10YR5/6), 5% dark gray (10YR4/1) and 5% black (10YR2/1) mottles, moist, hard, SILT with little fine- to coarse-grained sand and trace small gravel.	602	
10A	24/24 *100%*	SS	*2-8 14-19* N=22	14		*4.50*	18	Yellowish brown (10YR5/4) with 5% yellowish brown (10YR5/6), 5% dark gray (10YR4/1) and 5% black (10YR2/1) mottles, wet, stiff, SILT with little fine- to coarse-grained sand and little small gravel.	600	
							20	Dark grayish brown (10YR4/2) with 10% dark yellowish brown (10YR3/6) mottles, moist, hard, CLAY with some silt, little fine- to coarse-grained sand and trace small gravel.		

End of Boring = 20.0 ft. BGS

NOTE(S): G407 installed in boring.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/17/2016
Finish: 8/17/2016
WEATHER: Hazy, (low-80s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger
FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: T408
Well ID: T408
Surface Elev: 621.09 ft. MSL
Completion: 25.92 ft. BGS
Station: 873,999.36N 2,515,314.91E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
	0/60 *0%*	BD					0–2.3	Black (10YR2/1), moist, soft, clayey SILT (TOPSOIL)	620	
							2.3–5	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY	618	
	0/60 *0%*	BD					5–5.9	Gray (10YR6/1), moist, firm, silty CLAY slight trace sand	616	
							5.9–6.0	Gray (10YR5/1), very moist, soft, clayey, very fine- to fine-grained SAND		
							6–8	Gray (10YR6/1) with 25% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and trace gravel	614	
							8–10.7	Yellowish brown (10YR5/8) with 40% gray (10YR6/1) mottles, moist, firm, silty CLAY with sand and trace gravel	612	
	0/60 *0%*	BD					10.7–11.0	Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND	610	
							11.0–11.6	Dark brown (10YR3/3), very moist, soft, clayey, fine- to very coarse-grained SAND with slight trace gravel		
							11.6–11.9	Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND		
							~12	Dark yellowish brown (10YR4/4), moist, soft, sandy SILT with trace gravel	608	
							~12.1	Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND		
							12.1–14	Gray (10YR5/1), moist, very hard, very silty CLAY with sand and gravel		
4A	22/24 *92%*	SS	*8-16 33-35* N=49			*4.50*	14–18	Dark gray (10YR4/1), moist, hard, SILT with few fine- to coarse-grained sand, little clay and trace small gravel.	606, 604	
	0/36 *0%*	BD					18–20	Dark gray (10YR4/1), dry, hard, SILT with few fine- to coarse-grained sand, little clay and trace small gravel.	602	

NOTE(S): T408 installed in boring.
Boring was blind drilled to 26.0 feet bgs. Blind drill lithologies from boring G405 and G405D.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/17/2016
Finish: 8/17/2016
WEATHER: Hazy, (low-80s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger

FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: T408
Well ID: T408
Surface Elev: 621.09 ft. MSL
Completion: 25.92 ft. BGS
Station: 873,999.36N
2,515,314.91E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Dark gray (10YR4/1), dry, hard, SILT with few fine- to coarse-grained sand, little clay and little small gravel.			
								Dark gray (10YR4/1), moist, dense, fine- to coarse-grained SAND.		600	
	0/36 *0%*	BD					22				
7-1								Dark gray (10YR4/1), dry, hard, SILT with few fine- to coarse-grained sand, little clay and little small gravel.		598	
7-2	20/24 *83%*	DS					24				
7-3											
7-4										596	
	0/12 *0%*	BD									

End of Boring = 25.92 ft. BGS

NOTE(S): T408 installed in boring.
Boring was blind drilled to 26.0 feet bgs. Blind drill lithologies from boring G405 and G405D.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/19/2016
Finish: 8/19/2016
WEATHER: Cloudy, (70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger
FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: T409
Well ID: T409
Surface Elev: 621.85 ft. MSL
Completion: 26.99 ft. BGS
Station: 872,517.79N
2,514,693.89E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
	0/60 *0%*	BD					0–0.7	Dark brown (10YR3/3), moist, stiff, SILT with few clay and trace organics.		
							0.7–3.4	Brown (10YR5/3) with 10% dark brown (10YR3/3) mottles, SILT with some clay and trace small gravel.	620	
							3.4–3.7	Brown (10YR5/3) with 10% dark brown (10YR3/3) mottles, SILT with some clay.	618	
							3.7–4.9	Grayish brown (10YR5/2) with 5% dark yellowish brown (10YR4/6) mottles, moist, stiff, CLAY with few silt and little fine-grained sand.		
	0/60 *0%*	BD					4.9–6	Very pale brown (10YR7/4) with 25% yellowish brown (10YR5/6) mottles, moist, medium, CLAY with trace silt.	616	
							6–8	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with little silt and trace fine- to medium-grained sand.	614	
							8–10	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with little silt, little fine- to medium-grained sand and trace small gravel.	612	
	0/60 *0%*	BD					10–11.1	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with few fine- to medium-grained sand, little silt, and trace small gravel.		
							11.1–14	Gray (10YR6/1) with 25% brownish yellow (10YR6/8) and 5% strong brown (7.5YR4/6) mottles, moist, stiff, CLAY with few fine- to medium-grained sand, little silt, and trace small gravel.	610, 608	
							14–15.6	Gray (10YR6/1) with 10% brownish yellow (10YR6/8) and 5% strong brown (7.5YR4/6) mottles, moist, stiff, CLAY with some fine- to medium-grained sand, little silt, and trace small gravel.		
	0/60 *0%*	BD					15.6–16	Gray (10YR6/1) with 5% brownish yellow (10YR6/6) mottles, wet, loose, fine-grained SAND with some clay.	606	
							16–17.3	Gray (10YR6/1) with 5% brownish yellow (10YR6/6) mottles, moist, loose, fine-grained SAND with some clay.		
							17.3–20	Gray (10YR5/1), dry, hard, SILT with few clay, few fine- to coarse-grained sand and trace small gravel.	604, 602	

NOTE(S): T409 installed in boring.
Boring was blind drilled to 27.0 feet bgs. Blind drill lithologies from boring G406D.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/19/2016
Finish: 8/19/2016
WEATHER: Cloudy, (70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger

FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: T409
Well ID: T409
Surface Elev: 621.85 ft. MSL
Completion: 26.99 ft. BGS
Station: 872,517.79N
2,514,693.89E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
	0/36 *0%*	BD					22	Gray (10YR5/1), dry, hard, SILT with few clay, few fine- to coarse-grained sand and trace small gravel. *[Continued from previous page]*		600	
6-1 6-2 6-3 6-4	0/24 *0%*	DS					24	Pale brown (10YR6/3), wet, loose, fine-grained SAND. Pale brown (10YR6/3), wet, loose, fine-grained SAND and small GRAVEL. Gray (10YR5/1), dry, hard, SILT with some clay, trace fine- to coarse-grained sand and trace small gravel.		598	
	0/24 *0%*	BD					26	Dark gray (10YR4/1), dry, hard, CLAY with some silt, trace fine- to coarse-grained sand and trace small gravel.		596	

End of Boring = 26.99 ft. BGS

NOTE(S): T409 installed in boring.
Boring was blind drilled to 27.0 feet bgs. Blind drill lithologies from boring G406D.

Canonie

Canonie Construction Co.

Canonie Test Boring Services

Hamilton Lakes, 500 Park Boulevard, Suite 1212, Itasca, Illinois 60143, 312-773-4877

Job No.	DD-0514
Date	Feb. 8, 1985
Total Footage	50'0"
Foreman	W. Holloman
Classification By	Foreman

Client: Hanson Engineers, Inc.

Geographic Location: Coffeen, Illinois

Boring No. OW-1	O.G. EL.	Boring No. OW-2	O.G. EL.
Coordinates		Coordinates	

Boring No. OW-1

Ground Surface

Description		Depth
		0'0"
very hard brown silty sandy CLAY, with small to medium gravel		
		5'0"
COAL & CINDERS		
		20'0"
medium brown and gray silty CLAY	PUSHED	
		22'0"

Installed well with 15' of 2" PVC screen to a depth of 22'0".

Boring No. OW-2

Ground Surface

Description		Depth
		0'0"
very hard brown silty sandy CLAY with small to large gravel		
		3'6"
COAL & CINDERS		
		26'0"
medium brown silty CLAY	PUSHED	
		28'0"

Installed well with 15'0" of 2" PVC screen to a depth of 28'0".

A....All borings are plotted to a scale of 1"= 8 ft., using ground surface as a fixed datum.

B....Classifications are made from visual inspection of samples and are our opinion thereof.

C....Water Levels (WL). Figure indicates time of reading (hours) after completion of boring. Water levels indicated are those observed when borings were made, or as noted. Porosity of the soil strata, variations of rainfall, site topography, etc., may cause changes in these levels.

D....Figures in right hand column indicate number of blows required to drive 2" O.D. sampling spoon (6" u.n.o.), using a 140 lb. weight falling 30 inches.

Canonie Construction Co.

Canonie

Canonie Test Boring Services

Hamilton Lakes, 500 Park Boulevard, Suite 1212, Itasca, Illinois 60143, 312-773-4877

Job No.	DD-0514
Date	Feb. 8, 1985
Total Footage	68'0"
Foreman	W. Holloman
Classification By	Foreman

Client: Hanson Engineers, Inc.

Geographic Location: Coffeen, Illinois

Boring No. OW-3

O.G. EL.

Coordinates

Ground Surface

Description		Depth
very hard brown silty sandy CLAY with small to large gravel and some concrete		0'0" – 3'6"
COAL & CINDERS		3'6" – 26'0"
medium brown silty CLAY	PUSHED	26'0" – 28'0"

Installed well with 15'0" of 2" PVC screen to a depth of 28'0".

Boring No. OW-4

O.G. EL.

Coordinates

Ground Surface

Description		Depth
very hard brown silty sandy CLAY with small to medium gravel		0'0" – 3'6"
COAL & CINDERS	PUSHED	3'6" – 40'0"

Installed well with 25'0" of 2" PVC screen to a depth of 40'0".

A....All borings are plotted to a scale of 1"=....8.. ft., using ground..surface.... as a fixed datum.

B....Classifications are made from visual inspection of samples and are our opinion thereof.

C....Water Levels (WL). Figure indicates time of reading (hours) after completion of boring. Water levels indicated are those observed when borings were made, or as noted. Porosity of the soil strata, variations of rainfall, site topography, etc., may cause changes in these levels.

D....Figures in right hand column indicate number of blows required to drive 2" O.D. sampling spoon (6" u.n.o.), using a 140 lb. weight falling 30 inches.

Canonie Construction Co.

Canonie Canonie Test Boring Services

Hamilton Lakes, 500 Park Boulevard, Suite 1212, Itasca, Illinois 60143, 312-773-4877

Job No.	DD-0514
Date	Feb. 8, 1985
Total Footage	35'0"
Foreman	W. Holloman
Classification By	Foreman

Client: Hanson Engineers, Inc.		Geographic Location: Coffeen, Illinois	
Boring No. OW-5	O.G. EL.	Boring No.	O.G. EL.
Coordinates		Coordinates	

Ground Surface

Description		Depth
		0'0"
very hard brown silty sandy CLAY with small to medium gravel		4'0"
COAL & CINDERS mixed with lime		33'0"
soft brown and gray CLAY	PUSHED	35'0"

Installed well with 25'0" of 2" PVC screen to a depth of 35'0".

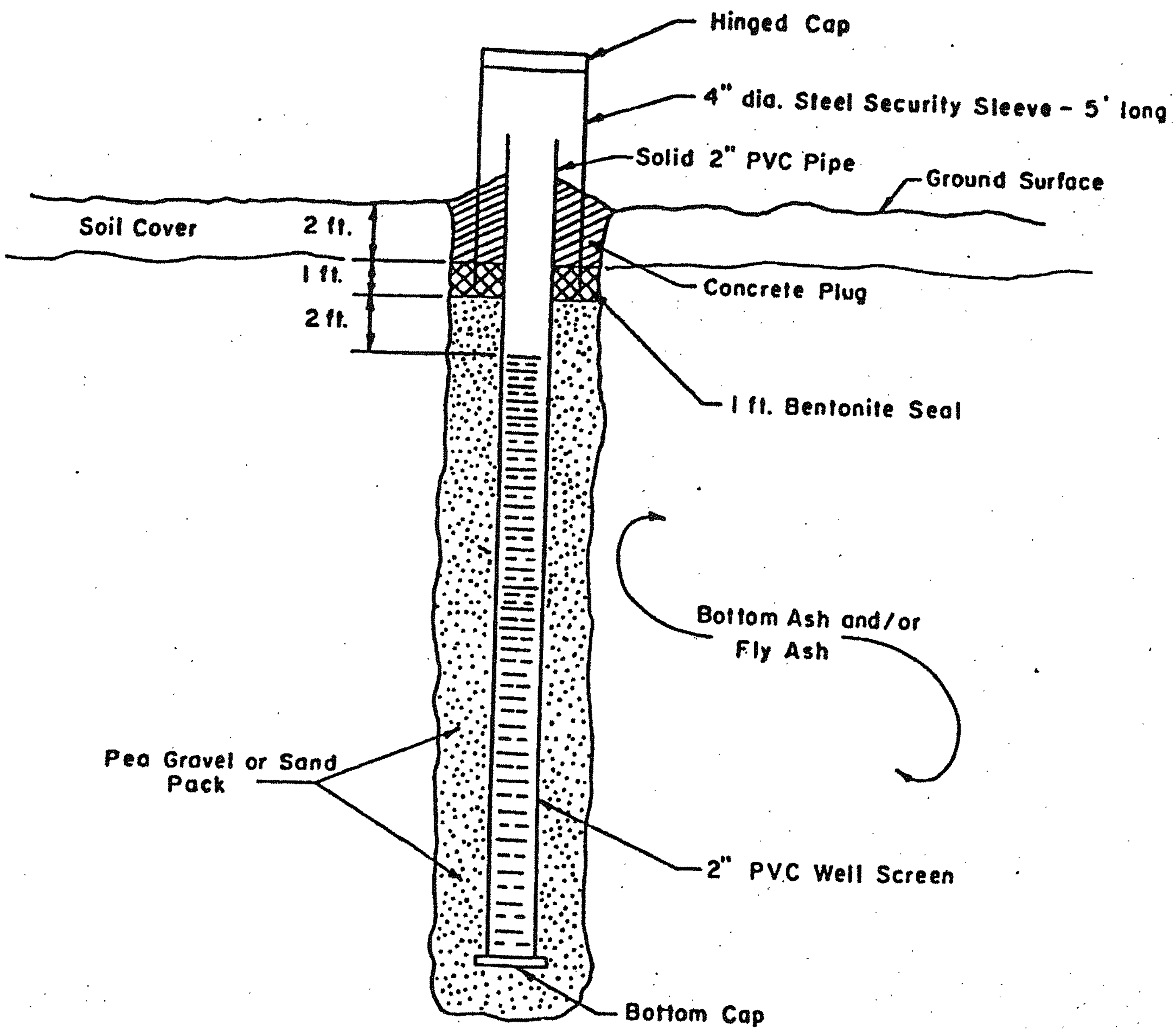
All wells installed in accordance with the attached "Exhibit 2", "Typical Observation Well Construction:.

A....All borings are plotted to a scale of 1"=...8... ft., using ...ground surface as a fixed datum.

B....Classifications are made from visual inspection of samples and are our opinion thereof.

C....Water Levels (WL). Figure indicates time of reading (hours) after completion of boring. Water levels indicated are those observed when borings were made, or as noted. Porosity of the soil strata, variations of rainfall, site topography, etc., may cause changes in these levels.

D....Figures in right hand column indicate number of blows required to drive 2" O.D. sampling spoon (6" u.n.o.), using a 140 lb. weight falling 30 inches.



NOTE:

Install screen to the base of the pond or as determined in the field during well installations.

NO SCALE

Typical Observation Well Construction	Coffeen Ash Pond No. 2 Coffeen Power Station Central Illinois Public Service Company
HANSON ENGINEERS SPRINGFIELD, IL • PEORIA, IL • ROCKFORD, IL	Exhibit 2

Illinois Environmental Protection Agency — Well Completion Report

Site #:
County: Montgomery
Well #: G401

Site Name: Coffeen Power Station
Borehole #: G401

State Plane Coordinate: X 872,510.6 Y 2,515,614.8 (or) Latitude: ______ Longitude: ______

Surveyed By: Gary C. Rogers
IL Registration #: 035-002957

Drilling Contractor: Ramsey
Driller: D. Crump

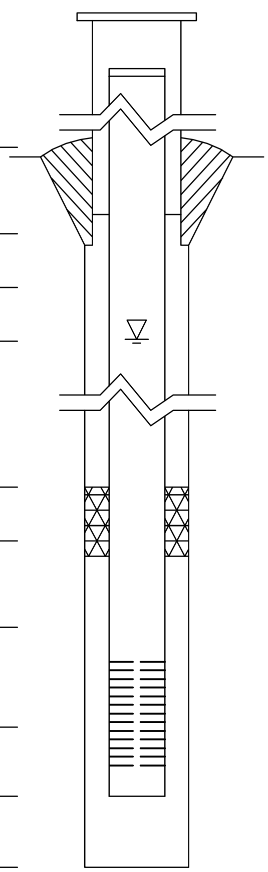
Consulting Firm: Hanson Professional Services Inc.
Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger
Drilling Fluid (Type): none

Logged By: Rhonald W. Hasenyager
Date Started: 9/14/2015 Date Finished: 9/14/2015

Report Form Completed By: Suzanna L. Keim
Date: 10/7/2015

ANNULAR SPACE DETAILS



Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite Chips

Installation Method: Gravity

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) — Granular

Installation Method: Gravity

Setting Time: 25 minutes

Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method:

Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.84	-2.81	Top of Protective Casing
625.57	-2.54	Top of Riser Pipe
623.03	0.00	Ground Surface
621.33	1.70	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
610.12	12.91	Top of Sand Pack
608.67	14.36	Top of Screen
604.24	18.79	Bottom of Screen
603.74	19.29	Bottom of Well
603.73	19.30	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	16.70
Bottom of Screen to End Cap	(feet)	0.50
Screen Length (1st slot to last slot)	(feet)	4.63
Total Length of Casing	(feet)	21.83
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Screen	SS304	SS316	PTFE	PVC (circled)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G403

Site Name: Coffeen Power Station Borehole #: G403

State Plane Coordinate: X 873,561.3 Y 2,514,616.6 (or) Latitude: ______ Longitude: ______

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Ramsey Driller: D. Crump

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld Date Started: 9/11/2015 Date Finished: 9/11/2015

Report Form Completed By: Suzanna L. Keim Date: 10/7/2015

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite Chips

Installation Method: Gravity

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: n/a

Setting Time: n/a

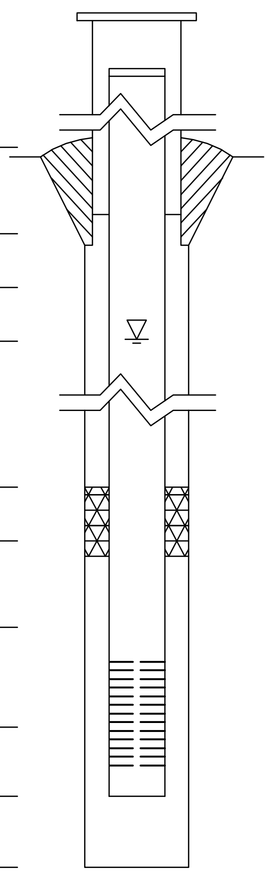
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.72	-2.91	Top of Protective Casing
626.47	-2.66	Top of Riser Pipe
623.81	0.00	Ground Surface
621.81	2.00	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
612.64	11.17	Top of Sand Pack
610.70	13.11	Top of Screen
606.03	17.78	Bottom of Screen
605.66	18.15	Bottom of Well
605.66	18.15	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	15.77
Bottom of Screen to End Cap	(feet)	0.37
Screen Length (1st slot to last slot)	(feet)	4.67
Total Length of Casing	(feet)	20.81
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Screen	SS304	SS316	PTFE	PVC (circled)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G404

Site Name: Coffeen Energy Center Borehole #: SB22

State Plane Coordinate: X 2,516,397.9 Y 873,999.8 (or) Latitude: ______ Longitude: ______

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: A. Rachford

Consulting Firm: Hanson Professional Services Inc. Geologist: , LPG #

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Rhonald W. Hasenyager Date Started: 5/1/2007 Date Finished: 5/1/2007

Report Form Completed By: Rhonald W. Hasenyager Date: 5/2/2007

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: gravity

Setting Time: >12 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

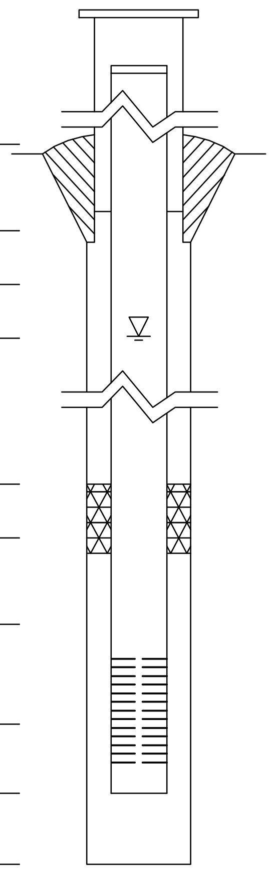
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: gravity

Type of Backfill Material: Formation sand (if applicable)

Installation Method: slough



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
616.02	-2.92	Top of Protective Casing
615.77	-2.67	Top of Riser Pipe
613.10	0.00	Ground Surface
613.10	0.00	Top of Annular Sealant
611.03	2.07	Static Water Level (After Completion) 5/10/2007
n/a	n/a	Top of Seal
608.05	5.05	Top of Sand Pack
606.68	6.42	Top of Screen
601.93	11.17	Bottom of Screen
601.48	11.62	Bottom of Well
601.10	12.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	9.09
Bottom of Screen to End Cap	(feet)	0.45
Screen Length (1st slot to last slot)	(feet)	4.75
Total Length of Casing	(feet)	14.29
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G405

Site Name: Coffeen Energy Center Borehole #: SB21

State Plane Coordinate: X 2,515,335.7 Y 873,996.8 (or) Latitude: ___ ___ ___ Longitude: ___ ___ ___

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: A. Rachford

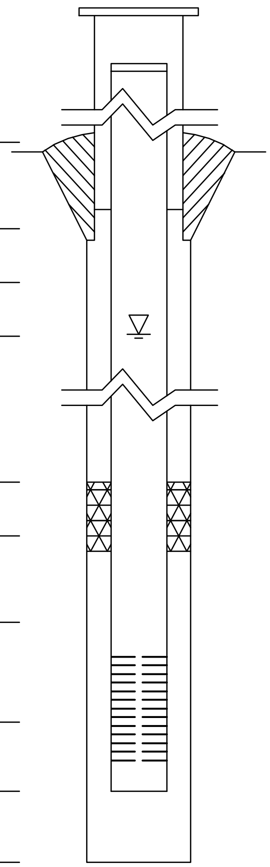
Consulting Firm: Hanson Professional Services Inc. Geologist: , LPG #

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Rhonald W. Hasenyager Date Started: 5/1/2007 Date Finished: 5/1/2007

Report Form Completed By: Rhonald W. Hasenyager Date: 5/2/2007

ANNULAR SPACE DETAILS



	Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
	624.04	-3.14	Top of Protective Casing
	623.78	-2.88	Top of Riser Pipe
Type of Surface Seal: Concrete	620.90	0.00	Ground Surface
Type of Annular Sealant: Bentonite chips	620.90	0.00	Top of Annular Sealant
Installation Method: gravity			
Setting Time: >12 hours	619.67	1.23	Static Water Level (After Completion) 5/10/2007
Type of Bentonite Seal -- Granular Pellet Slurry (choose one)			
Installation Method:	n/a	n/a	Top of Seal
Setting Time:	613.19	7.71	Top of Sand Pack
Type of Sand Pack: Quartz sand			
Grain Size: 10/20 (sieve size)	611.89	9.01	Top of Screen
Installation Method: gravity			
	607.14	13.76	Bottom of Screen
Type of Backfill Material: (if applicable)	606.69	14.21	Bottom of Well
Installation Method:	606.69	14.21	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	11.89
Bottom of Screen to End Cap	(feet)	0.45
Screen Length (1st slot to last slot)	(feet)	4.75
Total Length of Casing	(feet)	17.09
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G45D

Site Name: Coffeen Power Station - Ash Pond 2 Borehole #: G405D

State Plane Coordinate: X 2,515,322.2 Y 873,998.0 (or) Latitude: 39° 3' 51.657" Longitude: -89° 23' 46.612"

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Bulldog Drilling, Inc. Driller: J. Dittmaier

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld Date Started: 8/16/2016 Date Finished: 8/17/2016

Report Form Completed By: Suzanna L. Keim Date: 8/24/2016

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 38 minutes

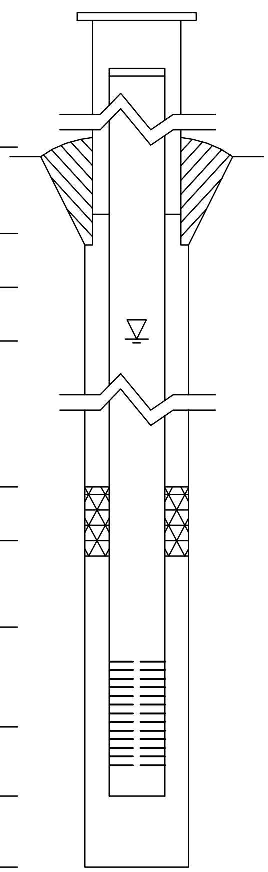
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
624.16	-3.22	Top of Protective Casing
623.81	-2.87	Top of Riser Pipe
620.94	0.00	Ground Surface
618.94	2.00	Top of Annular Sealant
584.66	36.28	Static Water Level (After Completion) 8/29/2016
590.59	30.35	Top of Seal
589.62	31.32	Top of Sand Pack
589.06	31.88	Top of Screen
579.42	41.52	Bottom of Screen
579.02	41.92	Bottom of Well
578.94	42.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	34.75
Bottom of Screen to End Cap	(feet)	0.40
Screen Length (1st slot to last slot)	(feet)	9.64
Total Length of Casing	(feet)	44.79
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: County: Montgomery Well #: G406

Site Name: Coffeen Power Station - Ash Pond 2 Borehole #: G406

State Plane Coordinate: X 2,514,702.4 Y 872,521.3 (or) Latitude: 39° 3' 37.114" Longitude: -89° 23' 54.628"

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Bulldog Drilling, Inc. Driller: J. Dittmaier

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld Date Started: 8/19/2016 Date Finished: 8/19/2016

Report Form Completed By: Suzanna L. Keim Date: 8/24/2016

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hours

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 30 minutes

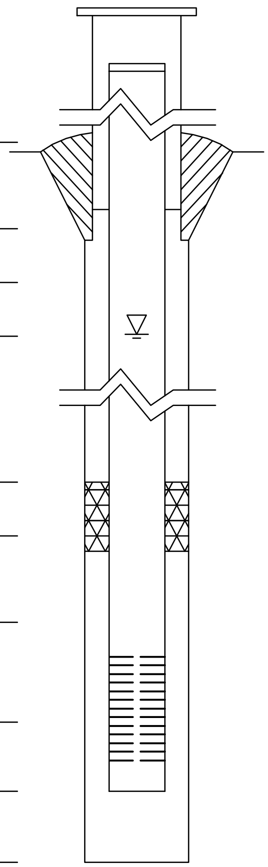
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method:



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.70	-3.84	Top of Protective Casing
625.36	-3.50	Top of Riser Pipe
621.86	0.00	Ground Surface
619.86	2.00	Top of Annular Sealant
		Static Water Level (After Completion)
610.74	11.12	Top of Seal
609.65	12.21	Top of Sand Pack
608.30	13.56	Top of Screen
603.49	18.37	Bottom of Screen
603.11	18.75	Bottom of Well
603.11	18.75	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.06
Bottom of Screen to End Cap	(feet)	0.38
Screen Length (1st slot to last slot)	(feet)	4.81
Total Length of Casing	(feet)	22.25
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel (circled)
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Screen	SS304	SS316	PTFE	PVC (circled)	OTHER:

Illinois Environmental Protection Agency

Well Completion Report

Site #: ______ County: Montgomery Well #: G46D

Site Name: Coffeen Power Station - Ash Pond 2 Borehole #: G406D

State Plane Coordinate: X 2,514,697.8 Y 872,519.7 (or) Latitude: 39° 3' 37.098" Longitude: -89° 23' 54.687"

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Bulldog Drilling, Inc. Driller: J. Dittmaier

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld Date Started: 8/19/2016 Date Finished: 8/19/2016

Report Form Completed By: Suzanna L. Keim Date: 8/24/2016

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: >12 hours

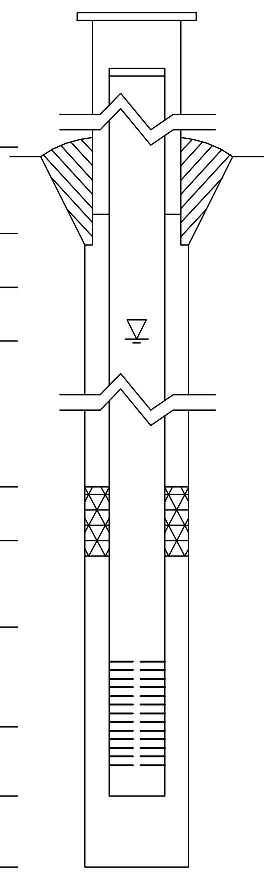
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.53	-3.62	Top of Protective Casing
625.24	-3.33	Top of Riser Pipe
621.91	0.00	Ground Surface
619.91	2.00	Top of Annular Sealant
589.60	32.31	Static Water Level (After Completion) 8/29/2016
582.34	39.57	Top of Seal
581.21	40.70	Top of Sand Pack
580.30	41.61	Top of Screen
570.65	51.26	Bottom of Screen
570.26	51.65	Bottom of Well
569.91	52.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	44.94
Bottom of Screen to End Cap	(feet)	0.39
Screen Length (1st slot to last slot)	(feet)	9.65
Total Length of Casing	(feet)	54.98
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G407

Site Name: Coffeen Power Station - Ash Pond 2 Borehole #: G407

State Plane Coordinate: X 2,513,705.9 Y 872,973.4 (or) Latitude: 39° 3' 41.665" Longitude: -89° 24' 7.213"

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Bulldog Drilling, Inc. Driller: J. Dittmaier

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld Date Started: 8/16/2016 Date Finished: 8/16/2016

Report Form Completed By: Suzanna L. Keim Date: 8/24/2016

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) — selected: Granular

Installation Method: Gravity

Setting Time: 15 minutes

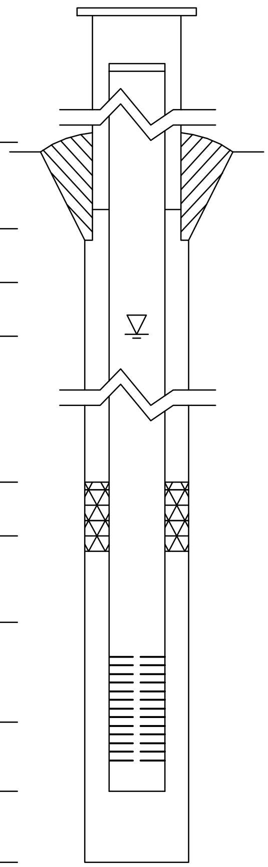
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz Sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
621.70	-3.35	Top of Protective Casing
621.32	-2.97	Top of Riser Pipe
618.35	0.00	Ground Surface
616.35	2.00	Top of Annular Sealant
		Static Water Level (After Completion)
607.50	10.85	Top of Seal
605.50	12.85	Top of Sand Pack
604.57	13.78	Top of Screen
599.74	18.61	Bottom of Screen
599.31	19.04	Bottom of Well
598.35	20.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	16.75
Bottom of Screen to End Cap	(feet)	0.43
Screen Length (1st slot to last slot)	(feet)	4.83
Total Length of Casing	(feet)	22.01
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (selected)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (selected)	OTHER:
Screen	SS304	SS316	PTFE	PVC (selected)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: T408

Site Name: Coffeen Power Station - Ash Pond 2 Borehole #: T408

State Plane Coordinate: X 2,515,314.9 Y 873,999.4 (or) Latitude: 39° 3' 51.671" Longitude: -89° 23' 46.704"

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Bulldog Drilling, Inc. Driller: J. Dittmaier

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld Date Started: 8/17/2016 Date Finished: 8/17/2016

Report Form Completed By: Suzanna L. Keim Date: 8/24/2016

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 30 minutes

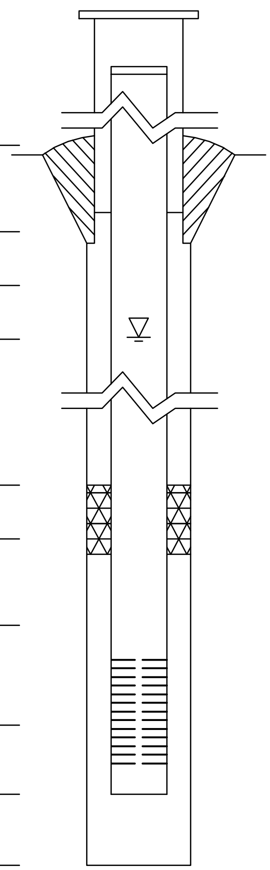
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: ______ (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
624.44	-3.35	Top of Protective Casing
624.08	-2.99	Top of Riser Pipe
621.09	0.00	Ground Surface
619.09	2.00	Top of Annular Sealant
618.21	2.88	Static Water Level (After Completion) 9/1/2016
602.99	18.10	Top of Seal
602.04	19.05	Top of Sand Pack
600.43	20.66	Top of Screen
595.60	25.49	Bottom of Screen
595.17	25.92	Bottom of Well
595.17	25.92	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	23.65
Bottom of Screen to End Cap	(feet)	0.43
Screen Length (1st slot to last slot)	(feet)	4.83
Total Length of Casing	(feet)	28.91
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: T409

Site Name: Coffeen Power Station - Ash Pond 2 Borehole #: T409

State Plane Coordinate: X 2,514,693.9 Y 872,517.8 (or) Latitude: 39° 3' 37.079" Longitude: -89° 23' 54.736"

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Bulldog Drilling, Inc. Driller: J. Dittmaier

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld Date Started: 8/19/2016 Date Finished: 8/19/2016

Report Form Completed By: Suzanna L. Keim Date: 8/24/2016

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 30 minutes

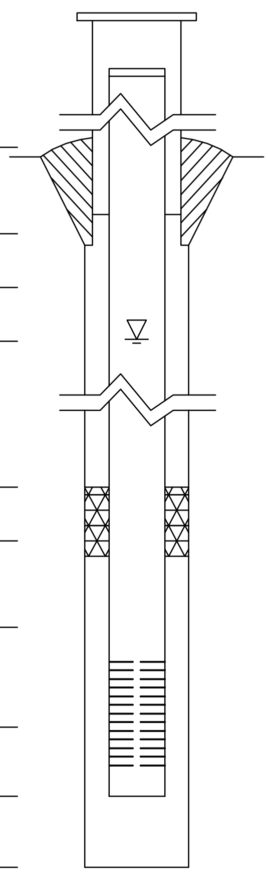
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: ______ (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.35	-3.50	Top of Protective Casing
625.01	-3.16	Top of Riser Pipe
621.85	0.00	Ground Surface
619.85	2.00	Top of Annular Sealant
615.80	6.05	Static Water Level (After Completion) 8/31/2016
602.65	19.20	Top of Seal
601.30	20.55	Top of Sand Pack
600.06	21.79	Top of Screen
595.26	26.59	Bottom of Screen
594.86	26.99	Bottom of Well
594.86	26.99	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	24.95
Bottom of Screen to End Cap	(feet)	0.40
Screen Length (1st slot to last slot)	(feet)	4.80
Total Length of Casing	(feet)	30.15
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

APPENDIX A2

GMF RECYCLE POND

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/9/2009
Finish: 9/10/2009
WEATHER: Sunny, warm (70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

BOREHOLE ID: G271
Well ID: G271
Surface Elev: 622.89 ft. MSL
Completion: 16.00 ft. BGS
Station: 874,239.38N
2,515,517.12E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.70 - While drilling
▼ = 12.50 - 9/21/09
▽ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) Failure Type
1A	20/24 *83%*	SS	*2-5 5-6* N=10	27		
2A	24/24 *100%*	SS	*2-6 5-5* N=11	23		
3A	23/24 *96%*	SS	*4-5 4-5* N=9	18		
4A	24/24 *100%*	SS	*2-4 4-5* N=8	17		
5A	24/24 *100%*	SS	*2-4 4-6* N=8	20		
6A	24/24 *100%*	SS	*2-4 4-5* N=8	22		
6B				20		
7A				20		
7B	20/24 *83%*	SS	*2-2 3-7* N=5	19		
8A	24/24 *100%*	SS	*10-19 30-33* N=49	7		

Depth ft. BGS — **Lithologic Description** — Borehole Detail — Elevation ft. MSL — Remarks

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16. Elevation scale: 622, 620, 618, 616, 614, 612, 610, 608.

- FILL - Yellowish brown (10YR5/4), moist, firm, silty CLAY with trace sand.
- Grayish brown (10YR5/2), dry, friable, clayey SILT.
- Yellowish brown (10YR5/6) with 10% gray (10YR6/1) mottles, moist, firm, silty CLAY with trace sand and slight trace gravel.
- Gray (10YR6/1), moist, firm, very silty CLAY with slight trace sand.
- Gray (10YR5/1) with 30% brownish yellow (10YR6/6) mottles, moist, firm, silty CLAY with sand and trace gravel.
- Very dark gray (10YR3/1), organic-rich (PEAT), silty CLAY and trace sand.
- Brownish yellow (10YR6/8) with 20% gray (10YR5/1) mottles, moist, firm, silty CLAY with sand and trace gravel.
- Gray (10YR6/1) with 20% brownish yellow (10YR6/8) mottles, very moist, soft, sandy CLAY with silt and slight trace gravel.
- Brownish yellow (10YR6/6), very moist to wet, soft, sandy CLAY with silt and slight trace gravel.
- Gray (10YR6/1), wet, loose, very fine to medium SAND with silt.
- Gray (10YR5/1), slightly moist, hard, very silty CLAY with sand and gravel.

End of Boring = 16.0 ft. BGS

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station	**CONTRACTOR:** Layne-Western Co		
Site: CCB Management Facility	**Rig mfg/model:** CME-750 ATV Drill	**BOREHOLE ID:** G272	
Location: Coffeen, Illinois	**Drilling Method:** 4¼" HSA w/SS & CME samplers	**Well ID:** G272	
Project: 05S3004A		**Surface Elev:** 620.72 ft. MSL	
DATES: Start: 9/10/2009	**FIELD STAFF: Driller:** G. Mills	**Completion:** 14.32 ft. BGS	
Finish: 9/10/2009	**Helper:** J. Twellman	**Station:** 874,234.83N	
WEATHER: Sunny, warm (70's)	**Eng/Geo:** R. Hasenyager	2,515,744.99E	

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.00 - While drilling
▼ = 9.49 - 9/21/09
▽ =

Number	Recov / Total (in) % Recovery	Type	Blows / 6 in N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) Qp (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	20/24 83%	SS	3-2 3-4 N=5	18			0–1.8	FILL - Brownish yellow (10YR6/6) with 30% gray (10YR5/1) mottles, moist, firm, silty CLAY with trace sand and slight trace gravel.	620	
2A	24/24 100%	SS	4-5 6-7 N=11	25			2, 4	Brownish yellow (10YR6/6) with 20% brownish yellow (10YR6/8) and 20% gray (10YR5/1) mottles, moist, firm, silty CLAY with trace sand and slight trace gravel.	618	
3A	23/24 96%	SS	2-4 4-6 N=8	18					616	
3B				17			6	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY with sand and trace gravel.		
4A	24/24 100%	SS	3-4 4-4 N=8	20			8		614	
5A	23/24 96%	SS	2-3 3-5 N=6	21			▼ 10	Yellowish brown (10YR5/8) with 15% gray (10YR6/1) mottles, moist, soft, silty CLAY with sand and slight trace gravel.	612	
6A	22/24 92%	SS	2-3 3-3 N=6	23				Gray (10YR6/1) with 30% brownish yellow (10YR6/6) mottles, very moist, soft, silty CLAY with sand and slight trace gravel.	610	
7A	18/24 75%	SS	2-9 15-21 N=24	14			12, ▼	Gray (10YR6/1), very moist, loose, SILT and very fine sand.	608	
								Gray (10YR6/1), wet, loose, SILT and very fine sand.		
7B				10			14	Yellowish brown (10YR5/6), moist, hard, very silty CLAY with sand and trace gravel.		

End of Boring = 14.3 ft. BGS

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/10/2009
Finish: 9/10/2009
WEATHER: Sunny, warm (70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

BOREHOLE ID: G273
Well ID: G273
Surface Elev: 620.17 ft. MSL
Completion: 16.00 ft. BGS
Station: 874,235.24N
2,515,975.49E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.50 - While drilling
▼ = 9.89 - 9/21/09
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) Failure Type
1A	16/24 *67%*	SS	*3-3 3-3* N=6	24		
2A	24/24 *100%*	SS	*3-4 5-7* N=9	28		
3A				18		
3B	24/24 *100%*	SS	*3-5 6-8* N=11	25		
4A				19		
4B	24/24 *100%*	SS	*3-5 5-6* N=10	16		
5A	23/24 *96%*	SS	*2-4 5-4* N=9	19		
5B				21		
6A	24/24 *100%*	SS	*1-2 3-4* N=5	19		
7A	24/24 *100%*	SS	*4-8 17-24* N=25	11		
7B				11		
8A	22/24 *92%*	SS	*9-22 22-23* N=44	8		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0–2	FILL -Dark yellowish brown (10YR4/6), moist, firm, silty CLAY with slight trace sand.	620
2–4.4	FILL - Gray (10YR5/1) with 20% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with slight trace sand and gravel.	618, 616
4.4–5.8	Brownish yellow (10YR6/8) with 40% gray (10YR5/1) mottles, moist, firm, silty CLAY with trace sand and slight trace gravel.	
5.8–6.8	Gray (10YR6/1) with 10% brownish yellow(10YR6/6) mottles, moist, firm, silty CLAY with trace sand and slight trace gravel.	614
6.8–9.2	Gray (10YR5/1), moist, firm, silty CLAY with sand and trace gravel.	612
9.2–10	Yellowish brown (10YR5/8) with 30% gray (10YR6/1) mottles, moist, soft, sandy CLAY with silty and slight trace gravel.	610
10–12.2	Brownish yellow (10YR6/8) with 10% gray (10YR6/1) mottles, very moist, soft, sandy CLAY with silt and slight trace gravel.	608
12.2–13.5	Gray (10YR6/1), moist, hard, very silty CLAY with sand and trace gravel.	
13.5–14	Light yellowish brown (10YR6/4), wet, loose, very fine- to very coarse-grained SAND with trace silt.	606
14–14.7	Light yellowish brown (10YR6/4), wet, dense, sandy, silty CLAY.	
14.7–16	Gray (10YR6/1), moist, hard, very silty CLAY with sand and trace gravel.	

End of Boring = 16.0 ft. BGS

Borehole Detail

Remarks

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/16/2009
Finish: 9/16/2009
WEATHER: Sunny, warm (80's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

BOREHOLE ID: G274
Well ID: G274
Surface Elev: 621.67 ft. MSL
Completion: 18.06 ft. BGS
Station: 874,239.25N
2,516,195.60E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 16.00 - While drilling
▼ = 13.12 - 9/21/09
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type
1A	20/24 *83%*	SS	*2-3 3-4* N=6	17		
2A	24/24 *100%*	SS	*4-6 7-9* N=13	25		
3A	24/24 *100%*	SS	*3-4 6-9* N=10	26		
3B				21		
4A	16/24 *67%*	SS	*3-6 6-8* N=12	24		
5A	24/24 *100%*	SS	*2-4 4-6* N=8	20		
6A	22/24 *92%*	SS	*1-3 4-6* N=7	19		
7A	23/24 *96%*	SS	*1-2 4-4* N=6	21		
8A	22/24 *92%*	SS	*1-3 3-6* N=6	17		
9A	14/24 *58%*	SS	*wor-4 9-11* N=13	13		
9B				13		

Depth ft. BGS	Lithologic Description
0 – ~5.6	FILL - Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY with trace sand and slight trace gravel.
~5.6 – ~8.5	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY with slight trace sand and gravel.
~8.5 – ~10.4	Dark gray (10YR4/1) with 15% yellowish brown (10YR5/8) mottles, moist, soft, silty CLAY with trace sand and slight trace gravel.
~10.4 – ~15.4	Gray (10YR5/1) with 30% yellowish brown (10YR5/8) mottles, moist, soft, silty CLAY with sand and trace gravel.
~15.4 – 16	Yellowish brown (10YR5/8), very moist, soft, silty CLAY with sand and trace gravel.
16 – ~17	Brownish yellow (10YR6/6), wet, loose, very fine- to very coarse-grained SAND.
~17 – ~17.7	Brownish yellow (10YR6/6), moist, firm, very silty CLAY with sand and gravel.
~17.7 – 18.1	Gray (10YR6/1), moist, hard, very silty CLAY with sand and gravel.

End of Boring = 18.1 ft. BGS

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18
Elevation ft. MSL: 620, 618, 616, 614, 612, 610, 608, 606, 604

Borehole Detail | Remarks

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/16/2009
Finish: 9/16/2009
WEATHER: Sunny, warm (80's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

BOREHOLE ID: G275
Well ID: G275
Surface Elev: 616.14 ft. MSL
Completion: 13.19 ft. BGS
Station: 874,298.94N
2,516,375.86E

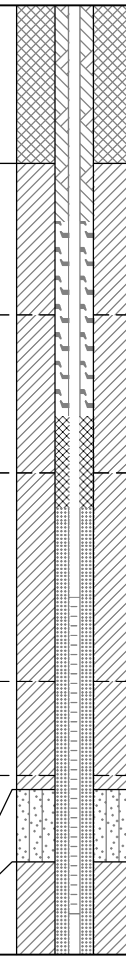
TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 10.90 - While drilling
▼ = 10.25 - 9/21/09
▽ =

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Qp* (tsf) Failure Type
1A	22/24 *92%*	SS	*2-4 4-6* N=8	22		
2A	18/24 *75%*	SS	*3-6 7-7* N=13	19		
3A	24/24 *100%*	SS	*2-4 4-5* N=8	22		
4A	24/24 *100%*	SS	*2-3 4-6* N=7	17		
5A	24/24 *100%*	SS	*1-2 3-3* N=5	18		
5B				21		
6A				16		
6B	20/24 *83%*	SS	*woh-4 5-2* N=9	13		
6C				15		
7A	12/12 *100%*	SS	*10-35*	8		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0 – 2.2	FILL - Gray (10YR5/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with trace sand and slight trace gravel.	616 – 614	
2.2 – 4.3	Dark gray (10YR4/1) with 20% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with slight trace sand and gravel.	614 – 612	
4.3 – 6.5	Gray (10YR6/1), moist, soft, silty CLAY with sand and slight trace gravel.	612 – 610	
6.5 – 9.4	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist, soft, silty CLAY with sand and slight trace gravel.	610 – 608	
9.4 – 10.7	Yellowish brown (10YR5/8) with 15% gray (10YR6/1) mottles, very moist, soft, silty CLAY with sand and trace gravel.	606	
10.7 – 11.6	Gray (10YR6/1) with 20% yellowish brown (10YR5/8) mottles, very moist, very soft, silty CLAY with sand and trace gravel.		
11.6 – 12.2	Gray (10YR6/1), wet, loose, very fine- to very coarse-grained SAND with trace gravel.	604	
12.2 – 13.2	Yellowish brown (10YR5/6), moist, hard, very silty CLAY with sand and gravel.		

Borehole Detail



End of Boring = 13.2 ft. BGS

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/16/2009
Finish: 9/16/2009
WEATHER: Sunny, mild (70'S)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

BOREHOLE ID: G276
Well ID: G276
Surface Elev: 629.14 ft. MSL
Completion: 28.00 ft. BGS
Station: 874,438.60N
2,516,358.83E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = 25.55 - 9/21/09
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	17/24 *71%*	SS	*5-8 9-10* N=17	10			0–6	FILL - Yellowish brown (10YR5/4) with 20% gray (10YR5/1) mottles, moist, hard, silty CLAY with trace sand and slight trace gravel.		
2A	19/24 *79%*	SS	*7-7 10-14* N=17	15						
3A	11/24 *46%*	SS	*5-10 14-27* N=24	14						Rock fragment in split spoon shoe
4A	24/24 *100%*	SS	*5-9 10-14* N=19	8			6–7	FILL - Yellowish brown (10YR5/4) with 20% gray (10YR5/1) mottles, slightly moist, hard, silty CLAY with trace sand and slight trace gravel.		
4B				5			7–8.3	FILL - Yellowish brown (10YR5/4) with 10% gray (10YR5/1) mottles, slightly moist, hard, friable, clayey SILT with sand and trace gravel.		
5A	17/24 *71%*	SS	*4-4 8-19* N=12	22			8.3–13	FILL - Yellowish brown (10YR5/4) with 25% gray (10YR5/1) mottles, slightly moist, firm, silty CLAY with slight trace sand and gravel.		
6A	17/24 *71%*	SS	*4-5 8-14* N=13	14						
7A	16/24 *67%*	SS	*6-7 2-4* N=9	20			13–16.8	Gray (10YR6/1) with 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with slight trace sand and gravel.		
8A	20/24 *83%*	SS	*2-4 6-6* N=10	21						
9A				17						
9B	22/24 *92%*	SS	*1-4 5-7* N=9	13			16.8–18.4	Gray (10YR6/1) with 20% yellowish brown (10YR5/6) mottles, moist, soft, sandy CLAY with silt and slight trace gravel.		
10A	23/24 *96%*	SS	*2-3 8-12* N=11	20			18.4–20	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and slight trace gravel.		

Depth scale (ft. BGS): 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Elevation scale (ft. MSL): 628, 626, 624, 622, 620, 618, 616, 614, 612, 610

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/16/2009
Finish: 9/16/2009
WEATHER: Sunny, mild (70'S)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

BOREHOLE ID: G276
Well ID: G276
Surface Elev: 629.14 ft. MSL
Completion: 28.00 ft. BGS
Station: 874,438.60N
2,516,358.83E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = 25.55 - 9/21/09
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
11A	24/24 *100%*	SS	*1-3* *5-7* N=8	21			22	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and slight trace gravel. *[Continued from previous page]*	608	
12A	24/24 *100%*	SS	*1-4* *6-7* N=10	16			24	Yellowish brown (10YR5/8), moist, firm, silty CLAY with sand and slight trace gravel.	606	
13A	24/24 *100%*	SS	*2-3* *4-6* N=7	16				Gray (10YR6/1) with 25% yellowish brown (10YR5/6) mottles, very moist, soft, silty CLAY with sand and trace gravel.	604	
							▼	Gray (10YR6/1), very moist, loose, very fine- to fine-grained, SAND		
14A	24/24 *100%*	SS	*1-5* *15-29* N=20	16			26	Gray (10YR6/1) with 25% yellowish brown (10YR5/6) mottles, very moist, soft, silty CLAY with sand and trace gravel.		
								Gray (10YR6/1), very moist, firm, clayey SILT with trace very fine-grained sand.	602	
								Gray (10YR6/1) with 40% yellowish brown (10YR5/4) mottles, moist, hard, very silty CLAY with sand and trace gravel.		
							28	Yellowish brown (10YR5/4), moist, hard, very silty CLAY with sand and trace gravel.		

End of Boring = 28.0 ft. BGS

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/14/2009
Finish: 9/14/2009
WEATHER: Sunny, mild (70'S)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

BOREHOLE ID: G277
Well ID: G277
Surface Elev: 620.79 ft. MSL
Completion: 20.00 ft. BGS
Station: 874,581.80N
2,516,370.51E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 16.40 - While drilling
▼ = 18.23 - 9/21/09
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type
1A	23/24 *96%*	SS	*2-2 4-6* N=6	21		
2A	24/24 *100%*	SS	*2-4 6-7* N=10	22		
2B				16		
3A				11		
3B	17/24 *71%*	SS	*4-7 9-11* N=16	22		
4A	18/24 *75%*	SS	*4-8 8-6* N=16	13		
5A	19/24 *79%*	SS	*3-7 8-9* N=15	12		
6A	22/24 *92%*	SS	*3-9 9-10* N=18	14		
6B				16		
7A	18/24 *75%*	SS	*3-5 7-9* N=12	17		
8A	22/24 *92%*	SS	*2-5 5-8* N=10	12		
9A	22/24 *92%*	SS	*1-2 3-3* N=5	14		
10A				11		
10B	23/24 *96%*	SS	*1-3 19-47* N=22	9		
10						

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0	FILL - Yellowish brown (10YR5/4) with 10% yellowish brown (10YR5/8) mottles, very moist, soft, silty CLAY with slight trace sand and gravel.	620
2	FILL - Yellowish brown (10YR5/4) with 20% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with slight trace sand and gravel.	618
	Yellowish brown (10YR5/4) with 20% gray (10YR5/1) and 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with slight trace sand.	
4	Light brownish gray (10YR6/2), dry, friable, clayey SILT.	616
6	Light brownish gray (10YR6/2) with 25% yellowish brown (10YR5/8) mottles, moist, firm, clayey SILT with slight trace sand.	614
8	Gray (10YR6/1) with 50% very dark grayish brown (10YR3/2) mottles, moist, hard, clayey SILT with slight trace sand and gravel.	612
10	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, hard, very silty CLAY with sand and slight trace gravel.	610
12–14	Yellowish brown (10YR5/8) with 30% gray (10YR6/1) mottles, moist, hard, silty CLAY with sand and trace gravel.	608, 606
16	Gray (10YR6/1), moist, slightly dense, silty, very fine- to very coarse-grained SAND.	
	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and trace gravel.	604
	Gray (10YR6/1) with 20% brownish yellow (10YR6/6) mottles, wet, very soft, silty, very fine- to fine-grained SAND with trace gravel.	
18	Gray (10YR6/1) with 30% grayish brown (10YR5/2) mottles, moist, soft, sandy CLAY with slight trace gravel.	
	Brownish yellow (10YR6/6) with 25% gray (10YR6/1) mottles, moist, hard, very silty CLAY with sand and trace gravel.	602
20	**End of Boring = 20.0 ft. BGS**	

Borehole Detail

Remarks

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/11/2009
Finish: 9/11/2009
WEATHER: Sunny, warm (70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

BOREHOLE ID: G278
Well ID: G278
Surface Elev: 628.85 ft. MSL
Completion: 24.06 ft. BGS
Station: 874,875.37N
2,516,200.66E

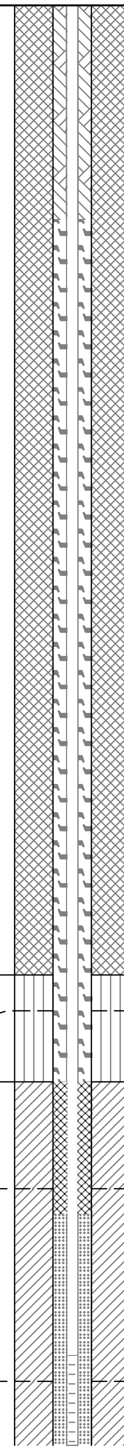
TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = 23.98 - 9/21/09
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Remarks
1A	16/24 *67%*	SS	*3-4 6-7* N=10	19			
2A	24/24 *100%*	SS	*4-7 8-11* N=15	21			
3A	22/24 *92%*	SS	*9-10 9-35* N=19	10			Rock fragment in split spoon shoe
4A	4/24 *17%*	SS	*20-7 10-8* N=17				Rock fragment in split spoon shoe
5A	14/24 *58%*	SS	*11-6 8-8* N=14	15			Rock fragment in split spoon shoe
6A	20/24 *83%*	SS	*6-4 8-9* N=12	26			
7A	24/24 *100%*	SS	*2-4 8-11* N=12	18			
8A	20/24 *83%*	SS	*4-7 10-11* N=17	12			
8B				22			
9A	22/24 *92%*	SS	*4-6 6-9* N=12	17			
10A	20/24 *83%*	SS	*2-4 5-8* N=9	21			

Depth ft. BGS	Lithologic Description
0 – 13.6	FILL - Yellowish brown (10YR5/4) with 15% yellowish brown(10YR5/8) mottles, moist, hard, silty CLAY with trace sand and slight trace gravel.
13.6 – 14.1	Gray (10YR6/1) with 30% brownish yellow (10YR6/6) mottles, moist, firm, clayey SILT with slight trace sand.
14.1 – 15.1	Very dark gray (10YR3/1), moist, firm, clayey SILT with slight trace sand and trace roots.
15.1 – 16.6	Gray (10YR5/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and trace gravel.
16.6 – 19.3	Gray (10YR6/1) with 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and trace gravel.
19.3 – 20	Yellowish brown (10YR5/8) with 20% gray (10YR5/1) mottles, moist, firm, silty CLAY with sand and trace gravel.

Borehole Detail



Elevation ft. MSL: 628, 626, 624, 622, 620, 618, 616, 614, 612, 610

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT:	AEG Coffeen Power Station	**CONTRACTOR:**	Layne-Western Co		
Site:	CCB Management Facility	**Rig mfg/model:**	CME-750 ATV Drill	**BOREHOLE ID:**	G278
Location:	Coffeen, Illinois	**Drilling Method:**	4¼" HSA w/SS & CME samplers	**Well ID:**	G278
Project:	05S3004A			**Surface Elev:**	628.85 ft. MSL
DATES: Start:	9/11/2009	**FIELD STAFF: Driller:**	G. Mills	**Completion:**	24.06 ft. BGS
Finish:	9/11/2009	**Helper:**	J. Twellman	**Station:**	874,875.37N
WEATHER:	Sunny, warm (70's)	**Eng/Geo:**	R. Hasenyager		2,516,200.66E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = 23.98 - 9/21/09
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	18/24 *75%*	SS	*2-4* *7-7* N=11	19				Yellowish brown (10YR5/8) with 20% gray (10YR5/1) mottles, moist, firm, silty CLAY with sand and trace gravel. *[Continued from previous page]*		608	
11B							22	Yellowish brown (10YR5/6), very moist, soft, silty, very fine- to medium-grained SAND.			
12A	20/24 *83%*	SS	*1-5* *10-18* N=15	16				Yellowish brown (10YR5/4), moist, hard, very silty CLAY with sand and trace gravel.		606	
12B				10			▼ 24				

End of Boring = 24.1 ft. BGS

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/10/2009
Finish: 9/10/2009
WEATHER: Sunny, warm (80's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

BOREHOLE ID: G279
Well ID: G279
Surface Elev: 629.19 ft. MSL
Completion: 28.00 ft. BGS
Station: 875,028.06N
2,516,245.60E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 23.60 - While drilling
▼ = 24.68 - 9/21/09
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) Failure Type
1A	24/24 *100%*	SS	*3-3 5-6* N=8	18		
2A	24/24 *100%*	SS	*5-9 10-11* N=19	14		
3A	24/24 *100%*	SS	*5-9 9-10* N=18	17		
4A	24/24 *100%*	SS	*4-5 7-6* N=12	21		
5A	24/24 *100%*	SS	*3-3 5-7* N=8	19		
6A	24/24 *100%*	SS	*3-4 6-9* N=10	17		
7A	23/24 *96%*	SS	*2-5 5-6* N=10	23		
8A	24/24 *100%*	SS	*2-3 7-6* N=10	23		
9A	18/24 *75%*	SS	*4-7 8-9* N=15	25		
10A	24/24 *100%*	SS	*3-6 7-10* N=13	17		

Depth ft. BGS: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Elevation ft. MSL: 628, 626, 624, 622, 620, 618, 616, 614, 612, 610

Lithologic Description

FILL - Brown (10YR4/3) with 30% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY with sand and trace gravel.

FILL - dark gray (10YR4/1) with 10% brownish yellow (10YR6/6) mottles, moist, hard, silty CLAY with sand and trace gravel.

Brownish yellow (10YR6/8) with 30% gray (10YR5/1) mottles, moist, firm, silty CLAY with slight trace sand and gravel.

Yellowish brown (10YR5/8) with 20% gray (10YR6/1) mottles, moist, firm, silty CLAY with slight trace sand and gravel.

Gray (10YR6/1) with 25% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and trace gravel.

Borehole Detail | Remarks

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/10/2009
Finish: 9/10/2009
WEATHER: Sunny, warm (80's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

BOREHOLE ID: G279
Well ID: G279
Surface Elev: 629.19 ft. MSL
Completion: 28.00 ft. BGS
Station: 875,028.06N
2,516,245.60E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 23.60 - While drilling
▼ = 24.68 - 9/21/09
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	23/24 *96%*	SS	*2-4 5-7* N=9	18				Gray (10YR6/1) with 25% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and trace gravel. *[Continued from previous page]*		608	
12A	19/24 *79%*	SS	*4-9 8-9* N=17	13			22	Yellowish brown (10YR5/8), moist, firm, clayey SILT and very fine-grained SAND with slight trace gravel.		606	
12B				12			24				
13A	17/24 *71%*	SS	*1-5 5-7* N=10	18				Light brownish gray (10YR6/2), wet, loose, very fine- to coarse-grained SAND.		604	
14A				16			26	Brownish yellow (10YR6/6), moist, hard, very silty CLAY with sand and trace gravel.			
14B	24/24 *100%*	SS	*10-10 18-18* N=28	14				Gray (10YR6/1), moist, hard, very silty CLAY with sand and trace gravel.		602	
							28	**End of Boring = 28.0 ft. BGS**			

NOTE(S):

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G271

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G271

~~State-~~ Plant ~~Plane~~ Coordinate: X 2,515,517.1 Y 874,239.4 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: G. Mills

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Rhonald W. Hasenyager Date Started: 9/9/2009 Date Finished: 9/10/2009

Report Form Completed By: Suzanna L. Simpson Date: 10/7/2009

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 10 min

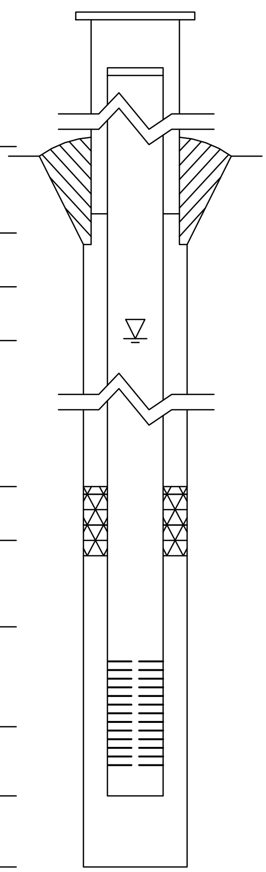
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.88	-2.99	Top of Protective Casing
625.57	-2.68	Top of Riser Pipe
622.89	0.00	Ground Surface
619.89	3.00	Top of Annular Sealant
610.39	12.50	Static Water Level (After Completion) 9/21/2009
616.16	6.73	Top of Seal
613.87	9.02	Top of Sand Pack
612.93	9.96	Top of Screen
608.58	14.31	Bottom of Screen
608.10	14.79	Bottom of Well
606.89	16.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	12.64
Bottom of Screen to End Cap	(feet)	0.48
Screen Length (1st slot to last slot)	(feet)	4.35
Total Length of Casing	(feet)	17.47
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G272

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G272

~~State~~ Plant ~~Plane~~ Coordinate: X 2,515,745.0 Y 874,234.8 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: G. Mills

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Rhonald W. Hasenyager Date Started: 9/10/2009 Date Finished: 9/10/2009

Report Form Completed By: Suzanna L. Simpson Date: 10/7/2009

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 10 min

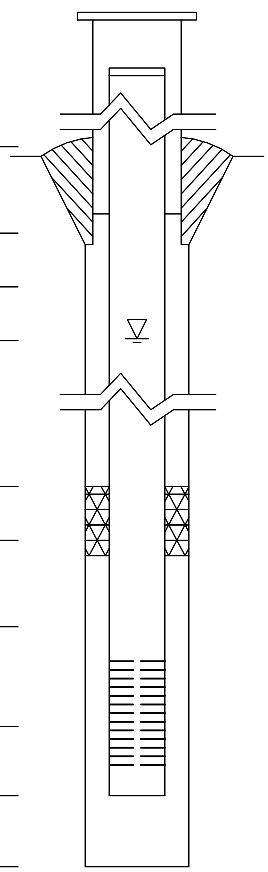
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
624.11	-3.39	Top of Protective Casing
623.81	-3.09	Top of Riser Pipe
620.72	0.00	Ground Surface
617.72	3.00	Top of Annular Sealant
611.23	9.49	Static Water Level (After Completion) 9/21/2009
614.55	6.17	Top of Seal
612.74	7.98	Top of Sand Pack
611.61	9.11	Top of Screen
606.74	13.98	Bottom of Screen
606.40	14.32	Bottom of Well
606.40	14.32	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	12.20
Bottom of Screen to End Cap	(feet)	0.34
Screen Length (1st slot to last slot)	(feet)	4.87
Total Length of Casing	(feet)	17.41
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G273

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G273

~~State-~~ Plant ~~Plane~~ Coordinate: X 2,515,975.5 Y 874,235.2 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: G. Mills

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Rhonald W. Hasenyager Date Started: 9/10/2009 Date Finished: 9/10/2009

Report Form Completed By: Suzanna L. Simpson Date: 10/7/2009

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) — Granular circled

Installation Method: Gravity

Setting Time: 10 min

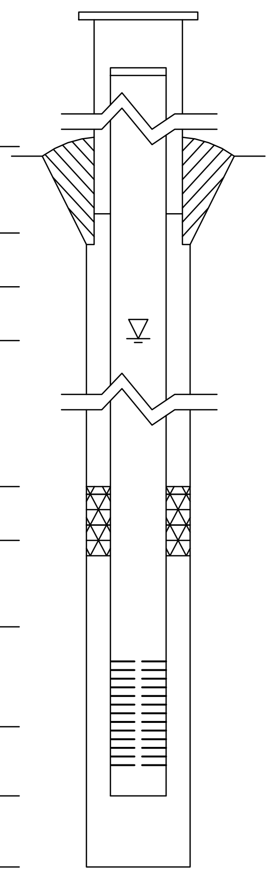
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
623.33	-3.16	Top of Protective Casing
623.02	-2.85	Top of Riser Pipe
620.17	0.00	Ground Surface
617.17	3.00	Top of Annular Sealant
610.28	9.89	Static Water Level (After Completion) 9/21/2009
614.07	6.10	Top of Seal
612.45	7.72	Top of Sand Pack
611.09	9.08	Top of Screen
605.61	14.56	Bottom of Screen
605.07	15.10	Bottom of Well
604.17	16.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	11.93
Bottom of Screen to End Cap	(feet)	0.54
Screen Length (1st slot to last slot)	(feet)	5.48
Total Length of Casing	(feet)	17.95
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____ County: Montgomery Well #: G274

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G274

~~State Plane~~ Plant Coordinate: X 2,516,195.6 Y 874,239.2 (or) Latitude: ° ' " Longitude: ° ' "

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: G. Mills

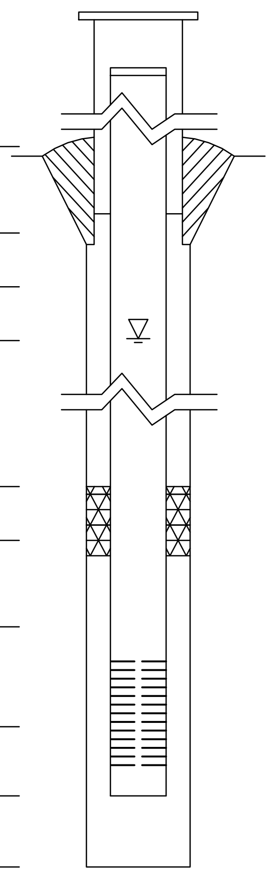
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type):

Logged By: Rhonald W. Hasenyager Date Started: 9/16/2009 Date Finished: 9/16/2009

Report Form Completed By: Suzanna L. Simpson Date: 10/7/2009

ANNULAR SPACE DETAILS



Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 15 min

Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a

Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
624.32	-2.65	Top of Protective Casing
624.04	-2.37	Top of Riser Pipe
621.67	0.00	Ground Surface
618.67	3.00	Top of Annular Sealant
608.55	13.12	Static Water Level (After Completion) 9/21/2009
611.93	9.74	Top of Seal
610.15	11.52	Top of Sand Pack
608.77	12.90	Top of Screen
604.00	17.67	Bottom of Screen
603.61	18.06	Bottom of Well
603.61	18.06	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	15.27
Bottom of Screen to End Cap	(feet)	0.39
Screen Length (1st slot to last slot)	(feet)	4.77
Total Length of Casing	(feet)	20.43
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____ County: Montgomery Well #: G275

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G275

~~State~~ Plant ~~Plane~~ Coordinate: X 2,516,375.9 Y 874,298.9 (or) Latitude: ____° ____' ____" Longitude: ____° ____' ____"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: G. Mills

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ____

Logged By: Rhonald W. Hasenyager Date Started: 9/16/2009 Date Finished: 9/16/2009

Report Form Completed By: Suzanna L. Simpson Date: 10/7/2009

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 15 min

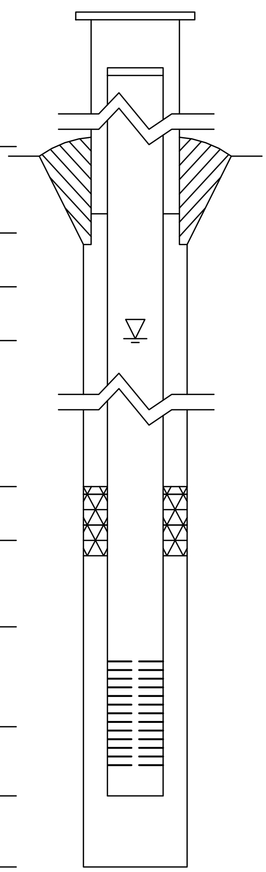
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
618.53	-2.39	Top of Protective Casing
618.26	-2.12	Top of Riser Pipe
616.14	0.00	Ground Surface
613.14	3.00	Top of Annular Sealant
605.89	10.25	Static Water Level (After Completion) 9/21/2009
610.42	5.72	Top of Seal
609.16	6.98	Top of Sand Pack
607.92	8.22	Top of Screen
603.52	12.62	Bottom of Screen
602.95	13.19	Bottom of Well
602.95	13.19	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	10.34
Bottom of Screen to End Cap	(feet)	0.52
Screen Length (1st slot to last slot)	(feet)	4.45
Total Length of Casing	(feet)	15.31
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G276

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G276

~~State-~~ Plant ~~Plane~~ Coordinate: X 2,516,358.8 Y 874,438.6 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: G. Mills

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Rhonald W. Hasenyager Date Started: 9/16/2009 Date Finished: 9/16/2009

Report Form Completed By: Suzanna L. Simpson Date: 10/7/2009

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 15 min

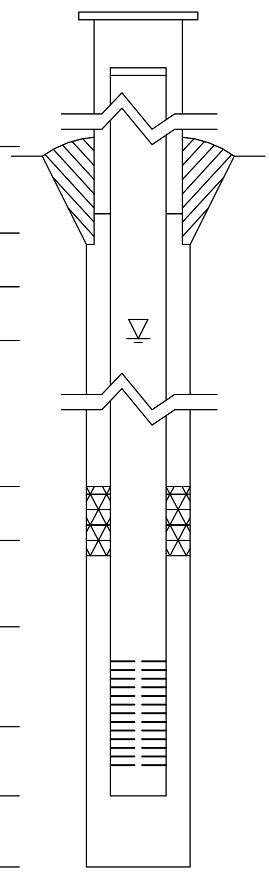
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
632.40	-3.26	Top of Protective Casing
632.00	-2.86	Top of Riser Pipe
629.14	0.00	Ground Surface
626.14	3.00	Top of Annular Sealant
603.59	25.55	Static Water Level (After Completion) 9/21/2009
610.06	19.08	Top of Seal
608.11	21.03	Top of Sand Pack
606.73	22.41	Top of Screen
601.92	27.22	Bottom of Screen
601.49	27.65	Bottom of Well
601.14	28.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	25.27
Bottom of Screen to End Cap	(feet)	0.43
Screen Length (1st slot to last slot)	(feet)	4.81
Total Length of Casing	(feet)	30.51
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency

Well Completion Report

Site #: ______ County: Montgomery Well #: G277

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G277

~~State-~~ Plant ~~Plane~~ Coordinate: X 2,516,370.5 Y 874,581.8 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: G. Mills

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Rhonald W. Hasenyager Date Started: 9/14/2009 Date Finished: 9/14/2009

Report Form Completed By: Suzanna L. Simpson Date: 10/7/2009

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 18 min

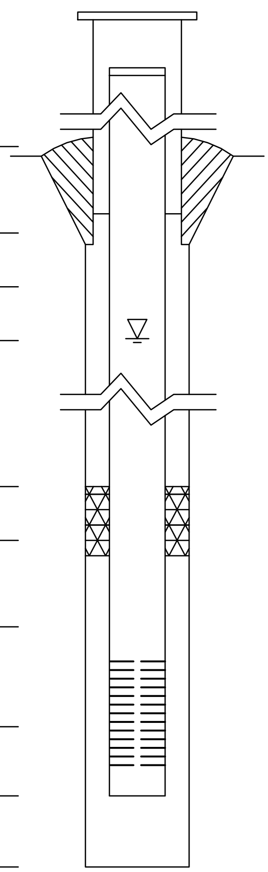
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
623.35	-2.56	Top of Protective Casing
623.08	-2.29	Top of Riser Pipe
620.79	0.00	Ground Surface
617.79	3.00	Top of Annular Sealant
602.56	18.23	Static Water Level (After Completion) 9/21/2009
608.00	12.79	Top of Seal
607.00	13.79	Top of Sand Pack
606.50	14.29	Top of Screen
602.02	18.77	Bottom of Screen
601.55	19.24	Bottom of Well
600.79	20.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	16.58
Bottom of Screen to End Cap	(feet)	0.47
Screen Length (1st slot to last slot)	(feet)	4.48
Total Length of Casing	(feet)	21.53
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel (circled)
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Screen	SS304	SS316	PTFE	PVC (circled)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G278

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G278

~~State~~ Plant ~~Plane~~ Coordinate: X 2,516,200.7 Y 874,875.4 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: G. Mills

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Rhonald W. Hasenyager Date Started: 9/11/2009 Date Finished: 9/11/2009

Report Form Completed By: Suzanna L. Simpson Date: 10/7/2009

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 22 min

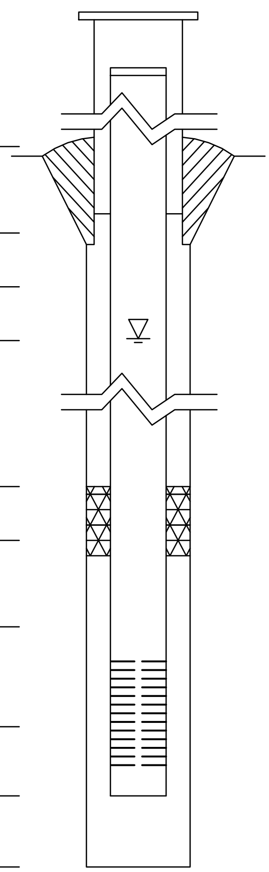
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
631.49	-2.64	Top of Protective Casing
631.17	-2.32	Top of Riser Pipe
628.85	0.00	Ground Surface
625.85	3.00	Top of Annular Sealant
604.87	23.98	Static Water Level (After Completion) 9/21/2009
613.74	15.11	Top of Seal
611.90	16.95	Top of Sand Pack
609.92	18.93	Top of Screen
605.15	23.70	Bottom of Screen
604.79	24.06	Bottom of Well
604.79	24.06	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	21.25
Bottom of Screen to End Cap	(feet)	0.36
Screen Length (1st slot to last slot)	(feet)	4.77
Total Length of Casing	(feet)	26.38
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____ County: Montgomery Well #: G279

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G279

~~State~~ Plant ~~Plane~~ Coordinate: X 2,516,245.6 Y 875,028.1 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: G. Mills

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ____

Logged By: Rhonald W. Hasenyager Date Started: 9/10/2009 Date Finished: 9/10/2009

Report Form Completed By: Suzanna L. Simpson Date: 10/7/2009

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 18 min

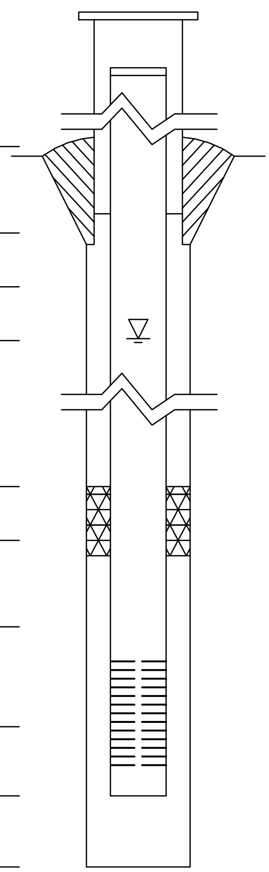
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz Sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
632.33	-3.14	Top of Protective Casing
632.04	-2.85	Top of Riser Pipe
629.19	0.00	Ground Surface
626.19	3.00	Top of Annular Sealant
601.66	27.53	Static Water Level (After Completion) 9/21/2009
610.45	18.74	Top of Seal
608.77	20.42	Top of Sand Pack
606.79	22.40	Top of Screen
602.40	26.79	Bottom of Screen
604.51	24.68	Bottom of Well
601.19	28.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	25.25
Bottom of Screen to End Cap	(feet)	0.53
Screen Length (1st slot to last slot)	(feet)	4.39
Total Length of Casing	(feet)	30.17
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

APPENDIX A3

GMF GYPSUM STACK POND

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 2/25/2008
Finish: 2/25/2008
WEATHER: Overcast, cold

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: S. Simpson

BOREHOLE ID: G200
Well ID: G200
Surface Elev: 624.2 ft. MSL
Completion: 18.0 ft. BGS
Station: 877,930.59N
2,515,649.96E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.50 - While drilling
▼ = 2.75 - 3/12/08
▽ =

SAMPLE Number	Recov / Total (in) % Recovery	Type	Blows / 6 in N - Value RQD	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) Failure Type
	24/24 100%	SS	3-2 3-3 N=5			
1A				31		1.36 B
2A				26		1.94 BSh
	19/24 79%	SS	3-3 6-6 N=9			
2B				26		2.33 Sh
3A	19/24 79%	SS	3-3 4-5 N=7	26		1.59 B
3B				23		1.55 B
4A	22/24 92%	SS	5-5 5-5 N=10	29		0.31 B
5A	20/24 83%	SS	2-2 3-5 N=5	25		1.09 B
	22/24 92%	SS	1-3 2-3 N=5			
6A				22		1.01
	24/24 100%	SS	3-3 5-6 N=8			
7A				15		0.50 B
7B				18		
8A				24		0.27 B
	19/24 79%	SS	0-3 5-8 N=8			
8B				17		
9A				13		
	24/24 100%	SS	8-15 30-50 N=45			
9B				8		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
	Very dark grayish brown (10YR3/2), moist, firm, friable, clayey SILT	624
2	Dark gray (10YR4/1) with 5% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY	622
	Dark gray (10YR4/1) with 70% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY	
4	Dark gray (10YR4/1) with 70% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, slight trace sand	620
	Very dark gray (10YR3/1), moist, firm, silty CLAY, slight trace sand	
6	Dark gray (10YR4/1) with 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, trace coarse sand	618
8	Dark gray (10YR4/1) with 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, sand and slight trace gravel	616
10		614
12	Yellowish brown (10YR5/8), moist, soft, sandy CLAY	612
	Gray (10YR5/1), wet, soft, fine- to coarse-grained SAND	
14	Gray (10YR5/1), wet, soft, silty CLAY, trace sand and gravel	610
	Yellowish brown (10YR5/4), wet, soft, fine- to coarse-grained SAND, trace gravel	
16		608
	Gray (10YR5/1), moist, hard, silty CLAY, trace sand and gravel	
18		

Borehole Detail

Remarks

End of Boring = 18.0 ft. BGS

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/15/2010
Finish: 10/15/2010
WEATHER: Sunny (mid-50's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: R. Hasenyager

BOREHOLE ID: R201
Well ID: R201
Surface Elev: 624.02 ft. MSL
Completion: 17.22 ft. BGS
Station: 877,925.26N
2,514,841.96E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Very dark grayish brown (10YR3/2), moist, soft, friable, clayey SILT, slight trace sand and gravel			
							2	Dark brown (10YR3/3), moist, soft, silty CLAY		622	
							4	Yellowish brown (10YR5/8) with 20% gray (10YR5/1) mottles, moist, firm, silty CLAY, trace sand, slight trace gravel		620	
							6	Gray (10YR5/1) with 5% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY, sand and trace gravel		618	
							8	Gray (10YR5/1), moist, firm, sandy CLAY, trace silt and slight trace gravel		616	
							10	Yellowish brown (10YR5/8) with 10% gray (10YR5/1) mottles, moist, firm, sandy CLAY, trace gravel		614	
							12	Yellowish brown (10YR5/8), wet, soft, silty SAND, trace gravel		612	
								Yellowish brown (10YR5/8), moist, firm, clayey SILT			
							14	Greenish gray (5GY6/1), moist, firm, interbedded clayey SILT and SILT		610	
							16	Yellowish brown (10YR5/8), wet, soft, fine- to coarse-grained SAND, slight trace gravel		608	
								Yellowish brown (10YR5/8), wet, firm, very fine- to fine-grained silty SAND			
								Gray (10YR5/1), wet, soft, SILT			
								Gray (10YR5/1), wet, soft, fine- to coarse-grained SAND, slight trace gravel			
								Gray (10YR5/1), moist, hard, very silty CLAY, trace sand and gravel			

End of Boring = 17.22 ft. BGS

NOTE(S): R201 blind drilled in borehole approximately 8 ft. west of G201. Lithology taken from G201.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 2/25/2008
Finish: 2/25/2008
WEATHER: Overcast, cold

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: S. Simpson

BOREHOLE ID: G201
Well ID: G201
Surface Elev: 623.9 ft. MSL
Completion: 18.2 ft. BGS
Station: 877,924.94N
2,514,849.47E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 10.20 - While drilling
▼ = 2.17 - 3/12/08
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	22/24 *92%*	SS	*3-3 2-3* N=5	23		
1B				33		1.16
2A	22/24 *92%*	SS	*2-3 5-6* N=8	26		2.33 *BSh*
3A	20/24 *83%*	SS	*2-4 5-5* N=9	15		1.94 *B*
4A	24/24 *100%*	SS	*7-7 7-6* N=14	19		1.24 *B*
5A	24/24 *100%*	SS	*1-2 3-3* N=5	23		1.16 *B*
6A	23/24 *96%*	SS	*0-1 1-2* N=2	20		
7A	20/24 *83%*	SS	*3-6 6-12* N=12	22		2.72 *BSh*
8A	24/24 *100%*	SS	*4-7 7-10* N=14	23		1.59 *Sh*
8B				19		
9A				15		
9B	24/24 *100%*	SS	*7-12 25-30* N=37	20		
9C				11		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
	Very dark grayish brown (10YR3/2), moist, soft, friable, clayey SILT, slight trace sand and gravel		
2 ▼	Dark brown (10YR3/3), moist, soft, silty CLAY	622	
4	Yellowish brown (10YR5/8) with 20% gray (10YR5/1) mottles, moist, firm, silty CLAY, trace sand, slight trace gravel	620	
6	Gray (10YR5/1) with 5% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY, sand and trace gravel	618	
8	Gray (10YR5/1), moist, firm, sandy CLAY, trace silt and slight trace gravel	616	
10 ▼	Yellowish brown (10YR5/8) with 10% gray (10YR5/1) mottles, moist, firm, sandy CLAY, trace gravel	614	
12	Yellowish brown (10YR5/8), wet, soft, silty SAND, trace gravel	612	
	Yellowish brown (10YR5/8), moist, firm, clayey SILT		
14	Greenish gray (5GY6/1), moist, firm, interbedded clayey SILT and SILT	610	
16	Yellowish brown (10YR5/8), wet, soft, fine- to coarse-grained SAND, slight trace gravel	608	
	Yellowish brown (10YR5/8), wet, firm, very fine- to fine-grained silty SAND		
	Gray (10YR5/1), wet, soft, SILT		
	Gray (10YR5/1), wet, soft, fine- to coarse-grained SAND, slight trace gravel		
18	Gray (10YR5/1), moist, hard, silty CLAY, trace sand and gravel	606	

End of Boring = 18.15 ft. BGS

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 2/21/2008
Finish: 2/21/2008
WEATHER: Overcast, cold

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: S. Simpson

BOREHOLE ID: G205
Well ID: G205
Surface Elev: 622.2 ft. MSL
Completion: 16.0 ft. BGS
Station: 875,550.19N
2,515,914.87E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.10 - While drilling
▼ = 5.06 - 3/12/08
▽ =

Number	Recov / Total (in) % Recovery	Type	Blows / 6 in N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	24/24 *100%*	SS	*4-3 4-4* N=7	22		
1B				30		1.67 *Sh*
2A	19/24 *79%*	SS	*3-5 6-5* N=11	24		1.86 *B*
3A	20/24 *83%*	SS	*2-2 5-5* N=7	19		1.55 *B*
4A	19/24 *79%*	SS	*5-6 7-8* N=13	20		1.12 *B*
5A	16/24 *67%*	SS	*2-2 3-5* N=5	20		0.62 *BSh*
6A	22/24 *92%*	SS	*1-2 3-3* N=5	17		0.62 *BSh*
6B				17		
7A				25		
7B	23/24 *96%*	SS	*3-3 5-6* N=8	17		1.36 *BSh*
8A				15		
8B	17/24 *71%*	SS	*5-19 26-35* N=45	10		

Depth ft. BGS	Lithologic Description
0 – 1.3	Very dark grayish brown (10YR3/2), moist, firm, clayey SILT
1.3 – 2.3	Yellowish brown (10YR5/4) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, slight trace sand
2.3 – 5.7	Yellowish brown (10YR5/4) with 30% yellowish brown (10YR5/8) mottles, moist, hard, silty CLAY, slight trace sand
5.7 – 8.4	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand, slight trace gravel
8.4 – 11.1	Yellowish brown (10YR5/6), moist, firm, silty CLAY with sand, trace gravel
11.1 – 12.3	Yellowish brown (10YR5/6), moist, soft, sandy SILT, slight trace gravel
12.3 – 14.5	Yellowish brown (10YR 5/4), moist, soft, silty SAND, trace gravel
14.5 – 16.0	Gray (10YR5/1), moist, hard, silty CLAY, trace sand and gravel

End of Boring = 16.0 ft. BGS

Depth ft. BGS: 2, 4, 6, 8, 10, 12, 14, 16
Elevation ft. MSL: 622, 620, 618, 616, 614, 612, 610, 608

Borehole Detail | Remarks

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/14/2010
Finish: 10/14/2010
WEATHER: Sunny, warm, breezy (lo-70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: S. Simpson

BOREHOLE ID: G206
Well ID: G206
Surface Elev: 630.54 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,103.91N
2,514,669.16E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 22.00 - While drilling
▼ = 21.54 - Upon completion
▽ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	12/24 *50%*	SS	*2-2 3-2* N=5	18		
2A	20/24 *83%*	SS	*2-2 3-5* N=5	16		
3A	20/24 *83%*	SS	*4-9 6-8* N=15	19		
4A	19/24 *79%*	SS	*2-4 5-6* N=9	20		
5A	17/24 *71%*	SS	*2-3 4-5* N=7	30		
6A	22/24 *92%*	SS	*2-3 4-6* N=7	19		
7A	23/24 *96%*	SS	*1-2 3-4* N=5	23		
8A	22/24 *92%*	SS	*1-1 3-3* N=4	22		
9A	24/24 *100%*	SS	*1-1 2-2* N=3	21		
10A	24/24 *100%*	SS	*woh-woh 1-5*	25		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0–3.2	FILL - Grayish brown (10YR5/2), moist, firm, silty CLAY with trace sand and gravel.	630, 628
3.2–8	FILL - Dark gray (10YR4/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	626, 624
8	Very dark gray (10YR3/1) with 20% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand, trace roots.	622
–10	Dark grayish brown (10YR4/2) with 35% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand.	
10–12.2	Gray (10YR5/1) with 20% dark yellowish brown (10YR4/6) mottles, moist, firm, clayey SILT with trace sand and gravel.	620
12.2–14	Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	618
14–16	Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.	616
16	Dark yellowish brown (10YR4/6) with 30% gray (10YR5/1) mottles, moist, soft, silty CLAY with trace sand and gravel.	614
	Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.	
18	Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, very soft, silty CLAY with trace sand and gravel.	612
	Gray (10YR5/1), moist, very soft, very fine- to fine-grained sandy CLAY with trace gravel.	
20	Gray (10YR5/1), moist, firm, very fine- to fine-grained	

NOTE(S): G206 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/14/2010
Finish: 10/14/2010
WEATHER: Sunny, warm, breezy (lo-70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: S. Simpson

BOREHOLE ID: G206
Well ID: G206
Surface Elev: 630.54 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,103.91N
2,514,669.16E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 22.00 - While drilling
▼ = 21.54 - Upon completion
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								sandy CLAY with trace gravel.			
11A	22/24 *92%*	SS	*19-6 13-19* N=19	13				Dark yellowish brown (10YR4/6), wet dense, silty, fine- to coarse-grained SAND with trace gravel.		610	
11B				16				Dark yellowish brown (10YR4/6), moist, hard, clayey SILT with sand and gravel.			
							▼ ▼ 22	Grayish brown (10YR5/2), moist, dense, silty, very fine- to fine-grained SAND.			
12A	20/24 *83%*	SS	*11-20 19-13* N=39	10				Dark gray (10YR4/1), slightly moist, hard, very silty CLAY with sand and gravel.		608	
12B				10				Dark gray (10YR4/1), wet, dense, silty, fine- to coarse-grained SAND with gravel.			
							24	Dark gray (10YR4/1), slightly moist, hard, very silty CLAY with sand and gravel.			

End of Boring = 24.0 ft. BGS

NOTE(S): G206 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/8/2010
Finish: 10/8/2010
WEATHER: Sunny, mild

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: R. Hasenyager

BOREHOLE ID: G207
Well ID: G207
Surface Elev: 630.61 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,166.36N
2,514,837.94E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = Dry - Upon completion
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	23/24 *96%*	SS	*6-5 5-8* N=10	15			0–2.2	FILL - Yellowish brown (10YR5/6) with 10% gray (10YR6/1) and 5% black (10YR2/1) mottles, slightly moist, hard, silty CLAY with trace sand and slight trace gravel.	630	
2A	24/24 *100%*	SS	*4-4 7-8* N=11	15			2	FILL - Gray (10YR5/1) with 20% yellowish brown (10YR5/8) mottles, moist, hard, silty CLAY with sand and trace gravel.	628	
3A	23/24 *96%*	SS	*3-6 7-9* N=13	17			4	FILL - Yellowish brown (10YR5/8) with 20% gray (10YR6/1) mottles, moist, hard, silty CLAY with sand and trace gravel.	626	
4A	24/24 *100%*	SS	*3-4 6-7* N=10	16			6	FILL - Dark yellowish brown (10YR4/4), moist, hard, silty CLAY with slight trace sand and gravel.	624	
								FILL - Gray (10YR5/1) with 20% yellowish brown (10YR5/8) mottles, moist, hard, silty CLAY with slight trace sand and gravel.		
5A	24/24 *100%*	SS	*2-2 3-4* N=5	22			8	Yellowish brown (10YR5/6) with 25% gray (10YR5/1) mottles, moist, firm, silty CLAY with slight trace sand and gravel.	622	
5B				24				Gray (10YR5/1) with 15% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with slight trace sand and gravel.		
6A	22/24 *92%*	SS	*2-2 2-5* N=4	27			10	Gray (10YR5/1) with 40% yellowish brown (10YR5/8) mottles, very moist, firm, silty CLAY with slight trace sand and gravel.	620	
7A	24/24 *100%*	SS	*2-2 2-3* N=4	27			12	Yellowish brown (10YR5/8) with 30% gray (10YR6/1) mottles, very moist, soft, silty CLAY with trace sand and gravel.	618	
8A	24/24 *100%*	SS	*woh-1 2-3* N=3	25			14	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, very moist, soft, silty CLAY with sand and slight trace gravel.	616	
9A	23/24 *96%*	SS	*woh-2 2-3* N=4	22			16	Yellowish brown (10YR5/6) with 25% gray (10YR6/1) mottles, very moist, very soft, sandy, silty CLAY with trace gravel.	614	
10A	24/24 *100%*	SS	*woh-woh 2-3*	19			18	Yellowish brown (10YR5/6) with 30% gray (10YR6/1) mottles, very moist, very soft, sandy CLAY with silt and trace gravel.	612	
							20			

NOTE(S): G207 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/8/2010
Finish: 10/8/2010
WEATHER: Sunny, mild

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: R. Hasenyager

BOREHOLE ID: G207
Well ID: G207
Surface Elev: 630.61 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,166.36N
2,514,837.94E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = Dry - Upon completion
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Yellowish brown (10YR5/6) with 30% gray (10YR6/1) mottles, very moist, very soft, sandy CLAY with silt and trace gravel. *[Continued from previous page]*		610	
11A	22/24 *92%*	SS	*woh-1 2-2* N=3	18				Gray (10YR6/1) with 40% yellowish brown (10YR5/6) mottles, very moist to wet, loose, silty, very fine- to fine-grained SAND with slight trace gravel.			
							22				
12A	24/24 *100%*	SS	*10-24 26-30* N=50					Gray (10YR5/1), slightly moist, hard, very silty CLAY with trace sand and slight trace gravel.		608	
							24	**End of Boring = 24.0 ft. BGS**			

NOTE(S): G207 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/7/2010
Finish: 10/7/2010
WEATHER: Sunny, warm (lo-70's)

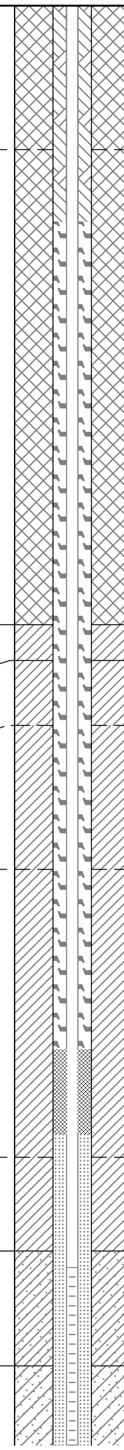
CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: S. Simpson

BOREHOLE ID: G208
Well ID: G208
Surface Elev: 630.57 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,231.46N
2,514,993.57E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = 23.92 - Upon completion
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
1A	19/24 *79%*	SS	*4-3 3-5* N=6	23			0–2	FILL - Brown (10YR4/3) with 5% dark gray (10YR4/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.		630	
2A	24/24 *100%*	SS	*2-3 4-6* N=7	14			2–8.6	FILL - Brown (10YR4/3) with 15% dark gray (10YR4/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.		628	
3A	24/24 *100%*	SS	*2-4 4-7* N=8	21						626	
4A	24/24 *100%*	SS	*2-4 6-8* N=10	17						624	
5A	20/24 *83%*	SS	*2-2 4-5* N=6	24				Very dark gray (10YR3/1), moist, firm, silty CLAY with trace sand and gravel, trace roots.		622	
							–10	Dark gray (10YR4/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand, trace roots.			
6A	23/24 *96%*	SS	*1-2 4-4* N=6	26			10–12	Dark gray (10YR4/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand, trace roots.		620	
7A	19/24 *79%*	SS	*1-2 2-3* N=4	23			12–16	Dark gray (10YR4/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand, trace roots.		618	
8A	22/24 *92%*	SS	*1-1 2-3* N=3	24						616	
9A	24/24 *100%*	SS	*1-1 2-3* N=3	24			16–	Dark gray (10YR4/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel, trace roots.		614	
9B				20			18	Gray (10YR5/1) with 20% dark yellowish brown (10YR4/6) mottles, very moist, soft, silty, very fine- to fine-grained sandy CLAY with trace gravel.		612	
10A	22/24 *92%*	SS	*woh-woh 1-2*	20				Dark yellowish brown (10YR4/6) with 15% gray (10YR5/1) mottles, very moist to wet, soft, clayey, very fine- to medium-grained SAND with trace gravel.			
10B				17			20				



NOTE(S): G208 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT:	AEG Coffeen Power Station	**CONTRACTOR:**	Layne-Western Co		
Site:	CCB Management Facility	**Rig mfg/model:**	CME-750 ATV Drill	**BOREHOLE ID:**	G208
Location:	Coffeen, Illinois	**Drilling Method:**	4¼" HSA w/SS samplers	**Well ID:**	G208
Project:	05S3004A			**Surface Elev:**	630.57 ft. MSL
DATES: Start:	10/7/2010	**FIELD STAFF: Driller:**	D. Mahurin	**Completion:**	24.00 ft. BGS
Finish:	10/7/2010	**Helper:**	J. Litsch/D. Smail	**Station:**	875,231.46N
WEATHER:	Sunny, warm (lo-70's)	**Eng/Geo:**	S. Simpson		2,514,993.57E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = 23.92 - Upon completion
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										610	
11A	20/24 *83%*	SS	*woh-2* *5-12* N=7	13				Yellowish brown (10YR5/4), moist, firm, very silty CLAY with sand and gravel.			
							22			608	
12A	24/24 *100%*	SS	*6-11* *18-24* N=29	9				Dark gray (10YR4/1), slightly moist, hard, very silty CLAY with sand and gravel.			
							▼ 24				

End of Boring = 24.0 ft. BGS

NOTE(S): G208 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/7/2010
Finish: 10/7/2010
WEATHER: Sunny, cool (lo-50's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: S. Simpson

BOREHOLE ID: G209
Well ID: G209
Surface Elev: 630.57 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,298.23N
2,515,149.56E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = 22.40 - Upon completion
∇ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*
1A	24/24 *100%*	SS	*4-4 4-6* N=8	21		
2A	24/24 *100%*	SS	*3-4 6-6* N=10	13		
3A	24/24 *100%*	SS	*2-3 6-8* N=9	19		
4A	22/24 *92%*	SS	*2-3 6-8* N=9	17		
5A	18/24 *75%*	SS	*2-3 3-5* N=6	20		
6A	24/24 *100%*	SS	*1-2 2-5* N=4	26		
7A	22/24 *92%*	SS	*1-3 4-4* N=7	22		
8A	24/24 *100%*	SS	*woh-1 2-3* N=3	25		
9A	19/24 *79%*	SS	*woh-1 2-3* N=3	24		
10A	14/24 *58%*	SS	*woh-2 3-3* N=5	20		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–7.6	FILL - Brown (10YR5/3) with 10% gray (10YR5/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.		
7.6–8.1	Grayish brown (10YR5/2), moist, firm, clayey SILT with trace sand and gravel.		
8.1–12.3	Dark gray (10YR4/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand.		
12.3–14	Dark gray (10YR4/1) with 25% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand.		
14–20	Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.		

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Elevation scale: 630, 628, 626, 624, 622, 620, 618, 616, 614, 612

NOTE(S): G209 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station	**CONTRACTOR:** Layne-Western Co		
Site: CCB Management Facility	**Rig mfg/model:** CME-750 ATV Drill	**BOREHOLE ID:** G209	
Location: Coffeen, Illinois	**Drilling Method:** 4¼" HSA w/SS samplers	**Well ID:** G209	
Project: 05S3004A		**Surface Elev:** 630.57 ft. MSL	
DATES: Start: 10/7/2010	**FIELD STAFF: Driller:** D. Mahurin	**Completion:** 24.00 ft. BGS	
Finish: 10/7/2010	**Helper:** J. Litsch/D. Smail	**Station:** 875,298.23N	
WEATHER: Sunny, cool (lo-50's)	**Eng/Geo:** S. Simpson	2,515,149.56E	

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = 22.40 - Upon completion
▽ =

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	1/24 *4%*	SS	*woh-1* *1-1* N=2	21				Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel. *[Continued from previous page]*		610	
12A	20/24 *83%*	SS	*9-16* *17-26* N=33	7			22 ▼	Dark gray (10YR4/1), slightly moist, hard, very silty CLAY with sand and gravel.		608	
							24	**End of Boring = 24.0 ft. BGS**			

NOTE(S): G209 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/6/2010
Finish: 10/6/2010
WEATHER: Sunny, warm (mid-70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: S. Simpson

BOREHOLE ID: G210
Well ID: G210
Surface Elev: 630.48 ft. MSL
Completion: 25.00 ft. BGS
Station: 875,359.71N
2,515,298.97E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 20.00 - While drilling
▼ = 19.90 - Upon completion
▽ =

SAMPLE: Number	Recov / Total (in) / *% Recovery*	Type	TESTING: *Blows / 6 in* / N - Value / **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) / *Failure Type*
1A	20/24 *83%*	SS	*4-3 5-6* N=8	16		
2A	24/24 *100%*	SS	*3-4 7-7* N=11	15		
3A	24/24 *100%*	SS	*3-5 10-9* N=15	19		
4A	24/24 *100%*	SS	*3-6 9-11* N=15	17		
5A	24/24 *100%*	SS	*3-4 5-7* N=9	15		
6A	22/24 *92%*	SS	*2-2 4-6* N=6	26		
7A	19/24 *79%*	SS	*1-3 3-5* N=6	23		
8A	24/24 *100%*	SS	*2-2 2-4* N=4	26		
9A	24/24 *100%*	SS	*1-1 2-3* N=3	24		
10A	20/24 *83%*	SS	*1-1 2-2* N=3	24		
10B				31		

Depth ft. BGS	Lithologic Description
0–6	FILL - Brown (10YR4/3) with 20% dark gray (N5/1) mottles, moist, firm, silty CLAY with trace sand and gravel.
6–8	FILL - Dark grayish brown (10YR4/2), slightly moist, firm, clayey SILT with trace sand and gravel.
8	Gray (10YR5/1) with 10% dark grayish brown (10YR4/2) mottles, moist, firm, silty CLAY with trace sand.
8–10	Dark gray (10YR4/1), moist, firm, silty CLAY with trace sand, trace roots.
10	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY with trace sand.
10–12	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY with trace sand and gravel.
12–14	Gray (10YR5/1) with 5% dark yellowish brown (10YR4/6) mottles, moist to very moist, firm, silty CLAY with sand.
14–16	Gray (10YR5/1) with 5% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with sand and trace gravel.
16–18	Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with sand and trace gravel.
18–20	Gray (N6/1), very moist, very soft, silty, very fine- to fine-grained sandy CLAY with trace gravel.
▼ 20	

Elevation ft. MSL: 630, 628, 626, 624, 622, 620, 618, 616, 614, 612

Remarks:

NOTE(S): G210 installed in borehole.

FIELD BORING LOG

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/6/2010
Finish: 10/6/2010
WEATHER: Sunny, warm (mid-70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: S. Simpson

HANSON

BOREHOLE ID: G210
Well ID: G210
Surface Elev: 630.48 ft. MSL
Completion: 25.00 ft. BGS
Station: 875,359.71N
2,515,298.97E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 20.00 - While drilling
▼ = 19.90 - Upon completion
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										610	
11A	14/24 *58%*	SS	*woh-5 6-18* N=11	12				Yellowish brown (10YR5/4), moist, medium dense, silty, fine- to coarse-grained SAND with trace gravel.			
								Gray (N6/1), moist, medium dense, silty, very fine - to fine-grained SAND.			
							22	Yellowish brown (10YR5/4), slightly moist, hard, clayey SILT with sand and gravel.			
12A	19/24 *79%*	SS	*7-18 26-36* N=44	14				Brown (10YR5/3), very moist, dense, very fine- to fine-grained sandy SILT with trace gravel.		608	
13A	10/12 *83%*	SS	*27-50/6"*	9			24	Gray (N5/1), slightly moist, hard, very silty CLAY with sand and gravel.		606	

End of Boring = 25.0 ft. BGS

NOTE(S): G210 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/11/2010
Finish: 10/11/2010
WEATHER: Sunny, warm (lo-70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: S. Simpson

BOREHOLE ID: G211
Well ID: G211
Surface Elev: 630.31 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,424.49N
2,515,449.06E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 20.00 - While drilling
▼ = 20.60 - Upon completion
▽ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	20/24 *83%*	SS	*5-3 4-5* N=7	23		
2A	20/24 *83%*	SS	*3-5 5-8* N=10	17		
3A	24/24 *100%*	SS	*2-3 5-7* N=8	24		
4A	24/24 *100%*	SS	*3-5 7-9* N=12	29		
5A	24/24 *100%*	SS	*2-2 3-5* N=5	31		
6A	17/24 *71%*	SS	*1-2 4-4* N=6	19		
7A	24/24 *100%*	SS	*1-2 2-4* N=4	22		
8A	24/24 *100%*	SS	*1-1 3-2* N=4	28		
9A	22/24 *92%*	SS	*1-1 1-2* N=2	19		
10A	19/24 *79%*	SS	*1-4 5-11* N=9	13		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0 – ~3.5	FILL - Brown (10YR4/3) with 20% dark gray (10YR4/1) mottles, moist, firm, silty CLAY with trace sand and gravel.	630 – 628	
~3.5 – ~7.8	FILL - Dark gray (10YR4/1) with 20% brown (10YR4/3) and 5% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	626 – 624	
~7.8 – 10	Dark gray (10YR4/1) with 20% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY, slight trace roots.	622	
10 – 12	Dark gray (10YR4/1) with 20% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand.	620	
12 – ~16.6	Dark gray (10YR4/1) with 20% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.	618 – 614	
~16.6 – ~18.4	Dark yellowish brown (10YR4/6) with 30% gray (10YR5/1) mottles, very moist, soft, very fine- to fine-grained sandy CLAY with trace gravel.	612	
~18.4 – 20	Dark yellowish brown (10YR4/4) with 15% grayish brown (10YR5/2) mottles, moist, firm, clayey SILT with sand and gravel.		

NOTE(S): G211 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station	**CONTRACTOR:** Layne-Western Co		
Site: CCB Management Facility	**Rig mfg/model:** CME-750 ATV Drill	**BOREHOLE ID:** G211	
Location: Coffeen, Illinois	**Drilling Method:** 4¼" HSA w/SS samplers	**Well ID:** G211	
Project: 05S3004A		**Surface Elev:** 630.31 ft. MSL	
DATES: Start: 10/11/2010	**FIELD STAFF: Driller:** D. Mahurin	**Completion:** 24.00 ft. BGS	
Finish: 10/11/2010	**Helper:** J. Litsch/D. Smail	**Station:** 875,424.49N	
WEATHER: Sunny, warm (lo-70's)	**Eng/Geo:** S. Simpson	2,515,449.06E	

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 20.00 - While drilling
▼ = 20.60 - Upon completion
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	18/24 *75%*	SS	*7-17 23-21* N=40	10			▼	Grayish brown (10YR5/2), slightly moist, hard, very silty CLAY with sand and gravel.		610	
							22				
12A	24/24 *100%*	SS	*4-14 15-17* N=29	13				Dark gray (10YR4/1), slightly moist, hard, very silty CLAY with sand and gravel.		608	
							24	**End of Boring = 24.0 ft. BGS**			

NOTE(S): G211 installed in borehole.

FIELD BORING LOG

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/11/2010
Finish: 10/11/2010
WEATHER: Sunny, warm (lo-80's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: S. Simpson

HANSON

BOREHOLE ID: G212
Well ID: G212
Surface Elev: 630.59 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,486.50N
2,515,583.03E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 19.00 - While drilling
▼ = 20.72 - Upon completion
∇ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*
1A	24/24 *100%*	SS	*4-3 3-6* N=6	17		
2A	24/24 *100%*	SS	*2-3 4-5* N=7	21		
3A	24/24 *100%*	SS	*2-5 6-7* N=11	13		
4A	24/24 *100%*	SS	*2-5 7-10* N=12	15		
5A	24/24 *100%*	SS	*2-2 4-7* N=6	29		
6A	18/24 *75%*	SS	*2-3 4-6* N=7	23		
7A	17/24 *71%*	SS	*1-2 2-2* N=4	25		
8A	24/24 *100%*	SS	*woh-1 2-3* N=3	27		
9A	22/24 *92%*	SS	*1-1 2-2* N=3	25		
10A	24/24 *100%*	SS	*woh-woh 1-2*	19		
10B				22		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–1.7	FILL - Brown (10YR4/3), slightly moist, firm, silty CLAY with trace sand and gravel.	630	
1.7–3.5	FILL - Dark gray (10YR4/1) with 20% brown (10YR4/3) and 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand.	628	
3.5–8.2	FILL - Brown (10YR4/3) with 15% dark gray (10YR4/1) and 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	626, 624	
8.2–10	Dark gray (10YR4/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY, slight trace roots.	622	
10–12	Dark gray (10YR4/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand.	620	
12–18	Dark gray (10YR4/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.	618, 616, 614	
18–19.5	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, very moist, very soft, silty, very fine- to fine-grained sandy CLAY with trace gravel.	612	
19.5–	Gray (10YR5/1), loose, wet, silty, very fine- to		

NOTE(S): G212 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/11/2010
Finish: 10/11/2010
WEATHER: Sunny, warm (lo-80's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: S. Simpson

BOREHOLE ID: G212
Well ID: G212
Surface Elev: 630.59 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,486.50N
2,515,583.03E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 19.00 - While drilling
▼ = 20.72 - Upon completion
▽ =

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								medium-grained SAND.			
11A	7/24 *29%*	SS	*1-6* *10-22* N=16	19			▼	Brown (10YR5/3), moist, medium dense, SILT with trace sand and gravel.		610	
12A	20/24 *83%*	SS	*5-21* *18-27* N=39	12			22	Dark gray (10YR4/1), slightly moist, hard, very silty CLAY with sand and gravel.		608	
							24	**End of Boring = 24.0 ft. BGS**			

NOTE(S): G212 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/12/2010
Finish: 10/12/2010
WEATHER: Partly cloudy, mild (mid-50's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: S. Simpson

BOREHOLE ID: G213
Well ID: G213
Surface Elev: 630.34 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,544.37N
2,515,723.51E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 20.00 - While drilling
▼ = 19.92 - Upon completion
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*
1A	23/24 *96%*	SS	*4-3 4-5* N=7	15		
2A	22/24 *92%*	SS	*2-4 6-8* N=10	21		
3A	22/24 *92%*	SS	*2-4 7-8* N=11	17		
4A	22/24 *92%*	SS	*2-4 4-8* N=8	16		
5A	20/24 *83%*	SS	*1-3 6-6* N=9	12		
6A	20/24 *83%*	SS	*2-2 5-7* N=7	24		
7A	20/24 *83%*	SS	*2-3 3-5* N=6	19		
8A	22/24 *92%*	SS	*1-2 2-3* N=4	24		
9A	24/24 *100%*	SS	*woh-1 2-2* N=3	24		
10A	18/24 *75%*	SS	*woh-woh 1-2*	24		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–10.3	FILL - Brown (10YR4/3) with 10% dark gray (10YR4/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, silty CLAY with trace sand and gravel.	630	
10.3–11.3	Dark gray (10YR4/1) with 25% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand, trace roots.		
11.3–12.2	Gray (10YR5/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, firm, clayey SILT, trace roots.		
12.2–14	Dark gray (10YR4/1) with 3% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.		
14–16.8	Dark gray (10YR4/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.		
16.8–17.8	Gray (10YR5/1) with 25% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.		
17.8–18.8	Gray (10YR5/1) with 20% dark yellowish brown (10YR4/6) mottles, moist, soft, very fine- to fine-grained sandy CLAY with trace gravel.		
18.8–20	Dark yellowish brown (10YR4/6), very moist, soft, sandy CLAY with trace gravel.		

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20 ▼
Elevation scale: 630, 628, 626, 624, 622, 620, 618, 616, 614, 612

NOTE(S): G213 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/12/2010
Finish: 10/12/2010
WEATHER: Partly cloudy, mild (mid-50's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: S. Simpson

BOREHOLE ID: G213
Well ID: G213
Surface Elev: 630.34 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,544.37N
2,515,723.51E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 20.00 - While drilling
▼ = 19.92 - Upon completion
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										610	
11A	18/24 *75%*	SS	*1-1 1-2* N=2	18				Dark yellowish brown (10YR4/6), moist, soft, clayey, very fine- to coarse-grained SAND with trace gravel.			
								Dark yellowish brown (10YR4/6), moist, firm, very silty CLAY with sand and gravel.			
							22			608	
12A	22/24 *92%*	SS	*10-13 18-22* N=31	11				Dark gray (10YR4/1), slightly moist, hard, very silty CLAY with sand and gravel.			
							24	**End of Boring = 24.0 ft. BGS**			

NOTE(S): G213 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station	**CONTRACTOR:** Layne-Western Co		
Site: CCB Management Facility	**Rig mfg/model:** CME-750 ATV Drill	**BOREHOLE ID:** G214	
Location: Coffeen, Illinois	**Drilling Method:** 4¼" HSA w/SS samplers	**Well ID:** G214	
Project: 05S3004A		**Surface Elev:** 630.39 ft. MSL	
DATES: Start: 10/14/2010	**FIELD STAFF: Driller:** D. Mahurin	**Completion:** 24.00 ft. BGS	
Finish: 10/14/2010	**Helper:** J. Litsch/D. Smail	**Station:** 875,668.02N	
WEATHER: Sunny, cool (lo-40's)	**Eng/Geo:** S. Simpson	2,515,960.84E	

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = Dry - Upon completion
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	24/24 *100%*	SS	*6-7 7-9* N=14	15			0–3.1	FILL - Brown (10YR4/3) with 10% dark gray (10YR4/1) and 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	630	
2A	24/24 *100%*	SS	*3-3 6-5* N=9	22			3.1–4	FILL - Dark gray (10YR4/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	628	
3A	24/24 *100%*	SS	*3-4 6-8* N=10	18			4–8.4	FILL - Brown (10YR4/3) with 10% dark yellowish brown (10YR4/6) and 5% dark gray (10YR4/1) mottles, moist, firm, silty CLAY with trace sand and gravel.	626	
4A	24/24 *100%*	SS	*3-4 7-10* N=11	17					624	
5A	24/24 *100%*	SS	*3-2 4-5* N=6	19			8.4–10.5	Grayish brown (10YR5/2) with 15% dark gray (10YR4/1) and 10% dark yellowish brown (10YR4/6) mottles, moist, firm, clayey SILT with trace sand and gravel.	622	
6A	24/24 *100%*	SS	*2-3 4-7* N=7	24			10.5–12.2	Brown (10YR4/3) with 15% dark gray (10YR4/1) and 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	620	
7A	24/24 *100%*	SS	*2-3 4-6* N=7	22			12.2–13	Gray (10YR6/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY.	618	
7B				16			13–16	Dark gray (10YR4/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	616	
8A	24/24 *100%*	SS	*woh-2 3-4* N=5	22			16–16.9	Dark gray (10YR4/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.	614	
9A	22/24 *92%*	SS	*1-2 2-3* N=4	21			16.9–19.4	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.	612	
10A	22/24 *92%*	SS	*woh-2 2-2* N=4	15						
10B				21			20			

NOTE(S): G214 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/14/2010
Finish: 10/14/2010
WEATHER: Sunny, cool (lo-40's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: S. Simpson

BOREHOLE ID: G214
Well ID: G214
Surface Elev: 630.39 ft. MSL
Completion: 24.00 ft. BGS
Station: 875,668.02N
2,515,960.84E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = Dry - Upon completion
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	20/24 *83%*	SS	*woh-woh 3-12*	24				Gray (10YR5/1), wet, loose, silty, very fine- to medium-grained SAND with trace gravel and clayey seams. *[Continued from previous page]*		610	
11B				14				Dark yellowish brown (10YR4/6), moist, firm, very silty CLAY with trace sand and gravel.			
							22				
12A	24/24 *100%*	SS	*12-28 32-28* N=60	7				Dark gray (10YR4/1), slightly moist, hard, very silty CLAY with trace sand and gravel.		608	
							24	**End of Boring = 24.0 ft. BGS**			

NOTE(S): G214 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/13/2010
Finish: 10/13/2010
WEATHER: Sunny, warm, windy (hi-60's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: S. Simpson

BOREHOLE ID: G215
Well ID: G215
Surface Elev: 630.48 ft. MSL
Completion: 24.31 ft. BGS
Station: 875,810.19N
2,515,971.55E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = Dry - Upon completion
▽ = 22.52 - 10/14/10

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	23/24 *96%*	SS	*5-3 3-5* N=6	18		
2A	19/24 *79%*	SS	*3-3 5-6* N=8	17		
3A	20/24 *83%*	SS	*2-3 7-7* N=10	13		
4A	23/24 *96%*	SS	*3-6 6-7* N=12	16		
4B				27		
5A	20/24 *83%*	SS	*3-3 3-5* N=6	20		
6A	13/24 *54%*	SS	*2-2 3-5* N=5	24		
7A	19/24 *79%*	SS	*2-3 4-6* N=7	17		
8A	20/24 *83%*	SS	*2-3 4-5* N=7	19		
9A	22/24 *92%*	SS	*1-3 3-4* N=6	19		
10A	24/24 *100%*	SS	*woh-1 2-2* N=3	17		

Depth ft. BGS	Lithologic Description
0–6	FILL - Brown (10YR4/3) with 30% dark gray (10YR4/1) and 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.
6–7.5	FILL - Dark grayish brown (10YR4/2), moist, firm, silty CLAY with trace sand and gravel.
7.5–8.4	FILL - Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand.
8.4–9.1	Very dark gray (10YR3/1), moist, firm, silty CLAY with trace sand, trace roots.
9.1–12	Dark gray (10YR4/1) with 30% dark yellowish brown (10YR4/6) moist, firm, silty CLAY with trace sand.
12–13.3	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, firm, clayey SILT with trace sand.
13.3–15	Dark gray (10YR4/1), moist, firm, clayey SILT with trace sand.
15–18.6	Dark gray (10YR4/1) with 30% Dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.
18.6–20	Dark gray (10YR4/1) with 30% Dark yellowish brown (10YR4/6) mottles, moist, soft, sandy CLAY with trace gravel.

Depth ft. BGS: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Borehole Detail | Elevation ft. MSL: 630, 628, 626, 624, 622, 620, 618, 616, 614, 612 | Remarks

NOTE(S): G215 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/13/2010
Finish: 10/13/2010
WEATHER: Sunny, warm, windy (hi-60's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: S. Simpson

BOREHOLE ID: G215
Well ID: G215
Surface Elev: 630.48 ft. MSL
Completion: 24.31 ft. BGS
Station: 875,810.19N
2,515,971.55E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = Dry - Upon completion
▽ = 22.52 - 10/14/10

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	20/24 *83%*	SS	*2-4* *4-4* N=8	17				Dark yellowish brown (10YR4/6), moist, medium dense, clayey SILT with sand and trace gravel.		610	
								Yellowish brown (10YR5/6), moist, medium dense, silty, very fine- to fine-grained SAND.			
							22	Dark yellowish brown (10YR4/6) with 30% dark gray (10YR4/1) mottles, moist, firm, sandy CLAY with trace gravel.			
12A	24/24 *100%*	SS	*7-11* *17-19* N=28	11			▽	Grayish brown (10YR5/2), slightly moist, very firm, very silty CLAY with sand and gravel.		608	
12B	0/4 *0%*	BD		9			24	Dark gray (10YR4/1), slightly moist, hard, very silty CLAY with sand and gravel.			

End of Boring = 24.3 ft. BGS

NOTE(S): G215 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/13/2010
Finish: 10/13/2010
WEATHER: Partly cloudy, mild, windy (lo-60's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: S. Simpson

BOREHOLE ID: G216
Well ID: G216
Surface Elev: 630.28 ft. MSL
Completion: 26.00 ft. BGS
Station: 875,976.05N
2,515,968.53E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 21.00 - While drilling
▼ = Dry - Upon completion
▽ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	24/24 *100%*	SS	*3-2 2-4* N=4	22		
2A	19/24 *79%*	SS	*2-2 5-4* N=7	28		
3A	24/24 *100%*	SS	*2-2 4-5* N=6	19		
4A	22/24 *92%*	SS	*3-4 6-6* N=10	19		
5A	20/24 *83%*	SS	*2-3 3-6* N=6	18		
6A	18/24 *75%*	SS	*2-3 3-4* N=6	17		
7A	16/24 *67%*	SS	*1-2 3-4* N=5	20		
8A	22/24 *92%*	SS	*2-2 5-5* N=7	20		
9A	23/24 *96%*	SS	*woh-2 3-3* N=5	18		
10A	24/24 *100%*	SS	*woh-woh 1-2*	17		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0–5.1	FILL - Brown (10YR4/3) with 20% dark gray (10YR4/6) and 5% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	
5.1–6.4	FILL - Dark gray (10YR4/1) with 15% brown (10YR4/3) and 10% dark yellowish brown (10YR4/6) mottles, moist, firm, clayey SILT with trace sand and gravel.	
6.4–8.4	FILL - Dark grayish brown (10YR4/2) with 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	
8.4–12	Dark gray (10YR4/1) with 40% gray (10YR6/1) and 10% dark yellowish brown (10YR4/6) mottles, moist, firm, clayey SILT with trace sand.	
12–14.2	Gray (10YR5/1) with 20% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.	
14.2–15.4	Very dark gray (10YR3/1), moist, firm, silty CLAY with trace sand.	
15.4–18.3	Gray (10YR5/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.	
18.3–19.3	Gray (10YR5/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, firm, sandy CLAY with trace gravel.	

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Elevation scale: 630, 628, 626, 624, 622, 620, 618, 616, 614, 612

Borehole Detail | Remarks

NOTE(S): G216 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station	**CONTRACTOR:** Layne-Western Co		
Site: CCB Management Facility	**Rig mfg/model:** CME-750 ATV Drill	**BOREHOLE ID:** G216	
Location: Coffeen, Illinois	**Drilling Method:** 4¼" HSA w/SS samplers	**Well ID:** G216	
Project: 05S3004A		**Surface Elev:** 630.28 ft. MSL	
DATES: Start: 10/13/2010	**FIELD STAFF: Driller:** D. Mahurin	**Completion:** 26.00 ft. BGS	
Finish: 10/13/2010	**Helper:** J. Litsch/D. Smail	**Station:** 875,976.05N	
WEATHER: Partly cloudy, mild, windy (lo-60's)	**Eng/Geo:** S. Simpson	2,515,968.53E	

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 21.00 - While drilling
▼ = Dry - Upon completion
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Dark yellowish brown (10YR4/6) and 40% gray (10YR5/1) mottles, moist, soft, sandy CLAY with trace gravel. *[Continued from previous page]*		610	
11A	20/24 *83%*	SS	*2-9* *9-7* N=18	14			▼	Light brownish gray (10YR6/2), wet, medium dense, very fine- to fine-grained sandy SILT with trace gravel.			
							22	Yellowish brown (10YR5/6), wet, medium dense, silty, very fine-to medium-grained SAND.		608	
12A	22/24 *92%*	SS	*5-10* *21-25* N=31	19				Gray (10YR5/1), very moist, medium dense, very fine- to fine-grained sandy SILT.			
12B				16				Gray (10YR5/1), wet, medium dense, very fine- to fine-grained sandy SILT.			
							24	Dark gray (10YR4/1), wet, dense, silty, fine- to coarse-grained SAND with gravel.		606	
13A	20/24 *83%*	SS	*14-25* *27-27* N=52	9				Dark gray (10YR4/1), slightly moist, hard, very silty CLAY with sand and gravel.			
							26	**End of Boring = 26.0 ft. BGS**			

NOTE(S): G216 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/12/2010
Finish: 10/12/2010
WEATHER: Sunny, warm (lo-80's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: S. Simpson

BOREHOLE ID: G217
Well ID: G217
Surface Elev: 630.67 ft. MSL
Completion: 26.00 ft. BGS
Station: 876,185.57N
2,515,963.02E

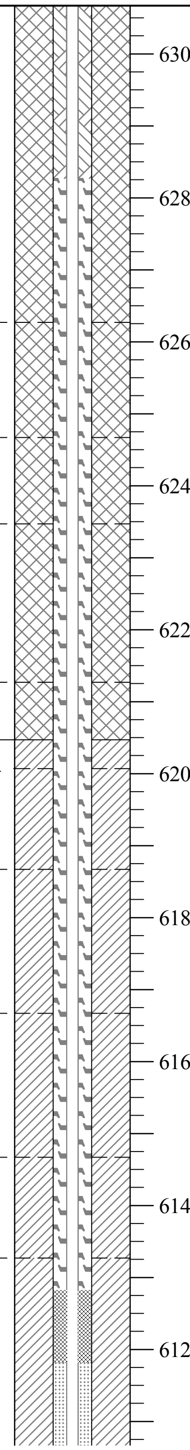
TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 23.00 - While drilling
▼ = 24.82 - Upon completion
▽ = 23.98 - 10/13/10

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	20/24 *83%*	SS	*5-2 3-4* N=5	21		
2A	19/24 *79%*	SS	*2-3 5-6* N=8	28		
3A	19/24 *79%*	SS	*2-3 6-7* N=9	14		
4A	23/24 *96%*	SS	*5-6 7-8* N=13	15		
5A	20/24 *83%*	SS	*3-5 7-6* N=12	13		
6A	19/24 *79%*	SS	*3-3 4-5* N=7	27		
7A	18/24 *75%*	SS	*3-4 6-8* N=10	28		
8A	20/24 *83%*	SS	*2-4 6-8* N=10	16		
9A	19/24 *79%*	SS	*2-3 4-5* N=7	26		
10A	19/24 *79%*	SS	*1-2 2-3* N=4	18		

Depth ft. BGS	Lithologic Description
0–4.4	FILL - Brown (10YR4/3) with 10% dark gray (10YR4/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.
4.4–6	FILL - Dark gray (10YR4/1) with 25% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.
6–7.2	FILL - Brown (10YR4/3) with 10% dark gray (10YR4/1) and 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.
7.2–9.4	FILL - Dark grayish brown (10YR4/2) with 5% dark yellowish brown (10YR4/6) slightly moist, firm, clayey SILT with trace sand and gravel.
9.4–10.2	FILL - Very dark gray (10YR3/1), moist, firm, silty CLAY with trace sand and gravel.
10.2–10.8	Dark gray (10YR4/1), moist, firm, silty CLAY with trace sand and gravel.
10.8–12	Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand, trace roots.
12–14	Dark grayish brown (10YR4/2) with 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY trace sand, trace roots.
14–16	Dark gray (10YR4/1), moist, firm, silty CLAY with trace sand and gravel.
16–17.4	Dark gray (10YR4/1) with 10% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY with trace sand and gravel.
17.4–20	Gray (10YR5/1) with 5% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with sand and trace gravel.

Borehole Detail | Elevation ft. MSL | Remarks



NOTE(S): G217 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/12/2010
Finish: 10/12/2010
WEATHER: Sunny, warm (lo-80's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: S. Simpson

BOREHOLE ID: G217
Well ID: G217
Surface Elev: 630.67 ft. MSL
Completion: 26.00 ft. BGS
Station: 876,185.57N
2,515,963.02E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 23.00 - While drilling
▼ = 24.82 - Upon completion
▽ = 23.98 - 10/13/10

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	22/24 *92%*	SS	*woh-woh* *1-2*	18				Gray (10YR5/1) with 5% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with sand and trace gravel. *[Continued from previous page]*		610	
							22	Gray (10YR5/1) with 20% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with sand and trace gravel.			
12A	10/24 *42%*	SS	*4-6* *7-10* N=13	13			▼	Yellowish brown (10 YR5/4), wet, medium dense, silty, very fine- to coarse-grained SAND with trace gravel.		608	
							▽ 24				
13A	22/24 *92%*	SS	*8-18* *17-17* N=35	12			▼	Dark gray (10YR4/1), slightly moist, hard, very silty CLAY with sand and gravel.		606	
							26				

End of Boring = 26.0 ft. BGS

NOTE(S): G217 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/12/2010
Finish: 10/12/2010
WEATHER: Partly cloudy, warm (lo-70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: S. Simpson

BOREHOLE ID: G218
Well ID: G218
Surface Elev: 630.64 ft. MSL
Completion: 26.00 ft. BGS
Station: 876,380.92N
2,515,962.16E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 24.00 - While drilling
▼ = 24.76 - Upon completion
▽ =

SAMPLE			TESTING			
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*
1A	18/24 *75%*	SS	*4-1 2-1* N=3	20		
2A	22/24 *92%*	SS	*2-2 3-5* N=5	20		
3A	19/24 *79%*	SS	*2-3 4-8* N=7	17		
4A	22/24 *92%*	SS	*2-5 6-8* N=11	14		
5A	20/24 *83%*	SS	*3-4 8-7* N=12	17		
6A	19/24 *79%*	SS	*2-2 3-5* N=5	19		
6B				25		
7A	22/24 *92%*	SS	*2-3 5-7* N=8	22		
8A	18/24 *75%*	SS	*2-3 4-5* N=7	19		
9A	24/24 *100%*	SS	*2-2 2-4* N=4	19		
10A	24/24 *100%*	SS	*1-2 2-3* N=4	18		

Depth ft. BGS	Lithologic Description
	FILL - Brown (10YR4/3) with 15% dark gray (10YR4/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.
	FILL - Dark gray (10YR4/1) with 30% brown (10YR4/3) and 10% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand and gravel.
	FILL - Brown (10YR5/3) with 10% dark gray (10YR4/1) mottles, slightly moist, firm, clayey SILT with trace sand and gravel.
	Dark grayish brown (10YR4/2) with 5% dark yellowish brown (10YR4/6) mottles, moist, firm, clayey SILT with trace sand.
	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, firm, silty CLAY with trace sand, slight trace roots.
	Dark gray (10YR4/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, firm, clayey SILT with trace sand.
	Gray (10YR5/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.

Borehole Detail | Elevation ft. MSL: 630, 628, 626, 624, 622, 620, 618, 616, 614, 612 | Remarks

NOTE(S): G218 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/12/2010
Finish: 10/12/2010
WEATHER: Partly cloudy, warm (lo-70's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: S. Simpson

BOREHOLE ID: G218
Well ID: G218
Surface Elev: 630.64 ft. MSL
Completion: 26.00 ft. BGS
Station: 876,380.92N
2,515,962.16E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 24.00 - While drilling
▼ = 24.76 - Upon completion
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
11A	22/24 *92%*	SS	*woh-woh* *woh-woh*	16		
12A	24/24 *100%*	SS	*1-1* *1-3* N=2	10		
12B				16		
13A	24/24 *100%*	SS	*1-5* *9-13* N=14	20		
13B				17		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
	Gray (10YR5/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, very soft, clayey, very fine- to coarse-grained SAND with trace gravel.	610
22	Yellowish brown, wet, loose, silty, very fine- to coarse-grained SAND with trace gravel.	608
	Dark gray (10YR4/1) with 10% dark yellowish brown (10YR4/6) mottles, moist, soft, silty CLAY with trace sand and gravel.	
24	Gray (10YR5/1), wet, loose, silty, very fine- to coarse-grained SAND with trace gravel.	606
	Dark gray (10YR4/1), slightly moist, very firm, very silty CLAY with sand and gravel.	
26	**End of Boring = 26.0 ft. BGS**	

Borehole Detail | Remarks

NOTE(S): G218 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/15/2010
Finish: 10/15/2010
WEATHER: Sunny (mid-50's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: R. Hasenyager

BOREHOLE ID: T202
Well ID: T202
Surface Elev: 626.22 ft. MSL
Completion: 18.00 ft. BGS
Station: 876,699.42N
2,514,895.01E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ = 15.42 - Upon completion
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
							0	FILL - Yellowish brown (10YR5/6), slightly moist, hard, silty CLAY with trace sand and gravel.	626	
1A	23/24 *96%*	SS	*6-4 5-7* N=9	27			2	Yellowish brown (10YR5/6) with 30% gray (10YR5/1) mottles, moist, hard, silty CLAY with slight trace sand and gravel.	624	
2A	24/24 *100%*	SS	*3-4 6-6* N=10	25						
2B				26			4	Yellowish brown (10YR5/8) with 35% gray (10YR5/1) and 15% very dark brown (10YR2/2) mottles, moist, hard, silty CLAY with trace sand and slight trace gravel.	622	
3A	22/24 *92%*	SS	*2-4 5-6* N=9	22			6		620	
4A	23/24 *96%*	SS	*1-2 3-3* N=5	21			8	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist, soft, silty CLAY with trace sand and slight trace gravel.	618	
5A	23/24 *96%*	SS	*1-1 3-2* N=4	22			10		616	
6A	24/24 *100%*	SS	*woh-1 3-3* N=4	23				Gray (10YR6/1) with 15% yellowish brown (10YR5/8) mottles, very moist, soft, silty CLAY with sand and slight trace gravel.		
6B				21			12	Yellowish brown (10YR5/8) with 10% gray (10YR6/1) mottles, very moist, firm, silty CLAY with sand and trace gravel.	614	
7A	24/24 *100%*	SS	*1-2 1-2* N=3	21						
7B				25			14	Gray (10YR6/1) with 10% brownish yellow (10YR6/6) mottles, very moist, soft, sandy CLAY with silt and slight trace gravel.	612	
8A	24/24 *100%*	SS	*woh-2 1-8* N=3	17			▼	Gray (10YR5/1), wet, loose, very fine- to medium-grained SAND with trace gravel.		
9A	24/24 *100%*	SS	*6-15 20-24* N=35	9			16	Gray (10YR6/1), moist, hard, very silty CLAY with sand and trace gravel.	610	
							18	**End of Boring = 18.0 ft. BGS**		

NOTE(S): T202 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 2/26/2008
Finish: 2/26/2008
WEATHER: Overcast, cold

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: S. Simpson

BOREHOLE ID: G270
Well ID: G270
Surface Elev: 622.9 ft. MSL
Completion: 18.3 ft. BGS
Station: 874,801.92N
2,514,996.84E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 16.00 - While drilling
▼ = 5.62 - 3/12/08
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	20/24 *83%*	SS	*2-2 2-4* N=4	24		
2A	19/24 *79%*	SS	*3-4 5-9* N=9	22		2.33 *B*
2B				20		5.04 *Sh*
3A	20/24 *83%*	SS	*14-5 7-8* N=12	17		2.52 *Sh*
4A	24/24 *100%*	SS	*8-6 7-5* N=13	21		1.24 *BSh*
4B				21		1.20 *B*
5A	22/24 *92%*	SS	*2-3 4-4* N=7	21		1.36 *B*
6A	24/24 *100%*	SS	*1-2 2-3* N=4	21		0.74 *BSh*
6B				24		0.78 *B*
7A	17/24 *71%*	SS	*2-2 2-3* N=4	21		
8A				20		
8B	19/24 *79%*	SS	*1-3 5-6* N=8	17		4.46 *Sh*
9A	24/24 *100%*	SS	*6-8 30-35* N=38	20		
9B				8		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
	Dark grayish brown (10YR4/2), moist, firm, clayey SILT	622
	Dark grayish brown (10YR4/2), moist, firm, silty CLAY	
2	Dark grayish brown (10YR4/2) with 5% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, slight trace sand	620
4	Gray (10YR5/1) with 70% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, slight trace sand and gravel	618
6	Dark gray (10YR4/1) with 5% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, trace sand, slight trace gravel	616
8	Gray (10YR5/1) with 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, trace sand, slight trace gravel	614
10	Gray (10YR5/1) with 60% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, trace sand, slight trace gravel	612
	Gray (10YR5/1), moist, soft, sandy CLAY	
12	Gray (10YR5/1), moist, soft, sandy CLAY, trace gravel	610
14	Gray (10YR5/1), moist, soft, fine- to coarse-grained SAND, trace gravel	
	Dark yellowish brown (10YR4/4), moist, soft, sandy CLAY	608
	Gray (10YR5/1) with 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, slight trace sand and gravel	
16	Yellowish brown (10YR5/4), wet, soft, fine to coarse SAND	606
18	Gray (10YR5/1), moist, hard, silty CLAY, trace sand and gravel	

End of Boring = 18.27 ft. BGS

Borehole Detail | Remarks

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 2/26/2008
Finish: 2/26/2008
WEATHER: Overcast, cold

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: S. Simpson

BOREHOLE ID: G280
Well ID: G280
Surface Elev: 623.0 ft. MSL
Completion: 18.0 ft. BGS
Station: 875,045.11N
2,515,679.48E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 15.60 - While drilling
▼ = 4.34 - 3/12/08
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	24/24 *100%*	SS	*5-3 4-4* N=7	23		
1B				26		2.33 *B*
2A	24/24 *100%*	SS	*3-4 4-6* N=8	30		1.28 *BSh*
2B				25		
	19/24 *79%*	SS	*3-4 6-6* N=10			
3A				14		3.10 *Sh*
	22/24 *92%*	SS	*9-11 10-8* N=21			
4A				18		1.67 *BSh*
5A	19/24 *79%*	SS	*2-2 4-4* N=6	20		1.47 *B*
5B				21		1.28 *B*
	22/24 *92%*	SS	*2-3 3-3* N=6			
6A				20		
	23/24 *96%*	SS	*3-14 23-21* N=37			
7A				13		
	23/24 *96%*	SS	*12-17 24-26* N=41			
8A				9		
8B				15		
9A	24/24 *100%*	SS	*11-27 54-43* N=81	26		
9B				7		

Depth ft. BGS	Lithologic Description
	Dark grayish brown (10YR4/2), moist, firm, clayey SILT
	Brown (10YR4/3) with 20% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY
2	Dark yellowish brown (10YR4/4), moist, firm, silty CLAY
4	Dark gray (10YR4/1) with 40% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY
6	Dark gray (10YR4/1) with 40% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, slight trace sand
	Dark gray (10YR4/1) with 40% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, trace sand, slight trace gravel
8, 10	Dark gray (10YR4/1) with 40% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, sand, trace gravel
12	Yellowish brown (10YR5/8) with 20% light gray (10YR6/1) mottles, moist, soft, sandy CLAY
	Yellowish brown (10YR5/8), moist, soft, fine to coarse SAND, trace gravel
	Yellowish brown (10YR5/8), moist, firm, sandy CLAY, trace gravel
14	Yellowish brown (10YR5/4), moist, firm, clayey SILT, trace sand and gravel
16	Yellowish brown (10YR5/4), wet, soft, fine- to coarse-grained SAND, trace gravel
	Gray (10YR5/1), moist, hard, silty CLAY, trace sand and gravel

Elevation ft. MSL: 622, 620, 618, 616, 614, 612, 610, 608, 606

Borehole Detail — Remarks

End of Boring = 17.98 ft. BGS

NOTE(S):

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G200

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G200

~~State-~~ ~~Plane~~ Plant Coordinate: X 877,930.6 Y 2,515,650.0 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Suzanna L Simpson Date Started: 2/25/2008 Date Finished: 2/25/2008

Report Form Completed By: Suzanna L Simpson Date: 2/29/2008

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: >24 hr.

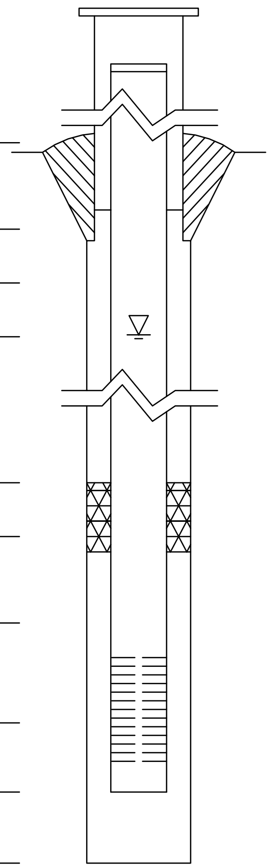
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Formation Sand (if applicable)

Installation Method: Slough



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.54	-2.34	Top of Protective Casing
625.94	-1.74	Top of Riser Pipe
624.20	0.00	Ground Surface
620.70	3.50	Top of Annular Sealant
621.45	2.75	Static Water Level (After Completion) 3/12/2008
620.70	3.50	Top of Seal
614.20	10.00	Top of Sand Pack
612.01	12.19	Top of Screen
607.22	16.98	Bottom of Screen
606.84	17.36	Bottom of Well
606.20	18.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	13.93
Bottom of Screen to End Cap	(feet)	0.38
Screen Length (1st slot to last slot)	(feet)	4.79
Total Length of Casing	(feet)	19.10
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: R201

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: R201

State Plane Coordinate: X 2,514,842.0 Y 877,925.3 (or) Latitude: 39 ° 4 ' 30.5 " Longitude: -89 ° 23 ' 52.3 "

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Rhonald W. Hasenyager Date Started: 10/15/2010 Date Finished: 10/15/2010

Report Form Completed By: Suzanna L. Simpson Date: 10/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) — Granular

Installation Method: Gravity

Setting Time: 48 min

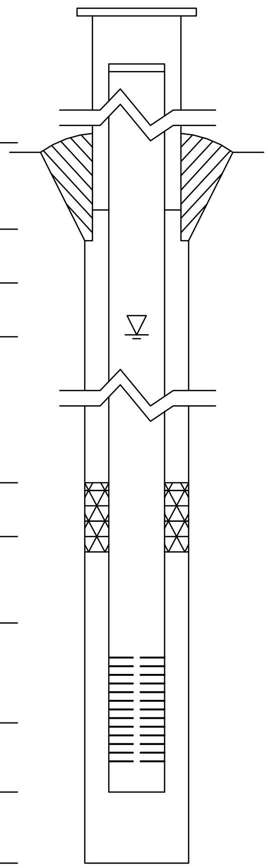
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.51	-2.49	Top of Protective Casing
626.34	-2.32	Top of Riser Pipe
624.02	0.00	Ground Surface
621.52	2.50	Top of Annular Sealant
618.70	5.32	Static Water Level (After Completion) 11/15/2010
614.47	9.55	Top of Seal
612.90	11.12	Top of Sand Pack
611.75	12.27	Top of Screen
607.36	16.66	Bottom of Screen
606.80	17.22	Bottom of Well
606.80	17.22	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	14.59
Bottom of Screen to End Cap	(feet)	0.56
Screen Length (1st slot to last slot)	(feet)	4.39
Total Length of Casing	(feet)	19.54
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ________ County: Montgomery Well #: G201

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G201

~~State-~~ ~~Plane~~ Plant Coordinate: X 877,924.9 Y 2,514,849.5 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ________

Logged By: Suzanna L Simpson Date Started: 2/25/2008 Date Finished: 2/25/2008

Report Form Completed By: Suzanna L Simpson Date: 2/29/2008

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: >24 hr.

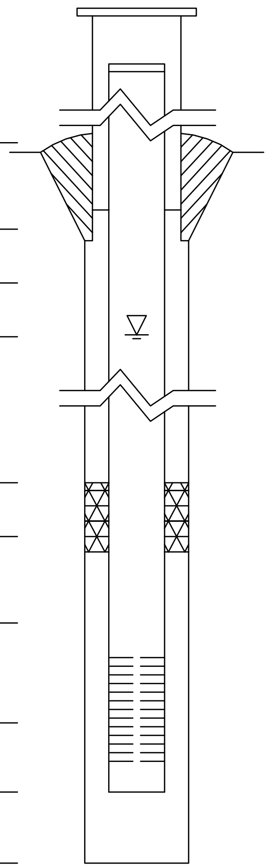
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
627.66	-3.76	Top of Protective Casing
627.12	-3.22	Top of Riser Pipe
623.90	0.00	Ground Surface
620.60	3.30	Top of Annular Sealant
621.73	2.17	Static Water Level (After Completion) 3/12/2008
620.60	3.30	Top of Seal
611.80	12.10	Top of Sand Pack
610.89	13.01	Top of Screen
606.10	17.80	Bottom of Screen
605.75	18.15	Bottom of Well
605.75	18.15	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	16.23
Bottom of Screen to End Cap	(feet)	0.35
Screen Length (1st slot to last slot)	(feet)	4.79
Total Length of Casing	(feet)	21.37
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel (circled)
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Screen	SS304	SS316	PTFE	PVC (circled)	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G205

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G205

~~State Plane~~ Plant Coordinate: X 875,550.2 Y 2,515,914.9 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Suzanna L Simpson Date Started: 2/21/2008 Date Finished: 2/21/2008

Report Form Completed By: Suzanna L Simpson Date: 2/29/2008

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: >24 hr.

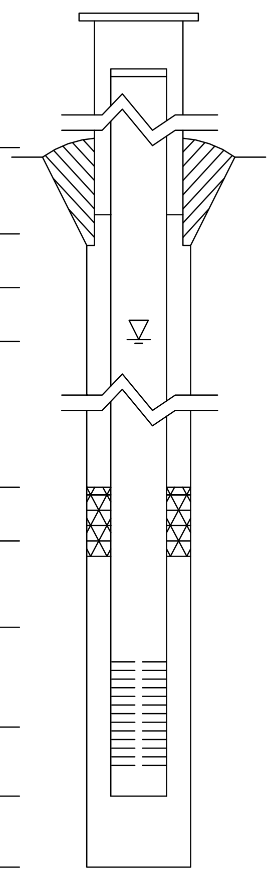
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Formation Sand (if applicable)

Installation Method: Slough



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
624.87	-2.72	Top of Protective Casing
624.45	-2.30	Top of Riser Pipe
622.15	0.00	Ground Surface
619.95	2.20	Top of Annular Sealant
617.09	5.06	Static Water Level (After Completion) 3/12/2008
619.95	2.20	Top of Seal
613.35	8.80	Top of Sand Pack
612.11	10.04	Top of Screen
607.62	14.53	Bottom of Screen
607.08	15.07	Bottom of Well
606.15	16.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	12.34
Bottom of Screen to End Cap	(feet)	0.54
Screen Length (1st slot to last slot)	(feet)	4.49
Total Length of Casing	(feet)	17.37
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G206

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G206

State Plane Coordinate: X 2,514,669.2 Y 875,103.9 (or) Latitude: 39 ° 4 ' 2.6 " Longitude: -89 ° 23 ' 54.8 "

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 10/14/2010 Date Finished: 10/14/2010

Report Form Completed By: Suzanna L. Simpson Date: 10/15/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) [circled: Granular]

Installation Method: Gravity

Setting Time: 15 min

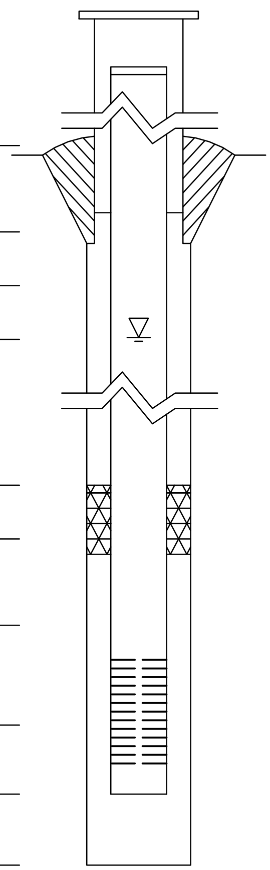
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.07	-2.53	Top of Protective Casing
632.82	-2.28	Top of Riser Pipe
630.54	0.00	Ground Surface
627.84	2.70	Top of Annular Sealant
611.96	18.58	Static Water Level (After Completion) 11/15/2010
616.24	14.30	Top of Seal
615.04	15.50	Top of Sand Pack
613.03	17.51	Top of Screen
608.62	21.92	Bottom of Screen
608.12	22.42	Bottom of Well
606.54	24.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	19.79
Bottom of Screen to End Cap	(feet)	0.50
Screen Length (1st slot to last slot)	(feet)	4.41
Total Length of Casing	(feet)	24.70
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G207

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G207

State Plane Coordinate: X 2,514,837.9 Y 875,166.4 (or) Latitude: 39 ° 4 ' 3.2 " Longitude: -89 ° 23 ' 52.6 "

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 10/8/2010 Date Finished: 10/8/2010

Report Form Completed By: Suzanna L. Simpson Date: 10/8/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 15 min

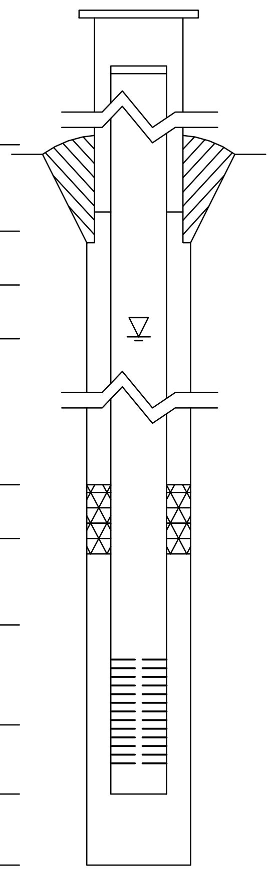
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.37	-2.76	Top of Protective Casing
633.21	-2.60	Top of Riser Pipe
630.61	0.00	Ground Surface
628.61	2.00	Top of Annular Sealant
612.86	17.75	Static Water Level (After Completion) 11/15/2010
614.76	15.85	Top of Seal
613.63	16.98	Top of Sand Pack
612.37	18.24	Top of Screen
607.84	22.77	Bottom of Screen
607.31	23.30	Bottom of Well
606.61	24.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	20.84
Bottom of Screen to End Cap	(feet)	0.53
Screen Length (1st slot to last slot)	(feet)	4.53
Total Length of Casing	(feet)	25.90
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G208

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G208

State Plane Coordinate: X 2,514,993.6 Y 875,231.5 (or) Latitude: 39 ° 4 ' 3.9 " Longitude: -89 ° 23 ' 50.6 "

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 10/7/2010 Date Finished: 10/7/2010

Report Form Completed By: Suzanna L. Simpson Date: 10/8/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 9 min

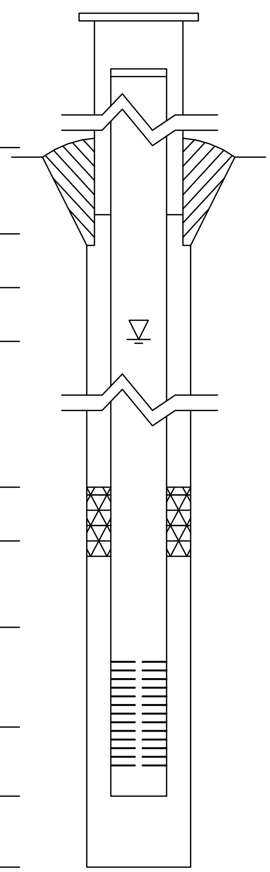
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.43	-2.86	Top of Protective Casing
633.16	-2.59	Top of Riser Pipe
630.57	0.00	Ground Surface
627.77	2.80	Top of Annular Sealant
614.76	15.81	Static Water Level (After Completion) 11/15/2010
616.07	14.50	Top of Seal
613.90	16.67	Top of Sand Pack
613.04	17.53	Top of Screen
608.51	22.06	Bottom of Screen
607.97	22.60	Bottom of Well
606.57	24.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	20.12
Bottom of Screen to End Cap	(feet)	0.54
Screen Length (1st slot to last slot)	(feet)	4.53
Total Length of Casing	(feet)	25.19
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G209

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G209

State Plane Coordinate: X 2,515,149.6 Y 875,298.2 (or) Latitude: 39 ° 4 ' 4.5 " Longitude: -89 ° 23 ' 48.7 "

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 10/7/2010 Date Finished: 10/7/2010

Report Form Completed By: Suzanna L. Simpson Date: 10/8/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) [Granular circled]

Installation Method: Gravity

Setting Time: 15 min

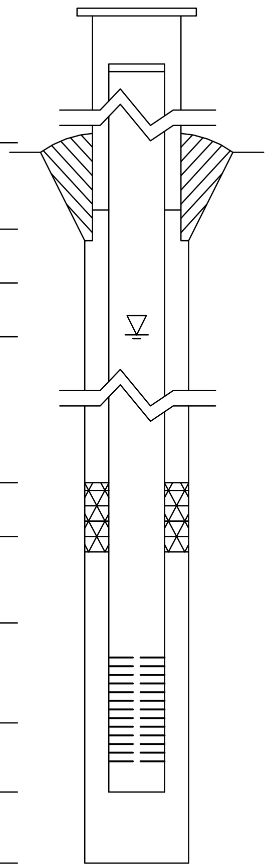
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.16	-2.59	Top of Protective Casing
632.91	-2.34	Top of Riser Pipe
630.57	0.00	Ground Surface
627.57	3.00	Top of Annular Sealant
615.52	15.05	Static Water Level (After Completion) 11/15/2010
616.07	14.50	Top of Seal
614.67	15.90	Top of Sand Pack
612.83	17.74	Top of Screen
608.29	22.28	Bottom of Screen
607.76	22.81	Bottom of Well
606.57	24.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	20.08
Bottom of Screen to End Cap	(feet)	0.53
Screen Length (1st slot to last slot)	(feet)	4.54
Total Length of Casing	(feet)	25.15
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G210

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G210

State Plane Coordinate: X 2,515,299.0 Y 875,359.7 (or) Latitude: 39 ° 4 ' 5.1 " Longitude: -89 ° 23 ' 46.8 "

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 10/6/2010 Date Finished: 10/6/2010

Report Form Completed By: Suzanna L. Simpson Date: 10/8/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 15 hrs

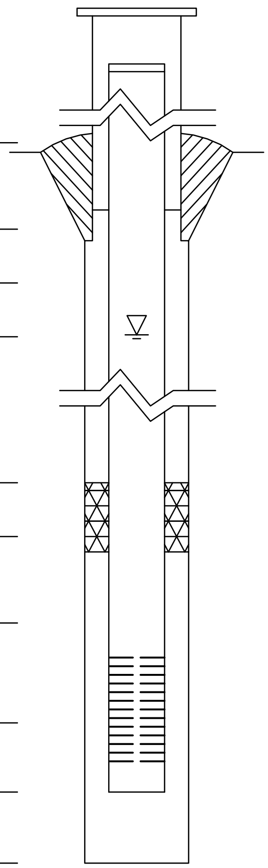
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.17	-2.69	Top of Protective Casing
632.99	-2.51	Top of Riser Pipe
630.48	0.00	Ground Surface
627.48	3.00	Top of Annular Sealant
615.38	15.10	Static Water Level (After Completion) 11/15/2010
614.03	16.45	Top of Seal
612.98	17.50	Top of Sand Pack
611.09	19.39	Top of Screen
606.55	23.93	Bottom of Screen
606.02	24.46	Bottom of Well
605.48	25.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	21.90
Bottom of Screen to End Cap	(feet)	0.53
Screen Length (1st slot to last slot)	(feet)	4.54
Total Length of Casing	(feet)	26.97
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: 　　County: Montgomery　　Well #: G211

Site Name: AEG Coffeen Power Station CCB Management Facility　　Borehole #: G211

State Plane Coordinate: X 2,515,449.1 Y 875,424.5 (or) Latitude: 39 ° 4 ' 5.7 " Longitude: -89 ° 23 ' 44.9 "

Surveyed By: Jeffrey D. Emrick　　IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co　　Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc.　　Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger　　Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson　　Date Started: 10/11/2010　　Date Finished: 10/11/2010

Report Form Completed By: Suzanna L. Simpson　　Date: 10/15/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) [Granular]

Installation Method: Gravity

Setting Time: 15 min

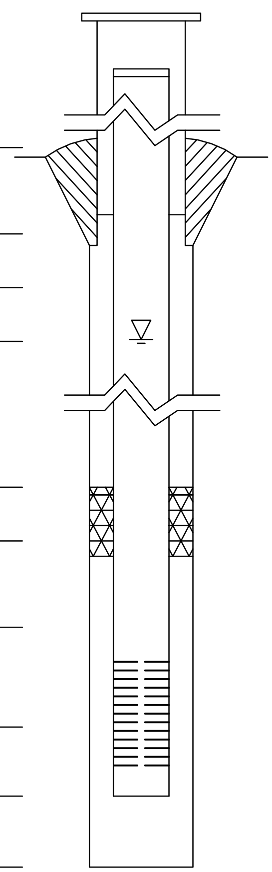
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
632.83	-2.52	Top of Protective Casing
632.64	-2.33	Top of Riser Pipe
630.31	0.00	Ground Surface
627.31	3.00	Top of Annular Sealant
616.17	14.14	Static Water Level (After Completion) 11/15/2010
616.01	14.30	Top of Seal
614.91	15.40	Top of Sand Pack
612.97	17.34	Top of Screen
608.43	21.88	Bottom of Screen
607.90	22.41	Bottom of Well
606.31	24.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	19.67
Bottom of Screen to End Cap	(feet)	0.53
Screen Length (1st slot to last slot)	(feet)	4.54
Total Length of Casing	(feet)	24.74
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G212

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G212

State Plane Coordinate: X 2,515,583.0 Y 875,486.5 (or) Latitude: 39 ° 4 ' 6.3 " Longitude: -89 ° 23 ' 43.1 "

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 10/11/2010 Date Finished: 10/11/2010

Report Form Completed By: Suzanna L. Simpson Date: 10/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 17 min

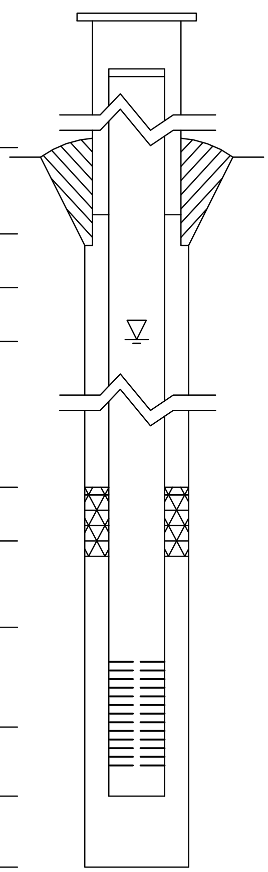
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.12	-2.53	Top of Protective Casing
632.89	-2.30	Top of Riser Pipe
630.59	0.00	Ground Surface
627.59	3.00	Top of Annular Sealant
616.10	14.49	Static Water Level (After Completion) 11/15/2010
616.89	13.70	Top of Seal
615.79	14.80	Top of Sand Pack
613.85	16.74	Top of Screen
609.30	21.29	Bottom of Screen
608.78	21.81	Bottom of Well
606.59	24.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	19.04
Bottom of Screen to End Cap	(feet)	0.52
Screen Length (1st slot to last slot)	(feet)	4.55
Total Length of Casing	(feet)	24.11
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G213

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G213

State Plane Coordinate: X 2,515,723.5 Y 875,544.4 (or) Latitude: 39 ° 4 ' 6.9 " Longitude: -89 ° 23 ' 41.4 "

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 10/12/2010 Date Finished: 10/12/2010

Report Form Completed By: Suzanna L. Simpson Date: 10/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- **Granular** Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 10 min

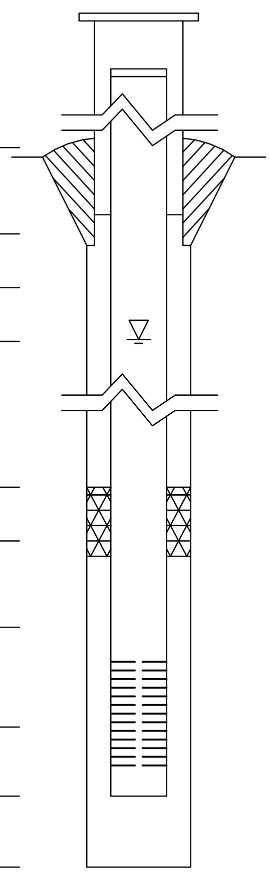
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.08	-2.74	Top of Protective Casing
632.81	-2.47	Top of Riser Pipe
630.34	0.00	Ground Surface
627.64	2.70	Top of Annular Sealant
615.01	15.33	Static Water Level (After Completion) 11/15/2010
616.54	13.80	Top of Seal
615.34	15.00	Top of Sand Pack
613.59	16.75	Top of Screen
609.05	21.29	Bottom of Screen
608.52	21.82	Bottom of Well
606.34	24.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	19.22
Bottom of Screen to End Cap	(feet)	0.53
Screen Length (1st slot to last slot)	(feet)	4.54
Total Length of Casing	(feet)	24.29
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: **Steel**
Riser Pipe Above W.T.	SS304	SS316	PTFE	**PVC**	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	**PVC**	OTHER:
Screen	SS304	SS316	PTFE	**PVC**	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G214

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G214

State Plane Coordinate: X 2,515,960.8 Y 875,668.0 (or) Latitude: 39 ° 4 ' 8.1 " Longitude: -89 ° 23 ' 38.3 "

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 10/14/2010 Date Finished: 10/14/2010

Report Form Completed By: Suzanna L. Simpson Date: 10/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 14 min

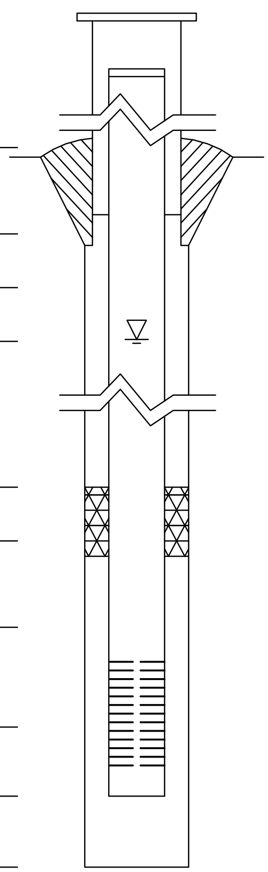
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.08	-2.69	Top of Protective Casing
632.85	-2.46	Top of Riser Pipe
630.39	0.00	Ground Surface
626.99	3.40	Top of Annular Sealant
609.48	20.91	Static Water Level (After Completion) 11/15/2010
615.39	15.00	Top of Seal
614.34	16.05	Top of Sand Pack
612.64	17.75	Top of Screen
608.25	22.14	Bottom of Screen
607.74	22.65	Bottom of Well
606.39	24.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	20.21
Bottom of Screen to End Cap	(feet)	0.51
Screen Length (1st slot to last slot)	(feet)	4.39
Total Length of Casing	(feet)	25.11
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G215

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G215

State Plane Coordinate: X 2,515,971.6 Y 875,810.2 (or) Latitude: 39 ° 4 ' 9.5 " Longitude: -89 ° 23 ' 38.2 "

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 10/13/2010 Date Finished: 10/13/2010

Report Form Completed By: Suzanna L. Simpson Date: 10/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 20 min

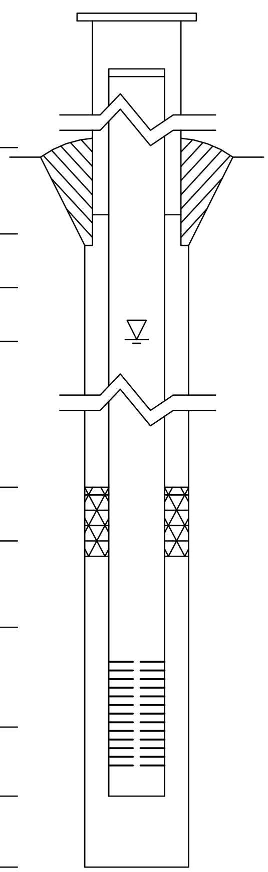
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.30	-2.82	Top of Protective Casing
633.06	-2.58	Top of Riser Pipe
630.48	0.00	Ground Surface
627.58	2.90	Top of Annular Sealant
607.64	22.84	Static Water Level (After Completion) 11/15/2010
614.08	16.40	Top of Seal
612.98	17.50	Top of Sand Pack
611.07	19.41	Top of Screen
606.68	23.80	Bottom of Screen
606.17	24.31	Bottom of Well
606.17	24.31	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	21.99
Bottom of Screen to End Cap	(feet)	0.51
Screen Length (1st slot to last slot)	(feet)	4.39
Total Length of Casing	(feet)	26.89
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G216

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G216

State Plane Coordinate: X 2,515,968.5 Y 875,976.1 (or) Latitude: 39 ° 4 ' 11.2 " Longitude: -89 ° 23 ' 38.2 "

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 10/13/2010 Date Finished: 10/13/2010

Report Form Completed By: Suzanna L. Simpson Date: 10/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 15 min

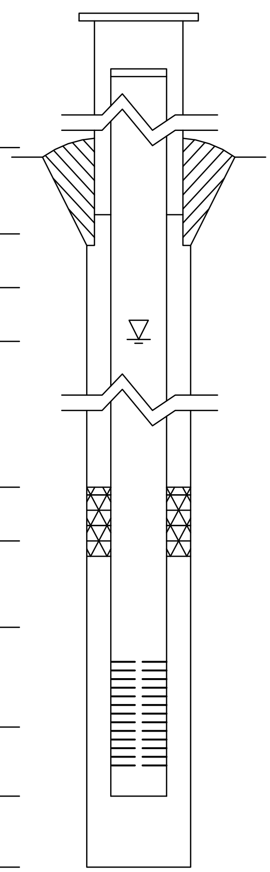
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.02	-2.74	Top of Protective Casing
632.76	-2.48	Top of Riser Pipe
630.28	0.00	Ground Surface
627.78	2.50	Top of Annular Sealant
607.52	22.76	Static Water Level (After Completion) 11/15/2010
613.28	17.00	Top of Seal
612.08	18.20	Top of Sand Pack
610.24	20.04	Top of Screen
605.86	24.42	Bottom of Screen
605.35	24.93	Bottom of Well
604.28	26.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	22.52
Bottom of Screen to End Cap	(feet)	0.51
Screen Length (1st slot to last slot)	(feet)	4.38
Total Length of Casing	(feet)	27.41
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G217

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G217

State Plane Coordinate: X 2,515,963.0 Y 876,185.6 (or) Latitude: 39 ° 4 ' 13.2 " Longitude: -89 ° 23 ' 38.3 "

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 10/12/2010 Date Finished: 10/12/2010

Report Form Completed By: Suzanna L. Simpson Date: 10/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 11 min

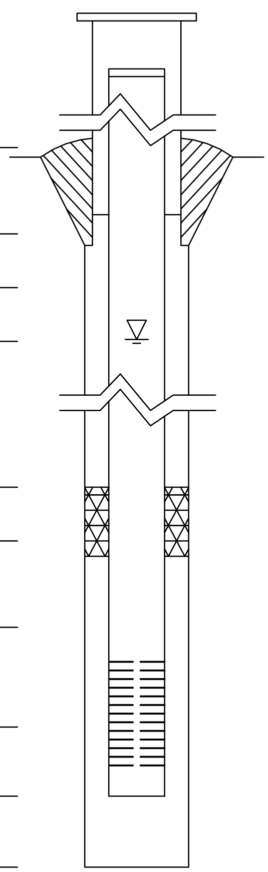
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.34	-2.67	Top of Protective Casing
633.10	-2.43	Top of Riser Pipe
630.67	0.00	Ground Surface
628.27	2.40	Top of Annular Sealant
609.28	21.39	Static Water Level (After Completion) 11/15/2010
612.82	17.85	Top of Seal
611.82	18.85	Top of Sand Pack
610.18	20.49	Top of Screen
605.79	24.88	Bottom of Screen
605.29	25.38	Bottom of Well
604.67	26.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	22.92
Bottom of Screen to End Cap	(feet)	0.50
Screen Length (1st slot to last slot)	(feet)	4.39
Total Length of Casing	(feet)	27.81
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel (circled)
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Screen	SS304	SS316	PTFE	PVC (circled)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G218

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G218

State Plane Coordinate: X 2,515,962.2 Y 876,380.9 (or) Latitude: 39 ° 4 ' 15.2 " Longitude: -89 ° 23 ' 38.2 "

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 10/12/2010 Date Finished: 10/12/2010

Report Form Completed By: Suzanna L. Simpson Date: 10/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 17 min

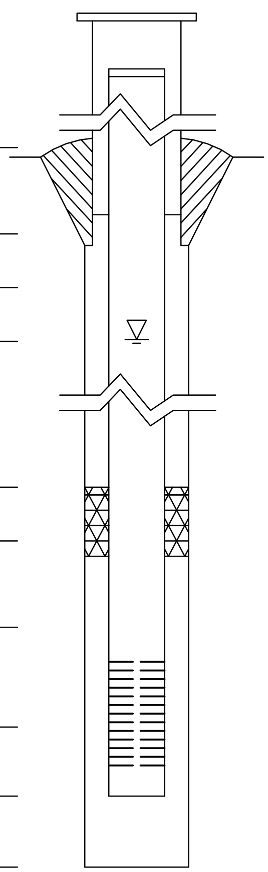
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.34	-2.70	Top of Protective Casing
633.11	-2.47	Top of Riser Pipe
630.64	0.00	Ground Surface
627.14	3.50	Top of Annular Sealant
609.89	20.75	Static Water Level (After Completion) 11/15/2010
613.14	17.50	Top of Seal
612.14	18.50	Top of Sand Pack
610.31	20.33	Top of Screen
605.87	24.77	Bottom of Screen
605.37	25.27	Bottom of Well
604.64	26.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	22.80
Bottom of Screen to End Cap	(feet)	0.50
Screen Length (1st slot to last slot)	(feet)	4.44
Total Length of Casing	(feet)	27.74
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G270

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G270

~~State- Plane~~ Plant Coordinate: X 874,801.9 Y 2,514,996.8 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Suzanna L Simpson Date Started: 2/26/2008 Date Finished: 2/26/2008

Report Form Completed By: Suzanna L Simpson Date: 2/29/2008

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: >24 hr.

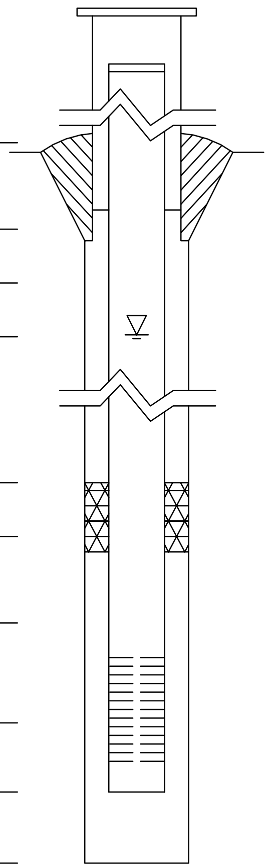
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.41	-3.49	Top of Protective Casing
625.97	-3.05	Top of Riser Pipe
622.92	0.00	Ground Surface
619.92	3.00	Top of Annular Sealant
617.30	5.62	Static Water Level (After Completion) 3/12/2008
619.92	3.00	Top of Seal
610.92	12.00	Top of Sand Pack
609.79	13.13	Top of Screen
605.00	17.92	Bottom of Screen
604.65	18.27	Bottom of Well
604.65	18.27	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	16.18
Bottom of Screen to End Cap	(feet)	0.35
Screen Length (1st slot to last slot)	(feet)	4.79
Total Length of Casing	(feet)	21.32
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G280

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G280

~~State-~~ ~~Plane~~ Plant Coordinate: X 875,045.1 Y 2,515,679.5 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Suzanna L Simpson Date Started: 2/26/2008 Date Finished: 2/26/2008

Report Form Completed By: Suzanna L Simpson Date: 2/29/2008

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: >24 hr.

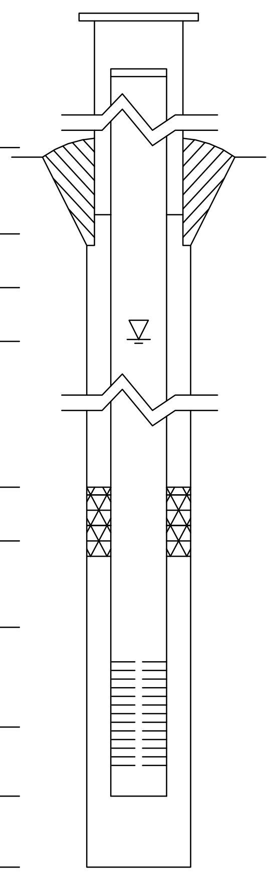
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.79	-2.84	Top of Protective Casing
625.30	-2.35	Top of Riser Pipe
622.95	0.00	Ground Surface
620.85	2.10	Top of Annular Sealant
618.61	4.34	Static Water Level (After Completion) 3/12/2008
620.85	2.10	Top of Seal
611.75	11.20	Top of Sand Pack
610.16	12.79	Top of Screen
605.32	17.63	Bottom of Screen
604.97	17.98	Bottom of Well
604.97	17.98	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	15.14
Bottom of Screen to End Cap	(feet)	0.35
Screen Length (1st slot to last slot)	(feet)	4.84
Total Length of Casing	(feet)	20.33
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #:
County: Montgomery
Well #: T202

Site Name: AEG Coffeen Power Station CCB Management Facility
Borehole #: T202

State Plane Coordinate: X 2,514,895.0 Y 876,699.4 (or) Latitude: 39 ° 4 ' 18.4 " Longitude: -89 ° 23 ' 51.7 "

Surveyed By: Jeffrey D. Emrick
IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co
Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc.
Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger
Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson
Date Started: 10/15/2010 Date Finished: 10/15/2010

Report Form Completed By: Suzanna L. Simpson
Date: 10/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 15 min

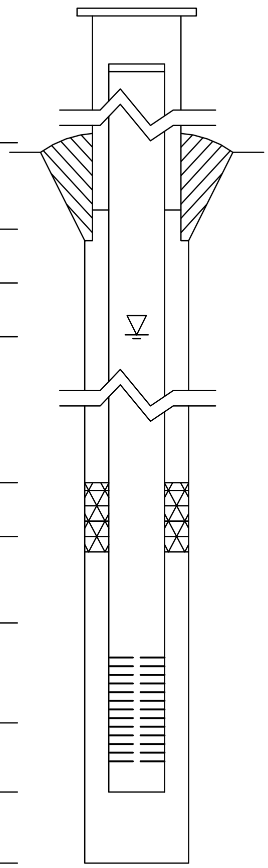
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
628.79	-2.57	Top of Protective Casing
628.63	-2.41	Top of Riser Pipe
626.22	0.00	Ground Surface
623.42	2.80	Top of Annular Sealant
613.72	12.50	Static Water Level (After Completion) 11/15/2010
616.50	9.72	Top of Seal
615.27	10.95	Top of Sand Pack
613.95	12.27	Top of Screen
609.57	16.65	Bottom of Screen
609.01	17.21	Bottom of Well
608.22	18.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	14.68
Bottom of Screen to End Cap	(feet)	0.56
Screen Length (1st slot to last slot)	(feet)	4.38
Total Length of Casing	(feet)	19.62
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

APPENDIX A4

LANDFILL

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/2/2010
Finish: 2/2/2010
WEATHER: Overcast, cold (lo-30's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Simpson

BOREHOLE ID: G101
Well ID: G101
Surface Elev: 625.27 ft. MSL
Completion: 21.92 ft. BGS
Station: 876,551.76N
2,514,214.31E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 15.50 - While drilling
▼ = 12.38 - Upon Completion
▽ = 7.31 - 3/1/2010

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
							0–0.4	TOPSOIL - Brown (10YR5/3), moist, soft, silty CLAY with slight trace sand and gravel, roots.		
1A	18/24 *75%*	SS	*1-1 2-3* N=3	24			–2	Dark grayish brown (10YR4/2), moist, soft, silty CLAY with slight trace sand, trace roots.	624	
2A	18/24 *75%*	SS	*1-3 3-5* N=6	30			2	Dark grayish brown (10YR4/2) with 15% yellowish brown (10YR5/4) mottles, moist, medium, silty CLAY, slight trace roots.		
							–4	Grayish brown (10YR5/2) with 15% yellowish brown (10YR5/4) mottles, moist, medium, silty CLAY, slight trace roots.	622	
3A	19/24 *79%*	SS	*2-3 4-4* N=7	26			4	Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY, slight trace roots.	620	
4A	19/24 *79%*	SS	*1-3 4-3* N=7	21			6 (▽ 7.31)	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand.	618	
5A	22/24 *92%*	SS	*1-3 3-4* N=6	23			8	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.	616	
6A	20/24 *83%*	SS	*1-2 2-3* N=4	24			10 (▼ 12.38)	Gray (10YR6/1) with 35% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with trace sand and slight trace gravel.	614	
7A	22/24 *92%*	SS	*1-2 3-2* N=5	17			–14	Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, very moist, medium, silty, sandy CLAY with trace gravel.	612	
8A 8B	14/24 *58%*	SS	*1-2 5-8* N=7	15 13			14	Brown (10YR5/3), very moist, medium, silty, clayey, very fine- to coarse-grained SAND with slight trace gravel.		
							(▼ 15.50) 16	Brown (10YR5/3), very moist, loose, silty, very fine- to coarse-grained SAND with slight trace gravel.	610	
9A	16/24 *67%*	SS	*2-5 15-25* N=20	16			–18	Brown (10YR5/3), very moist, medium dense, silty, very fine- to coarse-grained SAND with slight trace gravel.	608	
10A 10B	17/24 *71%*	SS	*19-20 22-18* N=42	14 8			18–20	Brown (10YR5/3), very moist, dense, silty, very fine- to coarse-grained SAND with slight trace gravel.	606	

NOTE(S): G101 installed in borehole.

FIELD BORING LOG

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/2/2010
Finish: 2/2/2010
WEATHER: Overcast, cold (lo-30's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Simpson

HANSON

BOREHOLE ID: G101
Well ID: G101
Surface Elev: 625.27 ft. MSL
Completion: 21.92 ft. BGS
Station: 876,551.76N
2,514,214.31E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 15.50 - While drilling
▼ = 12.38 - Upon Completion
▽ = 7.31 - 3/1/2010

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	16/23 *70%*	SS	*2-16 42-60/5"* N=58	8				Brown (10YR5/3), slightly moist, hard, clayey SILT with slight trace sand and gravel.			
								Dark gray (10YR4/1), slightly moist, hard, clayey SILT with slight trace sand and slight trace gravel.		604	

End of Boring = 21.9 ft. BGS

NOTE(S): G101 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 4/28/2006
Finish: 4/28/2006
WEATHER: Partly cloudy, mild (mid-60's)

CONTRACTOR: TSC
Rig mfg/model: CME-650 Track Drill
Drilling Method: 4¼" HSA (blind drill)
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-03a
Well ID: G102 (MW3S)
Surface Elev: 625.70 ft. MSL
Completion: 17.15 ft. BGS
Station: 876,554.77N
2,514,531.48E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 7.03 - 6/1/06
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*
1A	20/24 *83%*	SS	*2-2 4-6* N=6	17		2.07 *SP*
1B				20		
1C				26		3.30 *B*
2A	17/24 *71%*	SS	*2-3 4-5* N=7	25		3.05 *B*
3A	20/24 *83%*	SS	*2-3 3-5* N=6	16		1.96 *B*
4A	24/24 *100%*	SS	*4-3 5-6* N=8	21		2.27 *B*
5A	21/24 *88%*	SS	*1-3 3-4* N=6	20		2.18 *B*
5B				19		
6A	18/24 *75%*	SS	*1-2 2-4* N=4	24		0.87 *B*
7A	23/24 *96%*	SH		19		
7B	16/24 *67%*	SS	*3-2 2-4* N=4	12		
8A	23/24 *96%*	SS	*3-12 29-50* N=41	13		
8B				13		
8C				12		
9A	12/12 *100%*	SS	*8-82*	10		6.98 *B*

Depth ft. BGS | Lithologic Description | Borehole Detail | Elevation ft. MSL | Remarks

Depth markers: 2, 4, 6, 8, 10, 12, 14, 16
Elevation markers: 624, 622, 620, 618, 616, 614, 612, 610

- soil ery dark grayish brown (10YR3/2), lean CLAY
- Grayish brown (10YR5/2), lean CLAY, trace sand
- Yellowish brown (10YR5/6), lean CLAY, trace sand
- Yellowish brown (10YR5/6) with 40% gray (N5/1) mottles, lean CLAY, trace sand
- loess
- Yellowish brown (10YR5/6) with 40% gray (N5/1) mottles, sandy SILT, trace gravel
- Yellowish brown (10YR5/6) with 50% gray (N5/1) mottles, lean CLAY, trace sand and gravel
- Yellowish brown (10YR5/6), lean CLAY, little sand, trace gravel
- Dark gray (10YR4/1), sandy CLAY, trace gravel
- Gray (10YR6/1) with 50% yellowish brown (10YR5/8) mottles, lean CLAY, little sand, trace gravel
- hagarstown
- Yellowish brown (10YR5/8), silty, fine SAND, little medium sand, trace gravel, wet
- Yellowish brown (10YR5/8), silty, fine SAND, little clay, wet
- Yellowish brown (10YR5/6), lean CLAY, little sand, trace gravel
- Yellowish brown (10YR5/6), silty SAND, trace gravel, wet
- Yellowish brown (10YR5/4), clayey SILT, trace sand and gravel

End of Boring = 17.15 ft. BGS

NOTE(S): G102 (MW03S) installed in blind-drilled borehole within 10 ft of SB-03.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/15/2010
Finish: 2/15/2010
WEATHER: Cold, snowy (lo-20's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Simpson

BOREHOLE ID: G103
Well ID: G103
Surface Elev: 627.94 ft. MSL
Completion: 18.03 ft. BGS
Station: 876,199.48N
2,514,501.19E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ =
▽ = 16.99 - 3/1/2010

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	20/24 *83%*	SS	*5-4 5-7* N=9	16		
2A	16/24 *67%*	SS	*3-4 6-7* N=10	25		
3A	17/24 *71%*	SS	*3-5 7-8* N=12	21		
4A	16/24 *67%*	SS	*2-3 5-6* N=8	24		
5A	24/24 *100%*	SS	*3-4 4-4* N=8	22		
6A	20/24 *83%*	SS	*1-1 3-3* N=4	23		
7A	22/24 *92%*	SS	*1-2 2-4* N=4	26		
8A	20/24 *83%*	SS	*1-2 3-3* N=5	22		
9A	22/24 *92%*	SS	*1-10 21-33* N=31	14		
9B				10		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0 – ~4.8	FILL - Brown (10YR5/3) with 10% gray (10YR5/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY with trace sand and slight trace gravel.	
~4.8 – 6	Grayish brown (10YR5/2) with 25% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace sand, slight trace roots.	
6 – ~8.3	Grayish brown (10YR5/2) with 25% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand.	
~8.3 – 10	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.	
10 – ~16.4	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, soft, medium, silty CLAY with trace sand and slight trace gravel.	
~16.4 – ~16.8	Brown (10YR5/3) with 15% gray (10YR6/1) mottles, very moist, medium dense, silty, very fine- to medium-grained SAND.	
~16.8 – 18	Brown (10YR5/3), slightly moist, hard, clayey SILT with trace sand and gravel.	

Depth scale (ft. BGS): 2, 4, 6, 8, 10, 12, 14, 16, 18
Elevation scale (ft. MSL): 626, 624, 622, 620, 618, 616, 614, 612, 610

Borehole Detail

Remarks

End of Boring = 18.0 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 10/8/2010
Finish: 10/8/2010
WEATHER: Sunny, mild

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA (blind drill)
FIELD STAFF: Driller: D. Mahurin
Helper: J. Litsch/D. Smail
Eng/Geo: R. Hasenyager

BOREHOLE ID: R104
Well ID: R104
Surface Elev: 629.03 ft. MSL
Completion: 19.85 ft. BGS
Station: 875,857.80N
2,514,503.41E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0–4.5	FILL - Brown (10YR5/3) with 5% gray (10YR5/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, very stiff, silty CLAY with slight trace sand and gravel.			
							4.5–6.4	Grayish brown (10YR5/2) with 15% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace sand, slight trace roots.			
							6.4–12	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand.			
							12–14.6	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with trace sand and slight trace gravel.			
							14.6–16	Gray (10YR6/1) with 10% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with trace sand and slight trace gravel.			
							16–16.6	Gray (10YR6/1), moist, very soft, clayey, very fine- to coarse-grained SAND with trace gravel.			
							16.6–18.2	Brown (10YR5/3), slightly moist, hard, very silty CLAY with trace sand and gravel.			
							18.2–19.85	Gray (10YR4/1), slightly moist, hard, very silty CLAY with sand and gravel.			

Depth scale (ft. BGS): 2, 4, 6, 8, 10, 12, 14, 16, 18
Elevation scale (ft. MSL): 628, 626, 624, 622, 620, 618, 616, 614, 612, 610

End of Boring = 19.85 ft. BGS

NOTE(S): R104 blind drilled in borehole approximately 8 ft. north of G104. Lithology taken from G104.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/15/2010
Finish: 2/15/2010
WEATHER: Overcast, cold, windy (lo-20's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Simpson

BOREHOLE ID: G104
Well ID: G104
Surface Elev: 627.96 ft. MSL
Completion: 20.00 ft. BGS
Station: 875,849.26N
2,514,504.98E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ =
▽ = 15.40 - 3/1/2010

SAMPLE: Number	Recov / Total (in) / *% Recovery*	Type	TESTING: *Blows / 6 in* / N - Value / **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) / *Failure Type*
1A	16/24 *67%*	SS	*9-11 12-14* N=23	16		
2A	20/24 *83%*	SS	*3-5 9-12* N=14	21		
3A	19/24 *79%*	SS	*3-6 8-9* N=14	21		
4A	17/24 *71%*	SS	*2-3 4-7* N=7	25		
5A	22/24 *92%*	SS	*1-2 5-8* N=7	24		
6A	18/24 *75%*	SS	*1-2 3-5* N=5	21		
7A	23/24 *96%*	SS	*woh-2 3-4* N=5	23		
8A	22/24 *92%*	SS	*1-3 3-3* N=6	24		
9A				16		
9B	17/24 *71%*	SS	*woh-6 27-40* N=33	13		
10A	22/24 *92%*	SS	*10-24 44-66* N=68	7		

Depth ft. BGS: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Elevation ft. MSL: 626, 624, 622, 620, 618, 616, 614, 612, 610, 608

Lithologic Description
FILL - Brown (10YR5/3) with 5% gray (10YR5/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, very stiff, silty CLAY with slight trace sand and gravel.
Grayish brown (10YR5/2) with 15% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace sand, slight trace roots.
Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand.
Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with trace sand and slight trace gravel.
▽ Gray (10YR6/1) with 10% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with trace sand and slight trace gravel.
Gray (10YR6/1), moist, very soft, clayey, very fine- to coarse-grained SAND with trace gravel.
Brown (10YR5/3), slightly moist, hard, clayey SILT with trace sand and gravel.
Gray (10YR4/1), slightly moist, hard, clayey SILT with sand and gravel.

End of Boring = 20.0 ft. BGS

Borehole Detail | Remarks

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station	**CONTRACTOR:** Layne-Western Co		
Site: CCB Management Facility	**Rig mfg/model:** CME-750 ATV Drill	**BOREHOLE ID:** G105	
Location: Coffeen, Illinois	**Drilling Method:** 4¼" HSA w/SS samplers	**Well ID:** G105	
Project:		**Surface Elev:** 626.86 ft. MSL	
DATES: Start: 2/16/2010	**FIELD STAFF: Driller:** T. List	**Completion:** 19.83 ft. BGS	
Finish: 2/16/2010	**Helper:** M. Herbst/S. Hamby	**Station:** 875,499.70N	
WEATHER: Sunny, cold, windy (mid-20's)	**Eng/Geo:** S. Simpson	2,514,509.15E	

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

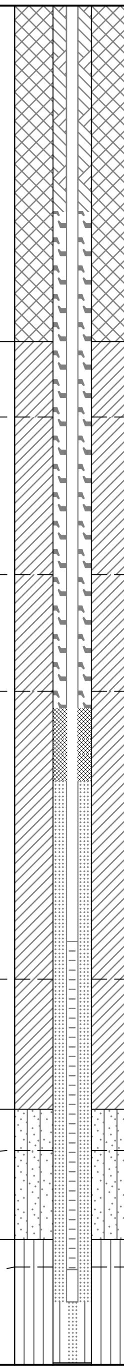
WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ =
▽ = 16.08 - 3/1/2010

SAMPLE / TESTING

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*
1A	18/24 *75%*	ss	*4-4 4-7* N=8	20		
2A	19/24 *79%*	ss	*2-4 6-10* N=10	19		
3A	19/24 *79%*	ss	*2-4 5-6* N=9	29		
4A	20/24 *83%*	ss	*1-4 4-5* N=8	29		
5A	22/24 *92%*	ss	*1-3 3-3* N=6	20		
6A	24/24 *100%*	ss	*1-2 3-4* N=5	25		
7A	24/24 *100%*	ss	*1-2 3-5* N=5	22		
8A	19/24 *79%*	ss	*1-2 2-2* N=4	18		
9A	18/24 *75%*	ss	*1-2 8-10* N=10	18		
9B				14		
10A	19/22 *86%*	ss	*11-40 53-60/4"* N=93	7		

Depth ft. BGS	Lithologic Description
0–4.9	FILL - Brown (10YR5/3) with 10% gray (10YR5/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, medium, silty CLAY with slight trace sand and gravel.
4.9–6	Grayish brown (10YR5/2) with 40% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY, slight trace roots.
6–8.3	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand.
8.3–10	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand.
10–14.2	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.
14.2–16.1	Gray (10YR6/1) with 15% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with trace sand and gravel.
16.1–16.7	Gray (10YR5/1), very moist to wet, loose, silty, fine- to coarse-grained SAND with slight trace gravel.
16.7–18	Brown (10YR5/3), very moist to wet, loose, silty, very fine- to coarse-grained SAND with slight trace gravel.
18–18.7	Brown (10YR5/3), slightly moist, hard, clayey SILT with trace sand and gravel.
18.7–19.8	Gray (10YR4/1), slightly moist, hard, clayey SILT with sand and gravel.

Borehole Detail



Elevation ft. MSL: 626, 624, 622, 620, 618, 616, 614, 612, 610, 608

Remarks

End of Boring = 19.8 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/16/2010
Finish: 2/16/2010
WEATHER: Overcast, cold, windy (mid-20's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Simpson

BOREHOLE ID: G106
Well ID: G106
Surface Elev: 625.96 ft. MSL
Completion: 18.00 ft. BGS
Station: 875,149.76N
2,514,512.79E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

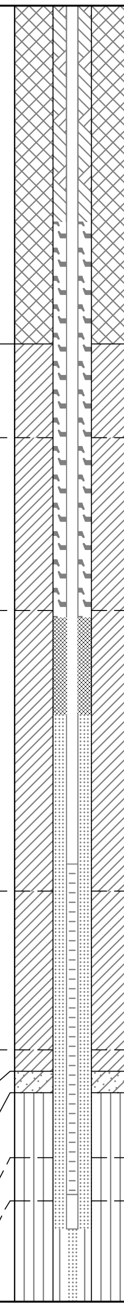
WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ =
▽ = 12.62 - 3/1/2010

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	17/24 *71%*	SS	*7-8 13-16* N=21	18		
2A	16/24 *67%*	SS	*2-4 5-7* N=9	16		
3A	17/24 *71%*	SS	*2-4 6-7* N=10	21		
4A	20/24 *83%*	SS	*2-3 5-6* N=8	24		
5A	22/24 *92%*	SS	*1-3 3-5* N=6	21		
6A	22/24 *92%*	SS	*1-2 4-4* N=6	24		
7A	23/24 *96%*	SS	*1-3 4-4* N=7	22		
8A	19/24 *79%*	SS	*1-4 7-7* N=11	20		
8B				14		
9A	23/24 *96%*	SS	*7-15 22-22* N=37	8		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–4.7	FILL - Brown (10YR5/3) with 15% gray (10YR5/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY with trace sand and slight trace gravel.		
4.7–6	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY with slight trace sand, slight trace roots.		
6–8.4	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, medium, silty CLAY with slight trace sand.		
8.4–12.3	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.		
12.3–14.5	Yellowish brown (10YR5/6) with 10% gray (10YR6/1) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.		
14.5–15.1	Gray (10YR6/1) with 10% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with trace sand.		
15.1–15.7	Brown (10YR5/3), moist, medium dense, clayey, very fine- to medium-grained SAND with slight trace gravel.		
15.7–16.7	Yellowish brown (10YR5/6) with 5% gray (10YR6/1) mottles, moist, medium, clayey SILT with trace sand and gravel.		
16.7–17.3	Brown (10YR5/3), slightly moist, hard, clayey SILT with trace sand and gravel.		
17.3–18	Gray (10YR4/1), slightly moist, hard, clayey SILT with trace sand and gravel.	608	

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18
Elevation scale: 624, 622, 620, 618, 616, 614, 612, 610, 608

Borehole Detail



End of Boring = 18.0 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/17/2010
Finish: 2/17/2010
WEATHER: Overcast, cold, windy (mid-20's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Simpson

BOREHOLE ID: G107
Well ID: G107
Surface Elev: 627.11 ft. MSL
Completion: 20.00 ft. BGS
Station: 874,994.33N
2,514,358.25E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 16.80 - While drilling
▼ = 11.56 - Upon Completion
▽ = 10.40 - 3/1/2010

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
	0/18 *0%*	BD				
1A	5/6 *83%*	SS	*3*	12		
2A	14/24 *58%*	SS	*3-3 6-8* N=9	17		
3A	16/24 *67%*	SS	*3-5 5-7* N=10	20		
4A	18/24 *75%*	SS	*2-3 6-7* N=9	27		
5A	22/24 *92%*	SS	*2-3 4-5* N=7	18		
6A	22/24 *92%*	SS	*1-3 3-4* N=6	23		
7A	24/24 *100%*	SS	*1-2 3-4* N=5	27		
8A	2/24 *8%*	SS	*1-3 2-3* N=5	23		
9A	20/24 *83%*	SS	*woh-3 8-12* N=11	22		
9B				10		
10A	20/24 *83%*	SS	*8-25 26-58* N=51	11		

Depth ft. BGS	Lithologic Description
0–1.8	GRAVEL FILL
1.8–4.3	FILL - Brown (10YR5/3) with 10% gray (10YR5/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY with trace sand and slight and gravel.
4.3–8.4	Grayish brown (10YR5/2) with 30% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace sand and gravel.
8.4–13.6	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.
13.6–15.0	Gray (10YR6/1) with 35% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.
15.0–16.4	Brown (10YR5/3), very moist to wet, very loose, clayey, very fine- to coarse-grained SAND.
16.4–18.0	Brown (10YR5/3), slightly moist, stiff, clayey SILT with trace sand and gravel.
18.0–18.7	Brown (10YR5/3), slightly moist, hard, clayey SILT with trace sand and gravel.
18.7–20.0	Gray (10YR4/1), slightly moist, hard, clayey SILT with trace sand and gravel.

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Elevation ft. MSL: 626, 624, 622, 620, 618, 616, 614, 612, 610, 608

Borehole Detail | Remarks

End of Boring = 20.0 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/12/2010
Finish: 2/12/2010
WEATHER: Overcast, cold ~25F

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: D. Lamb

BOREHOLE ID: G108
Well ID: G108
Surface Elev: 625.58 ft. MSL
Completion: 20.00 ft. BGS
Station: 874,948.81N
2,514,248.25E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.50 - While drilling
▼ = 19.00 - Upon completion
▽ = 8.93 - 3/1/2010

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	23/24 *96%*	SS	*24-25 13-13* N=38	16		
2A	13/24 *54%*	SS	*4-5 8-11* N=13	26		
3A	20/24 *83%*	SS	*2-2 5-7* N=7	28		
4A	24/24 *100%*	SS	*2-3 5-6* N=8	18		
5A	23/24 *96%*	SS	*1-2 3-4* N=5	20		
6A	24/24 *100%*	SS	*1-3 3-5* N=6	19		
7A	19/24 *79%*	SS	*1-1 1-2* N=2	19		
8A	23/24 *96%*	SS	*2-4 7-10* N=11	19		
8B				13		
9A	22/24 *92%*	SS	*10-24 25-10* N=49	11		
9B				8		
10A	24/24 *100%*	SS	*10-25 40-40* N=65	10		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–4.5	FILL - Grayish brown (10YR5/2) with 10% yellowish brown (10YR5/6) mottles, moist, hard, silty CLAY with slight trace gravel.	624	
	FILL - Grayish brown (10YR5/2) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with trace sand and slight trace gravel.	622	
4.5–6.8	Grayish brown (10YR5/2) with 25% yellowish brown (10YR5/8) and 5% very dark brown (10YR2/2) mottles, moist, medium, clayey SILT with trace sand and slight trace gravel.	620	
6.8–11.7	Gray (10YR5/1) with 10% brownish yellow (10YR6/8) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.	618, 616	
11.7–12.7	Grayish brown (10YR5/2) with brownish yellow (10YR6/8) mottles, moist, soft, sandy CLAY with trace gravel.	614	
12.7–14.0	Brownish yellow (10YR6/8), very moist, soft, sandy CLAY with trace gravel.	612	
14.0–14.7	Brownish yellow (10YR6/8), very moist, soft, sandy SILT with trace gravel.		
14.7–15.2	Brownish yellow (10YR6/6), wet, medium, SILT.		
15.2–17.8	Light yellowish brown (10YR6/4) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, clayey SILT with trace sand and gravel.	610, 608	
17.8–18.5	Gray (10YR5/1), slightly moist, hard, SILT with gravel.		
18.5–19.0	Gray (10YR5/1), wet, hard, SILT with sand and gravel.		
19.0–20.0	Gray (10YR5/1), very moist, hard, SILT with gravel.	606	

End of Boring = 20.0 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/11/2010
Finish: 2/11/2010
WEATHER: Sunny, cold ~32F

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: D. Lamb

BOREHOLE ID: G109
Well ID: G109
Surface Elev: 624.79 ft. MSL
Completion: 18.00 ft. BGS
Station: 874,970.10N
2,514,137.84E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.20 - While drilling
▼ = 11.50 - Upon completion
▽ = 8.85 - 3/1/2010

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
1A	24/24 *100%*	SS	*6-7 7-8* N=14	22			0–3.5	FILL - Grayish brown (10YR5/2) with 40% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace gravel.		624	
2A	19/24 *79%*	SS	*3-5 5-6* N=10	27			3.5–5.1	Light yellowish brown (10YR6/4) with 50% brownish yellow (10YR6/8) mottles, moist, medium, silty CLAY, slight trace roots.		622	
3A	20/24 *83%*	SS	*2-5 6-8* N=11	24			5.1–9.0	Light brownish gray (10YR6/2) with 10% brownish yellow (10YR6/6) mottles, moist, medium, silty CLAY with slight trace sand and gravel.		620	
4A	24/24 *100%*	SS	*2-4 5-6* N=9	19						618	
5A	22/24 *92%*	SS	*2-3 4-5* N=7	20			9.0–11.0	Light brownish gray (10YR6/2) with 10% brownish yellow (10YR6/6) and 2% very dark gray (10YR3/1) mottles, moist, medium, silty CLAY with slight trace sand and gravel.		616	
6A	24/24 *100%*	SS	*1-3 3-4* N=6	19			11.0–14.2	Light brownish gray (10YR6/2) with 30% brownish yellow (10YR6/8) mottles, moist, medium, sandy CLAY with slight trace gravel.		614	
7A	23/24 *96%*	SS	*1-1 2-2* N=3	19						612	
8A	22/24 *92%*	SS	*8-15 15-21* N=30	14			14.2–15.8	Brownish yellow (10YR6/6), wet, dense, silty SAND with trace gravel.		610	
9A	24/24 *100%*	SS	*12-29 44-45* N=73	7			15.8–17.3	Brownish yellow (10YR6/8), wet, dense, SAND with trace gravel.		608	
							17.3–18	Grayish brown (10YR5/2), slightly moist, hard, gravelly SILT with sand.			

End of Boring = 18.0 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/11/2010
Finish: 2/11/2010
WEATHER: Sunny, cold 10-20F

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: D. Lamb

BOREHOLE ID: G110
Well ID: G110
Surface Elev: 624.81 ft. MSL
Completion: 18.00 ft. BGS
Station: 875,015.42N
2,514,057.73E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 15.00 - While drilling
▼ =
▽ = 9.50 - 3/1/2010

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	24/24 *100%*	SS	*8-6 6-8* N=12	17		
2A	14/24 *58%*	SS	*2-4 5-7* N=9	25		
3A	22/24 *92%*	SS	*1-4 5-9* N=9	22		
4A	24/24 *100%*	SS	*3-6 8-9* N=14	18		
5A	24/24 *100%*	SS	*1-3 4-6* N=7	21		
6A	24/24 *100%*	SS	*2-4 4-6* N=8	21		
7A	24/24 *100%*	SS	*1-2 3-3* N=5	22		
8A	19/24 *79%*	SS	*1-2 2-1* N=4	24		
9A	24/24 *100%*	SS	*7-26 49-60* N=75	6		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0 – 5.5	FILL - Yellowish brown (10YR5/6) with 20% light brownish gray (10YR6/2) mottles, moist, stiff, silty CLAY with slight trace sand.	624, 622, 620
5.5 – 8	Grayish brown (10YR5/2) with 20% yellowish brown (10YR5/6) and 5% very dark brown (10YR2/2) mottles, moist, medium, silty CLAY.	618
8 – 11	Grayish brown (10YR5/2) with 20% yellowish brown (10YR5/6) and 5% very dark brown (10YR2/2) mottles, moist, medium, silty CLAY with slight trace sand and gravel.	616, 614
11 – 12.8	Light brownish gray (10YR6/2) with 30% brownish yellow (10YR6/8) mottles, moist, medium, clayey SILT with trace sand and gravel.	
12.8 – 13.3	Light brownish gray (10YR6/2) with 30% brownish yellow (10YR6/8) mottles, very moist, medium, sandy CLAY with trace gravel.	612
13.3 – 15	Light brownish gray (10YR6/2) with 30% brownish yellow (10YR6/8) mottles, moist, soft, clayey SILT with trace sand and slight trace gravel.	610
15 – 16.5	Gray (10YR6/1) with 30% brownish yellow (10YR6/8) mottles, wet, soft, sandy CLAY.	
16.5 – 18	Grayish brown (10YR5/2), slightly moist, hard, clayey SILT with trace sand and gravel.	608

End of Boring = 18.0 ft. BGS

Borehole Detail | Remarks

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/10/2010
Finish: 2/11/2010
WEATHER: Sunny, breezy ~25F

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: D. Lamb

BOREHOLE ID: G111
Well ID: G111
Surface Elev: 625.28 ft. MSL
Completion: 18.00 ft. BGS
Station: 875,058.70N
2,513,981.72E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.50 - While drilling
▼ =
▽ = 10.50 - 3/1/2010

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	20/24 *83%*	SS	*7-7 6-9* N=13	18		
2A	13/24 *54%*	SS	*3-5 7-8* N=12	20		
3A	18/24 *75%*	SS	*2-4 6-8* N=10	20		
4A	16/24 *67%*	SS	*4-12 20-17* N=32	18		
5A	22/24 *92%*	SS	*2-3 4-5* N=7	21		
6A	24/24 *100%*	SS	*2-3 6-6* N=9	23		
7A	24/24 *100%*	SS	*1-4 5-6* N=9	20		
8A	24/24 *100%*	SS	*1-2 2-2* N=4	17		
9A	18/18 *100%*	SS	*12-50 66* N=116	7		
	0/6 *0%*	BD				

Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
0 – 5.8	FILL - Grayish brown (10YR5/2) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace sand and gravel.		624, 622, 620	
5.8 – 7.5	Grayish brown (10YR5/2) with 20% yellowish brown (10YR5/6) and 5% dark brown (10YR3/3) mottles, moist, medium, clayey SILT with slight trace sand, slight trace roots.		618	
7.5 – 10	Grayish brown (10YR5/2) with 5% yellowish brown (10YR5/6) mottles, moist, medium, clayey SILT with trace sand.		616	
10 – 13.5	Grayish brown (10YR5/2) with 5% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace sand.		614, 612	
13.5 – 14.5	Grayish brown (10YR5/2) with 30% yellowish brown (10YR5/8) mottles, moist, stiff, clayey SILT with trace sand and gravel.			
14.5 – 16	Yellowish brown (10YR5/8), wet, soft, clayey SAND with trace gravel.		610	
16 – 18	Grayish brown (10YR5/2) with 20% brownish yellow (10YR6/6) mottles, slightly moist, hard, clayey SILT with gravel.		608	

End of Boring = 18.0 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/9/2010
Finish: 2/9/2010
WEATHER: Cold, snow, windy (lo-20's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Simpson

BOREHOLE ID: G119
Well ID: G119
Surface Elev: 626.57 ft. MSL
Completion: 20.10 ft. BGS
Station: 875,675.04N
2,513,907.73E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ =
▽ = 11.26 - 3/1/2010

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	16/24 *67%*	SS	*3-2 3-3* N=5	21		
2A	16/24 *67%*	SS	*2-4 5-5* N=9	20		
3A	10/24 *42%*	SS	*2-5 5-6* N=10	25		
4A	17/24 *71%*	SS	*2-5 4-5* N=9	18		
5A	20/24 *83%*	SS	*2-3 4-5* N=7	19		
6A	19/24 *79%*	SS	*1-3 4-6* N=7	21		
7A	20/24 *83%*	SS	*1-3 3-5* N=6	20		
8A	18/24 *75%*	SS	*1-2 2-2* N=4	18		
9A / 9B	22/24 *92%*	SS	*3-9 13-16* N=22	13 / 12		
10A	17/24 *71%*	SS	*6-25 33-39* N=58	8		

Depth ft. BGS	Lithologic Description
0 – 6	FILL - Brown (10YR5/3) with 10% gray (10YR5/1) and 5% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.
6 – 10	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand.
10 – 12.5	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.
12.5 – 14.2	Gray (10YR6/1) with 30% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and gravel.
14.2 – 16	Gray (10YR6/1) with 30% yellowish brown (10YR5/6) mottles, moist, soft, sandy CLAY with slight trace gravel.
16 – 16.6	Brown (10YR5/3), moist, medium, silty CLAY with trace sand and slight trace gravel.
16.6 – 17.2	Brown (10YR5/3), moist, medium dense, silty, very fine-grained SAND.
17.2 – 18.2	Brown (10YR5/3), slightly moist, hard, clayey SILT with trace sand and gravel.
18.2 – 20.1	Dark gray (10YR4/1), slightly moist, hard, clayey SILT with trace sand and gravel.

Depth scale (ft. BGS): 2, 4, 6, 8, 10, 12, 14, 16, 18, 20. Elevation scale (ft. MSL): 626, 624, 622, 620, 618, 616, 614, 612, 610, 608. Water level ▽ at about 11.26 ft. BGS.

Borehole Detail | Remarks

End of Boring = 20.1 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/8/2010
Finish: 2/8/2010
WEATHER: Cold, snow, windy (mid-20's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Simpson

BOREHOLE ID: G120
Well ID: G120
Surface Elev: 627.21 ft. MSL
Completion: 20.00 ft. BGS
Station: 875,854.43N
2,513,905.84E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ =
▽ = 13.85 - 3/1/2010

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	20/24 *83%*	SS	*3-3 4-5* N=7	16		
2A	19/24 *79%*	SS	*3-4 7-9* N=11	20		
3A	16/24 *67%*	SS	*2-3 4-5* N=7	26		
4A	17/24 *71%*	SS	*3-5 6-6* N=11	24		
5A	14/24 *58%*	SS	*2-4 4-6* N=8	22		
6A	22/24 *92%*	SS	*1-3 3-4* N=6	23		
7A	22/24 *92%*	SS	*1-2 3-5* N=5	21		
8A	19/24 *79%*	SS	*woh-2 3-3* N=5	25		
9A	24/24 *100%*	SS	*woh-3 12-21* N=15	21		
9B				10		
10A	24/24 *100%*	SS	*13-36 46-70* N=82	7		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–4.9	FILL - Brown (10YR5/3) with 10% gray (10YR5/1) and 5% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.		
4.9–6.5	Gray (10YR5/1) with15% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY with slight trace sand and gravel.		
6.5–8	Gray (10YR5/1) with15% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY with slight trace sand and gravel, slight trace roots.		
8–10	Gray (10YR5/1) with15% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY with slight trace sand.		
10–12.7	Gray (10YR5/1) with brownish yellow (10YR6/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.		
12.7–16.2	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.		
16.2–16.9	Brown (10YR5/3), very moist, soft, clayey SAND with slight trace gravel.		
16.9–18.2	Brown (10YR5/3), slightly moist, stiff, clayey SILT with trace sand and slight trace gravel.		
18.2–20	Dark gray (10YR4/1), slightly moist, hard, clayey SILT with trace sand and gravel.		

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20. Elevation scale: 626, 624, 622, 620, 618, 616, 614, 612, 610, 608.

End of Boring = 20.0 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/4/2010
Finish: 2/4/2010
WEATHER: Overcast, cold (lo-30's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Simpson

BOREHOLE ID: G121
Well ID: G121
Surface Elev: 627.94 ft. MSL
Completion: 22.00 ft. BGS
Station: 875,964.59N
2,513,904.35E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ =
▽ = 14.44 - 3/1/2010

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	22/24 *92%*	SS	*4-4 7-8* N=11	15			0–5.7	FILL - Brown (10YR4/3) with 10% gray (10YR5/1) and 5% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY with slight trace sand and gravel.		
2A	20/24 *83%*	SS	*3-5 8-12* N=13	16						
3A	18/24 *75%*	SS	*1-4 5-6* N=9	27						
4A	18/24 *75%*	SS	*2-3 5-6* N=8	25			5.7–7.3	Dark yellowish brown (10YR4/4), moist, medium, silty CLAY with slight trace sand.		
							7.3–8.2	Gray (10YR5/1) with 25% dark yellowish brown (10YR4/6) mottles, moist, medium, clayey SILT with trace sand.		
5A	18/24 *75%*	SS	*2-2 3-4* N=5	24			8.2–12	Gray (10YR6/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand.		
6A	13/24 *54%*	SS	*2-2 4-4* N=6	23						
7A	19/24 *79%*	SS	*woh-2 3-4* N=5	23			12–16.2	Gray (10YR6/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.		
8A	18/24 *75%*	SS	*1-2 2-2* N=4	23						
9A	23/24 *96%*	SS	*woh-woh 1-2*	21			16.2–18.2	Brown, (10YR5/3), very moist, very soft, clayey SAND with slight trace gravel.		
10A	22/24 *92%*	SS	*4-12 26-30* N=38	8			18.2–20	Brown (10YR5/3), slightly moist, hard, very silty CLAY with trace sand and gravel.		

Depth scale (ft. BGS): 2, 4, 6, 8, 10, 12, 14 (▽), 16, 18, 20
Elevation scale (ft. MSL): 626, 624, 622, 620, 618, 616, 614, 612, 610, 608

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT:	AEG Coffeen Power Station	**CONTRACTOR:**	Layne-Western Co		
Site:	CCB Management Facility	**Rig mfg/model:**	CME-750 ATV Drill	**BOREHOLE ID:**	G121
Location:	Coffeen, Illinois	**Drilling Method:**	4¼" HSA w/SS samplers	**Well ID:**	G121
Project:				**Surface Elev:**	627.94 ft. MSL
DATES: Start:	2/4/2010	**FIELD STAFF: Driller:**	T. List	**Completion:**	22.00 ft. BGS
Finish:	2/4/2010	**Helper:**	M. Herbst/S. Hamby	**Station:**	875,964.59N
WEATHER:	Overcast, cold (lo-30's)	**Eng/Geo:**	S. Simpson		2,513,904.35E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ =
▽ = 14.44 - 3/1/2010

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	24/24 *100%*	SS	*13-23* *31-48* N=54	7			22	Dark gray (10YR4/1), slightly moist, hard, clayey SILT with sand and gravel.		606	

End of Boring = 22.0 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/4/2010
Finish: 2/4/2010
WEATHER: Overcast, cold (lo-30's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: D. Lamb

BOREHOLE ID: G122
Well ID: G122
Surface Elev: 628.05 ft. MSL
Completion: 20.00 ft. BGS
Station: 876,080.14N
2,513,902.82E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 17.00 - While drilling
▼ =
▽ = 12.84 - 3/1/2010

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	23/24 *96%*	SS	*5-5 6-11* N=11	16		
2A	20/24 *83%*	SS	*3-3 5-5* N=8	22		
3A	20/24 *83%*	SS	*3-4 5-6* N=9	25		
4A	19/24 *79%*	SS	*1-5 5-6* N=10	29		
5A	20/24 *83%*	SS	*1-3 3-3* N=6	21		
6A	19/24 *79%*	SS	*1-2 3-3* N=5	22		
7A	16/24 *67%*	SS	*1-2 3-4* N=5	21		
8A	19/24 *79%*	SS	*1-1 2-2* N=3	21		
9A	20/24 *83%*	SS	*1-1 4-16* N=5	14		
10A	24/24 *100%*	SS	*10-38 51-58* N=89	6		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–4.8	FILL - Grayish brown (10YR5/2) with 15% gray (10YR5/1) and 5% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with trace sand and slight trace gravel.	626, 624	
4.8–7.5	Dark yellowish brown (10YR4/4), moist, medium, silty CLAY.	622	
7.5–9.5	Gray (10YR5/1) with 20% dark yellowish brown (10YR4/6) mottles, moist, medium, silty CLAY.	620	
9.5–11.7	Grayish brown (10YR5/2), moist, medium, clayey SILT with sand.	618	
11.7–12.5	Yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace gravel.	616	
12.5–13.7	Gray (10YR5/1), moist, medium, clayey SILT with fine sand.		
13.7–14.7	Brown (10YR4/3), moist, medium, silty CLAY with trace gravel.	614	
14.7–15.5	Grayish brown (10YR5/2), moist, soft, sandy SILT.		
15.5–17	Yellowish brown (10YR5/4) with 40% dark yellowish brown (10YR4/6) mottles, moist, medium, silty CLAY with slight trace sand.	612	
17–18.8	Dark yellowish brown (10YR4/6), wet, medium dense, silty SAND.	610	
18.8–19.4	Brownish yellow (10YR6/6), slightly moist, hard, clayey SILT with trace sand and gravel.		
19.4–20	Gray (10YR5/1), slightly moist, hard, clayey SILT with gravel.		

End of Boring = 20.0 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/3/2010
Finish: 2/4/2010
WEATHER: Overcast, cold (lo-30's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: D. Lamb

BOREHOLE ID: G123
Well ID: G123
Surface Elev: 628.12 ft. MSL
Completion: 24.00 ft. BGS
Station: 876,189.60N
2,513,901.46E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 16.50 - While drilling
▼ =
▽ = 15.98 - 3/1/2010

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	22/24 *92%*	SS	*6-8 9-11* N=17	16		
2A	19/24 *79%*	SS	*4-5 6-7* N=11	18		
3A	17/24 *71%*	SS	*2-3 5-6* N=8	24		
4A	18/24 *75%*	SS	*1-3 5-8* N=8	24		
5A	20/24 *83%*	SS	*2-3 4-5* N=7	18		
6A	19/24 *79%*	SS	*1-2 3-5* N=5	21		
7A	23/24 *96%*	SS	*1-3 4-4* N=7	19		
8A	22/24 *92%*	SS	*1-2 3-3* N=5	17		
9A	22/24 *92%*	SS	*1-1 2-2* N=3	19		
10A	12/24 *50%*	SS	*3-3 3-4* N=6	16		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–5.2	FILL - Grayish brown (10YR5/2) with 10% gray (10YR5/1) and 5% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with trace sand and slight trace gravel.	628–623	
5.2–6.4	Dark grayish brown (10YR4/2) with 20% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand, slight trace roots.		
6.4–8	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand.	620	
8–12	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.	618, 616	
12–13.5	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with sand and slight trace gravel.		
13.5–15	Dark yellowish brown (10YR3/6) with dark yellowish brown (10YR4/6) mottles, moist, medium, silty CLAY with trace gravel.	614	
15–16.5	Gray (10YR6/1) with 30% yellowish brown (10YR5/6) mottles, moist, medium, sandy SILT.	612	
16.5–18	Dark yellowish brown (10YR4/6), wet, soft, clayey SAND.	610	
18–20	Yellowish brown (10YR5/6), wet, medium, sandy SILT with trace gravel.		

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/3/2010
Finish: 2/4/2010
WEATHER: Overcast, cold (lo-30's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: D. Lamb

BOREHOLE ID: G123
Well ID: G123
Surface Elev: 628.12 ft. MSL
Completion: 24.00 ft. BGS
Station: 876,189.60N
2,513,901.46E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 16.50 - While drilling
▼ =
▽ = 15.98 - 3/1/2010

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft³)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Yellowish brown (10YR5/6), wet, medium, sandy SILT with trace gravel. *[Continued from previous page]*		608	
11A	20/24 *83%*	SS	*6-12* *12-12* N=24	11				Gray (10YR5/1), moist, very stiff, clayey SILT with trace gravel.			
							22			606	
12A	19/24 *79%*	SS	*3-8* *13-9* N=21	9				Dark gray (10YR4/1), moist, very stiff, sandy SILT with trace clay and gravel.			
							24	**End of Boring = 24.0 ft. BGS**			

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/3/2010
Finish: 2/3/2010
WEATHER: Sunny, cold (mid-30's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Simpson

BOREHOLE ID: G124
Well ID: G124
Surface Elev: 628.70 ft. MSL
Completion: 20.00 ft. BGS
Station: 876,304.85N
2,513,900.34E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - While drilling
▼ =
▽ = 10.99 - 3/1/2010

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	24/24 *100%*	SS	*6-4 5-6* N=9	17		
2A	22/24 *92%*	SS	*4-5 7-8* N=12	21		
3A	19/24 *79%*	SS	*2-4 6-7* N=10	25		
4A	13/24 *54%*	SS	*3-3 6-6* N=9	28		
5A	20/24 *83%*	SS	*1-3 5-6* N=8	21		
6A	17/24 *71%*	SS	*1-3 3-4* N=6	22		
7A	18/24 *75%*	SS	*1-3 3-4* N=6	23		
8A	20/24 *83%*	SS	*woh-woh 2-3*	28		
8B				22		
9A	19/24 *79%*	SS	*1-2 3-3* N=5	22		
9B				17		
10A	20/24 *83%*	SS	*4-10 17-23* N=27	12		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0–5.2	FILL - Brown (10YR5/3) with 10% gray (10YR5/1) and 5% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace sand and gravel.	628, 626, 624
5.2–6	Dark grayish brown (10YR4/2) with 5% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY.	
6–8	Dark grayish brown (10YR4/2) with 5% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY, slight trace roots.	622
8–10	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand and gravel.	620
10–15 (▽ at ~11)	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.	618, 616, 614
15–16.3	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, very soft, silty CLAY with trace sand and slight trace gravel.	
16.3–17.3	Gray (10YR6/1) with 5% yellowish brown (10YR5/6) mottles, moist, medium, sandy CLAY with slight trace gravel.	612
17.3–18.3	Gray (10YR6/1) with 20% yellowish brown (10YR5/6) mottles, moist, medium, sandy CLAY with slight trace gravel.	
18.3–19	Yellowish brown (10YR5/4), moist, medium, clayey SILT with trace sand and slight trace gravel.	610
19–19.6	Yellowish brown (10YR5/4), slightly moist, stiff, clayey SILT with trace sand and slight trace gravel.	
19.6–20	Gray (10YR5/1), slightly moist, stiff, clayey SILT with trace sand and slight trace gravel.	

End of Boring = 20.0 ft. BGS

Borehole Detail | Remarks

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/2/2010
Finish: 2/3/2010
WEATHER: Sunny, cold (mid-30's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Simpson

BOREHOLE ID: G125
Well ID: G125
Surface Elev: 628.85 ft. MSL
Completion: 20.13 ft. BGS
Station: 876,409.47N
2,513,899.12E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 17.00 - While drilling
▼ = Dry - Upon completion
▽ = 8.58 - 3/1/2010

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*
1A	18/24 *75%*	SS	*5-6 7-9* N=13	17		
2A	16/24 *67%*	SS	*3-4 6-9* N=10	17		
3A	20/24 *83%*	SS	*2-5 5-7* N=10	25		
4A	19/24 *79%*	SS	*2-4 5-5* N=9	23		
5A	14/24 *58%*	SS	*3-4 4-6* N=8	25		
6A	18/24 *75%*	SS	*2-3 3-5* N=6	22		
7A	20/24 *83%*	SS	*3-4 3-4* N=7	23		
8A	24/24 *100%*	SS	*3-3 3-3* N=6	23		
9A	24/24 *100%*	SS	*woh-1 2-1* N=3	25		
9B				18		
10A	19/24 *79%*	SS	*woh-1 7-19* N=8	22		
10B				11		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0 – ~4.7	FILL - Brown (10YR5/3) with 5% gray (10YR5/1) and 5% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace sand and gravel.	628, 626
~4.7 – ~8.2	Grayish brown (10YR5/2) with 15% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace sand and gravel, slight trace roots.	624, 622
~8.2 – ~10.7	Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand and gravel, slight trace roots.	620
~10.7 – 12	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with slight trace sand.	618
12 – ~14.8	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.	616
~14.8 – ~17.3	Gray (10YR6/1) with 10% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.	614, 612
~17.3 – ~18.9	Brown (10YR5/3), very moist, very soft, clayey SAND with slight trace gravel.	
~18.9 – 20.1	Brown (10YR5/3), slightly moist, medium, clayey SILT with trace sand and slight trace gravel.	610

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

Borehole Detail | Remarks

End of Boring = 20.1 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/10/2010
Finish: 2/10/2010
WEATHER: Partly cloudy, wind 10 mph, ~25F

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: D. Lamb

BOREHOLE ID: G126
Well ID: G126
Surface Elev: 622.96 ft. MSL
Completion: 18.00 ft. BGS
Station: 875,062.44N
2,513,895.37E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.20 - While drilling
▼ = 13.00 - Upon completion
▽ = 8.82 - 3/1/2010

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	20/24 *83%*	SS	*9-7 12-10* N=19	15		
2A	19/24 *79%*	SS	*2-4 6-9* N=10	26		
3A	22/24 *92%*	SS	*2-4 5-7* N=9	20		
4A	24/24 *100%*	SS	*2-3 4-5* N=7	22		
5A	24/24 *100%*	SS	*1-3 4-5* N=7	22		
6A	22/24 *92%*	SS	*1-3 4-5* N=7	18		
7A	20/24 *83%*	SS	*1-2 3-4* N=5	19		
8A	24/24 *100%*	SS	*4-15 12-29* N=27	20		
9A	23/24 *96%*	SS	*29-39 39-29* N=78	8		

Depth ft. BGS: 2, 4, 6, 8, 10, 12, 14, 16, 18
Elevation ft. MSL: 622, 620, 618, 616, 614, 612, 610, 608, 606

Lithologic Description
FILL - Dark yellowish brown (10YR4/6), moist, very stiff, sandy CLAY with silt and trace gravel.
Light grayish brown (10YR6/2), slightly moist, stiff, silty CLAY.
Light grayish brown (10YR6/2) with 20% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY, slight trace roots.
Dark brown (10YR3/3) with 10% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY.
Light grayish brown (10YR6/2) with 30% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.
Grayish brown (10YR5/2) with dark yellowish brown (10YR4/6) mottles, moist, medium, clayey SILT with sand and slight trace gravel.
Gray (10YR6/1). very moist, medium, sandy CLAY with trace gravel.
Yellowish brown (10YR5/8) with 40% dark yellowish brown (10YR4/6) mottles, slightly moist, very stiff, clayey SILT with trace gravel.
Brownish yellow (10YR6/8), moist, very stiff, sandy SILT with gravel.
Grayish brown (10YR5/2), moist, hard, sandy SILT with gravel.

End of Boring = 18.0 ft. BGS

Borehole Detail | Remarks

NOTE(S): G126 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/10/2010
Finish: 2/10/2010
WEATHER: Overcast, wind 15mph, ~10-20F

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: D. Lamb

BOREHOLE ID: T127
Well ID: T127
Surface Elev: 625.53 ft. MSL
Completion: 19.80 ft. BGS
Station: 875,359.21N
2,513,911.02E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 15.30 - While drilling
▼ = 18.00 - Upon completion
▽ = 11.26 - 3/1/10

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*
1	24/24 *100%*	SS	*8-5 5-8* N=10			
2	10/24 *42%*	SS	*5-6 7-11* N=13			
3	20/24 *83%*	SS	*1-4 5-7* N=9			
4	24/24 *100%*	SS	*2-4 5-6* N=9			
5	24/24 *100%*	SS	*2-4 5-6* N=9			
6	24/24 *100%*	SS	*3-3 5-7* N=8			
7	24/24 *100%*	SS	*1-2 3-3* N=5			
8	24/24 *100%*	SS	*1-1 2-1* N=3			
9	24/24 *100%*	SS	*8-12 28-30* N=40			
10	22/22 *100%*	SS	*8-44 65-60/4"* N=109			

Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
0–4.8	FILL - yellowish brown (10YR5/6) with 20% grayish brown (10YR5/2) mottles, moist, stiff, silty CLAY with trace sand and gravel.		624, 622	
4.8–7.0	Dark yellowish brown (10YR4/6) with 30% brownish yellow (10YR6/6) and 10% very dark gray (10YR3/1) mottles, moist, medium, clayey SILT with trace sand.		620	
7.0–8.5	Grayish brown (10YR5/2) with 20% dark yellowish brown (10YR4/6) mottles, moist, medium, clayey SILT with sand.		618	
8.5–11.8	Grayish brown (10YR5/2) with 20% dark yellowish brown (10YR4/6) and 5% very dark brown (10YR2/2) mottles, moist, medium, clayey SILT with sand and slight trace gravel.		616, 614	
11.8–13.0	Dark yellowish brown (10YR4/6) with 5% light brownish gray (10YR6/2) mottles, moist, medium, sandy SILT with gravel.			
13.0–15.3	Light brownish gray (10YR6/2) with 30% yellowish brown (10YR5/6) mottles, very moist, medium, clayey SAND with silt.		612	
15.3–17.0	Light brownish gray (10YR6/2) with 30% brownish yellow (10YR6/8) mottles, wet, very loose, silty SAND trace with gravel.		610	
17.0–18.4	Brownish yellow (10YR6/8), wet, medium dense, silty SAND with gravel.		608	
18.4–19.8	Grayish brown (10YR5/2), slightly moist, hard, clayey SILT with sand and gravel.		606	

End of Boring = 19.8 ft. BGS

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/9/2010
Finish: 2/9/2010
WEATHER: Cold, windy, snow (lo-20's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Simpson

BOREHOLE ID: T128
Well ID: T128
Surface Elev: 626.27 ft. MSL
Completion: 22.00 ft. BGS
Station: 875,509.70N
2,513,909.45E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 16.84 - While drilling
▼ =
▽ = 12.35 - 3/1/10

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	12/24 *50%*	SS	*37-17 15-18* N=32	14		
2A	7/24 *29%*	SS	*4-7 7-13* N=14			
3A	12/24 *50%*	SS	*3-4 6-8* N=10	26		
4A	19/24 *79%*	SS	*2-4 5-7* N=9	24		
5A	22/24 *92%*	SS	*1-3 4-5* N=7	20		
6A	22/24 *92%*	SS	*1-3 5-5* N=8	20		
7A	22/24 *92%*	SS	*2-3 4-5* N=7	19		
8A	20/24 *83%*	SS	*2-2 3-3* N=5	18		
9A / 9B	22/24 *92%*	SS	*woh-1 8-7* N=9	19 / 18		
10A / 10B	18/24 *75%*	SS	*3-10 13-11* N=23	17		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0–0.7	FILL - Brown (10YR5/3) with 5% gray (10YR5/1) and 5% yellowish brown (10YR5/6) mottles, moist, hard (frozen), silty CLAY with trace sand and slight trace gravel.	626
0.7–2	FILL - Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, moist, hard (frozen), silty CLAY with slight trace sand and gravel.	
2–4.3	FILL - Brown (10YR5/3) with 10% gray (10YR5/1) and 5% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace sand and gravel.	624
4.3–6	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with slight trace sand, slight trace roots.	622
6–13	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with trace sand and slight trace gravel.	620, 618, 616, 614
13–16.2	Gray (10YR6/1) with 30% yellowish brown (10YR5/6) mottles, moist, medium, silty CLAY with trace sand and slight trace gravel.	612
16.2–16.7	Brown (10YR5/3), moist, soft, clayey SAND with slight trace gravel.	610
16.7–17.3	Gray (10YR6/1), wet, loose, silty, very fine- to coarse-grained SAND.	
17.3–18.7	Brown (10YR5/3), wet, loose, silty, very fine- to fine-grained SAND.	608
18.7–20	Brown (10YR5/3), slightly moist, very stiff, clayey SILT with trace sand and gravel.	

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

Borehole Detail | Remarks

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project:
DATES: Start: 2/9/2010
Finish: 2/9/2010
WEATHER: Cold, windy, snow (lo-20's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: T. List
Helper: M. Herbst/S. Hamby
Eng/Geo: S. Simpson

BOREHOLE ID: T128
Well ID: T128
Surface Elev: 626.27 ft. MSL
Completion: 22.00 ft. BGS
Station: 875,509.70N
2,513,909.45E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 16.84 - While drilling
▼ =
▽ = 12.35 - 3/1/10

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	24/24 *100%*	SS	*8-16* *18-25* N=34	16				Dark gray (10YR4/1), slightly moist, hard, clayey SILT with trace sand and gravel.		606	
							22	**End of Boring = 22.0 ft. BGS**			

NOTE(S): Well completed prior to construction of berm road. Boring surface elevation is as of the well install date and not the final constructed elevation.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Holdings
Site: Coffeen Power Station
Location: Coffeen, Montgomery County, Illinois
Project: 14E0078
DATES: Start: 10/28/2014
Finish: 10/28/2014
WEATHER: Overcast, mild - mid 50's

CONTRACTOR: Ramsey
Rig mfg/model: D-50 Turbo Tracked MST 800ATV
Drilling Method: 4¼" Hollow Stem Auger with Split spoon

FIELD STAFF: Driller: B. Williamson
Helper: D. Crump
Eng/Geo: R. Hasenyager

BOREHOLE ID: TA31
Well ID: TA31
Surface Elev: 623.89 ft. MSL
Completion: 20.19 ft. BGS
Station: 876,542.25N
2,513,856.77E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 8.11 - 10/30/2014
▼ =
▽ =

SAMPLE Number	Recov / Total (in) / *% Recovery*	Type	*Blows / 6 in* / N - Value / **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) / Failure Type
1	24/24 *100%*	SS	*1-2 2-2* N=4	26		
2	22/24 *92%*	SS	*2-3 3-4* N=6	28		1.44 B
3	23/24 *96%*	SS	*2-3 4-4* N=7	20		1.71 Sh
4	24/24 *100%*	SS	*6-7 6-6* N=13	22		1.55 Sh
5	22/24 *92%*	SS	*2-2 2-4* N=4	22		1.55 Sh
6	24/24 *100%*	SS	*2-1 3-2* N=4	20		0.93 B
7A	24/24 *100%*	SS	*2-3 3-3* N=6	19		
7B				22		
8A	24/24 *100%*	SS	*4-5 8-7* N=13	12		
8B				13		
9	22/24 *92%*	SS	*5-4 4-4* N=8	18		
10	16/24 *67%*	SS	*2-4 3-5* N=7	12		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0–7.5	Yellowish brown (10YR5/4), moist, soft, SILT with little clay and trace very fine sand. Brown (10YR4/3), moist, soft, SILT with little clay and trace very fine sand.	622, 620, 618
7.5–10	Gray (10YR5/1) with 20% yellowish brown (10YR5/8) mottles, moist, soft, CLAY with few silt and trace very fine to fine sand.	616, 614
10–13.1	Brownish yellow (10YR6/6) with 20% gray (10YR6/1) mottles, moist, soft, CLAY with few silt and little very fine to fine sand and trace small gravel.	612
13.1–14	Brownish yellow (10YR6/6), wet, slightly dense, SAND (very fine to coarse) with little sand and silt and trace clay and small gravel.	610
14–14.7	Brownish yellow (10YR6/6), moist, soft, CLAY with few silt and trace very fine to fine sand and small gravel.	
14.7–15.3	Brownish yellow (10YR6/6), wet, loose, SAND (very fine to very coarse) and trace small gravel.	
15.3–16	Brownish yellow (10YR6/6) very moist, soft, SAND (very fine to medium) with few clay and silt.	608
16–17	Yellowish brown (10YR5/8), moist, soft, CLAY with few silt and trace sand (very fine to very coarse) and small gravel.	
17–19.5	Yellowish brown (10YR5/8), wet, loose, very fine to very coarse SAND.	606
19.5–20.19	Gray (10YR5/1), moist, hard, CLAY with few silt and (very fine to very coarse) sand and small gravel.	604

▼ 8 (water level)

End of Boring at 20.19 ft.

NOTE(S): Monitoring well TA31 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Holdings
Site: Coffeen Power Station
Location: Coffeen, Montgomery County, Illinois
Project: 14E0078
DATES: Start: 10/27/2014
Finish: 10/27/2014
WEATHER: Partly sunny, mild - mid 70's

CONTRACTOR: Ramsey
Rig mfg/model: D-50 Turbo Tracked MST 800ATV
Drilling Method: 4¼" Hollow Stem Auger with Split spoon
FIELD STAFF: Driller: B. Williamson
Helper: D. Crump
Eng/Geo: R. Hasenyager

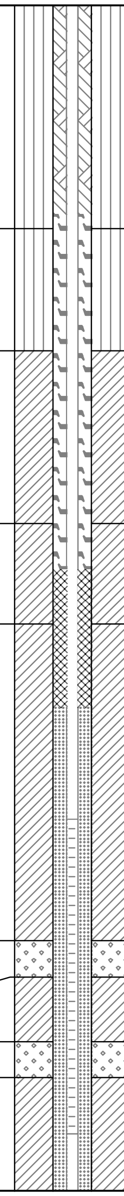
BOREHOLE ID: TA32
Well ID: TA32
Surface Elev: 618.93 ft. MSL
Completion: 16.47 ft. BGS
Station: 877,532.57N
2,513,605.19E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.05 - 10/30/2014
▼ =
▽ =

SAMPLE			TESTING			
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
1	18/24 *75%*	ss	*2-1 2-3* N=3	21		
	21/24 *88%*	ss	*2-1 1-1* N=2			
2				28		
3A				24		
	14/24 *58%*	ss	*1-1 3-3* N=4			
3B				22		1.15 Sh
4	20/24 *83%*	ss	*4-5 4-7* N=9	22		0.96 B
	21/24 *88%*	ss	*4-7 12-22* N=19			
5				9		8.45 Sh
	21/24 *88%*	ss	*6-16 27-42* N=43			
6				8		10.47 Sh
7	12/24 *50%*	ss	*36-55 50/4"*	6		
8	16/24 *67%*	ss	*16-35 69* N=104	8		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–2	Dark yellowish brown (10YR4/4), moist, soft, clayey SILT with trace sand (very fine).	618	
4	Black (10YR2/1), moist, soft, clayey SILT with trace sand (very fine).	616	
6	Very dark gray (10YR3/1), moist, soft, CLAY with little silt and trace sand (very fine to fine).	614 / 612	
8	Yellowish brown (10YR5/6) with 30% gray (10YR5/1) mottles, moist, medium, CLAY with little silt and trace sand (very fine to very coarse) and gravel (small).		
10–12	Yellowish brown (10YR5/8) with 30% Gray (10YR5/1) mottles, slightly moist, very hard, CLAY with silt and little sand (very fine to very coarse) trace gravel (small).	610 / 608	
	Yellowish brown (10YR5/8), slightly moist, loose, SAND (very fine to very coarse) and few gravel (small to medium).	606	
▼ 14	Gray (10YR5/1), slightly moist, very hard, CLAY with silt and few gravel (small to medium).		
	Gray (10YR5/1), moist, dense, SAND (very fine to coarse).	604	
16	Gray (10YR5/1), slightly moist, very hard, CLAY with silt and few gravel (small to medium).		



End of Boring at 16.47 ft.

NOTE(S): Monitoring well TA32 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Company
Site: Coffeen Well Sealing & Assmt Well Install
Location: Coffeen, Illinois
Project: 14E0078A
DATES: Start: 6/2/2015
Finish: 6/2/2015
WEATHER: Sunny, calm, hi-60s

CONTRACTOR: Ramsey
Rig mfg/model: Diedrich D-50
Drilling Method: 3 ¼" HSA, split spoon sampler
FIELD STAFF: Driller: B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: TA33a
Well ID: n/a
Surface Elev: 622.5 ft. MSL
Completion: 30.0 ft. BGS
Station: 876,610.00N
2,513,248.00E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.80 - during drilling
▼ =
▽ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
							0–0.3	Yellowish brown (10YR5/4), moist, stiff, clayey SILT, trace very fine-grained sand, roots.	622	
1A	21/24 *88%*	ss	*2-3 5-5* N=8				0.3–2.6	Light brownish gray (10YR6/2) with 35% yellowish brown (10YR5/6) mottles, moist, stiff to very stiff, clayey SILT, trace very fine- to fine-grained sand.	620	
2A	20/24 *83%*	ss	*3-4 4-5* N=8				2.6–4.5	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, very stiff, clayey SILT, little fine- to medium-grained sand, trace coarse-grained sand.	618	
3A	23/24 *96%*	ss	*5-6 6-9* N=12							
4A	24/24 *100%*	ss	*10-10 10-10* N=20				4.5–7.8	Gray (10YR5/1) with 5-10% dark yellowish brown (10YR4/6) mottles, moist, very stiff, silty CLAY, little fine- to medium-grained sand, trace coarse-grained sand.	616	
							7.8–8.7	Dark yellowish brown (10YR4/6) with 3% gray (10YR6/1) mottles, moist, very stiff, silty CLAY, little fine- to coarse-grained sand, trace small gravel.	614	
5A	21/24 *88%*	ss	*2-4 6-6* N=10				8.7–10.4	Gray (10YR6/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY, little fine- to coarse-grained sand, trace small gravel.	612	
6A	24/24 *100%*	ss	*0-3 4-8* N=7				10.4–11.9	Gray (10YR6/1) moist, medium, fine- to coarse-grained sandy CLAY, little silt, trace small to large gravel.		
7A	24/24 *100%*	ss	*15-27 32-41* N=59				11.9–13.6	Brown (10YR5/3) with 5% dark yellowish brown (10YR4/6) mottles, slightly moist, very stiff, very fine- to fine-grained sandy SILT, trace medium- to coarse-grained sand, trace small to large gravel, friable.	610	
7B							13.6–14.3 ▼	Dark yellowish brown (10YR4/6), very moist, dense, silty,very fine- to medium-grained SAND.	608	
8A	20/24 *83%*	ss	*5-12 18-22* N=30							
9A	16/24 *67%*	ss	*23-44 50/5"*				14.3–18.0	Brown (10YR5/3), slightly moist, hard, clayey SILT, few fine- to coarse-grained sand, trace small gravel.	606	
10A	22/24 *92%*	ss	*12-12 22-25* N=34				18.0–20	Dark gray (10YR4/1), slightly moist, hard, clayey SILT, few fine- to coarse-grained sand, trace small to large gravel.	604	

NOTE(S): Borehole sealed with high-solids bentonite grout.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Company
Site: Coffeen Well Sealing & Assmt Well Install
Location: Coffeen, Illinois
Project: 14E0078A
DATES: Start: 6/2/2015
Finish: 6/2/2015
WEATHER: Sunny, calm, hi-60s

CONTRACTOR: Ramsey
Rig mfg/model: Diedrich D-50
Drilling Method: 3 ¼" HSA, split spoon sampler
FIELD STAFF: Driller: B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: TA33a
Well ID: n/a
Surface Elev: 622.5 ft. MSL
Completion: 30.0 ft. BGS
Station: 876,610.00N
2,513,248.00E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.80 - during drilling
▼ =
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	24/24 *100%*	SS	*11-17 25-32* N=42					Dark gray (10YR4/1), slightly moist, hard, clayey SILT, few fine- to coarse-grained sand, trace small to large gravel. *[Continued from previous page]*		602	
12A	23/24 *96%*	SS	*17-23 35-44* N=58				22			600	
13A	21/24 *88%*	SS	*26-30 30-37* N=60				24			598	
14A	18/24 *75%*	SS	*19-35 47-50* N=82				26			596	
15A	24/24 *100%*	SS	*18-27 34-35* N=61				28			594	
							30	**End of boring = 30.0 feet**			

NOTE(S): Borehole sealed with high-solids bentonite grout.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Company
Site: Coffeen Well Sealing & Assmt Well Install
Location: Coffeen, Illinois
Project: 14E0078A
DATES: Start: 6/2/2015
Finish: 6/2/2015
WEATHER: Sunny, calm, hi-60s

CONTRACTOR: Ramsey
Rig mfg/model: Diedrich D-50
Drilling Method: 3 ¼" HSA, blind drill
FIELD STAFF: Driller: B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: TA33b
Well ID: TA33
Surface Elev: 622.51 ft. MSL
Completion: 17.44 ft. BGS
Station: 876,605.45N
2,513,248.73E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - during drilling
▼ = 7.00 - 6/16/15
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Yellowish brown (10YR5/4), moist, stiff, clayey SILT, trace very fine-grained sand, roots.		622	
							2	Light brownish gray (10YR6/2) with 35% yellowish brown (10YR5/6) mottles, moist, stiff to very stiff, clayey SILT, trace very fine- to fine-grained sand.		620	
							4	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, very stiff, clayey SILT, little fine- to medium-grained sand, trace coarse-grained sand.		618	
							6	Gray (10YR5/1) with 5-10% dark yellowish brown (10YR4/6) mottles, moist, very stiff, silty CLAY, little fine- to medium-grained sand, trace coarse-grained sand.		616	
							8	Dark yellowish brown (10YR4/6) with 3% gray (10YR6/1) mottles, moist, very stiff, silty CLAY, little fine- to coarse-grained sand, trace small gravel.		614	
							10	Gray (10YR6/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY, little fine- to coarse-grained sand, trace small gravel.		612	
								Gray (10YR6/1) moist, medium, fine- to coarse-grained sandy CLAY, little silt, trace small to large gravel.			
							12	Brown (10YR5/3) with 5% dark yellowish brown (10YR4/6) mottles, slightly moist, very stiff, very fine- to fine-grained sandy SILT, trace medium- to coarse-grained sand, trace small to large gravel, friable.		610	
							14	Dark yellowish brown (10YR4/6), very moist, dense, silty,very fine- to medium-grained SAND.		608	
							16	Brown (10YR5/3), slightly moist, hard, clayey SILT, few fine- to coarse-grained sand, trace small gravel.		606	

End of boring = 17.44 feet

NOTE(S): TA33 installed in bore hole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Company
Site: Coffeen Well Sealing & Assmt Well Install
Location: Coffeen, Illinois
Project: 14E0078A
DATES: Start: 6/3/2015
Finish: 6/3/2015
WEATHER: Mostly cloudy, windy, mid-60s

CONTRACTOR: Ramsey
Rig mfg/model: Diedrich D-50
Drilling Method: 3 ¼" HSA, split spoon sampler
FIELD STAFF: Driller: B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: TA34
Well ID: TA34
Surface Elev: 624.10 ft. MSL
Completion: 16.10 ft. BGS
Station: 875,906.10N
2,513,466.73E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.00 - during drilling
▼ = 8.10 - 6/16/15
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	21/24 *88%*	SS	*3-3 3-3* N=6				0–0.7	Gray (10YR5/1) with 10% dark yellowish brown (10YR3/6) mottles, moist, stiff, SILT, some clay, trace very fine-grained, roots.	624	
							0.7–2	Grayish brown (10YR5/2) with 10% yellowish brown (10YR5/6) mottles, moist, very stiff, silty CLAY, trace fine-grained sand.	622	
2A	17/24 *71%*	SS	*2-2 4-6* N=6				2–4	Light grayish brown (10YR6/2) with 15% yellowish brown (10YR5/6) mottles, slightly moist, very stiff, silty CLAY, trace fine-grained sand.	620	
3A	22/24 *92%*	SS	*3-3 3-4* N=6				4–8	Grayish brown (10YR5/2) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY, little fine-grained sand, trace medium- to coarse-grained sand.	618	
4A	24/24 *100%*	SS	*3-4 6-7* N=10						616	
5A	24/24 *100%*	SS	*2-2 5-5* N=7				8–12	Grayish brown (10YR5/2) with 25% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY, little fine-grained sand, trace medium- to coarse-grained sand, trace small gravel.	614	
6A	22/24 *92%*	SS	*3-3 4-5* N=7						612	
7A	21/24 *88%*	SS	*3-3 4-5* N=7				12–13.5	Dark yellowish brown (10YR4/6) with 15% light gray (10YR7/1) mottles, very moist, very soft, fine- to medium-grained sandy CLAY, trace coarse-grained sand.		
7B							13.5–14	Gray (10YR6/1), very moist, loose, clayey, silty, fine- to medium-grained SAND, trace coarse grained sand.	610	
8A	24/24 *100%*	SS	*18-28 25-32* N=53				14–14.7	Brown (10YR5/3), very moist, very dense, silty, fine- to coarse-grained SAND and small to large GRAVEL.		
							14.7–15.3	Yellowish brown (10YR5/6), slightly moist, hard, clayey SILT, little fine- to coarse-grained sand, trace small gravel.		
8B							15.3–16	Gray (10YR6/1), slightly moist, hard, clayey SILT, few fine- to coarse-grained sand, trace small gravel.	608	
8C							16–16.1	Dark gray (10YR4/1), slightly moist, hard, clayey SILT, few fine- to coarse-grained sand, trace small gravel.		

End of boring = 16.1 feet

NOTE(S): TA34 installed in bore hole.

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G101

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G101

~~State~~ Plant ~~Plane~~ Coordinate: X 2,514,214.3 Y 876,551.8 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 2/2/2010 Date Finished: 2/2/2010

Report Form Completed By: Suzanna L. Simpson Date: 2/4/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- **Granular** Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 20 min

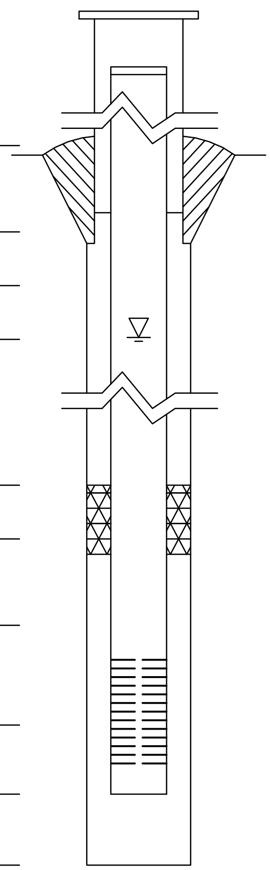
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
627.89	-2.62	Top of Protective Casing
627.60	-2.33	Top of Riser Pipe
625.27	0.00	Ground Surface
622.27	3.00	Top of Annular Sealant
617.96	7.31	Static Water Level (After Completion) 3/1/2010
614.27	11.00	Top of Seal
612.14	13.13	Top of Sand Pack
609.59	15.68	Top of Screen
604.95	20.32	Bottom of Screen
604.38	20.89	Bottom of Well
603.35	21.92	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	18.01
Bottom of Screen to End Cap	(feet)	0.57
Screen Length (1st slot to last slot)	(feet)	4.64
Total Length of Casing	(feet)	23.22
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: **Steel**
Riser Pipe Above W.T.	SS304	SS316	PTFE	**PVC**	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	**PVC**	OTHER:
Screen	SS304	SS316	PTFE	**PVC**	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____ County: Montgomery Well #: G102 (MW3S)

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-03a

~~State~~ Plant ~~Plane~~ Coordinate: X 2,514,531.5 Y 876,554.8 (or) Latitude: ____° ____' ____" Longitude: ____° ____' ____"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: TSC Driller: B. Williamson

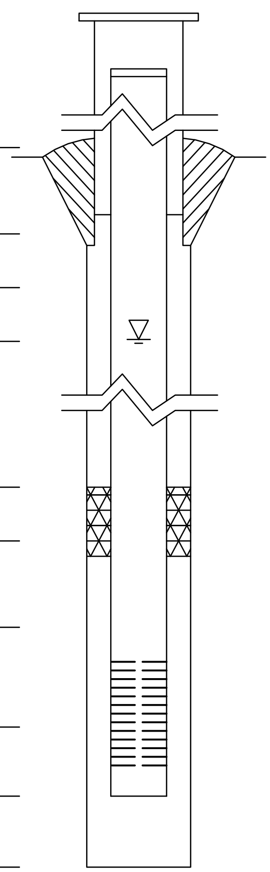
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Testing Services Corp. Date Started: 4/28/2006 Date Finished: 4/28/2006

Report Form Completed By: Rhonald W. Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS



	Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
	629.45	-3.75	Top of Protective Casing
	628.96	-3.26	Top of Riser Pipe
Type of Surface Seal: Concrete	625.70	0.00	Ground Surface
Type of Annular Sealant: Bentonite chips	623.70	2.00	Top of Annular Sealant
Installation Method: Gravity			
Setting Time: +24 hr.	618.67	7.03	Static Water Level (After Completion) 6/1/2006
Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)			
Installation Method: Gravity	623.70	2.00	Top of Seal
Setting Time: +24 hr.	616.20	9.50	Top of Sand Pack
Type of Sand Pack: Quartz sand			
Grain Size: #5 (sieve size)	613.68	12.02	Top of Screen
Installation Method: Gravity			
	608.92	16.78	Bottom of Screen
Type of Backfill Material: n/a (if applicable)	608.55	17.15	Bottom of Well
Installation Method: n/a	608.55	17.15	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	15.28
Bottom of Screen to End Cap	(feet)	0.37
Screen Length (1st slot to last slot)	(feet)	4.76
Total Length of Casing	(feet)	20.41
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency

Well Completion Report

Site #: ______ County: Montgomery Well #: G103

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G103

~~State~~ Plant ~~Plane~~ Coordinate: X 2,514,501.2 Y 876,199.5 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 2/15/2010 Date Finished: 2/15/2010

Report Form Completed By: Suzanna L. Simpson Date: 2/18/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 8 min

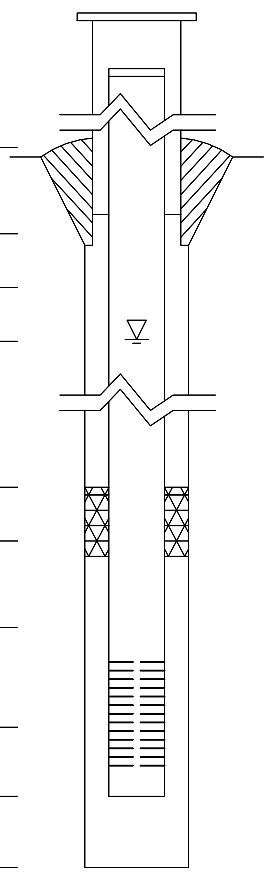
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
634.07	-3.08	Top of Protective Casing
633.80	-2.81	Top of Riser Pipe
630.99	0.00	Ground Surface
624.93	6.06	Top of Annular Sealant
614.00	16.99	Static Water Level (After Completion) 3/1/2010
618.51	12.48	Top of Seal
617.35	13.64	Top of Sand Pack
615.11	15.88	Top of Screen
610.32	20.67	Bottom of Screen
609.90	21.09	Bottom of Well
609.90	21.09	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	18.69
Bottom of Screen to End Cap	(feet)	0.42
Screen Length (1st slot to last slot)	(feet)	4.79
Total Length of Casing	(feet)	23.90
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: R104

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: R104

State Plane Coordinate: X 2,514,503.4 Y 875,857.8 (or) Latitude: 39 ° 4 ' 10 " Longitude: -89 ° 23 ' 56.8 "

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: D. Mahurin

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Rhonald W. Hasenyager Date Started: 10/8/2010 Date Finished: 10/8/2010

Report Form Completed By: Suzanna L. Simpson Date: 10/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 15 min

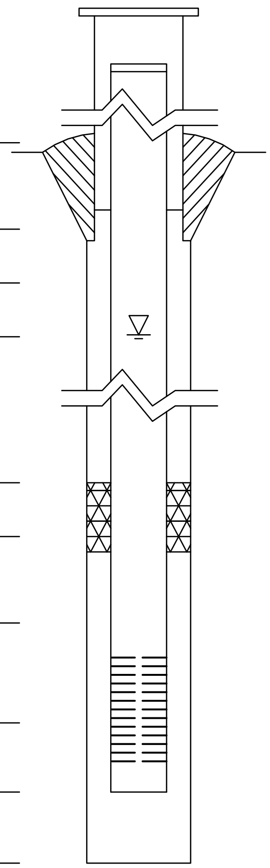
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
632.02	-2.99	Top of Protective Casing
631.84	-2.81	Top of Riser Pipe
629.03	0.00	Ground Surface
627.03	2.00	Top of Annular Sealant
612.85	16.18	Static Water Level (After Completion) 11/15/2010
617.03	12.00	Top of Seal
616.01	13.02	Top of Sand Pack
614.44	14.59	Top of Screen
609.71	19.32	Bottom of Screen
609.18	19.85	Bottom of Well
609.18	19.85	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.60
Bottom of Screen to End Cap	(feet)	0.53
Screen Length (1st slot to last slot)	(feet)	4.53
Total Length of Casing	(feet)	22.66
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G104

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G104

~~State~~ Plant ~~Plane~~ Coordinate: X 2,514,505.0 Y 875,849.3 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 2/15/2010 Date Finished: 2/15/2010

Report Form Completed By: Suzanna L. Simpson Date: 2/18/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 10 min

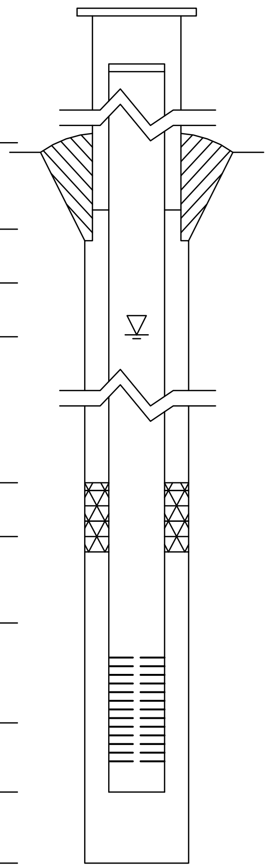
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.29	-3.17	Top of Protective Casing
632.94	-2.82	Top of Riser Pipe
630.12	0.00	Ground Surface
624.92	5.20	Top of Annular Sealant
614.72	15.40	Static Water Level (After Completion) 3/1/2010
619.17	10.95	Top of Seal
617.42	12.70	Top of Sand Pack
615.21	14.91	Top of Screen
610.51	19.61	Bottom of Screen
610.04	20.08	Bottom of Well
607.92	22.20	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.73
Bottom of Screen to End Cap	(feet)	0.47
Screen Length (1st slot to last slot)	(feet)	4.70
Total Length of Casing	(feet)	22.90
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G105

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G105

~~State~~ Plant ~~Plane~~ Coordinate: X 2,514,509.2 Y 875,499.7 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 2/16/2010 Date Finished: 2/16/2010

Report Form Completed By: Suzanna L. Simpson Date: 2/18/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) — selected: Granular

Installation Method: Gravity

Setting Time: 10 min

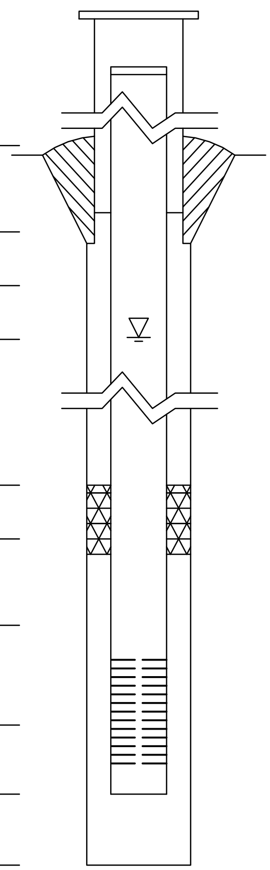
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
632.40	-3.14	Top of Protective Casing
632.08	-2.82	Top of Riser Pipe
629.26	0.00	Ground Surface
623.80	5.46	Top of Annular Sealant
613.18	16.08	Static Water Level (After Completion) 3/1/2010
616.55	12.71	Top of Seal
615.50	13.76	Top of Sand Pack
613.15	16.11	Top of Screen
608.36	20.90	Bottom of Screen
607.89	21.37	Bottom of Well
606.80	22.46	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	18.93
Bottom of Screen to End Cap	(feet)	0.47
Screen Length (1st slot to last slot)	(feet)	4.79
Total Length of Casing	(feet)	24.19
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency

Well Completion Report

Site #: ________ County: Montgomery Well #: G106

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G106

~~State~~ Plant ~~Plane~~ Coordinate: X 2,514,512.8 Y 875,149.8 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 2/16/2010 Date Finished: 2/16/2010

Report Form Completed By: Suzanna L. Simpson Date: 2/18/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 10 min

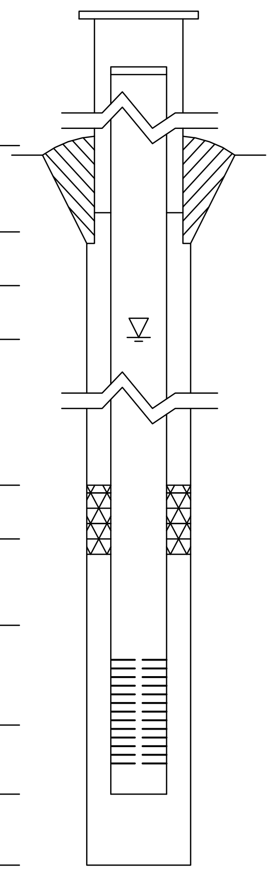
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
631.45	-3.06	Top of Protective Casing
631.15	-2.76	Top of Riser Pipe
628.39	0.00	Ground Surface
622.94	5.45	Top of Annular Sealant
615.77	12.62	Static Water Level (After Completion) 3/1/2010
617.44	10.95	Top of Seal
616.10	12.29	Top of Sand Pack
614.02	14.37	Top of Screen
609.43	18.96	Bottom of Screen
608.95	19.44	Bottom of Well
607.94	20.45	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.13
Bottom of Screen to End Cap	(feet)	0.48
Screen Length (1st slot to last slot)	(feet)	4.69
Total Length of Casing	(feet)	22.30
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G107

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G107

~~State~~ Plant ~~Plane~~ Coordinate: X 2,514,358.3 Y 874,994.3 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 2/17/2010 Date Finished: 2/17/2010

Report Form Completed By: Suzanna L. Simpson Date: 2/18/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 8 min

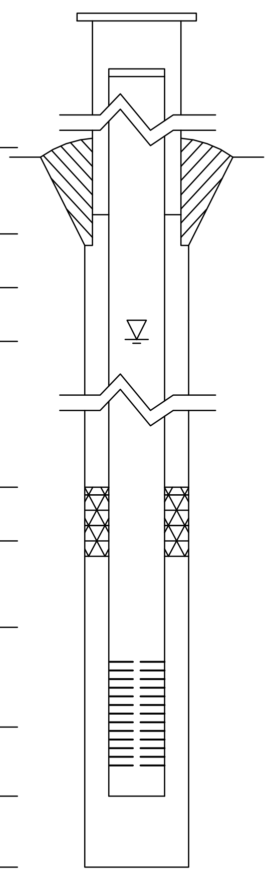
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
630.60	-2.81	Top of Protective Casing
630.23	-2.44	Top of Riser Pipe
627.79	0.00	Ground Surface
624.08	3.71	Top of Annular Sealant
617.39	10.40	Static Water Level (After Completion) 3/1/2010
617.41	10.38	Top of Seal
616.24	11.55	Top of Sand Pack
613.92	13.87	Top of Screen
609.29	18.50	Bottom of Screen
608.82	18.97	Bottom of Well
607.08	20.71	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	16.31
Bottom of Screen to End Cap	(feet)	0.47
Screen Length (1st slot to last slot)	(feet)	4.63
Total Length of Casing	(feet)	21.41
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G108

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G108

~~State~~ Plant ~~Plane~~ Coordinate: X 2,514,248.3 Y 874,948.8 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Diane M. Lamb Date Started: 2/12/2010 Date Finished: 2/12/2010

Report Form Completed By: Diane M. Lamb Date: 2/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Granular

Setting Time: 10 min

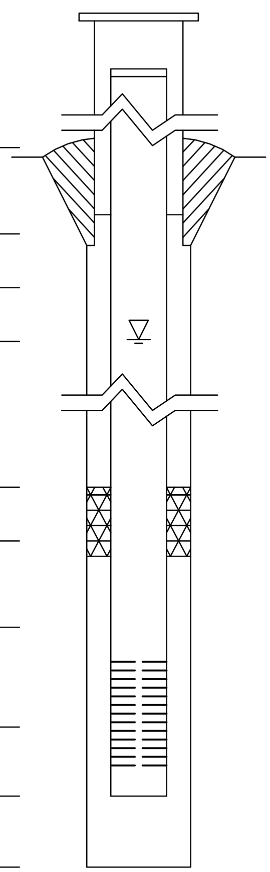
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
630.52	-3.02	Top of Protective Casing
630.22	-2.72	Top of Riser Pipe
627.50	0.00	Ground Surface
622.50	5.00	Top of Annular Sealant
618.57	8.93	Static Water Level (After Completion) 3/1/2010
614.00	13.50	Top of Seal
612.80	14.70	Top of Sand Pack
610.68	16.82	Top of Screen
606.00	21.50	Bottom of Screen
605.50	22.00	Bottom of Well
605.50	22.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	19.54
Bottom of Screen to End Cap	(feet)	0.50
Screen Length (1st slot to last slot)	(feet)	4.68
Total Length of Casing	(feet)	24.72
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G109

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G109

~~State~~ Plant ~~Plane~~ Coordinate: X 2,514,137.8 Y 874,970.1 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Diane M. Lamb Date Started: 2/11/2010 Date Finished: 2/11/2010

Report Form Completed By: Diane M. Lamb Date: 2/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- **Granular** Pellet Slurry (choose one)

Installation Method: Granular

Setting Time: 10 min

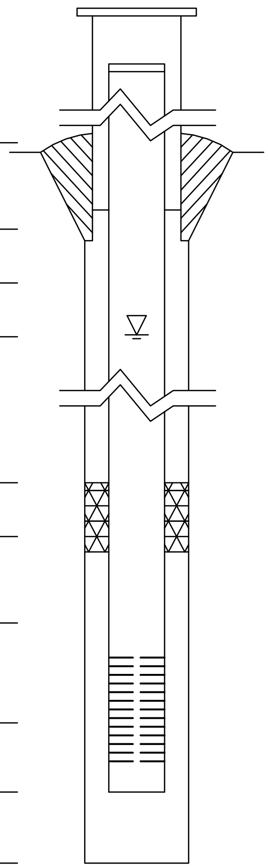
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
630.08	-2.88	Top of Protective Casing
629.76	-2.56	Top of Riser Pipe
627.20	0.00	Ground Surface
621.70	5.50	Top of Annular Sealant
618.35	8.85	Static Water Level (After Completion) 3/1/2010
614.90	12.30	Top of Seal
614.60	12.60	Top of Sand Pack
611.81	15.39	Top of Screen
607.27	19.93	Bottom of Screen
606.70	20.50	Bottom of Well
606.70	20.50	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.95
Bottom of Screen to End Cap	(feet)	0.57
Screen Length (1st slot to last slot)	(feet)	4.54
Total Length of Casing	(feet)	23.06
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: **Steel**
Riser Pipe Above W.T.	SS304	SS316	PTFE	**PVC**	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	**PVC**	OTHER:
Screen	SS304	SS316	PTFE	**PVC**	OTHER:

Well Completion Form (revised 02/06/02)

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G110

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G110

~~State~~ Plant ~~Plane~~ Coordinate: X 2,514,057.7 Y 875,015.4 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

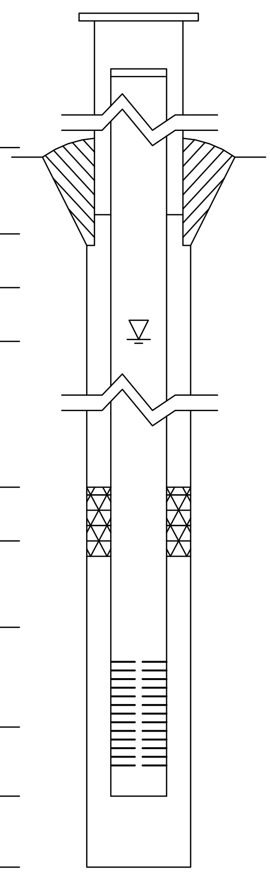
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Diane M. Lamb Date Started: 2/11/2010 Date Finished: 2/11/2010

Report Form Completed By: Diane M. Lamb Date: 2/19/2010

ANNULAR SPACE DETAILS



Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Granular

Setting Time: 10 min

Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a

Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
629.96	-2.94	Top of Protective Casing
629.65	-2.63	Top of Riser Pipe
627.02	0.00	Ground Surface
621.86	5.16	Top of Annular Sealant
617.52	9.50	Static Water Level (After Completion) 3/1/2010
615.46	11.56	Top of Seal
614.06	12.96	Top of Sand Pack
611.97	15.05	Top of Screen
607.43	19.59	Bottom of Screen
606.86	20.16	Bottom of Well
606.86	20.16	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.68
Bottom of Screen to End Cap	(feet)	0.57
Screen Length (1st slot to last slot)	(feet)	4.54
Total Length of Casing	(feet)	22.79
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____ County: Montgomery Well #: G111

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G111

~~State~~ Plant ~~Plane~~ Coordinate: X 2,513,981.7 Y 875,058.7 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Diane M. Lamb Date Started: 2/10/2010 Date Finished: 2/11/2010

Report Form Completed By: Diane M. Lamb Date: 2/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Granular

Setting Time: 10 min

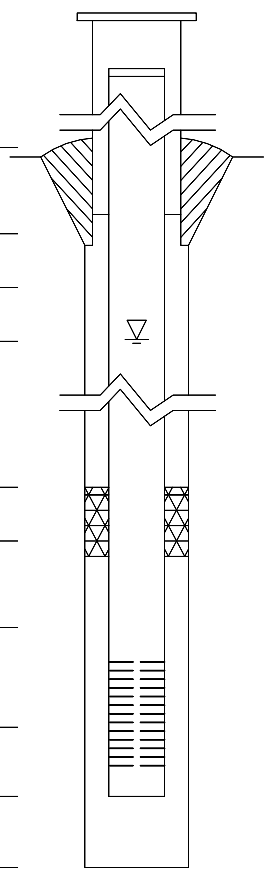
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
630.19	-2.95	Top of Protective Casing
629.90	-2.66	Top of Riser Pipe
627.24	0.00	Ground Surface
622.52	4.72	Top of Annular Sealant
616.74	10.50	Static Water Level (After Completion) 3/1/2010
616.41	10.83	Top of Seal
614.52	12.72	Top of Sand Pack
612.63	14.61	Top of Screen
608.09	19.15	Bottom of Screen
607.52	19.72	Bottom of Well
607.52	19.72	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.27
Bottom of Screen to End Cap	(feet)	0.57
Screen Length (1st slot to last slot)	(feet)	4.54
Total Length of Casing	(feet)	22.38
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Selected: Steel (Protective Casing); PVC (Riser Pipe Above W.T., Riser Pipe Below W.T., Screen)

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G119

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G119

~~State~~ Plant ~~Plane~~ Coordinate: X 2,513,907.7 Y 875,675.0 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 2/9/2010 Date Finished: 2/9/2010

Report Form Completed By: Suzanna L. Simpson Date: 2/18/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 15 min

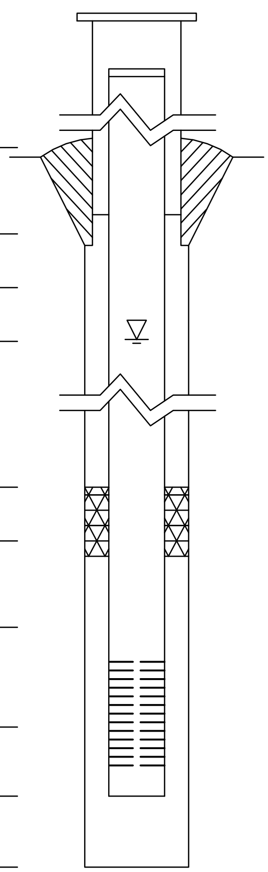
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
631.85	-3.00	Top of Protective Casing
631.55	-2.70	Top of Riser Pipe
628.85	0.00	Ground Surface
623.57	5.28	Top of Annular Sealant
617.59	11.26	Static Water Level (After Completion) 3/1/2010
614.87	13.98	Top of Seal
613.57	15.28	Top of Sand Pack
611.56	17.29	Top of Screen
607.02	21.83	Bottom of Screen
606.47	22.38	Bottom of Well
606.47	22.38	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	19.99
Bottom of Screen to End Cap	(feet)	0.55
Screen Length (1st slot to last slot)	(feet)	4.54
Total Length of Casing	(feet)	25.08
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G120

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G120

~~State~~ Plant ~~Plane~~ Coordinate: X 2,513,905.8 Y 875,854.4 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 2/8/2010 Date Finished: 2/8/2010

Report Form Completed By: Suzanna L. Simpson Date: 2/18/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 8 min

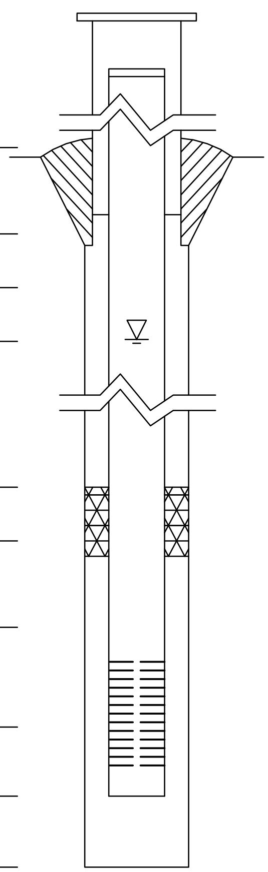
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
632.18	-2.88	Top of Protective Casing
631.87	-2.57	Top of Riser Pipe
629.30	0.00	Ground Surface
624.22	5.08	Top of Annular Sealant
615.45	13.85	Static Water Level (After Completion) 3/1/2010
618.14	11.16	Top of Seal
616.22	13.08	Top of Sand Pack
614.20	15.10	Top of Screen
609.68	19.62	Bottom of Screen
609.09	20.21	Bottom of Well
607.22	22.08	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.67
Bottom of Screen to End Cap	(feet)	0.59
Screen Length (1st slot to last slot)	(feet)	4.52
Total Length of Casing	(feet)	22.78
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G121

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G121

~~State~~ Plant ~~Plane~~ Coordinate: X 2,513,904.4 Y 875,964.6 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 2/4/2010 Date Finished: 2/4/2010

Report Form Completed By: Suzanna L. Simpson Date: 2/18/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) — Granular

Installation Method: Gravity

Setting Time: 7 min

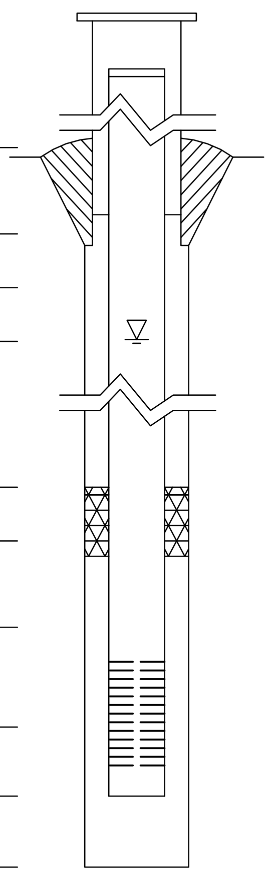
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.14	-3.57	Top of Protective Casing
632.83	-3.26	Top of Riser Pipe
629.57	0.00	Ground Surface
624.41	5.16	Top of Annular Sealant
615.13	14.44	Static Water Level (After Completion) 3/1/2010
616.81	12.76	Top of Seal
615.49	14.08	Top of Sand Pack
612.78	16.79	Top of Screen
608.10	21.47	Bottom of Screen
607.62	21.95	Bottom of Well
605.41	24.16	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	20.05
Bottom of Screen to End Cap	(feet)	0.48
Screen Length (1st slot to last slot)	(feet)	4.68
Total Length of Casing	(feet)	25.21
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G122

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G122

~~State~~ Plant ~~Plane~~ Coordinate: X 2,513,902.8 Y 876,080.1 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Diane M. Lamb Date Started: 2/4/2010 Date Finished: 2/4/2010

Report Form Completed By: Diane M. Lamb Date: 2/9/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 10 min

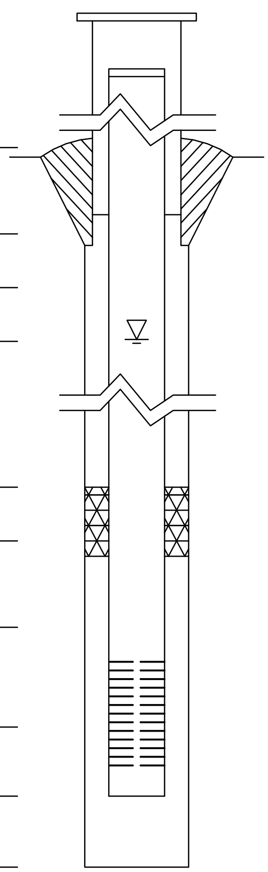
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
632.98	-3.12	Top of Protective Casing
632.69	-2.83	Top of Riser Pipe
629.86	0.00	Ground Surface
625.01	4.85	Top of Annular Sealant
617.02	12.84	Static Water Level (After Completion) 3/1/2010
617.01	12.85	Top of Seal
615.41	14.45	Top of Sand Pack
613.35	16.51	Top of Screen
608.81	21.05	Bottom of Screen
608.20	21.66	Bottom of Well
608.01	21.85	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	19.34
Bottom of Screen to End Cap	(feet)	0.61
Screen Length (1st slot to last slot)	(feet)	4.54
Total Length of Casing	(feet)	24.49
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G123

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G123

~~State-~~ Plant ~~Plane~~ Coordinate: X 2,513,901.5 Y 876,189.6 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Diane M. Lamb Date Started: 2/3/2010 Date Finished: 2/4/2010

Report Form Completed By: Diane M. Lamb Date: 2/9/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 10 min

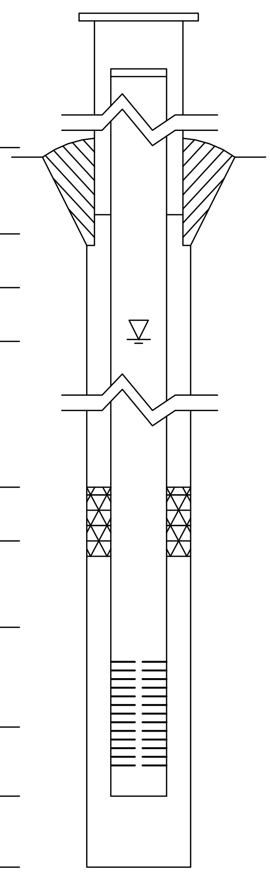
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.29	-3.16	Top of Protective Casing
632.96	-2.83	Top of Riser Pipe
630.13	0.00	Ground Surface
625.06	5.07	Top of Annular Sealant
614.15	15.98	Static Water Level (After Completion) 3/1/2010
612.31	17.82	Top of Seal
611.14	18.99	Top of Sand Pack
609.19	20.94	Top of Screen
604.67	25.46	Bottom of Screen
604.06	26.07	Bottom of Well
604.06	26.07	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	23.77
Bottom of Screen to End Cap	(feet)	0.61
Screen Length (1st slot to last slot)	(feet)	4.52
Total Length of Casing	(feet)	28.90
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G124

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G124

~~State~~ Plant ~~Plane~~ Coordinate: X 2,513,900.3 Y 876,304.9 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 2/3/2010 Date Finished: 2/3/2010

Report Form Completed By: Suzanna L. Simpson Date: 2/5/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 10 min

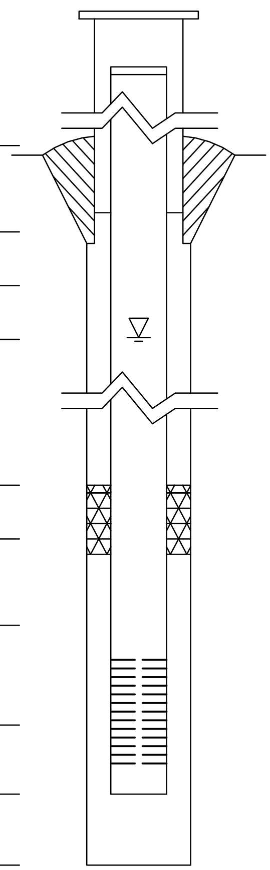
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.70	-3.28	Top of Protective Casing
633.39	-2.97	Top of Riser Pipe
630.42	0.00	Ground Surface
625.45	4.97	Top of Annular Sealant
619.43	10.99	Static Water Level (After Completion) 3/1/2010
618.34	12.08	Top of Seal
616.50	13.92	Top of Sand Pack
614.44	15.98	Top of Screen
609.91	20.51	Bottom of Screen
609.36	21.06	Bottom of Well
608.45	21.97	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	18.95
Bottom of Screen to End Cap	(feet)	0.55
Screen Length (1st slot to last slot)	(feet)	4.53
Total Length of Casing	(feet)	24.03
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G125

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G125

~~State~~ Plant ~~Plane~~ Coordinate: X 2,513,899.1 Y 876,409.5 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 2/2/2010 Date Finished: 2/3/2010

Report Form Completed By: Suzanna L. Simpson Date: 2/5/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 10 min

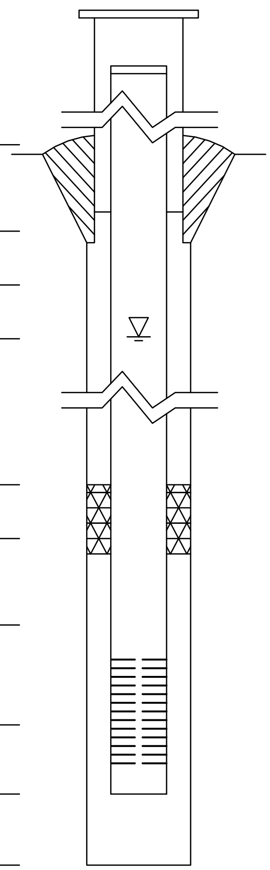
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
633.82	-3.14	Top of Protective Casing
633.51	-2.83	Top of Riser Pipe
630.68	0.00	Ground Surface
625.77	4.91	Top of Annular Sealant
622.10	8.58	Static Water Level (After Completion) 3/1/2010
617.15	13.53	Top of Seal
615.95	14.73	Top of Sand Pack
613.65	17.03	Top of Screen
609.12	21.56	Bottom of Screen
608.64	22.04	Bottom of Well
608.64	22.04	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	19.86
Bottom of Screen to End Cap	(feet)	0.58
Screen Length (1st slot to last slot)	(feet)	4.53
Total Length of Casing	(feet)	24.97
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G126

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G126

~~State~~ Plant ~~Plane~~ Coordinate: X 2,513,895.4 Y 875,062.4 (or) Latitude: ° ' " Longitude: ° ' "

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Diane M. Lamb Date Started: 2/10/2010 Date Finished: 2/10/2010

Report Form Completed By: Diane M. Lamb Date: 2/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Granular

Setting Time: 10 min

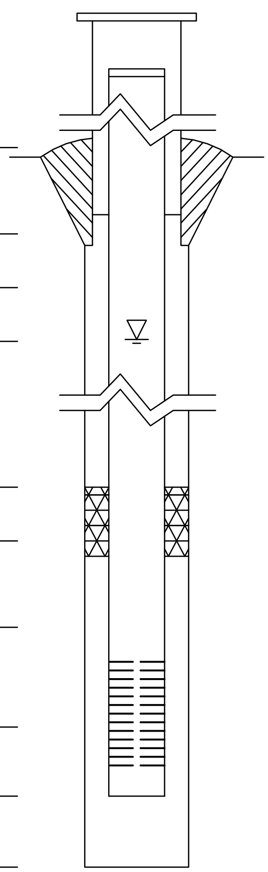
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS) (0.01 ft.)	
625.69	-2.73	Top of Protective Casing
625.39	-2.43	Top of Riser Pipe
622.96	0.00	Ground Surface
619.96	3.00	Top of Annular Sealant
614.14	8.82	Static Water Level (After Completion) 3/1/2010
613.96	9.00	Top of Seal
612.86	10.10	Top of Sand Pack
610.07	12.89	Top of Screen
605.53	17.43	Bottom of Screen
604.96	18.00	Bottom of Well
604.96	18.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	15.32
Bottom of Screen to End Cap	(feet)	0.57
Screen Length (1st slot to last slot)	(feet)	4.54
Total Length of Casing	(feet)	20.43
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: T127

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: T127

~~State-~~ Plant ~~Plane~~ Coordinate: X 2,513,911.0 Y 875,359.2 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: ______ IL Registration #: ______

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Diane M. Lamb Date Started: 2/10/2010 Date Finished: 2/10/2010

Report Form Completed By: Diane M. Lamb Date: 2/19/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Granular

Setting Time: 10 min

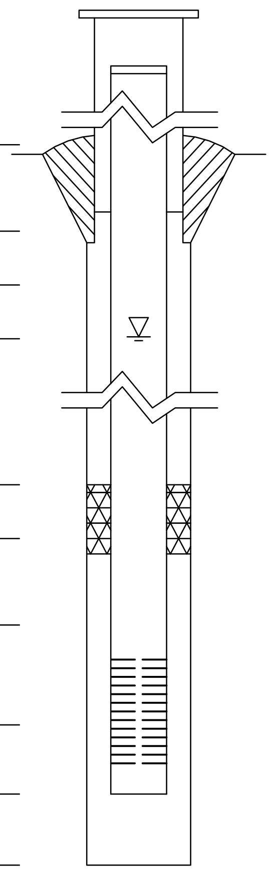
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
631.29	-3.22	Top of Protective Casing
630.96	-2.89	Top of Riser Pipe
628.07	0.00	Ground Surface
622.43	5.64	Top of Annular Sealant
616.81	11.26	Static Water Level (After Completion) 3/1/2010
613.43	14.64	Top of Seal
612.32	15.75	Top of Sand Pack
610.54	17.53	Top of Screen
606.00	22.07	Bottom of Screen
605.43	22.64	Bottom of Well
605.43	22.64	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	20.42
Bottom of Screen to End Cap	(feet)	0.57
Screen Length (1st slot to last slot)	(feet)	4.54
Total Length of Casing	(feet)	25.53
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: T128

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: T128

~~State~~ Plant ~~Plane~~ Coordinate: X 2,513,909.5 Y 875,509.7 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: ______ IL Registration #: ______

Drilling Contractor: Layne-Western Co Driller: T. List

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Suzanna L. Simpson Date Started: 2/9/2010 Date Finished: 2/9/2010

Report Form Completed By: Suzanna L. Simpson Date: 2/18/2010

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) — Granular

Installation Method: Granular

Setting Time: 10 min

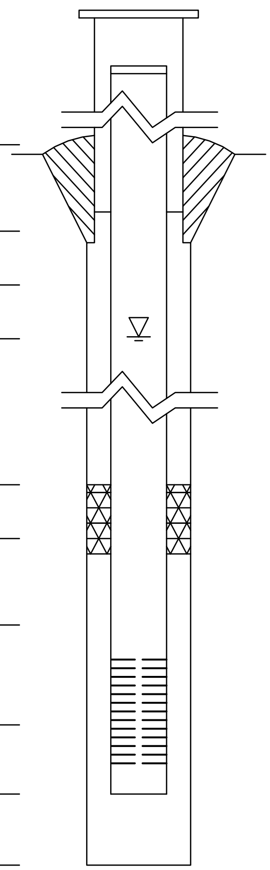
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
631.23	-2.79	Top of Protective Casing
630.93	-2.49	Top of Riser Pipe
628.44	0.00	Ground Surface
623.38	5.06	Top of Annular Sealant
616.09	12.35	Static Water Level (After Completion) 3/1/2010
615.53	12.91	Top of Seal
614.13	14.31	Top of Sand Pack
611.91	16.53	Top of Screen
607.40	21.04	Bottom of Screen
606.80	21.64	Bottom of Well
604.38	24.06	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	20.02
Bottom of Screen to End Cap	(feet)	0.60
Screen Length (1st slot to last slot)	(feet)	4.51
Total Length of Casing	(feet)	25.13
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: ______ Well #: TA31

Site Name: Coffeen Power Station Borehole #: TA31

State Plane Coordinate: X 2,513,856.8 Y 876,542.2 (or) Latitude: 39° 4' 16.930" Longitude: 89° 24' 4.920"

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Ramsey Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow Stem Auger Drilling Fluid (Type): none

Logged By: Rhonald W. Hasenyager Date Started: 10/28/2014 Date Finished: 10/28/2014

Report Form Completed By: Rhonald W. Hasenyager Date: 11/5/2014

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite

Installation Method: tremie

Setting Time: 45 min.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 30 min.

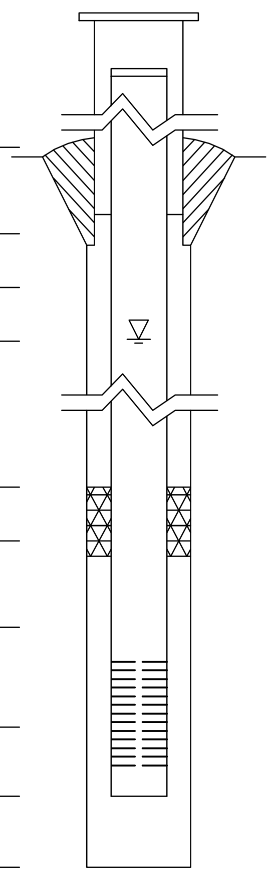
Type of Sand Pack: Quartz Sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity & Surge

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.90	-3.01	Top of Protective Casing
626.55	-2.66	Top of Riser Pipe
623.89	0.00	Ground Surface
620.89	3.00	Top of Annular Sealant
615.78	8.11	Static Water Level (After Completion) 10/30/2014
613.56	10.33	Top of Seal
610.81	13.08	Top of Sand Pack
608.80	15.09	Top of Screen
604.32	19.57	Bottom of Screen
603.70	20.19	Bottom of Well
603.70	20.19	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.82
Bottom of Screen to End Cap	(feet)	0.55
Screen Length (1st slot to last slot)	(feet)	4.48
Total Length of Casing	(feet)	22.85
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: ______ Well #: TA32

Site Name: Coffeen Power Station   Borehole #: TA32

State Plane Coordinate: X 2,513,605.2 Y 877,532.6 (or) Latitude: 39° 4' 26.730" Longitude: 89° 24' 8.000"

Surveyed By: Gary C. Rogers   IL Registration #: 035-002957

Drilling Contractor: Ramsey   Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc.   Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow Stem Auger   Drilling Fluid (Type): none

Logged By: Rhonald W. Hasenyager   Date Started: 10/27/2014   Date Finished: 10/27/2014

Report Form Completed By: Rhonald W. Hasenyager   Date: 11/5/2014

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite

Installation Method: tremie

Setting Time: 30 min.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 35 min.

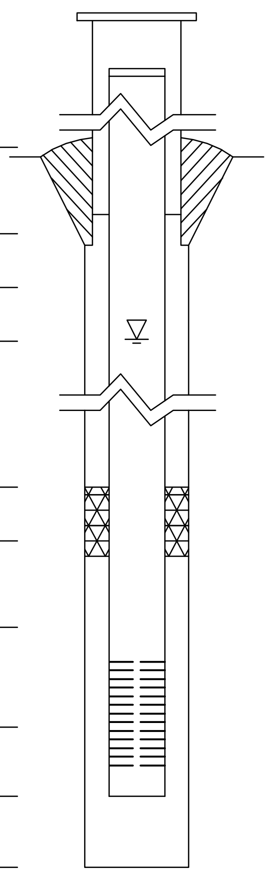
Type of Sand Pack: Quartz Sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
621.76	-2.83	Top of Protective Casing
621.42	-2.49	Top of Riser Pipe
618.93	0.00	Ground Surface
616.03	2.90	Top of Annular Sealant
604.88	14.05	Static Water Level (After Completion) 10/30/2014
611.09	7.84	Top of Seal
609.18	9.75	Top of Sand Pack
607.62	11.31	Top of Screen
603.25	15.68	Bottom of Screen
602.46	16.47	Bottom of Well
602.46	16.47	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	13.94
Bottom of Screen to End Cap	(feet)	0.65
Screen Length (1st slot to last slot)	(feet)	4.37
Total Length of Casing	(feet)	18.96
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Screen	SS304	SS316	PTFE	PVC (circled)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: TA33

Site Name: Coffeen Well Sealing & Assmt Well Install Borehole #: TA33b

State Plane Coordinate: X 2,513,248.7 Y 876,605.4 (or) Latitude: 39° 4' 17.500" Longitude: 89° 24' 12.700"

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Ramsey Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow Stem Auger Drilling Fluid (Type): None

Logged By: Suzanna L. Keim Date Started: 6/2/2015 Date Finished: 6/2/2015

Report Form Completed By: Suzanna L. Keim Date: 6/4/2015

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >48 hrs.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) [Granular]

Installation Method: Gravity

Setting Time: 30 minutes

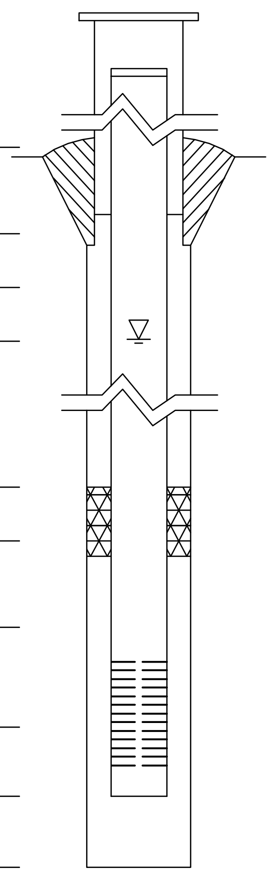
Type of Sand Pack: Quartz sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.05	-2.54	Top of Protective Casing
625.27	-2.76	Top of Riser Pipe
622.51	0.00	Ground Surface
620.51	2.00	Top of Annular Sealant
615.51	7.00	Static Water Level (After Completion) 6/16/2015
614.51	8.00	Top of Seal
612.11	10.40	Top of Sand Pack
610.28	12.23	Top of Screen
605.62	16.89	Bottom of Screen
605.07	17.44	Bottom of Well
605.07	17.44	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	7.5
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	14.99
Bottom of Screen to End Cap	(feet)	0.55
Screen Length (1st slot to last slot)	(feet)	4.66
Total Length of Casing	(feet)	20.20
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: TA34

Site Name: Coffeen Well Sealing & Assmt Well Install Borehole #: TA34

State Plane Coordinate: X 2,513,466.7 Y 875,906.1 (or) Latitude: 39° 4' 10.500" Longitude: 89° 24' 10.000"

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Ramsey Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow Stem Auger Drilling Fluid (Type): None

Logged By: Suzanna L. Keim Date Started: 6/3/2015 Date Finished: 6/3/2015

Report Form Completed By: Suzanna L. Keim Date: 6/4/2015

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: 1 hour

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: n/a

Setting Time: n/a

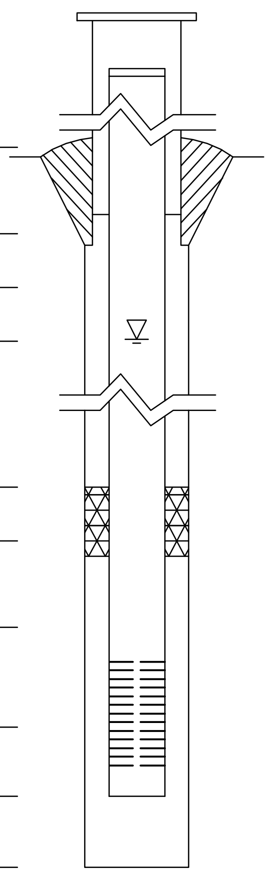
Type of Sand Pack: Quartz sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.77	-2.67	Top of Protective Casing
626.52	-2.42	Top of Riser Pipe
624.10	0.00	Ground Surface
623.10	1.00	Top of Annular Sealant
616.00	8.10	Static Water Level (After Completion) 6/16/2015
n/a	n/a	Top of Seal
615.10	9.00	Top of Sand Pack
613.18	10.92	Top of Screen
608.69	15.41	Bottom of Screen
608.00	16.10	Bottom of Well
608.00	16.10	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	7.5
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	13.34
Bottom of Screen to End Cap	(feet)	0.69
Screen Length (1st slot to last slot)	(feet)	4.49
Total Length of Casing	(feet)	18.52
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

APPENDIX A5

SOUTHWEST POND

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 12/19/2011
Finish: 12/19/2011
WEATHER: Cloudy, rain (mid-60's)

CONTRACTOR: Testing Service Corp.
Rig mfg/model: CME-550 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: B. Williamson
Helper: R. McCuan
Eng/Geo: R. Fiorito

BOREHOLE ID: G151
Well ID: G151
Surface Elev: 622.82 ft. MSL
Completion: 20.46 ft. BGS
Station: 875,023.67N
2,513,805.93E

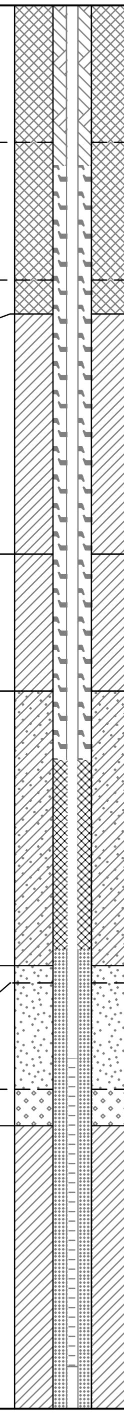
TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 16.00 - While drilling
▼ = 11.50 - Upon completion
▽ = 7.79 - 12/21/2011

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) Failure Type
1A	21/24 *88%*	SS	*2-3 4-5* N=7			
2A	19/24 *79%*	SS	*2-3 6-9* N=9			
3A	19/24 *79%*	SS	*2-4 6-8* N=10			
4A	19/24 *79%*	SS	*15-15 18-11* N=33			
5A	18/24 *75%*	SS	*1-3 4-4* N=7			
6A	16/24 *67%*	SS	*3-3 4-6* N=7			
7A	22/24 *92%*	SS	*9-9 10-9* N=19			
8A	19/24 *79%*	SS	*15-15 35-70* N=50			
9A	4/4 *100%*	SS	*50/4"*			
10A	10/23 *43%*	SS	*12-18 70-99/5"* N=88			

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0–2	FILL - Light yellowish brown (10YR6/4), silty CLAY with some sand and gravel.	622
2–4	FILL - Brown (10YR5/3), silty CLAY with some sand and slight trace gravel.	620
4–4.6	FILL - Brown (10YR5/3), silty CLAY with some sand and slight trace gravel.	
4.6–8	Brown (10YR5/3) with 30% gray (10YR6/1) mottles, clayey SILT with trace sand and slight trace gravel.	618, 616
8–10	Brown (10YR5/3) with 30% gray (10YR6/1) mottles, silty CLAY with sand and gravel.	614
10–14	Light gray (10YR5/1) with 40% yellowish brown (10YR5/6) mottles, sandy CLAY with some silt and slight trace gravel.	612, 610
14–14.6	Light brown (10YR5/3) silty SAND with slight trace gravel.	
14.6–15.8	Light gray (10YR6/1), silty SAND with slight trace gravel.	608
15.8–16.3	Light brown (10YR6/4), silty SAND with some gravel.	
16.3–20.5	Dark gray (10YR5/1), very silty CLAY with sand and trace gravel.	606, 604

Borehole Detail



Remarks

End of Boring = 20.5 ft. BGS

NOTE(S): G151 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 12/20/2011
Finish: 12/20/2011
WEATHER: Cloudy, (mid-40's), rainy later.

CONTRACTOR: Testing Service Corp.
Rig mfg/model: CME-550 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: B. Williamson
Helper: R. McCuan
Eng/Geo: R. Fiorito

BOREHOLE ID: G152
Well ID: G152
Surface Elev: 623.06 ft. MSL
Completion: 18.57 ft. BGS
Station: 874,687.53N
2,513,894.46E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.50 - While drilling
▼ = 3.05 - Upon completion
▽ = 17.00 - 12/21/2011

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type
1A	12/24 *50%*	SS	*2-2 2-3* N=4			
2A, 2B	22/24 *92%*	SS	*2-4 9-7* N=13			
3A, 3B	15/24 *63%*	SS	*3-4 5-6* N=9			
5A	19/24 *79%*	SS	*10-10 12-10* N=22			
5B	20/24 *83%*	SS	*2-4 6-7* N=10			
6A	21/24 *88%*	SS	*2-3 5-7* N=8			
7A	20/24 *83%*	SS	*5-7 9-10* N=16			
8A, 8B	21/24 *88%*	SS	*3-4 7-11* N=11			
9A	23/24 *96%*	SS	*14-35 60-70* N=95			

Depth ft. BGS: 2, 4, 6, 8, 10, 12, 14, 16, 18
Elevation ft. MSL: 622, 620, 618, 616, 614, 612, 610, 608, 606

Lithologic Description
Dark brown (10YR4/2), silty CLAY with trace sand and slight trace gravel.
Light yellowish brown (10YR6/4), silty CLAY with trace sand and slight trace gravel.
Gray (10YR6/1), silty CLAY with trace sand and slight trace gravel.
Gray (10YR6/1) and 25% brown (10YR5/6) mottles, silty CLAY with trace sand and slight trace gravel.
Gray (10YR5/1), clayey SILT silty CLAY with sand and slight trace gravel.
Gray (10YR5/1) with 25% brown (10YR5/6) mottles, silty CLAY with trace sand and slight trace gravel.
Gray (10YR6/1) with 25% yellowish brown (10YR5/6) mottles, silty CLAY with trace sand and slight trace gravel.
Gray (10YR6/1) with 25% yellowish brown (10YR5/6) mottles, clayey SAND with some silt and slight trace gravel.
Yellowish brown (10YR5/6) with 20% gray (10YR6/1), mottles, clayey SAND with some silt and slight trace gravel.
Yellowish brown (10YR5/6), silty SAND.
Yellowish brown (10YR5/6), silty SAND with slight trace gravel.
Dark grayish brown (10YR4/2), very silty CLAY with sand and trace gravel.
Grayish brown (10YR5/2) silty CLAY with sand and trace gravel.

Borehole Detail | Remarks

End of Boring = 18.6 ft. BGS

NOTE(S): G152 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 12/15/2011
Finish: 12/15/2011
WEATHER: Cloudy, windy, (mid-high 30's)

CONTRACTOR: Testing Service Corp.
Rig mfg/model: CME-550 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: B. Williamson
Helper: R. McCuan
Eng/Geo: R. Fiorito

BOREHOLE ID: G153
Well ID: G153
Surface Elev: 623.30 ft. MSL
Completion: 20.76 ft. BGS
Station: 874,532.71N
2,513,532.68E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 16.00 - While drilling
▼ = 15.70 - Upon completion
▽ = 17.55 - 12/21/2011

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) Failure Type
1A	16/24 *67%*	SS				
1B						
	17/24 *71%*	SS	*woh-3* *4-6* N=7			
2A						
3A	18/24 *75%*	SS	*3-4* *5-5* N=9			
4A	21/24 *88%*	SS	*4-5* *6-8* N=11			
	20/24 *83%*	SS	*1-4* *4-5* N=8			
5A						
	20/24 *83%*	SS	*1-4* *4-6* N=8			
6A						
	23/24 *96%*	SS	*7-6* *6-15* N=12			
7A						
8A	19/24 *79%*	SS	*15-23* *37-50* N=60			
9A	9/12 *75%*	SS	*50-99*			
	20/24 *83%*	SS	*23-50* *58-109* N=108			
10A						
	6/7 *86%*	SS	*75-99/1"*			
11A						

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0 – 1	FILL - Light yellowish brown (10YR6/4), silty CLAY with sand and slight trace gravel.	622
1 – 4	FILL - Gray (10YR6/1), silty CLAY with sand and slight trace gravel.	620
4 – 5	Gray (10YR6/1) with 50% brownish yellow (10YR6/8) mottles, silty CLAY with trace sand.	
5 – 9.25	Gray (10YR5/1), silty CLAY with trace sand.	618, 616
9.25 – 10	Gray (10YR6/1), silty CLAY with sand and slight trace gravel.	614
10 – 10.7	Gray (10YR6/1), silty CLAY with sand and slight trace gravel.	
10.7 – 12	Gray (10YR6/1) with 50% brownish yellow (10YR6/8) mottles, silty CLAY with sand and slight trace gravel.	612
12 – 14	Gray (10YR6/1) with 25% brownish yellow (10YR6/8) mottles, clayey SAND with trace silt.	610
14 – 17	Yellowish brown (10YR5/8), silty SAND with slight trace gravel.	608
17 – 18.25	Brownish yellow (10YR6/8), silty CLAY with sand and trace gravel.	606
18.25 – 20.8	Dark gray (10YR4/1), silty CLAY with sand and trace gravel.	604

Borehole Detail | Remarks

End of Boring = 20.8 ft. BGS

NOTE(S): G153 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 12/16/2011
Finish: 12/16/2011
WEATHER: Ptly. cloudy (mid-30's)

CONTRACTOR: Testing Service Corp.
Rig mfg/model: CME-550 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers
FIELD STAFF: Driller: B. Williamson
Helper: R. McCuan
Eng/Geo: R. Fiorito

BOREHOLE ID: G154
Well ID: G154
Surface Elev: 623.52 ft. MSL
Completion: 20.00 ft. BGS
Station: 874,978.38N
2,513,243.10E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.45 - While drilling
▼ =
▽ = 11.10 - 12/21/2011

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	14/24 *58%*	SS	*3-4 4-5* N=8				0–2	FILL - Light yellowish brown (10YR6/4), silty CLAY with trace sand and slight trace gravel.	622	
2A	10/24 *42%*	SS	*woh-1 4-5* N=5				2–4	Brownish yellow (10YR6/6) with 25% gray (10YR6/1) mottles, silty CLAY with trace sand.	620	
3A	14/24 *58%*	SS	*2-4 6-7* N=10				4–6	Gray (10YR5/1) with 25% yellowish brown (10YR5/4) mottles, silty CLAY with trace sand.	618	
4A	21/24 *88%*	SS	*6-8 10-10* N=18				6–12	Gray (10YR6/1) with 25% brownish yellow (10YR6/6) mottles, silty CLAY with trace sand and slight trace gravel.	616, 614, 612	
5A	16/24 *67%*	SS	*1-4 6-8* N=10							
6A	13/24 *54%*	SS	*1-4 6-8* N=10				▽			
7A	20/24 *83%*	SS	*4-6 8-12* N=14				12	Gray (10YR6/1) with 10% brownish yellow (10YR6/8) mottles, silty CLAY with trace sand and slight trace gravel.		
							▼	Gray (10YR6/1), silty CLAY with trace sand and slight trace gravel.	610	
7B							14			
8A	23/24 *96%*	SS	*4-18 30-37* N=48					Gray (10YR6/1), clayey SAND with trace silt.		
								Gray (10YR6/1) with 50% yellowish brown (10YR5/6) mottles, silty SAND with slight trace gravel.		
8B								Dark yellowish brown (10YR4/4), silty CLAY with sand and trace gravel.	608	
8C							16			
9A	21/24 *88%*	SS	*40-75 86-84* N=161					Brown (10YR4/3), silty CLAY with sand and trace gravel.	606	
10A	20/24 *83%*	SS	*28-28 30-34* N=58				18	Dark gray (10YR4/1), silty CLAY with sand and trace gravel.	604	
							20	**End of Boring = 20.0 ft. BGS**		

NOTE(S): G154 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 12/19/2011
Finish: 12/19/2011
WEATHER: Cloudy, rainy, (mid-40's)

CONTRACTOR: Testing Service Corp.
Rig mfg/model: CME-550 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. McCuan
Eng/Geo: R. Fiorito

BOREHOLE ID: G155
Well ID: G155
Surface Elev: 622.89 ft. MSL
Completion: 20.23 ft. BGS
Station: 875,127.65N
2,513,501.75E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
= 14.30 - While drilling
= 12.90 - Upon completion
= 7.90 - 12/21/2011

SAMPLE / TESTING

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) Failure Type
1A	20/24 *83%*	SS	*4-6 8-6* N=14			
2A	20/24 *83%*	SS	*2-4 6-7* N=10			
	17/24 *71%*	SS	*2-4 5-8* N=9			
3A						
4A	24/24 *100%*	SS	*6-7 11-11* N=18			
5A	22/24 *92%*	SS	*woh-3 6-6* N=9			
6A	17/24 *71%*	SS	*2-4 6-6* N=10			
7A	24/24 *100%*	SS	*6-8 10-12* N=18			
8A	23/24 *96%*	SS	*woh-woh 4-15*			
8B						
9A	16/16 *100%*	SS	*15-50 99/4"*			
10A	15/17 *88%*	SS	*24-68 99/5"*			

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0	FILL - Yellow (10YR7/6), silty CLAY with trace sand and slight trace gravel.	
	FILL - Brown (10YR5/3), silty CLAY with sand and trace gravel.	622
	FILL - Brown (10YR5/3), silty CLAY with trace sand and slight trace gravel.	
2	FILL - Brownish yellow (10YR6/6), silty CLAY with trace sand and slight trace gravel.	620
	FILL - Dark grayish brown (10YR4/2), silty CLAY with trace sand and slight trace gravel.	
4	Gray (10YR5/1), silty CLAY with trace sand and slight trace gravel.	618
6	Brownish yellow (10YR6/6) with 10% gray (10YR6/1) mottles, silty CLAY with trace sand and slight trace gravel.	616
8	Dark gray (10YR4/1) with10% brown (10YR4/3) mottles, silty CLAY with trace sand and slight trace gravel.	614
10	Dark yellowish brown (10YR4/6) with 30% grayish brown (10YR5/2) mottles,silty CLAY with trace sand and slight trace gravel.	612
12	Gray (10YR6/1) with 50% yellowish brown (10YR5/6) mottles, clayey SAND with trace silt.	610
14	Yellowish brown (10YR6/4), clayey SAND with trace silt.	
	Yellowish brown (10YR5/6), silty SAND with slight trace gravel.	608
16	Yellowish brown (10YR5/6), silty SAND with slight trace gravel.	606
	Light brownish gray (10YR6/2), silty CLAY with sand and trace gravel.	
18	Light gray (10YR6/2), silty CLAY with sand and trace gravel.	604
20		

Borehole Detail | Remarks

End of Boring = 20.2 ft. BGS

NOTE(S): G155 installed in borehole.

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G151

Site Name: CCB Management Facility Borehole #: G151

State Plane Coordinate: X 2,513,805.9 Y 875,023.7 (or) Latitude: ______ Longitude: ______

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Testing Service Corp. Driller: B. Williamson

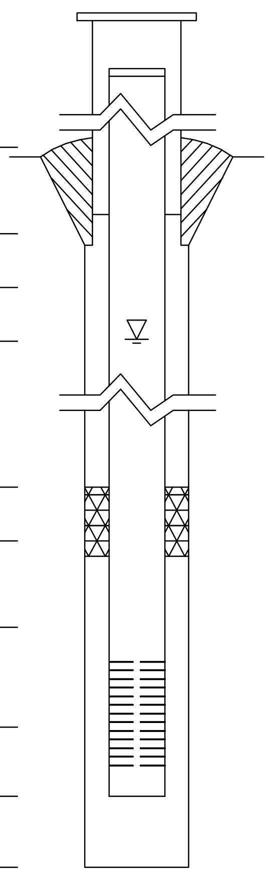
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Ryne M. Fiorito Date Started: 12/19/2011 Date Finished: 12/19/2011

Report Form Completed By: Rhonald W. Hasenyager Date: 12/27/2011

ANNULAR SPACE DETAILS



Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- **Granular** Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 24 min

Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a

Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.24	-3.42	Top of Protective Casing
625.93	-3.11	Top of Riser Pipe
622.82	0.00	Ground Surface
620.49	2.33	Top of Annular Sealant
615.03	7.79	Static Water Level (After Completion) 12/21/2011
611.82	11.00	Top of Seal
609.07	13.75	Top of Sand Pack
607.48	15.34	Top of Screen
602.98	19.84	Bottom of Screen
602.36	20.46	Bottom of Well
602.36	20.46	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	18.45
Bottom of Screen to End Cap	(feet)	0.62
Screen Length (1st slot to last slot)	(feet)	4.50
Total Length of Casing	(feet)	23.57
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	**PVC**	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	**PVC**	OTHER:
Screen	SS304	SS316	PTFE	**PVC**	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____________ County: Montgomery Well #: G152

Site Name: CCB Management Facility Borehole #: G152

State Plane Coordinate: X 2,513,894.5 Y 874,687.5 (or) Latitude: ____ ____ ____ Longitude: ____ ____ ____

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Testing Service Corp. Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Ryne M. Fiorito Date Started: 12/20/2011 Date Finished: 12/20/2011

Report Form Completed By: Rhonald W. Hasenyager Date: 12/27/2011

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Seal extended to near surface

Installation Method: ____________

Setting Time: ____________

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: >24 hr.

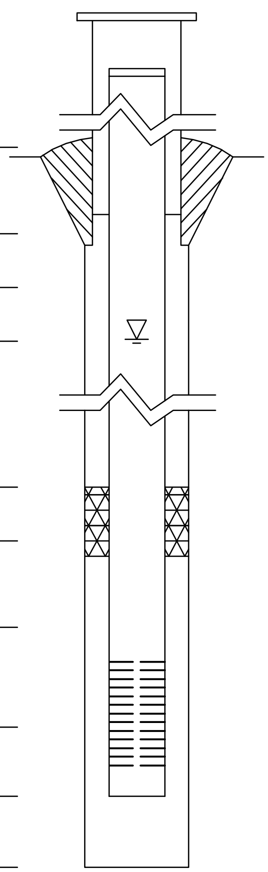
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.67	-3.61	Top of Protective Casing
626.52	-3.46	Top of Riser Pipe
623.06	0.00	Ground Surface
621.06	2.00	Top of Annular Sealant
606.06	17.00	Static Water Level (After Completion) 12/21/2011
621.06	2.00	Top of Seal
611.56	11.50	Top of Sand Pack
609.47	13.59	Top of Screen
604.97	18.09	Bottom of Screen
604.49	18.57	Bottom of Well
604.49	18.57	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.05
Bottom of Screen to End Cap	(feet)	0.48
Screen Length (1st slot to last slot)	(feet)	4.50
Total Length of Casing	(feet)	22.03
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Screen	SS304	SS316	PTFE	PVC (circled)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____ County: Montgomery Well #: G153

Site Name: CCB Management Facility Borehole #: G153

State Plane Coordinate: X 2,513,532.7 Y 874,532.7 (or) Latitude: ____ ____ ____ Longitude: ____ ____ ____

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Testing Service Corp. Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Ryne M. Fiorito Date Started: 12/15/2011 Date Finished: 12/15/2011

Report Form Completed By: Rhonald W. Hasenyager Date: 12/27/2011

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) — Granular circled

Installation Method: Gravity

Setting Time: >24 hr.

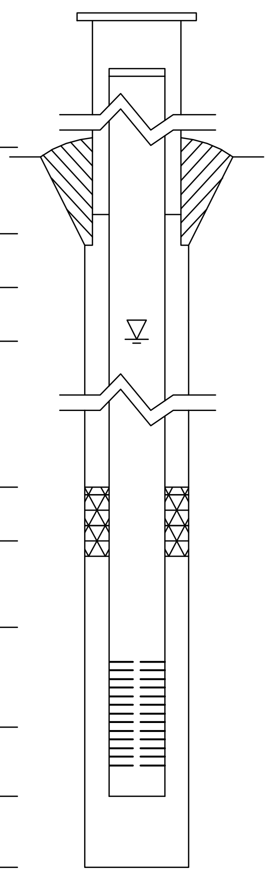
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.59	-3.29	Top of Protective Casing
626.35	-3.05	Top of Riser Pipe
623.30	0.00	Ground Surface
622.63	0.67	Top of Annular Sealant
605.75	17.55	Static Water Level (After Completion) 12/21/2011
610.30	13.00	Top of Seal
608.30	15.00	Top of Sand Pack
607.40	15.90	Top of Screen
602.96	20.34	Bottom of Screen
602.54	20.76	Bottom of Well
602.54	20.76	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	18.95
Bottom of Screen to End Cap	(feet)	0.42
Screen Length (1st slot to last slot)	(feet)	4.44
Total Length of Casing	(feet)	23.81
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Screen	SS304	SS316	PTFE	PVC (circled)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____________ County: Montgomery Well #: G154

Site Name: CCB Management Facility Borehole #: G154

State Plane Coordinate: X 2,513,243.1 Y 874,978.4 (or) Latitude: ____ ____ ____ Longitude: ____ ____ ____

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Testing Service Corp. Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Ryne M. Fiorito Date Started: 12/16/2011 Date Finished: 12/16/2011

Report Form Completed By: Rhonald W. Hasenyager Date: 12/27/2011

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 24 min

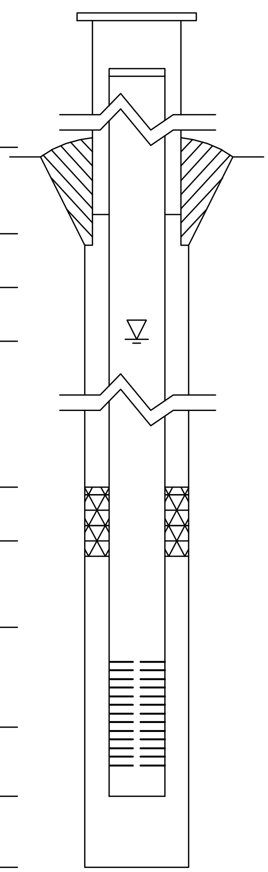
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.55	-3.03	Top of Protective Casing
626.35	-2.83	Top of Riser Pipe
623.52	0.00	Ground Surface
622.44	1.08	Top of Annular Sealant
612.42	11.10	Static Water Level (After Completion) 12/21/2011
613.02	10.50	Top of Seal
610.02	13.50	Top of Sand Pack
609.26	14.26	Top of Screen
604.76	18.76	Bottom of Screen
604.42	19.10	Bottom of Well
603.52	20.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.09
Bottom of Screen to End Cap	(feet)	0.34
Screen Length (1st slot to last slot)	(feet)	4.50
Total Length of Casing	(feet)	21.93
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Screen	SS304	SS316	PTFE	PVC (circled)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G155

Site Name: CCB Management Facility Borehole #: G155

State Plane Coordinate: X 2,513,501.8 Y 875,127.7 (or) Latitude: ______ Longitude: ______

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Testing Service Corp. Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Ryne M. Fiorito Date Started: 12/19/2011 Date Finished: 12/19/2011

Report Form Completed By: Rhonald W. Hasenyager Date: 12/27/2011

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 27 min

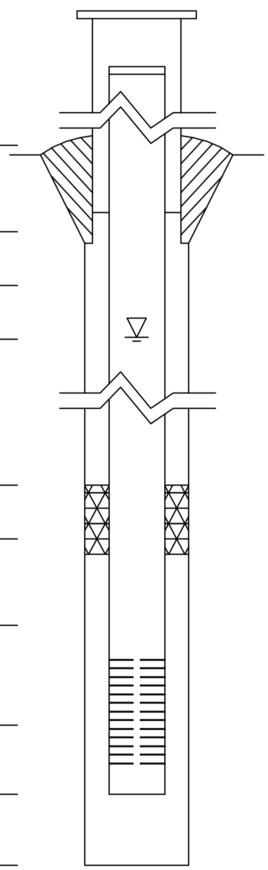
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.07	-3.18	Top of Protective Casing
625.86	-2.97	Top of Riser Pipe
622.89	0.00	Ground Surface
621.39	1.50	Top of Annular Sealant
614.99	7.90	Static Water Level (After Completion) 12/21/2011
611.89	11.00	Top of Seal
609.14	13.75	Top of Sand Pack
607.80	15.09	Top of Screen
603.31	19.58	Bottom of Screen
602.66	20.23	Bottom of Well
602.66	20.23	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	18.28
Bottom of Screen to End Cap	(feet)	0.43
Screen Length (1st slot to last slot)	(feet)	4.49
Total Length of Casing	(feet)	23.20
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

APPENDIX A6

ASH POND 1

FIELD BORING LOG

HANSON

CLIENT: Natural Resource Technology, Inc.
Site: Coffeen Energy Center
Location: Coffeen, Illinois
Project: 15E0030
DATES: Start: 9/8/2015
Finish: 9/8/2015
WEATHER: Sunny, hi 70's

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: D-50 Turbo Tracked MST 800ATV
Drilling Method: Hollow Stem Auger (3¼"overdrill / 4¼")
FIELD STAFF: Driller: D. Crump
Helper: D. Groves
Eng/Geo: K. Theesfeld

BOREHOLE ID: G281
Well ID: G281
Surface Elev: 623.82 ft. MSL
Completion: 20.29 ft. BGS
Station: 2,514,455.48N
874,375.37E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - During Drilling
▼ =
▽ =

SAMPLE Number	Recov / Total (in) % Recovery	Type	TESTING Blows / 6 in N - Value RQD	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) Qp (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	17/24 71%	SS	15-10 7-6 N=17	14			0	Light gray (10YR7/2), dry, very stiff, SILT with little clay and trace gravel.		
								Yellowish brown (10YR5/4) with 5% dark brown (10YR3/3) mottles, dry, very stiff, SILT with few clay and trace gravel.	622	
2A	19/24 79%	SS	2-4 5-5 N=9	25		1.50	2	Yellowish brown (10YR5/4) with 15% dark yellowish brown (10YR4/6) and 5% dark brown (10YR3/3) mottles, moist, stiff, SILT with few clay.	620	
3A	22/24 92%	SS	2-2 3-4 N=5	23		0.40	4	Yellowish brown (10YR5/4) with 15% dark yellowish brown (10YR4/6) mottles, moist, medium, CLAY with some silt and trace fine-grained sand and small gravel.	618	
4A	24/24 100%	SS	5-5 6-6 N=11	19		1.20	6	Yellowish brown (10YR5/4) with 15% dark yellowish brown (10YR4/6) and 5% dark brown (10YR3/3) mottles, moist, stiff, CLAY with some silt and trace fine-grained sand and small gravel.	616	
5A	20/24 83%	SS	2-2 3-4 N=5	21		1.40	8	Yellowish brown (10YR5/4) with 30% dark yellowish brown (10YR4/6) and 5% dark brown (10YR3/3) mottles, moist, stiff, SILT with some clay and trace very fine- to fine-grained sand and small gravel.	614	
6A	22/24 92%	SS	2-2 3-3 N=5	18		0.50	10	Dark yellowish brown (01YR4/6) with 30% yellowish brown (10YR5/4) mottles, moist, soft, SILT with few clay and little fine- to coarse-grained sand and small gravel, trace wood fragments.	612	
7A	17/24 71%	SS	3-4 5-5 N=9	19		0.30	12	Dark yellowish brown (01YR4/6) with 15% yellowish brown (10YR5/4) mottles, moist, soft, SILT with few clay and very fine- to fine-grained sand and trace small gravel.	610	
	19/24 79%	SS	3-11 21-28 N=32				14 ▼	Dark yellowish brown (10YR4/4), wet, dense, very fine- to fine-grained SAND with some silt, few clay and trace small gravel.	608	
	24/24 100%	SS	21-36 39-50 N=75				16	Dark yellowish brown (10YR4/4), wet, dense, very fine- to fine-grained SAND with few silt, little clay and trace small gravel.	606	
8A				7		4.50	18	Yellowish brown (10YR5/6) with 5% strong brown (7.5YR5/6) mottles, moist, hard, SILT with few clay and little fine-grained sand and small gravel.		
	11/24 46%	SS	16-9 30-50 N=39					Dark grayish brown (10YR4/2) with 5% strong brown (7.5YR5/6) mottles, moist, hard, SILT with few clay and little fine-grained sand and small gravel.	604	
	0/3 0%	BD					20			

End of boring = 20.29 feet

NOTE(S): G281 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Natural Resource Technology, Inc.
Site: Coffeen Energy Center
Location: Coffeen, Illinois
Project: 15E0030
DATES: Start: 9/4/2015
Finish: 9/4/2015
WEATHER: Sunny, hi 70's

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: D-50 Turbo Tracked MST 800ATV
Drilling Method: Hollow Stem Auger (3¼"overdrill / 4¼")
FIELD STAFF: Driller: D. Crump
Helper: D. Groves
Eng/Geo: K. Theesfeld

BOREHOLE ID: G301
Well ID: G301
Surface Elev: 620.27 ft. MSL
Completion: 16.21 ft. BGS
Station: 2,515,582.97N
872,234.82E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.00 - During Drilling
▼ =
▽ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
1A	19/24 *79%*	SS	*4-4 3-5* N=7	18		*1.80*	0–1.6	Brown (10YR4/3), moist, stiff, SILT with few clay, trace organics.		620	
							1.6–2.0	Brown (10YR5/3) with 30% yellowish brown (10YR5/6) mottles, moist, stiff, SILT with few clay, trace organics.			
2A	22/24 *92%*	SS	*2-4 4-6* N=8	26		*2.40*	2.0–4.2	Brown (10YR5/3) with 30% yellowish brown (10YR5/6) mottles, moist, stiff, SILT with few clay, trace very fine- to medium-grained sand.		618	
3A	21/24 *88%*	SS	*2-2 3-4* N=5	22		*1.30*	4.2–6.0	Brown (10YR5/3) with 15% yellowish brown (10YR5/6) mottles, moist, stiff, CLAY with some silt and trace very fine- to medium-grained sand.		616	
4A	24/24 *100%*	SS	*6-4 6-6* N=10	19		*1.10*	6.0–7.8	Brown (10YR5/3) with 10% yellowish brown (10YR5/6) mottles, moist, medium to stiff, CLAY with some silt and little very fine- to coarse-grained sand and small gravel.		614	
5A	21/24 *88%*	SS	*1-2 3-4* N=5	21			7.8–9.2	Brown (10YR5/3) with 5% yellowish brown (10YR5/6) mottles, moist, stiff, SILT with some clay and little very fine- to coarse-grained sand and small gravel.		612	
6A	24/24 *100%*	SS	*3-2 3-3* N=5	19		*0.80*	9.2–12.0	Brown (10YR5/3) with 20% yellowish brown (10YR5/6) mottles, moist, stiff, SILT with some clay and little very fine- to coarse-grained sand and small gravel.		610	
7A	24/24 *100%*	SS	*2-4 6-21* N=10	13		*1.60*	12.0–14.5	Yellowish brown (10YR5/6) with 10% grayish brown (10YR5/2) and 5% yellowish brown (10YR5/4) mottles, wet, stiff, SILT with few clay and little fine- to coarse-grained sand and small gravel.		608	
8A	21/24 *88%*	SS	*20-27 50* N=77	7		*4.50*	14.5–16.21	Grayish brown (10YR5/2) with 5% brown (10YR5/3) mottles, dry, hard, SILT with few clay, very fine- to coarse-grained sand and small gravel.		606	
	0/3 *0%*	BD									

End of boring = 16.21 feet

NOTE(S): G301 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Natural Resource Technology, Inc.
Site: Coffeen Energy Center
Location: Coffeen, Illinois
Project: 15E0030
DATES: Start: 9/3/2015
Finish: 9/4/2015
WEATHER: Sunny, hi 70's

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: D-50 Turbo Tracked MST 800ATV
Drilling Method: Hollow Stem Auger (3¼"overdrill / 4¼")
FIELD STAFF: Driller: D. Crump
Helper: D. Groves
Eng/Geo: K. Theesfeld

BOREHOLE ID: G302
Well ID: G302
Surface Elev: 617.95 ft. MSL
Completion: 18.39 ft. BGS
Station: 2,516,214.19N
872,252.95E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - During Drilling
▼ =
▽ =

SAMPLE			TESTING			
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type
1A	23/24 *96%*	SS	*5-5 5-6* N=10	17		*1.50*
2A	20/24 *83%*	SS	*2-3 4-4* N=7	27		*2.60*
3A	21/24 *88%*	SS	*1-2 3-4* N=5	26		*1.80*
4A	24/24 *100%*	SS	*4-7 8-8* N=15	18		*1.60*
5A	24/24 *100%*	SS	*2-3 5-5* N=8	17		*1.80*
6A	18/24 *75%*	SS	*2-2 4-5* N=6	19		
7A	24/24 *100%*	SS	*7-7 8-8* N=15	16		*1.70*
8A				18		*0.80*
8B	22/24 *92%*	SS	*2-5 25-32* N=30	12		*4.50*
9A	24/24 *100%*	SS	*7-24 48-38* N=72	8		*4.50*
	0/5 *0%*	BD				

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
	Yellowish brown (10YR5/6) to dark yellowish brown (10YR4/6), moist, hard, SILT with some clay and trace fine-grained sand and small gravel.	
2	Very dark brown (10YR3/1), moist, hard, SILT with some clay and trace fine-grained sand and small gravel.	616
4	Dark grayish brown (10YR4/2) with very dark gray (10YR3/1) mottles, moist, stiff, CLAY with some silt and trace sand.	614
	Brown (10YR5/3) with dark yellowish brown (10YR4/6) mottles, moist, stiff, CLAY with some silt and trace sand.	
6		612
8	Brown (10YR5/3) with dark yellowish brown (10YR4/6) mottles, moist, stiff, CLAY with some silt and few very fine- to fine-grained sand.	610
10		608
	Brown (10YR4/3) with dark yellowish brown (10YR4/6) mottles, moist, stiff, SILT with some clay and few sand.	
12	Dark gray (10YR4/1), moist, stiff, SILT with some clay and few sand.	606
	Yellowish brown (10YR5/8) with reddish brown (5YR4/4) inclusions, moist, stiff, SILT with some clay and few sand.	
	Dark gray (10YR4/1), moist, stiff, SILT with some clay, few sand and trace small gravel.	
▼ 14		604
	Grayish brown (10YR5/2), wet, hard, SILT with little clay and very fine-grained sand and trace small gravel.	
16	Brown (10YR5/3), wet, hard, SILT with little clay and very fine-grained sand and trace small gravel.	602
	Brown (10YR5/3) grading to yellowish brown (10YR5/4), moist, hard, SILT with some clay, few small gravel.	
18		600

End of boring = 18.39 feet

Borehole Detail | Remarks

NOTE(S): G302 installed in borehole.

Surface Elevation: 619.10

Datum msl

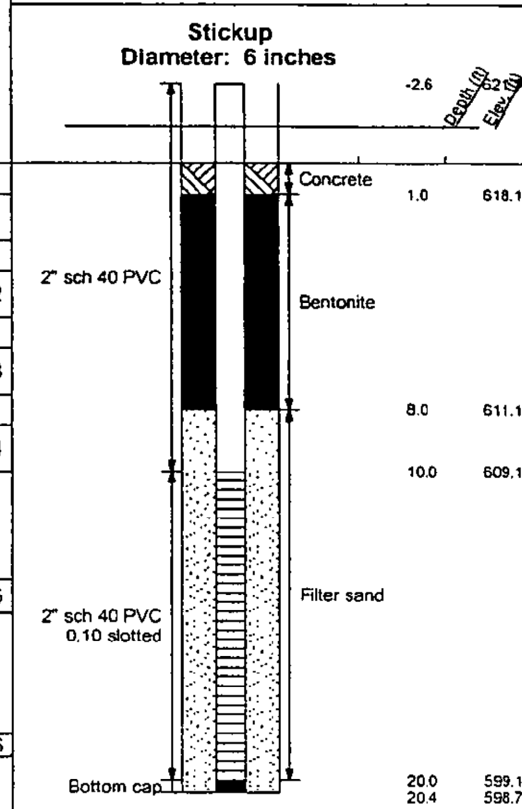
Completion Date: 8/26/10

Northing: 871382.45

Easting: 2516641.06

DEPTH IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
0	FILL: brown, silty clay		
		1-2-3	SS1
	Medium stiff, grayish-brown, silty CLAY with lignite - CL		
		1-3-3	SS2
5			
		1-3-4	SS3
		2-3-3	SS4
	Soft, brown, silty CLAY - CL ∇		
10	Stiff to hard, brown to grayish-brown, silty CLAY - CL (TILL)		
		27-44 -50/1"	SS5
15			
		44-50/2"	SS6
20	Boring terminated at 20 feet.		
25			
30			
35			

WELL DIAGRAM



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

ENCOUNTERED AT 9 FEET ∇

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM

WASHBORING FROM __ FEET

MVU DRILLER SWG LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by: DTK	App'vd. by: HBC
Date: 9/10/10	Date: 1-4-11	Date: 1/4/11

GEOTECHNOLOGY INC FROM THE GROUND UP

Ameren-Coffeen Ash Pond Evaluation

LOG OF BORING: APW-3

G303

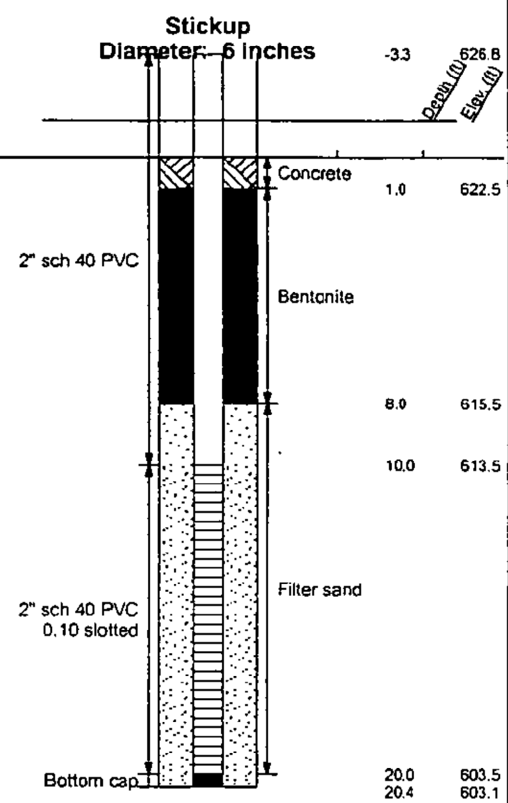
Project No. J017150.01

Surface Elevation: 623.46
Datum msl

Completion Date: 8/26/10
Northing: 871397.48
Easting: 2515520.23

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
0	Medium stiff, grayish-brown, silty CLAY - CL		0-1-1	SS1
			1-2-5	SS2
5			1-3-4	SS3
10			1-2-3	SS4
14	Medium to fine SAND - SP		1-2-1	SS5
15	Hard, gray, silty CLAY - CL (TILL)			
			14-47	SS6
20	Boring terminated at 20 feet.			
25				
30				
35				

WELL DIAGRAM



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J017150.01- COFFEEN.GPJ GTINC 0638301.GPJ 12/13/10

GROUNDWATER DATA

ENCOUNTERED AT 14 FEET ∇

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
MVU DRILLER SWG LOGGER
CME 55TRK DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by: DTK	App'vd. by: RJS
Date: 9/10/10	Date: 1-4-11	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren-Coffeen Ash Pond Evaluation

LOG OF BORING: APW-4

G304

Project No. J017150.01

FIELD BORING LOG

HANSON

CLIENT: Natural Resource Technology, Inc.
Site: Coffeen Power Station
Location: Coffeen, Illinois
Project: 15E0030
DATES: Start: 5/3/2016
Finish: 5/3/2016
WEATHER: Cloudy, breezy, warm, lo 60s

CONTRACTOR: Ramsey Geotechnical Engineering LLC
Rig mfg/model: D-50 Turbo Tracked MST 800ATV
Drilling Method: 4 ¼" HSA, split spoon sampler

FIELD STAFF: Driller: B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: G305
Well ID: G305
Surface Elev: 622.54 ft. MSL
Completion: 18.45 ft. BGS
Station: 2,515,199.36N
871,156.33E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 14, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 3.00 - During Drilling
▼ =
▽ =

SAMPLE Number	Recov / Total (in) / % Recovery	Type	Blows / 6 in / N - Value / **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) / Qp (tsf) / Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	14/24 *58%*	SS	*2-2 5-7* N=7	12			0–0.8	FILL - Grayish brown (10YR5/2), moist, soft, silty CLAY with few small to coarse sand and few small to large gravel.	622	
							0.8–2.4	FILL - Black (10YR2/1), moist, loose, silty, fine- to coarse-grained SAND with little coal fragments.		
2A	17/24 *71%*	SS	*6-7 7-6* N=14	19			2.4–4	Gray (10YR6/1) and light yellowish brown (10YR6/4), moist, very stiff, SILT with little clay.	620	
3A	18/24 *75%*	SS	*3-3 6-4* N=9	28			4–6	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, very stiff, silty CLAY with trace very fine-grained sand.	618	
4A	16/24 *67%*	SS	*6-6 7-8* N=13	24			6–8	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY with trace very fine- to coarse-grained sand.	616	
5A	23/24 *96%*	SS	*1-3 5-6* N=8	21			8–10.6	Dark gray (10YR4/1) with 25% dark yellowish brown (10YR4/6) mottles, moist, very stiff, silty CLAY with few fine- to coarse-grained sand and trace small gravel.	614	
6A	21/24 *88%*	SS	*3-4 6-6* N=10	21			10.6–12	Gray (10YR5/1) with 35% dark yellowish brown (10YR4/6) mottles, moist, very stiff, silty CLAY with few fine- to coarse-grained sand and trace small gravel.	612	
7A	24/24 *100%*	SS	*8-8 9-9* N=17	18			12–14	Yellowish brown (10YR5/8) with 15% gray (10YR5/1) mottles, moist, very stiff, silty CLAY with few fine- to coarse-grained sand and trace small gravel.	610	
	19/24 *79%*	SS	*3-3 4-4* N=7				14–15.3	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with little fine- to coarse-grained sand and trace small gravel.	608	
8A				18			15.3–16	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, moist, stiff, silty CLAY with some fine- to coarse-grained sand and trace small gravel.		
9A	22/24 *92%*	SS	*1-3 7-14* N=10	19			16–17.5	Brown (10YR5/3), wet, loose, very silty, very fine- to coarse-grained SAND with trace small gravel.	606	
9B	0/5 *0%*	BD		15			17.5–18.45	Brown (10YR5/3) with 40% yellowish brown (10YR5/8) mottles, moist, very stiff, SILT with little clay and trace fine- to coarse-grained sand.		

End of boring = 18.45 feet

NOTE(S): G305 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Natural Resource Technology, Inc.
Site: Coffeen Power Station
Location: Coffeen, Illinois
Project: 15E0030
DATES: Start: 5/3/2016
Finish: 5/3/2016
WEATHER: Sunny, calm, warm, lo 60s

CONTRACTOR: Ramsey Geotechnical Engineering LLC
Rig mfg/model: D-50 Turbo Tracked MST 800ATV
Drilling Method: 4 ¼" HSA, split spoon sampler
FIELD STAFF: Driller: B. Williamson
Helper: D. Crump
Eng/Geo: S. Keim

BOREHOLE ID: G306
Well ID: G306
Surface Elev: 622.84 ft. MSL
Completion: 18.00 ft. BGS
Station: 2,516,120.41N
871,140.98E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 14, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 5.50 - During Drilling
▼ =
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) Failure Type
1A	12/24 *50%*	ss	*1-3 3-4* N=6	14		
2A	24/24 *100%*	ss	*5-4 5-4* N=9	21		
2B				19		
3A	22/24 *92%*	ss	*2-2 3-3* N=5	30		
4A	20/24 *83%*	ss	*3-4 6-6* N=10	26		
5A	24/24 *100%*	ss	*2-2 3-3* N=5	23		
6A	22/24 *92%*	ss	*1-2 3-4* N=5	20		
7A	20/24 *83%*	ss	*5-6 6-6* N=12	21		
8A	20/24 *83%*	ss	*2-2 8-14* N=10	15		
8B				12		
9A	23/24 *96%*	ss	*14-17 28-50/5"* N=45	10		
9B				13		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0–2	Very dark brown (10YR2/2), moist, medium, SILT with little clay and few very fine- to medium-grained sand, roots, trace coal fragments.	622
2	Dark gray (10YR4/1) with 5% dark yellowish brown (10YR3/6) mottles, moist, stiff, SILT with little clay and trace very fine- to medium-grained sand.	620
	Gray (10YR6/1) with 10% yellowish brown (10YR5/6) mottles, moist, very stiff, SILT with little clay and trace very fine-grained sand.	
4	Gray (10YR6/1) with 20% yellowish brown (10YR5/6) mottles, moist, very stiff, SILT with some clay and trace very fine-grained sand.	618, 616
8	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, very stiff, silty CLAY with trace very fine- to coarse-grained sand.	614, 612
12	Gray (10YR5/1) with 30% dark yellowish brown (10YR4/6) mottles, moist, stiff, silty CLAY with few very fine- to coarse-grained sand.	610
14	Yellowish brown (10YR5/6), wet, soft, very fine- to coarse-grained sandy CLAY with little silt.	608
	Yellowish brown (10YR5/6), wet, medium dense, silty, very fine- to medium-grained SAND with trace coarse-grained sand.	
16	Yellowish brown (10YR5/6), moist, dense, fine- to coarse-grained SAND with little silt, little very fine-grained sand, and trace small gravel.	606
	Brown (10YR5/3) with 20% dark yellowish brown (10YR4/6) mottles, moist, hard, SILT with little clay, few very fine- to coarse-grained sand, and trace small gravel.	
18	**End of boring = 18.0 feet**	

Borehole Detail | Remarks

NOTE(S): G306 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Illinois Power Generating Co.
Site: Coffeen Power Station Ash Pond 1
Location: Coffeen, Illinois
Project: 16E0108
DATES: Start: 07/26/2016
Finish: 07/27/2016
WEATHER: Overcast, warm & humid (mid-80s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME 55LC Track Drill
Drilling Method: 4¼" Hollow Stem Auger w/Continuous Split Spoon
FIELD STAFF: Driller: J. Gates
Helper: C. Clines
Eng/Geo: R. Hasenyager

BOREHOLE ID: G307
Well ID: G307
Surface Elev: 622.08 ft. MSL
Completion: 18.22 ft. BGS
Station: 871,398.55N
2,515,553.26E

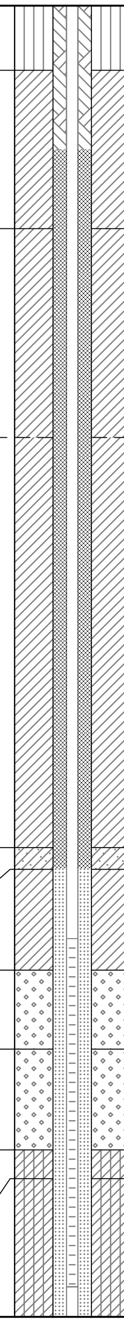
TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - during drilling
▼ = -1.76 - 7/27/2016 @ 07:30
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type
1A	18/24 *75%*	SS	*1-3 3-2* N=6	22		
2A	22/24 *92%*	SS	*2-1 3-3* N=4	28		
3A	24/24 *100%*	SS	*1-2 3-4* N=5	26		
4A	24/24 *100%*	SS	*1-3 3-3* N=6	18		
5A	24/24 *100%*	SS	*3-3 4-5* N=7	19		
6A	24/24 *100%*	SS	*3-3 4-5* N=7	20		
7A	24/24 *100%*	SS	*woh-2 5-13* N=7	20		
7B				11		
8A	24/24 *100%*	SS	*12-9 6-9* N=15	20		
9A	18/18 *100%*	SS	*8-30 50* N=80	8		
	0/9 *0%*	BD				

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
	Brown (10YR5/3), moist, stiff, SILT with few clay, trace sand, gravel and roots.	
2	Gray (10YR5/1), moist, soft, CLAY, with some silt, trace sand, gravel and roots.	620
4	Gray (10YR5/1) with 30% yellowish brown (10YR5/8) mottles, moist, soft, CLAY with some silt, trace sand, gravel and roots.	618
6, 8, 10	Yellowish brown (10YR5/6) with 20% gray (10YR5/1) mottles, moist, medium CLAY,with some silt, few very fine- to medium-grained sand, and trace gravel.	616, 614, 612
12	Gray (10YR5/1), moist, medium, CLAY with little silt and very fine to very coarse sand, trace gravel.	610
	Gray (10YR5/1) with 25% yellowish brown (10YR5/8) mottles, moist, soft, CLAY with some silt, trace sand and gravel.	
14 ▼	Gray (10YR6/1), wet, medium dense, very fine- to very coarse-grained SAND with few silt and trace clay.	608
	Yellow brown (10YR5/6), wet. medium dense, very fine- to very coarse-grained SAND, with little silt and trace gravel.	
16	Yellowish brown (10YR5/8), moist, hard, SILT with some clay, little very fine- to very coarse-grained sand and trace gravel.	606
	Gray (10YR5/1), moist, hard, SILT with some clay, little very fine- to very coarse-grained sand and trace gravel.	
18		604

Borehole Detail



Remarks

End of boring = 18.2 feet

NOTE(S):

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G281

Site Name: Coffeen Power Station Borehole #: G281

State Plane Coordinate: X 874,375.4 Y 2,514,455.5 (or) Latitude: ______ Longitude: ______

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Ramsey Driller: D. Crump

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld Date Started: 9/8/2015 Date Finished: 9/8/2015

Report Form Completed By: Suzanna L. Keim Date: 10/6/2015

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 25 minutes

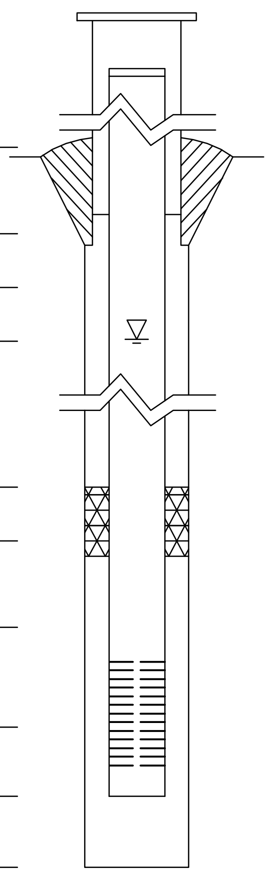
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.64	-2.82	Top of Protective Casing
626.36	-2.54	Top of Riser Pipe
623.82	0.00	Ground Surface
622.82	1.00	Top of Annular Sealant
		Static Water Level (After Completion)
612.59	11.23	Top of Seal
610.37	13.45	Top of Sand Pack
608.31	15.51	Top of Screen
603.66	20.16	Bottom of Screen
603.53	20.29	Bottom of Well
603.53	20.29	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.80
Bottom of Screen to End Cap	(feet)	0.38
Screen Length (1st slot to last slot)	(feet)	4.65
Total Length of Casing	(feet)	22.83
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: 　　County: Montgomery　　Well #: G301

Site Name: Coffeen Power Station　　Borehole #: G301

State Plane Coordinate: X 872,234.8 Y 2,515,583.0 (or) Latitude: ___ ___ ___ Longitude: ___ ___ ___

Surveyed By: Gary C. Rogers　　IL Registration #: 035-002957

Drilling Contractor: Ramsey　　Driller: D. Crump

Consulting Firm: Hanson Professional Services Inc.　　Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger　　Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld　　Date Started: 9/4/2015　　Date Finished: 9/4/2015

Report Form Completed By: Suzanna L. Keim　　Date: 10/6/2015

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite Chips

Installation Method: Gravity

Setting Time: >24 hours

Type of Bentonite Seal -- Granular　Pellet　Slurry (choose one)

Installation Method: Gravity

Setting Time: 25 minutes

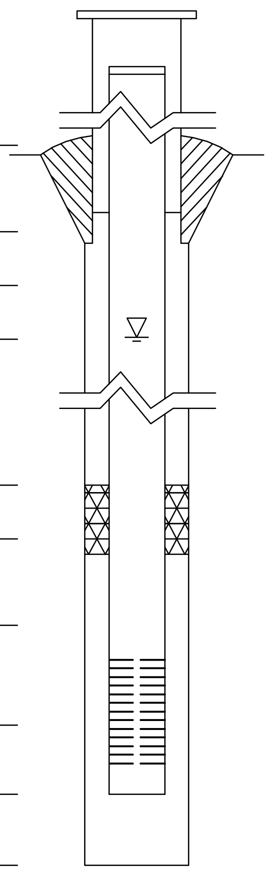
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method:



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
622.98	-2.71	Top of Protective Casing
622.65	-2.38	Top of Riser Pipe
620.27	0.00	Ground Surface
618.20	2.07	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
612.75	7.52	Top of Sand Pack
608.96	11.31	Top of Screen
604.31	15.96	Bottom of Screen
604.06	16.21	Bottom of Well
604.06	16.21	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	13.56
Bottom of Screen to End Cap	(feet)	0.38
Screen Length (1st slot to last slot)	(feet)	4.65
Total Length of Casing	(feet)	18.59
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ________ County: Montgomery Well #: G302

Site Name: Coffeen Power Station Borehole #: G302

State Plane Coordinate: X 872,253.0 Y 2,516,214.2 (or) Latitude: ____ ____ ____ Longitude: ____ ____ ____

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Ramsey Driller: D. Crump

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld Date Started: 9/3/2015 Date Finished: 9/4/2015

Report Form Completed By: Suzanna L. Keim Date: 10/7/2015

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 25 minutes

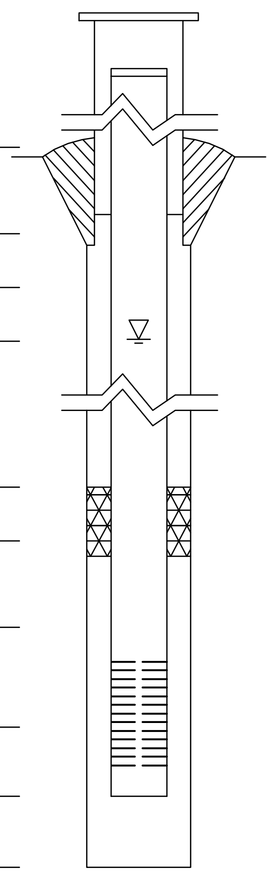
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ________



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
620.34	-2.39	Top of Protective Casing
620.04	-2.09	Top of Riser Pipe
617.95	0.00	Ground Surface
615.95	2.00	Top of Annular Sealant
		Static Water Level (After Completion)
607.78	10.17	Top of Seal
605.88	12.07	Top of Sand Pack
604.74	13.21	Top of Screen
600.09	17.86	Bottom of Screen
599.56	18.39	Bottom of Well
599.56	18.39	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	15.30
Bottom of Screen to End Cap	(feet)	0.53
Screen Length (1st slot to last slot)	(feet)	4.65
Total Length of Casing	(feet)	20.48
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G305

Site Name: Coffeen Power Station Borehole #: G305

State Plane Coordinate: X 871,156.3 Y 2,515,199.4 (or) Latitude: ______ Longitude: ______

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Ramsey Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Suzanna L. Keim Date Started: 5/3/2016 Date Finished: 5/3/2016

Report Form Completed By: Suzanna L. Keim Date: 5/19/2016

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite Chips

Installation Method: Gravity

Setting Time: >12 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: n/a

Setting Time: n/a

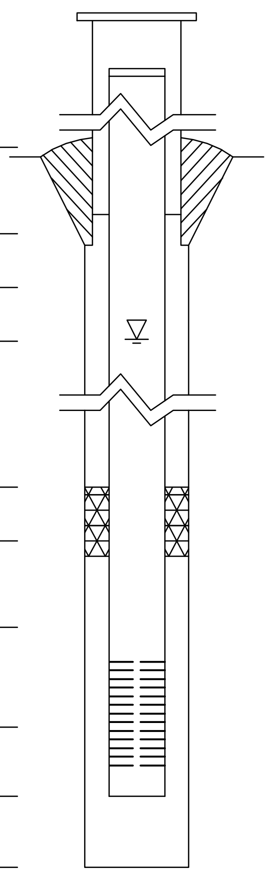
Type of Sand Pack: Quartz Sand

Grain Size: 10-40 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.88	-3.34	Top of Protective Casing
625.55	-3.01	Top of Riser Pipe
622.54	0.00	Ground Surface
621.54	1.00	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
611.04	11.50	Top of Sand Pack
609.10	13.44	Top of Screen
604.27	18.27	Bottom of Screen
604.09	18.45	Bottom of Well
604.09	18.45	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	16.45
Bottom of Screen to End Cap	(feet)	0.18
Screen Length (1st slot to last slot)	(feet)	4.83
Total Length of Casing	(feet)	21.46
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G306

Site Name: Coffeen Power Station Borehole #: G306

State Plane Coordinate: X 871,141.0 Y 2,516,120.4 (or) Latitude: ______ Longitude: ______

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Ramsey Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Suzanna L. Keim Date Started: 5/3/2016 Date Finished: 5/3/2016

Report Form Completed By: Suzanna L. Keim Date: 5/19/2016

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite Chips

Installation Method: Gravity

Setting Time: >12 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: n/a

Setting Time: n/a

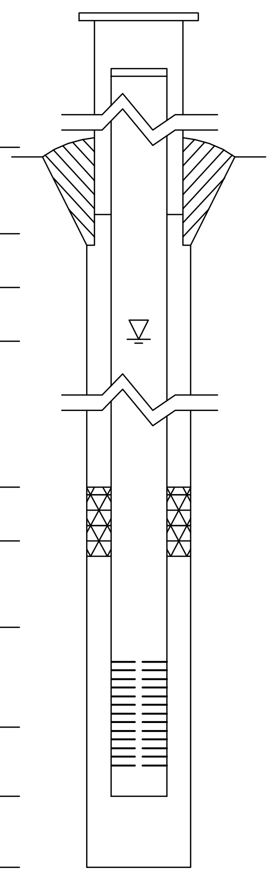
Type of Sand Pack: Quartz Sand

Grain Size: 10-40 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.12	-3.28	Top of Protective Casing
625.72	-2.88	Top of Riser Pipe
622.84	0.00	Ground Surface
621.84	1.00	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
611.24	11.60	Top of Sand Pack
609.77	13.07	Top of Screen
605.16	17.68	Bottom of Screen
604.98	17.86	Bottom of Well
604.84	18.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	15.95
Bottom of Screen to End Cap	(feet)	0.18
Screen Length (1st slot to last slot)	(feet)	4.61
Total Length of Casing	(feet)	20.74
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G307

Site Name: Coffeen Power Station Ash Pond 1 Borehole #: G307

State Plane Coordinate: X 2,515,553.3 Y 871,398.6 (or) Latitude: ______ Longitude: ______

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Bulldog Drilling, Inc. Driller: J. Gates

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow Stem Auger Drilling Fluid (Type): none

Logged By: Rhonald W. Hasenyager Date Started: 7/26/2016 Date Finished: 7/27/2016

Report Form Completed By: Rhonald W. Hasenyager Date: 7/28/2016

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite Chips

Installation Method: Gravity

Setting Time: 18 hrs.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

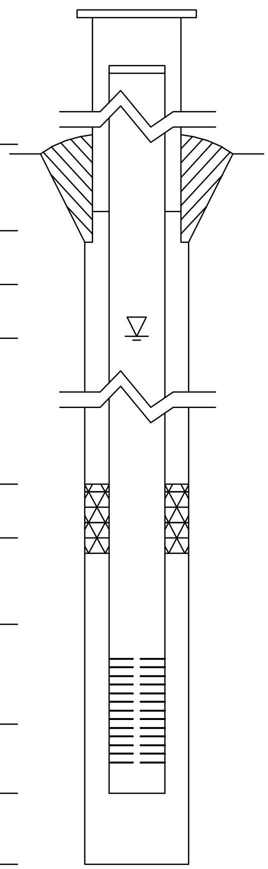
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: none (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
624.72	-2.64	Top of Protective Casing
624.47	-2.39	Top of Riser Pipe
622.08	0.00	Ground Surface
620.08	2.00	Top of Annular Sealant
623.84	-1.76	Static Water Level (After Completion) 7/27/2016
n/a	n/a	Top of Seal
610.10	11.98	Top of Sand Pack
609.12	12.96	Top of Screen
604.28	17.80	Bottom of Screen
603.86	18.22	Bottom of Well
603.86	18.22	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	15.37
Bottom of Screen to End Cap	(feet)	0.40
Screen Length (1st slot to last slot)	(feet)	4.84
Total Length of Casing	(feet)	20.61
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

APPENDIX A7

HISTORICAL BORING LOGS

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/3/2006
Finish: 5/3/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-01
Well ID: MW1D
Surface Elev: 607 ft. MSL
Completion: 40 ft. BGS
Station: 874,972.6N
2,513,478.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 34.00 - While drilling
▼ =
▽ = 36.28 - MW01D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	16/24 *67%*	SS	*1-1 1-2* N=2	22		0.78 *B*
2A	20/24 *83%*	SS	*2-3 5-5* N=8	13		3.71 *BSh*
3A	22/24 *92%*	SS	*2-2 3-6* N=5	14		2.62 *BSh*
4A	23/24 *96%*	SS	*8-12 19-19* N=31	13		3.30 *BSh*
5A	24/24 *100%*	SS	*4-9 13-19* N=22	13		4.80 *BSh*
6A	22/24 *92%*	SS	*3-6 12-15* N=18	12		8.73 *B*
7A	24/24 *100%*	SS	*14-19 23-30* N=42	12		7.86 *B*
8A	24/24 *100%*	SS	*4-8 12-14* N=20	13		7.56 *B*
9A	24/24 *100%*	SS	*16-16 20-21* N=36	14		7.01 *B*
10A	24/24 *100%*	SS	*3-5 8-11* N=13	14		5.24 *B*

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–1.7	Very dark gray (10YR3/1), clayey SILT, trace sand	606	
1.7–4	Light gray (10YR7/1) with 40% yellowish brown (10YR5/8) mottles, clayey SILT, trace sand and gravel	604	
4–6	Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, clayey SILT, trace sand and gravel	602	
6–8	Yellowish brown (10YR5/6) with 20% black (10YR2/1) mottles, clayey SILT, little sand and gravel	600	
8–12	Yellowish brown (10YR5/6) with 40% gray (N5/1) mottles, clayey SILT, trace sand and gravel	598, 596	
12–16	Dark gray (N4/1) with 25% yellowish brown (10YR5/6) mottles, clayey SILT, trace sand and gravel	594, 592	
16–20	Dark gray (N4/1), clayey SILT, trace sand and gravel	590, 588	

NOTE(S): MW01D installed in SB-01.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/3/2006
Finish: 5/3/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-01
Well ID: MW1D
Surface Elev: 607 ft. MSL
Completion: 40 ft. BGS
Station: 874,972.6N
2,513,478.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 34.00 - While drilling
▼ =
▽ = 36.28 - MW01D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*
11A	24/24 *100%*	SH		15		3.69 *B*
12A	24/24 *100%*	SS	*10-11 12-16* N=23	14		5.24 *B*
13A	6/24 *25%*	SH		14		3.69 *B*
14A	24/24 *100%*	SS	*10-12 18-18* N=30	15		4.27 *B*
15A	24/24 *100%*	SS	*5-9 11-16* N=20	14		4.27 *B*
16A	24/24 *100%*	SS	*5-8 10-12* N=18	17		2.72 *BSh*
17A	24/24 *100%*	SS	*8-14 14-16* N=28	14		5.62 *B*
18A	23/24 *96%*	SS	*8-28 40-65* N=68	14		
19A				13		
19B	24/24 *100%*	SS	*24-14 17-16* N=31	19		5.43 *B*
20A	24/24 *100%*	SS	*3-5 6-10* N=11	24		3.50 *BSh*

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
20–34	Dark gray (N4/1), clayey SILT, trace sand and gravel *[Continued from previous page]*	586, 584, 582, 580, 578, 576, 574	Shelby tube taken from shallow well borehole at indicated depth. (sample 11A); Shelby tube taken from shallow well borehole at indicated depth. (sample 13A)
34–37.3	Gray (N4/1), silty, fine to medium SAND, little coarse sand, trace gravel, wet	572	
37.3–38	Very dark gray (10YR3/1), silty CLAY	570	
38–40	Dark gray (N4/1) with 30% dark yellowish brown (10YR4/6) mottles, silty CLAY	568	

Depth scale: 22, 24, 26, 28, 30, 32, 34, 36, 38, 40

End of Boring = 40.0 ft. BGS

NOTE(S): MW01D installed in SB-01.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/5/2006
Finish: 5/5/2006
WEATHER: Partly cloudy, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-02
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 50 ft. BGS
Station: 876,410.0N 2,513,210.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 7.42 - MW02S on 6/1/06
▽ = 7.36 - MW02D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	24/24 *100%*	SS	*3-3 4-5* N=7	23				soil grayish brown (10YR4/2), clayey SILT, trace sand	624	
1B				18		1.96 *B*		loess Gray (10YR6/1), clayey SILT, trace sand		
1C				29		1.94 *B*		Yellowish brown (10YR5/4) with 20% gray (10YR6/1) mottles, lean CLAY, trace sand		
2A	24/24 *100%*	SS	*3-4 4-6* N=8	25		2.89 *B*	2	Yellowish brown (10YR5/8) with 15% gray (10YR6/1) mottles, lean CLAY, trace sand	622	
3A	24/24 *100%*	SS	*3-5 5-7* N=10	20		2.91 *B*	4	Yellowish brown (10YR5/8) with 40% gray (10YR6/1)mottles, lean CLAY, trace sand	620	
4A	24/24 *100%*	SS	*10-8 8-10* N=16	17		2.91 *B*	6	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, lean CLAY, little sand	618	
5A	24/24 *100%*	SS	*3-3 4-5* N=7	19		1.94 *B*	8	Gray (10YR5/1) with 50% yellowish brown (10YR5/6) mottles, lean CLAY, little sand	616	
6A				18		2.13 *B*	10		614	
6B	24/24 *100%*	SS	*2-3 6-5* N=9	17				Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, clayey SAND, trace gravel		
7A	24/24 *100%*	SS	*4-4 7-10* N=11	14		2.06 *B*	12	Gray (10YR6/1) with 30% white (10YR8/1) mottles, sandy CLAY, trace gravel	612	
7B				17				Yellowish brown (10YR5/4), silty, fine SAND, little medium sand, wet		
8A	24/24 *100%*	SS	*15-23 33-68* N=56	10			14		610	
9A	10/10 *100%*	SS	*48-62/4"*	10		3.92 *Sh*	16	Pale brown (10YR6/3), silty, fine SAND, trace gravel, wet	608	
10A	12/12 *100%*	SS	*15-45*	9		8.07 *BSh*	18	Dark gray (10YR4/1), clayey SILT, little sand and gravel	606	
							20			

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/5/2006
Finish: 5/5/2006
WEATHER: Partly cloudy, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-02
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 50 ft. BGS
Station: 876,410.0N
2,513,210.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 7.42 - MW02S on 6/1/06
▽ = 7.36 - MW02D on 6/1/06

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										604	
11A				9							
							22			602	
	36/60 *60%*	CS						Brown (10YR5/3), clayey SILT, little sand, trace gravel			
							24			600	
11B				11							
							26			598	
12A				21							
	60/60 *100%*	CS						Blueish gray (5B5/1), with 30% dark yellowish brown (10YR4/6) mottles, lean CLAY, trace coal			
							28			596	
12B				23							
							30			594	
							32			592	
	60/60 *100%*	CS									
							34			590	
13A				14							
								Very dark gray (10Y3/1), lean CLAY, trace sand and gravel			
							36			588	
	60/60 *100%*	CS									
							38			586	
14A				14							
							40				

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/5/2006
Finish: 5/5/2006
WEATHER: Partly cloudy, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

HANSON

BOREHOLE ID: SB-02
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 50 ft. BGS
Station: 876,410.0N
2,513,210.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 7.42 - MW02S on 6/1/06
▽ = 7.36 - MW02D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										584	
	60/60 *100%*	CS					42			582	
15A				14			44			580	
								Very dark gray (10Y3/1), lean CLAY, trace sand and gravel *[Continued from previous page]*			
							46			578	
	60/60 *100%*	CS					48			576	
16A				13			50				

End of Boring = 50.0 ft. BGS

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/5/2006
Finish: 5/5/2006
WEATHER: Partly cloudy, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA (blind drill)

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-02a
Well ID: MW2S
Surface Elev: 624 ft. MSL
Completion: 16 ft. BGS
Station: 876,408.9N
2,513,210.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 7.42 - MW02S on 6/1/06
▽ = 7.36 - MW02D on 6/1/06

SAMPLE: Number	SAMPLE: Recov / Total (in) % Recovery	SAMPLE: Type	TESTING: Blows / 6 in N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0	soil grayish brown (10YR4/2), clayey SILT, trace sand		624	
								loess Gray (10YR6/1), clayey SILT, trace sand			
								Yellowish brown (10YR5/4) with 20% gray (10YR6/1) mottles, lean CLAY, trace sand			
							2	Yellowish brown (10YR5/8) with 15% gray (10YR6/1) mottles, lean CLAY, trace sand		622	
							4	Yellowish brown (10YR5/8) with 40% gray (10YR6/1)mottles, lean CLAY, trace sand		620	
							6	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, lean CLAY, little sand		618	
							8	Gray (10YR5/1) with 50% yellowish brown (10YR5/6) mottles, lean CLAY, little sand		616	
							10			614	
								Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, clayey SAND, trace gravel			
							12	Gray (10YR6/1) with 30% white (10YR8/1) mottles, sandy CLAY, trace gravel		612	
								Yellowish brown (10YR5/4), silty, fine SAND, little medium sand, wet			
							14	Pale brown (10YR6/3), silty, fine SAND, trace gravel, wet		610	

End of Boring = 15.51 ft. BGS
See SB-02 for sample & testing details

NOTE(S): MW02S installed in blind-drilled borehole within 10 ft of SB-02.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/5/2006
Finish: 5/5/2006
WEATHER: Partly cloudy, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-02b
Well ID: MW2D
Surface Elev: 624 ft. MSL
Completion: 27 ft. BGS
Station: 876,414.0N
2,513,209.7E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 7.42 - MW02S on 6/1/06
▽ = 7.36 - MW02D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0–0.6	soil: grayish brown (10YR4/2), clayey SILT, trace sand		624	
							0.6–1.3	loess: Gray (10YR6/1), clayey SILT, trace sand			
							1.3–2	Yellowish brown (10YR5/4) with 20% gray (10YR6/1) mottles, lean CLAY, trace sand		622	
							2–4	Yellowish brown (10YR5/8) with 15% gray (10YR6/1) mottles, lean CLAY, trace sand		620	
							4–6	Yellowish brown (10YR5/8) with 40% gray (10YR6/1)mottles, lean CLAY, trace sand		618	
							6–8	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, lean CLAY, little sand		616	
							8–10.7	Gray (10YR5/1) with 50% yellowish brown (10YR5/6) mottles, lean CLAY, little sand		614	
							10.7–12	Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, clayey SAND, trace gravel		612	
							12–12.8	Gray (10YR6/1) with 30% white (10YR8/1) mottles, sandy CLAY, trace gravel			
							12.8–14	Yellowish brown (10YR5/4), silty, fine SAND, little medium sand, wet		610	
							14–18	Pale brown (10YR6/3), silty, fine SAND, trace gravel, wet		608	
							18–20	Dark gray (10YR4/1), clayey SILT, little sand and gravel		606	

NOTE(S): MW02D installed in blind-drilled borehole within 10 ft of SB-02.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/5/2006
Finish: 5/5/2006
WEATHER: Partly cloudy, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-02b
Well ID: MW2D
Surface Elev: 624 ft. MSL
Completion: 27 ft. BGS
Station: 876,414.0N
2,513,209.7E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 7.42 - MW02S on 6/1/06
▽ = 7.36 - MW02D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										604	
							22	Brown (10YR5/3), clayey SILT, little sand, trace gravel		602	
							24			600	
							26	Blueish gray (5B5/1), with 30% dark yellowish brown (10YR4/6) mottles, lean CLAY, trace coal		598	

End of Boring = 27.22 ft. BGS
See SB-02 for sample & testing details

NOTE(S): MW02D installed in blind-drilled borehole within 10 ft of SB-02.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/27/2006
Finish: 4/27/2006
WEATHER: Sunny, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-03
Well ID: MW3D
Surface Elev: 626 ft. MSL
Completion: 58 ft. BGS
Station: 876,554.5N
2,514,535.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 7.03 - MW03S on 6/1/06
▽ = 55.40 - MW03D on 6/1/06

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	20/24 *83%*	SS	*2-2* *4-6* N=6	17		2.07 *SP*		soil: Very dark grayish brown (10YR3/2), lean CLAY		
1B				20				Grayish brown (10YR5/2), lean CLAY, trace sand		
1C				26		3.30 *B*	2	Yellowish brown (10YR5/6), lean CLAY, trace sand	624	
2A	17/24 *71%*	SS	*2-3* *4-5* N=7	25		3.05 *B*	4	Yellowish brown (10YR5/6) with 40% gray (N5/1) mottles, lean CLAY, trace sand	622	
3A	20/24 *83%*	SS	*2-3* *3-5* N=6	16		1.96 *B*	6	loess: Yellowish brown (10YR5/6) with 40% gray (N5/1) mottles, sandy SILT, trace gravel	620	
4A	24/24 *100%*	SS	*4-3* *5-6* N=8	21		2.27 *B*	8	Yellowish brown (10YR5/6) with 50% gray (N5/1) mottles, lean CLAY, trace sand and gravel	618	
5A	21/24 *88%*	SS	*1-3* *3-4* N=6	20		2.18 *B*		Yellowish brown (10YR5/6), lean CLAY, little sand, trace gravel		
5B				19			10	Dark gray (10YR4/1), sandy CLAY, trace gravel	616	
6A	18/24 *75%*	SS	*1-2* *2-4* N=4	24		0.87 *B*	12	Gray (10YR6/1) with 50% yellowish brown (10YR5/8) mottles, lean CLAY, little sand, trace gravel	614	
7A	23/24 *96%*	SH		19						Shelby tube taken from shallow well borehole at indicated depth.
7B	16/24 *67%*	SS	*3-2* *2-4* N=4	12			14		612	
8A	23/24 *96%*	SS	*3-12* *29-50* N=41	13				hagarstown: Yellowish brown (10YR5/8), silty, fine SAND, little medium sand, trace gravel, wet		
8B				13				Yellowish brown (10YR5/8), silty, fine SAND, little clay, wet	610	
8C				12			16	Yellowish brown (10YR5/6), lean CLAY, little sand, trace gravel		
9A	14/24 *58%*	SS	*8-82* *85-72* N=167	10		6.98 *B*		Yellowish brown (10YR5/6), silty SAND, trace gravel, wet		
9B				13		6.18 *BSh*	18	vandalia: [Yellowish] brown (10YR5/4), clayey SILT, trace sand and gravel	608	
10A	18/24 *75%*	SS	*6-21* *32-49* N=53	8		11.95 *Sh*	20	Gray (10YR5/1), sandy SILT, trace gravel	606	

NOTE(S): MW03D installed in SB-03.

FIELD BORING LOG

HANSON

CLIENT: AEC Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/27/2006
Finish: 4/27/2006
WEATHER: Sunny, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-03
Well ID: MW3D
Surface Elev: 626 ft. MSL
Completion: 58 ft. BGS
Station: 876,554.5N
2,514,535.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 7.03 - MW03S on 6/1/06
▽ = 55.40 - MW03D on 6/1/06

SAMPLE Number	Recov / Total (in) / *% Recovery*	Type	*Blows / 6 in* / N - Value / **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) / *Failure Type*
11A	19/24 *79%*	SS	*3-20 35-29* N=55	10		5.36 *Sh*
12A	20/24 *83%*	SS	*15-25 89-69* N=114	8		13.00 *Sh*
13A	23/24 *96%*	SS	*14-19 24-22* N=43	9		
13B				13		6.98 *BSh*
14A	24/24 *100%*	SS	*19-21 26-32* N=47	15		7.01 *BSh*
15A	21/24 *88%*	SS	*10-25 25-23* N=50	12		
15B				13		8.53 *BSh*
16A	24/24 *100%*	SS	*7-12 19-30* N=31	13		9.16 *BSh*
17A				14		6.59 *B*
17B	24/24 *100%*	SS	*29-35 39-42* N=74	14		3.49 *Sh*
18A	23/24 *96%*	SS	*6-8 11-17* N=19	13		7.21 *BSh*
19A	24/24 *100%*	SS	*19-21 31-31* N=52	13		6.98 *BSh*
20A	24/24 *100%*	SS	*6-10 15-24* N=25	14		6.76 *BSh*

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
20–25.3	Gray (10YR5/1), sandy SILT, trace gravel *[Continued from previous page]*	604, 602	Wood fragments
25.3–26	Yellowish brown (10YR5/4), lean CLAY, trace sand and gravel	600	
26–27.9	Gray (10YR4/1), clayey SILT, trace sand and gravel	598	
27.9–29.6	Light gray (10YR6/1), SILT, trace sand		
29.6–36	Gray (10YR4/1), lean CLAY, trace sand and gravel	596, 594, 592, 590	
36–38	smithboro Gray (10YR4/1), clayey SILT, trace sand and gravel	588	
38–40	Gray (10YR4/1), lean CLAY, trace sand and gravel	586	

Depth scale: 22, 24, 26, 28, 30, 32, 34, 36, 38, 40

NOTE(S): MW03D installed in SB-03.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/27/2006
Finish: 4/27/2006
WEATHER: Sunny, mild (high-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-03
Well ID: MW3D
Surface Elev: 626 ft. MSL
Completion: 58 ft. BGS
Station: 876,554.5N
2,514,535.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 7.03 - MW03S on 6/1/06
▽ = 55.40 - MW03D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
21A	19/24 *79%*	SS	*4-10 16-23* N=26	13		8.04 *BSh*	40–42	Gray (10YR4/1), lean CLAY, trace sand and gravel *[Continued from previous page]*	584	
22A	21/24 *88%*	SS	*19-27 28-32* N=55	13		7.56 *BSh*	42–48	Gray (10YR4/1), clayey SILT, trace sand and gravel	582	
23A	23/24 *96%*	SS	*4-9 14-18* N=23	14		6.98 *BSh*			580	
24A	24/24 *100%*	SS	*20-26 30-33* N=56	14		6.59 *BSh*			578	
25A	24/24 *100%*	SS	*6-10 13-12* N=23	20		3.30 *BSh*	48–53.3	Gray (10YR4/1), lean CLAY, trace sand and gravel	576	
26A	24/24 *100%*	SS	*4-7 6-7* N=13	22		2.91 *BSh*			574	
27A	24/24 *100%*	SS	*7-18 37-85* N=55	16		4.05 *BSh*	53.3–54	yarmouth (10Y4/1), silty, fine to medium SAND, wet	572	
27B				13			54–55.6	Gray (10YR4/1), silty, fine SAND, trace clay, wet		
28A	23/24 *96%*	SS	*15-34 34-19* N=68	11		3.22 *SP*			570	
28B				13		5.82 *B*	55.6–58	lierle Very dark gray (10YR3/1), lean CLAY, trace sand and gravel		
29A	24/24 *100%*	SS	*19-22 28-18* N=50	20		4.36 *BSh*			568	

End of Boring = 58.0 ft. BGS

NOTE(S): MW03D installed in SB-03.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/28/2006
Finish: 4/28/2006
WEATHER: Partly cloudy, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-03a
Well ID: MW3S
Surface Elev: 626 ft. MSL
Completion: 17 ft. BGS
Station: 876,554.8N
2,514,531.5E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 7.03 - MW03S on 6/1/06
▽ = 55.40 - MW03D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								soil ery dark grayish brown (10YR3/2), lean CLAY			
								Grayish brown (10YR5/2), lean CLAY, trace sand			
								Yellowish brown (10YR5/6), lean CLAY, trace sand		624	
							2	Yellowish brown (10YR5/6) with 40% gray (N5/1) mottles, lean CLAY, trace sand		622	
							4	loess Yellowish brown (10YR5/6) with 40% gray (N5/1) mottles, sandy SILT, trace gravel		620	
							6	Yellowish brown (10YR5/6) with 50% gray (N5/1) mottles, lean CLAY, trace sand and gravel		618	
							8	Yellowish brown (10YR5/6), lean CLAY, little sand, trace gravel		616	
							10	Dark gray (10YR4/1), sandy CLAY, trace gravel			
							12	Gray (10YR6/1) with 50% yellowish brown (10YR5/8) mottles, lean CLAY, little sand, trace gravel		614 / 612	
							14	Yellowish brown (10YR5/8), silty, fine SAND, little medium sand, trace gravel, wet		610	
							16	Yellowish brown (10YR5/8), silty, fine SAND, little clay, wet			
								Yellowish brown (10YR5/6), lean CLAY, little sand, trace gravel			
								Yellowish brown (10YR5/6), silty SAND, trace gravel, wet			
								Yellowish brown (10YR5/4), clayey SILT, trace sand and gravel			

End of Boring = 17.15 ft. BGS
See SB-03 for sample & testing details

NOTE(S): MW03S installed in blind-drilled borehole within 10 ft of SB-03.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/11/2006
Finish: 5/11/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-04
Well ID: n/a
Surface Elev: 622 ft. MSL
Completion: 55 ft. BGS
Station: 878,000.0N
2,514,445.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 8.00 - While drilling
▼ = 5.67 - MW04S on 6/1/06
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*
1A	21/24 *88%*	SS	*1-2 2-4* N=4	24		1.09 *B*
1B				29		
2A	18/24 *75%*	SS	*2-4 5-6* N=9	27		2.72 *BSh*
3A	16/24 *67%*	SS	*2-3 4-6* N=7	23		1.71 *B*
4A	24/24 *100%*	SS	*4-5 5-7* N=10	20		1.40 *BSP*
5A	24/24 *100%*	SS	*1-2 2-2* N=4	23		0.70 *B*
6A	24/24 *100%*	SS	*0-1 2-3* N=3	24		0.31 *BSh*
6B				28		
7A	22/24 *92%*	SS	*0-1 3-7* N=4	20		0.08 *B*
7B				16		
7C				12		
8A	23/24 *96%*	SS	*4-9 22-35* N=31	14		4.36 *SP*
8B				11		
9A	24/24 *100%*	SS	*27-38 54-50* N=92	7		
10A	24/24 *100%*	SS	*24-29 39-34* N=68	9		2.18 *BSh*

Depth ft. BGS: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

Elevation ft. MSL: 622, 620, 618, 616, 614, 612, 610, 608, 606, 604

Lithologic Description
soil — …y dark gray (10YR3/1), clayey SILT, trace sand
Dark grayish brown (10YR4/2) with 15% yellowish brown (10YR5/6) mottles, lean CLAY
Yellowish brown (10YR5/8) with 50% grayish brown (10YR5/2) mottles, lean CLAY
loess — Dark gray (10YR4/1), clayey SILT, trace sand
Gray (10YR5/1), lean CLAY, trace sand and gravel
Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, sandy SILT
Very dark gray (10YR3/1) with 35% gray (10YR6/1) mottles, clayey SILT, wet
Yellowish brown (10YR5/6), clayey SAND, trace gravel
Light gray (10YR7/1) with 20% brown (10YR5/3) mottles, clayey SILT, trace sand and gravel
Yellowish brown (10YR5/8), silty, fine to medium SAND, trace coarse sand, wet
Gray (10YR4/1), sandy SILT, trace gravel

Borehole Detail | Remarks

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/11/2006
Finish: 5/11/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-04
Well ID: n/a
Surface Elev: 622 ft. MSL
Completion: 55 ft. BGS
Station: 878,000.0N
2,514,445.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 8.00 - While drilling
▼ = 5.67 - MW04S on 6/1/06
▽ =

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										602	
							22				
	60/60 *100%*	CS								600	
							24				
11A				7						598	
							26				
										596	
	60/60 *100%*	CS									
							28				
										594	
12A				7							
							30	Gray (10YR4/1), sandy SILT, trace gravel *[Continued from previous page]*			
										592	
							32				
	60/60 *100%*	CS								590	
							34				
13A				8						588	
							36				
										586	
	60/60 *100%*	CS									
							38				
										584	
14A				13							
							40				

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/11/2006
Finish: 5/11/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-04
Well ID: n/a
Surface Elev: 622 ft. MSL
Completion: 55 ft. BGS
Station: 878,000.0N
2,514,445.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 8.00 - While drilling
▼ = 5.67 - MW04S on 6/1/06
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
	60/60 *100%*	CS					40–48.4	Gray (10YR4/1), sandy SILT, trace gravel *[Continued from previous page]*		582–573.6	
15A				13							
	60/60 *100%*	CS									
							48.4–55	Greenish gray (10BG5/1) with 20% dark yellowish brown (10YR4/6) mottles, lean CLAY, trace sand		573.6–567	
16A				14							
16B				21							
	60/60 *100%*	CS									
17A				24							

Depth scale: 42, 44, 46, 48, 50, 52, 54. Elevation scale: 582, 580, 578, 576, 574, 572, 570, 568.

End of Boring = 55.0 ft. BGS

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/11/2006
Finish: 5/11/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-04a
Well ID: MW4S
Surface Elev: 622 ft. MSL
Completion: 15 ft. BGS
Station: 877,999.7N
2,514,450.6E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 8.00 - While drilling
▼ = 5.67 - MW04S on 6/1/06
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0–0.8	soil y dark gray (10YR3/1), clayey SILT, trace sand		622	
							0.8–2	Dark grayish brown (10YR4/2) with 15% yellowish brown (10YR5/6) mottles, lean CLAY			
							2–4	Yellowish brown (10YR5/8) with 50% grayish brown (10YR5/2) mottles, lean CLAY		620	
							4–6	loess Dark gray (10YR4/1), clayey SILT, trace sand		618	
							6–8	Gray (10YR5/1), lean CLAY, trace sand and gravel		616	
							8–10.6	Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, sandy SILT		614, 612	
							10.6–12.4	Very dark gray (10YR3/1) with 35% gray (10YR6/1) mottles, clayey SILT, wet		610	
							12.4–13.3	Yellowish brown (10YR5/6), clayey SAND, trace gravel			
							13.3–14	Light gray (10YR7/1) with 20% brown (10YR5/3) mottles, clayey SILT, trace sand and gravel			
							14–14.6	Yellowish brown (10YR5/8), silty, fine to medium SAND, trace coarse sand, wet		608	
							14.6–14.77	Gray (10YR4/1), sandy SILT, trace gravel			

End of Boring = 14.77 ft. BGS
See SB-04 for sample & testing details

NOTE(S): MW04S installed in blind-drilled borehole within 10 ft of SB-03.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/12/2006
Finish: 5/17/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-05
Well ID: MW5D
Surface Elev: 623 ft. MSL
Completion: 54 ft. BGS
Station: 878,174.8N
2,513,290.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 10.00 - While drilling
▼ = 6.74 - MW05S on 6/1/06
▽ = 50.44 - MW05D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	19/24 *79%*	SS	*0-2 3-4* N=5	29		
1B				28		
2A	22/24 *92%*	SS	*2-5 5-7* N=10	27		2.47 *BSh*
2B				22		2.13 *B*
3A	24/24 *100%*	SS	*2-2 3-6* N=5	21		2.33 *BSP*
4A	24/24 *100%*	SS	*7-6 6-8* N=12	21		1.90 *BSh*
5A	18/24 *75%*	SS	*1-3 4-5* N=7	22		1.78 *B*
6A	20/24 *83%*	SS	*0-1 3-4* N=4	16		
6B				22		0.70 *BSh*
7A	24/24 *100%*	SS	*3-6 17-20* N=23	19		
7B				16		
8A	20/24 *83%*	SS	*4-16 25-25* N=41	20		
8B				11		
9A	24/24 *100%*	SS	*14-18 38-62* N=56	12		
9B				8		
10A	18/24 *75%*	SS	*14-39 77* N=116	9		3.27 *Sh*

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0 – ~0.6	soil grayish brown (10YR4/2), clayey SILT, trace sand	622	
~0.6 – ~3.2	loess Gray (10YR5/1 with 50% yellowish brown (10YR5/6) mottles, clayey SILT	620	
~3.2 – 4	Very dark brown (10YR2/2) with 20% dark gray (10YR4/1) mottles, clayey SILT, trace sand		
4 – 6	Dark gray (10YR4/1) with 30% light gray (10YR7/1) mottles, lean CLAY	618	
6 – 8	Gray (10YR6/1), lean CLAY, trace sand	616	
8 – 10	Gray (10YR6/1) with 50% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand	614	
10 – ~10.6	Yellowish brown (10YR5/6), clayey SAND, trace gravel, wet		
~10.6 – 12	Yellowish brown (10YR5/6) with 50% gray 10YR5/1) mottles, sandy CLAY	612	
12 – ~12.7	Gray 10YR6/1), clayey, fine to medium SAND, trace gravel, wet	610	
~12.7 – 14	Brownish yellow (10YR6/6), silty, fine SAND, trace medium sand		
14 – ~15.3	Yellowish brown (10YR5/6), silty, fine SAND, wet	608	
~15.3 – ~16.6	Brown (10YR5/3), silty SAND and GRAVEL, wet	606	
~16.6 – 20	Dark gray (10YR4/1), sandy SILT, trace clay and gravel	604	

NOTE(S): MW05D installed in SB-05.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/12/2006
Finish: 5/17/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-05
Well ID: MW5D
Surface Elev: 623 ft. MSL
Completion: 54 ft. BGS
Station: 878,174.8N
2,513,290.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 10.00 - While drilling
▼ = 6.74 - MW05S on 6/1/06
▽ = 50.44 - MW05D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
11A	60/60 *100%*	CS		7		
11B				7		
12A	60/60 *100%*	CS		7		
13A	60/60 *100%*	CS		8		
14A	48/60 *80%*	CS		7		
14B				14		

Depth ft. BGS	Lithologic Description
to 22	Dark gray (10YR4/1), sandy SILT, trace clay and gravel *[Continued from previous page]*
22 – ~23.3	Dark gray (10YR4/1), silty, fine SAND, trace medium sand
~23.3 – ~37.3	Dark gray (10YR4/1), sandy SILT, trace clay and gravel
~37.3 – ~37.7	Gray (10YR6/1), fine to medium SAND
~37.7 – 40	Dark gray (10YR4/1), sandy SILT, trace clay and gravel

Depth scale (ft. BGS): 22, 24, 26, 28, 30, 32, 34, 36, 38, 40

Elevation scale (ft. MSL): 602, 600, 598, 596, 594, 592, 590, 588, 586, 584

Borehole Detail | Remarks

NOTE(S): MW05D installed in SB-05.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/12/2006
Finish: 5/17/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

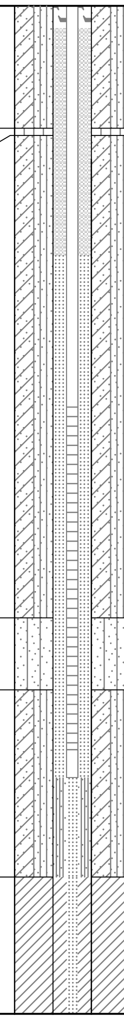
BOREHOLE ID: SB-05
Well ID: MW5D
Surface Elev: 623 ft. MSL
Completion: 54 ft. BGS
Station: 878,174.8N
2,513,290.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 10.00 - While drilling
▼ = 6.74 - MW05S on 6/1/06
▽ = 50.44 - MW05D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
								Dark gray (10YR4/1), sandy SILT, trace clay and gravel *[Continued from previous page]*	582	
	60/60 *100%*	CS					42	Gray (10YR4/1), clayey SILT, trace sand	580	
15A				16			44	Dark gray (10YR4/1), sandy SILT, trace clay and gravel	578	
	60/60 *100%*	CS					46		576	
16A				14			48	Gray(10YR4/1), silty, fine to medium SAND, trace organics and coal	574	
16B				20						
17A	24/24 *100%*	SS	*7-10* *15-16* N=25	12			50 ▽	Dark gray (10YR4/1), sandy SILT, trace clay and gravel	572	
18A	24/24 *100%*	SS	*17-18* *19-21* N=37	22			52	Greenish gray (5G5/1) with 40% yellowish brown (10YR5/6)mottles, lean CLAY	570	
							54			

Borehole Detail



End of Boring = 54.0 ft. BGS

NOTE(S): MW05D installed in SB-05.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/17/2006
Finish: 5/17/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-05a
Well ID: MW5S
Surface Elev: 623 ft. MSL
Completion: 18 ft. BGS
Station: 878,175.6N
2,513,285.5E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 10.00 - While drilling
▼ = 6.74 - MW05S on 6/1/06
▽ = 50.44 - MW05D on 6/1/06

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0	soil: grayish brown (10YR4/2), clayey SILT, trace sand		622	
								loess: Gray (10YR5/1 with 50% yellowish brown (10YR5/6) mottles, clayey SILT		620	
							3.2	Very dark brown (10YR2/2) with 20% dark gray (10YR4/1) mottles, clayey SILT, trace sand			
							4	Dark gray (10YR4/1) with 30% light gray (10YR7/1) mottles, lean CLAY		618	
							6	Gray (10YR6/1), lean CLAY, trace sand		616	
							8	Gray (10YR6/1) with 50% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand		614	
							10	Yellowish brown (10YR5/6), clayey SAND, trace gravel, wet			
								Yellowish brown (10YR5/6) with 50% gray 10YR5/1) mottles, sandy CLAY		612	
							12	Gray 10YR6/1), clayey, fine to medium SAND, trace gravel, wet		610	
								Brownish yellow (10YR6/6), silty, fine SAND, trace medium sand			
							14	Yellowish brown (10YR5/6), silty, fine SAND, wet		608	
							16	Brown (10YR5/3), silty SAND and GRAVEL, wet		606	
								Dark gray (10YR4/1), sandy SILT, trace clay and gravel			

End of Boring = 17.71 ft. BGS
See SB-05 for sample & testing details

NOTE(S): MW05S installed in blind-drilled borehole within 10 ft of SB-05.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/4/2006
Finish: 5/4/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-06
Well ID: n/a
Surface Elev: 623 ft. MSL
Completion: 60 ft. BGS
Station: 879,015.0N
2,513,190.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 9.30 - While drilling
▼ = 6.21 - MW06S on 6/1/06
▽ =

SAMPLE / TESTING

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*
1A	24/24 *100%*	SS	*2-3 3-5* N=6	25		1.22 *SP*
1B				28		1.96 *B*
2A	24/24 *100%*	SS	*2-4 5-6* N=9	27		1.94 *BSh*
2B				19		2.52 *BSh*
3A	24/24 *100%*	SS	*1-3 4* N=7	21		1.36 *B*
4A	24/24 *100%*	SS	*4-6 6* N=12	17		1.78 *B*
5A	22/24 *92%*	SS	*1-2 3-3* N=5	18		0.85 *BSh*
5B				17		0.81 *None*
5C				21		0.31 *None*
6A	20/24 *83%*	SS	*0-1 2-4* N=3	25		
7A	24/24 *100%*	SS	*2-4 7-8* N=11	15		
7B				12		1.48 *BSh*
8B	22/24 *92%*	SS	*11-33 57-35* N=90	8		7.18 *Sh*
9A	22/24 *92%*	SS	*30-39 46-55* N=85	9		11.35 *Sh*
8A				11		
10A	24/24 *100%*	SS	*4-23 50-51* N=73	7		11.64 *Sh*

Depth ft. BGS / Lithologic Description / Borehole Detail / Elevation ft. MSL / Remarks

- soil: grayish brown (10YR4/2), clayey SILT, trace sand
- loess: Light brownish gray (10YR6/2) with 20% yellowish brown (10YR5/8) mottles, clayey SILT, trace sand
- Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand
- Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, clayey SILT, trace sand
- Gray (10YR6/1) with 20% yellowish brown (10YR5/8) mottles, clayey, fine SAND
- Yellowish brown (10YR5/6), silty, fine SAND, trace clay, wet
- Dark yellowish brown (10YR4/6), silty, fine SAND, wet
- Brownish yellow (10YR6/6), silty, fine to medium SAND, little coarse sand, trace gravel, wet
- Yellowish brown (10YR5/4), sandy SILT, trace gravel, wet
- Brown (10YR5/3), silty, fine SAND, little medium sand, trace gravel, wet
- Gray (N5/1), clayey SILT, little sand, trace gravel
- Dark gray (N4/1), clayey SILT, trace sand and gravel

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/4/2006
Finish: 5/4/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-06
Well ID: n/a
Surface Elev: 623 ft. MSL
Completion: 60 ft. BGS
Station: 879,015.0N
2,513,190.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 9.30 - While drilling
▼ = 6.21 - MW06S on 6/1/06
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
11A	20/24 *83%*	SS	*6-16 33-58* N=49	11		3.49 *BSh*	22	Dark gray (N4/1), clayey SILT, trace sand and gravel *[Continued from previous page]*	602	
12A	20/24 *83%*	SS	*45-56 54-50/3"* N=110	9		11.64 *Sh*	24		600	
13A	12/24 *50%*	SS	*26-78*	12		2.84 *Sh*	26		598	
14A	8/24 *33%*	SS	*52-48/2"*	9		5.43 *BSh*	28		596	
15A	24/24 *100%*	SS	*10-24 30-40* N=54	13		4.95 *BSh*	30		594	
16A	21/24 *88%*	SS	*10-16 37-38* N=53	8		10.91 *BSh*	32		592	
17A	17/24 *71%*	SS	*36-47 61/5"*	9			34		590	
18A	22/24 *92%*	SS	*11-36 45-60* N=81	9		10.04 *Sh*	36		588	
19A	22/24 *92%*	SS	*40-35 34-29* N=69	10		9.60 *Sh*			586	
19B				13		8.92 *B*	38	Very dark greenish gray (10Y3/1), lean CLAY, trace sand		
20A	24/24 *100%*	SS	*3-8 12-15* N=20	14		8.53 *BSh*	40		584	

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/4/2006
Finish: 5/4/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

HANSON

BOREHOLE ID: SB-06
Well ID: n/a
Surface Elev: 623 ft. MSL
Completion: 60 ft. BGS
Station: 879,015.0N
2,513,190.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 9.30 - While drilling
▼ = 6.21 - MW06S on 6/1/06
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
21A	23/24 *96%*	SS	*3-5 8-12* N=13	15		4.27 *B*	40–42	Very dark greenish gray (10Y3/1), lean CLAY, trace sand and gravel	582	
22A	22/24 *92%*	SS	*6-6 7-8* N=13	14		3.49 *B*	42–44		580	
23A	24/24 *100%*	SS	*5-7 9-12* N=16	16		2.72 *B*	44–46		578	
24A	24/24 *100%*	SS	*4-8 10-11* N=18	15		4.07 *B*	46–48		576	
25A	24/24 *100%*	SS	*5-6 9-13* N=15	15		3.10 *B*	48–50		574	
26A	24/24 *100%*	SS	*5-6 8-12* N=14	22		1.94 *B*	50–52		572	
27A	24/24 *100%*	SS	*5-6 8-8* N=14	23		2.13 *B*	52–54	Dark greenish gray (10BG4/1), lean CLAY	570	
28A	24/24 *100%*	SS	*3-5 6-8* N=11	24		2.33 *BSh*	54–56		568	
29A	24/24 *100%*	SS	*12-10 12-14* N=22	24		3.30 *BSh*	56–58	Greenish gray (5G4/1) with 10% dark yellowish brown (10YR3/4) mottles, lean CLAY, trace sand	566	
30A	24/24 *100%*	SS	*5-8 12-13* N=20	27		2.13 *BSh*	58–60	Dark greenish gray (10G4/1), lean CLAY, trace sand	564	

End of Boring = 60.0 ft. BGS

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/4/2006
Finish: 5/4/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA (blind drill)

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-06a
Well ID: MW6S
Surface Elev: 623 ft. MSL
Completion: 16 ft. BGS
Station: 879,021.2N
2,513,189.4E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 9.30 - While drilling
▼ = 6.21 - MW06S on 6/1/06
∇ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								soil grayish brown (10YR4/2), clayey SILT, trace sand			
								loess Light brownish gray (10YR6/2) with 20% yellowish brown (10YR5/8) mottles, clayey SILT, trace sand		622	
							2	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand		620	
							4	Gray (10YR5/1) with 15% yellowish brown (10YR5/6) mottles, clayey SILT, trace sand		618	
							6 ▼			616	
							8	Gray (10YR6/1) with 20% yellowish brown (10YR5/8) mottles, clayey, fine SAND		614	
							▼	Yellowish brown (10YR5/6), silty, fine SAND, trace clay, wet			
							10	Dark yellowish brown (10YR4/6), silty, fine SAND, wet		612	
							12	Brownish yellow (10YR6/6), silty, fine to medium SAND, little coarse sand, trace gravel, wet		610	
								Yellowish brown (10YR5/4), sandy SILT, trace gravel, wet			
							14	Brown (10YR5/3), silty, fine SAND, little medium sand, trace gravel, wet			
								Gray (N5/1), clayey SILT, little sand, trace gravel		608	
							16	Dark gray (N4/1), clayey SILT, trace sand and gravel			

End of Boring = 16.08 ft. BGS
See SB-06 for sample & testing details

NOTE(S): MW06S installed in blind-drilled borehole within 10 ft of SB-06.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/5/2006
Finish: 5/8/2006
WEATHER: Partly cloudy, mild (mid-70s)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: P. McIntire
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-07
Well ID: n/a
Surface Elev: 625 ft. MSL
Completion: 54 ft. BGS
Station: 879,180.0N
2,514,390.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 10.80 - While drilling
▼ = 4.90 - MW07S on 6/1/06
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	18/24 *75%*	SS	*1-1 1-1* N=2	23		2.40 *B*
1B				24		
2A	24/24 *100%*	SS	*0-0 1-1* N=1	26		2.33 *B*
3A	24/24 *100%*	SS	*0-1 1-2* N=2	25		4.33 *BSh*
3B				25		2.52 *BSh*
3C				22		3.05 *B*
4A	24/24 *100%*	SS	*0-1 1-2* N=2	22		1.75 *B*
5A	24/24 *100%*	SS	*0-0 1-1* N=1	22		1.24 *B*
6A	24/24 *100%*	SS	*0-0 0-1* N=0	24		0.54 *B*
6B				20		1.65 *B*
7A	24/24 *100%*	SS	*0-0 1-2* N=1	24		
7B				13		2.89 *B*
8A	24/24 *100%*	SS	*2-5 7-9* N=12	8		5.04 *BSh*
9A	24/24 *100%*	SS	*3-6 6-8* N=12	9		9.27 *BSh*
10A	24/24 *100%*	SS	*3-6 8-11* N=14	9		11.13 *BSh*

Depth ft. BGS: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Elevation ft. MSL: 624, 622, 620, 618, 616, 614, 612, 610, 608, 606

Lithologic Description
soil dark gray (10YR3/1), moist, soft, clayey SILT with trace sand and trace gravel.
Dark gray (10YR4/1), moist, soft, silty CLAY with trace and and trace gravel.
Gray (10YR5/1) with 20% yellowish brown mottles, moist, soft, silty CLAY with trace sand and trace gravel.
loess Black (10YR2/1), very moist, soft, clayey SILT.
Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist soft, silty CLAY with trace sand and trace gravel.
Black (10YR2/1), moist, soft, silty CLAY with trace sand and trace gravel.
Dark gray (10YR4/1), very moist, soft, silty CLAY with some sand and trace gravel.
Gray (10YR5/1) with 30% yellowish brown (10YR5/8) mottles, moist, soft, silty CLAY with sand and gravel.
Yellowish brown (10YR5/8) wet, very soft, clayey, very fine- to fine-grained, SAND with trace gravel.
Yellowish brown (10YR5/8) wet, soft, clayey, very fine- to fine-grained, SAND with trace gravel.
Gray (10YR4/1), moist, very hard, sandy, clayey SILT with gravel.

Remarks: I question whether this is some type of ash based on how soft this is + color

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/5/2006
Finish: 5/8/2006
WEATHER: Partly cloudy, mild (mid-70s)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: P. McIntire
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-07
Well ID: n/a
Surface Elev: 625 ft. MSL
Completion: 54 ft. BGS
Station: 879,180.0N
2,514,390.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 10.80 - While drilling
▼ = 4.90 - MW07S on 6/1/06
▽ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*
11A				8		
	35/48 *73%*	CS				
11B				14		
	50/60 *83%*	CS				
12A				7		
13A				6		
	56/60 *93%*	CS				
13B				6		
13C				8		
	60/60 *100%*	CS				
14A				14		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
	Gray (10YR4/1), moist, very hard, sandy, clayey SILT with gravel. *[Continued from previous page]*	604
22	Gray (10YR6/1), wet, loose, fine- to medium-grained SAND.	602
24–32	Gray (10YR5/1), moist, very hard, sandy, clayey SILT with gravel.	600, 598, 596, 594
32	Gray (10YR5/1), wet, loose, medium- to very coarse-grained SAND and GRAVEL.	592
	Gray (10YR5/1), wet, dense, very fine- to fine-grained SAND.	
34	Gray (10YR5/1), moist, very hard, sandy, clayey SILT with gravel.	590
36–40	Gray (10YR5/1), moist, firm, sandy, clayey SILT with gravel.	588, 586

Depth scale: 22, 24, 26, 28, 30, 32, 34, 36, 38, 40

Borehole Detail | Remarks

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/5/2006
Finish: 5/8/2006
WEATHER: Partly cloudy, mild (mid-70s)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: P. McIntire
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-07
Well ID: n/a
Surface Elev: 625 ft. MSL
Completion: 54 ft. BGS
Station: 879,180.0N
2,514,390.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 10.80 - While drilling
▼ = 4.90 - MW07S on 6/1/06
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
15A	60/60 *100%*	CS		14		
	60/60 *100%*	CS				
16A				15		
17A				24		
	60/60 *100%*	CS				
17B						

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
40–49	Gray (10YR5/1), moist, firm, sandy, clayey SILT with gravel. *[Continued from previous page]*	584, 582, 580, 578, 576
49–51.2	Dark greenish gray (10BG4/1), moist, soft, silty CLAY with trace sand and trace gravel.	574
51.2–51.5	Very dark gray (10YR3/1), moist firm, clayey SILT.	
51.5–54	Dark greenish gray (10BG4/1), moist, soft, silty CLAY with trace sand and trace gravel.	572

Depth scale: 42, 44, 46, 48, 50, 52, 54

End of Boring = 54.0 ft BGS

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/9/2006
Finish: 5/9/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: P. McIntire
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-07a
Well ID: MW7S
Surface Elev: 625 ft. MSL
Completion: 14 ft. BGS
Station: 879,181.1N
2,514,397.5E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 10.80 - While drilling
▼ = 4.90 - MW07S on 6/1/06
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								soil Dark gray (10YR3/1), moist, soft, clayey SILT with trace sand and trace gravel.		624	
								Dark gray (10YR4/1), moist, soft, silty CLAY with trace and and trace gravel.			
							2	Gray (10YR5/1) with 20% yellowish brown mottles, moist, soft, silty CLAY with trace sand and trace gravel.		622	
							4	loess Black (10YR2/1), very moist, soft, clayey SILT.		620	
							▼	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist soft, silty CLAY with trace sand and trace gravel.			
							6	Black (10YR2/1), moist, soft, silty CLAY with trace sand and trace gravel.		618	
							8	Dark gray (10YR4/1), very moist, soft, silty CLAY with some sand and trace gravel.		616	
							10	Gray (10YR5/1) with 30% yellowish brown (10YR5/8) mottles, moist, soft, silty CLAY with sand and gravel.		614	
							▼	Yellowish brown (10YR5/8) wet, very soft, clayey, very fine- to fine-grained, SAND with trace gravel.			
							12	Yellowish brown (10YR5/8) wet, soft, clayey, very fine- to fine-grained, SAND with trace gravel.		612	
							14	Gray (10YR4/1), moist, very hard, sandy, clayey SILT with gravel.			

End of Boring = 14.39 ft. BGS
See SB-07 for sample & testing details

NOTE(S): MW07S installed in blind-drilled borehole within 10 ft of SB-07.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/9/2006
Finish: 5/10/2006
WEATHER: Foggy to partly sunny, mild (hi-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-08
Well ID: n/a
Surface Elev: 625 ft. MSL
Completion: 59 ft. BGS
Station: 879,770.0N
2,514,480.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.70 - While drilling
▼ = 5.33 - MW08S on 6/1/06
▽ =

SAMPLE Number	Recov / Total (in) % Recovery	Type	TESTING Blows / 6 in N - Value RQD	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) Failure Type
	24/24 100%	SS	1-1 1 N=2			
2A	24/24 100%	SS	1-1 1 N=2	25		1.59 B
3A	24/24 100%	SS	1-1 1 N=2	20		1.86 B
3B				21		1.20 B
	24/24 100%	SS	0-1 1 N=2			
4A				25		1.01 None
	24/24 100%	SS	0-1 1 N=2			
5A				21		
6A	24/24 100%	SS	0-1 1 N=2	21		0.70 BSh
6B				31		
7A	20/24 83%	SS	0-1 3 N=4	13		
7B				15		
8A	23/24 96%	SS	7-11 16 N=27	9		5.45 Sh
8B				8		
	24/30 80%	CS				
9A				5		

Depth ft. BGS: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Elevation ft. MSL: 624, 622, 620, 618, 616, 614, 612, 610, 608, 606

Lithologic Description (Borehole Detail, Remarks)

soil
Very dark gray (10YR3/1), moist, soft, clayey SILT with trace sand and trace gravel.

Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.

Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.

Gray (10YR5/1) with 40% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.

loess
Gray (10YR5/1), moist, soft, clayey SILTwith little sand and trace gravel.

Yellowish brown (10YR5/6) with 20% gray (10YR5/1) mottles, moist, soft, sandy CLAY with sl. trace gravel.

Yellowish brown (10YR5/6) with 10% gray (10YR5/1) mottles, moist, soft, sandy CLAY with sl. trace gravel.

Gray (10YR5/1), wet, soft, very silty, very fine- to coarse-grained SAND.

Light gray (10YR6/1) with 50% yellowish brown (10YR5/6) mottles, wet, very dense, very fine- to fine-grained SAND.

Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, wet, dense, fine- to very coarse-grained SAND.

Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/9/2006
Finish: 5/10/2006
WEATHER: Foggy to partly sunny, mild (hi-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-08
Well ID: n/a
Surface Elev: 625 ft. MSL
Completion: 59 ft. BGS
Station: 879,770.0N
2,514,480.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.70 - While drilling
▼ = 5.33 - MW08S on 6/1/06
▽ =

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
	60/60 *100%*	CS								604	
10A				7			22			602	
							24			600	
11A	36/60 *60%*	CS		10			26			598	
							28			596	
	60/60 *100%*	CS					30	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*		594	
12A				6			32			592	
							34			590	
	60/60 *100%*	CS					36			588	
13A				7			38			586	
							40				

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/9/2006
Finish: 5/10/2006
WEATHER: Foggy to partly sunny, mild (hi-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-08
Well ID: n/a
Surface Elev: 625 ft. MSL
Completion: 59 ft. BGS
Station: 879,770.0N
2,514,480.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.70 - While drilling
▼ = 5.33 - MW08S on 6/1/06
∇ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
	60/60 *100%*	CS						Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*	584	
14A				14			42	Greenish gray (10BG5/1) with 10% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY with little sand and trace gravel		
14B				11				Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.	582	
							44	Dark yellowish brown (10YR4/4), moist, firm, clayey SILT with some sand and trace gravel.		
15A				12					580	
15B	60/60 *100%*	CS		15			46	Gray (10YR4/1), moist, hard, clayey, sandy SILT with trace gravel.	578	
15C				13			48	Gray (10YR4/1) with 50% very dark grayish brown (10YR3/2), moist, firm, silty CLAY with sand and trace gravel.	576	
16A	60/60 *100%*	CS		14			50	Gray (10YR4/1), moist, hard, clayey, sandy SILT with trace gravel.	574	
							52		572	
16B				19			54	Greenish gray (10BG4/1), moist, soft, silty CLAY with little sand and sl. trace gravel.	570	
17A	60/60 *100%*	CS		24						
							56	Yellowish brown (10YR5/6) with 20% Greenish gray (10BG4/1) mottles, moist, soft, silty CLAY with little sand and sl. trace gravel.	568	
17B				19			58			

End of Boring = 58.5 ft.

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/10/2006
Finish: 5/10/2006
WEATHER: Foggy to partly sunny, mild (hi-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA (blind drill)
FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-08a
Well ID: MW8S
Surface Elev: 625 ft. MSL
Completion: 17 ft. BGS
Station: 879,776.6N
2,514,478.8E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.70 - While drilling
▼ = 5.33 - MW08S on 6/1/06
▽ =

SAMPLE: Number	Recov / Total (in) % Recovery	Type	TESTING: Blows / 6 in N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0–1.5	soil: Very dark gray (10YR3/1), moist, soft, clayey SILT with trace sand and trace gravel.		624	
							1.5–3	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.		622	
							3–4.5	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.			
							4.5–5.5	Gray (10YR5/1) with 40% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.		620	
							5.5–7.5	loess: Gray (10YR5/1), moist, soft, clayey SILTwith little sand and trace gravel.		618	
							7.5–9.5	Yellowish brown (10YR5/6) with 20% gray (10YR5/1) mottles, moist, soft, sandy CLAY with sl. trace gravel.		616	
							9.5–12.7	Yellowish brown (10YR5/6) with 10% gray (10YR5/1) mottles, moist, soft, sandy CLAY with sl. trace gravel.		614, 612	
							12.7–14.5	Gray (10YR5/1), wet, soft, very silty, very fine- to coarse-grained SAND.		610	
							14.5–15.2	Light gray (10YR6/1) with 50% yellowish brown (10YR5/6) mottles, wet, very dense, very fine- to fine-grained SAND.			
							15.2–16	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, wet, dense, fine- to very coarse-grained SAND.			
							16–17.08	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.		608	

End of Boring = 17.08 ft. BGS
See SB-08 for sample & testing details

NOTE(S): MW08S installed in blind-drilled borehole within 10 ft of SB-08.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/3/2006
Finish: 5/3/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-09
Well ID: MW9D
Surface Elev: 625 ft. MSL
Completion: 54 ft. BGS
Station: 879,679.7N
2,515,666.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 5.23 - MW09S on 6/1/06
▽ = 52.46 - MW09D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*
1A	22/24 *92%*	SS	*0-1 1-1* N=2	24		1.65 *B*
2A	20/24 *83%*	SS	*1-2 1-1* N=3	27		2.06 *B*
3A	24/24 *100%*	SS	*1-1 1-1* N=2	24		1.65 *B*
4A	24/24 *100%*	SS	*1-1 1-2* N=2	23		1.57 *B*
5A	24/24 *100%*	SS	*0-1 1-1* N=2	27		1.85 *B*
6A	24/24 *100%*	SS	*0-0 0-0* N=0	22		1.44 *B*
7A	24/24 *100%*	SS	*0-0 1-2* N=1	21		0.93 *BSh*
7B				18		0.97 *BSh*
7C				15		
8A	24/24 *100%*	SS	*1-3 6-6* N=9	18		
8B				18		
9A	24/24 *100%*	SS	*7-13 19-25* N=32	8		7.86 *Sh*
	12/12 *100%*	CS				

Depth ft. BGS: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

Elevation ft. MSL: 624, 622, 620, 618, 616, 614, 612, 610, 608, 606

Lithologic Description

soil dark gray (10YR3/1), moist, soft, clayey SILT with trace sand and trace gravel.

Yellowish brown (10YR5/6), moist, soft, silty CLAY with little sand.

Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.

Gray (10YR5/1) with 50% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with sand.

Yellowish brown (10YR5/6) with 10% Gray (10YR5/1) mottles, moist, soft, silty CLAY with sand.

Yellowish brown (10YR5/8), very moist, soft, sandy CLAY with trace gravel.

Yellowish brown (10YR5/6) with 30% gray (10YR5/1) mottles, moist to very moist, clayey SILT with sand and trace gravel.

Gray (10YR5/1), wet, soft, clayey very fine- to fine-grained SAND.

Gray (10YR5/1), wet, loose, fine- to very coarse-grained SAND with trace gravel.

Gray (10YR5/1), wet, dense, silty very fine- to fine-grained SAND.

Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.

Borehole Detail | Remarks

NOTE(S): MW09D installed in SB-09.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/3/2006
Finish: 5/3/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-09
Well ID: MW9D
Surface Elev: 625 ft. MSL
Completion: 54 ft. BGS
Station: 879,679.7N
2,515,666.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 5.23 - MW09S on 6/1/06
▽ = 52.46 - MW09D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
11A	60/60 *100%*	CS		2			20–35.5	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*	605–589.5	
12A	49/60 *82%*	CS		3						2" Sand stringer
13A	60/60 *100%*	CS		3						
14A	60/60 *100%*	CS		10			35.5–37	Yellowish brown (10YR5/6) with 40% gray (10YR5/1) mottles, moist, very hard, clayey SILT with little sand and occasional dry, silt stringers (<1").		
14B				11			37–39	Gray (10YR5/1), moist, very hard, clayey SILT with little sand and trace gravel.		
							39–40	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.		DRILLER NOTE: Appears more plastic

Depth scale (ft. BGS): 22, 24, 26, 28, 30, 32, 34, 36, 38, 40
Elevation scale (ft. MSL): 604, 602, 600, 598, 596, 594, 592, 590, 588, 586

NOTE(S): MW09D installed in SB-09.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/3/2006
Finish: 5/3/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-09
Well ID: MW9D
Surface Elev: 625 ft. MSL
Completion: 54 ft. BGS
Station: 879,679.7N
2,515,666.3E

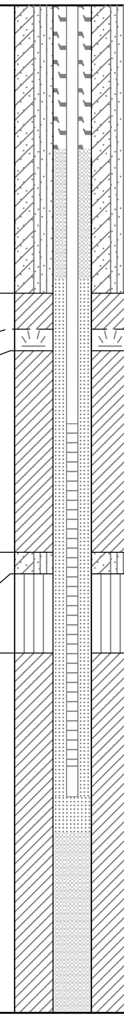
TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 5.23 - MW09S on 6/1/06
▽ = 52.46 - MW09D on 6/1/06

SAMPLE / TESTING

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
15A	60/60 *100%*	CS		12		
19	60/60 *100%*	CS		22		
16A				17		
17A	60/60 *100%*	CS				

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
42	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*	584, 582	
44	Very dark grayish brown (10YR3/2), moist, hard, silty CLAY with trace sand and trace organic matter.	580	
	Very dark grayish brown (10YR3/2), moist, firm, PEAT.		
46	Dark greenish gray (10BG4/1), moist, firm, silty CLAY with little sand and trace gravel.	578	
	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.		
48	Dark gray (10YR3/1), moist, hard, clayey SILT.	576	
50, 52 ▽, 54	Dark greenish gray (10BG4/1), moist, firm, silty CLAY with little sand and trace gravel.	574, 572	



End of Boring = 54.0 ft.

NOTE(S): MW09D installed in SB-09.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/3/2006
Finish: 5/3/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA (blind drill)

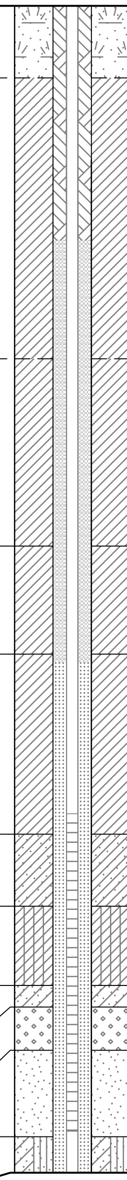
FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-09a
Well ID: MW9S
Surface Elev: 625 ft. MSL
Completion: 16 ft. BGS
Station: 879,684.9N
2,515,666.2E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 5.23 - MW09S on 6/1/06
▽ = 52.46 - MW09D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								soil dark gray (10YR3/1), moist, soft, clayey SILT with trace sand and trace gravel.		624	
							2	Yellowish brown (10YR5/6), moist, soft, silty CLAY with little sand.		622	
							4			620	
							6	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.		618	
							8	Gray (10YR5/1) with 50% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with sand.		616	
							10	Yellowish brown (10YR5/6) with 10% Gray (10YR5/1) mottles, moist, soft, silty CLAY with sand.		614	
							12	Yellowish brown (10YR5/8), very moist, soft, sandy CLAY with trace gravel.			
								Yellowish brown (10YR5/6) with 30% gray (10YR5/1) mottles, moist to very moist, clayey SILT with sand and trace gravel.		612	
							14	Gray (10YR5/1), wet, soft, clayey very fine- to fine-grained SAND.			
								Gray (10YR5/1), wet, loose, fine- to very coarse-grained SAND with trace gravel.		610	
								Gray (10YR5/1), wet, dense, silty very fine- to fine-grained SAND.			
							16	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.			



End of Boring = 16.20 ft. BGS
See SB-09 for sample & testing details

NOTE(S): MW09S installed in blind-drilled borehole within 10 ft of SB-09.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/1/2006
Finish: 5/1/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-10
Well ID: MW10D
Surface Elev: 621 ft. MSL
Completion: 49 ft. BGS
Station: 878,245.1N
2,515,914.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.80 - While drilling
▼ = 4.91 - MW10S on 6/1/06
▽ = 47.48 - MW10D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING Blows / 6 in N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	17/24 *71%*	SS	*1-1* *1-1* N=2	23		2.33 *B*
2A	24/24 *100%*	SS	*1-1* *2-2* N=3	25		2.47 *BSh*
3A	24/24 *100%*	SS	*1-2* *1-2* N=3	24		2.33 *B*
4A	24/24 *100%*	SS	*1-1* *1-1* N=2	23		1.55 *B*
4B						
5A	17/24 *71%*	SS	*1-1* *1-2* N=2	23		2.06 *B*
6A	24/24 *100%*	SS	*0-1* *1-1* N=2	17		1.16 *B*
7A	23/24 *96%*	SS	*1-1* *3-3* N=4	17		2.84 *B*
7B				18		
8A	24/24 *100%*	SS	*3-5* *9-9* N=14	10		7.64 *BSP*
10A	12/33 *36%*	CS		16		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0	soil dark gray (10YR3/1), moist, soft, clayey SILT with trace sand and trace gravel.	
	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.	620
2	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.	618
4		616
6	Gray (10YR5/1), moist, soft, clayey, very fine- to fine-grained SAND.	
	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand and trace gravel.	614
8		612
10	Gray (10YR5/1) with 10% yellowish brown (10YR5/8) mottles, clayey, very fine- to medium-grained SAND with trace gravel.	610
12		608
	Grayish brown (10YR5/2), wet, loose, very fine- to medium-grained SAND with trace coarse- to very coarse-grained sand.	
14	Yellowish brown (10YR5/6), moist, firm, silty CLAY with little sand and trace gravel.	606
16	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.	604
18		602
20		

Borehole Detail | Remarks

NOTE(S): MW10D installed in SB-10.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/1/2006
Finish: 5/1/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

HANSON

BOREHOLE ID: SB-10
Well ID: MW10D
Surface Elev: 621 ft. MSL
Completion: 49 ft. BGS
Station: 878,245.1N
2,515,914.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.80 - While drilling
▼ = 4.91 - MW10S on 6/1/06
▽ = 47.48 - MW10D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										600	
							22				
								Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*		598	
							24				
11A				12							
										596	
	56/60 *93%*	CS					26				2" Gravel stringer
11B				13				Dark grayish brown (10YR4/2), very moist, soft, PEAT.		594	
							28				
11C				196							
										592	
							30				
	60/60 *100%*	CS								590	
12A				13			32				
								Gray (10YR4/1), moist, very hard, clayey, sandy SILT with trace gravel.		588	
							34				
										586	
	60/60 *100%*	CS					36				
										584	
13A				12							
							38				
										582	
							40				

NOTE(S): MW10D installed in SB-10.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station	**CONTRACTOR:** Reynolds Drilling Corp.		
Site: CCB Management Facility	**Rig mfg/model:** CME-1050 ATV Rig	**BOREHOLE ID:** SB-10	
Location: Coffeen, Illinois	**Drilling Method:** 4¼" HSA w/SS & CME samplers	**Well ID:** MW10D	
Project: 05S3004A		**Surface Elev:**	621 ft. MSL
DATES: Start: 5/1/2006	**FIELD STAFF: Driller:** K. Doetzel	**Completion:**	49 ft. BGS
Finish: 5/1/2006	**Helper:** S. McCartney	**Station:**	878,245.1N
WEATHER: Overcast, mild (mid-60's)	**Eng/Geo:** R. Hasenyager		2,515,914.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.80 - While drilling
▼ = 4.91 - MW10S on 6/1/06
▽ = 47.48 - MW10D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
14A	60/60 *100%*	CS		14				Gray (10YR4/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*	580	
14B				23			42	Greenish gray (5G5/1), moist, firm, silty CLAY with little sand and sl. trace gravel.	578	1" Gravel stringer
15A				13			44	Greenish gray (5G5/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with little sand and sl. trace gravel.	576	
15B	60/60 *100%*	CS		25			46 ▽ 48	Greenish gray (5G5/1), moist, firm, silty CLAY with little sand and sl. trace gravel.	574	

End of Boring = 48.75 ft.

NOTE(S): MW10D installed in SB-10.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/2/2006
Finish: 5/2/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA (blind drill)

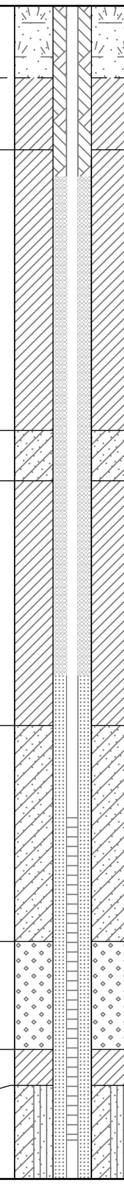
FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-10a
Well ID: MW10S
Surface Elev: 621 ft. MSL
Completion: 16 ft. BGS
Station: 878,250.5N
2,515,914.4E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.80 - While drilling
▼ = 4.91 - MW10S on 6/1/06
▽ = 47.48 - MW10D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0–1	soil dark gray (10YR3/1), moist, soft, clayey SILT with trace sand and trace gravel.			
							1–2	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.		620	
							2–6	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand.		618, 616	
							6–6.7	Gray (10YR5/1), moist, soft, clayey, very fine- to fine-grained SAND.			
							6.7–10	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, moist, soft, silty CLAY with little sand and trace gravel.		614, 612	
							10–13	Gray (10YR5/1) with 10% yellowish brown (10YR5/8) mottles, clayey, very fine- to medium-grained SAND with trace gravel.		610	
							13–14.5	Grayish brown (10YR5/2), wet, loose, very fine- to medium-grained SAND with trace coarse- to very coarse-grained sand.		608	
							14.5–15.1	Yellowish brown (10YR5/6), moist, firm, silty CLAY with little sand and trace gravel.		606	
							15.1–16.3	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.			



End of Boring = 16.30 ft. BGS
See SB-10 for sample & testing details

NOTE(S): MW10S installed in blind-drilled borehole within 10 ft of SB-10.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/27/2006
Finish: 4/28/2006
WEATHER: Partly cloudy, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-11
Well ID: MW11D
Surface Elev: 622 ft. MSL
Completion: 36 ft. BGS
Station: 876,749.6N
2,515,976.7E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.70 - While drilling
▼ = 5.42 - MW11S on 6/1/06
▽ = 6.03 - MW11D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*
1A	24/24 *100%*	SS	*3-3 4-4* N=7	16		
1B				34		1.09 *B*
2A	24/24 *100%*	SS	*4-7 14-21* N=21	27		2.13 *BSh*
3A	24/24 *100%*	SS	*4-6 7-8* N=13	24		2.27 *BSh*
3B				19		2.33 *B*
4A	24/24 *100%*	SS	*7-8 13-14* N=21	21		2.13 *None*
5A	24/24 *100%*	SS	*3-4 4-4* N=8	20		1.55 *Sh*
6A	24/24 *100%*	SS	*3-2 2-3* N=4	19		0.78 *BSh*
6B				18		
7A	24/24 *100%*	SS	*3-6 14-21* N=20	16		
7B				9		5.45 *BSP*
8A	11/12 *92%*	SS	*41-61/5"*	7		
9A	48/54 *89%*	CS		8		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0	soil Very dark grey (10YR3/1), moist, soft, clayey SILT.	622
	Yellowish brown (10YR5/6) with 20% gray (10YR5/1) mottles, moist , soft, silty CLAY.	
2	Yellowish brown (10YR5/6) with 40% gray (10YR5/1) mottles, moist , soft, silty CLAY.	620
4	Gray (10YR5/1), moist, soft, clayey SILT.	618
6		616
8	Gray (10YR4/1), moist, firm, silty CLAY with little sand and trace gravel.	614
10		612
12	Gray (10YR4/1), wet, soft, sandy CLAY.	610
	Yellowish brown (10YR5/6) with 50% gray (10YR5/1) mottles, wet, soft, sandy CLAY with trace gravel.	
14	Gray (10YR5/1), moist, very hard, sandy, clayey SILT with gravel.	608
	Gray (10YR5/1), moist, hard, silty CLAY with little sand and trace gravel.	
	Light gray (10YR7/1) with 10% yellowish brown (10YR5/8) mottles, moist, hard, silty CLAY with little sand and trace gravel.	
16		606
18	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.	604
20		602

Remarks: DRILLER NOTE: sampler recovered wet.

NOTE(S): MW11D installed in SB-11.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/27/2006
Finish: 4/28/2006
WEATHER: Partly cloudy, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-11
Well ID: MW11D
Surface Elev: 622 ft. MSL
Completion: 36 ft. BGS
Station: 876,749.6N
2,515,976.7E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.70 - While drilling
▼ = 5.42 - MW11S on 6/1/06
▽ = 6.03 - MW11D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
										DRILLER NOTE: soft drilling 20.5' to 21.0'
	54/60 *90%*	CS					22		600	
10A				6						Wet, gravelly zone from 22.4' to 22.8'
							24	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*	598	
							26		596	
11A	58/60 *97%*	CS		8						
							28		594	
							30	Gray (10YR5/1), wet, loose, clayey, very fine- to medium-grained SAND with little coarse-grained sand and trace gravel.	592	
12A	32/60 *53%*	CS		9			32		590	
							34	Gray (10YR6/1) with occasional black (10YR2/1) varves, dry, dense, SILT with trace sand.	588	
12B				9						
	22/22 *100%*	SS	*7-19* *41-50/4"* N=60							
13B				14		4.85 *BSh*	36	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.	586	

End of Boring = 36.33 ft.

NOTE(S): MW11D installed in SB-11.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/28/2006
Finish: 4/28/2006
WEATHER: Partly cloudy, mild (mid-60's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-11a
Well ID: MW11S
Surface Elev: 622 ft. MSL
Completion: 14 ft. BGS
Station: 876,749.4N
2,515,971.2E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.70 - While drilling
▼ = 5.42 - MW11S on 6/1/06
▽ = 6.03 - MW11D on 6/1/06

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0–1.1	soil Very dark grey (10YR3/1), moist, soft, clayey SILT.		622	
							1.1–2	Yellowish brown (10YR5/6) with 20% gray (10YR5/1) mottles, moist , soft, silty CLAY.		620	
							2–4.2	Yellowish brown (10YR5/6) with 40% gray (10YR5/1) mottles, moist , soft, silty CLAY.		618	
							4.2–4.7	Gray (10YR5/1), moist, soft, clayey SILT.			
							4.7–11.7	Gray (10YR4/1), moist, firm, silty CLAY with little sand and trace gravel.		616, 614, 612	
							11.7–12	Gray (10YR4/1), wet, soft, sandy CLAY.		610	
							12–13.3	Yellowish brown (10YR5/6) with 50% gray (10YR5/1) mottles, wet, soft, sandy CLAY with trace gravel.			
							13.3–14.08	Gray (10YR5/1), moist, very hard, sandy, clayey SILT with gravel.		608	

End of Boring = 14.08 ft. BGS
See SB-11 for sample & testing details

NOTE(S): MW11S installed in blind-drilled borehole within 10 ft of SB-11.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/10/2006
Finish: 5/10/2006
WEATHER: Foggy to partly sunny, mild (hi-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-12
Well ID: MW12D
Surface Elev: 622 ft. MSL
Completion: 50 ft. BGS
Station: 875,515.1N
2,515,900.6E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.00 - While drilling
▼ = 6.76 - MW12S on 6/1/06
▽ = 46.90 - MW12D on 6/1/06

SAMPLE: Number	Recov / Total (in) % Recovery	Type	TESTING: Blows / 6 in N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description
1A	24"/24	SS	*2-3 4-5* N=7	22		1.27 *Sh*	0–1.2	soil — Very dark gray (10YR3/1), clayey SILT, trace sand
1B				27		2.33 *B*	1.2–2	Dark gray (10YR4/1) with 15% yellowish brown (10YR5/6) mottles, lean CLAY
2A	19"/24	SS	*2-4 5-7* N=9	24		2.91 *B*	2–4	loess — Yellowish brown (10YR5/8) with 40% grayish brown (10YR5/2) mottles, lean CLAY
3A	20"/24	SS	*2-2 3-4* N=5	21		2.13 *B*	4–6	Gray (10YR5/1), lean CLAY, trace sand and gravel
4A	24/24 *100%*	SS	*4-5 5-6* N=10	21		1.36 *BSh*	6–8	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand
5A	24"/24	SS	*1-2 2-5* N=4	20		1.47 *BSh*	8–10	Yellowish brown (10YR5/8) with 20% gray (10YR6/1) mottles, lean CLAY, trace sand and gravel
6A	20"/24	SS	*0-1 3-3* N=4	21		0.62 *B*	10–12	hagarstown — Yellowish brown (10YR 5/8) with 25% gray (10YR6/1) mottles, clayey SAND, trace gravel
7A	21"/24	SS	*2-2 3-5* N=5	22		0.19 *B*	12–12.7	Gray (10YR6/1), clayey SAND, trace gravel, wet
7B				22			12.7–13.6	Dark yellowish brown (10YR4/6), clayey SAND, trace gravel, wet
7C				15		3.71 *B*	13.6–14.5	Light yellowish brown (10YR6/4) with 30% brownish yellow (10YR6/6) mottles, clayey SILT, trace sand and gravel
8A	24"/24	SS	*4-13 18-29* N=31	9		5.15 *BSh*	14.5–20	vandalia — Dark greenish gray (N4/1), clayey SILT, trace sand and gravel
9A	24"/24	SS	*26-32 46-50* N=78	9		6.59 *Sh*		
10A	24"/24	SS	*21-31 63-71* N=94	11		6.39 *Sh*		

Elevation ft. MSL: 622 (0 ft), 620 (2 ft), 618 (4 ft), 616 (6 ft), 614 (8 ft), 612 (10 ft), 610 (12 ft), 608 (14 ft), 606 (16 ft), 604 (18 ft)

Borehole Detail

Remarks

NOTE(S): MW12D installed in SB-12.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/10/2006
Finish: 5/10/2006
WEATHER: Foggy to partly sunny, mild (hi-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-12
Well ID: MW12D
Surface Elev: 622 ft. MSL
Completion: 50 ft. BGS
Station: 875,515.1N
2,515,900.6E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.00 - While drilling
▼ = 6.76 - MW12S on 6/1/06
▽ = 46.90 - MW12D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
11A	60/60 *100%*	CS		6			20–25	Dark greenish gray (N4/1), clayey SILT, trace sand and gravel *[Continued from previous page]*	602–597	
12A	60/60 *100%*	CS		7			25–30	Dark greenish gray (N4/1), sandy SILT, trace gravel	597–592	
13A	60/60 *100%*	CS		13			30–35	Dark greenish gray (N4/1), sandy SILT, trace gravel	592–587	
14A	60/60 *100%*	CS		16			35–40	smithboro Very dark gray (N3/1), clayey SILT, trace sand and gravel	587–582	

Depth scale: 22, 24, 26, 28, 30, 32, 34, 36, 38, 40

Elevation scale: 602, 600, 598, 596, 594, 592, 590, 588, 586, 584

NOTE(S): MW12D installed in SB-12.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/10/2006
Finish: 5/10/2006
WEATHER: Foggy to partly sunny, mild (hi-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-12
Well ID: MW12D
Surface Elev: 622 ft. MSL
Completion: 50 ft. BGS
Station: 875,515.1N
2,515,900.6E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.00 - While drilling
▼ = 6.76 - MW12S on 6/1/06
▽ = 46.90 - MW12D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										582	
	60/60 *100%*	CS					42	Very dark gray (N3/1), clayey SILT, trace sand and gravel *[Continued from previous page]*		580	
15A				14			44			578	
								Very dark gray (N3/1), PEAT			
							46			576	
							▽				
	60/60 *100%*	CS					48	Gray (N5/1) with 30% yellowish brown (10YR5/6) mottles, lean CLAY		574	
16A				45			50				

End of Boring = 50.0 ft. BGS

NOTE(S): MW12D installed in SB-12.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/10/2006
Finish: 5/10/2006
WEATHER: Foggy to partly sunny, mild (hi-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA (blind drill)

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-12a
Well ID: MW12S
Surface Elev: 622 ft. MSL
Completion: 16 ft. BGS
Station: 875,520.1N 2,515,900.5E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								soil Very dark gray (10YR3/1), clayey SILT, trace sand		622	
							2	Dark gray (10YR4/1) with 15% yellowish brown (10YR5/6) mottles, lean CLAY			
							4	Yellowish brown (10YR5/8) with 40% grayish brown (10YR5/2) mottles, lean CLAY		620	
							6	Gray (10YR5/1), lean CLAY, trace sand and gravel		618	
							8	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand		616	
							10	Yellowish brown (10YR5/8) with 20% gray (10YR6/1) mottles, lean CLAY, trace sand and gravel		614	
							12	Yellowish brown (10YR 5/8) with 25% gray (10YR6/1) mottles, clayey SAND, trace gravel		612	
								Gray (10YR6/1), clayey SAND, trace gravel, wet		610	
								Dark yellowish brown (10YR4/6), clayey SAND, trace gravel, wet			
							14	Light yellowish brown (10YR6/4) with 30% brownish yellow (10YR6/6) mottles, clayey SILT, trace sand and gravel		608	
								Dark greenish gray (N4/1), clayey SILT, trace sand and gravel			

End of Boring = 15.61 ft. BGS
See SB-12 for sample & testing details

NOTE(S): MW12S installed in blind-drilled borehole within 10 ft of SB-12.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/9/2006
Finish: 5/9/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-13
Well ID: MW13D
Surface Elev: 623 ft. MSL
Completion: 55 ft. BGS
Station: 874,694.3N
2,513,929.9E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.40 - While drilling
▼ = 8.24 - MW12S on 6/1/06
▽ = 56.03 - MW13D on 6/1/06

Number	Recov / Total (in)	% Recovery	Type	Blows / 6 in	N - Value	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf)	Failure Type
1A	22/24	92%	SS	4-5		21			
1B				4-4	N=9	15			
1C						28		2.13	B
2A	21/24	88%	SS	3-4 5-8	N=9	25		2.13	BSh
3A	24/24	100%	SS	4-5 6-8	N=11	22		2.84	Sh
3B						21		2.91	BSh
4A	24/24	100%	SS	9-12 10-10	N=22	23		2.33	B
5A	24/24	100%	SS	3-4 6-7	N=10	21		2.72	Sh
6A	19/24	79%	SS	1-3 6-8	N=9	23		1.94	Sh
7A	21/24	88%	SS	6-8 10-12	N=18	18		1.94	Sh
7B						13		1.55	BSh
8A	22/24	92%	SS	7-21 29-30	N=50	11			
8B						9			
9A	23/24	96%	SS	25-28 28-45	N=56	9		9.16	Sh
10A	24/24	100%	SS	18-27 31-36	N=58	8		12.00	Sh

Depth ft. BGS — Lithologic Description — Borehole Detail — Elevation ft. MSL — Remarks

soil ...yish brown (10YR5/2), clayey SILT, trace sand

Light gray (10YR7/2), clayey SILT, trace sand

Light brownish gray (10YR6/2) with 15%yellowish brown (10YR5/6) mottles, lean CLAY, trace sand

Gray (10YR6/1) with 40% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand

Dark gray (10YR4/1), lean CLAY, trace sand and gravel

Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand and gravel

Yellowish brown (10YR5/6), silty SAND, trace gravel, wet

Yellowish brown (10YR5/8) with 30% light brownish gray (10YR6/2) mottles, sandy SILT, trace gravel

Dark gray (10YR4/1), sandy SILT, trace gravel

NOTE(S): MW13D installed in SB-13.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/9/2006
Finish: 5/9/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-13
Well ID: MW13D
Surface Elev: 623 ft. MSL
Completion: 55 ft. BGS
Station: 874,694.3N
2,513,929.9E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

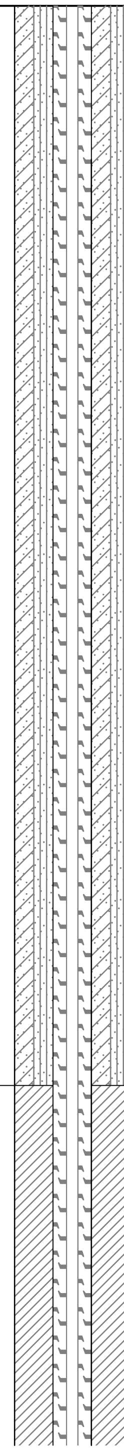
WATER LEVEL INFORMATION:
▼ = 12.40 - While drilling
▼ = 8.24 - MW12S on 6/1/06
▽ = 56.03 - MW13D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
11A	60/60 *100%*	CS		13		
12A	60/60 *100%*	CS				
13A	60/60 *100%*	CS		15		
14A	60/60 *100%*	CS		15		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
to 35	Dark gray (10YR4/1), sandy SILT, trace gravel *[Continued from previous page]*	to 588	
35–40	Dark gray (10YR4/1), lean CLAY, trace sand and gravel	588–583	

Depth scale: 22, 24, 26, 28, 30, 32, 34, 36, 38, 40
Elevation scale: 602, 600, 598, 596, 594, 592, 590, 588, 586, 584

Borehole Detail



NOTE(S): MW13D installed in SB-13.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/9/2006
Finish: 5/9/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler & 4¼" HSA overdrill

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-13
Well ID: MW13D
Surface Elev: 623 ft. MSL
Completion: 55 ft. BGS
Station: 874,694.3N
2,513,929.9E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.40 - While drilling
▼ = 8.24 - MW12S on 6/1/06
▽ = 56.03 - MW13D on 6/1/06

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										582	
	60/60 *100%*	CS					42			580	
15A				15			44			578	
							46	Dark gray (10YR4/1), lean CLAY, trace sand and gravel *[Continued from previous page]*		576	
	60/60 *100%*	CS					48			574	
16A				15			50			572	
17A	60/60 *100%*	CS		14			52	Gray (10YR4/1), silty, fine to medium SAND, wet			
17B				20				Gray (10YR4/1), sandy SILT		570	
17C				14							
							54	Dark greenish gray (5GY4/1) with 25% yellowish brown (10YR5/6) mottles, lean CLAY		568	
17D				22							

End of Boring = 55.0 ft. BGS

NOTE(S): MW13D installed in SB-13.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/9/2006
Finish: 5/9/2006
WEATHER: Overcast, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA (blind drill)

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-13a
Well ID: MW13S
Surface Elev: 623 ft. MSL
Completion: 17 ft. BGS
Station: 874,695.7N
2,513,925.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.00 - While drilling
▼ = 6.76 - MW13S on 6/1/06
▽ = 46.90 - MW12D on 6/1/06

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								soil yish brown (10YR5/2), clayey SILT, trace sand		622	
								Light gray (10YR7/2), clayey SILT, trace sand			
							2	Light brownish gray (10YR6/2) with 15%yellowish brown (10YR5/6) mottles, lean CLAY, trace sand			
							4	Gray (10YR6/1) with 40% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand		620, 618	
							6	Dark gray (10YR4/1), lean CLAY, trace sand and gravel			
							▼ 6.76, 8, 10, ▼ 12	Gray (10YR5/1) with 25% yellowish brown (10YR5/6) mottles, lean CLAY, trace sand and gravel		616, 614, 612	
							14	Yellowish brown (10YR5/6), silty SAND, trace gravel, wet		610, 608	
							16	Yellowish brown (10YR5/8) with 30% light brownish gray (10YR6/2) mottles, sandy SILT, trace gravel			
								Dark gray (10YR4/1), sandy SILT, trace gravel			

End of Boring = 16.62 ft. BGS
See SB-13 for sample & testing details

NOTE(S): MW13S installed in blind-drilled borehole within 10 ft of SB-13.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/1/2006
Finish: 5/2/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-14
Well ID: n/a
Surface Elev: 625 ft. MSL
Completion: 60 ft. BGS
Station: 875,740.0N
2,514,130.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 4.49 - MW14S on 6/1/06
▽ =

SAMPLE Number	Recov / Total (in) % Recovery	Type	Blows / 6 in N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) Failure Type
1A	23/24 96%	SS	2-3 2-3 N=5	16		
1B				26		2.33 B
2A	24/24 100%	SS	3-4 5-7 N=9	23		3.10 B
3A	23/24 96%	SS	3-3 5-5 N=8	19		2.33 B
4A	24/24 100%	SS	5-6 5-7 N=11	23		2.68 BSh
5A	24/24 100%	SS	2-2 3-4 N=5	26		1.83 B
6A	19/24 79%	SS	2-2 3-5 N=5	17		2.18 B
7A	20/24 83%	SS	2-3 3-3 N=6	22		1.16 B
8A	24/24 100%	SS	5-14 14-20 N=28	16		1.36 B
8B				11		5.77 BSh
9A	12/24 50%	SS	57-65	10		
10A	24/24 100%	SS	6-8 16-18 N=24	12		5.04 BSh

Depth ft. BGS | Lithologic Description | Borehole Detail | Elevation ft. MSL | Remarks

soil
Grayish brown (10YR5/2), clayey SILT, trace sand

Gray (10YR6/1) with 30% yellowish brown (10YR6/8) mottles, lean CLAY, trace sand

Light gray (10YR7/1) with 30% yellowish brown (10YR6/8) mottles, lean CLAY, trace sand

Light gray (10YR7/1) with 15% yellowish brown (10YR6/8) mottles, lean CLAY, trace sand

Yellowish brown (10YR5/8) with 50% light gray (10YR7/1) mottles, sandy CLAY

Yellowish brown (10YR5/6), silty, fine SAND, trace medium sand and gravel, wet

Yellowish brown (10YR5/6), sandy SILT, trace gravel

Yellowsh brown (10YR5/6) with 40% gray (10YR6/1) mottles, sandy SILT, trace gravel

Dark gray (10YR4/1), clayey SILT, trace sand and gravel

Depth scale (ft. BGS): 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Elevation scale (ft. MSL): 624, 622, 620, 618, 616, 614, 612, 610, 608, 606

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/1/2006
Finish: 5/2/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-14
Well ID: n/a
Surface Elev: 625 ft. MSL
Completion: 60 ft. BGS
Station: 875,740.0N
2,514,130.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 4.49 - MW14S on 6/1/06
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL
11A	24/24 *100%*	SS	*2-7 13-30* N=20	13		9.70 *B*	22	Dark gray (10YR4/1), clayey SILT, trace sand and gravel *[Continued from previous page]*	604
12A	24/24 *100%*	SS	*26-40 36-40* N=76	9		13.09 *BSP*	24		602
13A	24/24 *100%*	SS	*8-18 28-34* N=46	9		8.73 *BSP*	26		600
14A	22/24 *92%*	SS	*20-18 24-30* N=42	9		7.42 *BSP*	28		598
15A	19/24 *79%*	SS	*8-27 33-67* N=60	9			30		596
16A	24/24 *100%*	SS	*8-25 27-33* N=52	10		9.60 *BSh*	32		594
17A	20/24 *83%*	SS	*11-15 20-24* N=35	14		6.80 *B*	34		592
18A	24/24 *100%*	SS	*3-4 7-9* N=11	16		3.88 *B*	36	Dark gray (N4/1), lean CLAY, trace sand and gravel	590
19A	24/24 *100%*	SS	*8-12 13-15* N=25	16		6.18 *B*	38		588
20A	24/24 *100%*	SS	*3-7 10-13* N=17	14		3.10 *B*	40		586

Borehole Detail | Remarks

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/1/2006
Finish: 5/2/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-14
Well ID: n/a
Surface Elev: 625 ft. MSL
Completion: 60 ft. BGS
Station: 875,740.0N
2,514,130.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 4.49 - MW14S on 6/1/06
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
21A	23/24 *96%*	SS	*3-6 8-13* N=14	15		4.80 *B*	42	Dark gray (N4/1), lean CLAY, trace sand and gravel *[Continued from previous page]*	584	
22A	24/24 *100%*	SS	*13-15 16-18* N=31	14		5.62 *B*	44		582	
23A	24/24 *100%*	SS	*4-8 11-13* N=19	15		4.65 *B*	46		580	
24A	24/24 *100%*	SS	*18-18 20-20* N=38	15		4.65 *B*	48		578	
25A	24/24 *100%*	SS	*4-7 9-11* N=16	19		2.13 *BSh*	50	Dark gray (N4/1), clayey SILT, trace sand and gravel; Gray (N4/1), wet, loose, fine- to medium-grained SAND; Dark gray (N4/1), clayey SILT, trace sand and gravel	576	
26A	22/24 *92%*	SS	*3-5 6-8* N=11	22		3.30 *BSh*	52	Greenish gray (5BG5/1), lean CLAY	574	
27A	24/24 *100%*	SS	*3-5 5-7* N=10	25		2.89 *BSh*	54	Greenish gray (5BG5/1) with 15% yellowish brown (10YR5/6) mottles, lean CLAY	572	
28A	21/24 *88%* 0/24 *0%*	SS SH	*4-6 7-8* N=13	22		3.71 *BSh*	56	Greenish gray (5BG5/1) with 25% yellowish brown (10YR5/6) mottles, lean CLAY	570	
29A	14/24 *58%*	SS	*0-0 0-0* N=0	22		3.09 *BSh*	58	Greenish gray (5BG5/1) with 50% yellowish brown (10YR5/6) mottles, lean CLAY	568	
30A	22/24 *92%*	SS	*5-6 8-12* N=14	19		4.46 *BSh*	60	Yellowish brown (10YR4/6) with 10% greenish gray (5BG5/1) mottles, lean CLAY **End of Boring = 60.0 ft. BGS**	566	

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/2/2006
Finish: 5/2/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: Sb-14a
Well ID: MW14S
Surface Elev: 625 ft. MSL
Completion: 17 ft. BGS
Station: 875,737.8N
2,514,125.9E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - While drilling
▼ = 4.49 - MW14S on 6/1/06
▽ =

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0–1.2	soil Grayish brown (10YR5/2), clayey SILT, trace sand		624	
							1.2–2	Gray (10YR6/1) with 30% yellowish brown (10YR6/8) mottles, lean CLAY, trace sand			
							2–4	Light gray (10YR7/1) with 30% yellowish brown (10YR6/8) mottles, lean CLAY, trace sand		622	
							4–10 (▼ 4.49)	Light gray (10YR7/1) with 15% yellowish brown (10YR6/8) mottles, lean CLAY, trace sand		620, 618, 616	
							10–14	Yellowish brown (10YR5/8) with 50% light gray (10YR7/1) mottles, sandy CLAY		614, 612	
							14 (▼ 14.00)	Yellowish brown (10YR5/6), silty, fine SAND, trace medium sand and gravel, wet			
							–16	Yellowish brown (10YR5/6), sandy SILT, trace gravel		610	
							16–17.38	Yellowsh brown (10YR5/6) with 40% gray (10YR6/1) mottles, sandy SILT, trace gravel		608	

End of Boring = 17.38 ft. BGS
See SB-14 for sample & testing details

NOTE(S): MW14S installed in blind-drilled borehole within 10 ft of SB-14.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/24/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (lo-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-15
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 84 ft. BGS
Station: 875,970.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.40 - While drilling
▼ = 4.99 - MW15S on 6/1/06
▽ = 5.24 - MW15D on 6/1/06

SAMPLE: Number	Recov / Total (in) / *% Recovery*	Type	TESTING: *Blows / 6 in* / N - Value / **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) / *Failure Type*
1A	24/24 *100%*	SS	*2-2 3-4* N=5	19		
1B				27		1.94 *B*
2A	24/24 *100%*	SS	*2-2 4-6* N=6	25		3.10 *B*
3A	20/24 *83%*	SS	*2-3 3-5* N=6	29		2.10 *B*
4A	24/24 *100%*	SS	*4-6 5-5* N=11	24		1.75 *B*
5A	22/24 *92%*	SS	*1-2 3-4* N=5	26		1.55 *B*
6A	22/24 *92%*	SS	*2-3 3-4* N=6	22		1.85 *B*
	19/24 *79%*	SH				
7A	24/24 *100%*	SS	*4-4 5-5* N=9	23		1.22 *B*
7B				17		
8A	21/24 *88%*	SS	*2-6 15-19* N=21	11		3.22 *BSP*
9A	24/24 *100%*	SS	*18-29 40-50* N=69	20		
9B				21		
9C				9		
10A	17/24 *71%*	SS	*11-43 59/5"*	7		7.42 *B*

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
	soil — Dark brown (10YR3/3), clayey SILT		
	Dark grayish brown (10YR3/2), clayey SILT, trace sand		
2	Grayish brown (10YR5/2), with 50% very dark gray (10YR3/1) mottles, lean CLAY, trace sand	622	
	Gray (10YR6/1), lean CLAY, trace sand		
4	loess — Yellowish brown (10YR5/6) with 40% gray (10YR6/1) mottles, lean CLAY, trace sand	620	
6	Gray (10YR6/1), lean CLAY, trace sand	618	
8	Gray (10YR6/1) with 50% yellowish brown (10YR5/6) mottles, lean CLAY, little sand, trace gravel	616	
10		614	
12		612	Shelby tube taken from shallow well borehole at indicated depth.
	hagarstown — ...R6/1) with 30% yellowish brown (10YR5/6) mottles, silty, fine to medium SAND, trace coarse sand and gravel, wet	610	
14	Pale brown (10YR6/3), clayey SILT, little sand, trace gravel		
16	Yellowish brown (10YR5/4), silty, fine to coarse SAND, wet	608	
	Yellowish brown (10YR5/4) silty fine SAND, wet		
	Gray (10YR6/1), sandy SILT, trace medium to coarse sand and trace gravel	606	
18	vandalia — Dark gray (10YR4/1), clayey SILT, little sand, trace gravel		
20		604	

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/24/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (lo-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-15
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 84 ft. BGS
Station: 875,970.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.40 - While drilling
▼ = 4.99 - MW15S on 6/1/06
▽ = 5.24 - MW15D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	14/24 *58%*	SS	*14-55 45/2"*	8			22			602	
12A	8/24 *33%*	SS	*100/8"*	8		6.76 *SP*	24			600	
13A	23/24 *96%*	SS	*12-28 43-57/5"* N=71	5			26			598	
14A	8/24 *33%*	SS	*59-41/2"*	6		7.95 *BSh*	28	Dark gray (10YR4/1), clayey SILT, little sand, trace gravel *[Continued from previous page]*		596	
15A	16/24 *67%*	SS	*11-26 74/4"*	12		4.74 *BSh*	30			594	
16A	12/24 *50%*	SS	*39-61*	7			32			592	
17A	10/24 *42%*	SS	*49-51/4"*	9		5.43 *B*	34			590	
18A	11/24 *46%*	SS	*100-95*	11			36	mulberry grove		588	
19A	8/24 *33%*	SS	*61-39/2"*	10			38	Dark gray (10YR4/1), silty, fine to medium SAND, trace coarse sand and gravel, wet		586	
20A	24/24 *100%*	SS	*21-41 21-24* N=62	12		16.00 *None*		Very dark gray (10YR3/1), clayey SILT, little sand, trace gravel			
20B				13		9.38	40	Very dark gray (10YR3/1) with 20% dark grayish brown (10YR4/2) mottles, clayey SILT, trace sand and gravel		584	

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/24/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (lo-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-15
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 84 ft. BGS
Station: 875,970.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.40 - While drilling
▼ = 4.99 - MW15S on 6/1/06
▽ = 5.24 - MW15D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
						BSh
21A	22/24 *92%*	SS	*3-7 11-18* N=18	19		6.11 *BSh*
22A	24/24 *100%*	SS	*4-7 8-10* N=15	23		4.46 *B*
23A	24/24 *100%*	SS	*3-6 6-10* N=12	21		
23B				16		3.69 *B*
24A	24/24 *100%*	SS	*10-12 10-15* N=22	16		4.58 *B*
25A	24/24 *100%*	SS	*2-4 7-9* N=11	16		4.65 *B*
26A	19/24 *79%*	SS	*3-5 7-13* N=12	21		3.88 *B*
27A	24/24 *100%*	SS	*8-10 8-13* N=18	25		3.49 *BSh*
28A	24/24 *100%*	SS	*4-5 8-12* N=13	22		3.49 *BSh*
29A	24/24 *100%*	SS	*5-9 15-18* N=24	20		
30A	24/24 *100%*	SS	*8-9 14-18* N=23	18		5.82 *BSh*

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
to 42	smithboro Dark gray (10YR4/1), clayey SILT, trace sand and gravel	582	
42 – 44	Dark greenish gray (5GY4/1) with 30% dark gray (N4/1) mottles, lean CLAY, trace sand	580	
44 – 52	Dark gray (N4/1), lean CLAY, trace sand and gravel	578, 576, 574, 572	
52 – 54	yarmouth Dark yellowish brown (10YR3/4) with 50% dark grayish brown (10YR4/2) mottles, lean CLAY, trace sand and gravel	570	
54 – 58	lierle Greenish gray (10YR5/1) with 20% dark yellowish brown (10YR4/4) mottles, lean CLAY, trace sand and gravel	568, 566	
58 – 60	banner Olive (5Y4/3) with 15% greenish gray (10GY5/1) mottles, lean CLAY, trace sand and gravel	564	

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/24/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (lo-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS sampler

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-15
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 84 ft. BGS
Station: 875,970.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.40 - While drilling
▼ = 4.99 - MW15S on 6/1/06
▽ = 5.24 - MW15D on 6/1/06

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
31A	24/24 *100%*	SS	*4-7* *13-15* N=20	18		5.42 *BSh*	62	Olive (5Y4/3) with 15% greenish gray (10GY5/1) mottles, lean CLAY, trace sand and gravel *[Continued from previous page]*	562	
32A	24/24 *100%*	SS	*10-15* *11-16* N=26	20		4.74 *BSh*	64		560	
33A	24/24 *100%*	SS	*6-10* *11-13* N=21	16		6.98 *BSh*	66	Greenish gray (10Y5), lean CLAY, trace sand and gravel	558	
34A	24/24 *100%*	SS	*11-14* *18-31* N=32	18		6.98 *BSh*	68	Dark yellowish brown (10YR4/4), lean CLAY, trace sand and gravel	556	
35A	23/24 *96%*	SS	*9-18* *27-40* N=45	15		11.95 *BSh*	70		554	
36A	24/24 *100%*	SS	*4-12* *18-24* N=30	16		7.15 *BSh*	72		552	
37A	24/24 *100%*	SS	*17-29* *36-47* N=65	17		8.24 *BSh*	74		550	
38A	20/24 *83%*	SS	*12-18* *23-28* N=41	17		6.59 *BSh*	76		548	
39A	9/24 *38%*	SS	*29-39* *48-66* N=87	16			78		546	
40A	24/24 *100%*	SS	*5-9* *13-18* N=22	18		6.21 *B*	80		544	

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station	**CONTRACTOR:** Testing Service Corporation		
Site: CCB Management Facility	**Rig mfg/model:** CME-650 Track Rig	**BOREHOLE ID:** SB-15	
Location: Coffeen, Illinois	**Drilling Method:** 3¼" HSA w/SS sampler	**Well ID:** n/a	
Project: 05S3004A		**Surface Elev:**	624 ft. MSL
DATES: Start: 4/24/2006	**FIELD STAFF: Driller:** B. Williamson	**Completion:**	84 ft. BGS
Finish: 4/25/2006	**Helper:** R. Keedy	**Station:**	875,970.0N
WEATHER: Overcast, cool (lo-50's)	**Eng/Geo:** R. Hasenyager		2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.40 - While drilling
▼ = 4.99 - MW15S on 6/1/06
▽ = 5.24 - MW15D on 6/1/06

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
41A	24/24 *100%*	SS	*6-8 13-16* N=21	17		5.82 *B*	82	Dark yellowish brown (10YR4/4), lean CLAY, trace sand and gravel *[Continued from previous page]*		542	
42A	24/24 *100%*	SS	*18-28 25-25* N=53	18		5.82 *BSh*	84			540	

End of Boring = 84.0 ft. BGS

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/25/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (lo-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-15a
Well ID: MW15S
Surface Elev: 624 ft. MSL
Completion: 20 ft. BGS
Station: 875,971.1N
2,515,076.3E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.40 - While drilling
▼ = 4.99 - MW15S on 6/1/06
▽ = 5.24 - MW15D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0	soil — Dark brown (10YR3/3), clayey SILT		624	
								Dark grayish brown (10YR3/2), clayey SILT, trace sand			
							2	Grayish brown (10YR5/2), with 50% very dark gray (10YR3/1) mottles, lean CLAY, trace sand		622	
								Gray (10YR6/1), lean CLAY, trace sand			
							4			620	
								Yellowish brown (10YR5/6) with 40% gray (10YR6/1) mottles, lean CLAY, trace sand			
							6			618	
								Gray (10YR6/1), lean CLAY, trace sand			
							8			616	
							10	Gray (10YR6/1) with 50% yellowish brown (10YR5/6) mottles, lean CLAY, little sand, trace gravel		614	
							12			612	
							14	Gray (10YR6/1) with 30% yellowish brown (10YR5/6) mottles, silty, fine to medium SAND, trace coarse sand and gravel, wet		610	
								Pale brown (10YR6/3), clayey SILT, little sand, trace gravel			
							16	Yellowish brown (10YR5/4), silty, fine to coarse SAND, wet		608	
								Yellowish brown (10YR5/4) silty fine SAND, wet			
							18	Gray (10YR6/1), sandy SILT, trace medium to coarse sand and trace gravel		606	
								Dark gray (10YR4/1), clayey SILT, little sand, trace gravel			
								See SB-15 for sample & testing details			
								End of Boring = 19.62 ft. BGS			

NOTE(S): MW15S installed in blind-drilled borehole within 10 ft of SB-15.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/24/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (lo-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-15b
Well ID: MW15D
Surface Elev: 624 ft. MSL
Completion: 39 ft. BGS
Station: 875,970.5N
2,515,080.7E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.40 - While drilling
▼ = 4.99 - MW15S on 6/1/06
▽ = 5.24 - MW15D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								soil — Dark brown (10YR3/3), clayey SILT			
								Dark grayish brown (10YR3/2), clayey SILT, trace sand			
							2	Grayish brown (10YR5/2), with 50% very dark gray (10YR3/1) mottles, lean CLAY, trace sand		622	
								Gray (10YR6/1), lean CLAY, trace sand			
							4			620	
								Yellowish brown (10YR5/6) with 40% gray (10YR6/1) mottles, lean CLAY, trace sand			
							6			618	
								Gray (10YR6/1), lean CLAY, trace sand			
							8			616	
							10			614	
								Gray (10YR6/1) with 50% yellowish brown (10YR5/6) mottles, lean CLAY, little sand, trace gravel			
							12			612	
								Gray (10YR6/1) with 30% yellowish brown (10YR5/6) mottles, silty, fine to medium SAND, trace coarse sand and gravel, wet		610	
							14				
								Pale brown (10YR6/3), clayey SILT, little sand, trace gravel			
							16	Yellowish brown (10YR5/4), silty, fine to coarse SAND, wet		608	
								Yellowish brown (10YR5/4) silty fine SAND, wet			
								Gray (10YR6/1), sandy SILT, trace medium to coarse sand and trace gravel		606	
							18				
								Dark gray (10YR4/1), clayey SILT, little sand, trace gravel			
							20			604	

NOTE(S): MW15D installed in blind-drilled borehole within 10 ft of SB-15.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/24/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (lo-50's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-15b
Well ID: MW15D
Surface Elev: 624 ft. MSL
Completion: 39 ft. BGS
Station: 875,970.5N
2,515,080.7E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.40 - While drilling
▼ = 4.99 - MW15S on 6/1/06
▽ = 5.24 - MW15D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							to 36	Dark gray (10YR4/1), clayey SILT, little sand, trace gravel *[Continued from previous page]*			
							36–38	Dark gray (10YR4/1), silty, fine to medium SAND, trace coarse sand and gravel, wet			
							38–38.8	Very dark gray (10YR3/1), clayey SILT, little sand, trace gravel			

Depth scale: 22, 24, 26, 28, 30, 32, 34, 36, 38
Elevation scale: 602, 600, 598, 596, 594, 592, 590, 588, 586

End of Boring = 38.80 ft. BGS
See SB-15 for sample & testing details

NOTE(S): MW15D installed in blind-drilled borehole within 10 ft of SB-15.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/21/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (mid-40's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-16
Well ID: n/a
Surface Elev: 626 ft. MSL
Completion: 92 ft. BGS
Station: 877,355.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 5.74 - MW16S on 6/1/06
▽ = 51.37 - MW16D on 6/1/06

SAMPLE / TESTING

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*
1A	21/24 *88%*	SS	*4-4 6-7* N=10	22		
1B				29		2.13 *B*
2A	24/24 *100%*	SS	*4-6 7-9* N=13	25		2.13 *B*
3A	20/24 *83%*	SS	*3-4 5-7* N=9	21		2.33 *B*
4A	24/24 *100%*	SS	*2-3 4-6* N=7	25		2.13 *B*
5A	24/24 *100%*	SS	*3-4 5-5* N=9	24		2.33 *B*
6A	24/24 *100%* 24/24 *100%*	SS SH	*2-4 4-5* N=8	24		1.75 *B*
7A	24/24 *100%*	SS	*4-7 7-7* N=14	22		1.94 *BSh*
7B				18		
8A	21/24 *88%*	SS	*1-2 2-4* N=4	20		
9A	18/24 *75%*	SS	*4-3 4-10* N=7	14		
9B				15		
10A				10		
10B	20/24 *83%*	SS	*27-54 59-59* N=113	17		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0	soil (10YR2/1), sl. moist, firm, clayey SILT with trace sand and trace gravel.	626	
2	Brown (10YR4/3), sl. moist, firm, silty CLAY with trace sand.	624	
4	Gray (10YR5/1) with 25% yellowish brown (10YR5/8) mottles, moist, very soft, very silty CLAY with trace sand.	622	
6	Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, very soft, very silty CLAY with trace sand.	620	
8	Gray (10YR5/1) with 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with some sand and trace gravel.	618	
10		616	Shelby tube taken from shallow well borehole at indicated depth.
12	Dark yellowish brown (10YR4/6), wet, sl. dense, silty, very fine- to fine-grained SAND.	614	
14	Dark yellowish brown (10YR4/6), moist, firm, silty CLAY with sand and trace gravel.	612	
	Dark yellowish brown (10YR4/6), wet, loose, silty, very fine- to fine-grained SAND.		
	Dark yellowish brown (10YR4/6), wet, soft, silty CLAY with sand and trace gravel.		
16	Yellowish brown (10YR5/6), wet, loose, very fine- to very coarse-grained SAND.	610	
	Gray (10YR5/1), wet, loose, fine- to medium-grained SAND.		
18	Gray (10YR5/1), moist, hard, clayey SILT with sand and trace gravel.	608	
	Gray (10YR5/1), wet, loose, very fine- to fine-grained SAND.		
20	Gray (10YR4/1), moist, very hard, clayey, sandy SILT with trace gravel.		

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/21/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (mid-40's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-16
Well ID: n/a
Surface Elev: 626 ft. MSL
Completion: 92 ft. BGS
Station: 877,355.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 5.74 - MW16S on 6/1/06
▽ = 51.37 - MW16D on 6/1/06

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
11A	10/24 *42%*	SS	*10-96*	8					606	
	14/24 *58%*	SS	*84-132*				22		604	
12A				10		3.10 *BSh*				
13A				10		7.56 *B*	24		602	
	20/24 *83%*	SS	*41-68* *82* N=150							
							26		600	
14A	12/24 *50%*	SS	*58-119*	10		9.89 *B*				Dusky red (7.5YR3/4) staining.
							28		598	
	24/24 *100%*	SS	*30-48* *70-71* N=118							
15A				9		5.62 *B*				
							30	Gray (10YR4/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*	596	
	24/24 *100%*	SS	*50-54* *68-93* N=122							
16A				9						
							32		594	
17A				17						
	35/36 *97%*	CS								
							34		592	
							36		590	
	60/60 *100%*	CS								
18A				10			38		588	
							40			Wood fragments.

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/21/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (mid-40's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-16
Well ID: n/a
Surface Elev: 626 ft. MSL
Completion: 92 ft. BGS
Station: 877,355.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 5.74 - MW16S on 6/1/06
▽ = 51.37 - MW16D on 6/1/06

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
									586	
19A				19				Gray (10YR5/1) with 50% black (10YR2/1) varves, very moist, soft SILT.		
	60/60 *100%*	CS					42	Gray (10YR4/1), moist, very hard, clayey, sandy SILT with trace gravel.	584	
							44		582	
19B				11						
							46	Very dark greenish gray (10Y3/1), moist, hard, silty CLAY with sand and trace gravel.	580	
20A	60/60 *100%*	CS		13			48		578	
	24/24 *100%*	SS	*6-14* *18-22* N=32				50		576	
21A				19		1.94 *B*	▽			
	0/48 *0%*	CS					52	Very dark bluish gray (5BG3/1), moist, firm, silty CLAY with trace sand and trace gravel.	574	Possible rock at end of auger.
							54		572	
	24/24 *100%*	SS	*2-7* *7-15* N=14				56		570	
22A				21		3.71 *BSh*		Greenish gray (5G6/1) with 40% yellowish brown (10YR5/6) mottles, moist, hard, silty CLAY with sl. trace sand.		
	24/24 *100%*	SS	*4-8* *11-13* N=19				58		568	
23A	0/12 *0%*	BD		26		2.13 *BSh*	60			

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/21/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (mid-40's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-16
Well ID: n/a
Surface Elev: 626 ft. MSL
Completion: 92 ft. BGS
Station: 877,355.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 5.74 - MW16S on 6/1/06
▽ = 51.37 - MW16D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
	0/48 *0%*	RC					62	Greenish gray (5G6/1) with 40% yellowish brown (10YR5/6) mottles, moist, hard, silty CLAY with sl. trace sand. *[Continued from previous page]*	566, 564	
26A	24/24 *100%*	SS	*32-34 42-51* N=76	25		2.72 *BSh*	64	Yellowish brown (10YR5/6) with 20% greenish gray (5G6/1) mottles, moist, hard, silty CLAY with trace sand and trace coal fragments.	562	
	0/24 *0%*	RC					66		560	
	24/24 *100%*	SS	*15-21 21-21* N=42				68		558	
28A				18		2.72 *BSh*				
	24/24 *100%*	SS	*14-17 21-25* N=38				70	Yellowish brown (10YR5/6) with zones of gray (10YR4/1) mottles, moist, hard, clayey SILT with some sand and trace gravel.	556	70' to 79.5' - possible oxidation rinds.
29A				20		2.91 *BSh*				
	24/24 *100%*	SS	*12-21 34-35* N=55				72		554	
30A				18		5.04 *BSh*				
	24/24 *100%*	SS	*16-21 27-35* N=48				74		552	
31A				16		8.15 *BSh*				
							76		550	
	60/60 *100%*	CS					78		548	
32A				19			80			

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/21/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (mid-40's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-16
Well ID: n/a
Surface Elev: 626 ft. MSL
Completion: 92 ft. BGS
Station: 877,355.0N
2,515,080.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 5.74 - MW16S on 6/1/06
▽ = 51.37 - MW16D on 6/1/06

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
	60/60 *100%*	CS					80–82.4	Yellowish brown (10YR5/6) with zones of gray (10YR4/1) mottles, moist, hard, clayey SILT with some sand and trace gravel. *[Continued from previous page]*	546–544	
33A				16			82.4–86.5	Yellow brown (10YR5/6), very moist, very soft, clayey, very fine-grained SAND and SILT.		
	0/60 *0%*	CS					86.5–90.5	Yellowish brown (10YR5/6), moist, hard, silty CLAY with sand and trace gravel.		Possible rock at end of auger.
35A	24/24 *100%*	SS	*9* *11-16* N=20			2.72 *BSh*	90.5–92	Dark gray (10YR3/1), moist, firm, silty CLAY with sand and trace gravel.		

End of Boring = 92.0 ft. BGS

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/25/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (mid-40's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-16a
Well ID: MW16S
Surface Elev: 626 ft. MSL
Completion: 20 ft. BGS
Station: 877,355.1N
2,515,088.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 5.74 - MW16S on 6/1/06
▽ = 51.37 - MW16D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								soil (10YR2/1), sl. moist, firm, clayey SILT with trace sand and trace gravel.			
							2	Brown (10YR4/3), sl. moist, firm, silty CLAY with trace sand.		624	
							4	Gray (10YR5/1) with 25% yellowish brown (10YR5/8) mottles, moist, very soft, very silty CLAY with trace sand.		622	
							6	Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, very soft, very silty CLAY with trace sand.		620	
							8, 10, 12	Gray (10YR5/1) with 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with some sand and trace gravel.		618, 616, 614	
								Dark yellowish brown (10YR4/6), wet, sl. dense, silty, very fine- to fine-grained SAND.			
							14	Dark yellowish brown (10YR4/6), moist, firm, silty CLAY with sand and trace gravel.		612	
								Dark yellowish brown (10YR4/6), wet, loose, silty, very fine- to fine-grained SAND.			
							16	Dark yellowish brown (10YR4/6), wet, soft, silty CLAY with sand and trace gravel.		610	
								Yellowish brown (10YR5/6), wet, loose, very fine- to very coarse-grained SAND.			
								Gray (10YR5/1), wet, loose, fine- to medium-grained SAND.			
							18	Gray (10YR5/1), moist, hard, clayey SILT with sand and trace gravel.		608	
								Gray (10YR5/1), wet, loose, very fine- to fine-grained SAND.			
								Gray (10YR4/1), moist, very hard, clayey, sandy SILT with trace gravel.			

End of Boring = 19.90 ft. BGS
See SB-16 for sample & testing details

NOTE(S): MW16S installed in blind-drilled borehole within 10 ft of SB-16.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/21/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (mid-40's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-16b
Well ID: MW16D
Surface Elev: 626 ft. MSL
Completion: 51 ft. BGS
Station: 877,354.9N
2,515,079.4E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 5.74 - MW16S on 6/1/06
▽ = 51.37 - MW16D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0–1	soil (10YR2/1), sl. moist, firm, clayey SILT with trace sand and trace gravel.		626	
							1–2.7	Brown (10YR4/3), sl. moist, firm, silty CLAY with trace sand.		624	
							2.7–6	Gray (10YR5/1) with 25% yellowish brown (10YR5/8) mottles, moist, very soft, very silty CLAY with trace sand.		622	
							6–7.3	Gray (10YR5/1) with 15% dark yellowish brown (10YR4/6) mottles, moist, very soft, very silty CLAY with trace sand.		620	
							7.3–12.8	Gray (10YR5/1) with 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with some sand and trace gravel.		618, 616, 614	
							12.8–13.8	Dark yellowish brown (10YR4/6), wet, sl. dense, silty, very fine- to fine-grained SAND.			
							13.8–14.3	Dark yellowish brown (10YR4/6), moist, firm, silty CLAY with sand and trace gravel.		612	
							14.3–14.9	Dark yellowish brown (10YR4/6), wet, loose, silty, very fine- to fine-grained SAND.			
							14.9–16.2	Dark yellowish brown (10YR4/6), wet, soft, silty CLAY with sand and trace gravel.		610	
							16.2–17	Yellowish brown (10YR5/6), wet, loose, very fine- to very coarse-grained SAND.			
							17–17.8	Gray (10YR5/1), wet, loose, fine- to medium-grained SAND.			
							17.8–18.4	Gray (10YR5/1), moist, hard, clayey SILT with sand and trace gravel.		608	
							18.4–19.4	Gray (10YR5/1), wet, loose, very fine- to fine-grained SAND.			
							19.4–20	Gray (10YR4/1), moist, very hard, clayey, sandy SILT with trace gravel.			

NOTE(S): MW16D installed in blind-drilled borehole within 10 ft of SB-16.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/21/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (mid-40's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-16b
Well ID: MW16D
Surface Elev: 626 ft. MSL
Completion: 51 ft. BGS
Station: 877,354.9N
2,515,079.4E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 5.74 - MW16S on 6/1/06
▽ = 51.37 - MW16D on 6/1/06

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
										606	
							22			604	
							24			602	
							26			600	
							28			598	
							30	Gray (10YR4/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*		596	
							32			594	
							34			592	
							36			590	
							38			588	
							40				

NOTE(S): MW16D installed in blind-drilled borehole within 10 ft of SB-16.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 4/21/2006
Finish: 4/25/2006
WEATHER: Overcast, cool (mid-40's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-850 Track Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-16b
Well ID: MW16D
Surface Elev: 626 ft. MSL
Completion: 51 ft. BGS
Station: 877,354.9N
2,515,079.4E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.80 - While drilling
▼ = 5.74 - MW16S on 6/1/06
▽ = 51.37 - MW16D on 6/1/06

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Gray (10YR5/1) with 50% black (10YR2/1) varves, very moist, soft SILT.		586	
							42	Gray (10YR4/1), moist, very hard, clayey, sandy SILT with trace gravel.		584	
							44			582	
							46	Very dark greenish gray (10Y3/1), moist, hard, silty CLAY with sand and trace gravel.		580	
							48			578	
							50	Very dark bluish gray (5BG3/1), moist, firm, silty CLAY with trace sand and trace gravel.		576	

End of Boring = 51.00 ft. BGS
See SB-16 for sample & testing details

NOTE(S): MW16D installed in blind-drilled borehole within 10 ft of SB-16.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/4/2006
Finish: 5/4/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-17
Well ID: MW17D
Surface Elev: 627 ft. MSL
Completion: 54 ft. BGS
Station: 878,659.0N
2,515,090.4E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.70 - While drilling
▼ = 6.89 - MW17S on 6/1/06
▽ = 54.45 - MW17D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	Blows / 6 in N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*
1A	20/24 *83%*	SS	*1-1 1-1* N=2	29		
2A	24/24 *100%*	SS	*1-1 2-2* N=3	26		1.71 *None*
3A	24/24 *100%*	SS	*1-1 1-3* N=2	16		2.62 *BSh*
4A	24/24 *100%*	SS	*1-2 2-3* N=4	18		2.33 *B*
5A	24/24 *100%*	SS	*1-1 2-3* N=3	18		
6A	24/24 *100%*	SS	*1-1 1-1* N=2	21		0.58 *B*
6B				18		
7A	24/24 *100%*	SS	*1-1 3-7* N=4	21		
7B				19		
8A	24/24 *100%*	SS	*2-5 5-7* N=10	15		
8B				13		
8C				13		
9A	24/24 *100%*	SS	*0-6 6-6* N=12	17		
10A	24/24 *100%*	SS	*0-2 2-3* N=4	19		
10B				23		

Depth ft. BGS: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

Elevation ft. MSL: 626, 624, 622, 620, 618, 616, 614, 612, 610, 608

Lithologic Description

soil grayish brown (10YR4/2), moist, soft, clayey SILT with trace sand and trace gravel.

Yellowish brown (10YR5/8), moist, soft, silty CLAY.

Gray (10YR5/1) with 40% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY with little sand and trace gravel.

Yellowish brown (10YR5/6) with 10% gray (10YR5/1) mottles, moist, firm sandy, clayey SILT.

Yellowish brown (10YR5/6) with 30% gray (10YR5/1) mottles, moist, firm sandy, clayey SILT.

Yellowish brown (10YR5/6), moist, soft, very sandy, clayey SILT.

Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, very moist, soft, very sandy, clayey SILT.

Moderate yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND.

Yellowish brown (10YR5/6), wet, dense, silty, very fine- to fine-grained SAND.

Yellowish brown (10YR5/6), very moist, dense, silty, very fine-grained SAND.

Yellowish brown (10YR5/6) wet, dense, fine- to medium-grained SAND.

Moderate yellowish brown (10YR5/4), wet, dense, SILT and very fine-grained SAND.

Yellowish brown (10YR5/6), moist, clayey SILT and very fine-grained SAND with trace gravel.

Yellowish brown (10YR5/6), wet, loose, very fine- to medium-grained SAND.

Yellowish brown (10YR5/6), wet, loose, very fine- to fine-grained SAND.

Yellowish brown (10YR5/6), wet, sl. dense, SILT with some very fine-grained SAND.

Gray (10YR5/1), wet, sl. dense, SILT with some very

Borehole Detail | Remarks

NOTE(S): CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/4/2006
Finish: 5/4/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-17
Well ID: MW17D
Surface Elev: 627 ft. MSL
Completion: 54 ft. BGS
Station: 878,659.0N
2,515,090.4E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.70 - While drilling
▼ = 6.89 - MW17S on 6/1/06
▽ = 54.45 - MW17D on 6/1/06

Number	Recov / Total (in) % Recovery	Type	Blows / 6 in N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
								fine-grained SAND.		
11A	12/24 *50%*	SS	*0-1* *1-2* N=2	21				Yellowish brown (10YR5/6), wet, loose, very fine- to fine-grained SAND.	606	
							22			
12A	24/24 *100%*	SS	*2-2* *5-7* N=7	18				Gray (10YR5/1), wet, loose, very fine- to fine-grained SAND.	604	
12B				9		4.65 *BSh*	24			
									602	
	25/60 *42%*	CS					26			
									600	
13A							28			
									598	
							30	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.		
	60/60 *100%*	CS							596	
14A				9			32			
									594	
							34			
									592	
	60/60 *100%*	CS					36			
15A				16				Gray (10YR5/1), wet, dense, very fine- to fine-grained SAND.	590	
							38			
15B				8				Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.	588	
							40			

NOTE(S): CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station	**CONTRACTOR:** Reynolds Drilling Corp.		
Site: CCB Management Facility	**Rig mfg/model:** CME-1050 ATV Rig	**BOREHOLE ID:** SB-17	
Location: Coffeen, Illinois	**Drilling Method:** 4¼" HSA w/SS & CME samplers	**Well ID:**	MW17D
Project: 05S3004A		**Surface Elev:**	627 ft. MSL
DATES: Start: 5/4/2006	**FIELD STAFF: Driller:** K. Doetzel	**Completion:**	54 ft. BGS
Finish: 5/4/2006	**Helper:** S. McCartney	**Station:**	878,659.0N
WEATHER: Partly sunny, cool (mid-50's)	**Eng/Geo:** R. Hasenyager		2,515,090.4E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.70 - While drilling
▼ = 6.89 - MW17S on 6/1/06
▽ = 54.45 - MW17D on 6/1/06

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
	48/60 *80%*	CS							586	
							42			
16A				14						
16B				8					584	
							44		582	
							46	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*		
	60/60 *100%*	CS							580	
17A				13			48			
									578	
							50			
	60/60 *100%*	CS							576	
18A				22				Dark bluish gray (10BG4/1), moist, hard, silty CLAY with little sand.		
18B				16			52	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.		
18C				11				Gray (10YR5/1), moist, firm, silty, very fine-grained to fine-grained SAND.	574	
								Dark bluish gray (10BG4/1), moist, hard, silty CLAY with little sand.		

End of Boring = 53.87 ft.

NOTE(S): CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/4/2006
Finish: 5/4/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-17a
Well ID: MW17S
Surface Elev: 627 ft. MSL
Completion: 24 ft. BGS
Station: 878,658.5N
2,515,084.8E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.70 - While drilling
▼ = 6.89 - MW17S on 6/1/06
▽ = 54.45 - MW17D on 6/1/06

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								soil grayish brown (10YR4/2), moist, soft, clayey SILT with trace sand and trace gravel.			
								Yellowish brown (10YR5/8), moist, soft, silty CLAY.		626	
							2				
								Gray (10YR5/1) with 40% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY with little sand and trace gravel.		624	
							4				
								Yellowish brown (10YR5/6) with 10% gray (10YR5/1) mottles, moist, firm sandy, clayey SILT.		622	
							6				
							▼			620	
							8	Yellowish brown (10YR5/6) with 30% gray (10YR5/1) mottles, moist, firm sandy, clayey SILT.			
										618	
							10	Yellowish brown (10YR5/6), moist, soft, very sandy, clayey SILT.			
								Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, very moist, soft, very sandy, clayey SILT.		616	
							▼				
							12	Moderate yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND.			
								Yellowish brown (10YR5/6), wet, dense, silty, very fine- to fine-grained SAND.		614	
								Yellowish brown (10YR5/6), very moist, dense, silty, very fine-grained SAND.			
							14	Yellowish brown (10YR5/6) wet, dense, fine- to medium-grained SAND.			
								Moderate yellowish brown (10YR5/4), wet, dense, SILT and very fine-grained SAND.		612	
								Yellowish brown (10YR5/6), moist, clayey SILT and very fine-grained SAND with trace gravel.			
							16				
								Yellowish brown (10YR5/6), wet, loose, very fine- to medium-grained SAND.		610	
							18				
								Yellowish brown (10YR5/6), wet, loose, very fine- to fine-grained SAND.			
								Yellowish brown (10YR5/6), wet, sl. dense, SILT with some very fine-grained SAND.		608	
							20	Gray (10YR5/1), wet, sl. dense, SILT with some very			

NOTE(S): MW17S installed in blind-drilled borehole within 10 ft of SB-17.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/4/2006
Finish: 5/4/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA (blind drill)

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-17a
Well ID: MW17S
Surface Elev: 627 ft. MSL
Completion: 24 ft. BGS
Station: 878,658.5N
2,515,084.8E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 2, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 11.70 - While drilling
▼ = 6.89 - MW17S on 6/1/06
▽ = 54.45 - MW17D on 6/1/06

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								fine-grained SAND.			
							22	Yellowish brown (10YR5/6), wet, loose, very fine- to fine-grained SAND.		606	
								Gray (10YR5/1), wet, loose, very fine- to fine-grained SAND.		604	
							24	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.			

End of Boring = 24.11 ft. BGS
See SB-17 for sample & testing details

NOTE(S): MW17S installed in blind-drilled borehole within 10 ft of SB-17.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/11/2006
Finish: 5/11/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-18
Well ID: n/a
Surface Elev: 626 ft. MSL
Completion: 54 ft. BGS
Station: 878,605.0N
2,513,750.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.20 - While drilling
▼ = 6.87 - MW18S on 6/1/06
▽ =

SAMPLE Number	Recov / Total (in) / % Recovery	Type	Blows / 6 in / N - Value / **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) / Failure Type
1A	18/24 75%	SS	0-1 1-1 N=2	24		1.31 BSh
2A	24/24 100%	SS	1-2 2-2 N=4	28		1.78 Sh
3A	24/24 100%	SS	1-2 2-2 N=4	23		1.32 BSh
4A	24/24 100%	SS	1-1 1-2 N=2	24		1.09 B
5A	24/24 100%	SS	1-1 1-2 N=2	28		0.54 BSh
6A	24/24 100%	SS	0-0 1-2 N=1	21		0.39 B
7A	24/24 100%	SS	3-5 9-15 N=14	17		
7B				15		
8A	24/24 100%	SS	8-9 9-10 N=18	14		
8B				11		
8C				9		
9A	24/36 67%	CS				

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0	Dark grayish brown (10YR4/2), moist, soft, clayey SILT with trace sand and trace gravel.	
	Yellowish brown (10YR5/6) with 50% gray (10YR4/1) mottles, moist, silty CLAY with little sand.	624
2	Yellowish brown (10YR5/6) with 10% gray (10YR4/1) mottles, moist, silty CLAY with little sand.	622
4	Gray (10YR4/1)with 10% Yellowish brown (10YR5/6) mottles, moist, silty CLAY with little sand.	620, 618, 616
	Light gray (10YR6/1) moist, soft, clayey, very fine- to fine-grained SAND.	614
12	Light gray (10YR6/1) moist, soft, silty, very fine- to fine-grained SAND.	
	Yellowish brown (10YR5/6), very moist, soft, silty, very fine- to fine-grained, SAND with trace gravel.	612
14	Yellowish brown (10YR5/6), wet, loose, fine- to medium-grained SAND.	
	Yellowish brown (10YR5/6), very moist, soft, sandy (very fine- to fine-grained) SILT.	610
	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.	608, 606
20		

Borehole Detail | Remarks

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/11/2006
Finish: 5/11/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-18
Well ID: n/a
Surface Elev: 626 ft. MSL
Completion: 54 ft. BGS
Station: 878,605.0N
2,513,750.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.20 - While drilling
▼ = 6.87 - MW18S on 6/1/06
▽ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
	60/60 *100%*	CS					22			604	
10A							24			602	
	60/60 *100%*	CS					26			600	
11A				5			28	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*		598	
							30			596	
12A	60/60 *100%*	CS		11			32			594	Coal fragment seam
							34			592	
	60/60 *100%*	CS					36			590	
13A				10				Gray (10YR5/1), moist, dense, SILT.		588	
13B				12			38	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.		586	
							40				

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/11/2006
Finish: 5/11/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: K. Doetzel
Helper: S. McCartney
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-18
Well ID: n/a
Surface Elev: 626 ft. MSL
Completion: 54 ft. BGS
Station: 878,605.0N
2,513,750.0E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.20 - While drilling
▼ = 6.87 - MW18S on 6/1/06
▽ =

SAMPLE: Number	SAMPLE: Recov / Total (in) % Recovery	SAMPLE: Type	TESTING: Blows / 6 in N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
	60/60 *100%*	CS							584	
							42			Appears more clayey
14A				13					582	
							44			
									580	
							46	Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel. *[Continued from previous page]*		
	60/60 *100%*	CS								
									578	
							48			
15A				13						
									576	
							50			
16A				13						
	60/60 *100%*	CS							574	
							52	Greenish gray (10BG5/1), moist, firm, silty CLAY with little sand and trace gravel.		
16B				22					572	
							54			

End of Boring = 54.0 ft.

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.
CME-1050 had 280# hammer for SPT.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/11/2006
Finish: 5/11/2006
WEATHER: Partly sunny, cool (mid-50's)

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-1050 ATV Rig
Drilling Method: 4¼" HSA (blind drill)

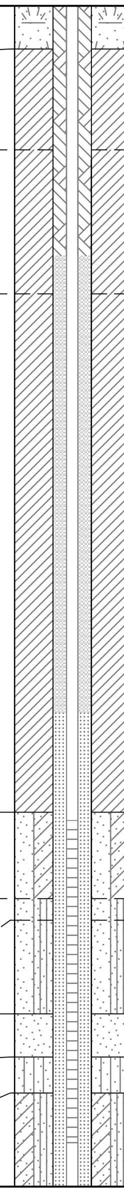
FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-18a
Well ID: MW18S
Surface Elev: 626 ft. MSL
Completion: 16 ft. BGS
Station: 878,604.7N
2,513,745.2E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.20 - While drilling
▼ = 6.87 - MW18S on 6/1/06
▽ =

SAMPLE: Number	Recov / Total (in) *% Recovery*	Type	TESTING: *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
							0	soil — Dark grayish brown (10YR4/2), moist, soft, clayey SILT with trace sand and trace gravel.			
								Yellowish brown (10YR5/6) with 50% gray (10YR4/1) mottles, moist, silty CLAY with little sand.		624	
							2	Yellowish brown (10YR5/6) with 10% gray (10YR4/1) mottles, moist, silty CLAY with little sand.		622	
							4	Gray (10YR4/1)with 10% Yellowish brown (10YR5/6) mottles, moist, silty CLAY with little sand.		620, 618, 616	
							6.87 ▼				
								Light gray (10YR6/1) moist, soft, clayey, very fine- to fine-grained SAND.		614	
							12.20 ▼	Light gray (10YR6/1) moist, soft, silty, very fine- to fine-grained SAND.			
								Yellowish brown (10YR5/6), very moist, soft, silty, very fine- to fine-grained, SAND with trace gravel.		612	
							14	Yellowish brown (10YR5/6), wet, loose, fine- to medium-grained SAND.			
								Yellowish brown (10YR5/6), very moist, soft, sandy (very fine- to fine-grained) SILT.			
								Gray (10YR5/1), moist, very hard, clayey, sandy SILT with trace gravel.		610	
							16				



End of Boring = 16.40 ft. BGS
See SB-18 for sample & testing details

NOTE(S): MW18S installed in blind-drilled borehole within 10 ft of SB-18.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/17/2006
Finish: 5/17/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-19
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 60 ft. BGS
Station: 875,415.4N
2,513,226.4E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.00 - While drilling
▼ =
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*
1A	20/24 *83%*	SS	*2-2 3-4* N=5	21		
1B				22		
2A	22/24 *92%*	SS	*2-2 5-6* N=7	23		2.89 *B*
3A	23/24 *96%*	SS	*2-3 5-6* N=8	17		1.82 *B*
4A	24/24 *100%*	SS	*6-8 10-8* N=18	19		2.52 *B*
5A	24/24 *100%*	SS	*3-4 6-8* N=10	18		2.52 *B*
6A	24/24 *100%*	SS	*2-3 4-5* N=7	16		1.24 *None*
7A	24/24 *100%*	SS	*4-8 10-10* N=18	25		
7B				13		
8A	22/24 *92%*	SS	*3-5 18-25* N=23	18		
9A	24/24 *100%*	SS	*20-40 59-68* N=99	12		4.26 *BSh*
10A	24/24 *100%*	SS	*29-38 56-79* N=94	9		

Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
0–1	soil Dark grayish brown (10YR4/2), clayey SILT, trace sand			
1–2	Pale brown (10YR6/3) with 50% brown (10YR5/3) mottles, clayey SILT		622	
2–4	Pale brown (10YR6/3) with 40% yellowish brown (10YR5/6) mottles, lean CLAY		620	
4–8	Gray (10YR6/1) with 25% yellowish brown (10YR5/6) mottles, clayey SILT, trace sand		618, 616	
8–10	Yellowish brown (10YR5/6) with 30% gray (10YR6/1) mottles, sandy CLAY		614	
10–12	Yellowish brown (10YR5/6) with 30% gray (10YR6/1) mottles, clayey SAND		612	
12–13 (▼ 12)	Brownish yellow (10YR6/6), silty, fine to medium SAND, wet			
13–14	Yellowish brown (10YR5/6), sandy SILT, trace gravel		610	
14–16	Yellowish brown (10YR5/8), silty, fine SAND, wet		608	
16–18	Light gray (10YR7/1), silty, fine SAND, trace gravel		606	
18–20	Dark gray (10YR4/1), sandy SILT, trace gravel		604	

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/17/2006
Finish: 5/17/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-19
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 60 ft. BGS
Station: 875,415.4N
2,513,226.4E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.00 - While drilling
▼ =
▽ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
									602	
	60/60 *100%*	CS					22	Dark gray (10YR4/1), sandy SILT, trace gravel *[Continued from previous page]*		
							24		600	
11A				8						
							26		598	
12A				10				Dark gray (10YR4/1), medium to coarse SAND, trace gravel		
	60/60 *100%*	CS					28		596	
12B				6			30	Dark gray (10YR4/1), sandy SILT, trace gravel, trace sandstone fragments	594	
	60/60 *100%*	CS					32		592	
								Dary grayish brown (10YR4/2), SILT	590	
13A				11			34			
13B				10				Dark gray (10YR4/1), sandy SILT, trace gravel	588	
14A				10			36	Gray (10YR5/1), silty, fine SAND, trace medium to coarse sand and gravel		
14B				10				Dark gray (10YR4/1), sandy SILT, trace gravel		
14C	60/60 *100%*	CS		8			38	Gray (10YR5/1), silty, fine SAND, trace medium to coarse sand and gravel	586	
								Dark gray (10YR4/1), sandy SILT, trace gravel		
14D				21				Gray (10YR5/1), silty, fine SAND, trace medium to coarse sand and gravel	584	
							40			

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 5/17/2006
Finish: 5/17/2006
WEATHER: Sunny, mild (mid-60's)

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB-19
Well ID: n/a
Surface Elev: 624 ft. MSL
Completion: 60 ft. BGS
Station: 875,415.4N
2,513,226.4E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 3, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 12.00 - While drilling
▼ =
▽ =

SAMPLE: Number	SAMPLE: Recov / Total (in) *% Recovery*	SAMPLE: Type	TESTING: *Blows / 6 in* N - Value **RQD**	TESTING: Moisture (%)	TESTING: Dry Den. (lb/ft^3)	TESTING: Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
15A				24				Dark greenish gray (5G4/1) with 20% yellowish brown (10YR5/6) mottles, lean CLAY *[Continued from previous page]*			
										582	
	60/60 *100%*	CS					42				
										580	
							44				
15B				14							
										578	
							46	Dark gray (10YR4/1), clayey SILT, trace sand and gravel			
	60/60 *100%*	CS								576	
							48				
16A				15							
										574	
							50				
										572	
							52				
	60/60 *100%*	CS						Dark gray (10YR4/1), sandy SILT, some gravel			
										570	
17A				10			54				
17B				14				Dark gray (10YR4/1), clayey SILT, trace sand and gravel			
										568	
							56				
	60/60 *100%*	CS						Dark greenish gray (10BG4/1) with 30% yellowish brown (10YR5/6) mottles, lean CLAY		566	
							58				
18A										564	
							60	**End of Boring = 60.0 ft. BGS**			

NOTE(S): Borehole abandoned using bentonite grout pumped from bottom of borehole.

APPENDIX 3-A-4
Well Completion Reports

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW1D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-01

State Plane Coordinate: X 874,972.6 Y 2,513,478.0 (or) Latitude: ____° ____' ____" Longitude: ____° ____' ____"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Testing Services Corp. Date Started: 5/3/2006 Date Finished: 5/3/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 21 min.

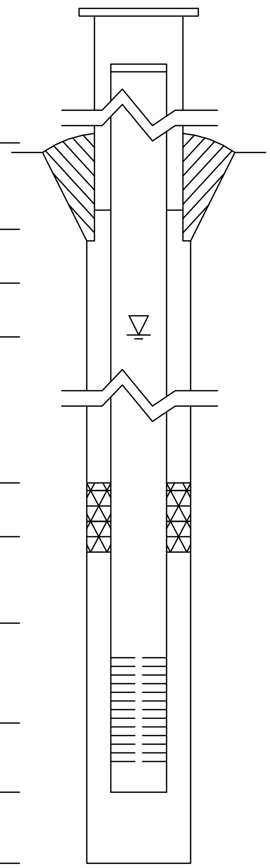
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
609.29	-1.89	Top of Protective Casing
609.01	-1.61	Top of Riser Pipe
607.40	0.00	Ground Surface
604.80	2.60	Top of Annular Sealant
571.12	36.28	Static Water Level (After Completion) 6/1/2006
578.90	28.50	Top of Seal
575.82	31.58	Top of Sand Pack
574.11	33.29	Top of Screen
569.35	38.05	Bottom of Screen
568.99	38.41	Bottom of Well
567.40	40.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	7.3
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	35.17
Bottom of Screen to End Cap	(feet)	0.36
Screen Length (1st slot to last slot)	(feet)	4.76
Total Length of Casing	(feet)	40.29
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____ County: Montgomery Well #: MW2S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-02a

State Plane Coordinate: X 876,408.9 Y 2,513,210.0 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

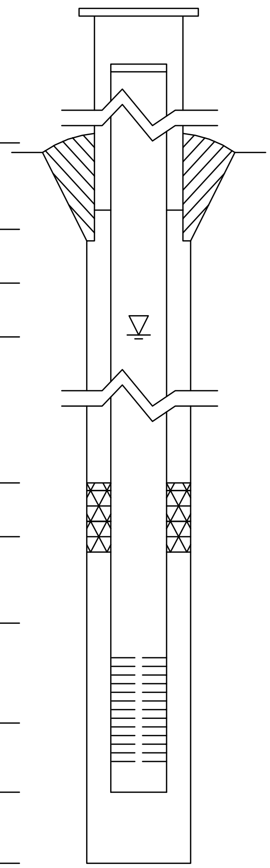
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Testing Services Corp. Date Started: 5/5/2006 Date Finished: 5/5/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS



Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular / Pellet / Slurry (choose one): Granular

Installation Method: Gravity

Setting Time: +24 hr.

Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a

Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
627.55	-3.45	Top of Protective Casing
627.07	-2.97	Top of Riser Pipe
624.10	0.00	Ground Surface
619.72	4.38	Top of Annular Sealant
616.68	7.42	Static Water Level (After Completion) 6/1/2006
619.72	4.38	Top of Seal
614.60	9.50	Top of Sand Pack
613.76	10.34	Top of Screen
608.98	15.12	Bottom of Screen
608.59	15.51	Bottom of Well
608.59	15.51	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	7.3
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	13.31
Bottom of Screen to End Cap	(feet)	0.39
Screen Length (1st slot to last slot)	(feet)	4.78
Total Length of Casing	(feet)	18.48
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel (circled)
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Screen	SS304	SS316	PTFE	PVC (circled)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW2D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-02b

State Plane Coordinate: X 876,414.0 Y 2,513,209.7 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Testing Services Corp. Date Started: 5/5/2006 Date Finished: 5/5/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 20 min.

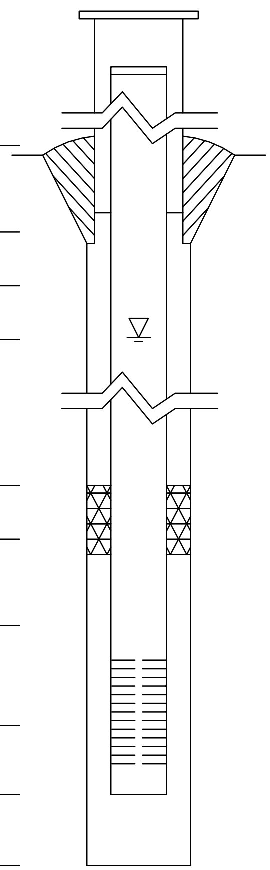
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: Re-drill borehole



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
627.52	-3.42	Top of Protective Casing
627.07	-2.97	Top of Riser Pipe
624.10	0.00	Ground Surface
621.00	3.10	Top of Annular Sealant
616.74	7.36	Static Water Level (After Completion) 6/1/2006
606.00	18.10	Top of Seal
603.92	20.18	Top of Sand Pack
602.07	22.03	Top of Screen
597.27	26.83	Bottom of Screen
596.88	27.22	Bottom of Well
596.88	27.22	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	25.00
Bottom of Screen to End Cap	(feet)	0.39
Screen Length (1st slot to last slot)	(feet)	4.80
Total Length of Casing	(feet)	30.19
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW3D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-03

State Plane Coordinate: X 876,554.5 Y 2,514,535.3 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Testing Services Corp. Date Started: 4/27/2006 Date Finished: 4/27/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 25 min.

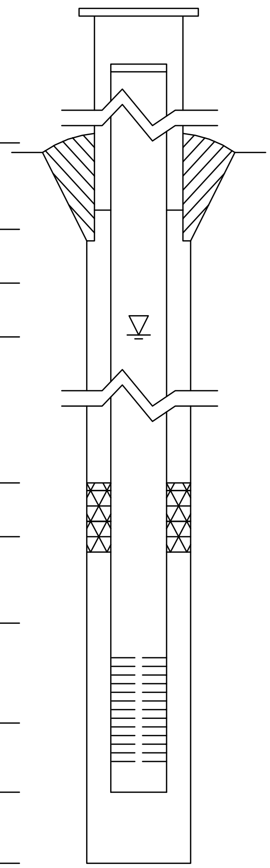
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Cutting (if applicable)

Installation Method: Over-drill borehole



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
629.37	-3.67	Top of Protective Casing
628.94	-3.24	Top of Riser Pipe
625.70	0.00	Ground Surface
623.00	2.70	Top of Annular Sealant
570.30	55.40	Static Water Level (After Completion) 6/1/2006
576.70	49.00	Top of Seal
575.60	50.10	Top of Sand Pack
573.41	52.29	Top of Screen
568.64	57.06	Bottom of Screen
568.30	57.40	Bottom of Well
567.70	58.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	55.51
Bottom of Screen to End Cap	(feet)	0.36
Screen Length (1st slot to last slot)	(feet)	4.77
Total Length of Casing	(feet)	60.64
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW3S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-03a

State Plane Coordinate: X 876,554.8 Y 2,514,531.5 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Testing Services Corp. Date Started: 4/28/2006 Date Finished: 4/28/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) [Granular circled]

Installation Method: Gravity

Setting Time: +24 hr.

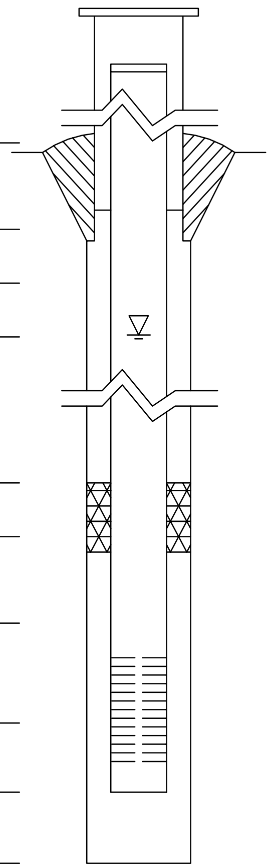
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
629.45	-3.75	Top of Protective Casing
628.96	-3.26	Top of Riser Pipe
625.70	0.00	Ground Surface
623.70	2.00	Top of Annular Sealant
618.67	7.03	Static Water Level (After Completion) 6/1/2006
623.70	2.00	Top of Seal
616.20	9.50	Top of Sand Pack
613.68	12.02	Top of Screen
608.92	16.78	Bottom of Screen
608.55	17.15	Bottom of Well
608.55	17.15	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	15.28
Bottom of Screen to End Cap	(feet)	0.37
Screen Length (1st slot to last slot)	(feet)	4.76
Total Length of Casing	(feet)	20.41
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW4S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-04a

State Plane Coordinate: X 877,999.7 Y 2,514,450.6 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Testing Services Corp. Date Started: 5/11/2006 Date Finished: 5/11/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: +24 hr.

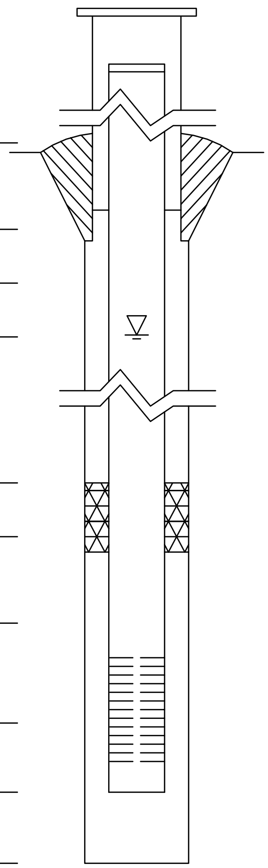
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.07	-3.67	Top of Protective Casing
625.60	-3.20	Top of Riser Pipe
622.40	0.00	Ground Surface
619.57	2.83	Top of Annular Sealant
616.73	5.67	Static Water Level (After Completion) 6/1/2006
619.57	2.83	Top of Seal
614.15	8.25	Top of Sand Pack
612.57	9.83	Top of Screen
608.14	14.26	Bottom of Screen
607.63	14.77	Bottom of Well
607.63	14.77	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	7.3
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	14.25
Bottom of Screen to End Cap	(feet)	0.51
Screen Length (1st slot to last slot)	(feet)	4.43
Total Length of Casing	(feet)	19.19
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW5D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-05

State Plane Coordinate: X 878,174.8 Y 2,513,290.3 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Testing Services Corp. Date Started: 5/12/2006 Date Finished: 5/17/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one) — Granular

Installation Method: Gravity

Setting Time: 18 min.

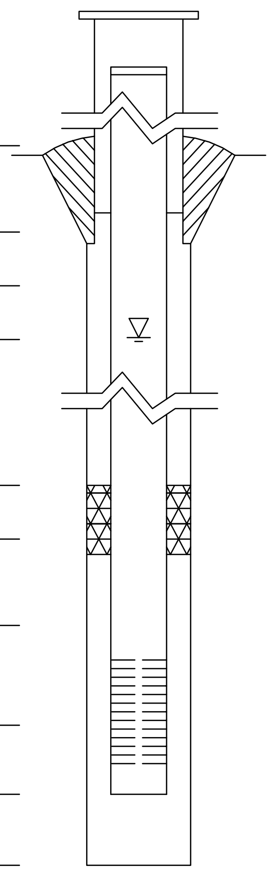
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS) (0.01 ft.)	
626.21	-3.61	Top of Protective Casing
625.78	-3.18	Top of Riser Pipe
622.60	0.00	Ground Surface
620.77	1.83	Top of Annular Sealant
572.16	50.44	Static Water Level (After Completion) 6/1/2006
582.29	40.31	Top of Seal
579.14	43.46	Top of Sand Pack
577.03	45.57	Top of Screen
572.27	50.33	Bottom of Screen
571.88	50.72	Bottom of Well
568.60	54.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	48.74
Bottom of Screen to End Cap	(feet)	0.39
Screen Length (1st slot to last slot)	(feet)	4.76
Total Length of Casing	(feet)	53.89
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel (circled)
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Screen	SS304	SS316	PTFE	PVC (circled)	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW5S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-05a

State Plane Coordinate: X 878,175.6 Y 2,513,285.5 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

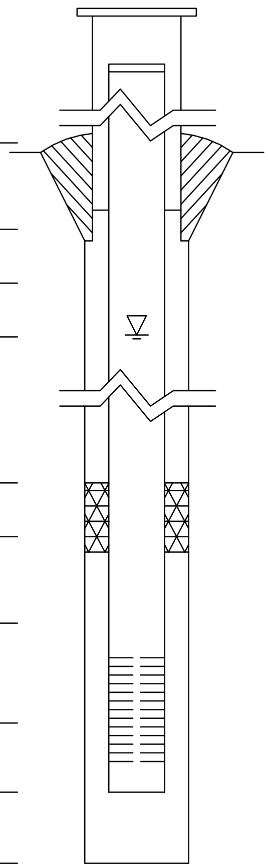
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Testing Services Corp. Date Started: 5/17/2006 Date Finished: 5/17/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS



Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: +24 hr.

Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Cuttings (if applicable)

Installation Method: Over-drill borehole

Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.14	-3.54	Top of Protective Casing
625.73	-3.13	Top of Riser Pipe
622.60	0.00	Ground Surface
620.49	2.11	Top of Annular Sealant
615.86	6.74	Static Water Level (After Completion) 6/1/2006
620.49	2.11	Top of Seal
611.06	11.54	Top of Sand Pack
609.94	12.66	Top of Screen
605.19	17.41	Bottom of Screen
604.89	17.71	Bottom of Well
604.89	17.71	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	15.69
Bottom of Screen to End Cap	(feet)	0.40
Screen Length (1st slot to last slot)	(feet)	4.75
Total Length of Casing	(feet)	20.84
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW6S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-06a

State Plane Coordinate: X 879,021.2 Y 2,513,189.4 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Testing Services Corp. Date Started: 5/4/2006 Date Finished: 5/4/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: +24 hr.

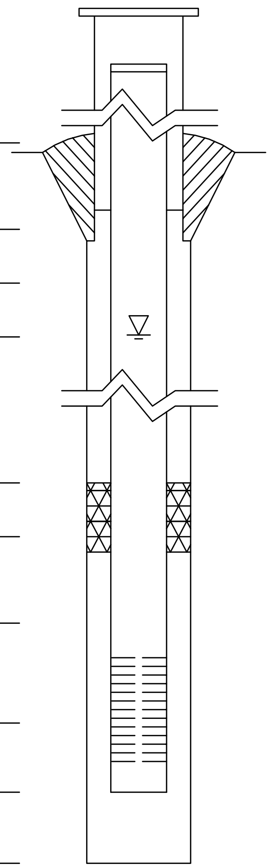
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.67	-3.57	Top of Protective Casing
626.21	-3.11	Top of Riser Pipe
623.10	0.00	Ground Surface
620.10	3.00	Top of Annular Sealant
616.89	6.21	Static Water Level (After Completion) 6/1/2006
620.10	3.00	Top of Seal
613.34	9.76	Top of Sand Pack
612.06	11.04	Top of Screen
607.48	15.62	Bottom of Screen
607.02	16.08	Bottom of Well
607.02	16.08	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	7.3
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	14.15
Bottom of Screen to End Cap	(feet)	0.46
Screen Length (1st slot to last slot)	(feet)	4.58
Total Length of Casing	(feet)	19.19
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW7S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-07a

State Plane Coordinate: X 879,181.1 Y 2,514,397.5 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: P. McIntire

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Rhonald W Hasenyager Date Started: 5/9/2006 Date Finished: 5/9/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: +24 hr.

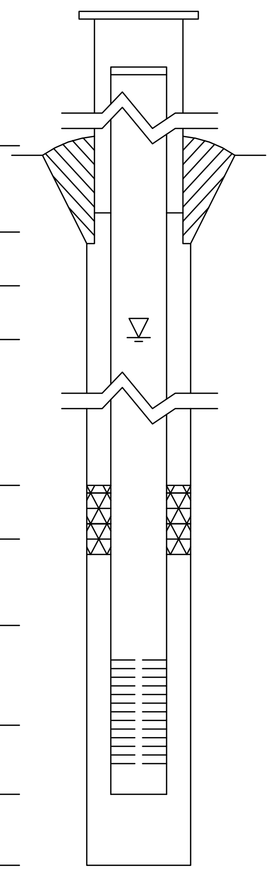
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
627.71	-3.21	Top of Protective Casing
627.56	-3.06	Top of Riser Pipe
624.50	0.00	Ground Surface
621.70	2.80	Top of Annular Sealant
619.60	4.90	Static Water Level (After Completion) 6/1/2006
621.70	2.80	Top of Seal
616.23	8.27	Top of Sand Pack
614.59	9.91	Top of Screen
610.71	13.79	Bottom of Screen
610.11	14.39	Bottom of Well
610.11	14.39	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	12.37
Bottom of Screen to End Cap	(feet)	0.60
Screen Length (1st slot to last slot)	(feet)	4.48
Total Length of Casing	(feet)	17.45
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW8S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-08a

State Plane Coordinate: X 879,776.6 Y 2,514,478.8 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: K. Doetzel

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/10/2006 Date Finished: 5/10/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: +24 hr.

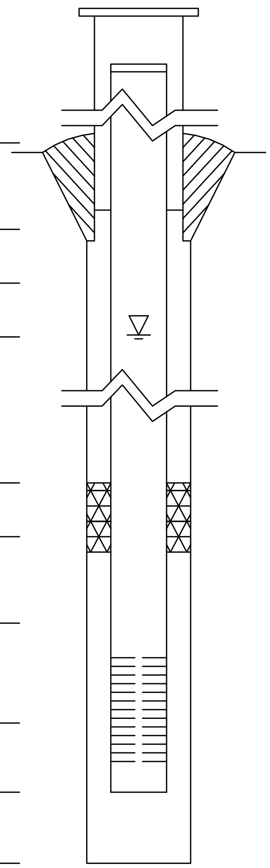
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
628.26	-3.56	Top of Protective Casing
627.92	-3.22	Top of Riser Pipe
624.70	0.00	Ground Surface
622.20	2.50	Top of Annular Sealant
619.37	5.33	Static Water Level (After Completion) 6/1/2006
622.20	2.50	Top of Seal
614.72	9.98	Top of Sand Pack
613.19	11.51	Top of Screen
608.70	16.00	Bottom of Screen
608.10	16.60	Bottom of Well
607.62	17.08	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	14.73
Bottom of Screen to End Cap	(feet)	0.60
Screen Length (1st slot to last slot)	(feet)	4.49
Total Length of Casing	(feet)	19.82
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW9D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-09

State Plane Coordinate: X 879,679.7 Y 2,515,666.3 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: K. Doetzel

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/3/2006 Date Finished: 5/3/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 15 min.

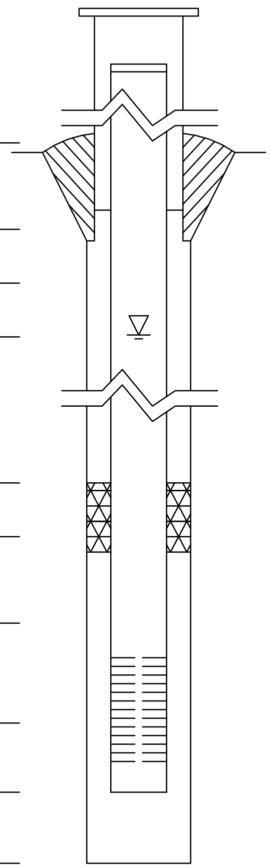
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
627.84	-3.24	Top of Protective Casing
627.52	-2.92	Top of Riser Pipe
624.60	0.00	Ground Surface
621.70	2.90	Top of Annular Sealant
572.14	52.46	Static Water Level (After Completion) 6/1/2006
582.60	42.00	Top of Seal
580.80	43.80	Top of Sand Pack
578.79	45.81	Top of Screen
574.03	50.57	Bottom of Screen
573.60	51.00	Bottom of Well
570.60	54.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	52.25
Bottom of Screen to End Cap	(feet)	0.43
Screen Length (1st slot to last slot)	(feet)	4.76
Total Length of Casing	(feet)	57.44
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____ County: Montgomery Well #: MW9S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-09a

State Plane Coordinate: X 879,684.9 Y 2,515,666.2 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: K. Doetzel

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/3/2006 Date Finished: 5/3/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: +24 hr.

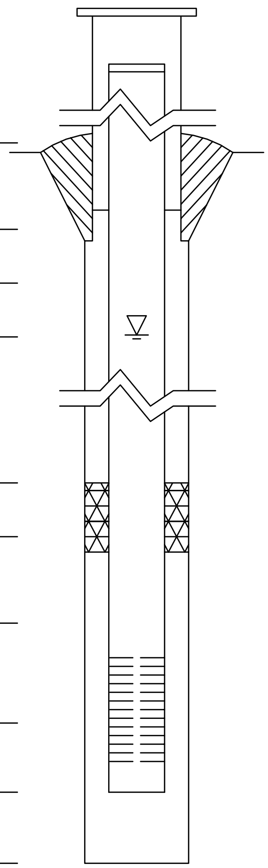
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
627.84	-3.24	Top of Protective Casing
627.51	-2.91	Top of Riser Pipe
624.60	0.00	Ground Surface
621.35	3.25	Top of Annular Sealant
619.37	5.23	Static Water Level (After Completion) 6/1/2006
621.35	3.25	Top of Seal
615.49	9.11	Top of Sand Pack
613.39	11.21	Top of Screen
608.98	15.62	Bottom of Screen
608.40	16.20	Bottom of Well
608.40	16.20	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	14.12
Bottom of Screen to End Cap	(feet)	0.58
Screen Length (1st slot to last slot)	(feet)	4.41
Total Length of Casing	(feet)	19.11
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW10D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-10

State Plane Coordinate: X 878,245.1 Y 2,515,914.0 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: K. Doetzel

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/1/2006 Date Finished: 5/1/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Tremie

Setting Time: 22 min.

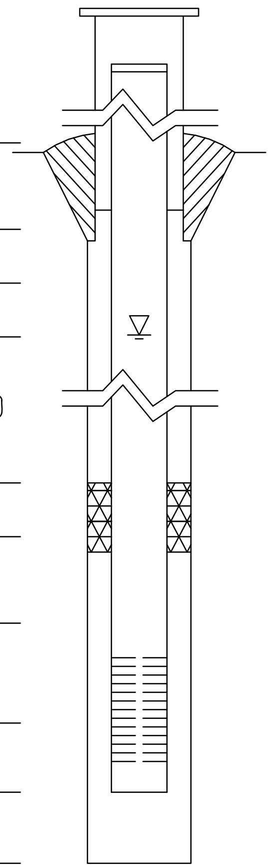
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
624.72	-3.52	Top of Protective Casing
624.42	-3.22	Top of Riser Pipe
621.20	0.00	Ground Surface
619.77	1.43	Top of Annular Sealant
573.72	47.48	Static Water Level (After Completion) 6/1/2006
619.77	1.43	Top of Seal
581.65	39.55	Top of Sand Pack
579.46	41.74	Top of Screen
574.63	46.57	Bottom of Screen
574.18	47.02	Bottom of Well
572.45	48.75	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	45.06
Bottom of Screen to End Cap	(feet)	0.45
Screen Length (1st slot to last slot)	(feet)	4.73
Total Length of Casing	(feet)	50.24
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02) **Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW10S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-10a

State Plane Coordinate: X 878,250.5 Y 2,515,914.4 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: K. Doetzel

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/2/2006 Date Finished: 5/2/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: +24 hr.

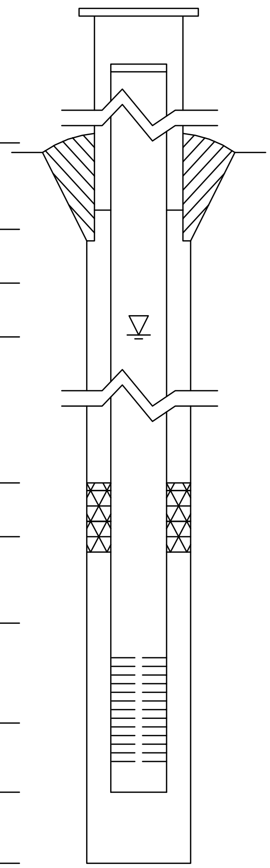
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
624.55	-3.35	Top of Protective Casing
624.24	-3.04	Top of Riser Pipe
621.20	0.00	Ground Surface
618.83	2.37	Top of Annular Sealant
616.29	4.91	Static Water Level (After Completion) 6/1/2006
618.83	2.37	Top of Seal
611.90	9.30	Top of Sand Pack
609.92	11.28	Top of Screen
605.44	15.76	Bottom of Screen
604.90	16.30	Bottom of Well
604.90	16.30	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	14.32
Bottom of Screen to End Cap	(feet)	0.54
Screen Length (1st slot to last slot)	(feet)	4.48
Total Length of Casing	(feet)	19.34
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____ County: Montgomery Well #: MW11D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-11

State Plane Coordinate: X 876,749.6 Y 2,515,976.7 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: K. Doetzel

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 4/27/2006 Date Finished: 4/28/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 18 min.

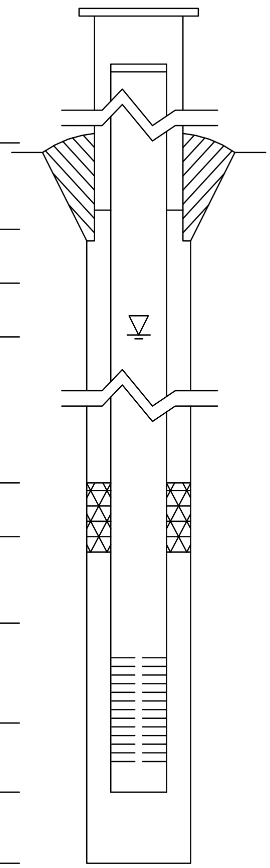
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.70	-3.70	Top of Protective Casing
625.36	-3.36	Top of Riser Pipe
622.00	0.00	Ground Surface
618.89	3.11	Top of Annular Sealant
615.97	6.03	Static Water Level (After Completion) 6/1/2006
597.20	24.80	Top of Seal
595.59	26.41	Top of Sand Pack
593.69	28.31	Top of Screen
588.96	33.04	Bottom of Screen
588.50	33.50	Bottom of Well
585.67	36.33	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	31.67
Bottom of Screen to End Cap	(feet)	0.46
Screen Length (1st slot to last slot)	(feet)	4.73
Total Length of Casing	(feet)	36.86
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW11S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-11a

State Plane Coordinate: X 876,749.4 Y 2,515,971.2 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: K. Doetzel

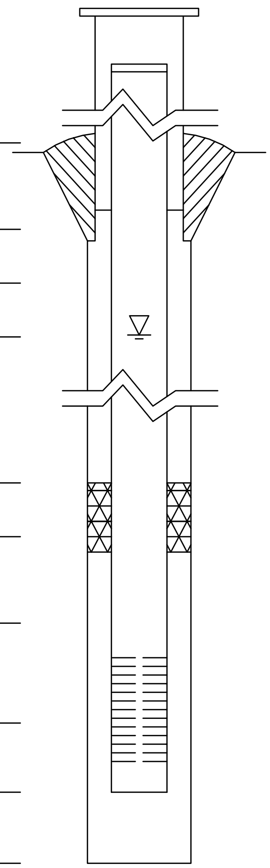
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 4/28/2006 Date Finished: 4/28/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS



Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 26 min.

Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a

Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.47	-3.47	Top of Protective Casing
625.16	-3.16	Top of Riser Pipe
622.00	0.00	Ground Surface
620.00	2.00	Top of Annular Sealant
616.58	5.42	Static Water Level (After Completion) 6/1/2006
620.00	2.00	Top of Seal
615.25	6.75	Top of Sand Pack
613.11	8.89	Top of Screen
608.37	13.63	Bottom of Screen
607.92	14.08	Bottom of Well
607.92	14.08	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	12.04
Bottom of Screen to End Cap	(feet)	0.46
Screen Length (1st slot to last slot)	(feet)	4.74
Total Length of Casing	(feet)	17.24
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW12D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-12

State Plane Coordinate: X 875,515.1 Y 2,515,900.6 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/10/2006 Date Finished: 5/10/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: +24 hr.

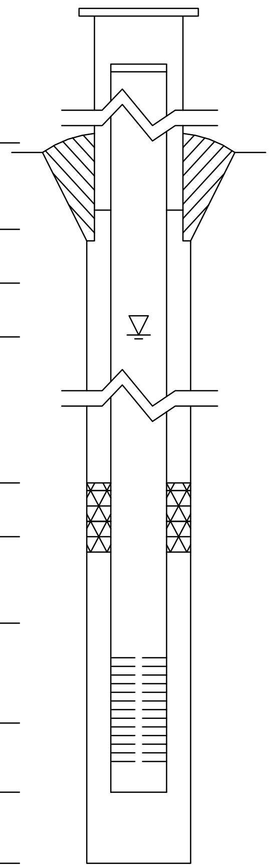
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: Over-drill borehole



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.49	-3.29	Top of Protective Casing
625.03	-2.83	Top of Riser Pipe
622.20	0.00	Ground Surface
619.43	2.77	Top of Annular Sealant
575.30	46.90	Static Water Level (After Completion) 6/1/2006
585.50	36.70	Top of Seal
581.69	40.51	Top of Sand Pack
579.74	42.46	Top of Screen
575.21	46.99	Bottom of Screen
574.73	47.47	Bottom of Well
572.20	50.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	45.29
Bottom of Screen to End Cap	(feet)	0.48
Screen Length (1st slot to last slot)	(feet)	4.53
Total Length of Casing	(feet)	50.30
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel (circled)
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Screen	SS304	SS316	PTFE	PVC (circled)	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW12S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-12a

State Plane Coordinate: X 875,520.1 Y 2,515,900.5 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/10/2006 Date Finished: 5/10/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 18 min.

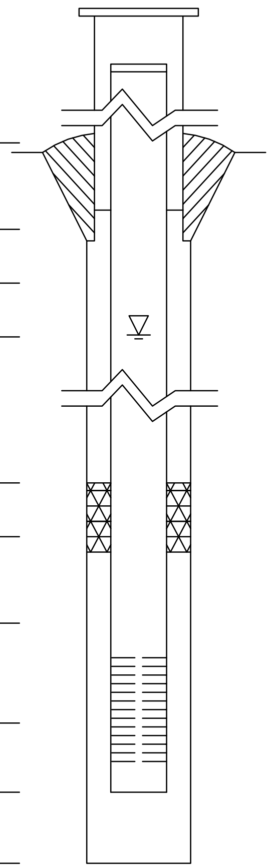
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.58	-3.38	Top of Protective Casing
625.10	-2.90	Top of Riser Pipe
622.20	0.00	Ground Surface
619.20	3.00	Top of Annular Sealant
615.44	6.76	Static Water Level (After Completion) 6/1/2006
619.20	3.00	Top of Seal
613.95	8.25	Top of Sand Pack
611.59	10.61	Top of Screen
607.02	15.18	Bottom of Screen
606.59	15.61	Bottom of Well
606.59	15.61	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	7.3
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	13.51
Bottom of Screen to End Cap	(feet)	0.43
Screen Length (1st slot to last slot)	(feet)	4.57
Total Length of Casing	(feet)	18.51
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW13D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-13

State Plane Coordinate: X 874,694.3 Y 2,513,929.9 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/9/2006 Date Finished: 5/9/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: +24 hr.

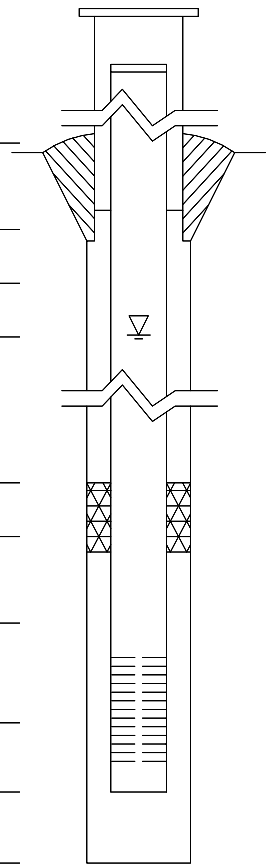
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.33	-3.63	Top of Protective Casing
625.87	-3.17	Top of Riser Pipe
622.70	0.00	Ground Surface
619.64	3.06	Top of Annular Sealant
566.67	56.03	Static Water Level (After Completion) 6/1/2006
577.48	45.22	Top of Seal
574.76	47.94	Top of Sand Pack
572.89	49.81	Top of Screen
568.10	54.60	Bottom of Screen
567.70	55.00	Bottom of Well
567.70	55.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	52.98
Bottom of Screen to End Cap	(feet)	0.40
Screen Length (1st slot to last slot)	(feet)	4.79
Total Length of Casing	(feet)	58.17
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW13S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-13a

State Plane Coordinate: X 874,695.7 Y 2,513,925.3 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/9/2006 Date Finished: 5/9/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 21 min.

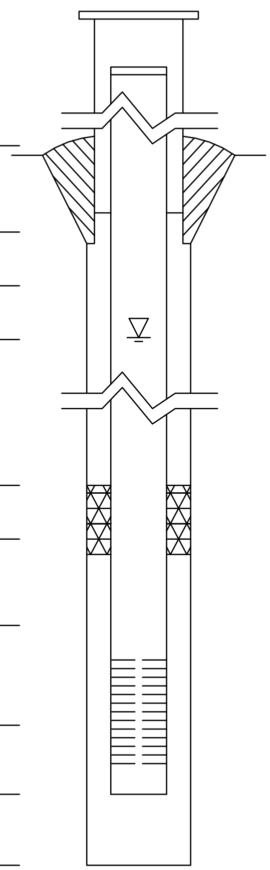
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.42	-3.72	Top of Protective Casing
625.92	-3.22	Top of Riser Pipe
622.70	0.00	Ground Surface
619.35	3.35	Top of Annular Sealant
614.46	8.24	Static Water Level (After Completion) 6/1/2006
619.35	3.35	Top of Seal
612.65	10.05	Top of Sand Pack
611.27	11.43	Top of Screen
606.47	16.23	Bottom of Screen
606.08	16.62	Bottom of Well
606.08	16.62	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	7.3
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	14.65
Bottom of Screen to End Cap	(feet)	0.39
Screen Length (1st slot to last slot)	(feet)	4.80
Total Length of Casing	(feet)	19.84
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW14S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: Sb-14a

State Plane Coordinate: X 875,737.8 Y 2,514,125.9 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/2/2006 Date Finished: 5/2/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 23 min.

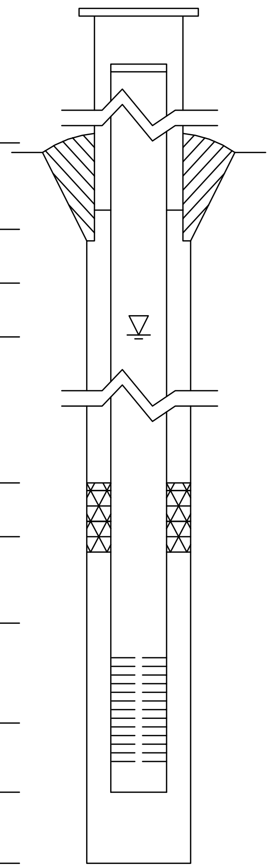
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
627.23	-2.63	Top of Protective Casing
626.82	-2.22	Top of Riser Pipe
624.60	0.00	Ground Surface
622.20	2.40	Top of Annular Sealant
620.11	4.49	Static Water Level (After Completion) 6/1/2006
622.20	2.40	Top of Seal
613.67	10.93	Top of Sand Pack
612.34	12.26	Top of Screen
607.58	17.02	Bottom of Screen
607.22	17.38	Bottom of Well
607.22	17.38	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	14.48
Bottom of Screen to End Cap	(feet)	0.36
Screen Length (1st slot to last slot)	(feet)	4.76
Total Length of Casing	(feet)	19.60
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW15S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-15a

State Plane Coordinate: X 875,971.1 Y 2,515,076.3 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 4/25/2006 Date Finished: 4/25/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 20 min.

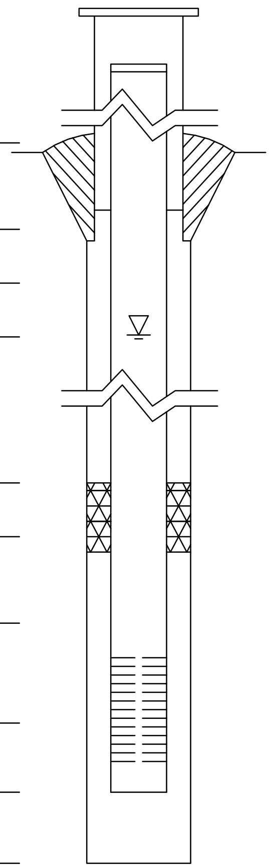
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
627.06	-3.26	Top of Protective Casing
626.60	-2.80	Top of Riser Pipe
623.80	0.00	Ground Surface
623.30	0.50	Top of Annular Sealant
618.81	4.99	Static Water Level (After Completion) 6/1/2006
614.30	9.50	Top of Seal
611.60	12.20	Top of Sand Pack
609.39	14.41	Top of Screen
604.64	19.16	Bottom of Screen
604.18	19.62	Bottom of Well
604.18	19.62	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.28
Bottom of Screen to End Cap	(feet)	19.62
Screen Length (1st slot to last slot)	(feet)	4.77
Total Length of Casing	(feet)	41.67
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW15D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-15b

State Plane Coordinate: X 875,970.5 Y 2,515,080.7 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 4/24/2006 Date Finished: 4/25/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular / Pellet / Slurry (choose one) — Granular

Installation Method: Gravity

Setting Time: +24 hr.

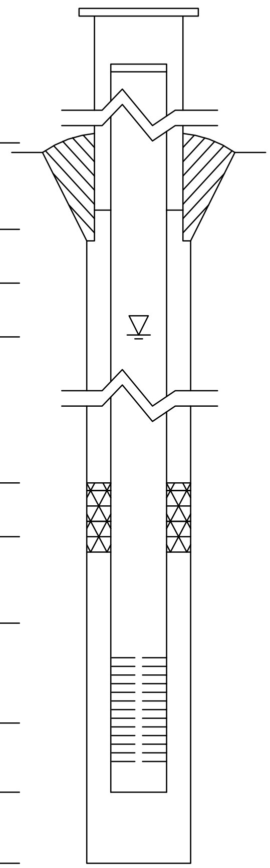
Type of Sand Pack: Quartz sand

Grain Size: #5 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: Re-drill borehole



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.93	-3.13	Top of Protective Casing
626.45	-2.65	Top of Riser Pipe
623.80	0.00	Ground Surface
620.55	3.25	Top of Annular Sealant
618.56	5.24	Static Water Level (After Completion) 6/1/2006
594.80	29.00	Top of Seal
591.80	32.00	Top of Sand Pack
590.12	33.68	Top of Screen
585.35	38.45	Bottom of Screen
585.00	38.80	Bottom of Well
585.00	38.80	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	36.32
Bottom of Screen to End Cap	(feet)	0.36
Screen Length (1st slot to last slot)	(feet)	4.77
Total Length of Casing	(feet)	41.45
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____ County: Montgomery Well #: MW16S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-16a

State Plane Coordinate: X 877,355.1 Y 2,515,088.0 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: K. Doetzel

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Rhonald W Hasenyager Date Started: 4/25/2006 Date Finished: 4/25/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 17 min.

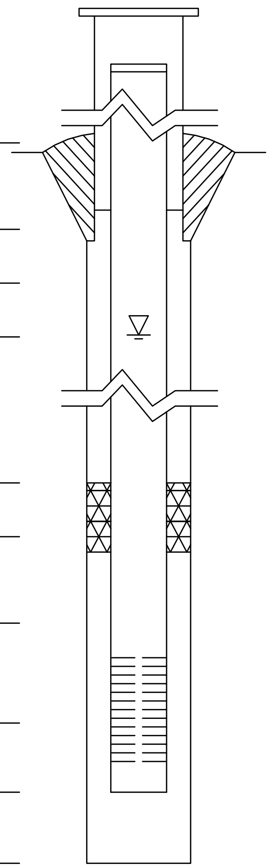
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
629.62	-3.52	Top of Protective Casing
629.28	-3.18	Top of Riser Pipe
626.10	0.00	Ground Surface
624.66	1.44	Top of Annular Sealant
620.36	5.74	Static Water Level (After Completion) 6/1/2006
624.66	1.44	Top of Seal
612.40	13.70	Top of Sand Pack
611.51	14.59	Top of Screen
606.69	19.41	Bottom of Screen
606.34	19.76	Bottom of Well
606.20	19.90	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.74
Bottom of Screen to End Cap	(feet)	0.38
Screen Length (1st slot to last slot)	(feet)	4.82
Total Length of Casing	(feet)	22.94
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW16D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-16b

State Plane Coordinate: X 877,354.9 Y 2,515,079.4 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: K. Doetzel

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Rhonald W Hasenyager Date Started: 4/21/2006 Date Finished: 4/25/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: +24 hr.

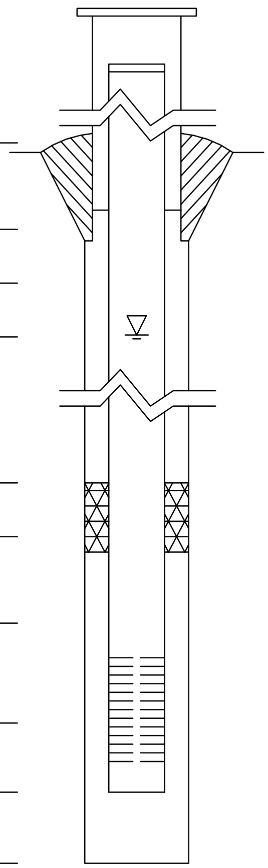
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: Re-drill borehole



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
629.68	-3.58	Top of Protective Casing
629.33	-3.23	Top of Riser Pipe
626.10	0.00	Ground Surface
623.77	2.33	Top of Annular Sealant
574.73	51.37	Static Water Level (After Completion) 6/1/2006
584.65	41.45	Top of Seal
582.65	43.45	Top of Sand Pack
580.20	45.90	Top of Screen
575.76	50.34	Bottom of Screen
575.32	50.78	Bottom of Well
575.10	51.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	48.83
Bottom of Screen to End Cap	(feet)	0.44
Screen Length (1st slot to last slot)	(feet)	4.74
Total Length of Casing	(feet)	54.01
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____________ County: Montgomery Well #: MW17D

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-17

State Plane Coordinate: X 878,659.0 Y 2,515,090.4 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: K. Doetzel

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/4/2006 Date Finished: 5/4/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite grout

Installation Method: Tremie

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: +24 hr.

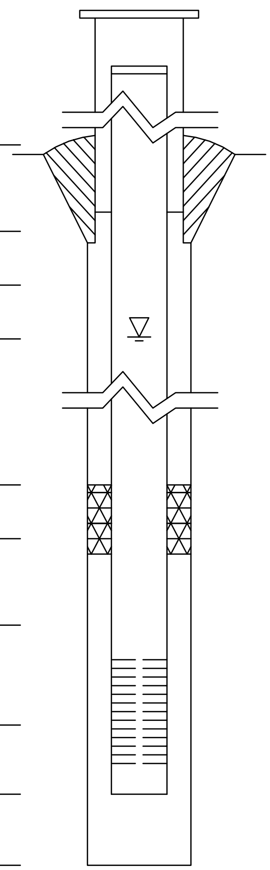
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
630.62	-3.52	Top of Protective Casing
630.29	-3.19	Top of Riser Pipe
627.10	0.00	Ground Surface
624.92	2.18	Top of Annular Sealant
572.65	54.45	Static Water Level (After Completion) 6/1/2006
581.55	45.55	Top of Seal
580.25	46.85	Top of Sand Pack
578.28	48.82	Top of Screen
573.78	53.32	Bottom of Screen
573.23	53.87	Bottom of Well
573.23	53.87	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	52.01
Bottom of Screen to End Cap	(feet)	0.55
Screen Length (1st slot to last slot)	(feet)	4.50
Total Length of Casing	(feet)	57.06
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW17S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-17a

State Plane Coordinate: X 878,658.5 Y 2,515,084.8 (or) Latitude: ____° ____' ____" Longitude: ____° ____' ____"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: K. Doetzel

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/4/2006 Date Finished: 5/4/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 22 min.

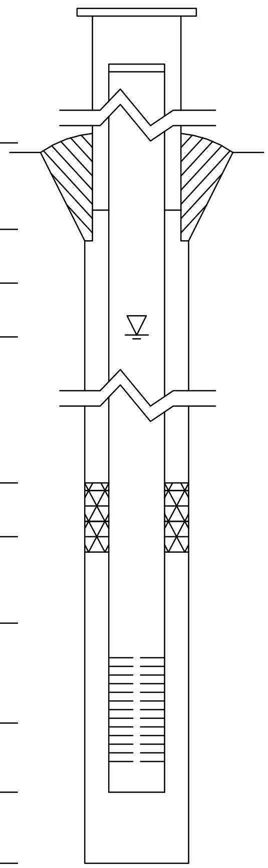
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
630.68	-3.58	Top of Protective Casing
630.34	-3.24	Top of Riser Pipe
627.10	0.00	Ground Surface
626.40	0.70	Top of Annular Sealant
620.21	6.89	Static Water Level (After Completion) 6/1/2006
617.33	9.77	Top of Seal
614.80	12.30	Top of Sand Pack
613.08	14.02	Top of Screen
603.54	23.56	Bottom of Screen
602.99	24.11	Bottom of Well
602.99	24.11	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.26
Bottom of Screen to End Cap	(feet)	0.55
Screen Length (1st slot to last slot)	(feet)	9.54
Total Length of Casing	(feet)	27.35
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: MW18S

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: SB-18a

State Plane Coordinate: X 878,604.7 Y 2,513,745.2 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): Potable water

Logged By: Reynolds Drilling Corp. Date Started: 5/11/2006 Date Finished: 5/11/2006

Report Form Completed By: Rhonald W Hasenyager Date: 6/7/2006

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: +24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 25 min.

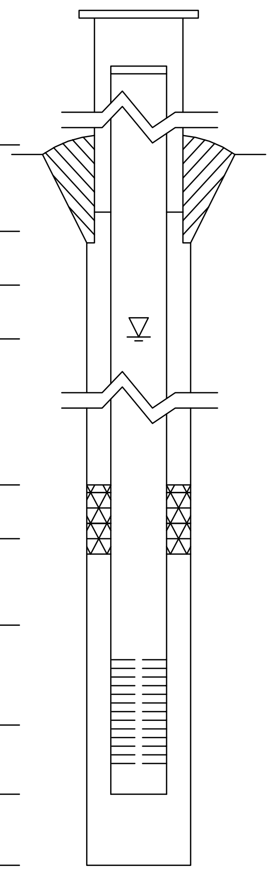
Type of Sand Pack: Quartz sand

Grain Size: #JC50FS (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
629.02	-3.42	Top of Protective Casing
628.71	-3.11	Top of Riser Pipe
625.60	0.00	Ground Surface
622.13	3.47	Top of Annular Sealant
618.73	6.87	Static Water Level (After Completion) 6/1/2006
622.13	3.47	Top of Seal
615.79	9.81	Top of Sand Pack
614.29	11.31	Top of Screen
609.81	15.79	Bottom of Screen
609.20	16.40	Bottom of Well
609.20	16.40	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	14.42
Bottom of Screen to End Cap	(feet)	0.61
Screen Length (1st slot to last slot)	(feet)	4.48
Total Length of Casing	(feet)	19.51
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

**Hand-Slotted Well Screens Are Unacceptable

APPENDIX A8

AECOM BORING LOGS AND PIEZOMETER CONSTRUCTION DOCUMENTATION

Project: Dynegy

Project Location: Coffeen Power Station, IL

Project Number: 60440742

Log of Boring COF-B001

Date(s) Drilled	08/07/2015 8:40 AM to 08/07/2015 4:10 PM	Logged By	E. Drumright	Checked By	D. Swanson
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	7.5 inch O.D. HSA	Borehole Depth	35.0 ft
Drill Rig Type	CME 550X	Drilling Contractor	Geotechnology	Surface Elevation	634.8 ft NAVD88
Borehole Backfill	Cement-Bentonite Grout (Installed COF-P000 5 ft South of COF-B001)	Sampling Method(s)	SS / ST	Hammer Data	Automatic
Boring Location	N 871595.4 E 2516695.5 (ft NAD83)	Groundwater Level(s)	Not Encountered		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
634.8	0.0														
			S1	3 4 6	67		Stiff, moist, brown and gray, silty and sandy CLAY, trace fine gravel, topsoil upper 2 inches, (CL) (EMBANKMENT FILL).	12.9				3.5			
630	5		S2	2 4 6	61		Stiff, moist, brown and gray, medium plasticity, silty and sandy CLAY, trace fine gravel, (CL) (EMBANKMENT FILL).	20.3		31	17	2.5			
			S3	2 5 7	72		Stiff, very moist, brown and gray, medium plastic, silty and sandy CLAY, trace gravel (CL) (EMBANKMENT FILL).	15.4				1.75			
625	10		S4	2 4 5	83		Stiff, moist, brown and gray, sandy CLAY, trace fine gravel, with gray silt seams, (CL) (EMBANKMENT FILL).	16.1				1.5			
620	15		S5		92		Very stiff, very moist, dark grayish brown with yellowish brown and dark gray, medium plastic, CLAY, with sand, (CL) (EMBANKMENT FILL).	14.7	129.4	35	20	2.5			
							Very stiff to 19'								
615.8	19.0														
615	20		S6	1 2 2	83		Soft, wet, brown and gray, silty CLAY, trace fine sand and decayed organic matter, organic odor, (CL) (NATIVE).	23.2							
613.8	21.0														
			S7		92		Gray with yellowish brown, very plastic, CLAY, with sand, (CH).	23.4	125.7	66	44				
611.8	23.0														
610	25		S8	1 4 5	100		Stiff, very moist, brown and gray, high plasticity, sandy CLAY, trace fine gravel, (CL).	19.6		41	26	1.5			
605.3	29.5		S9	1 3 3	100			16.8				< 0.25			
605	30														

AECOM

Project: Dynegy

Project Location: Coffeen Power Station, IL

Project Number: 60440742

Log of Boring COF-B001

Elevation (feet)	Depth (feet)	Samples: Type	Samples: Number	Samples: Sampling Resist. OR Core RQD (%)	Samples: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		S10		58		Medium stiff, very wet, orange brown, sandy CLAY, trace silt, (CL) (TILL). 603.6 / 31.2					4.5			*Pushed 14" then refused. Hard at tip of tube.*
							Hard, sandy CLAY, trace fine gravel, trace silt , (CL) (TILL).								
600	35		S11	8 17 24	78		Hard, brown and gray, medium plastic, CLAY, trace fine gravel, trace silt, (CL) (TILL). 599.8 / 35.0	11.7		30	17	4.5			
							End of Boring at 35 ft								*Installed Piezometer COF-P000 with 5 ft offset to the South.*
595	40														
590	45														
585	50														
580	55														
575	60														
570	65														

AECOM

Project: Dynegy

Project Location: Coffeen Power Station, IL

Project Number: 60440742

Log of Boring COF-B002

Date(s) Drilled	08/06/2015 9:30 AM to 08/06/2015 3:00 PM	Logged By	E. Drumright	Checked By	D. Swanson
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	7.5 inch O.D. HSA	Borehole Depth	35.5 ft
Drill Rig Type	CME 550X	Drilling Contractor	Geotechnology	Surface Elevation	635.4 ft NAVD88
Borehole Backfill	Piezometer COF-P002	Sampling Method(s)	SS / ST	Hammer Data	Automatic
Boring Location	N 871459.5 E 2516041.9 (ft NAD83)	Groundwater Level(s)	28 ft on 8/6/2015 1:00:00 PM		

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
635.4	0.0													
		SS	S1	1 2 4	78	Medium stiff, very moist, brown and gray, CLAY, trace organics, (CL) (EMBANKMENT FILL).	25.4				2.0			
		SS	S2	2 3 5	89	Stiff, very moist, brown and gray, medium plastic, sandy CLAY, trace fine gravel, (CL) (EMBANKMENT FILL).	25.9		35	18	1.0			
		SS	S3	1 3 5	83	Medium stiff, very moist, brown and gray, sandy CLAY, trace fine gravel, (CL) (EMBANKMENT FILL).	25.9				1.25			
		ST	S4		100	Very stiff, very moist, gray with yellowish brown, high plasticity, CLAY, with sand, (CL) (EMBANKMENT FILL).	17.8	134.5	40	25	3.5			
		SS	S5	1 1 2	78	Soft, moist to wet, brown and gray, CLAY, with fine sand, trace fine gravel, (CL) (EMBANKMENT FILL).	23.3				0.75			
		ST	S6		100	Soft, very moist, gray with brown, low plasticity, silty CLAY, (CL) (EMBANKMENT FILL).	26.7	120.2	25	7	0.75			
618.4	17.0													
		SS	S7	2 3 5	94	Medium stiff, very moist, brown and gray, high plasticity, CLAY, trace fine sand, with brown silt seams, (CL) (NATIVE).	25.4		47	29	1.5			
		SS	S8	2 3 4	100		18.9				0.75			
607.4	28.0													
		SS	S9	1 2 4		Loose, very wet, brown fine to coarse clayey SAND, trace gravel, (SP-SC) (NATIVE).	13.6							

AECOM

Elevation (feet)	Depth (feet)	Samples: Type	Samples: Number	Samples: Sampling Resist. OR Core RQD (%)	Samples: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
605	30														*Till ~ 31.5' harder drilling*
603.9	31.5						Very dense, moist, brown, low plasticity, sandy silty CLAY, trace fine gravel, with iron staining, (CL) (TILL).								
			S10	34/50 4"				9.5		20	7				
599.9	35.5						End of Boring at 35.5 ft								*Very hard drilling with new teeth. Installed Piezometer COF-P002 in boring.*

Elevation scale: 605, 600, 595, 590, 585, 580, 575

Depth scale: 30, 35, 40, 45, 50, 55, 60, 65

AECOM

Project: Dynegy

Project Location: Coffeen Power Station, IL

Project Number: 60440742

Log of Boring COF-B003

Date(s) Drilled	08/05/2015 11:30 AM to 08/05/2015 5:30 PM	Logged By	E. Drumright	Checked By	D. Swanson
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	7.5 inch O.D. HSA	Borehole Depth	45.0 ft
Drill Rig Type	CME 550X (Rubber Tire ATV)	Drilling Contractor	Geotechnology	Surface Elevation	635.7 ft NAVD88
Borehole Backfill	Piezometer COF-P003	Sampling Method(s)	SS / ST	Hammer Data	Automatic
Boring Location	N 871786.2 E 2515149.7 (ft NAD83)	Groundwater Level(s)	Not Encountered		

Elevation (feet)	Depth (feet)	Samples: Type	Samples: Number	Samples: Sampling Resist. OR Core RQD (%)	Samples: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
635.7	0.0														
		SS	S1	3 5 4	50		Stiff, dry, brown and gray, sandy CLAY, trace fine gravel, trace coarse ash, (CL) (EMBANKMENT FILL).	14.2				4.5			
		SS	S2	2 3 4	67		Medium stiff, moist, brown and gray, high plasticity, sandy CLAY, trace fine gravel, trash coarse ash, (CL) (EMBANKMENT FILL).	18.1		42	26	1.25			
		SS	S3	2 2 5	67		Medium stiff, moist, brown and gray, sandy CLAY, trace fine gravel, (CL) (EMBANKMENT FILL).	15.0				2.5			
		SS	S4	2 4 8			Stiff, very moist, brown and gray, sandy CLAY, trace fine gravel, (CL) (EMBANKMENT FILL).	17.4				1.5			
621.7	14.0	ST	S5		92		Stiff, very moist, dark gray trace yellowish brown, high plasticity, CLAY, (CH).	21.8	127.5	54	36	1.75			
		SS	S6	2 3 4	83		Medium stiff, very moist, brown and gray, medium plasticity, CLAY, trace fine sand, (CH).	26.0				1.75			
		SS	S7	WOH 2 3	100		Medium stiff, very moist, brown and gray, high plasticity, CLAY, with sand, with iron stained seams, (CH).	20.8		50	34	1.75			
606.7	29.0	SS	S8	2 1 9	100		Stiff, very moist, brown, low plasticity, sandy silty CLAY, trace fine gravel, (CL) (TILL).	12.5		21	6	3.5			

Depth (feet)	Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Elevation (feet)	MATERIAL DESCRIPTION	Depth (feet)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
30		S9		100	604.7		31.0	11.8	141.7			4.5			S9 refusal at 30.8'
					602.2	Dense, wet, dark yellowish brown with grayish brown, silty SAND, trace gravel, (SM), (TILL).	33.5								
35		S10	2 2 6			Loose, very wet, brown, fine to coarse SAND, (SP) (TILL).									Top of S10 full of water
40		S11	19 34 40	61	592.2	Very dense, very wet, brown, silty fine to coarse SAND, trace gravel, (SP) (TILL).	43.5	9.5							
45		S12	30 60 50/3"	100	590.7	Very dense, very wet, brown and gray, fine to coarse clayey SAND, trace fine gravel, (SC) (TILL).	45.0	9.9							Installed Piezometer COF-P003 in boring.
						End of Boring at 45 ft									

Elevation scale (feet): 605, 600, 595, 590, 585, 580, 575

Depth scale (feet): 30, 35, 40, 45, 50, 55, 60, 65

Project: Dynegy

Project Location: Coffeen Power Station, IL

Project Number: 60440742

Log of Boring COF-B004

Sheet 1 of 2

Date(s) Drilled	08/04/2015 10:20 AM to 08/05/2015 11:00 AM	Logged By	E. Drumright	Checked By	D. Swanson
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	7.5 inch O.D. HSA	Borehole Depth	45.0 ft
Drill Rig Type	CME 550X (Rubber Tire ATV)	Drilling Contractor	Geotechnology	Surface Elevation	635.0 ft NAVD88
Borehole Backfill	Cement-Bentonite Grout (Installed COF-P005 5 ft West of COF-B004)	Sampling Method(s)	SS / ST	Hammer Data	Automatic
Boring Location	N 872197.6 E 2516082 (ft NAD83)	Groundwater Level(s)	Not Encountered		

Elevation (feet)	Depth (feet)	Samples: Type	Samples: Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
635	0						Elevation 635.0 / Depth 0.0								
		SS	S1	2 3 5	67		Medium stiff, moist, brown, CLAY, with fine sand, trace fine gravel, (CL) (EMBANKMENT FILL).	18.0				1.75			
		SS	S2	3 4 5	67		Stiff, moist, brown and gray, sandy CLAY, trace fine gravel, (CL) (EMBANKMENT FILL).	10.9				3.5			
630	5														
		SS	S3	2 4 4	72		Medium stiff, moist, brown and gray, sandy CLAY, trace fine gravel, (CL) (EMBANKMENT FILL).	11.0				2.25			
625	10	ST	S4		79		Medium stiff, moist, yellowish brown with gray, high plasticity, CLAY, with sand, (CL) (EMBANKMENT FILL).	12.8	136.6	39	24	2.25			
620	15	SS	S5	3 5 6	94		Stiff, moist, brown and gray, medium plastic, sandy CLAY, trace fine gravel, (CL) (EMBANKMENT FILL).	13.1		26	12	4.0			
							Elevation 617.0 / Depth 18.0								
615	20	SS	S6	2 3 7	83		Stiff, very moist, brown and gray, sandy CLAY, trace fine gravel, with gray silt seams, (CL) (NATIVE).	21.8				1.75			
610	25	ST	S7		92		Very stiff, very moist, reddish brown, high plasticity, silty CLAY, trace fine sand, with dark gray silt seams, (CL).	20.6	129.5	51	34	2.75			
605	30	SS	S8	1 4 5	100		Stiff, very moist, brown and gray silt seams, high plasticity, CLAY, with fine to medium sand, (CL).	24.2		43	27	1.75			

Elevation (feet)	Depth (feet)	Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
605	30														
602.5	32.5						Hard, moist, brown and gray, low plasticity, sandy CLAY, trace fine gravel, (CL) (TILL).								
			S9	16 31 37	100			8.4		21	8	4.5+			
600	35														
			S10	14 45 44	83		Hard, moist, brown and gray, sandy silty CLAY, trace fine to coarse gravel, (CL) (TILL). 38.5' - 39.2' gray silt seams	8.8				4.5+			
595	40														
591.5	43.5		S11	19 54 50/4"	94		Hard, wet, brown and gray, sandy silty CLAY, trace gravel, (CL) (TILL).	14.8				-			
590.0	45.0						End of Boring at 45 ft								*Installed Piezometer COF-P005 with 5 ft offset to the West.*
585	50														
580	55														
575	60														
570	65														

Project: Dynegy

Project Location: Coffeen Power Station, IL

Project Number: 60440742

Log of Boring COF-B005

Date(s) Drilled	08/08/2015 7:45 AM to 08/08/2015 12:00 PM	Logged By	E. Drumright	Checked By	D. Swanson
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	7.5 inch O.D. HSA	Borehole Depth	60.0 ft
Drill Rig Type	CME 550X	Drilling Contractor	Geotechnology	Surface Elevation	635.1 ft NAVD88
Borehole Backfill	Cement-Bentonite Grout (Installed COF-P006 5 ft South of COF-B005)	Sampling Method(s)	SS / ST	Hammer Data	Automatic
Boring Location	N 872109.6 E 2516693.3 (ft NAD83)	Groundwater Level(s)	Not Encountered		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
635	0						635.1 / 0.0								
		SS	S1	2 3 4	83		Medium stiff, moist, brown and gray, CLAY, (CL) (EMBANKMENT FILL).	21.1				1.5			
630	5	ST	S2		54		Stiff, moist, brown, low plasticity, sandy CLAY, (CL) (EMBANKMENT FILL).	8.0	136.6	22	9	3.0			
		SS	S3	1 3 4	72		Medium stiff, moist, brown, sandy CLAY, (CL) (EMBANKMENT FILL).	13.1				0.75			
625	10	SS	S4	2 7 6	89		Stiff, moist, brown, low plasticity, sandy silty CLAY, trace fine gravel, (CL) (EMBANKMENT FILL).	9.9		20	6	3.0			*Shale in tip*
620	15	SS	S5	2 6 6	78		Stiff, moist, brown and gray, sandy CLAY, trace fine gravel, (CL) (EMBANKMENT FILL).	10.3				2.0			
615	20	SS	S6	WOH 2 3	67		Medium stiff, moist, brown and gray, sandy CLAY, trace fine gravel, (CL) (EMBANKMENT FILL).	9.4				1.0			
							612.1 / 23.0								
610	25	ST	S7		92		Stiff to very stiff, gray with grayish brown, medium plastic, CLAY, with sand, with organics, (CL) (NATIVE).	18.7	131.4	37	20	1.5			
							606.6 / 28.5								
	30	SS	S8	1 4 6	89		Stiff, brown and gray, medium plastic, CLAY, trace fine sand, trace organics, (CH).	21.9				2.0			

AECOM

Project: Dynegy

Project Location: Coffeen Power Station, IL

Project Number: 60440742

Log of Boring COF-B005

Elevation (feet)	Depth (feet)	Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Elevation (feet)	MATERIAL DESCRIPTION	Depth (feet)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
605	30															
						603.1	Very stiff, low plasticity, sandy CLAY, with organics, (CL).	32.0								
			S9	1 1 1	100				26.7		22	6	2.5			
						601.1	Very loose, saturated, brown and gray, silty, clayey SAND, (SC-SM) (TILL).	34.0								
600	35					599.6		35.5								*35': Attempt ST refusal at 35.5'*
			S10	8 22 27	100		Dense, wet, brown and gray, clayey SAND, trace fine gravel, (SC) (TILL).		11.6				-			
595	40															
						592.1		43.0								
			S11	4 7 11	100		Very stiff, very moist, brown and gray, medium plastic, sandy CLAY, trace gravel, iron stained vertical seams, (CL) (TILL).		12.8		32	17	3.25			
590	45															
			S12	2 6 8	100		Stiff, saturated, brown and gray, medium plastic, sandy CLAY, trace gravel, iron stained vertical seams, (CL) (TILL).		15.5		32	17	3.0			
585	50															
			S13	2 5 7	100		Stiff, very moist, brown and gray, sandy CLAY, trace gravel, iron stained vertical seams, (CL) (TILL).		23.2				1.25			
580	55															
			S14	2 3 6	100		Stiff, brown and gray, high plasticity, CLAY, with sand, (CL).		23.3		47	30	1.25			
575	60					575.1	End of Boring at 60 ft	60.0								*Installed Piezometer COF-P006 with 5 ft offset to the South.*
	65															

AECOM

Project: Dynegy

Project Location: Coffeen Power Station, IL

Project Number: 60440742

Log of Boring COF-B006

Date(s) Drilled	08/06/2015 4:00 PM to 08/07/2015 7:30 AM	Logged By	E. Drumright	Checked By	D. Swanson
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	7.5 inch O.D. HSA	Borehole Depth	33.5 ft
Drill Rig Type	CME 550X	Drilling Contractor	Geotechnology	Surface Elevation	631.9 ft NAVD88
Borehole Backfill	Cement-Bentonite Grout	Sampling Method(s)	SS / ST	Hammer Data	Automatic
Boring Location	N 871654.5 E 2515234.7 (ft NAD83)	Groundwater Level(s)	4 ft on 8/6/2015 5:00:00 PM		

Elevation (feet)	Depth (feet)	Sample Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
631.9	0.0				Medium dense, moist, black CINDERS, well-graded sand, with silt, trace fine gravel, (ASH).								
		S1	5 13 15	78		6.6							
					Very loose, wet, black CINDERS, with clay, (ASH).								
		S2	2 2 2	100		48.3							
		S3		17		22.2							
		S4	3 4 6	100	Loose, wet, black CINDERS, well-graded sand, with clay, (FILL).	16.7							
617.9	14.0	S5	WOH 2 3		Medium stiff, very moist, brown and gray, high plasticity CLAY, trace fine sand, (CH) (NATIVE).	24.4		57	37	1.75			
		S6	1 3 4	67		21.9				1.25			
608.9	23.0	S7	1 1 1	100	Very soft, very wet, brown, low plasticity, sandy CLAY, (CL) (TILL).	19.8		23	9	0.5			
605.9	26.0	S8	20 50/4"		Hard, very wet, brown and gray, sandy CLAY, (CL) (TILL).	16.1							

Project: Dynegy

Project Location: Coffeen Power Station, IL

Project Number: 60440742

Log of Boring COF-B006

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30														
600			S9	24 34 50/5"	94		Hard, moist, brown and gray, medium plastic, sandy CLAY, trace fine gravel, (CL).	8.1		25	12				*Hard augering below 32'*
598.4	33.5						End of Boring at 33.5 ft								
	35														
595															
	40														
590															
	45														
585															
	50														
580															
	55														
575															
	60														
570															
	65														

AECOM

Project: Dynegy

Project Location: Coffeen Power Station, IL

Project Number: 60440742

Log of Boring COF-B006A

Sheet 1 of 1

Date(s) Drilled	08/19/2015 7:15 AM to 08/19/2015 10:15 AM	Logged By	A. Grossman	Checked By	D. Swanson
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	7.5 inch O.D. HSA	Borehole Depth	25.5 ft
Drill Rig Type	CME 550X	Drilling Contractor	Geotechnology	Surface Elevation	632 ft NAVD88
Borehole Backfill	Cement-Bentonite Grout	Sampling Method(s)	Piston	Hammer Data	-
Boring Location	N 871649.5 E 2515234.7 (ft NAD83)	Groundwater Level(s)	Not Encountered		

Elevation (feet)	Depth (feet)	Samples: Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Material Description (Elevation / Depth, feet)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
632.0	0.0				Loose, moist, black, medium to coarse grained , CINDERS, (ASH).								
		PS-1		75									
		PS-2		20									
619.5	12.5				Stiff, light grayish brown, silty CLAY, some ash, (CL).								
		PS-3		70						1.25			
		PS-4		83						1.25			
		PS-5		73						1.25			
		PS-6		93	Stiff to very stiff, grayish brown CLAY, (CL).					2.0			
606.5	25.5				End of Boring at 25.5 ft								*Auger refusal at 25.5' bgs.*

AECOM

Project: Dynegy

Project Location: Coffeen Power Station, IL

Project Number: 60440742

Log of Boring COF-B007

Date(s) Drilled	08/11/2015 12:00 AM to	Logged By	A. Grossman	Checked By	D. Swanson
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	7.5 inch O.D. HSA	Borehole Depth	37.5 ft
Drill Rig Type	CME 550X	Drilling Contractor	Geotechnology	Surface Elevation	638.0 ft NAVD88
Borehole Backfill	Piezometer COF-P009	Sampling Method(s)	SS / ST	Hammer Data	Automatic
Boring Location	N 873894 E 2515111.2 (ft NAD83)	Groundwater Level(s)	Not Encountered		

Elevation (feet)	Depth (feet)	Samples: Type	Samples: Number	Samples: Sampling Resist. OR Core RQD (%)	Samples: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
638.0	0.0						Very stiff, slightly moist, brown, silty and sandy CLAY, some fine to coarse gravel, trace silt, (CL) (EMBANKMENT FILL).								
		SS	S1	6 9 12	89			21.4							
635															
	5	ST	S2		83		Very stiff, moist, gray, high plasticity, silty CLAY, well sorted, (CL) (EMBANKMENT FILL).	23.2	126.8	46	27				
		ST	S3		100		Medium stiff to stiff, moist, gray trace yellowish brown, medium plastic, CLAY, well sorted, with sand, (CL) (EMBANKMENT FILL).	21.7							
630															
	10	SS	S4	2 5 7	78		Stiff, moist, brown and gray, medium plastic, CLAY, trace fine sand, well sorted, (CL) (EMBANKMENT FILL).	25.3							
625															
	15	SS	S5	2 7 9	83		Very stiff, moist, brown and gray, high plasticity, CLAY, trace fine sand and gravel, (CL) (EMBANKMENT FILL).	21.6		47	28				
621.0	17.0														
620															
	20	SS	S6	2 2 4	94		Medium stiff, moist, brown and gray, high plasticity, CLAY, trace fine to coarse sand, (CH).	24.5							
		ST	S7		92		Firm, moist, yellowish brown with dark gray, high plasticity, CLAY, with sand, trace gravel, (CH).	22.5	127.0	52	35				
615		ST	S8		100			18.3	128.5	43	27				
	25														
610															
609.0	29.0														
	30	SS	S9	1	72		Soft, wet to saturated, brown and gray, sandy CLAY (CL).	20.3							

AECOM

Elevation (feet)	Depth (feet)	Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		S9	1 3	72										
605.0	33.0														
	35		S10	12 15 21	89		Hard, moist, gray, medium plastic, sandy CLAY, well sorted, (CL) (TILL).	11.0		34	19				
			S11	8 12 9	89		Very stiff, saturated, gray, CLAY, with sand, well sorted, (CL).	13.6							
600.5	37.5						End of Boring at 37.5 ft								*Auger refusal at 37.5' Grouted to 30 ft-set overnight, then installed Piezometer COF-P009 in boring.*

Elevation scale (feet): 605, 600, 595, 590, 585, 580, 575
Depth scale (feet): 30, 35, 40, 45, 50, 55, 60, 65

Project: Dynegy

Project Location: Coffeen Power Station, IL

Project Number: 60440742

Log of Boring COF-B008

Date(s) Drilled	08/13/2015 8:00 AM to 08/14/2015 9:30 AM	Logged By	A. Grossman	Checked By	D. Swanson
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	7.5 inch O.D. HSA	Borehole Depth	38.5 ft
Drill Rig Type	CME 550X	Drilling Contractor	Geotechnology	Surface Elevation	635.7 ft NAVD88
Borehole Backfill	Cement-Bentonite Grout	Sampling Method(s)	SS / ST	Hammer Data	Automatic
Boring Location	N 873886.6 E 2516222.7 (ft NAD83)	Groundwater Level(s)	Not Encountered		

Elevation (feet)	Depth (feet)	Sample Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
635.7	0.0	S1	2 4 5	89	Stiff, moist, brown and gray, CLAY, trace sand, with roots, (CL) (EMBANKMENT FILL).	19.7							
		S2	2 1 2	67	Soft, moist, brown, high plasticity, CLAY, with roots, (CL) (EMBANKMENT FILL).	16.3		46	29				
628.7	7.0	S3	1 3 6	78	Stiff, moist, brown and gray, medium plastic, CLAY, trace sand, with roots, (CH) (EMBANKMENT FILL).	21.7				3.25			
		S4	2 4 8	78		21.6		54	36	2.25			
624.7	11.0	S5		83	Very stiff to hard, moist to wet, dark gray with trace grayish brown, high plasticity, CLAY, with sand, with roots, (CL) (EMBANKMENT FILL).	16.6	131.5	43	27	> 4.5			
		S6		100	Stiff, wet, light yellowish brown with light gray, medium plastic, CLAY, with sand, with roots, (CL) (EMBANKMENT FILL).	13.9	137.2	35	20	2.25			
615.7	20.0	S7	2 3 6	83	Stiff, moist, brown and gray, medium plastic, CLAY, trace sand, (CH) (NATIVE).	20.5				2.0			
		S8	2 6 7	78	Stiff, moist, brown and gray , medium plastic, CLAY, with sand, (CH).	16.4				3.25			
607.7	28.0	S9		96	Soft, moist to wet, grayish brown, medium plastic, CLAY, some silt, (CL) (NATIVE).	19.1	128.4			0.5			

AECOM

Project: Dynegy

Project Location: Coffeen Power Station, IL

Project Number: 60440742

Log of Boring COF-B008

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		S10		0										*ST refusal at 30.5'*
			S11	50/6"	100		Hard, moist, brown and gray, sandy CLAY, trace fine gravel, poorly sorted, (CL).	5.8							
597.2	38.5						End of Boring at 38.5 ft								*Auger refusal at 38.5'*

Elevation scale: 605, 600, 595, 590, 585, 580, 575

Depth scale: 30, 35, 40, 45, 50, 55, 60, 65

Project: Dynegy

Project Location: Coffeen Power Station, IL

Project Number: 60440742

Log of Boring COF-B009

Date(s) Drilled	08/13/2015 9:00 AM to 08/13/2015 12:15 PM	Logged By	E. Drumright/A.Grossman	Checked By	D. Swanson
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	7.5 inch O.D. HSA	Borehole Depth	40.0 ft
Drill Rig Type	CME 550X	Drilling Contractor	Geotechnology	Surface Elevation	635.2 ft NAVD88
Borehole Backfill	Piezometer COF-B010	Sampling Method(s)	SS / ST	Hammer Data	Automatic
Boring Location	N 873505 E 2516620.8 (ft NAD83)	Groundwater Level(s)	Not Encountered		

Elevation (feet)	Depth (feet)	Samples: Type	Samples: Number	Samples: Sampling Resist. OR Core RQD (%)	Samples: Recovery (%)	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
635	0					Elevation 635.2 / Depth 0.0								
			S1	3 4 6	83	Medium dense, moist, 2" sandy clay layer over 12" black, fine to coarse CINDERS, (ASH).	2.6							
						631.7 / 3.5								
			S2	1 2 3	44	Medium stiff, very moist, 2" ash layer over brown and gray, silty CLAY, trace sand, (CH) (EMBANKMENT FILL).	26.1				1.25			
630	5													
			S3	2 4 5	83	Stiff, very moist, dark grayish brown, high plasticity, CLAY, (CH) (EMBANKMENT FILL).	17.1		58	40	2.0			
			S4	2 5 6	61	Stiff, very moist, brown and gray, CLAY, trace sand, (CH) (EMBANKMENT FILL).	22.4				2.0			
625	10													
			S5		79	Very stiff, very moist, olive gray and grayish brown, high plasticity, CLAY, with sand, (CH) (EMBANKMENT FILL).	18.4	131.5	50	35	2.25			
620	15					619.7 / 15.5								
			S6		75	Stiff, very moist, brown and gray, CLAY, (CL-CH) (EMBANKMENT FILL).	23.3	128.5			1.75			
			S7	1 3 6	100		29.3				1.75			
615	20													
			S8	1 3 5	89	Medium stiff, very moist, brown and gray, high plasticity, CLAY, trace sand, (CL) (EMBANKMENT FILL).	23.1		48	30	1.75			
610	25													
						608.2 / 27.0								
			S9		92	Very stiff, brown and gray, high plasticity, CLAY, (CH) (NATIVE).	24.9	124.9	62	40	2.25			
	30													

AECOM

Project: Dynegy

Project Location: Coffeen Power Station, IL

Project Number: 60440742

Log of Boring COF-B009

Elevation (feet)	Depth (feet)	Samples: Type	Samples: Number	Samples: Sampling Resist. OR Core RQD (%)	Samples: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
605	30		S9		92				124.9		40	2.25			
			S10	5 6 7	94		Stiff, moist to wet, brown and gray, CLAY, trace sand, (CH).	20.1				1.75			
600	35						599.2 / 36.0								36': harder drilling
			S11	4 7 9	100		Very stiff, very moist, brown and gray, high plasticity, CLAY, (CL) (TILL).	21.6		49	32	2.25			
595	40						595.2 / 40.0 End of Boring at 40 ft								*Installed Piezometer COF-P010 in boring.*
590	45														
585	50														
580	55														
575	60														
	65														

AECOM

Project: Dynegy

Project Location: Coffeen Power Station, IL

Project Number: 60440742

Log of Boring COF-B010

Date(s) Drilled	08/10/2015 3:00 PM to 08/11/2015 10:00 AM	Logged By	E. Drumright/A.Grossman	Checked By	D. Swanson
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	HSA	Borehole Depth	44.0 ft
Drill Rig Type	CME 550X	Drilling Contractor	Geotechnology	Surface Elevation	642.2 ft NAVD88
Borehole Backfill	Piezometer COF-P012	Sampling Method(s)	SS / ST	Hammer Data	Automatic
Boring Location	N 872690.8 E 2515090.7 (ft NAD83)	Groundwater Level(s)	10 ft on 8/10/2015 3:30:00 PM		

Elevation (feet)	Depth (feet)	Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
642.2	0.0														
640			S1	3 6 7	89		Stiff, moist, brown and gray, CLAY, trace fine gravel and ash, with orange-brown seams, (CL) (FILL).	15.1				4.5			
638.5	3.7														
	5		S2	3 7 7	72		Medium dense, moist, 2" layer of well-graded SAND, over medium to coarse grained CINDERS (ASH).	5.8							
635			S3	8 14 16	72		Dense, moist, black medium to coarse grained CINDERS (ASH).	3.8							
	10		S4	3 9 13	72		Medium dense, moist to wet, black medium to coarse grained, CINDERS (ASH).	9.6							
630															
	15		S5	2 7 12	89		Medium dense, wet, black medium to coarse grained CINDERS, (ASH).	14.2							
625															
	20		S6	4 6 6	67		Medium dense, black, non-plastic, CINDERS, (ASH).	14.8		NP	NP				
620															
618.2	24.0														
	25		S7	3 3 5	100		Medium stiff, wet, brown and gray, CLAY, trace fine sand, (CH) (NATIVE).	13.9/24.1							
615															
613.7	28.5														
	30		S8	3 3 5	100		Medium stiff, brown and gray, high plasticity, sandy CLAY, (CL).	21.9		48	31				

Report: GEO_SOIL; File N:\PROJECTS\60428794_DYNEGY_CCR_RULEASMT\SUB_00\10.0_CALCULATIONS_ANALYSIS_DATA\SITE INVESTIGATION\COFFEEN\BORINGS\GINT TEMPLATE\DYNEGY_COFFEEN_2015.GPJ; 12/29/2015 5:44:04 PM

AECOM

Project: Dynegy

Project Location: Coffeen Power Station, IL

Project Number: 60440742

Log of Boring COF-B010

Elevation (feet)	Depth (feet)	Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Elevation (feet)	Depth (feet)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30																
610																	
	35		S9	1 3 5	100		Medium stiff, wet, brown and gray, high plasticity, sandy CLAY, trace fine gravel, (CL).			18.6							
605								603.7	38.5								
	40		S10	7 27 29	100		Hard, very moist, gray, high plasticity, sandy CLAY (CL).			9.1		47	28				
600			S11	12 22 50/2"	100		Hard, gray, sandy silty CLAY, trace fine gravel, (CL).	598.2	44.0	9.6							
	45						End of Boring at 44 ft										*Installed Piezometer COF-P012 in boring.*
595																	
	50																
590																	
	55																
585																	
	60																
580																	
	65																

AECOM

Project: Dynegy

Project Location: Coffeen Power Station, IL

Project Number: 60440742

Log of Boring COF-B011

Date(s) Drilled	08/11/2015 9:45 AM to 08/11/2015 1:15 PM	Logged By	E. Drumright	Checked By	D. Swanson
Drilling Method	Hollow Stem Auger	Drill Bit Size/Type	7.5 inch O.D. HSA	Borehole Depth	40.0 ft
Drill Rig Type	CME 550X	Drilling Contractor	Geotechnology	Surface Elevation	635.1 ft NAVD88
Borehole Backfill	Piezometer COF-P014	Sampling Method(s)	SS / ST	Hammer Data	Automatic
Boring Location	N 872538.3 E 2515411.6 (ft NAD83)	Groundwater Level(s)	Not Encountered		

Elevation (feet)	Depth (feet)	Samples: Number	Samples: Sampling Resist. OR Core RQD (%)	Samples: Recovery (%)	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
635	0				635.1 / 0.0 Stiff, moist, brown and gray, CLAY, with fine to medium sand, with roots, (CL-CH) (EMBANKMENT FILL).								
		S1	2 3 6	67		23.9				2.5			
		S2	2 4 5	94	631.6 / 3.5 Stiff, moist, brown and gray, very plastic, CLAY, with roots, one ash seam, (CH) (EMBANKMENT FILL).	23.5		67	47	1.75			
630	5				630.1 / 5.0								
		S3	2 4 6	89	Stiff, moist, brown and gray, CLAY, trace fine sand, with roots, (CL) (EMBANKMENT FILL).	26.1				2.0			
		S4	30/3"	17		21.8							*S4: Concrete or boulder chips in tip of spoon. Drill through to continue.*
		S5	4 8 8	83	Very stiff, very moist, brown and gray, medium plastic, sandy CLAY, trace fine gravel, limestone rock in middle of sample, (CL) (EMBANKMENT FILL).	10.9		32	18	4.0			
625	10												
		S6		58	Very stiff, yellowish brown with grayish brown, medium plastic, sandy CLAY, (CL) (EMBANKMENT FILL).	11.5	139.4	34	20	4.0			
620	15												*Gravel in tip. Bent tip of tube.*
		S7		54	Hard, very moist, yellowish brown trace gray, medium plastic, sandy CLAY, trace gravel, (CL) (EMBANKMENT FILL).	12.0	134.1	30	16	4.5+			
					617.1 / 18.0								
		S8	2 3 6	83	Stiff, very moist, brown and gray, CLAY, with orange-brown silt seams, (CL-CH) (NATIVE).	27.3				1.75			
615	20												
		S9	2 4 5	100	Stiff, brown and gray, CLAY, trace fine to medium sand, (CL).	19.4				1.5			
610	25												
		S10	1 2 3	100	Medium stiff, brown and gray, medium plastic, sandy CLAY, trace fine gravel, (CL). 605.6 / 29.5	17.3		32	17	0.25			
	30												

AECOM

Project: Dynegy

Project Location: Coffeen Power Station, IL

Project Number: 60440742

Log of Boring COF-B011

Elevation (feet)	Depth (feet)	Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Elevation (feet)	Depth (feet)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
605	30		S11		100		Soft to stiff, wet, with orange brown, sandy CLAY TILL, trace fine sand, with orange-brown silt seams, (CL).	603.1	32.0	9.9	144.5						
			S12				Brown and gray, sand CLAY, trace fine gravel, (CL).	602.1	33.0	8.9							
			S13	16 32 41	94		Very dense, very moist, gray, silty clayey SAND, trace gravel, with orange-brown silt seams, (SC-SM) (TILL).	596.6	38.5	9.3				4.5+			
600	35																
			S14	20 46 50/4"	83		Hard, wet, gray, sandy silty CLAY, trace fine grave, (CL) (TILL).	595.1	40.0	9.8				4.5+			
595	40						End of Boring at 40 ft										*Installed Piezometer COF-P014 in boring.*
590	45																
585	50																
580	55																
575	60																
	65																

AECOM

Project: Dynegy

Project Location: Coffeen Power Station, IL

Project Number: 60440742

Log of Boring COF-HA1

Date(s) Drilled	08/30/2015 12:00 AM to	Logged By	E. Drumright	Checked By	D. Swanson
Drilling Method	Hand Auger	Drill Bit Size/Type	2.25" O.D Hand Auger	Borehole Depth	8.0 ft
Drill Rig Type		Drilling Contractor	AECOM	Surface Elevation	610.5 ft NAVD88
Borehole Backfill	Drill Cuttings	Sampling Method(s)	Bag	Hammer Data	None
Boring Location	N 872484.5 E 2516572.3 (ft NAD83)	Groundwater Level(s)	7.3' ft on 8/30/2015		

Elevation (feet)	Depth (feet)	SAMPLES Type	SAMPLES Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
610.5	0.0		S1				Very stiff to stiff, moist to very moist, brown to brown and gray, medium plastic, CLAY (CL-CH), (FILL).	12.9							
			S2					13.3		35	14				
			S3					21.7							
607.5	3.0		S4				Stiff to very stiff, very moist, brown and gray, CLAY, trace sand to with sand, (CL-CH).	19.0							
			S5					18.1							
			S6					18.0							
604.5	6.0		S7				Stiff, very wet, brown and gray, high plasticity, sandy CLAY, (CL) (TILL).	16.0		35	21				
			S8					22.9							
602.5	8.0						End of Boring at 8 ft								

AECOM

Report: GEO_SOIL; File N:\PROJECTS\60428794_DYNEGY_CCR_RULEASMT\SUB_00\10.0_CALCULATIONS_ANALYSIS_DATA\SITE INVESTIGATION\COFFEEN\BORINGS\GINT TEMPLATE\DYNEGY_COFFEEN_2015.GPJ; 12/29/2015 5:44:22 PM

Project: Dynegy

Project Location: Coffeen Power Station, IL

Project Number: 60440742

Log of Boring COF-HA2

Sheet 1 of 1

Date(s) Drilled	08/30/2015 12:00 AM to	Logged By	E. Drumright	Checked By	D. Swanson
Drilling Method	Hand Auger	Drill Bit Size/Type	2.25" O.D Hand Auger	Borehole Depth	5.5 ft
Drill Rig Type		Drilling Contractor	AECOM	Surface Elevation	594.6 ft NAVD88
Borehole Backfill	Drill Cuttings	Sampling Method(s)	Bag	Hammer Data	None
Boring Location	N 873496.7 E 2516761.2 (ft NAD83)	Groundwater Level(s)	Not Encountered		

Elevation (feet)	Depth (feet)	SAMPLES Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0						594.6 — 0.0								
			S1				593.9 Dark brown, high plasticity, CLAY, with sand, cinders and organics, (CH) (TOPSOIL). 0.7	18.6		51	25				
			S2				Very stiff, very moist, brown, CLAY, (CL).	20.9		47	27				
			S3				591.6 — 3.0	22.8							
			S4				Stiff to very stiff, very moist, brown, high plasticity, CLAY, trace sand to sandy, none to trace fine gravel, (CL) (TILL).	15.8							
590	5		S5					13.4		43	27				
			S6				589.1 — 5.5	11.4							
							End of Boring at 5.5 ft								
585	10														
580	15														
575	20														
570	25														
565	30														

AECOM

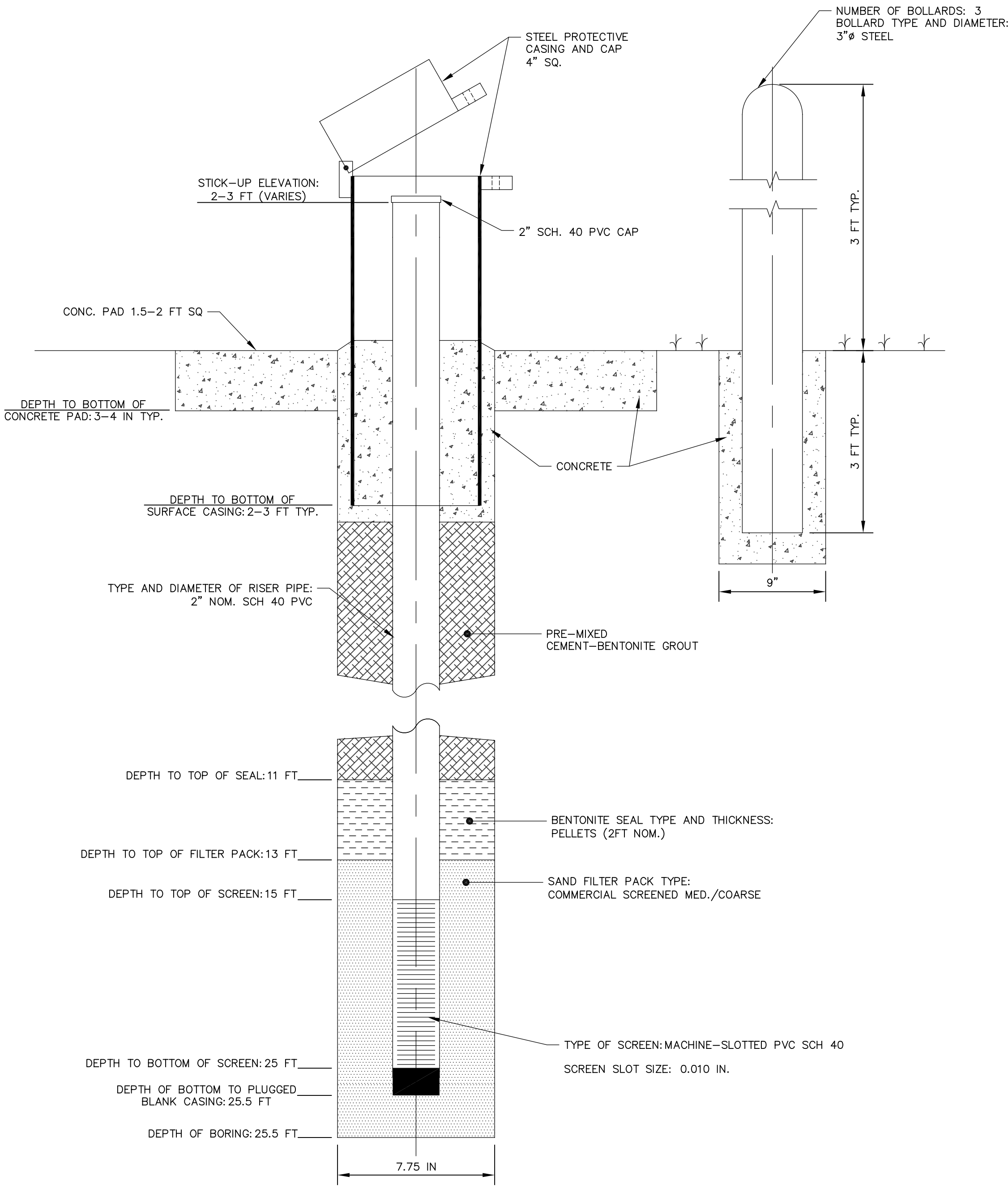
Project: Dynegy

Project Location: COFFEEN POWER STATION, ILLINOIS

Project Number: 60440742

Log of Piezometer

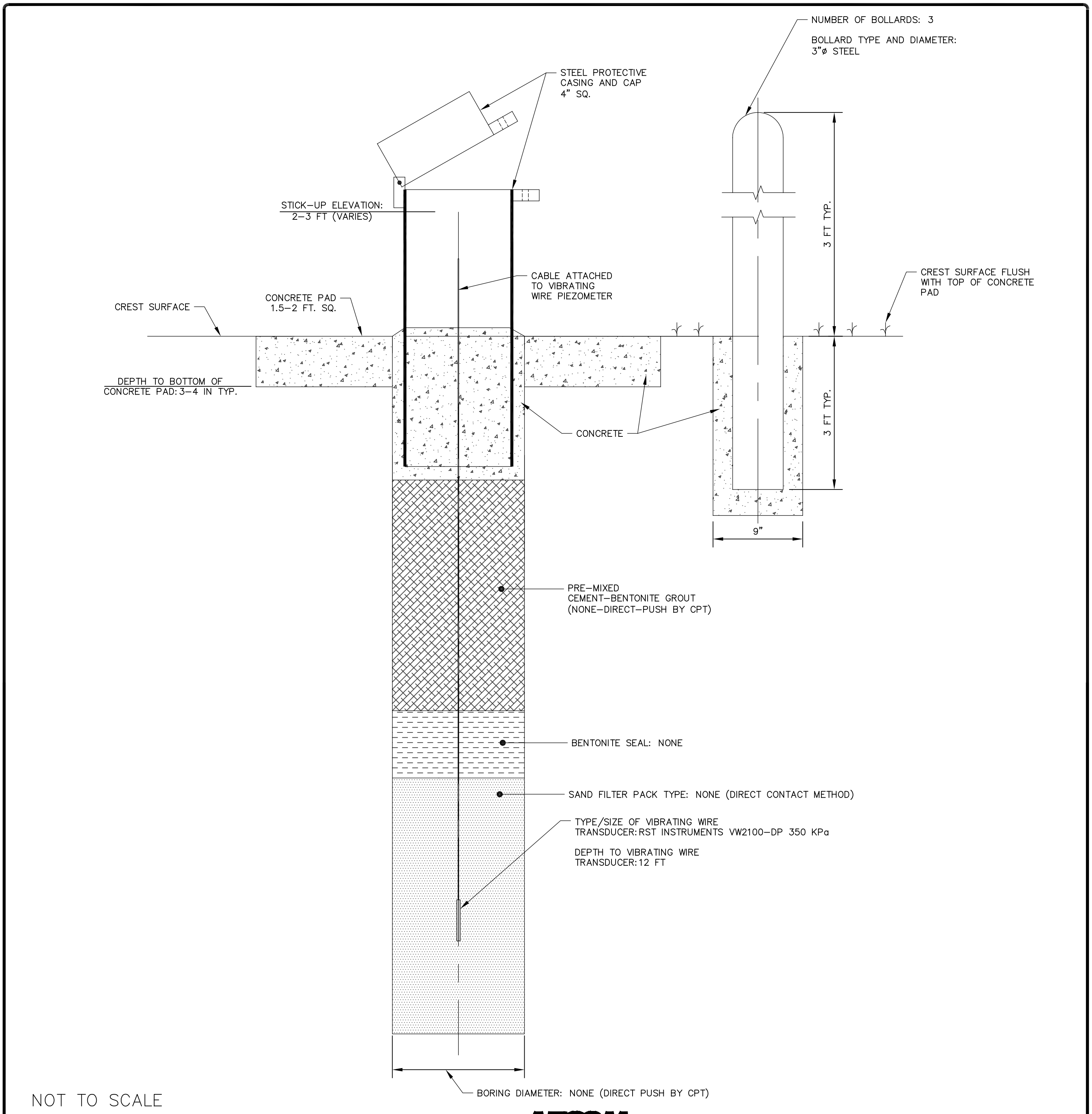
Piezometer Location	COF-P000	Date Installed	8/7/2015	Time	
Installed By		Observed By	AECOM	Total Depth	25 FT
Method of Installation	HOLLOW STEM AUGER	Drilling Contractor	GEOTECHNOLOGY, INC.	Surface Elevation	
Screened Interval	15-25 FT	Completion Zone	EMBANKMENT/FOUNDATION		
Remarks	OFFSET 5 FT SOUTH FROM COF-B001	Groundwater Level(s)	17.9 FT ON 8/29/2015		



NOT TO SCALE

Project: Dynegy	Log of Piezometer
Project Location: COFFEEN POWER STATION, ILLINOIS	
Project Number: 60440742	Sheet 1 of 1

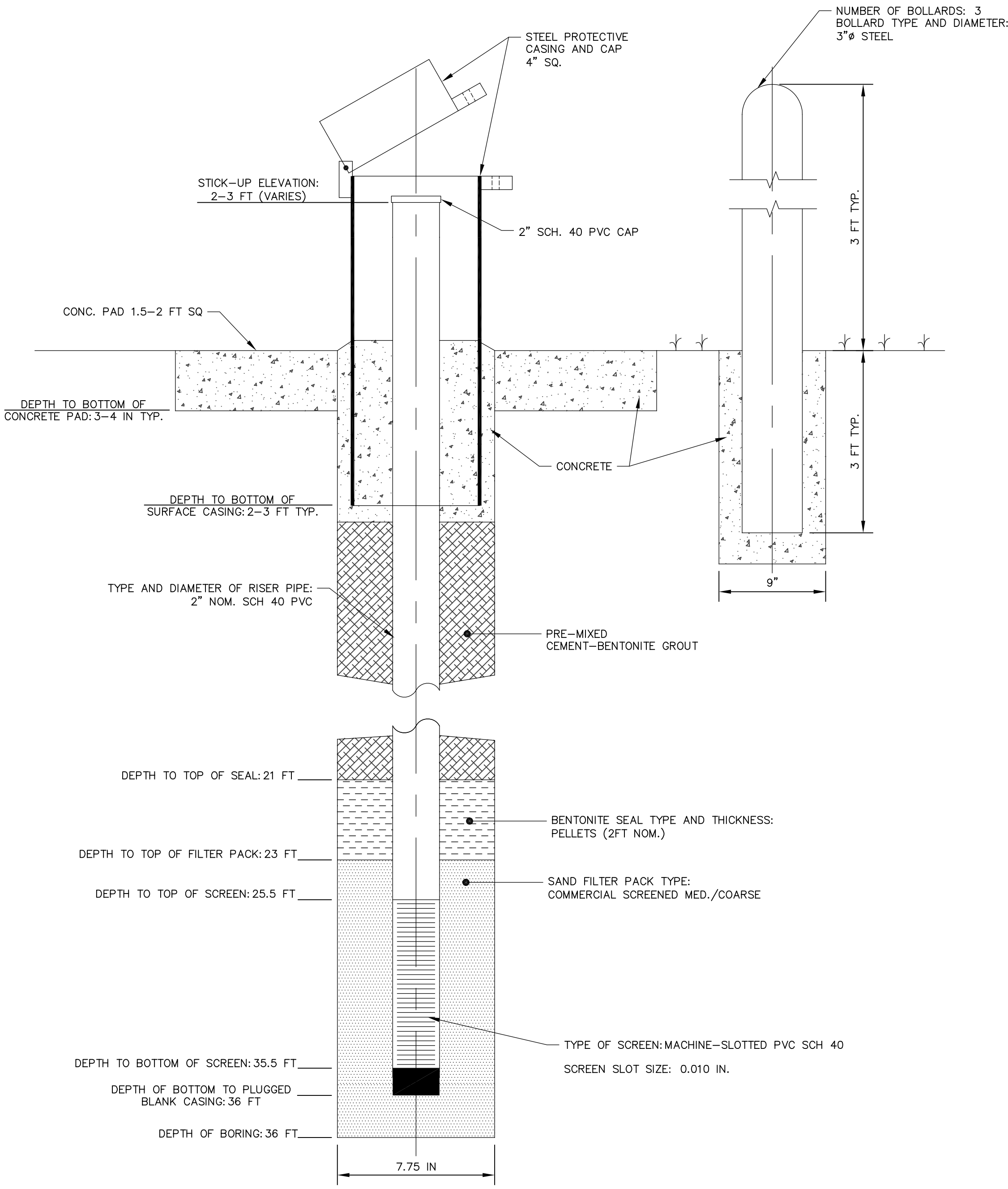
Piezometer Location	COF-P001	Date Installed	8/12/2015	Time	
Installed By		Observed By	AECOM	Total Depth	12 FT
Method of Installation	CPT - DIRECT PUSH	Drilling Contractor	CONETEC, INC.	Surface Elevation	615.6 FT
Screened Interval	N/A	Completion Zone	POND #1 FOUNDATION		
Remarks		Groundwater Level(s)	1.3 FT ON 8/29/2015		



NOT TO SCALE

Project: Dynegy	Log of Piezometer
Project Location: COFFEEN POWER STATION, ILLINOIS	
Project Number: 60440742	Sheet 1 of 1

Piezometer Location	COF-P002	Date Installed	8/6/2015	Time	
Installed By		Observed By	AECOM	Total Depth	35.5 FT
Method of Installation	HOLLOW STEM AUGER	Drilling Contractor	GEOTECHNOLOGY, INC.	Surface Elevation	635.4 FT
Screened Interval	25.5-35.5 FT	Completion Zone	POND #1 FOUNDATION		
Remarks	INSTALL IN COF-B002	Groundwater Level(s)	10.5 FT ON 8/29/2015		

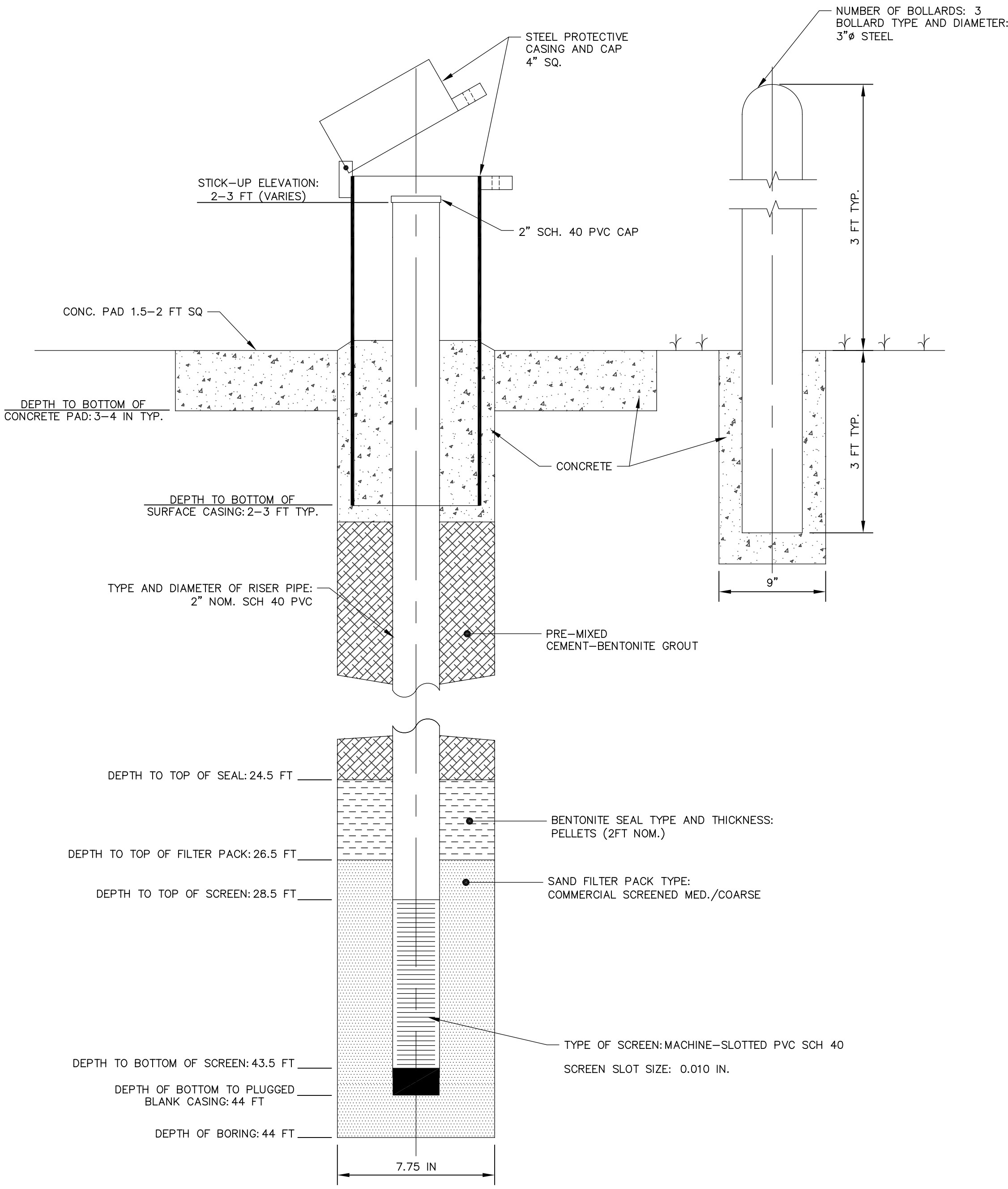


NOT TO SCALE

AECOM

Project: Dynegy	Log of Piezometer
Project Location: COFFEEN POWER STATION, ILLINOIS	
Project Number: 60440742	Sheet 1 of 1

Piezometer Location	COF-P003	Date Installed	8/5/2015	Time	
Installed By		Observed By	AECOM	Total Depth	43.5 FT
Method of Installation	HOLLOW STEM AUGER	Drilling Contractor	GEOTECHNOLOGY, INC.	Surface Elevation	635.7 FT
Screened Interval	28.5-43.5 FT	Completion Zone	POND #1 FOUNDATION		
Remarks	INSTALL IN COF-B003	Groundwater Level(s)	15.3 FT ON 8/29/2015		

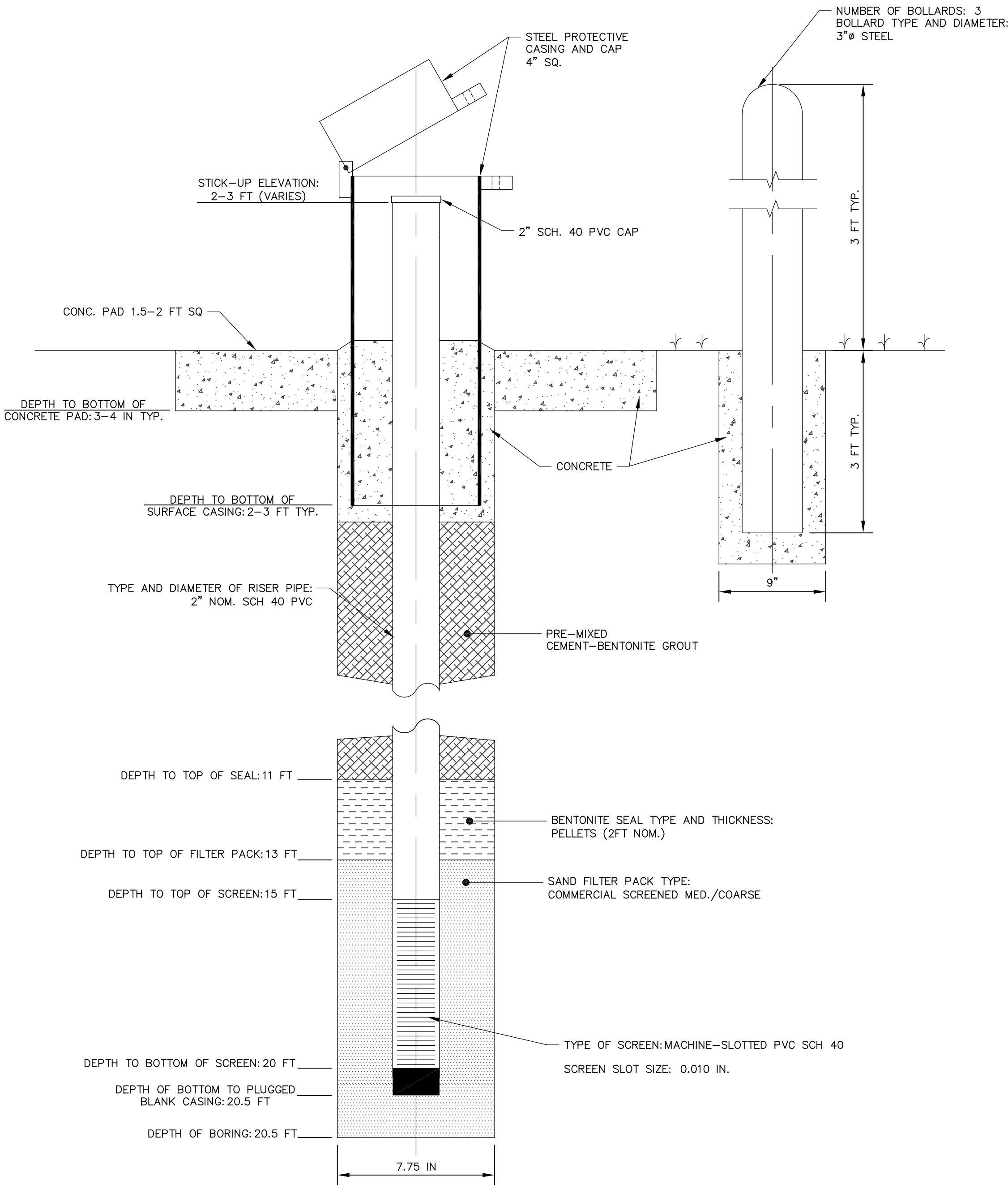


NOT TO SCALE

AECOM

Project: Dynegy	Log of Piezometer
Project Location: COFFEEN POWER STATION, ILLINOIS	
Project Number: 60440742	Sheet 1 of 1

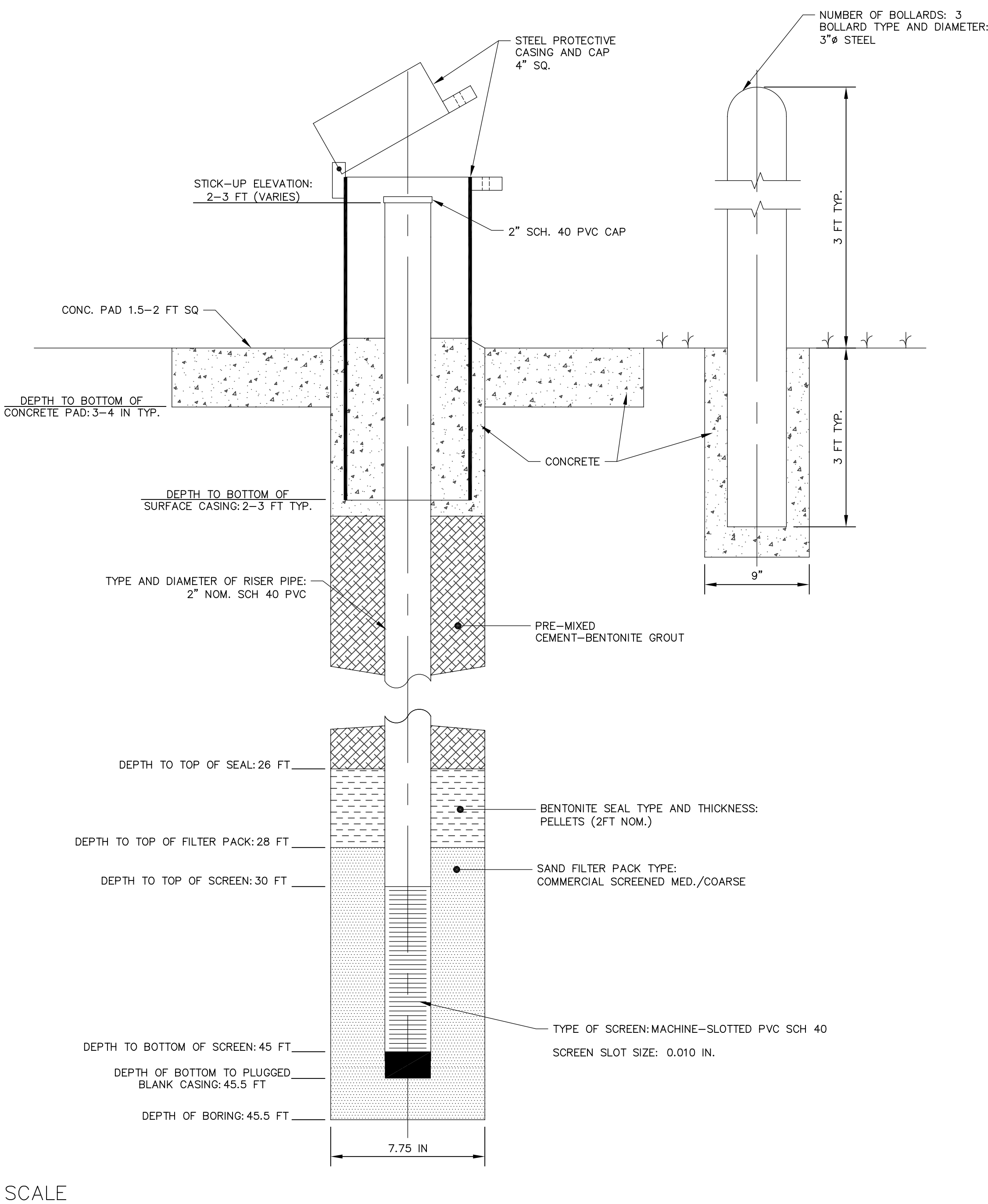
Piezometer Location	COF-P005	Date Installed	8/5/2015	Time	
Installed By		Observed By	AECOM	Total Depth	20 FT
Method of Installation	HOLLOW STEM AUGER	Drilling Contractor	GEOTECHNOLOGY, INC.	Surface Elevation	635.0 FT
Screened Interval	15-20 FT	Completion Zone	EMBANKMENT		
Remarks	OFFSET 5' WEST OF COF-B004	Groundwater Level(s)	14.4 FT ON 8/29/2015		



NOT TO SCALE

Project: Dynegy	Log of Piezometer
Project Location: COFFEEN POWER STATION, ILLINOIS	
Project Number: 60440742	Sheet 1 of 1

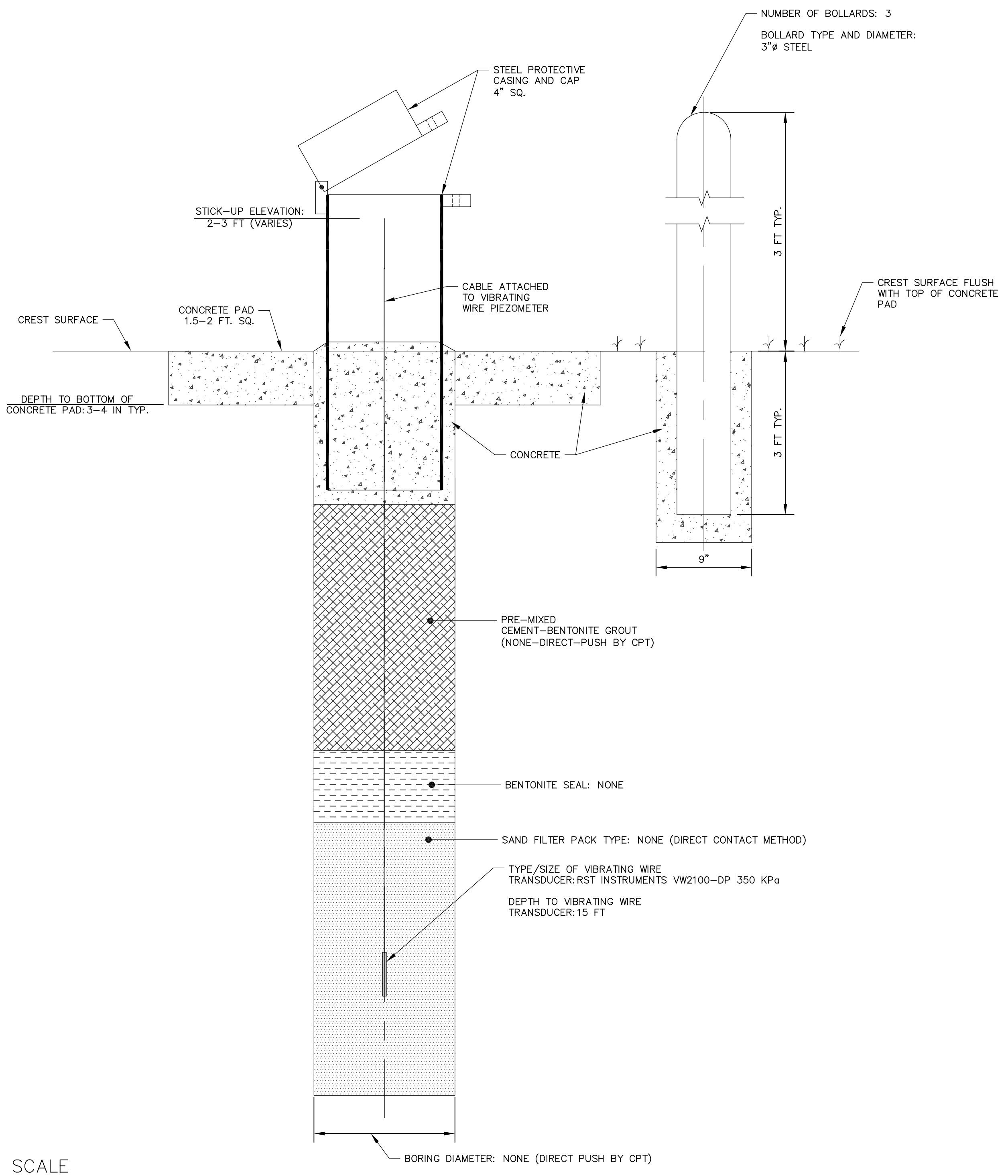
Piezometer Location	COF-P006	Date Installed	8/10/2015	Time	
Installed By		Observed By	AECOM	Total Depth	45 FT
Method of Installation	HOLLOW STEM AUGER	Drilling Contractor	GEOTECHNOLOGY, INC.	Surface Elevation	635.1 FT
Screened Interval	30-45 FT	Completion Zone	POND #1 FOUNDATION		
Remarks	OFFSET 5' SOUTH FROM COF-B005	Groundwater Level(s)	22.2 FT ON 8/29/2015		



AECOM

Project: Dynegy	Log of Piezometer
Project Location: COFFEEN POWER STATION, ILLINOIS	
Project Number: 60440742	Sheet 1 of 1

Piezometer Location	COF-P007	Date Installed	8/12/2015	Time	
Installed By		Observed By	AECOM	Total Depth	15 FT
Method of Installation	CPT - DIRECT PUSH	Drilling Contractor	CONETEC, INC.	Surface Elevation	617.5 FT
Screened Interval	N/A	Completion Zone	POND #1 FOUNDATION		
Remarks		Groundwater Level(s)	6.1 FT ON 8/29/2015		



Project: Dynegy

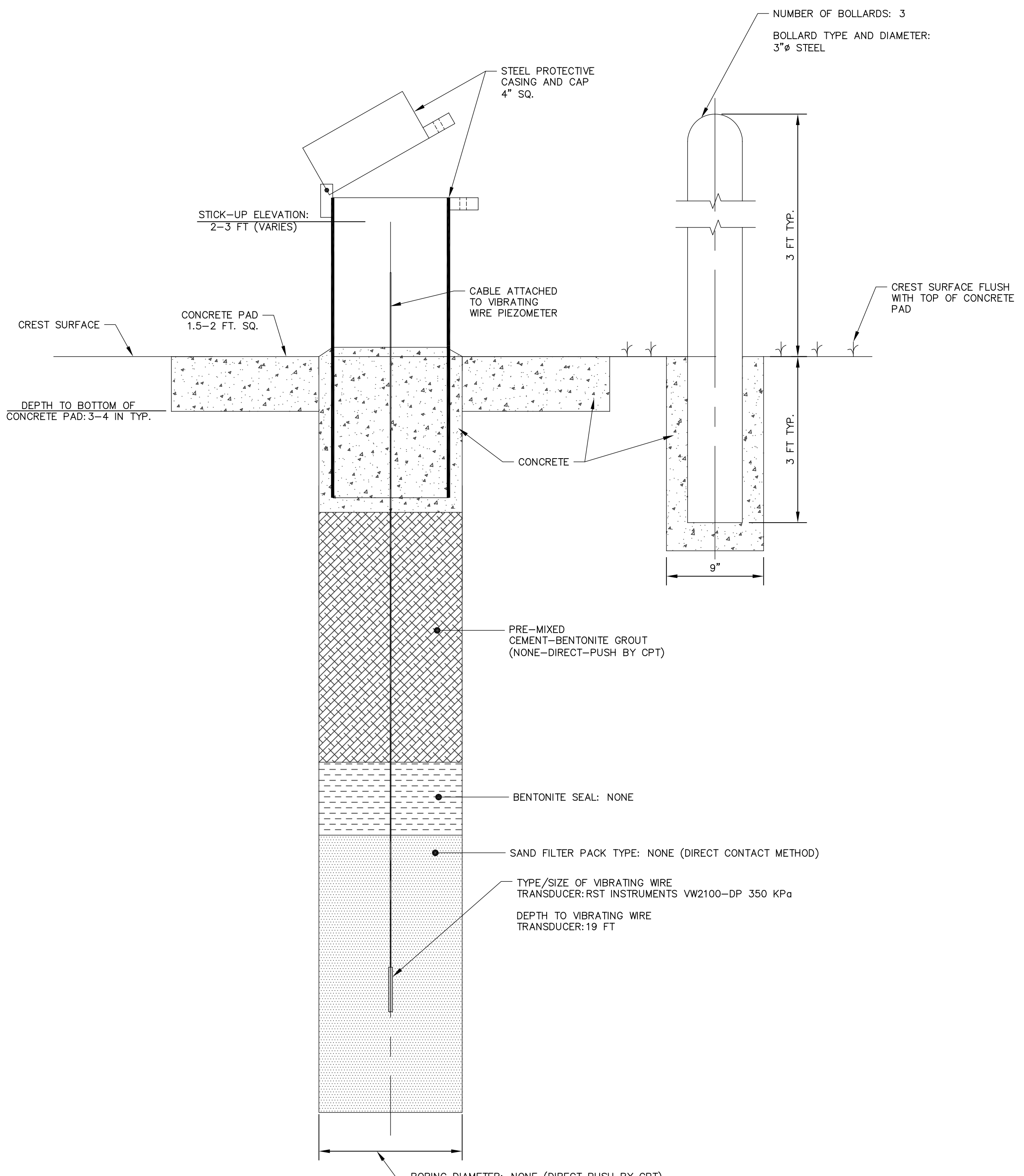
Project Location: COFFEEN POWER STATION, ILLINOIS

Project Number: 60440742

Log of Piezometer

Sheet 1 of 1

Piezometer Location	COF-P008	Date Installed	8/12/2015	Time	
Installed By		Observed By	AECOM	Total Depth	19 FT
Method of Installation	CPT - DIRECT PUSH	Drilling Contractor	CONETEC, INC.	Surface Elevation	625.1 FT
Screened Interval	N/A	Completion Zone	POND #1 FOUNDATION		
Remarks		Groundwater Level(s)	2.6 FT ON 8/29/2015		



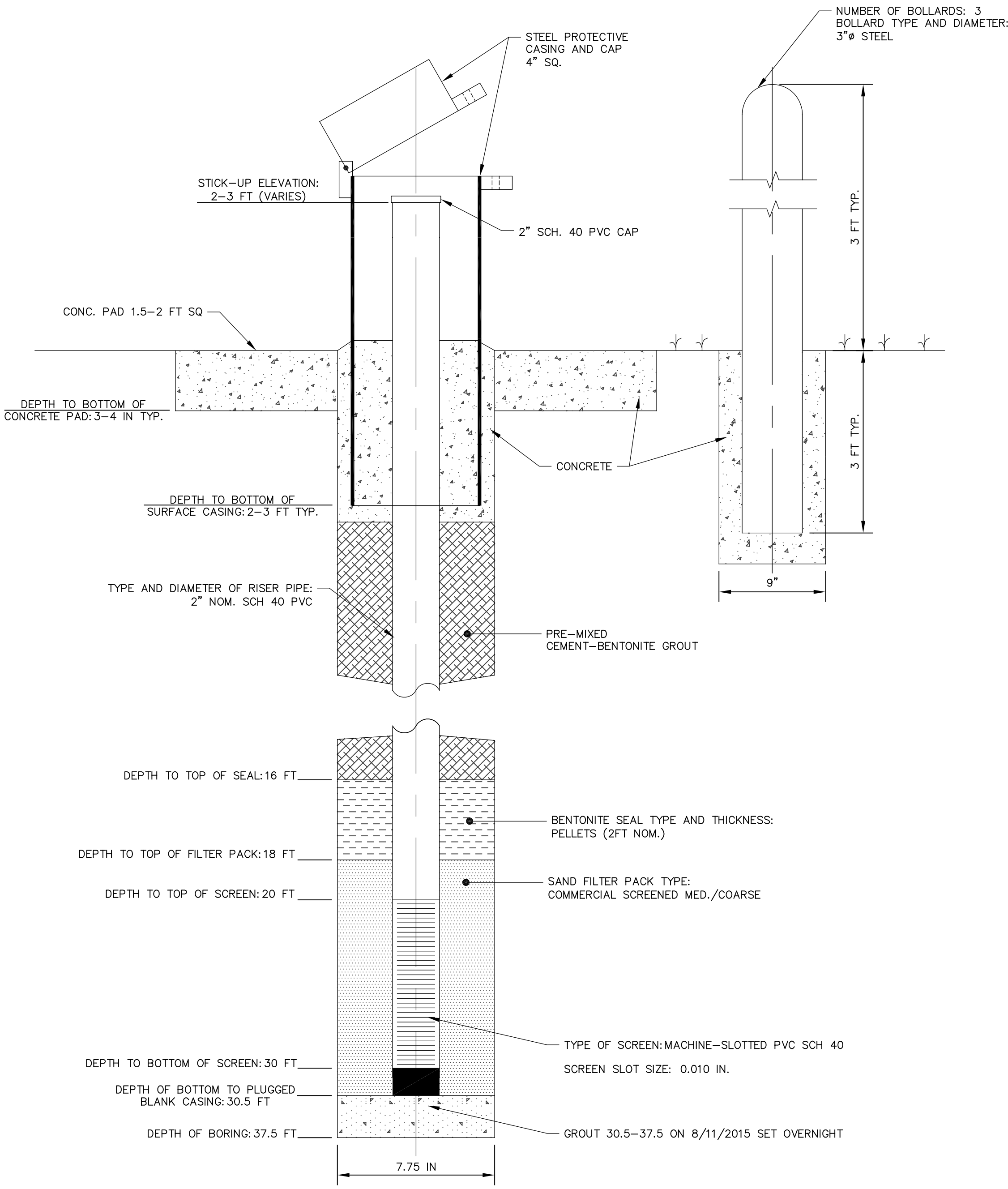
NOT TO SCALE

AECOM

NOT TO SCALE

Project: Dynegy	Log of Piezometer
Project Location: COFFEEN POWER STATION, ILLINOIS	
Project Number: 60440742	Sheet 1 of 1

Piezometer Location	COF-P009	Date Installed	8/12/2015	Time	
Installed By		Observed By	AECOM	Total Depth	37.5 FT
Method of Installation	HOLLOW STEM AUGER	Drilling Contractor	GEOTECHNOLOGY, INC.	Surface Elevation	638.0 FT
Screened Interval	20-30 FT	Completion Zone	POND #2 FOUNDATION		
Remarks	INSTALL IN COF-B007	Groundwater Level(s)			



NOT TO SCALE

Project: Dynegy

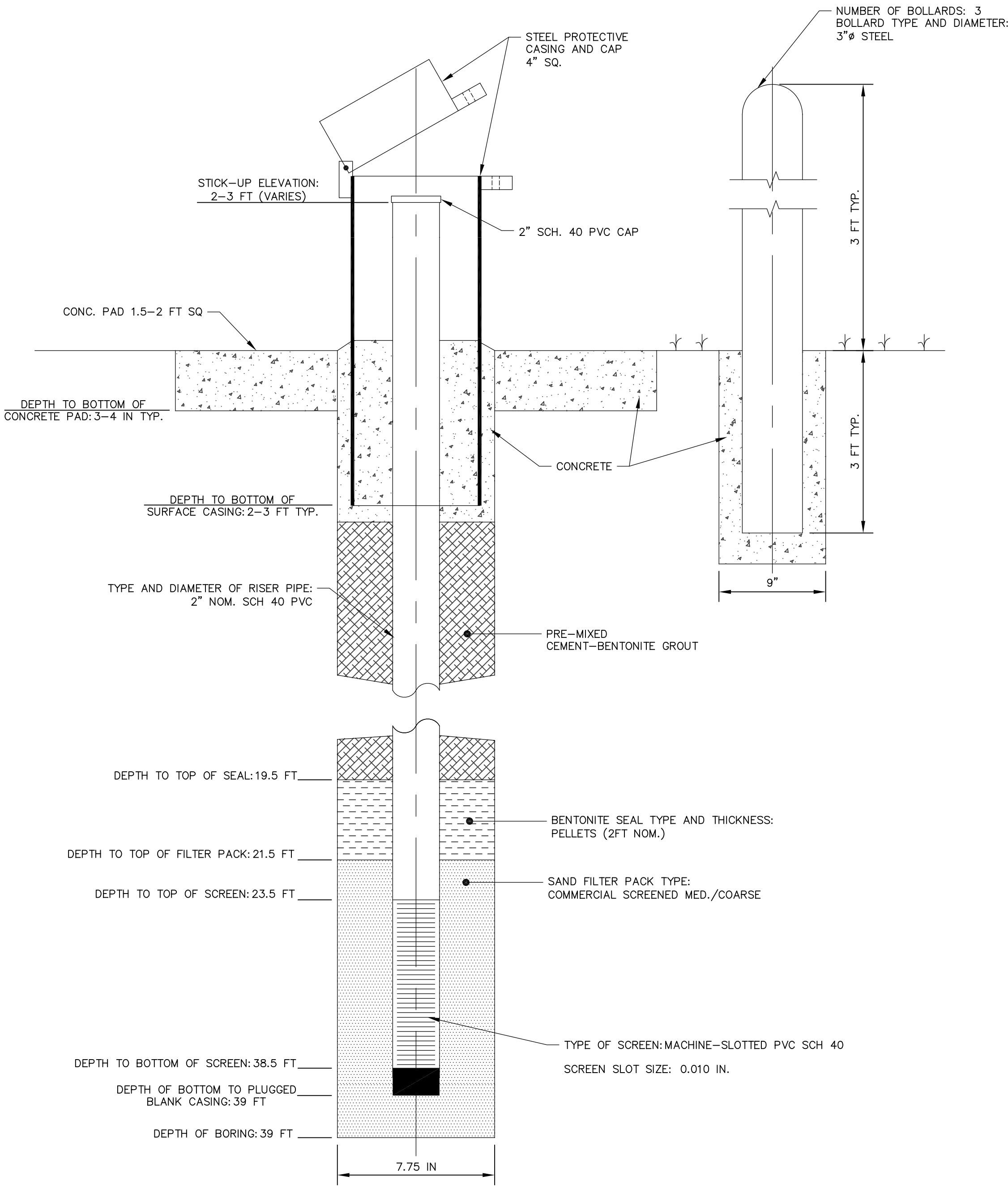
Project Location: COFFEEN POWER STATION, ILLINOIS

Project Number: 60440742

Log of Piezometer

Sheet 1 of 1

Piezometer Location	COF-P010	Date Installed	8/13/2015	Time	
Installed By		Observed By	AECOM	Total Depth	38.5 FT
Method of Installation	HOLLOW STEM AUGER	Drilling Contractor	GEOTECHNOLOGY, INC.	Surface Elevation	635.2 FT
Screened Interval	23.5-38.5 FT	Completion Zone	POND #2 FOUNDATION		
Remarks	INSTALL IN COF-B009	Groundwater Level(s)	29.6 FT ON 8/29/2015		



NOT TO SCALE

Project: Dynegy

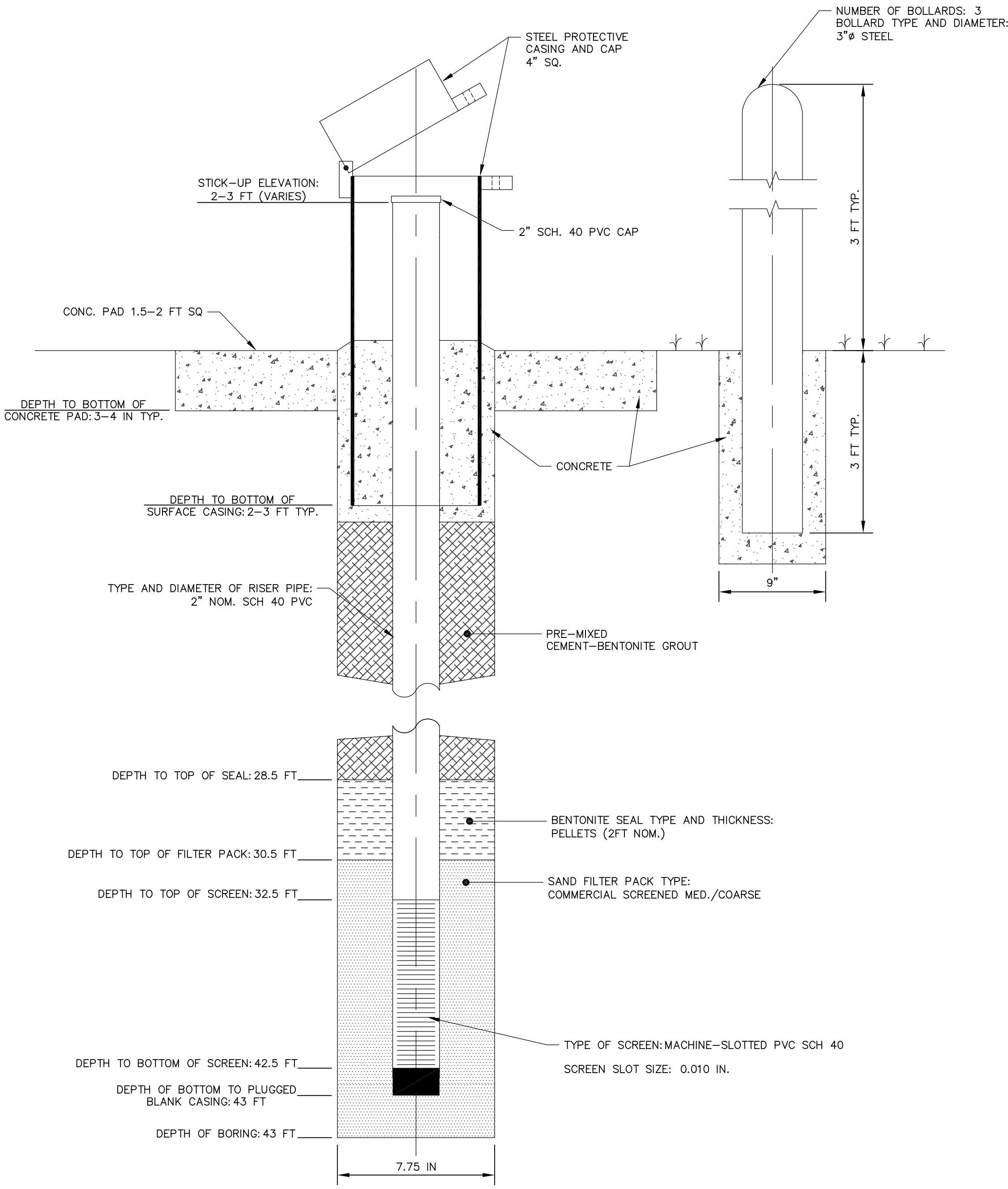
Project Location: COFFEEN POWER STATION, ILLINOIS

Project Number: 60440742

Log of Piezometer

Sheet 1 of 1

Piezometer Location	COF-P012	Date Installed	8/11/2015	Time	
Installed By		Observed By	AECOM	Total Depth	42.5 FT
Method of Installation	HOLLOW STEM AUGER	Drilling Contractor	GEOTECHNOLOGY, INC.	Surface Elevation	635.1 FT
Screened Interval	32.5-42.5 FT	Completion Zone	POND #2 FOUNDATION		
Remarks	INSTALL IN COF-B010	Groundwater Level(s)	16.8 FT ON 8/29/2015		



NOT TO SCALE

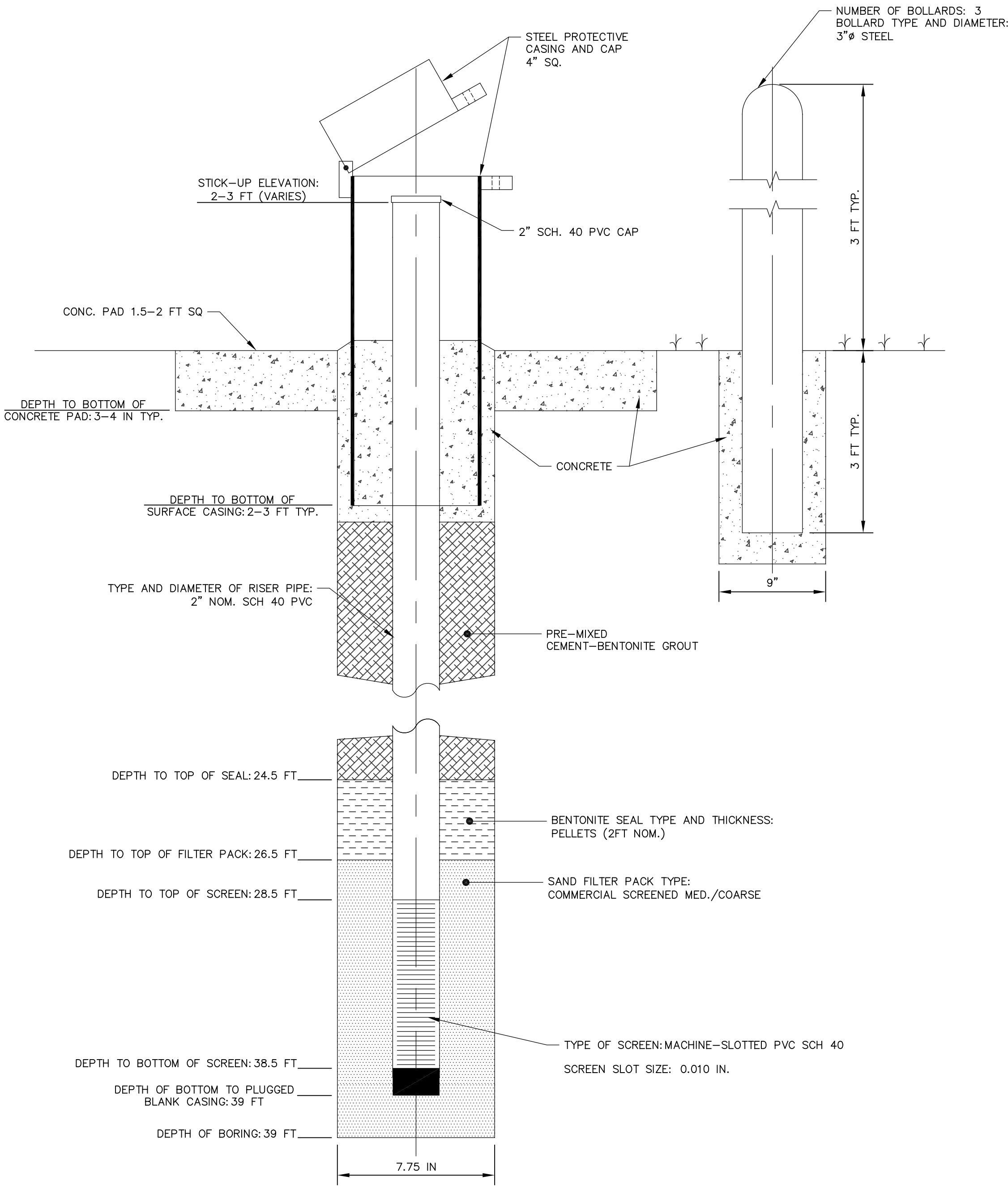
Project: Dynegy

Project Location: COFFEEN POWER STATION, ILLINOIS

Project Number: 60440742

Log of Piezometer

Piezometer Location	COF-P014	Date Installed	8/11/2015	Time	
Installed By		Observed By	AECOM	Total Depth	38.5 FT
Method of Installation	HOLLOW STEM AUGER	Drilling Contractor	GEOTECHNOLOGY, INC.	Surface Elevation	642.2 FT
Screened Interval	28.5-38.5 FT	Completion Zone	POND #2 FOUNDATION		
Remarks	INSTALL IN COF-B011	Groundwater Level(s)	21.5 FT ON 8/29/2015		



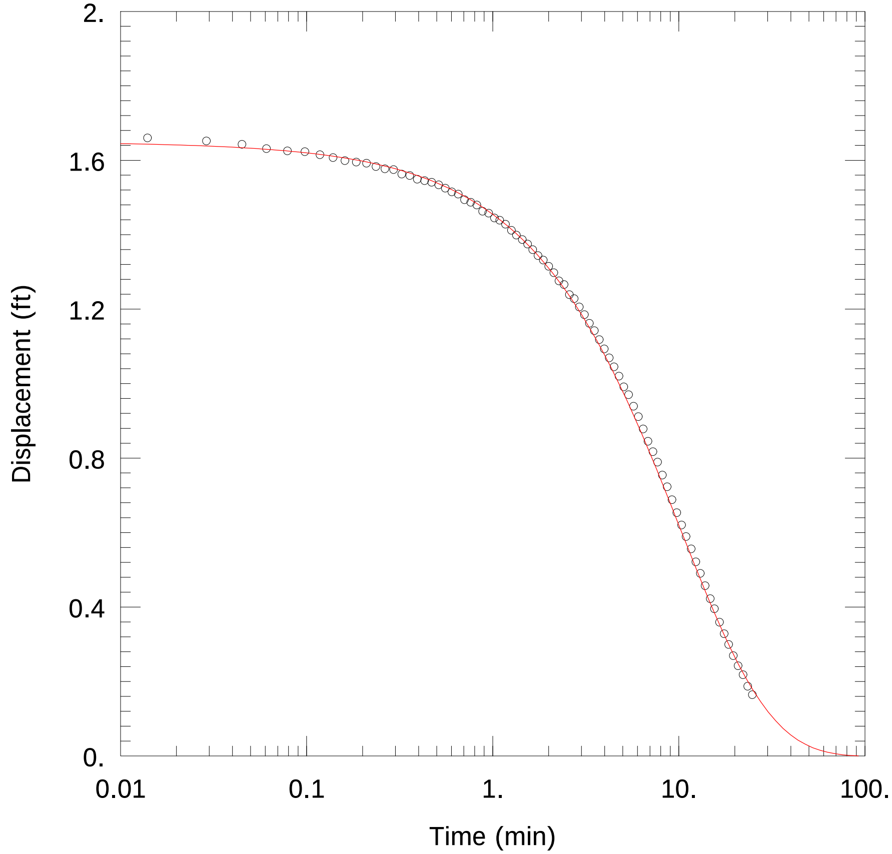
NOT TO SCALE

APPENDIX B

HYDRAULIC CONDUCTIVITY TEST RESULTS

APPENDIX B1

HYDRAULIC CONDUCTIVITY ANALYSES (WELLS)



G105 @ CCR LANDFILL – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G105
Test Date: 16 Jun 2016

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 0.00015 cm/sec
Ss = 6.0E-5 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 14.82 ft

WELL DATA (G105)

Initial Displacement: 1.65 ft
Total Well Penetration Depth: 14.82 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 14.82 ft
Screen Length: 4.58 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G105fh.aqt
Title: G105 @ CCR Landfill – Falling Head Test
Date: 11/11/16
Time: 11:38:43

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 16 Jun 2016
Test Well: G105

AQUIFER DATA

Saturated Thickness: 14.82 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G105

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.65 ft
Static Water Column Height: 14.82 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.58 ft
Total Well Penetration Depth: 14.82 ft

No. of Observations: 82

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	1.656	0.953	1.458	5.723	0.939
0.014	1.66	1.023	1.445	6.073	0.911
0.029	1.652	1.093	1.439	6.443	0.878
0.045	1.643	1.173	1.428	6.843	0.845
0.061	1.631	1.263	1.412	7.263	0.817
0.079	1.625	1.343	1.399	7.703	0.789
0.098	1.623	1.443	1.387	8.173	0.754
0.118	1.615	1.543	1.375	8.673	0.723
0.139	1.607	1.643	1.36	9.203	0.688
0.161	1.599	1.753	1.344	9.763	0.653
0.185	1.595	1.873	1.332	10.36	0.62
0.21	1.592	2.003	1.315	10.96	0.589
0.236	1.583	2.133	1.298	11.66	0.556

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.264	1.577	2.273	1.276	12.36	0.521
0.294	1.575	2.423	1.266	13.06	0.49
0.325	1.563	2.583	1.239	13.86	0.457
0.359	1.559	2.743	1.228	14.76	0.422
0.394	1.549	2.923	1.206	15.56	0.395
0.431	1.545	3.113	1.185	16.56	0.359
0.471	1.541	3.313	1.162	17.56	0.328
0.513	1.534	3.523	1.142	18.56	0.299
0.557	1.525	3.743	1.118	19.66	0.269
0.604	1.515	3.983	1.093	20.86	0.242
0.654	1.509	4.233	1.069	22.16	0.218
0.707	1.494	4.493	1.045	23.46	0.187
0.763	1.487	4.773	1.02	24.86	0.164
0.823	1.48	5.073	0.991		
0.883	1.463	5.383	0.97		

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00015	cm/sec
Ss	6.0E-5	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.06776 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0001464	1.653E-5	+/- 3.29E-5	8.858	cm/sec
Ss	5.669E-5	3.386E-5	+/- 6.739E-5	1.674	ft^{-1}
Kz/Kr	1.	1.041	+/- 2.071	0.961	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.06614 cm²/sec

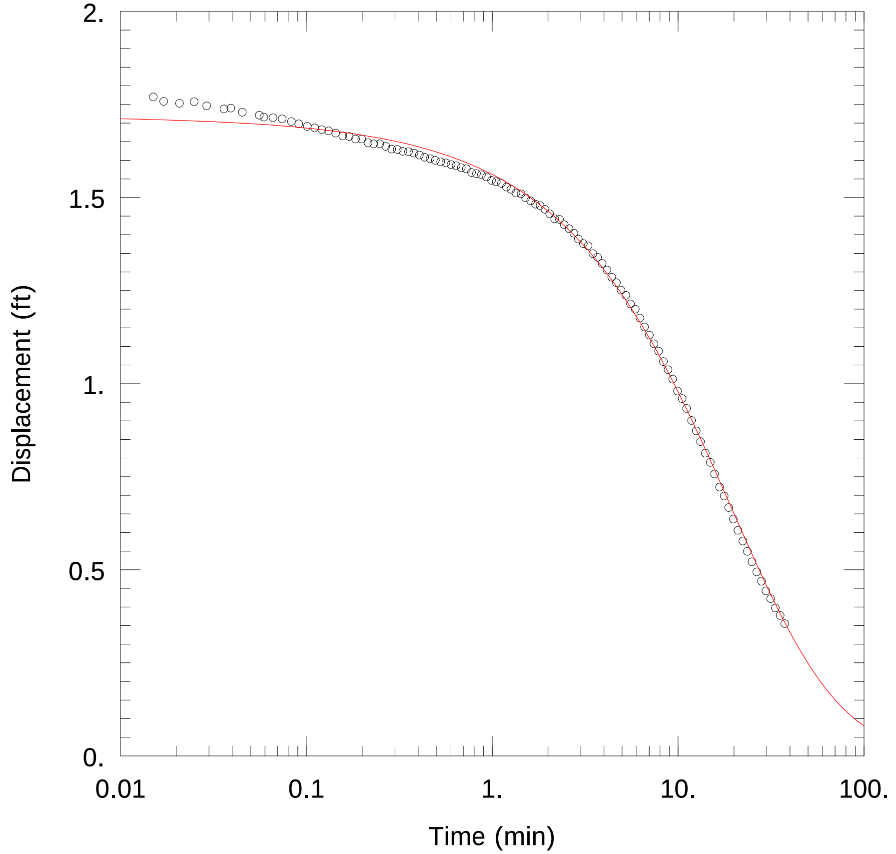
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-1.00
Ss	-0.99	1.00	0.99
Kz/Kr	-1.00	0.99	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.006265 ft^2
Variance . . . . 7.93E-5 ft^2
Std. Deviation . . . . 0.008905 ft
Mean. . . . . -0.002224 ft
No. of Residuals 82
No. of Estimates. 3



G105 @CCR LANDFILL – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G105
Test Date: 16 Jun 2016

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 5.7E-5 cm/sec
Ss = 0.001 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 14.82 ft

WELL DATA (G105)

Initial Displacement: 1.72 ft
Total Well Penetration Depth: 14.82 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 14.82 ft
Screen Length: 4.58 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G105rh.aqt
Title: G105 @CCR Landfill – Rising Head Test
Date: 11/11/16
Time: 11:43:09

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 16 Jun 2016
Test Well: G105

AQUIFER DATA

Saturated Thickness: 14.82 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G105

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.72 ft
Static Water Column Height: 14.82 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.58 ft
Total Well Penetration Depth: 14.82 ft

No. of Observations: 112

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	1.834	0.4953	1.6	4.943	1.251
0.004167	1.767	0.5293	1.596	5.243	1.237
0.008333	1.773	0.5643	1.593	5.553	1.214
0.01505	1.77	0.6013	1.588	5.893	1.2
0.01712	1.758	0.6413	1.585	6.243	1.176
0.02083	1.753	0.6833	1.58	6.613	1.152
0.025	1.757	0.7273	1.577	7.013	1.13
0.02917	1.746	0.7746	1.567	7.433	1.107
0.03612	1.738	0.8243	1.564	7.873	1.087
0.03933	1.74	0.8773	1.561	8.343	1.059
0.04537	1.729	0.9333	1.555	8.843	1.037
0.05595	1.721	0.9933	1.546	9.373	1.012
0.05933	1.716	1.053	1.542	9.933	0.98

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.06633	1.714	1.123	1.538	10.53	0.96
0.07433	1.711	1.193	1.528	11.13	0.933
0.08333	1.704	1.263	1.522	11.83	0.901
0.09133	1.698	1.343	1.512	12.53	0.873
0.1013	1.691	1.433	1.51	13.23	0.844
0.1113	1.687	1.513	1.499	14.03	0.813
0.1213	1.682	1.613	1.491	14.93	0.788
0.1323	1.679	1.713	1.482	15.73	0.757
0.1443	1.673	1.813	1.478	16.73	0.722
0.1573	1.665	1.923	1.468	17.73	0.698
0.1703	1.664	2.043	1.456	18.73	0.667
0.1843	1.657	2.173	1.443	19.83	0.636
0.1993	1.657	2.303	1.441	21.03	0.606
0.2153	1.647	2.443	1.427	22.33	0.577
0.2313	1.644	2.593	1.416	23.63	0.549
0.2493	1.644	2.753	1.404	25.03	0.521
0.2683	1.637	2.913	1.388	26.53	0.494
0.2883	1.63	3.093	1.376	28.13	0.469
0.3093	1.629	3.283	1.37	29.73	0.443
0.3313	1.624	3.483	1.349	31.53	0.422
0.3553	1.623	3.693	1.339	33.43	0.397
0.3803	1.619	3.913	1.323	35.43	0.377
0.4063	1.614	4.153	1.305	37.53	0.355
0.4343	1.608	4.403	1.286		
0.4643	1.604	4.663	1.271		

SOLUTION

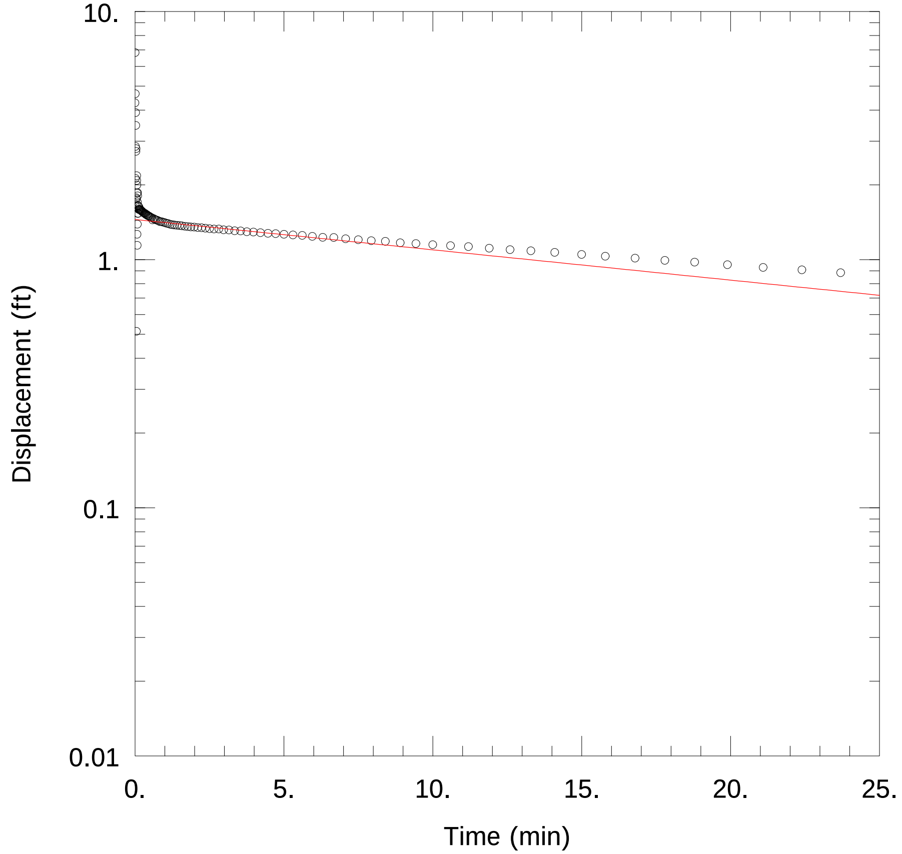
Slug Test
Aquifer Model: Unconfined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	5.7E-5	cm/sec
Ss	0.001	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.02575 cm²/sec



G106 @ CCR LANDFILL – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G106
Test Date: 15 Jun 2016

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 4.0E-5 cm/sec
y0 = 1.45 ft

AQUIFER DATA

Saturated Thickness: 12.5 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G106)

Initial Displacement: 1.67 ft
Total Well Penetration Depth: 12.5 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 12.5 ft
Screen Length: 4.58 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G106fh.aqt
Title: G106 @ CCR Landfill – Falling Head Test
Date: 12/01/16
Time: 09:04:15

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 15 Jun 2016
Test Well: G106

AQUIFER DATA

Saturated Thickness: 12.5 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G106

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.67 ft
Static Water Column Height: 12.5 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.58 ft
Total Well Penetration Depth: 12.5 ft

No. of Observations: 121

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.00455	4.279	0.282	1.547	2.98	1.317
0.008333	6.825	0.298	1.542	3.16	1.316
0.0125	4.654	0.316	1.537	3.35	1.306
0.01667	2.121	0.335	1.534	3.55	1.303
0.02083	2.856	0.355	1.527	3.76	1.294
0.025	3.905	0.376	1.518	3.98	1.29
0.02917	3.468	0.398	1.516	4.22	1.283
0.03745	2.726	0.422	1.505	4.47	1.274
0.04113	2.798	0.447	1.499	4.73	1.271
0.0448	1.772	0.473	1.496	5.01	1.263
0.04847	0.514	0.501	1.487	5.31	1.257
0.05212	1.755	0.531	1.477	5.62	1.25
0.0603	2.176	0.562	1.474	5.96	1.24

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.06397	2.082	0.596	1.444	6.31	1.229
0.06767	1.996	0.631	1.461	6.68	1.226
0.07133	1.85	0.668	1.451	7.08	1.213
0.075	1.264	0.708	1.444	7.5	1.202
0.07865	1.141	0.75	1.44	7.94	1.191
0.08232	1.388	0.794	1.432	8.41	1.183
0.08598	1.706	0.841	1.421	8.91	1.168
0.08965	1.859	0.891	1.42	9.44	1.159
0.09332	1.805	0.944	1.414	10.	1.148
0.09697	1.651	1.	1.408	10.6	1.137
0.1006	1.533	1.06	1.399	11.2	1.127
0.106	1.534	1.12	1.396	11.9	1.11
0.112	1.644	1.19	1.386	12.6	1.095
0.1208	1.639	1.26	1.382	13.3	1.085
0.126	1.59	1.33	1.378	14.1	1.068
0.133	1.594	1.41	1.374	15.	1.048
0.141	1.623	1.5	1.371	15.8	1.031
0.15	1.59	1.58	1.367	16.8	1.013
0.158	1.592	1.68	1.362	17.8	0.992
0.168	1.594	1.78	1.358	18.8	0.976
0.178	1.583	1.88	1.353	19.9	0.953
0.188	1.584	1.99	1.351	21.1	0.929
0.199	1.58	2.11	1.344	22.4	0.909
0.211	1.573	2.24	1.343	23.7	0.884
0.224	1.569	2.37	1.337	25.1	0.858
0.237	1.565	2.51	1.332	26.6	0.833
0.251	1.56	2.66	1.328		
0.266	1.552	2.82	1.327		

SOLUTION

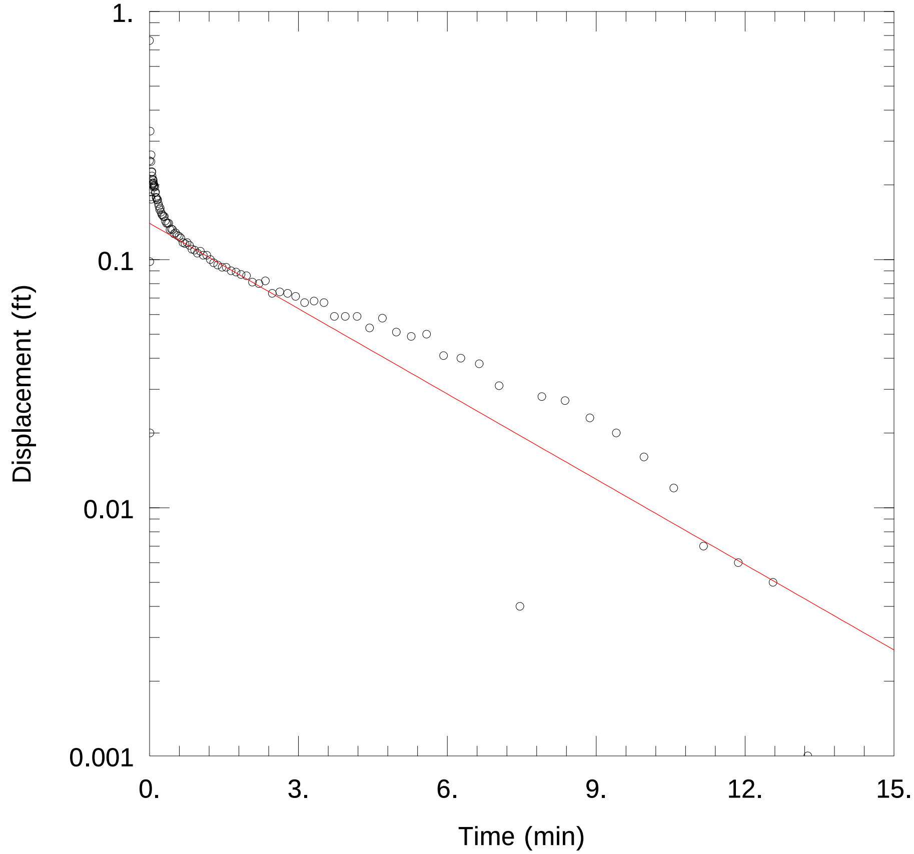
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 3.694

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	4.0E-5	cm/sec
y0	1.45	ft

T = K*b = 0.01524 cm²/sec



G106 @CCR LANDFILL – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G106
Test Date: 15 Jun 2016

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.00074 cm/sec
y0 = 0.14 ft

AQUIFER DATA

Saturated Thickness: 12.5 ft

Anisotropy Ratio (Kz/Kr): 0.001

WELL DATA (G106)

Initial Displacement: 0.25 ft
Total Well Penetration Depth: 12.5 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 12.5 ft
Screen Length: 4.58 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G106rh.aqt
Title: G106 @CCR Landfill – Rising Head Test
Date: 11/18/16
Time: 11:53:58

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 15 Jun 2016
Test Well: G106

AQUIFER DATA

Saturated Thickness: 12.5 ft
Anisotropy Ratio (Kz/Kr): 0.001

SLUG TEST WELL DATA

Test Well: G106

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.25 ft
Static Water Column Height: 12.5 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.58 ft
Total Well Penetration Depth: 12.5 ft

No. of Observations: 102

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	0.763	0.2487	0.152	1.957	0.086
0.00785	0.098	0.2647	0.151	2.077	0.081
0.01152	0.02	0.2827	0.149	2.207	0.08
0.0152	0.329	0.3017	0.149	2.337	0.082
0.01887	0.187	0.3217	0.143	2.477	0.073
0.02662	0.179	0.3427	0.14	2.627	0.074
0.03028	0.248	0.3647	0.14	2.787	0.073
0.03395	0.264	0.3887	0.14	2.947	0.071
0.03762	0.175	0.4137	0.132	3.127	0.067
0.04558	0.225	0.4397	0.133	3.317	0.068
0.04927	0.226	0.4677	0.132	3.517	0.067
0.05293	0.217	0.4977	0.127	3.727	0.059
0.05662	0.202	0.5287	0.128	3.947	0.059

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.06387	0.2	0.5627	0.125	4.187	0.059
0.06753	0.21	0.5977	0.124	4.437	0.053
0.07125	0.21	0.6347	0.122	4.697	0.058
0.07532	0.208	0.6747	0.117	4.977	0.051
0.079	0.204	0.7167	0.116	5.277	0.049
0.08268	0.202	0.7607	0.117	5.587	0.05
0.08637	0.196	0.8077	0.114	5.927	0.041
0.09267	0.198	0.8577	0.11	6.277	0.04
0.09967	0.199	0.9107	0.109	6.647	0.038
0.1077	0.196	0.9667	0.106	7.047	0.031
0.1167	0.186	1.027	0.108	7.467	0.004
0.1247	0.187	1.087	0.104	7.907	0.028
0.1347	0.178	1.157	0.104	8.377	0.027
0.1447	0.177	1.227	0.1	8.877	0.023
0.1547	0.174	1.297	0.097	9.407	0.02
0.1657	0.174	1.377	0.095	9.967	0.016
0.1777	0.168	1.467	0.093	10.57	0.012
0.1907	0.164	1.547	0.093	11.17	0.007
0.2037	0.159	1.647	0.09	11.87	0.006
0.2177	0.161	1.747	0.089	12.57	0.005
0.2327	0.155	1.847	0.087	13.27	0.001

SOLUTION

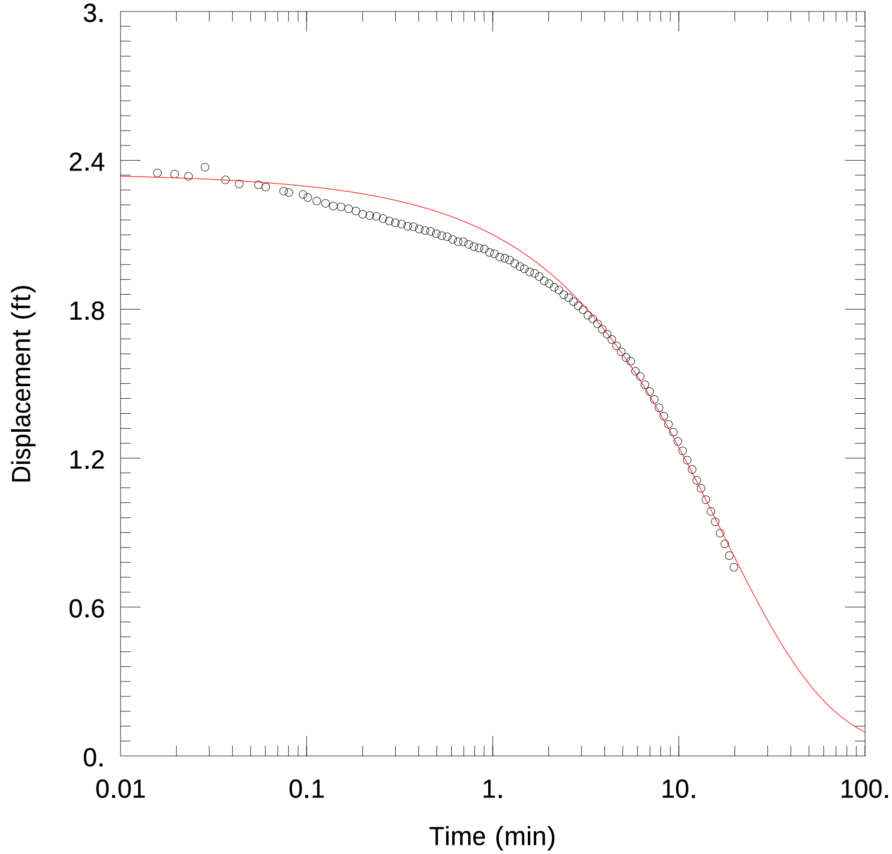
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 7.28

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.00074	cm/sec
y0	0.14	ft

T = K*b = 0.2819 cm²/sec



G107 @ CCR LANDFILL – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G107
Test Date: 15 Jun 2016

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 6.3E-5 cm/sec
Ss = 0.0015 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 10.86 ft

WELL DATA (G107)

Initial Displacement: 2.35 ft
Total Well Penetration Depth: 10.86 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 10.86 ft
Screen Length: 4.48 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G107fh.aqt
Title: G107 @ CCR Landfill – Falling Head Test
Date: 11/28/16
Time: 10:25:40

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 15 Jun 2016
Test Well: G107

AQUIFER DATA

Saturated Thickness: 10.86 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G107

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.35 ft
Static Water Column Height: 10.86 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.48 ft
Total Well Penetration Depth: 10.86 ft

No. of Observations: 103

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
-0.03917	2.789	0.3245	2.143	3.063	1.797
-0.035	2.535	0.3495	2.134	3.252	1.775
-0.03078	2.269	0.3755	2.132	3.453	1.761
-0.02297	2.403	0.4035	2.123	3.663	1.741
-0.01928	2.442	0.4335	2.117	3.882	1.719
-0.01558	2.401	0.4645	2.113	4.122	1.699
-0.0119	2.368	0.4985	2.104	4.372	1.678
-0.003683	2.371	0.5335	2.096	4.633	1.652
0.	2.38	0.5705	2.092	4.912	1.628
0.003683	2.362	0.6105	2.081	5.213	1.605
0.00735	2.355	0.6525	2.071	5.523	1.59
0.01582	2.349	0.6965	2.071	5.862	1.55
0.01953	2.344	0.7435	2.061	6.213	1.529

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.02323	2.335	0.7935	2.052	6.582	1.495
0.0285	2.372	0.8465	2.046	6.982	1.468
0.03668	2.321	0.9025	2.042	7.402	1.436
0.0435	2.304	0.9625	2.029	7.843	1.402
0.05523	2.301	1.023	2.023	8.313	1.369
0.0605	2.292	1.093	2.01	8.813	1.336
0.07527	2.276	1.163	2.005	9.342	1.304
0.0805	2.27	1.232	1.998	9.902	1.267
0.09568	2.262	1.313	1.984	10.5	1.229
0.1015	2.25	1.403	1.972	11.1	1.191
0.1135	2.236	1.482	1.962	11.8	1.154
0.1265	2.226	1.583	1.95	12.5	1.11
0.1395	2.215	1.683	1.944	13.2	1.078
0.1535	2.212	1.783	1.931	14.	1.032
0.1685	2.204	1.893	1.914	14.9	0.985
0.1845	2.195	2.013	1.903	15.7	0.943
0.2005	2.182	2.143	1.888	16.7	0.897
0.2185	2.177	2.273	1.877	17.7	0.854
0.2375	2.174	2.413	1.858	18.7	0.807
0.2575	2.165	2.563	1.846	19.8	0.76
0.2785	2.155	2.723	1.83		
0.3005	2.148	2.882	1.813		

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	6.3E-5	cm/sec
Ss	0.0015	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.02085 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	4.079E-5	3.684E-6	+/- 7.31E-6	11.07	cm/sec
Ss	0.008117	0.001889	+/- 0.003747	4.297	ft^{-1}
Kz/Kr	1.	1.82	+/- 3.611	0.5494	

C.I. is approximate 95% confidence interval for parameter

t-ratio = estimate/std. error
No estimation window

$T = K*b = 0.0135\ cm^2/sec$

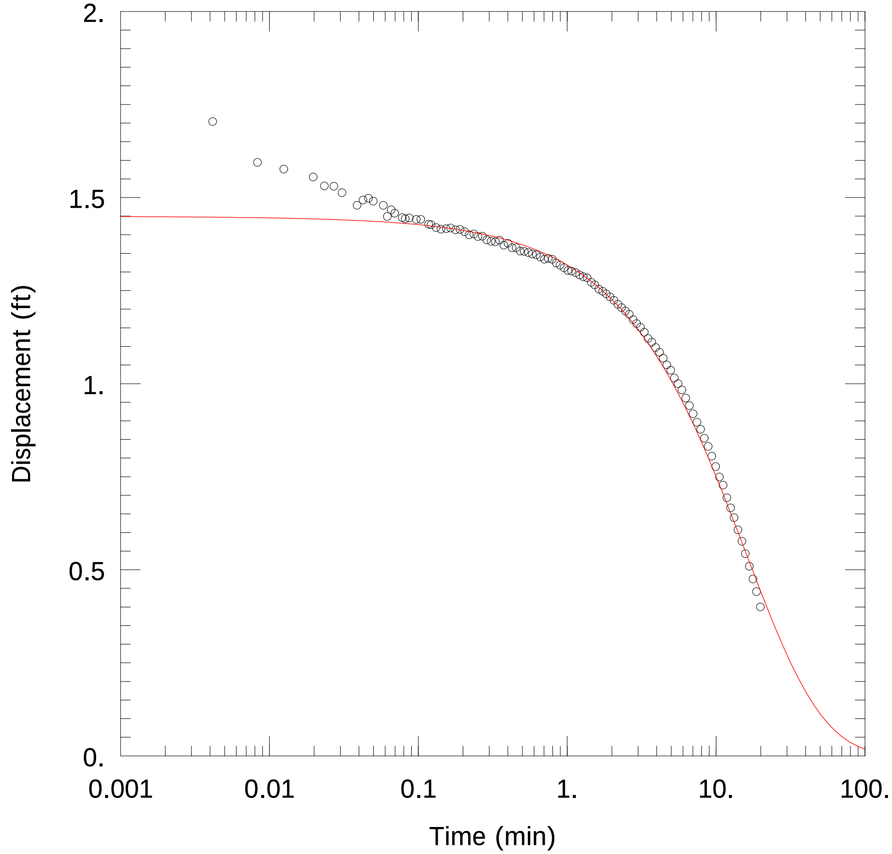
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.96	-0.37
Ss	-0.96	1.00	0.19
Kz/Kr	-0.37	0.19	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.3683 ft^2
Variance . . . . 0.003683 ft^2
Std. Deviation . . . . 0.06069 ft
Mean. . . . . 0.002549 ft
No. of Residuals 103
No. of Estimates. 3



G107 @CCR LANDFILL – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G107
Test Date: 15 Jun 2016

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 8.9E-5 cm/sec
Ss = 0.0002 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 10.86 ft

WELL DATA (G107)

Initial Displacement: 1.45 ft
Total Well Penetration Depth: 10.86 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 10.86 ft
Screen Length: 4.48 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G107rh.aqt
Title: G107 @CCR Landfill – Rising Head Test
Date: 11/18/16
Time: 11:55:10

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 15 Jun 2016
Test Well: G107

AQUIFER DATA

Saturated Thickness: 10.86 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G107

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.45 ft
Static Water Column Height: 10.86 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.48 ft
Total Well Penetration Depth: 10.86 ft

No. of Observations: 106

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	1.826	0.3302	1.381	2.934	1.161
0.004167	1.704	0.3522	1.385	3.114	1.151
0.008333	1.594	0.3762	1.372	3.304	1.138
0.0125	1.576	0.4012	1.377	3.504	1.121
0.01975	1.555	0.4272	1.365	3.714	1.111
0.02345	1.531	0.4552	1.365	3.934	1.097
0.02713	1.53	0.4852	1.356	4.174	1.084
0.0308	1.513	0.5162	1.355	4.424	1.068
0.03893	1.479	0.5502	1.352	4.684	1.05
0.04263	1.493	0.5852	1.348	4.964	1.036
0.04632	1.498	0.6222	1.346	5.264	1.015
0.04998	1.49	0.6622	1.34	5.574	1.
0.05843	1.479	0.7042	1.334	5.914	0.983

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.06212	1.449	0.7482	1.336	6.264	0.961
0.06582	1.467	0.7952	1.334	6.634	0.941
0.06952	1.458	0.8452	1.324	7.034	0.919
0.07817	1.446	0.8982	1.318	7.454	0.896
0.08188	1.443	0.9542	1.311	7.894	0.877
0.08717	1.445	1.014	1.304	8.364	0.853
0.09723	1.441	1.074	1.302	8.864	0.831
0.1042	1.441	1.144	1.298	9.394	0.805
0.1175	1.428	1.214	1.292	9.954	0.777
0.1222	1.427	1.284	1.287	10.55	0.749
0.1322	1.419	1.364	1.284	11.15	0.727
0.1422	1.415	1.454	1.272	11.85	0.693
0.1544	1.416	1.534	1.265	12.55	0.666
0.1652	1.418	1.634	1.254	13.25	0.64
0.1782	1.413	1.734	1.248	14.05	0.607
0.1912	1.414	1.834	1.241	14.95	0.576
0.2052	1.408	1.944	1.233	15.75	0.543
0.2202	1.4	2.064	1.224	16.75	0.509
0.2362	1.402	2.194	1.213	17.75	0.475
0.2522	1.395	2.324	1.204	18.75	0.441
0.2702	1.396	2.464	1.195	19.85	0.4
0.2892	1.386	2.614	1.186		
0.3092	1.382	2.774	1.172		

SOLUTION

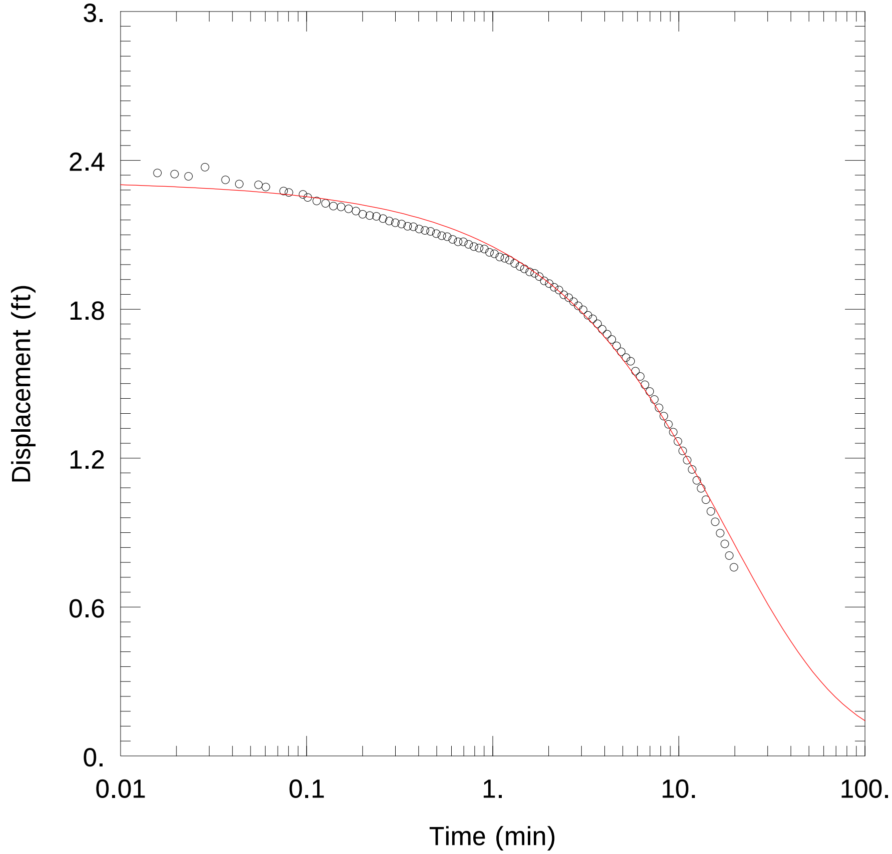
Slug Test
Aquifer Model: Unconfined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	8.9E-5	cm/sec
Ss	0.0002	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.02946 cm^2/sec



G110 @ CCR LANDFILL – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G110
Test Date: 14 Jun 2016

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 4.7E-5 cm/sec
Ss = 0.004 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 10.21 ft

WELL DATA (G110)

Initial Displacement: 2.32 ft
Total Well Penetration Depth: 10.21 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 10.21 ft
Screen Length: 4.54 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G110fh.aqt
Title: G110 @ CCR Landfill – Falling Head Test
Date: 11/28/16
Time: 10:27:16

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 14 Jun 2016
Test Well: G110

AQUIFER DATA

Saturated Thickness: 10.21 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G110

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.32 ft
Static Water Column Height: 10.21 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.54 ft
Total Well Penetration Depth: 10.21 ft

No. of Observations: 103

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
-0.03917	2.789	0.3245	2.143	3.063	1.797
-0.035	2.535	0.3495	2.134	3.252	1.775
-0.03078	2.269	0.3755	2.132	3.453	1.761
-0.02297	2.403	0.4035	2.123	3.663	1.741
-0.01928	2.442	0.4335	2.117	3.882	1.719
-0.01558	2.401	0.4645	2.113	4.122	1.699
-0.0119	2.368	0.4985	2.104	4.372	1.678
-0.003683	2.371	0.5335	2.096	4.633	1.652
0.	2.38	0.5705	2.092	4.912	1.628
0.003683	2.362	0.6105	2.081	5.213	1.605
0.00735	2.355	0.6525	2.071	5.523	1.59
0.01582	2.349	0.6965	2.071	5.862	1.55
0.01953	2.344	0.7435	2.061	6.213	1.529

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.02323	2.335	0.7935	2.052	6.582	1.495
0.0285	2.372	0.8465	2.046	6.982	1.468
0.03668	2.321	0.9025	2.042	7.402	1.436
0.0435	2.304	0.9625	2.029	7.843	1.402
0.05523	2.301	1.023	2.023	8.313	1.369
0.0605	2.292	1.093	2.01	8.813	1.336
0.07527	2.276	1.163	2.005	9.342	1.304
0.0805	2.27	1.232	1.998	9.902	1.267
0.09568	2.262	1.313	1.984	10.5	1.229
0.1015	2.25	1.403	1.972	11.1	1.191
0.1135	2.236	1.482	1.962	11.8	1.154
0.1265	2.226	1.583	1.95	12.5	1.11
0.1395	2.215	1.683	1.944	13.2	1.078
0.1535	2.212	1.783	1.931	14.	1.032
0.1685	2.204	1.893	1.914	14.9	0.985
0.1845	2.195	2.013	1.903	15.7	0.943
0.2005	2.182	2.143	1.888	16.7	0.897
0.2185	2.177	2.273	1.877	17.7	0.854
0.2375	2.174	2.413	1.858	18.7	0.807
0.2575	2.165	2.563	1.846	19.8	0.76
0.2785	2.155	2.723	1.83		
0.3005	2.148	2.882	1.813		

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	4.7E-5	cm/sec
Ss	0.004	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.01463 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	4.675E-5	2.299E-5	+/- 4.561E-5	2.034	cm/sec
Ss	0.004389	0.004059	+/- 0.008053	1.081	ft^{-1}
Kz/Kr	1.	19.63	+/- 38.94	0.05095	

C.I. is approximate 95% confidence interval for parameter

t-ratio = estimate/std. error
No estimation window

T = K*b = 0.01455 cm^2/sec

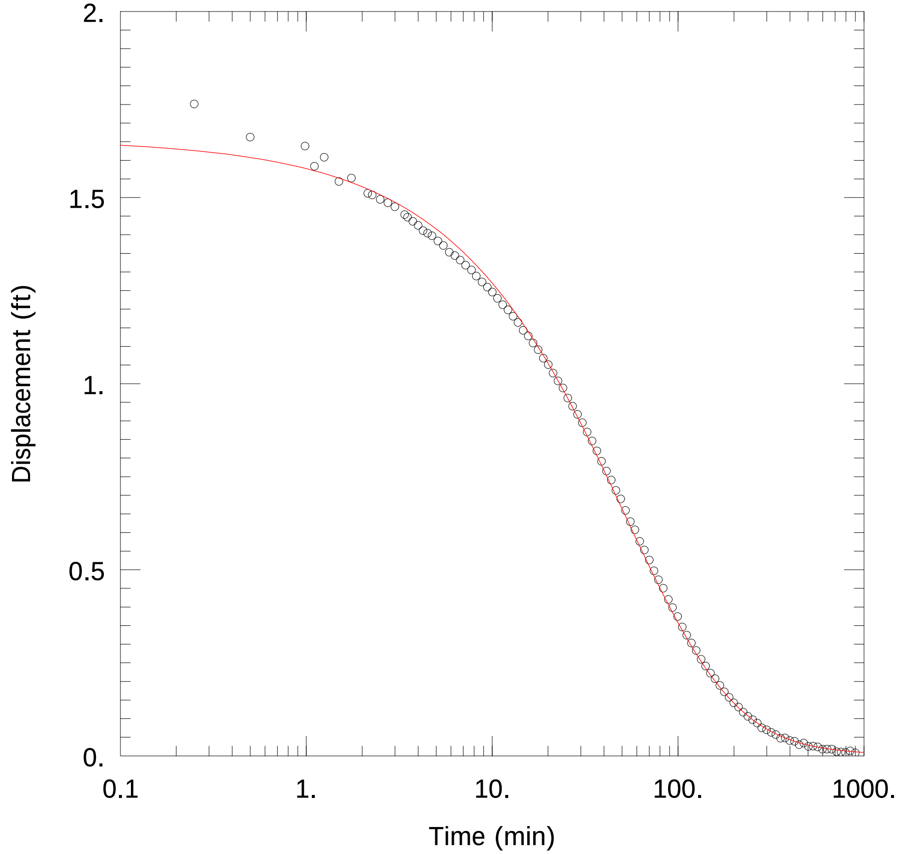
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-0.98
Ss	-0.99	1.00	0.95
Kz/Kr	-0.98	0.95	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.4068 ft^2
Variance . . . . 0.004068 ft^2
Std. Deviation . . . . 0.06378 ft
Mean. . . . . 0.009142 ft
No. of Residuals 103
No. of Estimates 3



G110 @ CCR LANDFILL – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G110
Test Date: 14 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 2.0E-5 cm/sec
Ss = 0.0015 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 10.21 ft

WELL DATA (G110)

Initial Displacement: 1.66 ft
Total Well Penetration Depth: 10.21 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 10.21 ft
Screen Length: 4.54 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G110rh.aqt
Title: G110 @ CCR Landfill – Rising Head Test
Date: 11/18/16
Time: 11:56:09

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 14 Jun 2016
Test Well: G110

AQUIFER DATA

Saturated Thickness: 10.21 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G110

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.66 ft
Static Water Column Height: 10.21 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.54 ft
Total Well Penetration Depth: 10.21 ft

No. of Observations: 107

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	1.475	14.71	1.143	125.3	0.283
0.25	1.751	15.67	1.128	133.1	0.259
0.5	1.662	16.63	1.109	140.9	0.241
0.986	1.638	17.71	1.091	149.3	0.222
1.108	1.584	18.85	1.068	158.3	0.207
1.25	1.608	20.05	1.051	167.9	0.189
1.5	1.543	21.31	1.028	177.5	0.172
1.75	1.552	22.63	1.007	188.3	0.157
2.142	1.511	24.07	0.988	199.7	0.142
2.265	1.507	25.57	0.961	211.7	0.131
2.5	1.495	27.13	0.939	224.3	0.117
2.75	1.486	28.81	0.917	237.5	0.106
3.	1.475	30.61	0.895	251.9	0.097

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
3.386	1.454	32.47	0.87	266.9	0.088
3.509	1.447	34.51	0.846	282.5	0.075
3.75	1.436	36.61	0.819	299.3	0.07
4.	1.425	38.83	0.791	317.3	0.063
4.25	1.411	41.23	0.765	335.9	0.057
4.5	1.404	43.75	0.741	356.4	0.047
4.75	1.397	46.39	0.713	377.3	0.048
5.11	1.383	49.21	0.69	399.5	0.041
5.47	1.371	52.21	0.659	423.5	0.039
5.89	1.353	55.39	0.629	448.7	0.03
6.31	1.344	58.75	0.607	475.1	0.034
6.73	1.332	62.35	0.576	503.3	0.025
7.21	1.318	65.95	0.553	533.3	0.026
7.75	1.305	70.15	0.526	565.1	0.024
8.23	1.289	74.35	0.497	598.7	0.018
8.83	1.273	78.55	0.473	634.9	0.018
9.43	1.259	83.35	0.45	670.7	0.018
10.03	1.246	88.75	0.42	712.7	0.011
10.69	1.229	93.55	0.398	754.7	0.01
11.41	1.212	99.55	0.374	796.7	0.009
12.19	1.198	105.5	0.346	844.7	0.013
12.97	1.181	111.5	0.324	898.7	0.008
13.81	1.164	118.1	0.303		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	2.0E-5	cm/sec
Ss	0.0015	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.006224 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	1.835E-5	1.521E-6	+/- 3.015E-6	12.07	cm/sec
Ss	0.002304	0.0005947	+/- 0.001179	3.874	ft^{-1}
Kz/Kr	1.	1.446	+/- 2.867	0.6918	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

$T = K*b = 0.00571\ cm^2/sec$

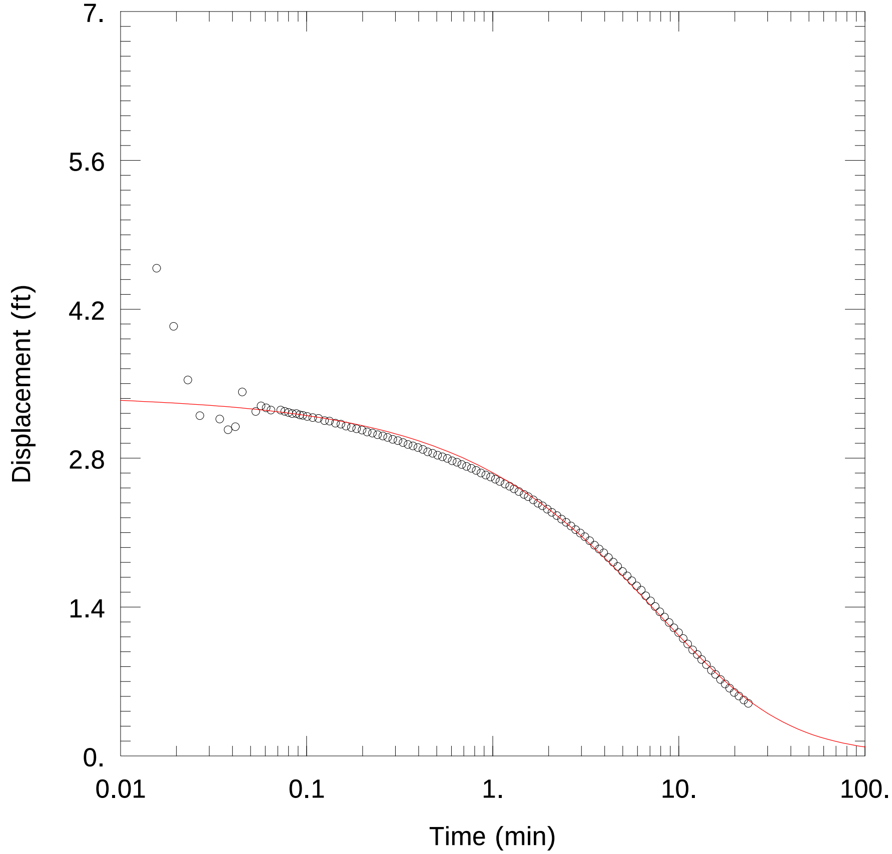
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.98	-0.95
Ss	-0.98	1.00	0.88
Kz/Kr	-0.95	0.88	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.074 ft^2
Variance . . . . 0.0007115 ft^2
Std. Deviation . . . . 0.02667 ft
Mean. . . . . -0.002906 ft
No. of Residuals 107
No. of Estimates 3



G119 @ CCR LANDFILL – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G119
Test Date: 15 Jun 2016

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 8.6E-5 cm/sec
Ss = 0.01 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 9.17 ft

WELL DATA (G119)

Initial Displacement: 3.4 ft
Total Well Penetration Depth: 9.17 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 9.17 ft
Screen Length: 4.58 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G119fh.aqt
Title: G119 @ CCR Landfill – Falling Head Test
Date: 11/18/16
Time: 11:57:05

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 15 Jun 2016
Test Well: G119

AQUIFER DATA

Saturated Thickness: 9.17 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G119

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 3.4 ft
Static Water Column Height: 9.17 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.58 ft
Total Well Penetration Depth: 9.17 ft

No. of Observations: 114

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	5.641	0.291	2.976	2.795	2.126
0.004167	6.01	0.31	2.963	2.955	2.094
0.008333	5.281	0.33	2.945	3.135	2.06
0.01565	4.584	0.351	2.927	3.325	2.023
0.01932	4.038	0.373	2.913	3.525	1.981
0.02303	3.534	0.397	2.899	3.735	1.944
0.02672	3.198	0.422	2.881	3.955	1.908
0.03417	3.166	0.448	2.858	4.195	1.864
0.03785	3.065	0.476	2.845	4.445	1.821
0.04152	3.094	0.506	2.826	4.705	1.78
0.0452	3.421	0.537	2.812	4.985	1.734
0.05333	3.237	0.571	2.796	5.285	1.691
0.05702	3.29	0.606	2.773	5.595	1.646

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.06068	3.272	0.643	2.76	5.935	1.598
0.0644	3.251	0.683	2.739	6.285	1.557
0.07275	3.251	0.725	2.721	6.655	1.504
0.07642	3.239	0.769	2.703	7.055	1.456
0.0801	3.228	0.816	2.683	7.475	1.404
0.08383	3.218	0.866	2.66	7.915	1.354
0.08827	3.217	0.919	2.64	8.385	1.305
0.09195	3.206	0.975	2.622	8.885	1.253
0.09563	3.201	1.035	2.601	9.415	1.203
0.101	3.19	1.095	2.579	9.975	1.158
0.108	3.18	1.165	2.556	10.57	1.103
0.116	3.172	1.235	2.534	11.18	1.051
0.125	3.151	1.305	2.51	11.88	0.996
0.133	3.147	1.385	2.484	12.57	0.952
0.143	3.128	1.475	2.458	13.28	0.906
0.153	3.119	1.555	2.437	14.07	0.858
0.163	3.101	1.655	2.406	14.98	0.805
0.174	3.087	1.755	2.375	15.78	0.765
0.186	3.075	1.855	2.35	16.77	0.718
0.199	3.063	1.965	2.319	17.77	0.675
0.212	3.045	2.085	2.289	18.77	0.636
0.226	3.034	2.215	2.259	19.88	0.595
0.241	3.019	2.345	2.226	21.07	0.563
0.257	3.007	2.485	2.195	22.38	0.524
0.273	2.993	2.635	2.161	23.68	0.493

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	8.6E-5	cm/sec
Ss	0.01	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.02404 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	8.635E-5	7.858E-5	+/- 0.0001557	1.099	cm/sec
Ss	0.01033	0.01841	+/- 0.03648	0.5609	ft^{-1}

Kz/Kr	0.03458	7.758	+/- 15.38	0.004457

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.02413 cm^2/sec

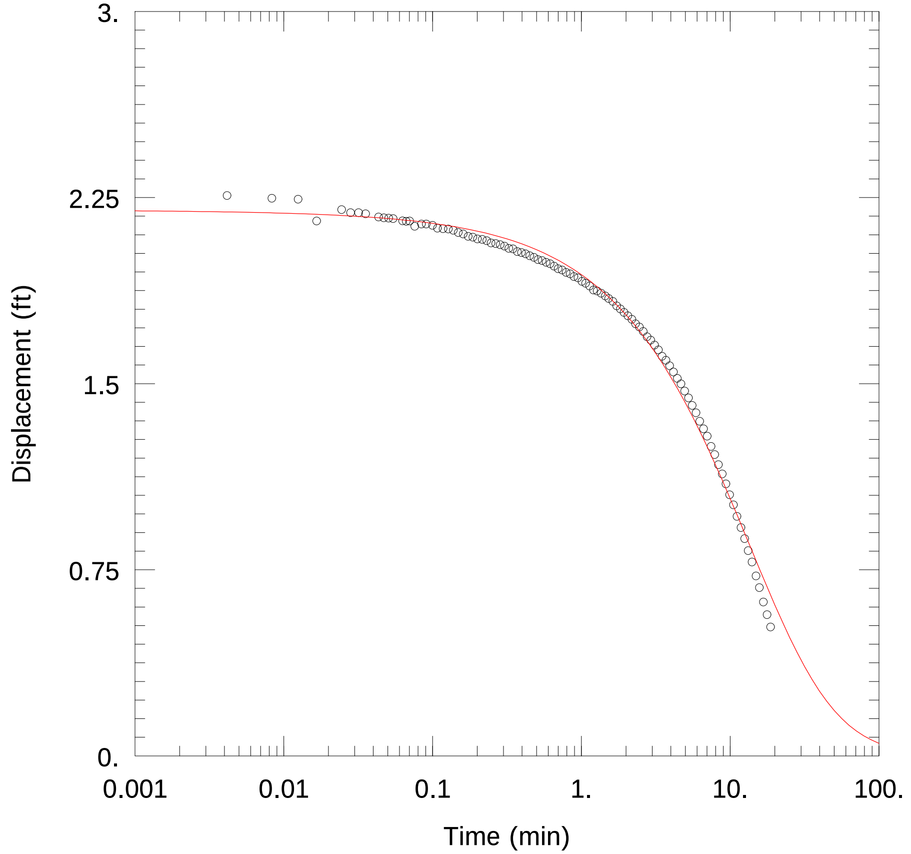
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-0.96
Ss	-0.99	1.00	0.91
Kz/Kr	-0.96	0.91	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 18.21 ft^2
Variance . . . . 0.164 ft^2
Std. Deviation . . . . 0.405 ft
Mean. . . . . 0.06266 ft
No. of Residuals 114
No. of Estimates. 3



G119 @CCR LANDFILL – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G119
Test Date: 15 Jun 2016

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 8.2E-5 cm/sec
Ss = 0.001 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 9.17 ft

WELL DATA (G119)

Initial Displacement: 2.2 ft
Total Well Penetration Depth: 9.17 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 9.17 ft
Screen Length: 4.58 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G119rh.aqt
Title: G119 @CCR Landfill – Rising Head Test
Date: 11/28/16
Time: 10:28:38

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 15 Jun 2016
Test Well: G119

AQUIFER DATA

Saturated Thickness: 9.17 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G119

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.2 ft
Static Water Column Height: 9.17 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.58 ft
Total Well Penetration Depth: 9.17 ft

No. of Observations: 104

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	2.268	0.326	2.045	2.77	1.689
0.004167	2.258	0.348	2.043	2.93	1.675
0.008333	2.247	0.372	2.032	3.11	1.655
0.0125	2.243	0.397	2.028	3.3	1.636
0.01667	2.155	0.423	2.023	3.5	1.61
0.02452	2.201	0.451	2.015	3.71	1.594
0.0282	2.189	0.481	2.009	3.93	1.572
0.03187	2.189	0.512	2.	4.17	1.547
0.03555	2.184	0.546	1.996	4.42	1.521
0.04347	2.171	0.581	1.989	4.68	1.499
0.04715	2.168	0.618	1.983	4.96	1.47
0.05082	2.167	0.658	1.973	5.26	1.442
0.0545	2.165	0.7	1.963	5.57	1.412

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.06295	2.156	0.744	1.958	5.91	1.382
0.06663	2.154	0.791	1.948	6.26	1.348
0.07033	2.155	0.841	1.942	6.63	1.318
0.076	2.134	0.894	1.931	7.03	1.288
0.08445	2.143	0.95	1.926	7.45	1.247
0.091	2.143	1.01	1.912	7.89	1.214
0.1	2.138	1.07	1.904	8.36	1.173
0.108	2.126	1.14	1.893	8.86	1.136
0.118	2.124	1.21	1.877	9.39	1.096
0.128	2.123	1.28	1.873	9.95	1.052
0.138	2.118	1.36	1.864	10.55	1.011
0.149	2.109	1.45	1.853	11.15	0.965
0.161	2.103	1.53	1.843	11.85	0.92
0.174	2.093	1.63	1.831	12.55	0.875
0.187	2.09	1.73	1.813	13.25	0.827
0.201	2.083	1.83	1.801	14.05	0.781
0.216	2.081	1.94	1.787	14.95	0.725
0.232	2.076	2.06	1.773	15.75	0.678
0.248	2.067	2.19	1.759	16.75	0.62
0.266	2.064	2.32	1.741	17.75	0.569
0.285	2.06	2.46	1.728	18.75	0.519
0.305	2.054	2.61	1.71		

SOLUTION

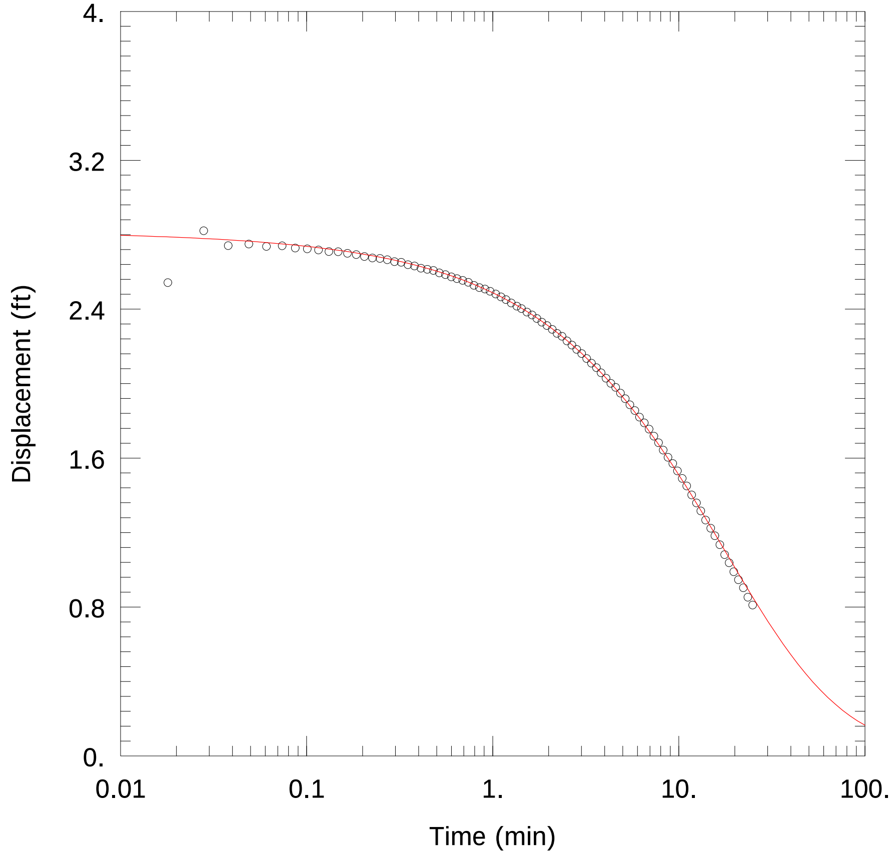
Slug Test
Aquifer Model: Unconfined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	8.2E-5	cm/sec
Ss	0.001	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.02292 cm^2/sec



G125 @ CCR LANDFILL – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G125
Test Date: 14 Jun 2016

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 4.8E-5 cm/sec
Ss = 0.004 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 8.72 ft

WELL DATA (G125)

Initial Displacement: 2.82 ft
Total Well Penetration Depth: 8.67 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 8.72 ft
Screen Length: 4.53 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G125fh.aqt
Title: G125 @ CCR Landfill – Falling Head Test
Date: 11/28/16
Time: 09:18:08

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 14 Jun 2016
Test Well: G125

AQUIFER DATA

Saturated Thickness: 8.72 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G125

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.82 ft
Static Water Column Height: 8.72 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.53 ft
Total Well Penetration Depth: 8.67 ft

No. of Observations: 90

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	1.869	0.691	2.554	4.58	1.98
0.008	3.276	0.741	2.544	4.86	1.949
0.018	2.542	0.794	2.528	5.16	1.919
0.02802	2.821	0.85	2.516	5.47	1.886
0.038	2.741	0.91	2.508	5.81	1.855
0.049	2.75	0.97	2.496	6.16	1.82
0.061	2.737	1.04	2.481	6.53	1.789
0.074	2.74	1.11	2.466	6.93	1.755
0.087	2.728	1.18	2.451	7.35	1.717
0.101	2.724	1.26	2.433	7.79	1.682
0.116	2.718	1.35	2.416	8.26	1.643
0.132	2.709	1.43	2.403	8.76	1.604
0.148	2.708	1.53	2.384	9.29	1.57

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.166	2.7	1.63	2.369	9.85	1.531
0.185	2.693	1.73	2.35	10.45	1.49
0.205	2.683	1.84	2.33	11.05	1.45
0.226	2.675	1.96	2.312	11.75	1.402
0.248	2.672	2.09	2.291	12.45	1.359
0.272	2.665	2.22	2.27	13.15	1.316
0.297	2.655	2.36	2.254	13.95	1.267
0.323	2.652	2.51	2.229	14.85	1.223
0.351	2.639	2.67	2.207	15.65	1.182
0.381	2.632	2.83	2.184	16.65	1.134
0.412	2.62	3.01	2.161	17.65	1.081
0.446	2.614	3.2	2.135	18.65	1.037
0.481	2.608	3.4	2.11	19.75	0.989
0.518	2.595	3.61	2.086	20.95	0.946
0.558	2.585	3.83	2.058	22.25	0.903
0.6	2.573	4.07	2.029	23.55	0.852
0.644	2.564	4.32	2.001	24.95	0.81

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	4.8E-5	cm/sec
Ss	0.004	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.01276 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	4.918E-5	3.398E-5	+/- 6.756E-5	1.447	cm/sec
Ss	0.003764	0.005048	+/- 0.01004	0.7457	ft^{-1}
Kz/Kr	1.	23.17	+/- 46.07	0.04315	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.01307 cm²/sec

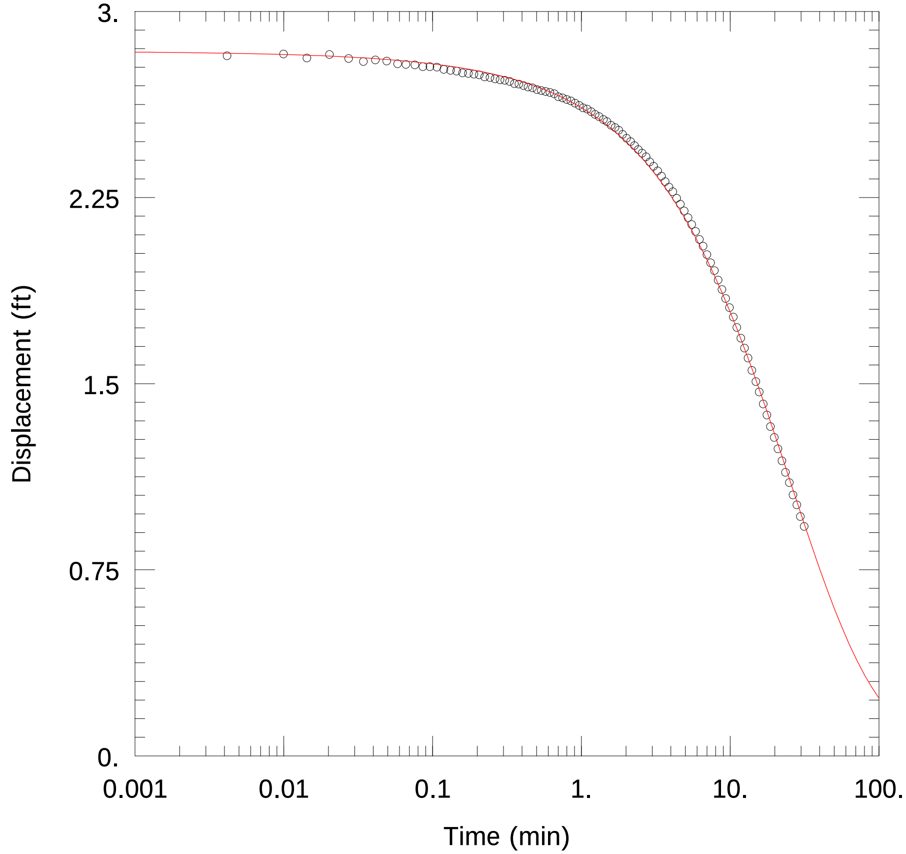
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-0.99
Ss	-0.99	1.00	0.95
Kz/Kr	-0.99	0.95	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 1.205 ft^2
Variance . . . . 0.01385 ft^2
Std. Deviation . . . . 0.1177 ft
Mean. . . . . -0.01063 ft
No. of Residuals 90
No. of Estimates 3



G125 @CCR LANDFILL – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G125
Test Date: 14 Jun 2016

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 4.1E-5 cm/sec
Ss = 0.0015 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 8.72 ft

WELL DATA (G125)

Initial Displacement: 2.84 ft
Total Well Penetration Depth: 8.72 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 8.72 ft
Screen Length: 4.53 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G125rh.aqt
Title: G125 @CCR Landfill – Rising Head Test
Date: 11/28/16
Time: 09:18:43

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 14 Jun 2016
Test Well: G125

AQUIFER DATA

Saturated Thickness: 8.72 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G125

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.84 ft
Static Water Column Height: 8.72 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.53 ft
Total Well Penetration Depth: 8.72 ft

No. of Observations: 113

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
-0.04167	2.799	0.3553	2.709	3.888	2.292
-0.0375	2.992	0.3813	2.707	4.128	2.273
-0.03098	2.871	0.4093	2.701	4.378	2.247
-0.02893	2.922	0.4393	2.695	4.638	2.223
-0.025	2.865	0.4703	2.692	4.918	2.196
-0.02083	2.851	0.5043	2.685	5.218	2.169
-0.01667	2.867	0.5393	2.681	5.528	2.141
-0.009933	2.861	0.5763	2.677	5.868	2.113
-0.007867	2.868	0.6163	2.673	6.218	2.081
-0.004167	2.838	0.6583	2.668	6.588	2.054
0.	2.846	0.7023	2.656	6.988	2.02
0.004167	2.821	0.7493	2.651	7.408	1.987
0.009984	2.828	0.7993	2.645	7.848	1.955

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.01433	2.812	0.8523	2.639	8.318	1.917
0.02033	2.826	0.9083	2.63	8.818	1.879
0.02733	2.81	0.9683	2.621	9.348	1.843
0.03433	2.798	1.028	2.611	9.908	1.806
0.04133	2.804	1.098	2.606	10.51	1.768
0.04933	2.8	1.168	2.596	11.11	1.726
0.05833	2.789	1.238	2.585	11.81	1.683
0.06633	2.786	1.318	2.576	12.51	1.643
0.07633	2.784	1.409	2.564	13.21	1.603
0.08633	2.777	1.488	2.556	14.01	1.553
0.09633	2.777	1.588	2.541	14.91	1.508
0.1073	2.775	1.688	2.532	15.71	1.466
0.1193	2.766	1.788	2.521	16.71	1.418
0.1323	2.762	1.898	2.504	17.71	1.373
0.1453	2.759	2.018	2.489	18.71	1.327
0.1593	2.752	2.148	2.475	19.81	1.283
0.1743	2.75	2.278	2.459	21.01	1.237
0.1903	2.747	2.418	2.443	22.31	1.189
0.2063	2.744	2.568	2.429	23.61	1.142
0.2243	2.736	2.728	2.414	25.01	1.101
0.2433	2.733	2.888	2.393	26.51	1.051
0.2633	2.728	3.068	2.376	28.11	1.011
0.2843	2.724	3.258	2.357	29.71	0.964
0.3063	2.722	3.458	2.336	31.51	0.924
0.3303	2.718	3.668	2.314		

SOLUTION

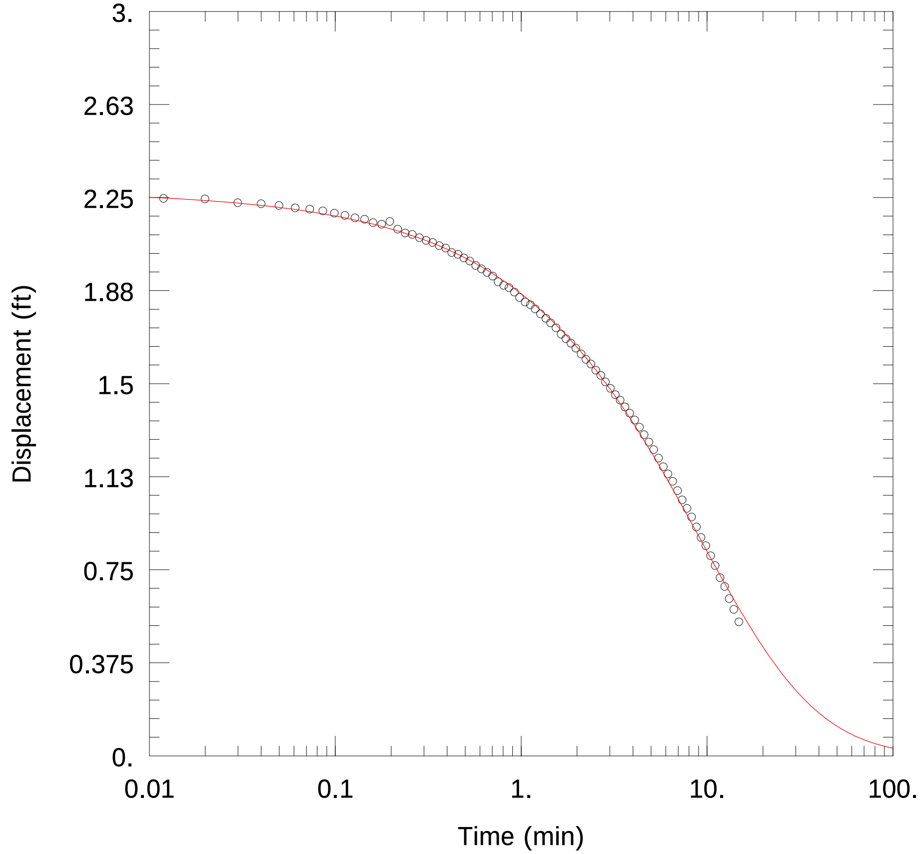
Slug Test
Aquifer Model: Unconfined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	4.1E-5	cm/sec
Ss	0.0015	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.0109 cm²/sec



G153 @ SW DETENTION POND – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G153
Test Date: 16 Jun 2016

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 0.00025 cm/sec
Ss = 0.015 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 3. ft

WELL DATA (G153)

Initial Displacement: 2.28 ft
Total Well Penetration Depth: 11.78 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 11.78 ft
Screen Length: 4.44 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G153fh.aqt
Title: G153 @ SW Detention Pond – Falling Head Test
Date: 11/28/16
Time: 09:19:16

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 16 Jun 2016
Test Well: G153

AQUIFER DATA

Saturated Thickness: 3. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G153

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.28 ft
Static Water Column Height: 11.78 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.44 ft
Total Well Penetration Depth: 11.78 ft

No. of Observations: 83

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	2.241	0.5299	1.994	3.212	1.455
0.0037	2.266	0.5699	1.976	3.412	1.433
0.01193	2.246	0.6119	1.962	3.622	1.406
0.01993	2.244	0.656	1.948	3.842	1.381
0.02993	2.229	0.7029	1.933	4.082	1.353
0.03995	2.225	0.7529	1.91	4.332	1.324
0.04993	2.218	0.806	1.896	4.592	1.294
0.06093	2.208	0.8619	1.887	4.872	1.264
0.07293	2.203	0.9219	1.869	5.172	1.234
0.08593	2.196	0.9819	1.847	5.482	1.2
0.09893	2.187	1.052	1.829	5.822	1.165
0.1129	2.178	1.122	1.818	6.172	1.136
0.128	2.168	1.192	1.801	6.542	1.106

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.1439	2.162	1.272	1.781	6.942	1.069
0.16	2.149	1.362	1.763	7.362	1.031
0.178	2.142	1.442	1.745	7.802	0.997
0.1969	2.153	1.542	1.725	8.272	0.962
0.2169	2.122	1.642	1.699	8.772	0.922
0.2379	2.107	1.742	1.681	9.302	0.88
0.2599	2.101	1.852	1.663	9.862	0.847
0.2839	2.088	1.972	1.643	10.46	0.806
0.309	2.077	2.102	1.62	11.06	0.767
0.335	2.069	2.232	1.598	11.76	0.718
0.3629	2.056	2.372	1.579	12.46	0.682
0.3929	2.046	2.522	1.554	13.16	0.633
0.4239	2.028	2.682	1.533	13.96	0.59
0.458	2.021	2.842	1.507	14.86	0.54
0.4929	2.006	3.022	1.481		

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00025	cm/sec
Ss	0.015	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.02286 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0002498	2.214E-5	+/- 4.406E-5	11.28	cm/sec
Ss	0.0138	0.002624	+/- 0.005222	5.259	ft^{-1}
Kz/Kr	1.	1.248	+/- 2.484	0.801	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.02284 cm²/sec

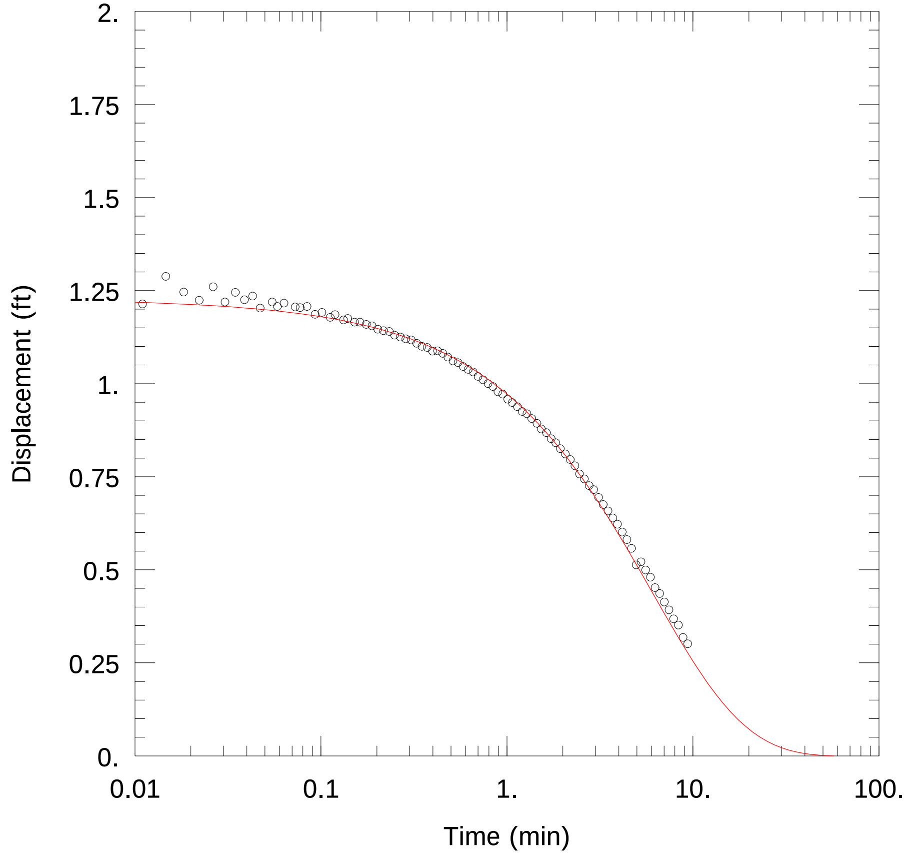
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-0.98
Ss	-0.99	1.00	0.95
Kz/Kr	-0.98	0.95	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.02333 ft^2
Variance . . . . 0.0002916 ft^2
Std. Deviation . . . . 0.01708 ft
Mean. . . . . 0.0007214 ft
No. of Residuals 83
No. of Estimates 3



G153 @ SW DETENTION POND – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G153
Test Date: 16 Jun 2016

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 0.00054 cm/sec
Ss = 0.0025 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 3. ft

WELL DATA (G153)

Initial Displacement: 1.23 ft
Total Well Penetration Depth: 11.78 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 11.78 ft
Screen Length: 4.44 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G153rh.aqt
Title: G153 @ SW Detention Pond – Rising Head Test
Date: 11/28/16
Time: 09:19:48

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 16 Jun 2016
Test Well: G153

AQUIFER DATA

Saturated Thickness: 3. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G153

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.23 ft
Static Water Column Height: 11.78 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.44 ft
Total Well Penetration Depth: 11.78 ft

No. of Observations: 93

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	1.222	0.2334	1.14	1.631	0.868
0.003666	1.261	0.2494	1.13	1.731	0.852
0.007333	1.285	0.2674	1.125	1.831	0.841
0.011	1.214	0.2864	1.12	1.941	0.825
0.01467	1.288	0.3064	1.117	2.061	0.811
0.01832	1.246	0.3274	1.108	2.191	0.796
0.02222	1.224	0.3494	1.1	2.321	0.779
0.02638	1.26	0.3734	1.097	2.461	0.757
0.03055	1.219	0.3984	1.087	2.611	0.744
0.03472	1.245	0.4244	1.088	2.771	0.726
0.03888	1.225	0.4524	1.081	2.931	0.715
0.04305	1.235	0.4824	1.071	3.111	0.694
0.04722	1.203	0.5134	1.061	3.301	0.675

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.05473	1.219	0.5474	1.056	3.503	0.658
0.05843	1.207	0.5824	1.046	3.711	0.639
0.06338	1.216	0.6194	1.038	3.931	0.622
0.0728	1.206	0.6594	1.031	4.171	0.601
0.07738	1.204	0.7014	1.019	4.421	0.581
0.08438	1.207	0.7454	1.01	4.681	0.557
0.09303	1.186	0.7924	1.	4.961	0.513
0.1014	1.191	0.8424	0.992	5.261	0.521
0.1124	1.178	0.8954	0.978	5.571	0.499
0.1194	1.185	0.9514	0.972	5.911	0.48
0.1325	1.171	1.011	0.958	6.261	0.452
0.1394	1.175	1.071	0.949	6.631	0.436
0.1518	1.165	1.141	0.938	7.031	0.413
0.1626	1.165	1.211	0.925	7.451	0.392
0.1754	1.159	1.281	0.919	7.891	0.368
0.1884	1.155	1.361	0.906	8.361	0.351
0.2024	1.146	1.451	0.893	8.861	0.318
0.2174	1.142	1.531	0.878	9.391	0.301

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00054	cm/sec
Ss	0.0025	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.04938 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0005399	9.804E-5	+/- 0.0001948	5.507	cm/sec
Ss	0.00256	0.001483	+/- 0.002947	1.726	ft^{-1}
Kz/Kr	1.	1.411	+/- 2.803	0.7089	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.04937 cm²/sec

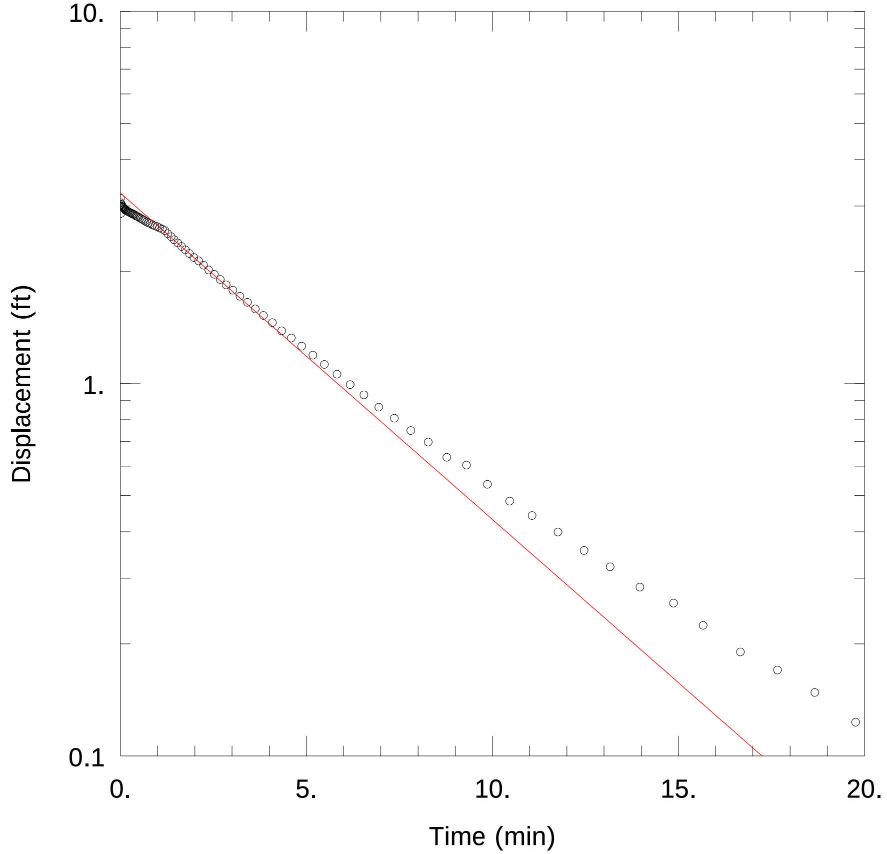
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-0.99
Ss	-0.99	1.00	0.97
Kz/Kr	-0.99	0.97	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.0362 ft^2
Variance . . . . 0.0004022 ft^2
Std. Deviation . . . . 0.02005 ft
Mean. . . . . -0.005578 ft
No. of Residuals 93
No. of Estimates. 3



G206 @ GMF GYPSUM POND – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G206
Test Date: 14 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.0003 cm/sec
y0 = 3.25 ft

AQUIFER DATA

Saturated Thickness: 13.15 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G206)

Initial Displacement: 3.01 ft
Total Well Penetration Depth: 13.15 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 13.15 ft
Screen Length: 4.41 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G206fh.aqt
Title: G206 @ GMF Gypsum Pond – Falling Head Test
Date: 11/28/16
Time: 10:38:25

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 14 Jun 2016
Test Well: G206

AQUIFER DATA

Saturated Thickness: 13.15 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G206

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 3.01 ft
Static Water Column Height: 13.15 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.41 ft
Total Well Penetration Depth: 13.15 ft

No. of Observations: 89

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	3.143	0.617	2.752	4.087	1.458
0.008	3.062	0.661	2.737	4.337	1.386
0.017	2.865	0.708	2.718	4.597	1.325
0.025	3.029	0.758	2.701	4.877	1.26
0.035	3.023	0.811	2.69	5.177	1.192
0.045	2.995	0.867	2.669	5.487	1.126
0.055	2.986	0.927	2.655	5.827	1.06
0.066	2.978	0.987	2.64	6.177	0.994
0.078	2.97	1.057	2.619	6.547	0.933
0.091	2.963	1.127	2.599	6.947	0.864
0.104	2.95	1.197	2.576	7.367	0.807
0.118	2.941	1.277	2.527	7.807	0.748
0.133	2.926	1.367	2.48	8.277	0.696

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.149	2.927	1.447	2.434	8.777	0.634
0.165	2.92	1.547	2.388	9.307	0.604
0.183	2.906	1.647	2.336	9.867	0.536
0.202	2.901	1.747	2.288	10.47	0.483
0.222	2.895	1.857	2.236	11.07	0.442
0.243	2.887	1.977	2.182	11.77	0.399
0.265	2.878	2.107	2.136	12.47	0.356
0.289	2.874	2.237	2.081	13.17	0.322
0.314	2.859	2.377	2.019	13.97	0.284
0.34	2.849	2.527	1.965	14.87	0.257
0.368	2.846	2.687	1.905	15.67	0.224
0.398	2.836	2.847	1.841	16.67	0.19
0.429	2.819	3.027	1.782	17.67	0.17
0.463	2.81	3.217	1.717	18.67	0.148
0.498	2.8	3.417	1.653	19.77	0.123
0.535	2.784	3.627	1.588	20.97	0.112
0.575	2.77	3.847	1.524		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 3.715

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0003	cm/sec
y0	3.25	ft

T = K*b = 0.1202 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
K	0.0002598	2.211E-6	+/- 4.395E-6	117.5	cm/sec
y0	3.047	0.007694	+/- 0.0153	396.	ft

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.1041 cm²/sec

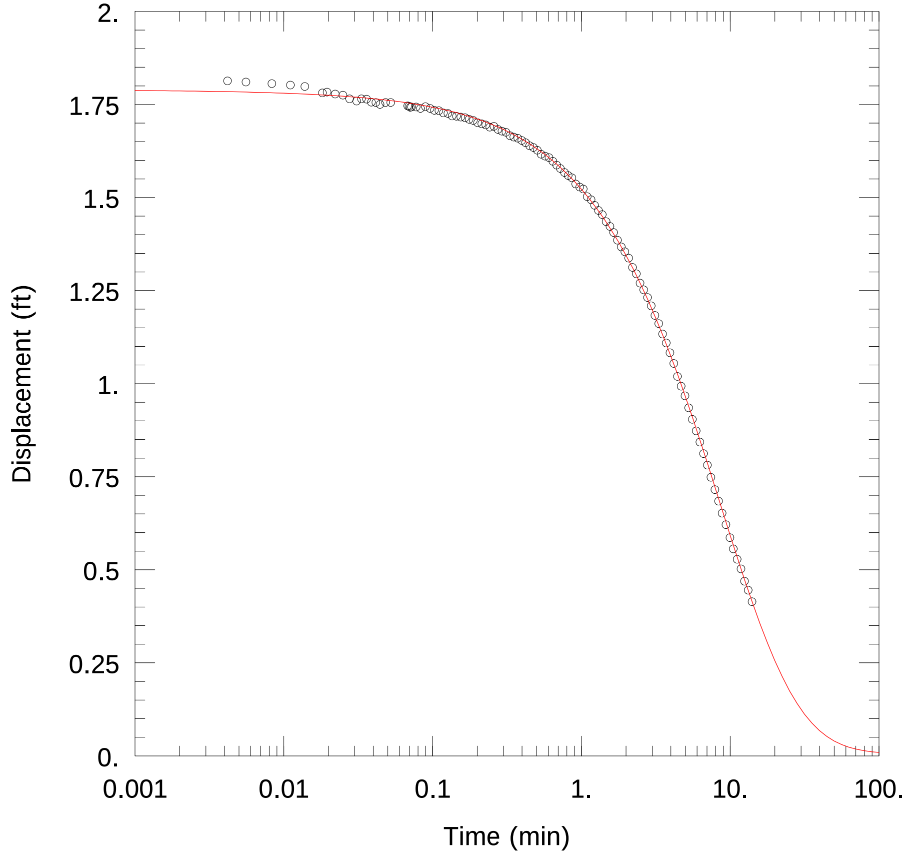
Parameter Correlations

	K	y0
K	1.00	0.55
y0	0.55	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.168 ft^2
Variance . . . . 0.001931 ft^2
Std. Deviation . . . . 0.04394 ft
Mean. . . . . 0.0007809 ft
No. of Residuals 89
No. of Estimates. 2



G206 @ GMF GYPSUM POND – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G206
Test Date: 14 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00016 cm/sec
Ss = 0.0003 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 13.15 ft

WELL DATA (G206)

Initial Displacement: 1.79 ft
Total Well Penetration Depth: 13.15 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 13.15 ft
Screen Length: 4.41 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G206rh.aqt
Title: G206 @ GMF Gypsum Pond – Rising Head Test
Date: 11/28/16
Time: 09:20:24

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 14 Jun 2016
Test Well: G206

AQUIFER DATA

Saturated Thickness: 13.15 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G206

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.79 ft
Static Water Column Height: 13.15 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.41 ft
Total Well Penetration Depth: 13.15 ft

No. of Observations: 110

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	1.857	0.2011	1.701	1.858	1.367
0.0042	1.813	0.2144	1.698	1.964	1.354
0.005578	1.81	0.2284	1.695	2.084	1.337
0.008333	1.806	0.2431	1.689	2.211	1.312
0.01111	1.802	0.2591	1.691	2.344	1.295
0.01389	1.798	0.2758	1.683	2.484	1.27
0.01823	1.781	0.2931	1.678	2.631	1.252
0.0196	1.783	0.3118	1.675	2.791	1.231
0.02222	1.778	0.3318	1.666	2.958	1.209
0.025	1.775	0.3524	1.662	3.131	1.183
0.02778	1.765	0.3751	1.659	3.318	1.161
0.03093	1.759	0.3984	1.653	3.518	1.133
0.03333	1.765	0.4231	1.647	3.724	1.109

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.03611	1.764	0.4498	1.639	3.951	1.083
0.03889	1.756	0.4778	1.634	4.184	1.054
0.04167	1.755	0.5071	1.627	4.431	1.019
0.04444	1.75	0.5384	1.616	4.698	0.993
0.04843	1.755	0.5718	1.611	4.978	0.967
0.05244	1.755	0.6071	1.607	5.271	0.935
0.06822	1.746	0.6444	1.597	5.584	0.904
0.0696	1.745	0.6844	1.587	5.918	0.873
0.07099	1.742	0.7244	1.578	6.271	0.843
0.07236	1.743	0.7711	1.567	6.644	0.812
0.07777	1.743	0.8178	1.559	7.044	0.781
0.0831	1.739	0.8644	1.553	7.444	0.748
0.08977	1.744	0.9178	1.536	7.911	0.715
0.09644	1.739	0.9778	1.528	8.378	0.684
0.1031	1.734	1.031	1.523	8.844	0.652
0.1104	1.733	1.098	1.502	9.378	0.621
0.1184	1.727	1.164	1.494	9.978	0.586
0.1271	1.726	1.231	1.479	10.51	0.556
0.1358	1.719	1.304	1.465	11.18	0.528
0.1451	1.718	1.384	1.454	11.84	0.502
0.1551	1.716	1.471	1.435	12.51	0.469
0.1658	1.714	1.558	1.422	13.24	0.445
0.1764	1.71	1.651	1.406	14.04	0.414
0.1884	1.707	1.751	1.385		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00016	cm/sec
Ss	0.0003	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.06413 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0001598	1.133E-5	+/- 2.245E-5	14.1	cm/sec
Ss	0.0003168	8.69E-5	+/- 0.0001722	3.645	ft^{-1}
Kz/Kr	1.	0.8787	+/- 1.742	1.138	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.06404 cm^2/sec

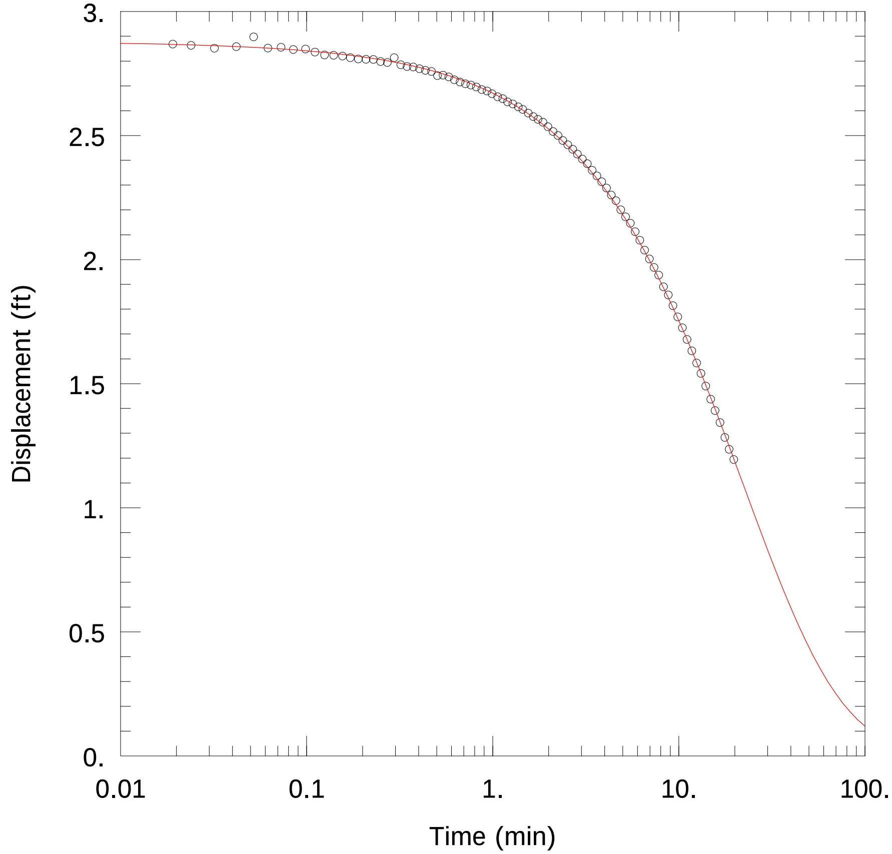
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-0.99
Ss	-0.99	1.00	0.96
Kz/Kr	-0.99	0.96	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.01105 ft^2
Variance . . . . 0.0001033 ft^2
Std. Deviation . . . . 0.01016 ft
Mean. . . . . -7.742E-5 ft
No. of Residuals 110
No. of Estimates 3



G208 @ GMF GYPSUM POND – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G208
Test Date: 16 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 6.0E-5 cm/sec
Ss = 0.0003 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 18.08 ft

WELL DATA (G208)

Initial Displacement: 2.88 ft
Total Well Penetration Depth: 18.08 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 18.08 ft
Screen Length: 4.53 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G208fh.aqt
Title: G208 @ GMF Gypsum Pond – Falling Head Test
Date: 11/28/16
Time: 09:21:07

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 16 Jun 2016
Test Well: G208

AQUIFER DATA

Saturated Thickness: 18.08 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G208

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.88 ft
Static Water Column Height: 18.08 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.53 ft
Total Well Penetration Depth: 18.08 ft

No. of Observations: 89

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	2.84	0.582	2.736	3.854	2.313
0.007	2.857	0.624	2.724	4.095	2.288
0.01912	2.868	0.668	2.715	4.344	2.26
0.024	2.863	0.715	2.708	4.604	2.237
0.032	2.851	0.765	2.703	4.884	2.2
0.042	2.858	0.818	2.695	5.184	2.172
0.052	2.897	0.874	2.685	5.494	2.146
0.062	2.852	0.934	2.679	5.834	2.112
0.073	2.855	0.994	2.668	6.184	2.078
0.085	2.846	1.064	2.656	6.554	2.038
0.09877	2.848	1.134	2.648	6.954	2.002
0.111	2.836	1.204	2.635	7.374	1.968
0.125	2.824	1.284	2.627	7.814	1.937

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.14	2.823	1.374	2.615	8.284	1.89
0.156	2.82	1.454	2.605	8.784	1.857
0.172	2.813	1.554	2.59	9.314	1.814
0.19	2.808	1.654	2.576	9.874	1.769
0.209	2.807	1.754	2.565	10.47	1.725
0.229	2.806	1.864	2.553	11.07	1.678
0.25	2.798	1.984	2.535	11.77	1.632
0.272	2.794	2.114	2.516	12.47	1.583
0.296	2.813	2.244	2.5	13.18	1.541
0.321	2.785	2.384	2.48	13.97	1.49
0.347	2.778	2.534	2.462	14.87	1.437
0.375	2.776	2.694	2.444	15.68	1.391
0.405	2.769	2.854	2.425	16.67	1.343
0.436	2.762	3.034	2.405	17.67	1.283
0.47	2.758	3.224	2.386	18.67	1.235
0.505	2.741	3.424	2.36	19.77	1.194
0.542	2.743	3.634	2.337		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	6.0E-5	cm/sec
Ss	0.0003	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.03306 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	6.04E-5	4.084E-6	+/- 8.118E-6	14.79	cm/sec
Ss	0.0002752	6.697E-5	+/- 0.0001331	4.109	ft^{-1}
Kz/Kr	1.	0.9578	+/- 1.904	1.044	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.03329 cm²/sec

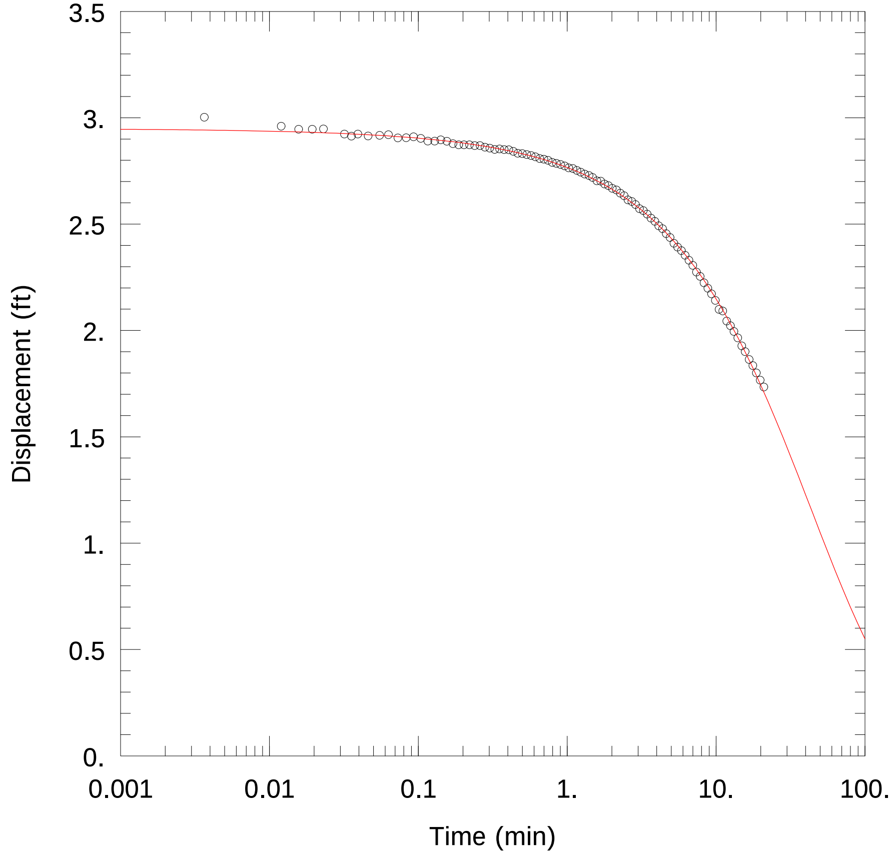
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-0.99
Ss	-0.99	1.00	0.96
Kz/Kr	-0.99	0.96	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.007952 ft^2
Variance . . . . 9.246E-5 ft^2
Std. Deviation . . . . 0.009616 ft
Mean. . . . . -0.001847 ft
No. of Residuals 89
No. of Estimates 3



G208 @ GMF GYPSUM POND – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G208
Test Date: 16 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 2.1E-5 cm/sec
Ss = 0.0028 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 18.08 ft

WELL DATA (G208)

Initial Displacement: 2.95 ft
Total Well Penetration Depth: 18.08 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 18.08 ft
Screen Length: 4.53 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G208rh.aqt
Title: G208 @ GMF Gypsum Pond – Rising Head Test
Date: 11/28/16
Time: 09:21:28

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 16 Jun 2016
Test Well: G208

AQUIFER DATA

Saturated Thickness: 18.08 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G208

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.95 ft
Static Water Column Height: 18.08 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.53 ft
Total Well Penetration Depth: 18.08 ft

No. of Observations: 97

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	3.003	0.4671	2.833	3.665	2.528
0.003667	3.002	0.5011	2.831	3.885	2.513
0.01203	2.96	0.5361	2.827	4.125	2.492
0.01573	2.946	0.5731	2.822	4.375	2.478
0.01943	2.946	0.6131	2.816	4.635	2.455
0.02312	2.947	0.6551	2.808	4.915	2.437
0.03195	2.923	0.6991	2.805	5.215	2.41
0.03565	2.913	0.7461	2.8	5.525	2.392
0.03937	2.923	0.7961	2.79	5.865	2.375
0.04613	2.914	0.8491	2.785	6.215	2.353
0.05507	2.917	0.9051	2.78	6.585	2.33
0.06312	2.92	0.9651	2.773	6.985	2.306
0.07312	2.905	1.025	2.764	7.405	2.274

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.08313	2.906	1.095	2.761	7.845	2.254
0.09312	2.91	1.165	2.752	8.315	2.224
0.1041	2.903	1.235	2.744	8.815	2.198
0.1161	2.89	1.315	2.735	9.345	2.172
0.1291	2.89	1.405	2.728	9.905	2.141
0.1421	2.896	1.485	2.719	10.51	2.099
0.1561	2.889	1.585	2.703	11.11	2.091
0.1711	2.878	1.685	2.702	11.81	2.044
0.1871	2.873	1.785	2.688	12.51	2.022
0.2031	2.873	1.895	2.681	13.21	1.995
0.2211	2.873	2.015	2.668	14.01	1.965
0.2401	2.869	2.145	2.66	14.91	1.927
0.2601	2.869	2.275	2.645	15.71	1.9
0.2811	2.861	2.416	2.633	16.71	1.863
0.3031	2.857	2.565	2.614	17.71	1.835
0.3271	2.851	2.725	2.606	18.71	1.8
0.3521	2.853	2.885	2.592	19.81	1.766
0.3781	2.85	3.065	2.572	21.01	1.734
0.4061	2.849	3.255	2.563		
0.4361	2.842	3.455	2.547		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	2.1E-5	cm/sec
Ss	0.0028	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.01157 cm^2/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	2.111E-5	2.793E-6	+/- 5.544E-6	7.557	cm/sec
Ss	0.002783	0.000655	+/- 0.0013	4.25	ft^{-1}
Kz/Kr	1.	5.786	+/- 11.48	0.1728	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.01163 cm^2/sec

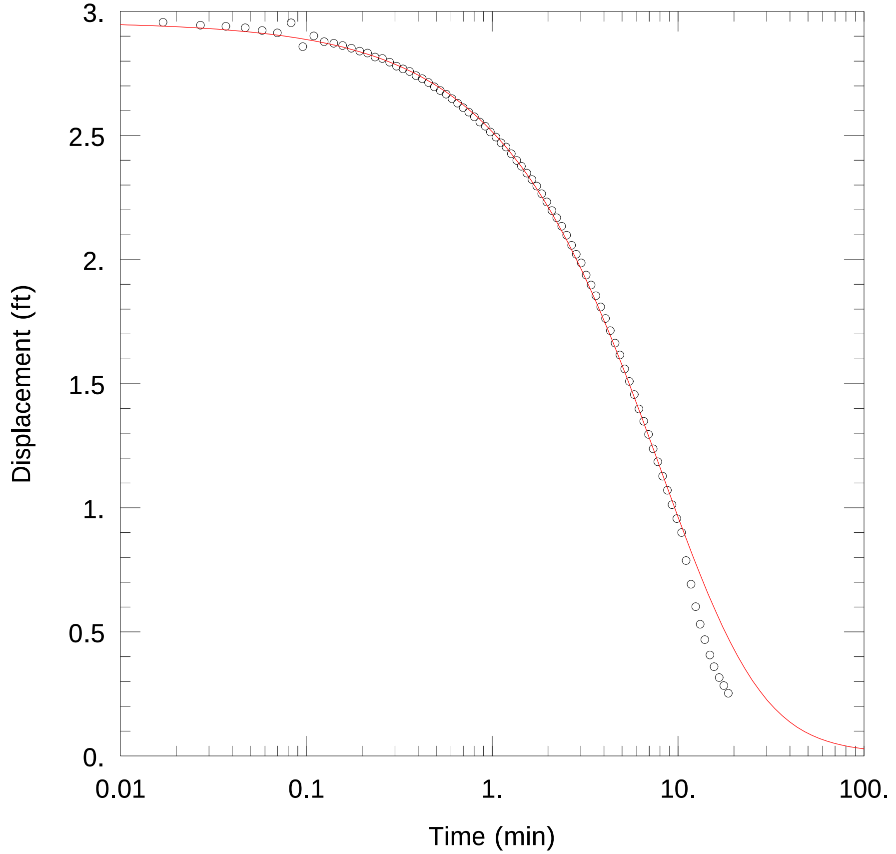
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-0.99
Ss	-0.99	1.00	0.96
Kz/Kr	-0.99	0.96	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.01242 ft^2
Variance . . . . 0.0001321 ft^2
Std. Deviation . . . . 0.01149 ft
Mean. . . . . 0.001463 ft
No. of Residuals 97
No. of Estimates. 3



G209 @ GMF GYPSUM POND – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G209
Test Date: 14 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.0002 cm/sec
Ss = 0.0001 ft^{-1}
Kz/Kr = 0.01

AQUIFER DATA

Saturated Thickness: 25.48 ft

WELL DATA (G209)

Initial Displacement: 2.96 ft
Total Well Penetration Depth: 25.48 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 25.48 ft
Screen Length: 4.54 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G209fh.aqt
Title: G209 @ GMF Gypsum Pond – Falling Head Test
Date: 11/28/16
Time: 09:22:04

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 14 Jun 2016
Test Well: G209

AQUIFER DATA

Saturated Thickness: 25.48 ft
Anisotropy Ratio (Kz/Kr): 0.01

SLUG TEST WELL DATA

Test Well: G209

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.96 ft
Static Water Column Height: 25.48 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.54 ft
Total Well Penetration Depth: 25.48 ft

No. of Observations: 86

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	2.947	0.609	2.648	3.839	1.809
0.009	2.943	0.653	2.63	4.079	1.762
0.017	2.956	0.7	2.612	4.329	1.713
0.027	2.944	0.75	2.594	4.589	1.663
0.037	2.94	0.803	2.575	4.869	1.615
0.047	2.934	0.859	2.554	5.169	1.559
0.058	2.923	0.919	2.537	5.479	1.509
0.07	2.913	0.979	2.514	5.819	1.456
0.083	2.954	1.049	2.493	6.169	1.398
0.096	2.858	1.119	2.47	6.539	1.348
0.11	2.901	1.189	2.453	6.939	1.295
0.125	2.878	1.269	2.426	7.359	1.237
0.141	2.871	1.359	2.399	7.799	1.185

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.157	2.862	1.439	2.376	8.269	1.127
0.175	2.851	1.539	2.348	8.769	1.07
0.194	2.84	1.639	2.322	9.299	1.012
0.214	2.832	1.739	2.296	9.859	0.956
0.235	2.816	1.849	2.265	10.46	0.9
0.257	2.81	1.969	2.232	11.06	0.787
0.281	2.795	2.099	2.197	11.76	0.691
0.306	2.779	2.229	2.168	12.46	0.601
0.332	2.768	2.369	2.134	13.16	0.53
0.36	2.758	2.519	2.098	13.96	0.468
0.39	2.741	2.679	2.057	14.86	0.406
0.421	2.729	2.839	2.021	15.66	0.359
0.455	2.713	3.019	1.986	16.66	0.315
0.49	2.696	3.209	1.937	17.66	0.283
0.527	2.681	3.409	1.897	18.66	0.252
0.567	2.666	3.619	1.854		

SOLUTION

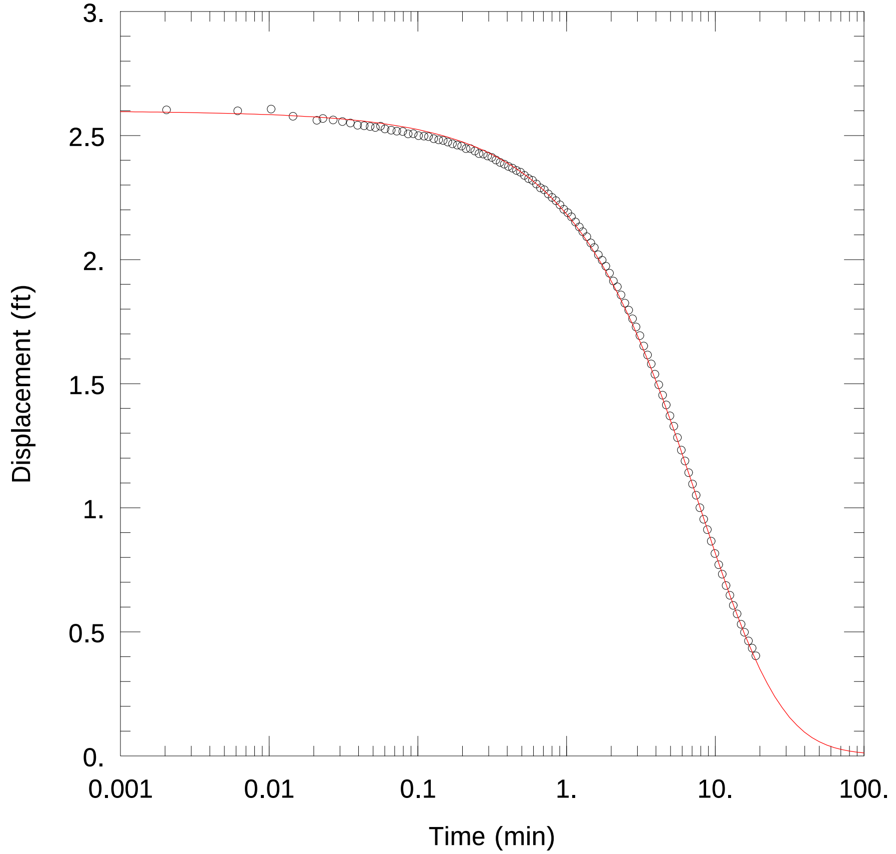
Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.0002	cm/sec
Ss	0.0001	ft^{-1}
Kz/Kr	0.01	

T = K*b = 0.1553 cm²/sec



G209 @ GMF GYPSUM POND – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G209
Test Date: 14 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00016 cm/sec
Ss = 0.0004 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 25.48 ft

WELL DATA (G209)

Initial Displacement: 2.6 ft
Total Well Penetration Depth: 25.48 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 25.48 ft
Screen Length: 4.54 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G209rh.aqt
Title: G209 @ GMF Gypsum Pond – Rising Head Test
Date: 11/28/16
Time: 09:22:32

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 14 Jun 2016
Test Well: G209

AQUIFER DATA

Saturated Thickness: 25.48 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G209

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.6 ft
Static Water Column Height: 25.48 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.54 ft
Total Well Penetration Depth: 25.48 ft

No. of Observations: 107

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	2.613	0.2953	2.417	2.62	1.796
0.00205	2.603	0.3153	2.411	2.78	1.761
0.006167	2.599	0.3363	2.401	2.94	1.728
0.01033	2.606	0.3583	2.391	3.12	1.693
0.0145	2.577	0.3823	2.384	3.31	1.651
0.02102	2.561	0.4073	2.375	3.51	1.615
0.02307	2.568	0.4333	2.368	3.72	1.579
0.027	2.562	0.4613	2.359	3.94	1.538
0.03117	2.556	0.4913	2.352	4.18	1.495
0.03533	2.55	0.5223	2.339	4.43	1.453
0.0395	2.541	0.5563	2.326	4.69	1.414
0.04367	2.539	0.5913	2.319	4.97	1.37
0.04783	2.536	0.6283	2.304	5.27	1.328

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.052	2.532	0.6683	2.289	5.581	1.282
0.05617	2.537	0.7103	2.281	5.92	1.232
0.06033	2.526	0.7543	2.264	6.27	1.188
0.06633	2.521	0.8013	2.25	6.64	1.141
0.07233	2.517	0.8513	2.237	7.04	1.095
0.07933	2.516	0.9043	2.22	7.46	1.05
0.08633	2.506	0.9603	2.202	7.9	1.
0.09333	2.507	1.02	2.189	8.37	0.953
0.1013	2.499	1.08	2.172	8.87	0.911
0.1103	2.497	1.15	2.151	9.4	0.865
0.1183	2.495	1.22	2.131	9.96	0.815
0.1283	2.487	1.29	2.112	10.56	0.77
0.1383	2.482	1.37	2.092	11.16	0.732
0.1483	2.48	1.46	2.067	11.86	0.686
0.1593	2.473	1.54	2.048	12.56	0.647
0.1713	2.466	1.64	2.019	13.26	0.606
0.1843	2.461	1.74	1.997	14.06	0.572
0.1973	2.457	1.84	1.973	14.96	0.53
0.2113	2.447	1.95	1.945	15.76	0.498
0.2263	2.447	2.07	1.913	16.76	0.463
0.2423	2.437	2.2	1.89	17.76	0.434
0.2583	2.427	2.33	1.857	18.76	0.403
0.2763	2.425	2.47	1.824		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00016	cm/sec
Ss	0.0004	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.1243 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0001569	8.484E-6	+/- 1.682E-5	18.49	cm/sec
Ss	0.0004212	8.747E-5	+/- 0.0001734	4.816	ft^{-1}
Kz/Kr	1.	0.6918	+/- 1.372	1.446	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.1218 cm^2/sec

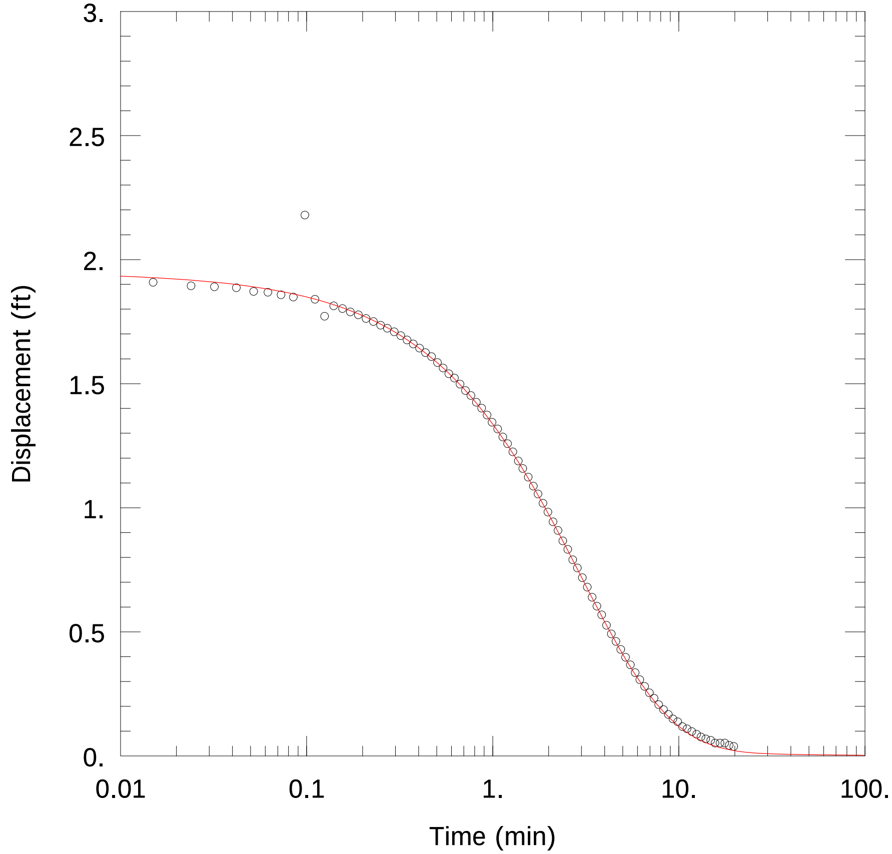
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-0.99
Ss	-0.99	1.00	0.95
Kz/Kr	-0.99	0.95	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.02054 ft^2
Variance . . . . 0.0001975 ft^2
Std. Deviation . . . . 0.01405 ft
Mean. . . . . -0.004298 ft
No. of Residuals 107
No. of Estimates 3



G210 @ GMF GYPSUM POND – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G210
Test Date: 16 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.0005 cm/sec
Ss = 0.0001 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 15.7 ft

WELL DATA (G210)

Initial Displacement: 1.95 ft
Total Well Penetration Depth: 15.7 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 15.7 ft
Screen Length: 4.54 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G210fh.aqt
Title: G210 @ GMF Gypsum Pond – Falling Head Test
Date: 11/28/16
Time: 09:23:01

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 16 Jun 2016
Test Well: G210

AQUIFER DATA

Saturated Thickness: 15.7 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G210

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.95 ft
Static Water Column Height: 15.7 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.54 ft
Total Well Penetration Depth: 15.7 ft

No. of Observations: 89

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	1.988	0.582	1.54	3.854	0.568
0.007	1.947	0.624	1.522	4.094	0.526
0.015	1.908	0.668	1.498	4.344	0.491
0.024	1.894	0.715	1.472	4.604	0.461
0.032	1.89	0.765	1.452	4.884	0.429
0.042	1.886	0.818	1.425	5.184	0.397
0.052	1.871	0.874	1.401	5.494	0.367
0.062	1.868	0.934	1.373	5.834	0.335
0.073	1.858	0.994	1.344	6.184	0.307
0.085	1.849	1.064	1.317	6.554	0.28
0.098	2.179	1.134	1.285	6.954	0.254
0.111	1.84	1.204	1.258	7.374	0.232
0.125	1.771	1.284	1.225	7.814	0.206

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.14	1.813	1.374	1.188	8.284	0.186
0.156	1.802	1.454	1.158	8.784	0.167
0.172	1.789	1.554	1.123	9.314	0.149
0.19	1.777	1.654	1.087	9.874	0.137
0.209	1.762	1.754	1.055	10.47	0.118
0.229	1.75	1.864	1.018	11.07	0.109
0.25	1.735	1.984	0.982	11.77	0.098
0.272	1.723	2.114	0.943	12.47	0.087
0.296	1.709	2.244	0.908	13.17	0.076
0.321	1.693	2.384	0.866	13.97	0.068
0.347	1.676	2.534	0.832	14.87	0.062
0.375	1.66	2.694	0.79	15.67	0.051
0.405	1.643	2.854	0.757	16.67	0.051
0.436	1.625	3.034	0.718	17.67	0.051
0.47	1.609	3.224	0.68	18.67	0.042
0.505	1.585	3.424	0.639	19.77	0.038
0.542	1.563	3.634	0.603		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.0005	cm/sec
Ss	0.0001	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.2393 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0004908	0.000128	+/- 0.0002545	3.835	cm/sec
Ss	0.0001094	0.0001408	+/- 0.0002798	0.7771	ft^{-1}
Kz/Kr	1.	2.525	+/- 5.019	0.3961	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.2349 cm²/sec

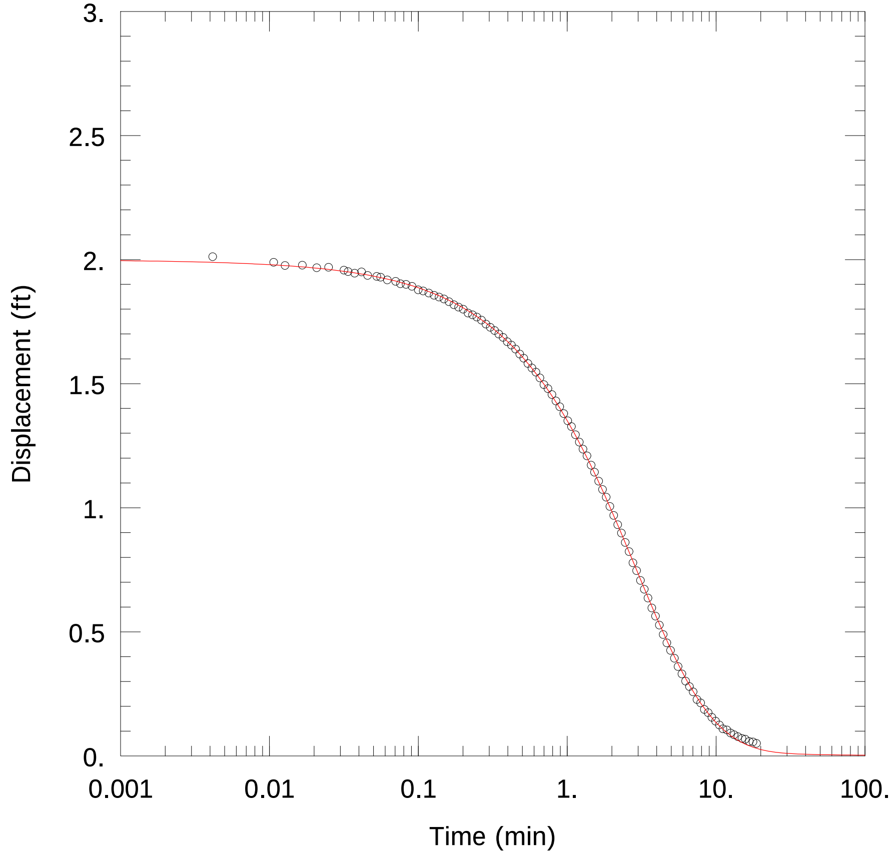
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-1.00
Ss	-0.99	1.00	0.98
Kz/Kr	-1.00	0.98	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.1181 ft^2
Variance . . . . 0.001373 ft^2
Std. Deviation . . . . 0.03705 ft
Mean. . . . . 0.003124 ft
No. of Residuals 89
No. of Estimates 3



G210 @ GMF GYPSUM POND – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G210
Test Date: 16 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00048 cm/sec
Ss = 0.0002 ft^{-1}
Kz/Kr = 0.9532

AQUIFER DATA

Saturated Thickness: 15.7 ft

WELL DATA (G210)

Initial Displacement: 2. ft
Total Well Penetration Depth: 15.7 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 15.7 ft
Screen Length: 4.54 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G210rh.aqt
Title: G210 @ GMF Gypsum Pond – Rising Head Test
Date: 11/28/16
Time: 09:23:24

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 16 Jun 2016
Test Well: G210

AQUIFER DATA

Saturated Thickness: 15.7 ft
Anisotropy Ratio (Kz/Kr): 0.9532

SLUG TEST WELL DATA

Test Well: G210

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2. ft
Static Water Column Height: 15.7 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.54 ft
Total Well Penetration Depth: 15.7 ft

No. of Observations: 104

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	2.058	0.326	1.714	2.77	0.778
0.004167	2.011	0.348	1.7	2.93	0.746
0.01072	1.989	0.372	1.686	3.11	0.707
0.01277	1.976	0.397	1.669	3.3	0.671
0.01667	1.977	0.423	1.655	3.5	0.636
0.02083	1.967	0.451	1.639	3.71	0.596
0.025	1.969	0.481	1.619	3.93	0.563
0.03177	1.957	0.512	1.602	4.17	0.527
0.03382	1.951	0.546	1.581	4.42	0.489
0.0375	1.945	0.581	1.563	4.68	0.455
0.04167	1.95	0.618	1.546	4.96	0.425
0.04583	1.936	0.658	1.523	5.26	0.393
0.05278	1.932	0.7	1.496	5.57	0.36

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.056	1.929	0.744	1.48	5.91	0.33
0.06203	1.918	0.791	1.456	6.26	0.301
0.07057	1.912	0.841	1.43	6.63	0.279
0.076	1.902	0.894	1.407	7.03	0.258
0.083	1.9	0.95	1.379	7.45	0.227
0.091	1.892	1.01	1.35	7.89	0.213
0.1	1.878	1.07	1.327	8.36	0.187
0.108	1.873	1.14	1.294	8.86	0.174
0.118	1.865	1.21	1.264	9.39	0.155
0.128	1.856	1.28	1.236	9.95	0.14
0.138	1.849	1.36	1.209	10.55	0.124
0.149	1.841	1.45	1.171	11.15	0.109
0.161	1.83	1.53	1.143	11.85	0.104
0.174	1.818	1.63	1.107	12.55	0.092
0.187	1.808	1.73	1.073	13.25	0.085
0.201	1.8	1.83	1.042	14.05	0.077
0.216	1.784	1.94	1.005	14.95	0.07
0.232	1.777	2.06	0.969	15.75	0.067
0.248	1.768	2.19	0.931	16.75	0.058
0.266	1.756	2.32	0.898	17.75	0.056
0.285	1.74	2.46	0.86	18.75	0.05
0.305	1.727	2.61	0.823		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00048	cm/sec
Ss	0.0002	ft^{-1}
Kz/Kr	0.9532	

T = K*b = 0.2297 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0004796	2.439E-5	+/- 4.839E-5	19.66	cm/sec
Ss	0.0002031	4.796E-5	+/- 9.515E-5	4.235	ft^{-1}
Kz/Kr	0.9532	0.495	+/- 0.9822	1.925	

C.I. is approximate 95% confidence interval for parameter

t-ratio = estimate/std. error
No estimation window

T = K*b = 0.2295 cm^2/sec

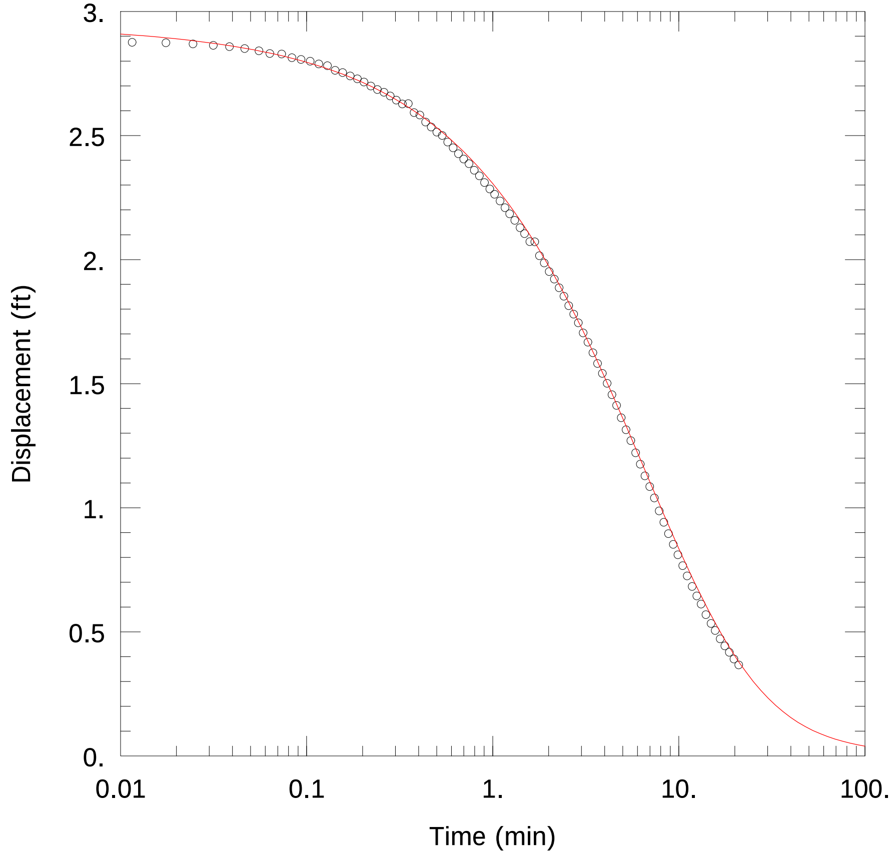
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-0.99
Ss	-0.99	1.00	0.98
Kz/Kr	-0.99	0.98	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.008583 ft^2
Variance . . . . 8.498E-5 ft^2
Std. Deviation . . . . 0.009219 ft
Mean. . . . . 0.001622 ft
No. of Residuals 104
No. of Estimates 3



G212 @ GMF GYPSUM POND – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G212
Test Date: 14 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00013 cm/sec
Ss = 0.004 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 12.71 ft

WELL DATA (G212)

Initial Displacement: 2.95 ft
Total Well Penetration Depth: 12.71 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 12.71 ft
Screen Length: 4.55 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G212fh.aqt
Title: G212 @ GMF Gypsum Pond – Falling Head Test
Date: 11/28/16
Time: 09:23:53

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 14 Jun 2016
Test Well: G212

AQUIFER DATA

Saturated Thickness: 12.71 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G212

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.95 ft
Static Water Column Height: 12.71 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.55 ft
Total Well Penetration Depth: 12.71 ft

No. of Observations: 96

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	2.913	0.4676	2.534	3.456	1.624
0.00365	2.884	0.5016	2.513	3.666	1.581
0.0073	2.877	0.5366	2.5	3.886	1.541
0.01157	2.875	0.5736	2.473	4.126	1.501
0.01758	2.873	0.6136	2.45	4.376	1.455
0.02457	2.869	0.6556	2.426	4.636	1.412
0.03157	2.863	0.6996	2.405	4.916	1.362
0.03857	2.858	0.7466	2.386	5.216	1.314
0.04657	2.85	0.7966	2.36	5.526	1.27
0.05557	2.841	0.8496	2.337	5.866	1.221
0.06357	2.83	0.9056	2.31	6.216	1.175
0.07357	2.828	0.9656	2.284	6.586	1.128
0.08357	2.813	1.026	2.263	6.986	1.085

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.09357	2.806	1.096	2.236	7.406	1.039
0.1046	2.799	1.166	2.209	7.846	0.987
0.1166	2.788	1.236	2.184	8.316	0.941
0.1296	2.781	1.316	2.158	8.816	0.895
0.1426	2.762	1.406	2.128	9.346	0.852
0.1566	2.753	1.486	2.104	9.906	0.81
0.1716	2.74	1.586	2.072	10.51	0.766
0.1876	2.728	1.686	2.071	11.11	0.725
0.2036	2.715	1.786	2.015	11.81	0.682
0.2216	2.699	1.896	1.986	12.51	0.644
0.2406	2.685	2.016	1.951	13.21	0.611
0.2606	2.674	2.146	1.921	14.01	0.569
0.2816	2.659	2.276	1.886	14.91	0.533
0.3036	2.642	2.416	1.852	15.71	0.505
0.3276	2.627	2.566	1.814	16.71	0.471
0.3526	2.628	2.726	1.78	17.71	0.443
0.3786	2.592	2.886	1.745	18.71	0.417
0.4066	2.582	3.066	1.704	19.81	0.39
0.4366	2.554	3.256	1.667	21.01	0.366

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00013	cm/sec
Ss	0.004	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.05036 cm^2/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0001337	5.707E-6	+/- 1.133E-5	23.42	cm/sec
Ss	0.004071	0.0003972	+/- 0.0007888	10.25	ft^{-1}
Kz/Kr	1.	1.219	+/- 2.421	0.8205	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

$T = K*b = 0.05178\ cm^2/sec$

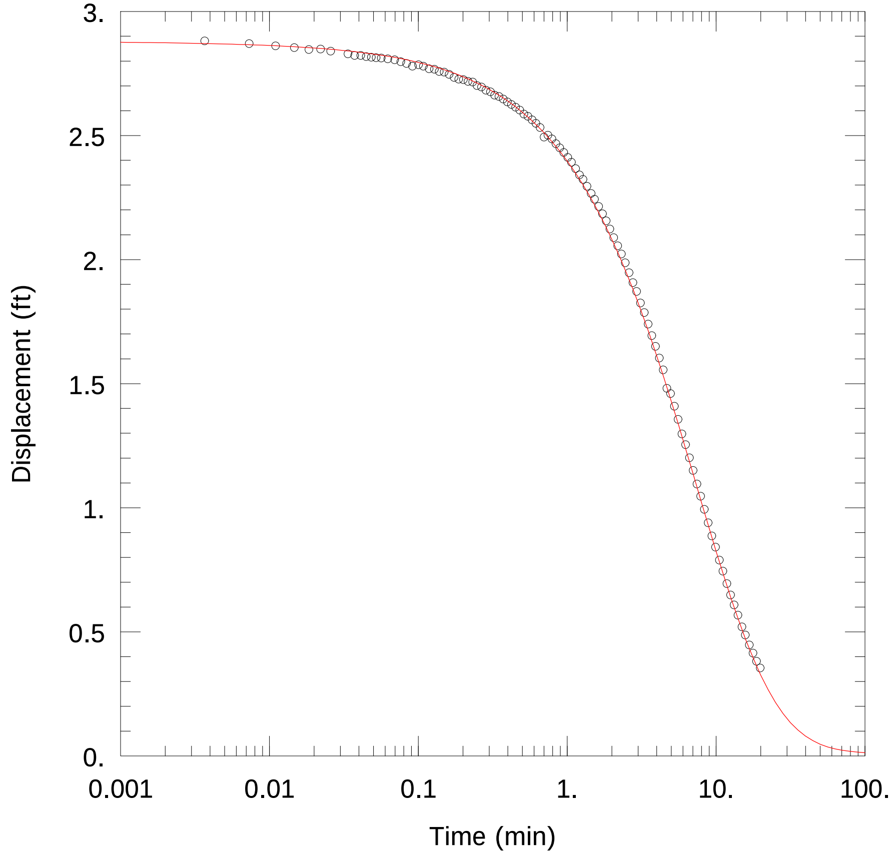
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.98	-0.97
Ss	-0.98	1.00	0.93
Kz/Kr	-0.97	0.93	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.01956 ft^2
Variance . . . . 0.0002103 ft^2
Std. Deviation . . . . 0.0145 ft
Mean. . . . . -0.002036 ft
No. of Residuals 96
No. of Estimates. 3



G212 @ GMF GYPSUM POND – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G212
Test Date: 14 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00018 cm/sec
Ss = 0.0003 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 12.71 ft

WELL DATA (G212)

Initial Displacement: 2.88 ft
Total Well Penetration Depth: 12.71 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 12.71 ft
Screen Length: 4.55 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G212rh.aqt
Title: G212 @ GMF Gypsum Pond – Rising Head Test
Date: 11/28/16
Time: 09:24:15

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 14 Jun 2016
Test Well: G212

AQUIFER DATA

Saturated Thickness: 12.71 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G212

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.88 ft
Static Water Column Height: 12.71 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.55 ft
Total Well Penetration Depth: 12.71 ft

No. of Observations: 106

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	2.866	0.3265	2.662	2.93	1.871
0.003683	2.881	0.3485	2.657	3.111	1.825
0.007333	2.87	0.3725	2.647	3.301	1.786
0.01102	2.861	0.3975	2.635	3.501	1.74
0.01473	2.854	0.4235	2.625	3.711	1.693
0.01843	2.846	0.4515	2.614	3.93	1.65
0.02213	2.848	0.4815	2.602	4.17	1.603
0.02583	2.84	0.5125	2.586	4.42	1.555
0.0338	2.829	0.5465	2.577	4.681	1.481
0.03748	2.822	0.5815	2.563	4.96	1.46
0.04115	2.822	0.6185	2.549	5.261	1.409
0.0448	2.818	0.6585	2.532	5.571	1.356
0.04847	2.815	0.7005	2.493	5.911	1.297

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.05215	2.813	0.7445	2.501	6.261	1.254
0.0565	2.812	0.7915	2.486	6.63	1.201
0.0625	2.809	0.8415	2.467	7.031	1.15
0.0695	2.805	0.8945	2.45	7.45	1.095
0.0765	2.797	0.9505	2.431	7.891	1.046
0.0835	2.79	1.011	2.411	8.361	0.993
0.0915	2.779	1.071	2.392	8.861	0.939
0.1005	2.785	1.141	2.366	9.39	0.886
0.1085	2.779	1.21	2.341	9.95	0.841
0.1185	2.769	1.281	2.323	10.55	0.789
0.1285	2.767	1.361	2.295	11.15	0.744
0.1385	2.758	1.45	2.266	11.85	0.694
0.1495	2.755	1.531	2.243	12.55	0.648
0.1615	2.746	1.631	2.214	13.25	0.608
0.1745	2.734	1.73	2.184	14.05	0.567
0.1875	2.727	1.831	2.156	14.95	0.52
0.2015	2.725	1.94	2.123	15.75	0.487
0.2165	2.718	2.061	2.088	16.75	0.447
0.2325	2.715	2.191	2.055	17.75	0.414
0.2485	2.701	2.321	2.022	18.75	0.381
0.2665	2.695	2.461	1.987	19.85	0.354
0.2855	2.682	2.611	1.947		
0.3055	2.676	2.771	1.907		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00018	cm/sec
Ss	0.0003	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.06973 cm^2/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0001762	7.1E-6	+/- 1.408E-5	24.81	cm/sec
Ss	0.0002962	4.965E-5	+/- 9.845E-5	5.966	ft^{-1}
Kz/Kr	1.	0.4616	+/- 0.9153	2.166	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.06825 cm^2/sec

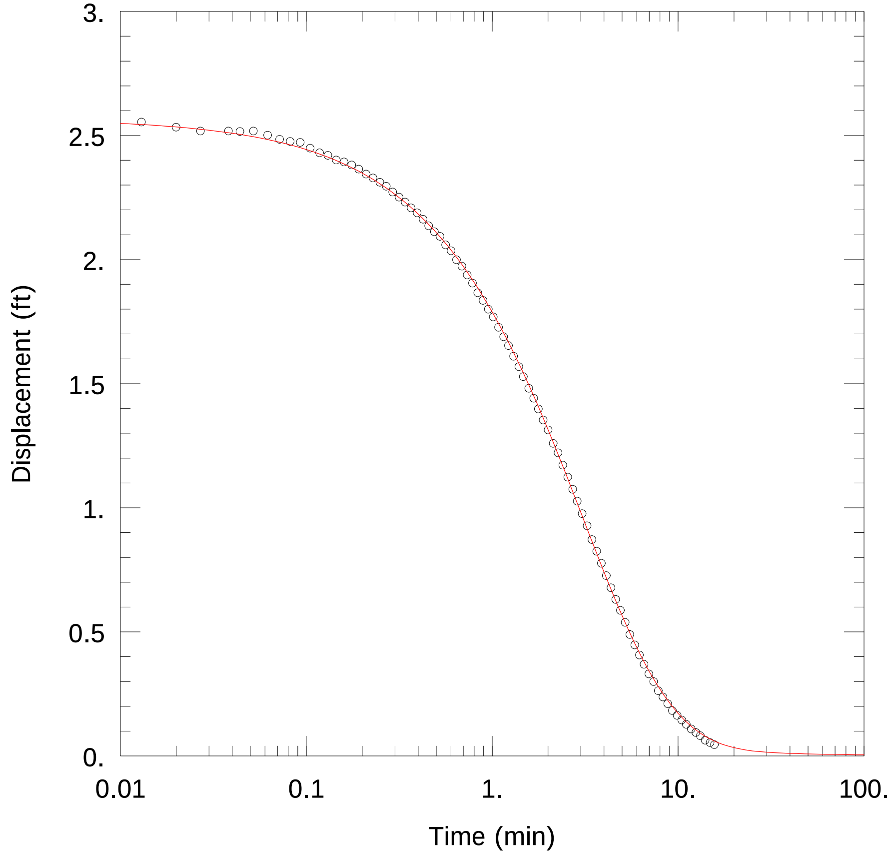
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-0.99
Ss	-0.99	1.00	0.96
Kz/Kr	-0.99	0.96	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.01265 ft^2
Variance . . . . 0.0001228 ft^2
Std. Deviation . . . . 0.01108 ft
Mean. . . . . -0.003437 ft
No. of Residuals 106
No. of Estimates 3



G215 @ GMF GYPSUM POND – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G215
Test Date: 14 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.0005 cm/sec
Ss = 9.0E-5 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 12.7 ft

WELL DATA (G215)

Initial Displacement: 2.57 ft
Total Well Penetration Depth: 12.7 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 12.7 ft
Screen Length: 4.39 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G215fh.aqt
Title: G215 @ GMF Gypsum Pond – Falling Head Test
Date: 11/28/16
Time: 09:24:40

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 14 Jun 2016
Test Well: G215

AQUIFER DATA

Saturated Thickness: 12.7 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G215

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.57 ft
Static Water Column Height: 12.7 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.39 ft
Total Well Penetration Depth: 12.7 ft

No. of Observations: 88

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	2.543	0.49	2.112	3.244	0.927
0.006	2.561	0.525	2.093	3.444	0.871
0.013	2.554	0.562	2.059	3.654	0.824
0.02	2.533	0.602	2.035	3.874	0.776
0.027	2.518	0.644	1.999	4.114	0.726
0.03818	2.518	0.688	1.973	4.364	0.677
0.044	2.516	0.735	1.938	4.624	0.63
0.052	2.518	0.785	1.905	4.904	0.586
0.062	2.501	0.838	1.866	5.204	0.538
0.072	2.484	0.894	1.835	5.514	0.489
0.082	2.476	0.954	1.8	5.854	0.447
0.093	2.472	1.014	1.769	6.204	0.406
0.105	2.449	1.084	1.727	6.574	0.369

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.118	2.43	1.154	1.689	6.974	0.33
0.131	2.42	1.224	1.653	7.394	0.299
0.145	2.401	1.304	1.61	7.834	0.262
0.16	2.393	1.394	1.568	8.304	0.237
0.176	2.381	1.474	1.528	8.804	0.21
0.192	2.364	1.574	1.481	9.339	0.182
0.21	2.344	1.674	1.441	9.894	0.163
0.229	2.329	1.774	1.398	10.49	0.144
0.249	2.311	1.884	1.353	11.09	0.127
0.27	2.295	2.004	1.313	11.79	0.108
0.292	2.272	2.134	1.259	12.49	0.094
0.316	2.251	2.264	1.221	13.19	0.081
0.341	2.231	2.404	1.171	13.99	0.063
0.367	2.208	2.554	1.123	14.89	0.053
0.395	2.188	2.714	1.074	15.69	0.045
0.425	2.162	2.874	1.026		
0.456	2.136	3.054	0.976		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.0005	cm/sec
Ss	9.0E-5	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.1935 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0005031	5.308E-5	+/- 0.0001055	9.478	cm/sec
Ss	8.802E-5	4.315E-5	+/- 8.578E-5	2.04	ft^{-1}
Kz/Kr	1.	1.055	+/- 2.097	0.9479	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.1948 cm²/sec

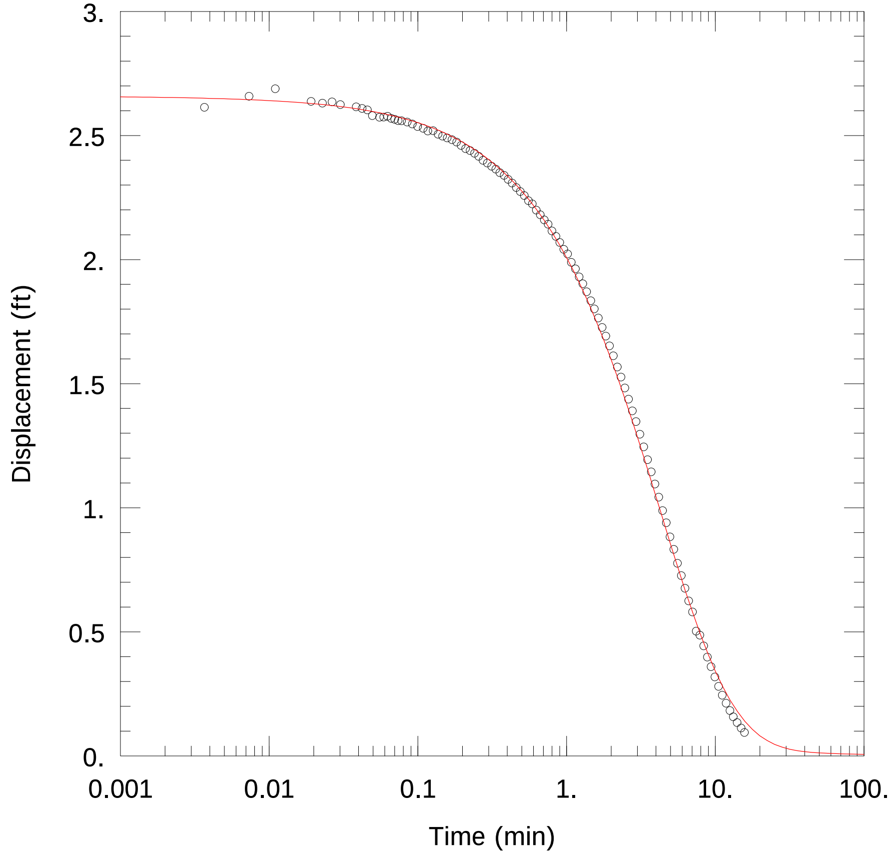
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-1.00	-1.00
Ss	-1.00	1.00	0.99
Kz/Kr	-1.00	0.99	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.00943 ft^2
Variance . . . . 0.0001109 ft^2
Std. Deviation . . . . 0.01053 ft
Mean. . . . . 3.96E-5 ft
No. of Residuals 88
No. of Estimates 3



G215 @ GMF GYPSUM POND – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G215
Test Date: 14 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00035 cm/sec
Ss = 0.00015 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 12.7 ft

WELL DATA (G215)

Initial Displacement: 2.66 ft
Total Well Penetration Depth: 12.7 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 12.7 ft
Screen Length: 4.39 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G215rh.aqt
Title: G215 @ GMF Gypsum Pond – Rising Head Test
Date: 11/28/16
Time: 09:25:02

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 14 Jun 2016
Test Well: G215

AQUIFER DATA

Saturated Thickness: 12.7 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G215

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.66 ft
Static Water Column Height: 12.7 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.39 ft
Total Well Penetration Depth: 12.7 ft

No. of Observations: 104

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	2.653	0.275	2.4	2.329	1.526
0.003683	2.613	0.2939	2.389	2.469	1.482
0.00735	2.658	0.314	2.376	2.619	1.437
0.01102	2.688	0.335	2.364	2.779	1.39
0.01922	2.637	0.3569	2.35	2.939	1.347
0.02288	2.63	0.381	2.339	3.119	1.296
0.02657	2.635	0.4059	2.323	3.309	1.245
0.03023	2.624	0.432	2.308	3.509	1.193
0.03862	2.615	0.46	2.29	3.719	1.144
0.04228	2.609	0.49	2.274	3.939	1.095
0.04595	2.603	0.521	2.258	4.179	1.042
0.04962	2.58	0.555	2.237	4.429	0.988
0.05535	2.573	0.5899	2.224	4.689	0.939

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.05905	2.574	0.627	2.199	4.969	0.882
0.06277	2.577	0.667	2.18	5.269	0.832
0.06643	2.569	0.7089	2.16	5.588	0.776
0.07012	2.565	0.753	2.142	5.921	0.726
0.0738	2.56	0.8	2.115	6.269	0.675
0.07795	2.559	0.8499	2.093	6.639	0.624
0.08495	2.554	0.903	2.069	7.039	0.58
0.09195	2.546	0.9589	2.041	7.459	0.502
0.09995	2.536	1.019	2.022	7.899	0.486
0.109	2.529	1.079	1.989	8.369	0.443
0.117	2.518	1.149	1.962	8.869	0.398
0.127	2.519	1.219	1.93	9.399	0.359
0.1369	2.505	1.289	1.902	9.959	0.318
0.147	2.497	1.369	1.87	10.56	0.28
0.158	2.49	1.459	1.834	11.16	0.244
0.1699	2.483	1.539	1.801	11.86	0.212
0.183	2.473	1.639	1.764	12.56	0.182
0.196	2.46	1.739	1.726	13.26	0.157
0.21	2.447	1.839	1.691	14.06	0.134
0.225	2.439	1.949	1.652	14.96	0.112
0.241	2.428	2.069	1.612	15.76	0.094
0.257	2.416	2.199	1.567		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00035	cm/sec
Ss	0.00015	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.1355 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0003512	5.917E-5	+/- 0.0001174	5.935	cm/sec
Ss	0.0001143	8.861E-5	+/- 0.0001758	1.29	ft^{-1}
Kz/Kr	1.	1.688	+/- 3.348	0.5925	

C.I. is approximate 95% confidence interval for parameter

t-ratio = estimate/std. error
No estimation window

T = K*b = 0.1359 cm^2/sec

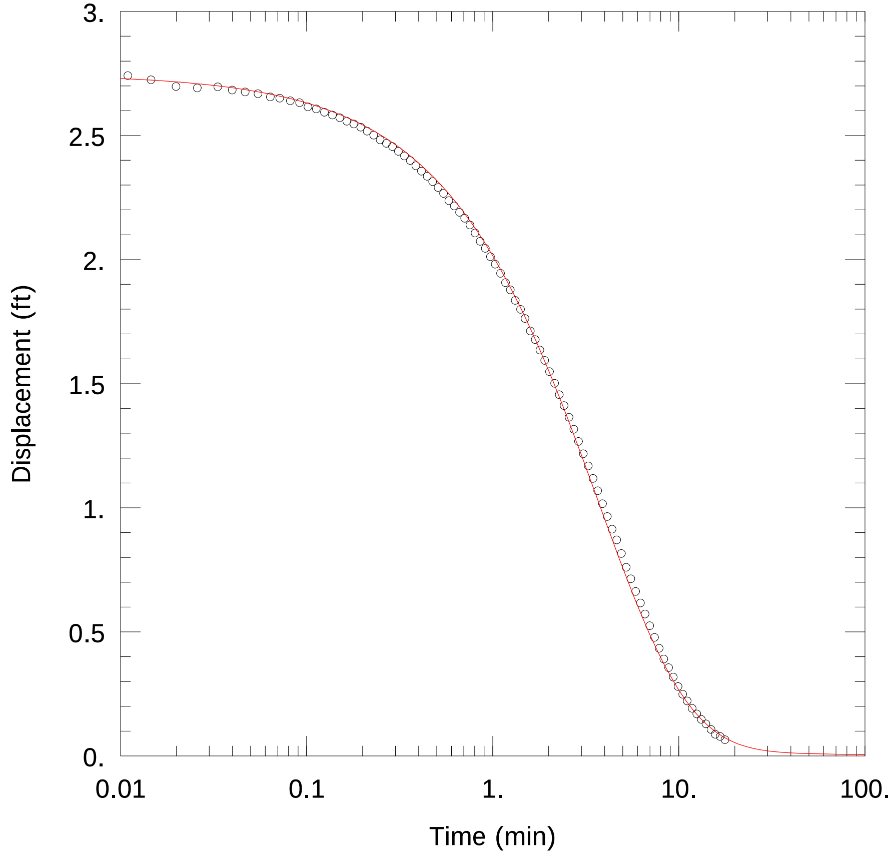
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-1.00
Ss	-0.99	1.00	0.99
Kz/Kr	-1.00	0.99	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.05196 ft^2
Variance . . . . 0.0005144 ft^2
Std. Deviation . . . . 0.02268 ft
Mean. . . . . -0.007737 ft
No. of Residuals 104
No. of Estimates. 3



G218 @ GMF GYPSUM POND – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G218
Test Date: 14 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00041 cm/sec
Ss = 0.0001 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 14.16 ft

WELL DATA (G218)

Initial Displacement: 2.75 ft
Total Well Penetration Depth: 14.16 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 14.16 ft
Screen Length: 4.44 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G218fh.aqt
Title: G218 @ GMF Gypsum Pond – Falling Head Test
Date: 11/28/16
Time: 09:25:29

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 14 Jun 2016
Test Well: G218

AQUIFER DATA

Saturated Thickness: 14.16 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G218

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.75 ft
Static Water Column Height: 14.16 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.44 ft
Total Well Penetration Depth: 14.16 ft

No. of Observations: 95

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	2.731	0.4149	2.356	3.074	1.217
0.00365	2.758	0.4449	2.335	3.264	1.168
0.007317	2.755	0.4759	2.314	3.464	1.118
0.01097	2.741	0.5099	2.29	3.674	1.068
0.01462	2.724	0.5449	2.266	3.894	1.016
0.01988	2.697	0.5819	2.237	4.134	0.964
0.02588	2.691	0.6219	2.216	4.384	0.913
0.03338	2.696	0.6639	2.19	4.644	0.87
0.03988	2.683	0.7079	2.166	4.924	0.815
0.04687	2.675	0.7549	2.139	5.224	0.76
0.05488	2.668	0.8049	2.107	5.534	0.713
0.06387	2.655	0.8579	2.073	5.874	0.662
0.07187	2.65	0.9139	2.045	6.224	0.616

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.08188	2.64	0.9739	2.011	6.594	0.571
0.09188	2.632	1.034	1.981	6.994	0.524
0.1019	2.615	1.104	1.944	7.414	0.477
0.1129	2.607	1.174	1.907	7.854	0.433
0.1249	2.593	1.244	1.878	8.324	0.39
0.1379	2.582	1.324	1.835	8.824	0.355
0.1509	2.571	1.414	1.799	9.354	0.317
0.1649	2.557	1.494	1.762	9.918	0.279
0.1799	2.546	1.594	1.712	10.51	0.248
0.1959	2.533	1.694	1.677	11.11	0.221
0.2119	2.517	1.794	1.635	11.81	0.191
0.2299	2.501	1.904	1.593	12.51	0.169
0.2489	2.482	2.024	1.548	13.21	0.147
0.2689	2.468	2.154	1.501	14.01	0.129
0.2899	2.455	2.284	1.455	14.91	0.106
0.3119	2.436	2.424	1.411	15.71	0.087
0.3359	2.417	2.574	1.364	16.71	0.078
0.3609	2.399	2.734	1.316	17.71	0.065
0.3869	2.378	2.894	1.267		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00041	cm/sec
Ss	0.0001	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.177 cm^2/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0004038	6.674E-5	+/- 0.0001326	6.05	cm/sec
Ss	9.763E-5	7.71E-5	+/- 0.0001531	1.266	ft^{-1}
Kz/Kr	1.	1.614	+/- 3.206	0.6195	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.1743 cm^2/sec

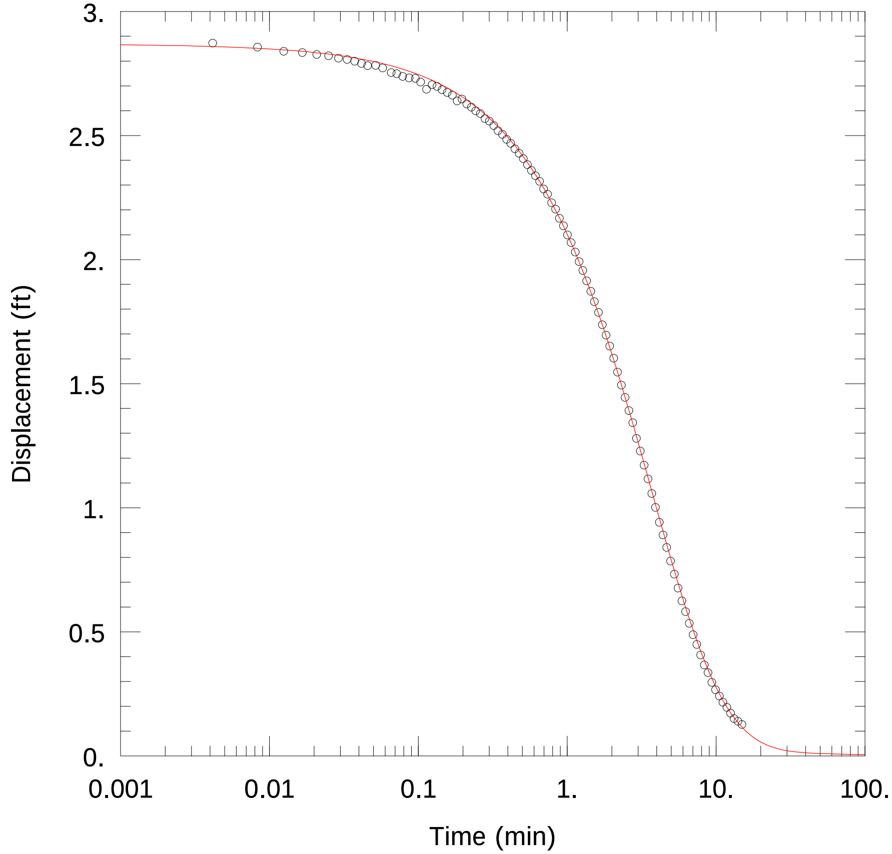
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-1.00	-1.00
Ss	-1.00	1.00	0.99
Kz/Kr	-1.00	0.99	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.03742 ft^2
Variance . . . . 0.0004068 ft^2
Std. Deviation . . . . 0.02017 ft
Mean. . . . . -0.006913 ft
No. of Residuals 95
No. of Estimates. 3



G218 @ GMF GYPSUM POND – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G218
Test Date: 14 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00041 cm/sec
Ss = 0.0001 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 14.16 ft

WELL DATA (G218)

Initial Displacement: 2.87 ft
Total Well Penetration Depth: 14.16 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 14.16 ft
Screen Length: 4.44 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G218rh.aqt
Title: G218 @ GMF Gypsum Pond – Rising Head Test
Date: 11/28/16
Time: 09:25:51

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 14 Jun 2016
Test Well: G218

AQUIFER DATA

Saturated Thickness: 14.16 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G218

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.87 ft
Static Water Column Height: 14.16 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.44 ft
Total Well Penetration Depth: 14.16 ft

No. of Observations: 99

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	2.887	0.3008	2.558	2.316	1.494
0.004167	2.872	0.3218	2.54	2.456	1.444
0.008333	2.856	0.3438	2.519	2.606	1.391
0.0125	2.839	0.3678	2.504	2.766	1.342
0.01667	2.834	0.3928	2.484	2.926	1.279
0.02083	2.826	0.4188	2.468	3.106	1.228
0.025	2.821	0.4469	2.446	3.296	1.171
0.02917	2.811	0.4768	2.428	3.496	1.116
0.03333	2.806	0.5078	2.407	3.706	1.057
0.0375	2.799	0.5418	2.382	3.926	1.001
0.04167	2.79	0.5768	2.359	4.166	0.941
0.04583	2.781	0.6138	2.338	4.416	0.89
0.05183	2.782	0.6538	2.315	4.676	0.84

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.05785	2.772	0.6958	2.284	4.956	0.785
0.06585	2.753	0.7398	2.263	5.256	0.732
0.07183	2.749	0.7868	2.229	5.566	0.676
0.07883	2.738	0.8368	2.203	5.906	0.624
0.08693	2.732	0.8898	2.166	6.256	0.581
0.09583	2.73	0.9458	2.136	6.626	0.534
0.104	2.715	1.006	2.099	7.026	0.488
0.1138	2.686	1.066	2.068	7.446	0.449
0.1238	2.704	1.136	2.03	7.886	0.406
0.1338	2.698	1.206	1.991	8.356	0.366
0.1448	2.684	1.276	1.956	8.856	0.335
0.1568	2.673	1.356	1.914	9.386	0.296
0.1698	2.662	1.446	1.872	9.946	0.266
0.1828	2.639	1.526	1.83	10.55	0.241
0.1968	2.647	1.626	1.787	11.15	0.216
0.2118	2.627	1.726	1.737	11.85	0.195
0.2278	2.614	1.826	1.695	12.55	0.172
0.2438	2.599	1.936	1.651	13.25	0.15
0.2618	2.588	2.056	1.602	14.05	0.139
0.2808	2.568	2.186	1.546	14.95	0.126

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00041	cm/sec
Ss	0.0001	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.177 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0004113	3.569E-5	+/- 7.084E-5	11.53	cm/sec
Ss	0.0001095	4.481E-5	+/- 8.895E-5	2.444	ft^{-1}
Kz/Kr	1.	0.8554	+/- 1.698	1.169	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.1775 cm^2/sec

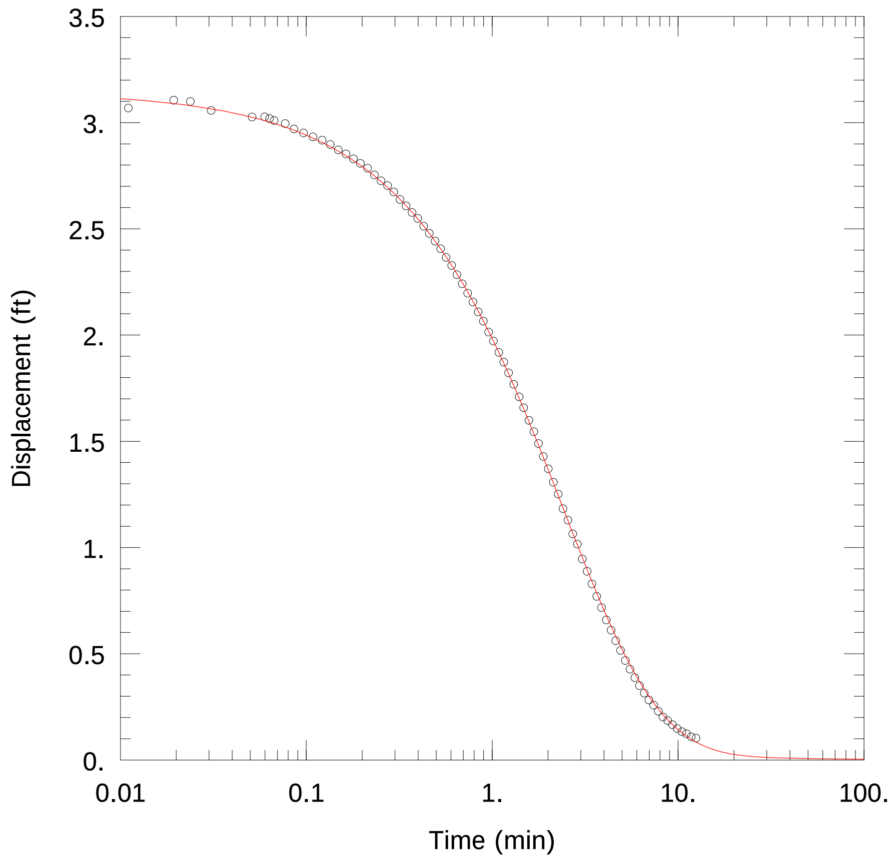
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-1.00	-1.00
Ss	-1.00	1.00	0.99
Kz/Kr	-1.00	0.99	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.01553 ft^2
Variance . . . . 0.0001617 ft^2
Std. Deviation . . . . 0.01272 ft
Mean. . . . . -0.004094 ft
No. of Residuals 99
No. of Estimates. 3



G270 @ GMF RECYCLE POND – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G270
Test Date: 16 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00055 cm/sec
Ss = 0.0002 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 16.41 ft

WELL DATA (G270)

Initial Displacement: 3.15 ft
Total Well Penetration Depth: 16.41 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 16.41 ft
Screen Length: 4.79 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G270fh.aqt
Title: G270 @ GMF Recycle Pond – Falling Head Test
Date: 11/28/16
Time: 09:26:15

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 16 Jun 2016
Test Well: G270

AQUIFER DATA

Saturated Thickness: 16.41 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G270

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 3.15 ft
Static Water Column Height: 16.41 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.79 ft
Total Well Penetration Depth: 16.41 ft

No. of Observations: 86

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	3.166	0.3988	2.549	2.558	1.129
0.003684	3.185	0.4288	2.512	2.718	1.064
0.007367	3.122	0.4598	2.478	2.878	1.016
0.01105	3.068	0.4938	2.442	3.058	0.946
0.0194	3.105	0.5288	2.406	3.248	0.888
0.02382	3.099	0.5658	2.365	3.448	0.828
0.03082	3.057	0.6059	2.327	3.658	0.77
0.05118	3.026	0.6478	2.284	3.878	0.717
0.05982	3.027	0.6918	2.241	4.118	0.659
0.06355	3.019	0.7388	2.197	4.368	0.611
0.06725	3.01	0.7888	2.155	4.628	0.561
0.07712	2.995	0.8418	2.109	4.908	0.515
0.08595	2.97	0.8978	2.065	5.208	0.468

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.09682	2.951	0.9578	2.014	5.518	0.427
0.1088	2.933	1.018	1.972	5.858	0.387
0.1218	2.917	1.088	1.918	6.208	0.35
0.1348	2.897	1.158	1.872	6.578	0.314
0.1488	2.871	1.228	1.822	6.978	0.282
0.1638	2.852	1.308	1.768	7.398	0.258
0.1798	2.829	1.398	1.709	7.838	0.229
0.1958	2.808	1.478	1.658	8.308	0.202
0.2138	2.785	1.578	1.598	8.808	0.185
0.2328	2.754	1.678	1.545	9.338	0.166
0.2528	2.726	1.778	1.489	9.898	0.147
0.2738	2.703	1.888	1.428	10.5	0.133
0.2958	2.673	2.008	1.37	11.1	0.123
0.3198	2.638	2.138	1.307	11.8	0.109
0.3448	2.608	2.268	1.251	12.5	0.103
0.3708	2.577	2.408	1.183		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00055	cm/sec
Ss	0.0002	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.2751 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0005615	2.665E-5	+/- 5.3E-5	21.07	cm/sec
Ss	0.0001649	3.741E-5	+/- 7.442E-5	4.408	ft^{-1}
Kz/Kr	1.	0.4806	+/- 0.9559	2.081	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.2809 cm²/sec

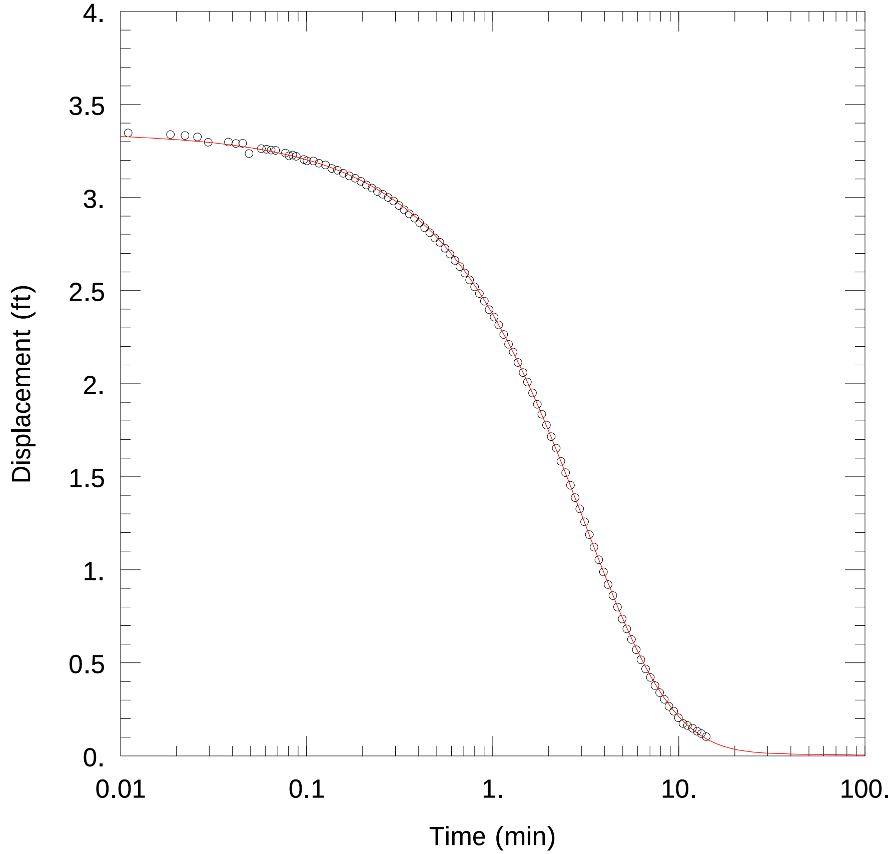
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-1.00
Ss	-0.99	1.00	0.98
Kz/Kr	-1.00	0.98	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.01042 ft^2
Variance . . . . 0.0001255 ft^2
Std. Deviation . . . . 0.0112 ft
Mean. . . . . 0.001403 ft
No. of Residuals 86
No. of Estimates 3



G270 @ GMF RECYCLE POND – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G270
Test Date: 16 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00048 cm/sec
Ss = 3.0E-5 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 16.41 ft

WELL DATA (G270)

Initial Displacement: 3.35 ft
Total Well Penetration Depth: 16.41 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 16.41 ft
Screen Length: 4.79 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G270rh.aqt
Title: G270 @ GMF Recycle Pond – Rising Head Test
Date: 11/28/16
Time: 09:26:36

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 16 Jun 2016
Test Well: G270

AQUIFER DATA

Saturated Thickness: 16.41 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G270

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 3.35 ft
Static Water Column Height: 16.41 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.79 ft
Total Well Penetration Depth: 16.41 ft

No. of Observations: 102

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	3.415	0.2566	3.017	2.069	1.715
0.003683	3.383	0.2747	3.	2.199	1.653
0.00735	3.366	0.2937	2.981	2.329	1.582
0.01102	3.347	0.3136	2.957	2.469	1.521
0.01857	3.338	0.3347	2.934	2.619	1.453
0.02223	3.333	0.3567	2.912	2.779	1.387
0.02595	3.325	0.3806	2.889	2.939	1.327
0.02962	3.297	0.4057	2.864	3.119	1.257
0.03803	3.298	0.4316	2.837	3.309	1.188
0.04172	3.29	0.4597	2.811	3.509	1.121
0.0454	3.291	0.4896	2.782	3.719	1.053
0.04907	3.236	0.5206	2.759	3.939	0.988
0.05722	3.262	0.5546	2.727	4.179	0.92

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.06092	3.259	0.5897	2.696	4.429	0.861
0.06458	3.255	0.6267	2.662	4.689	0.799
0.06827	3.253	0.6666	2.628	4.969	0.735
0.07693	3.238	0.7087	2.594	5.269	0.682
0.08063	3.224	0.7527	2.557	5.579	0.625
0.08433	3.228	0.7996	2.52	5.919	0.57
0.08803	3.221	0.8497	2.484	6.269	0.516
0.09683	3.204	0.9026	2.443	6.639	0.467
0.1006	3.197	0.9587	2.397	7.039	0.421
0.1089	3.196	1.019	2.357	7.459	0.377
0.1167	3.184	1.079	2.315	7.899	0.339
0.1267	3.175	1.149	2.264	8.369	0.303
0.1366	3.156	1.219	2.211	8.869	0.266
0.1467	3.146	1.289	2.169	9.399	0.24
0.1577	3.13	1.369	2.113	9.959	0.204
0.1697	3.116	1.459	2.059	10.56	0.173
0.1827	3.103	1.539	2.008	11.16	0.163
0.1956	3.087	1.639	1.95	11.86	0.148
0.2097	3.067	1.739	1.889	12.56	0.132
0.2246	3.051	1.839	1.835	13.26	0.119
0.2407	3.032	1.949	1.777	14.06	0.103

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00048	cm/sec
Ss	3.0E-5	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.2401 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0004785	5.292E-5	+/- 0.000105	9.043	cm/sec
Ss	3.353E-5	1.819E-5	+/- 3.61E-5	1.843	ft^{-1}
Kz/Kr	1.	1.096	+/- 2.175	0.912	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error

No estimation window

T = K*b = 0.2394 cm^2/sec

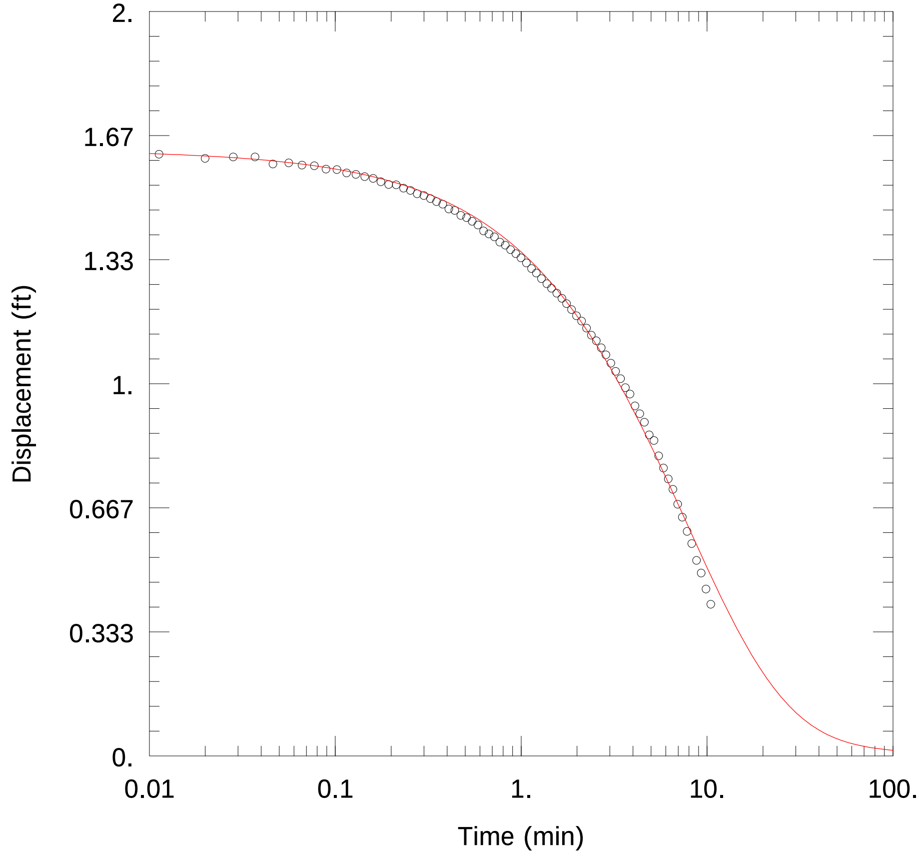
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-1.00
Ss	-0.99	1.00	0.99
Kz/Kr	-1.00	0.99	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.01528 ft^2
Variance . . . . 0.0001544 ft^2
Std. Deviation . . . . 0.01242 ft
Mean. . . . . 0.001996 ft
No. of Residuals 102
No. of Estimates. 3



G271 @ GMF RECYCLE POND – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G271
Test Date: 15 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00016 cm/sec
Ss = 0.0007 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 7.36 ft

WELL DATA (G271)

Initial Displacement: 1.63 ft
Total Well Penetration Depth: 7.36 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 7.36 ft
Screen Length: 4.35 ft
Well Radius: 0.08333 ft

Diagnostic Statistics

Estimation complete! Parameter change criterion (ETOL) reached.

Aquifer Model: Confined
Solution Method: KGS Model

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.000162	1.925E-5	+/- 3.835E-5	8.418	cm/sec
Ss	0.0007608	0.0002807	+/- 0.0005592	2.71	ft^{-1}
Kz/Kr	1.	1.965	+/- 3.914	0.5089	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.03635 cm^2/sec

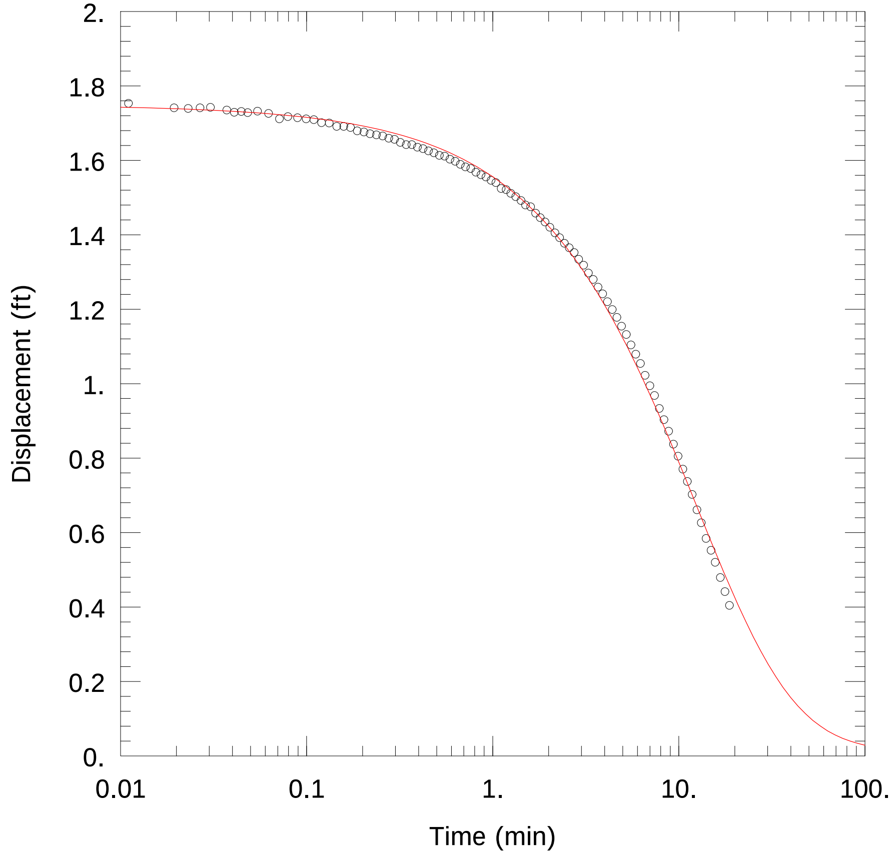
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.97	-0.97
Ss	-0.97	1.00	0.88
Kz/Kr	-0.97	0.88	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.02832 ft^2
Variance . . . . 0.0003726 ft^2
Std. Deviation . . . . 0.0193 ft
Mean. . . . . -0.002737 ft
No. of Residuals 79
No. of Estimates 3



G271 @ GMF RECYCLE POND – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G271
Test Date: 15 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00011 cm/sec
Ss = 0.0003 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 7.36 ft

WELL DATA (G271)

Initial Displacement: 1.75 ft
Total Well Penetration Depth: 7.36 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 7.36 ft
Screen Length: 4.35 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G271rh.aqt
Title: G271 @ GMF Recycle Pond – Rising Head Test
Date: 11/28/16
Time: 09:27:29

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 15 Jun 2016
Test Well: G271

AQUIFER DATA

Saturated Thickness: 7.36 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G271

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.75 ft
Static Water Column Height: 7.36 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.35 ft
Total Well Penetration Depth: 7.36 ft

No. of Observations: 99

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	1.752	0.3685	1.642	2.902	1.334
0.003667	1.759	0.3945	1.635	3.082	1.318
0.00735	1.758	0.4225	1.631	3.272	1.297
0.01105	1.753	0.4525	1.625	3.471	1.28
0.01943	1.741	0.4835	1.62	3.682	1.259
0.02312	1.739	0.5175	1.613	3.902	1.241
0.02678	1.741	0.5525	1.611	4.141	1.22
0.03045	1.742	0.5895	1.603	4.391	1.199
0.03727	1.735	0.6295	1.597	4.652	1.178
0.04097	1.729	0.6715	1.589	4.931	1.154
0.04467	1.731	0.7155	1.582	5.231	1.132
0.04837	1.728	0.7625	1.578	5.542	1.104
0.0545	1.732	0.8125	1.568	5.882	1.079

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.06252	1.726	0.8655	1.561	6.231	1.054
0.0715	1.711	0.9215	1.555	6.601	1.022
0.0795	1.717	0.9815	1.546	7.002	0.994
0.0895	1.714	1.042	1.54	7.422	0.968
0.09952	1.711	1.111	1.524	7.862	0.933
0.1095	1.709	1.182	1.521	8.332	0.903
0.1205	1.701	1.252	1.511	8.832	0.872
0.1325	1.7	1.331	1.502	9.361	0.837
0.1455	1.691	1.422	1.492	9.922	0.805
0.1585	1.691	1.502	1.48	10.52	0.77
0.1725	1.688	1.601	1.475	11.13	0.737
0.1875	1.679	1.702	1.458	11.82	0.702
0.2035	1.676	1.802	1.446	12.52	0.661
0.2195	1.671	1.912	1.434	13.22	0.626
0.2375	1.668	2.031	1.42	14.02	0.584
0.2565	1.665	2.162	1.405	14.92	0.552
0.2765	1.659	2.292	1.392	15.72	0.52
0.2975	1.656	2.432	1.377	16.72	0.479
0.3195	1.648	2.582	1.365	17.72	0.441
0.3435	1.642	2.741	1.352	18.72	0.404

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00011	cm/sec
Ss	0.0003	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.02468 cm^2/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0001097	2.066E-5	+/- 4.102E-5	5.308	cm/sec
Ss	0.0002898	0.0001997	+/- 0.0003965	1.451	ft^{-1}
Kz/Kr	1.	2.523	+/- 5.007	0.3964	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.02461 cm^2/sec

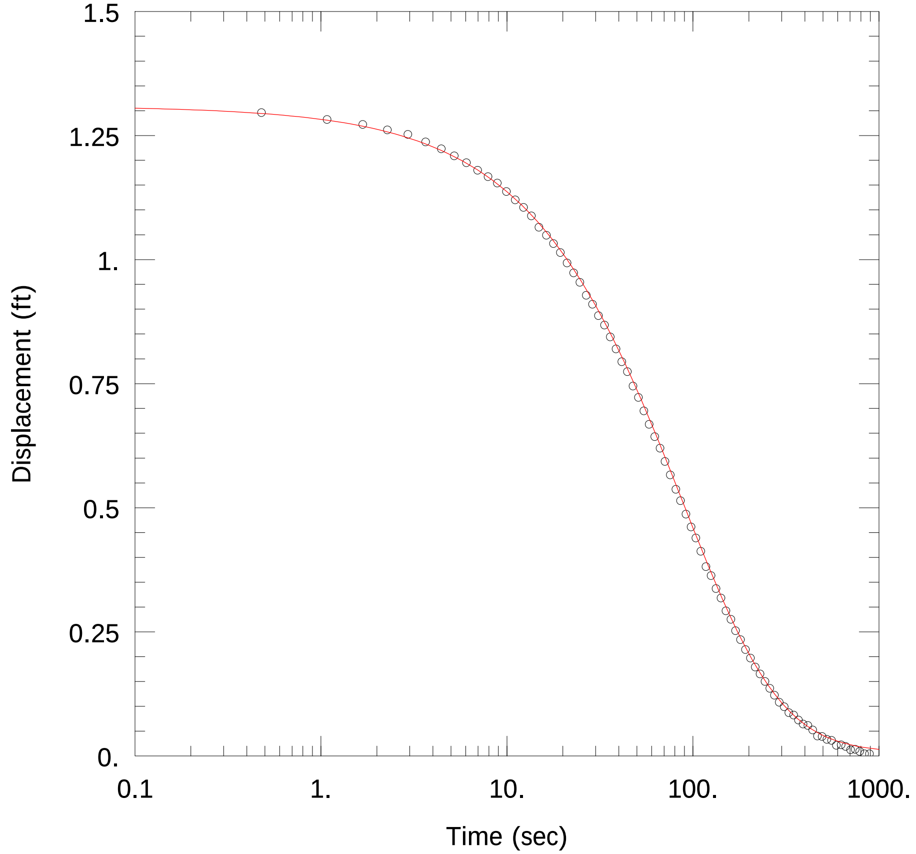
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-0.99
Ss	-0.99	1.00	0.97
Kz/Kr	-0.99	0.97	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.02807 ft^2
Variance . . . . 0.0002924 ft^2
Std. Deviation . . . . 0.0171 ft
Mean. . . . . -0.003834 ft
No. of Residuals 99
No. of Estimates 3



G273 @ GMF RECYCLE POND – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G273
Test Date: 16 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.001 cm/sec
Ss = 9.0E-5 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 6.69 ft

WELL DATA (G273)

Initial Displacement: 1.31 ft
Total Well Penetration Depth: 6.69 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 6.69 ft
Screen Length: 4.48 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G273fh.aqt
Title: G273 @ GMF Recycle Pond – Falling Head Test
Date: 11/28/16
Time: 09:27:52

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 16 Jun 2016
Test Well: G273

AQUIFER DATA

Saturated Thickness: 6.69 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G273

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.31 ft
Static Water Column Height: 6.69 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.48 ft
Total Well Penetration Depth: 6.69 ft

No. of Observations: 89

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
-3.499	1.386	22.86	0.973	169.8	0.252
-3.249	1.325	24.72	0.954	180.6	0.234
-2.85	1.405	26.76	0.928	192.	0.214
-2.639	1.363	28.86	0.91	204.	0.197
-2.279	1.387	31.08	0.887	216.6	0.179
-1.859	1.36	33.48	0.868	229.8	0.165
-1.439	1.343	36.	0.844	244.2	0.15
-1.02	1.331	38.64	0.82	259.2	0.136
0.	1.307	41.46	0.794	274.8	0.122
0.48	1.296	44.46	0.774	291.6	0.108
1.081	1.282	47.64	0.745	309.6	0.099
1.681	1.272	51.	0.722	328.2	0.087
2.281	1.261	54.6	0.695	348.6	0.082

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
2.94	1.252	58.2	0.668	369.6	0.072
3.66	1.237	62.4	0.643	391.8	0.064
4.44	1.223	66.6	0.62	415.8	0.061
5.22	1.209	70.8	0.593	441.	0.052
6.061	1.195	75.65	0.566	467.4	0.04
6.96	1.18	81.	0.537	495.6	0.039
7.92	1.167	85.8	0.514	525.6	0.033
8.88	1.154	91.8	0.487	557.4	0.031
9.96	1.137	97.8	0.461	591.	0.021
11.1	1.12	103.8	0.439	627.	0.022
12.3	1.105	110.4	0.412	663.	0.019
13.56	1.088	117.6	0.381	705.	0.012
14.88	1.065	125.4	0.363	747.	0.013
16.32	1.049	133.2	0.337	789.	0.009
17.82	1.032	141.6	0.318	837.	0.004
19.38	1.014	150.6	0.292	891.	0.004
21.06	0.993	160.2	0.275		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.001	cm/sec
Ss	9.0E-5	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.2039 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.001024	0.0001056	+/- 0.0002099	9.693	cm/sec
Ss	8.684E-5	3.541E-5	+/- 7.039E-5	2.452	ft^{-1}
Kz/Kr	1.	2.292	+/- 4.557	0.4362	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.2087 cm²/sec

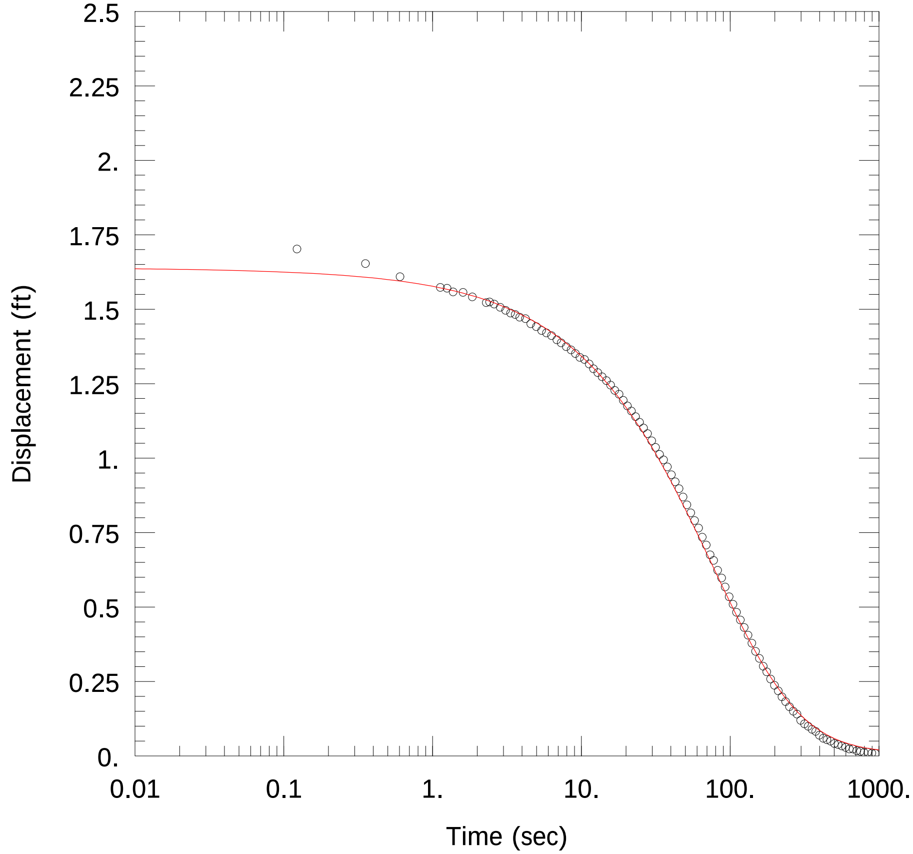
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.47	-0.92
Ss	-0.47	1.00	0.11
Kz/Kr	-0.92	0.11	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.02896 ft^2
Variance . . . . 0.0003367 ft^2
Std. Deviation . . . . 0.01835 ft
Mean. . . . . 0.004437 ft
No. of Residuals 89
No. of Estimates. 3



G273 @ GMF RECYCLE POND – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G273
Test Date: 16 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00083 cm/sec
Ss = 0.0015 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 6.69 ft

WELL DATA (G273)

Initial Displacement: 1.64 ft
Total Well Penetration Depth: 6.69 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 6.69 ft
Screen Length: 4.48 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G273rh.aqt
Title: G273 @ GMF Recycle Pond – Rising Head Test
Date: 11/28/16
Time: 09:28:15

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 16 Jun 2016
Test Well: G273

AQUIFER DATA

Saturated Thickness: 6.69 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G273

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.64 ft
Static Water Column Height: 6.69 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.48 ft
Total Well Penetration Depth: 6.69 ft

No. of Observations: 105

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.692	15.73	1.245	132.3	0.405
0.123	1.702	16.82	1.227	140.1	0.378
0.355	1.653	17.95	1.214	148.5	0.351
0.605	1.609	19.16	1.194	157.5	0.327
1.131	1.573	20.41	1.175	167.1	0.301
1.254	1.57	21.73	1.158	176.7	0.282
1.377	1.558	23.18	1.139	187.5	0.258
1.605	1.556	24.68	1.12	198.9	0.237
1.855	1.541	26.23	1.101	210.9	0.218
2.298	1.522	27.91	1.082	223.5	0.198
2.421	1.524	29.73	1.058	236.7	0.182
2.605	1.517	31.57	1.036	251.1	0.165
2.855	1.506	33.62	1.012	266.1	0.15

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
3.105	1.496	35.72	0.994	281.7	0.14
3.355	1.487	37.94	0.97	298.5	0.119
3.605	1.482	40.34	0.944	316.5	0.107
3.855	1.473	42.85	0.92	335.1	0.099
4.215	1.468	45.49	0.897	355.5	0.089
4.575	1.451	48.31	0.869	376.5	0.082
4.995	1.441	51.31	0.843	398.7	0.069
5.415	1.428	54.49	0.816	422.7	0.059
5.835	1.42	57.85	0.79	447.9	0.054
6.315	1.411	61.45	0.765	474.3	0.049
6.855	1.397	65.06	0.734	502.5	0.041
7.335	1.387	69.25	0.708	532.5	0.038
7.935	1.374	73.45	0.675	564.3	0.033
8.535	1.363	77.66	0.656	597.9	0.028
9.136	1.351	82.45	0.623	633.9	0.023
9.795	1.338	87.86	0.597	669.9	0.023
10.52	1.331	92.66	0.567	711.9	0.017
11.3	1.316	98.66	0.534	753.9	0.015
12.07	1.3	104.7	0.509	795.9	0.011
12.91	1.287	110.7	0.482	843.9	0.012
13.82	1.273	117.3	0.456	897.9	0.009
14.78	1.26	124.5	0.431	945.9	0.008

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00083	cm/sec
Ss	0.0015	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.1692 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0008319	7.881E-5	+/- 0.0001563	10.56	cm/sec
Ss	0.001271	0.0003781	+/- 0.0007497	3.362	ft^{-1}
Kz/Kr	1.	1.63	+/- 3.232	0.6135	

C.I. is approximate 95% confidence interval for parameter

t-ratio = estimate/std. error
No estimation window

$T = K*b = 0.1696\ cm^2/sec$

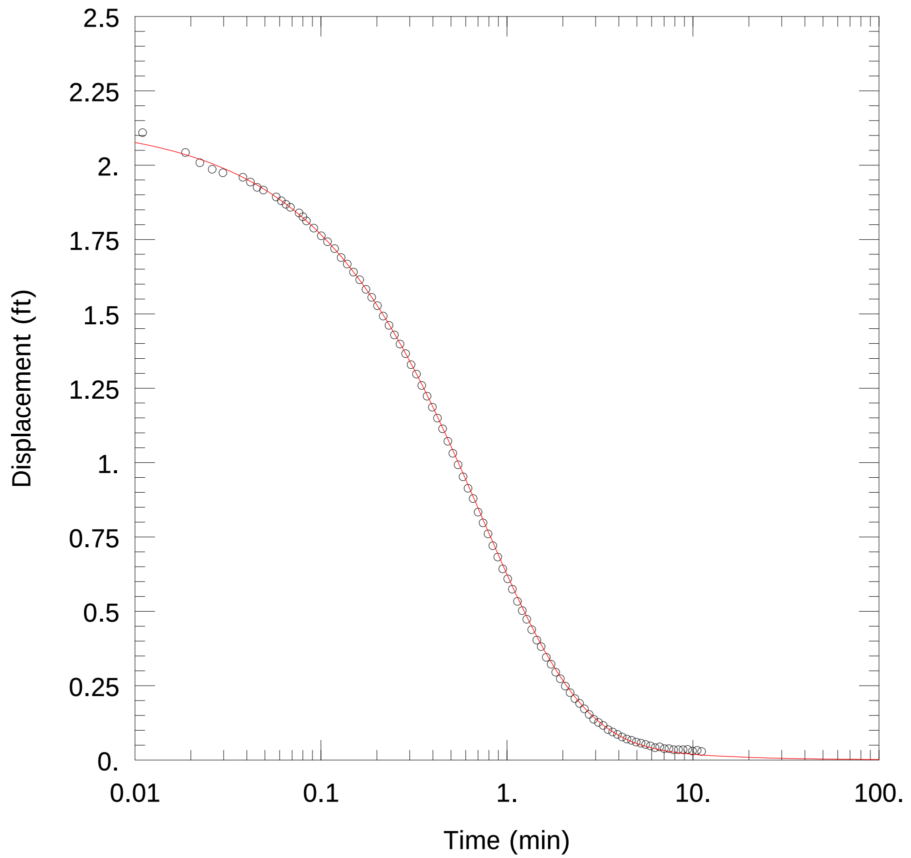
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-0.98
Ss	-0.99	1.00	0.95
Kz/Kr	-0.98	0.95	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.02784 ft^2
Variance . . . . 0.000273 ft^2
Std. Deviation . . . . 0.01652 ft
Mean. . . . . -0.003839 ft
No. of Residuals 105
No. of Estimates 3



G279 @ GMF RECYCLE POND – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G279
Test Date: 15 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.0017 cm/sec
Ss = 0.0007 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 7. ft

WELL DATA (G279)

Initial Displacement: 2.15 ft
Total Well Penetration Depth: 7. ft
Casing Radius: 0.08333 ft

Static Water Column Height: 7. ft
Screen Length: 4.39 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G279fh.aqt
Title: G279 @ GMF Recycle Pond – Falling Head Test
Date: 11/28/16
Time: 09:28:43

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 15 Jun 2016
Test Well: G279

AQUIFER DATA

Saturated Thickness: 7. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G279

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.15 ft
Static Water Column Height: 7. ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.39 ft
Total Well Penetration Depth: 7. ft

No. of Observations: 96

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	2.068	0.2487	1.429	1.831	0.295
0.003683	2.003	0.2667	1.398	1.941	0.273
0.00735	2.023	0.2857	1.366	2.061	0.248
0.011	2.109	0.3057	1.329	2.191	0.226
0.0187	2.042	0.3267	1.297	2.321	0.206
0.02238	2.008	0.3487	1.259	2.461	0.19
0.02607	1.986	0.3727	1.223	2.611	0.172
0.02973	1.974	0.3977	1.186	2.771	0.153
0.0381	1.959	0.4237	1.149	2.931	0.137
0.0418	1.943	0.4517	1.113	3.111	0.126
0.04547	1.925	0.4817	1.071	3.301	0.116
0.04915	1.916	0.5127	1.031	3.501	0.102
0.05758	1.893	0.5467	0.992	3.711	0.094

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.06127	1.88	0.5817	0.952	3.931	0.086
0.06497	1.868	0.6187	0.913	4.171	0.077
0.06865	1.858	0.6587	0.879	4.421	0.07
0.07633	1.839	0.7007	0.833	4.681	0.066
0.08003	1.826	0.7447	0.797	4.961	0.06
0.08372	1.812	0.7917	0.76	5.261	0.056
0.09167	1.788	0.8417	0.72	5.571	0.052
0.1007	1.762	0.8947	0.682	5.911	0.047
0.1087	1.742	0.9507	0.642	6.261	0.041
0.1187	1.719	1.011	0.609	6.631	0.044
0.1287	1.689	1.071	0.574	7.031	0.038
0.1387	1.667	1.141	0.533	7.451	0.038
0.1497	1.64	1.211	0.502	7.891	0.034
0.1617	1.614	1.281	0.473	8.361	0.034
0.1747	1.582	1.361	0.438	8.861	0.034
0.1877	1.555	1.451	0.403	9.391	0.035
0.2017	1.527	1.531	0.381	9.951	0.03
0.2167	1.492	1.631	0.345	10.55	0.032
0.2327	1.461	1.731	0.322	11.15	0.028

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.0017	cm/sec
Ss	0.0007	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.3627 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.001719	0.0001754	+/- 0.0003483	9.798	cm/sec
Ss	0.0007021	0.0002498	+/- 0.000496	2.811	ft^{-1}
Kz/Kr	1.	1.488	+/- 2.955	0.672	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

$T = K*b = 0.3667\ cm^2/sec$

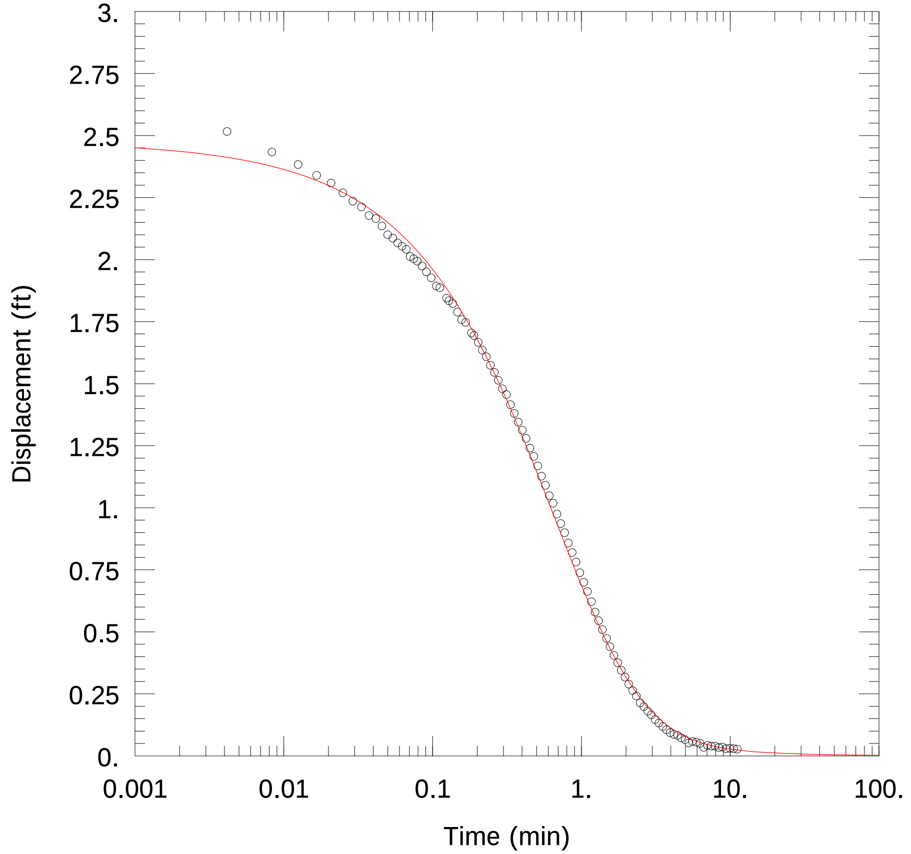
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-0.99
Ss	-0.99	1.00	0.97
Kz/Kr	-0.99	0.97	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.02749 ft^2
Variance . . . . 0.0002956 ft^2
Std. Deviation . . . . 0.01719 ft
Mean. . . . . -0.0009089 ft
No. of Residuals 96
No. of Estimates. 3



G279 @ GMF RECYCLE POND – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G279
Test Date: 15 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.0015 cm/sec
Ss = 0.0025 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 7. ft

WELL DATA (G279)

Initial Displacement: 2.48 ft
Total Well Penetration Depth: 7. ft
Casing Radius: 0.08333 ft

Static Water Column Height: 7. ft
Screen Length: 4.39 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G279rh.aqt
Title: G279 @ GMF Recycle Pond – Rising Head Test
Date: 11/28/16
Time: 10:43:04

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 15 Jun 2016
Test Well: G279

AQUIFER DATA

Saturated Thickness: 7. ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G279

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.48 ft
Static Water Column Height: 7. ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.39 ft
Total Well Penetration Depth: 7. ft

No. of Observations: 102

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	2.581	0.2162	1.635	1.659	0.405
0.004167	2.516	0.2302	1.608	1.759	0.375
0.008333	2.433	0.2452	1.574	1.859	0.345
0.0125	2.383	0.2612	1.545	1.969	0.317
0.01667	2.339	0.2772	1.513	2.089	0.289
0.02083	2.308	0.2952	1.479	2.219	0.263
0.025	2.269	0.3142	1.456	2.349	0.241
0.02917	2.235	0.3342	1.415	2.489	0.213
0.03333	2.212	0.3552	1.38	2.639	0.198
0.0375	2.177	0.3772	1.345	2.799	0.18
0.04167	2.165	0.4012	1.312	2.959	0.165
0.04583	2.135	0.4262	1.279	3.139	0.146
0.05	2.1	0.4522	1.24	3.329	0.132

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.05417	2.086	0.4802	1.206	3.529	0.118
0.05833	2.067	0.5102	1.168	3.739	0.105
0.0625	2.053	0.5412	1.127	3.959	0.093
0.06667	2.041	0.5752	1.09	4.199	0.086
0.07083	2.012	0.6102	1.048	4.449	0.082
0.075	2.003	0.6472	1.018	4.709	0.072
0.07917	1.993	0.6872	0.974	4.989	0.065
0.08517	1.974	0.7292	0.936	5.291	0.051
0.09117	1.95	0.7732	0.899	5.599	0.058
0.09817	1.926	0.8202	0.857	5.939	0.055
0.1062	1.893	0.8702	0.819	6.289	0.05
0.1122	1.886	0.9232	0.781	6.659	0.034
0.1245	1.844	0.9792	0.738	7.059	0.042
0.1292	1.834	1.039	0.699	7.479	0.039
0.1372	1.822	1.099	0.662	7.919	0.039
0.1472	1.788	1.169	0.621	8.389	0.033
0.1572	1.758	1.239	0.579	8.889	0.035
0.1672	1.747	1.309	0.545	9.419	0.029
0.1829	1.704	1.389	0.509	9.979	0.03
0.1902	1.694	1.479	0.473	10.58	0.029
0.2032	1.666	1.559	0.44	11.18	0.027

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.0015	cm/sec
Ss	0.0025	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.32 cm^2/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.001475	0.0001155	+/- 0.0002292	12.77	cm/sec
Ss	0.00256	0.0005911	+/- 0.001173	4.331	ft^{-1}
Kz/Kr	1.	1.448	+/- 2.872	0.6908	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error

No estimation window

T = K*b = 0.3147 cm^2/sec

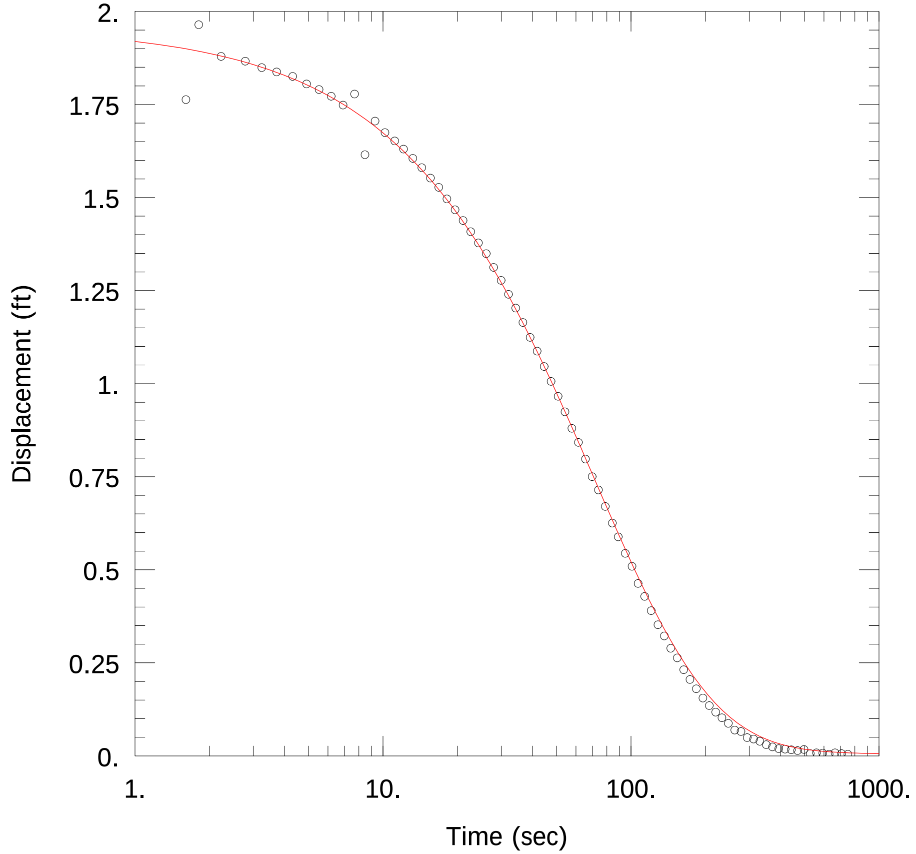
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.98	-0.96
Ss	-0.98	1.00	0.91
Kz/Kr	-0.96	0.91	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.08946 ft^2
Variance . . . . 0.0009036 ft^2
Std. Deviation . . . . 0.03006 ft
Mean. . . . . -0.004822 ft
No. of Residuals 102
No. of Estimates 3



G280 @ GMF RECYCLE POND – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G280
Test Date: 17 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00125 cm/sec
Ss = 2.0E-5 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 15.26 ft

WELL DATA (G280)

Initial Displacement: 1.96 ft
Total Well Penetration Depth: 15.26 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 15.26 ft
Screen Length: 4.84 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G280fh.aqt
Title: G280 @ GMF Recycle Pond – Falling Head Test
Date: 11/28/16
Time: 09:29:18

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 17 Jun 2016
Test Well: G280

AQUIFER DATA

Saturated Thickness: 15.26 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G280

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.96 ft
Static Water Column Height: 15.26 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.84 ft
Total Well Penetration Depth: 15.26 ft

No. of Observations: 86

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.974	24.31	1.378	153.8	0.263
0.417	1.933	26.11	1.349	163.4	0.231
0.61	1.928	27.97	1.312	173.1	0.205
0.971	1.913	30.01	1.277	183.8	0.18
1.607	1.763	32.11	1.24	195.3	0.155
1.81	1.964	34.33	1.203	207.3	0.135
2.23	1.879	36.73	1.164	219.8	0.117
2.789	1.866	39.25	1.124	233.1	0.102
3.25	1.849	41.89	1.087	247.4	0.087
3.73	1.837	44.71	1.046	262.4	0.069
4.33	1.825	47.71	1.006	278.	0.065
4.93	1.805	50.89	0.966	294.8	0.049
5.53	1.79	54.25	0.924	312.8	0.045

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
6.19	1.772	57.85	0.88	331.4	0.039
6.91	1.748	61.45	0.842	351.8	0.03
7.69	1.778	65.65	0.797	372.8	0.024
8.47	1.615	69.85	0.75	395.	0.019
9.31	1.705	74.05	0.714	419.	0.018
10.21	1.674	78.85	0.67	444.3	0.016
11.17	1.652	84.25	0.625	470.6	0.014
12.13	1.63	89.05	0.588	499.	0.017
13.21	1.605	95.05	0.544	528.8	0.006
14.35	1.58	101.1	0.509	560.6	0.008
15.55	1.552	107.1	0.463	594.2	0.007
16.81	1.527	113.6	0.428	630.4	0.004
18.13	1.496	120.8	0.39	666.2	0.008
19.57	1.467	128.7	0.352	708.2	0.006
21.07	1.438	136.4	0.322	750.2	0.004
22.63	1.408	144.8	0.289		

SOLUTION

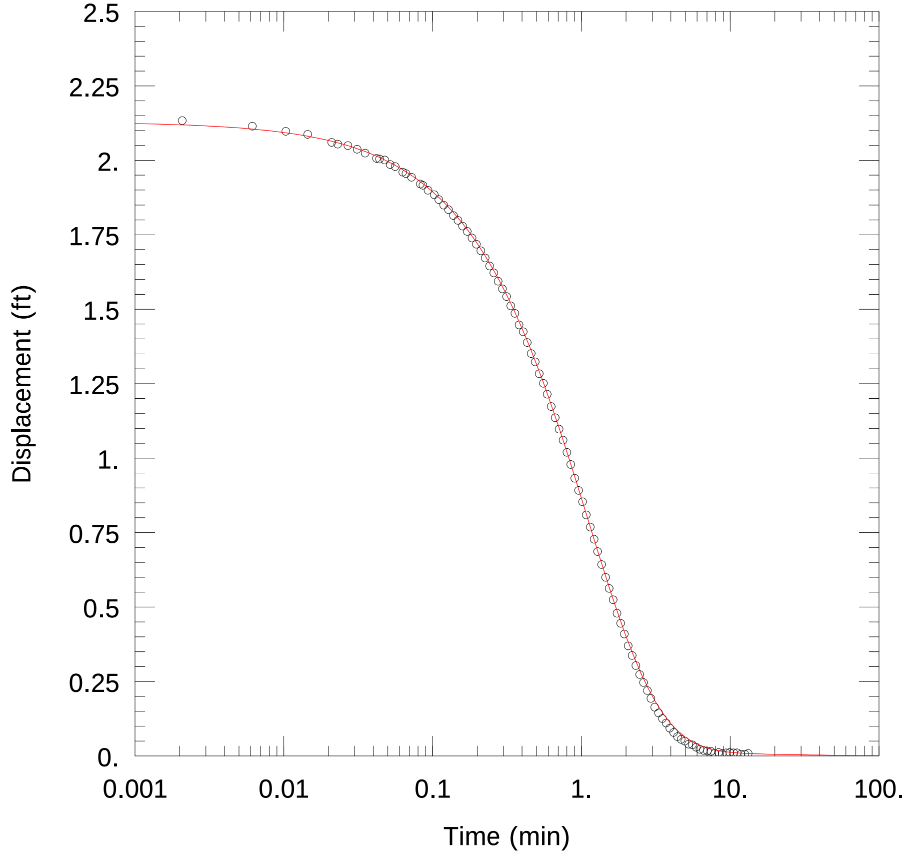
Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00125	cm/sec
Ss	2.0E-5	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.5814 cm²/sec



G280 @ GMF RECYCLE POND – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G280
Test Date: 17 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.0013 cm/sec
Ss = 6.0E-5 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 15.26 ft

WELL DATA (G280)

Initial Displacement: 2.13 ft
Total Well Penetration Depth: 15.26 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 15.26 ft
Screen Length: 4.84 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G280rh.aqt
Title: G280 @ GMF Recycle Pond – Rising Head Test
Date: 11/28/16
Time: 09:29:41

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 17 Jun 2016
Test Well: G280

AQUIFER DATA

Saturated Thickness: 15.26 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G280

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.13 ft
Static Water Column Height: 15.26 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.84 ft
Total Well Penetration Depth: 15.26 ft

No. of Observations: 101

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	2.135	0.2583	1.622	2.07	0.369
0.002083	2.133	0.2763	1.594	2.2	0.337
0.006167	2.114	0.2953	1.568	2.33	0.303
0.01033	2.097	0.3153	1.542	2.47	0.273
0.0145	2.087	0.3363	1.511	2.62	0.246
0.02105	2.06	0.3583	1.486	2.78	0.219
0.0231	2.054	0.3823	1.447	2.94	0.193
0.027	2.049	0.4073	1.424	3.12	0.163
0.03117	2.037	0.4333	1.388	3.31	0.144
0.03533	2.024	0.4613	1.351	3.51	0.125
0.04208	2.006	0.4913	1.323	3.72	0.11
0.04413	2.004	0.5223	1.283	3.94	0.093
0.04783	2.001	0.5563	1.251	4.18	0.078

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.052	1.986	0.5913	1.214	4.43	0.064
0.05617	1.979	0.6283	1.173	4.69	0.055
0.0631	1.96	0.6683	1.135	4.97	0.049
0.06633	1.955	0.7103	1.097	5.27	0.039
0.07235	1.943	0.7543	1.06	5.58	0.037
0.08297	1.92	0.8013	1.019	5.921	0.029
0.08633	1.916	0.8513	0.978	6.27	0.022
0.09333	1.899	0.9043	0.932	6.64	0.018
0.103	1.884	0.9603	0.891	7.04	0.016
0.1103	1.868	1.02	0.853	7.46	0.015
0.1191	1.849	1.08	0.809	7.9	0.008
0.1283	1.834	1.15	0.768	8.37	0.011
0.1383	1.814	1.22	0.727	8.87	0.007
0.1483	1.798	1.29	0.686	9.4	0.01
0.1593	1.779	1.37	0.642	9.96	0.011
0.1713	1.761	1.46	0.599	10.56	0.01
0.1843	1.739	1.54	0.562	11.16	0.01
0.1973	1.718	1.64	0.524	11.86	0.005
0.2113	1.696	1.74	0.479	12.56	0.005
0.2263	1.672	1.84	0.445	13.26	0.008
0.2423	1.645	1.95	0.409		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.0013	cm/sec
Ss	6.0E-5	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.6047 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.001322	0.0001102	+/- 0.0002187	11.99	cm/sec
Ss	5.714E-5	2.337E-5	+/- 4.636E-5	2.445	ft^{-1}
Kz/Kr	1.	0.8362	+/- 1.659	1.196	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error

No estimation window

T = K*b = 0.6148 cm^2/sec

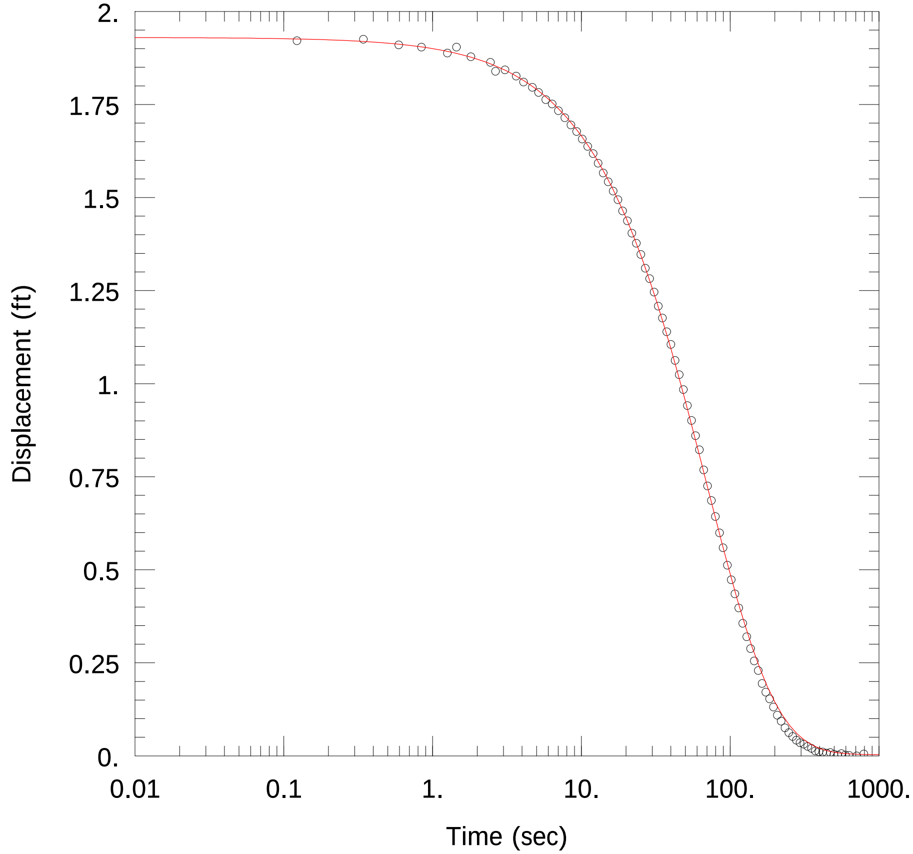
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-1.00
Ss	-0.99	1.00	0.99
Kz/Kr	-1.00	0.99	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.005558 ft^2
Variance . . . . 5.672E-5 ft^2
Std. Deviation . . . . 0.007531 ft
Mean. . . . . -0.002476 ft
No. of Residuals 101
No. of Estimates 3



G281 @ ASH POND 2 – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G281
Test Date: 17 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.0021 cm/sec
Ss = 2.0E-12 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 15.8 ft

WELL DATA (G281)

Initial Displacement: 1.93 ft
Total Well Penetration Depth: 15.8 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 15.8 ft
Screen Length: 4.65 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G281fh.aqt
Title: G281 @ Ash Pond 2 – Falling Head Test
Date: 11/28/16
Time: 09:30:07

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 17 Jun 2016
Test Well: G281

AQUIFER DATA

Saturated Thickness: 15.8 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G281

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.93 ft
Static Water Column Height: 15.8 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.65 ft
Total Well Penetration Depth: 15.8 ft

No. of Observations: 91

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.951	21.91	1.404	154.7	0.229
0.123	1.921	23.47	1.377	164.3	0.194
0.344	1.925	25.15	1.347	173.9	0.171
0.594	1.91	26.95	1.31	184.7	0.153
0.844	1.904	28.81	1.282	196.1	0.131
1.261	1.888	30.85	1.246	208.1	0.109
1.453	1.904	32.95	1.208	220.7	0.093
1.816	1.878	35.17	1.176	233.9	0.075
2.451	1.863	37.57	1.139	248.3	0.062
2.653	1.839	40.09	1.105	263.3	0.052
3.073	1.843	42.73	1.062	278.9	0.042
3.651	1.826	45.55	1.024	295.7	0.035
4.093	1.81	48.55	0.984	313.7	0.031

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
4.689	1.796	51.73	0.941	332.3	0.025
5.173	1.782	55.09	0.901	352.7	0.02
5.774	1.763	58.69	0.86	373.7	0.013
6.374	1.751	62.29	0.822	395.9	0.011
7.033	1.733	66.49	0.768	419.9	0.01
7.753	1.714	70.69	0.725	445.1	0.007
8.533	1.695	74.89	0.686	471.5	0.009
9.313	1.677	79.69	0.643	499.7	0.004
10.15	1.657	85.09	0.599	529.7	0.002
11.05	1.637	89.89	0.559	561.5	0.006
12.01	1.618	95.89	0.512	595.1	0.002
12.97	1.592	101.9	0.473	631.1	0.001
14.05	1.566	107.9	0.435	667.1	-0.001
15.19	1.542	114.5	0.397	709.1	0.
16.39	1.517	121.7	0.356	751.1	-0.003
17.65	1.494	129.5	0.32	793.2	0.005
18.97	1.464	137.3	0.288		
20.41	1.437	145.7	0.255		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.0021	cm/sec
Ss	2.0E-12	ft^{-1}
Kz/Kr	1.	

T = K*b = 1.011 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.002112	0.0008403	+/- 0.00167	2.513	cm/sec
Ss	1.86E-12	9.133E-9	+/- 1.815E-8	0.0002036	ft^{-1}
Kz/Kr	1.	2098.5	+/- 4169.8	0.0004765	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 1.017 cm²/sec

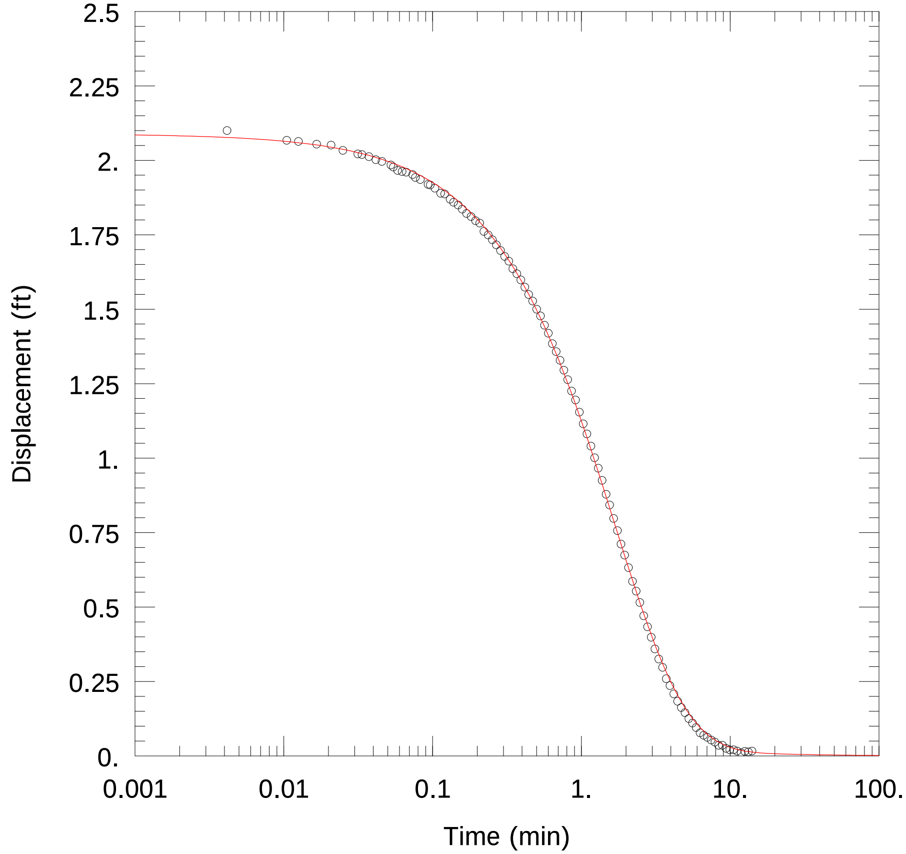
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.97	0.97
Ss	-0.97	1.00	-1.00
Kz/Kr	0.97	-1.00	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.01011 ft^2
Variance . . . . 0.0001149 ft^2
Std. Deviation . . . . 0.01072 ft
Mean. . . . . -0.00248 ft
No. of Residuals 91
No. of Estimates. 3



G281 @ ASH POND 2 – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G281
Test Date: 17 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00089 cm/sec
Ss = 6.2E-5 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 15.8 ft

WELL DATA (G281)

Initial Displacement: 2.09 ft
Total Well Penetration Depth: 15.8 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 15.8 ft
Screen Length: 4.65 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G281rh.aqt
Title: G281 @ Ash Pond 2 – Rising Head Test
Date: 11/28/16
Time: 09:31:04

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 17 Jun 2016
Test Well: G281

AQUIFER DATA

Saturated Thickness: 15.8 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G281

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.09 ft
Static Water Column Height: 15.8 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.65 ft
Total Well Penetration Depth: 15.8 ft

No. of Observations: 104

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	2.116	0.2528	1.733	2.081	0.632
0.004167	2.1	0.2688	1.716	2.211	0.586
0.0105	2.067	0.2868	1.697	2.341	0.553
0.01257	2.063	0.3058	1.677	2.481	0.515
0.01667	2.054	0.3258	1.661	2.631	0.47
0.02083	2.051	0.3468	1.636	2.791	0.433
0.025	2.033	0.3688	1.619	2.951	0.398
0.03152	2.021	0.3928	1.598	3.131	0.359
0.03358	2.019	0.4178	1.574	3.321	0.325
0.0375	2.012	0.4438	1.549	3.521	0.297
0.04167	2.002	0.4718	1.527	3.731	0.259
0.04583	1.996	0.5018	1.5	3.951	0.236
0.05258	1.984	0.5328	1.477	4.191	0.208

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.05465	1.977	0.5668	1.446	4.441	0.183
0.05833	1.966	0.6018	1.419	4.701	0.162
0.0625	1.962	0.6388	1.384	4.981	0.145
0.06667	1.96	0.6788	1.357	5.281	0.125
0.07362	1.952	0.7208	1.328	5.591	0.11
0.07682	1.942	0.7648	1.295	5.931	0.095
0.08287	1.935	0.8118	1.263	6.281	0.077
0.09345	1.919	0.8618	1.225	6.651	0.069
0.09682	1.917	0.9148	1.195	7.051	0.062
0.1038	1.906	0.9708	1.154	7.471	0.053
0.1135	1.889	1.031	1.115	7.911	0.046
0.1208	1.887	1.091	1.081	8.381	0.035
0.1316	1.869	1.161	1.04	8.881	0.035
0.1388	1.859	1.231	1.001	9.411	0.025
0.1488	1.85	1.301	0.966	9.971	0.02
0.1588	1.836	1.381	0.925	10.57	0.02
0.1698	1.821	1.471	0.878	11.17	0.016
0.1818	1.811	1.551	0.842	11.87	0.01
0.1948	1.797	1.651	0.797	12.57	0.015
0.2078	1.789	1.751	0.756	13.27	0.013
0.2218	1.761	1.851	0.711	14.07	0.016
0.2368	1.749	1.961	0.674		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00089	cm/sec
Ss	6.2E-5	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.4286 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0008928	0.0001189	+/- 0.0002359	7.51	cm/sec
Ss	6.185E-5	4.021E-5	+/- 7.978E-5	1.538	ft^{-1}
Kz/Kr	1.	1.309	+/- 2.598	0.7637	

C.I. is approximate 95% confidence interval for parameter

t-ratio = estimate/std. error
No estimation window

T = K*b = 0.4299 cm^2/sec

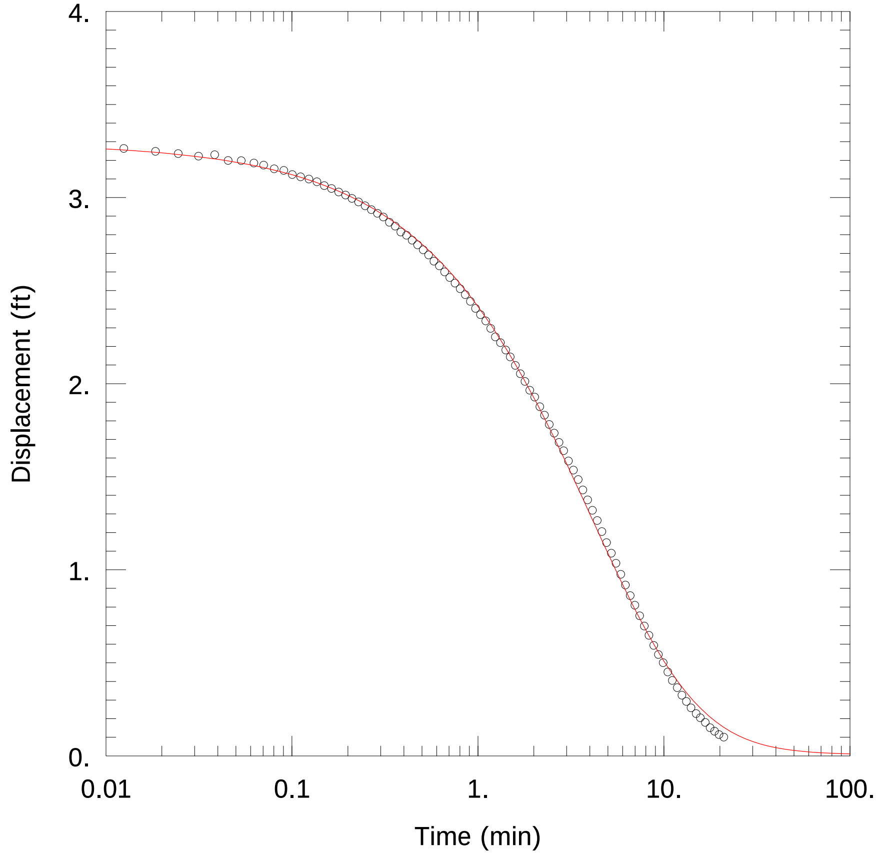
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-1.00	-1.00
Ss	-1.00	1.00	0.99
Kz/Kr	-1.00	0.99	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.01291 ft^2
Variance . . . . 0.0001278 ft^2
Std. Deviation . . . . 0.01131 ft
Mean. . . . . -0.003426 ft
No. of Residuals 104
No. of Estimates. 3



G301 @ ASH POND 1 – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G301
Test Date: 13 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00027 cm/sec
Ss = 0.0009 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 11.82 ft

WELL DATA (G301)

Initial Displacement: 3.3 ft
Total Well Penetration Depth: 11.82 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 11.82 ft
Screen Length: 4.65 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G301fh.aqt
Title: G301 @ Ash Pond 1 – Falling Head Test
Date: 11/28/16
Time: 09:31:30

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 13 Jun 2016
Test Well: G301

AQUIFER DATA

Saturated Thickness: 11.82 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G301

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 3.3 ft
Static Water Column Height: 11.82 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.65 ft
Total Well Penetration Depth: 11.82 ft

No. of Observations: 97

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	3.31	0.4745	2.745	3.672	1.428
0.004167	3.255	0.5085	2.719	3.893	1.375
0.008333	3.267	0.5435	2.691	4.133	1.319
0.0125	3.263	0.5805	2.658	4.383	1.264
0.0185	3.248	0.6205	2.633	4.643	1.205
0.02452	3.236	0.6625	2.6	4.923	1.145
0.0315	3.222	0.7065	2.57	5.223	1.089
0.0385	3.23	0.7535	2.54	5.532	1.034
0.0455	3.199	0.8035	2.51	5.872	0.975
0.0535	3.198	0.8565	2.478	6.223	0.917
0.0625	3.185	0.9125	2.442	6.593	0.861
0.0705	3.174	0.9725	2.404	6.992	0.809
0.0805	3.154	1.033	2.37	7.412	0.752

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.0905	3.145	1.103	2.337	7.853	0.697
0.1005	3.123	1.173	2.296	8.322	0.647
0.1115	3.111	1.242	2.251	8.822	0.593
0.1235	3.099	1.323	2.22	9.352	0.544
0.1365	3.084	1.413	2.18	9.912	0.5
0.1495	3.064	1.492	2.143	10.51	0.45
0.1635	3.048	1.593	2.098	11.11	0.405
0.1785	3.029	1.692	2.053	11.81	0.366
0.1945	3.013	1.793	2.012	12.51	0.326
0.2105	2.995	1.903	1.964	13.21	0.292
0.2285	2.976	2.023	1.927	14.01	0.258
0.2475	2.955	2.152	1.876	14.91	0.227
0.2675	2.935	2.283	1.83	15.71	0.204
0.2885	2.915	2.422	1.78	16.71	0.179
0.3105	2.895	2.572	1.734	17.72	0.151
0.3345	2.867	2.732	1.684	18.72	0.132
0.3595	2.846	2.893	1.639	19.81	0.114
0.3855	2.814	3.072	1.584	21.01	0.1
0.4135	2.797	3.263	1.535		
0.4435	2.77	3.462	1.484		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00027	cm/sec
Ss	0.0009	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.09727 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0002698	1.629E-5	+/- 3.234E-5	16.56	cm/sec
Ss	0.0008799	0.0001922	+/- 0.0003815	4.579	ft^{-1}
Kz/Kr	1.	0.8564	+/- 1.7	1.168	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.09719 cm^2/sec

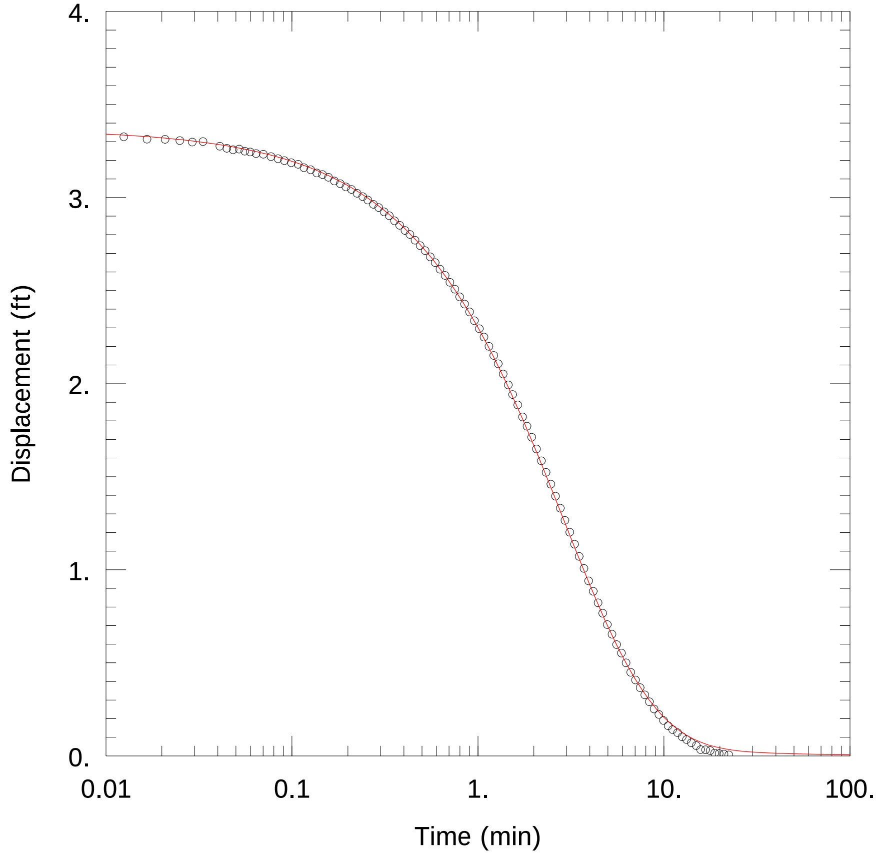
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.98	-0.97
Ss	-0.98	1.00	0.93
Kz/Kr	-0.97	0.93	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.07757 ft^2
Variance . . . . 0.0008252 ft^2
Std. Deviation . . . . 0.02873 ft
Mean. . . . . -0.006371 ft
No. of Residuals 97
No. of Estimates. 3



G301 @ ASH POND 1 – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G301
Test Date: 13 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.0005 cm/sec
Ss = 9.0E-5 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 11.82 ft

WELL DATA (G301)

Initial Displacement: 3.37 ft
Total Well Penetration Depth: 11.82 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 11.82 ft
Screen Length: 4.65 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G301rh.aqt
Title: G301 @ Ash Pond 1 – Rising Head Test
Date: 11/28/16
Time: 09:32:12

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 13 Jun 2016
Test Well: G301

AQUIFER DATA

Saturated Thickness: 11.82 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G301

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 3.37 ft
Static Water Column Height: 11.82 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.65 ft
Total Well Penetration Depth: 11.82 ft

No. of Observations: 112

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
-0.02083	3.462	0.2933	2.946	2.938	1.265
-0.01667	3.446	0.3133	2.923	3.118	1.201
-0.0125	3.401	0.3343	2.902	3.308	1.137
0.	3.35	0.3563	2.874	3.508	1.071
0.004167	3.343	0.3803	2.85	3.718	1.007
0.008333	3.341	0.4053	2.823	3.938	0.94
0.0125	3.326	0.4313	2.801	4.178	0.884
0.01667	3.313	0.4593	2.77	4.428	0.822
0.02083	3.312	0.4893	2.741	4.688	0.766
0.025	3.305	0.5203	2.714	4.968	0.705
0.02917	3.298	0.5543	2.681	5.268	0.653
0.03333	3.3	0.5893	2.65	5.578	0.597
0.04102	3.275	0.6263	2.615	5.918	0.552

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.04472	3.264	0.6663	2.581	6.268	0.499
0.04838	3.256	0.7083	2.544	6.638	0.449
0.05208	3.26	0.7523	2.507	7.038	0.407
0.0559	3.249	0.7993	2.466	7.465	0.366
0.05975	3.244	0.8493	2.427	7.898	0.327
0.06433	3.236	0.9023	2.385	8.368	0.29
0.07033	3.232	0.9583	2.338	8.868	0.252
0.07733	3.219	1.018	2.295	9.398	0.222
0.08433	3.208	1.078	2.25	9.958	0.19
0.09133	3.198	1.148	2.2	10.56	0.161
0.09933	3.187	1.218	2.151	11.16	0.141
0.1083	3.178	1.288	2.106	11.86	0.124
0.1163	3.16	1.368	2.051	12.56	0.102
0.1263	3.149	1.458	1.993	13.26	0.087
0.1363	3.132	1.538	1.941	14.06	0.07
0.1463	3.123	1.638	1.885	14.96	0.055
0.1573	3.108	1.738	1.821	15.76	0.033
0.1693	3.089	1.838	1.771	16.76	0.032
0.1823	3.074	1.948	1.711	17.76	0.028
0.1953	3.057	2.068	1.649	18.76	0.014
0.2093	3.043	2.198	1.585	19.86	0.012
0.2243	3.022	2.328	1.523	21.06	0.009
0.2403	3.004	2.468	1.459	22.36	0.005
0.2563	2.986	2.618	1.395		
0.2743	2.963	2.778	1.33		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.0005	cm/sec
Ss	9.0E-5	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.1801 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0004957	5.04E-5	+/- 9.988E-5	9.836	cm/sec
Ss	9.396E-5	4.339E-5	+/- 8.599E-5	2.166	ft^{-1}

Kz/Kr	1.	1.072	+/- 2.124	0.933

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.1786 cm^2/sec

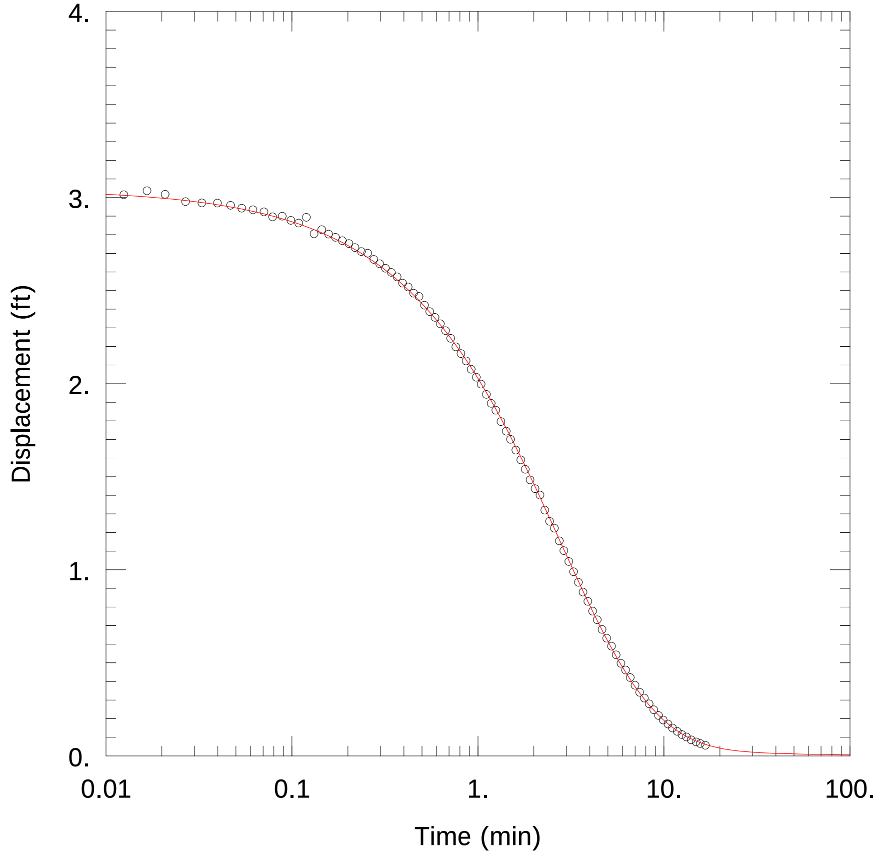
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-1.00
Ss	-0.99	1.00	0.98
Kz/Kr	-1.00	0.98	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.03615 ft^2
Variance . . . . 0.0003317 ft^2
Std. Deviation . . . . 0.01821 ft
Mean. . . . . -0.004631 ft
No. of Residuals 112
No. of Estimates. 3



G302 @ ASH POND 1 – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G302
Test Date: 13 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00049 cm/sec
Ss = 0.0002 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 11.37 ft

WELL DATA (G302)

Initial Displacement: 3.05 ft
Total Well Penetration Depth: 11.37 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 11.37 ft
Screen Length: 4.65 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G302fh.aqt
Title: G302 @ Ash Pond 1 – Falling Head Test
Date: 11/28/16
Time: 09:32:35

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 13 Jun 2016
Test Well: G302

AQUIFER DATA

Saturated Thickness: 11.37 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G302

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 3.05 ft
Static Water Column Height: 11.37 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.65 ft
Total Well Penetration Depth: 11.37 ft

No. of Observations: 95

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	3.007	0.3938	2.54	2.901	1.102
0.004167	2.93	0.4218	2.519	3.081	1.044
0.008333	2.962	0.4518	2.486	3.271	0.989
0.0125	3.015	0.4828	2.468	3.471	0.932
0.01667	3.036	0.5168	2.421	3.681	0.88
0.02083	3.017	0.5518	2.387	3.901	0.83
0.02683	2.978	0.5888	2.356	4.141	0.777
0.03283	2.971	0.6288	2.321	4.391	0.731
0.03983	2.97	0.6708	2.284	4.651	0.679
0.04683	2.958	0.7148	2.243	4.931	0.632
0.05382	2.942	0.7618	2.197	5.231	0.589
0.06183	2.934	0.8118	2.161	5.541	0.542
0.07083	2.923	0.8648	2.122	5.881	0.497

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.07883	2.896	0.9208	2.077	6.231	0.461
0.08883	2.899	0.9808	2.034	6.601	0.42
0.09883	2.877	1.041	1.997	7.001	0.379
0.1088	2.862	1.111	1.942	7.421	0.341
0.1198	2.893	1.181	1.894	7.861	0.31
0.1318	2.805	1.251	1.857	8.331	0.279
0.1448	2.827	1.331	1.796	8.831	0.247
0.1578	2.803	1.421	1.744	9.361	0.216
0.1718	2.786	1.501	1.7	9.921	0.192
0.1868	2.768	1.601	1.643	10.52	0.171
0.2028	2.752	1.701	1.59	11.12	0.149
0.2188	2.731	1.801	1.539	11.82	0.131
0.2368	2.709	1.911	1.483	12.52	0.114
0.2558	2.701	2.031	1.435	13.22	0.101
0.2758	2.667	2.161	1.401	14.02	0.086
0.2968	2.644	2.291	1.32	14.92	0.074
0.3188	2.62	2.431	1.26	15.72	0.066
0.3428	2.597	2.581	1.223	16.72	0.056
0.3678	2.573	2.741	1.155		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00049	cm/sec
Ss	0.0002	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.1698 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0004933	4.307E-5	+/- 8.553E-5	11.45	cm/sec
Ss	0.0001891	7.368E-5	+/- 0.0001463	2.566	ft^{-1}
Kz/Kr	1.	0.9375	+/- 1.862	1.067	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

$T = K*b = 0.171\ cm^2/sec$

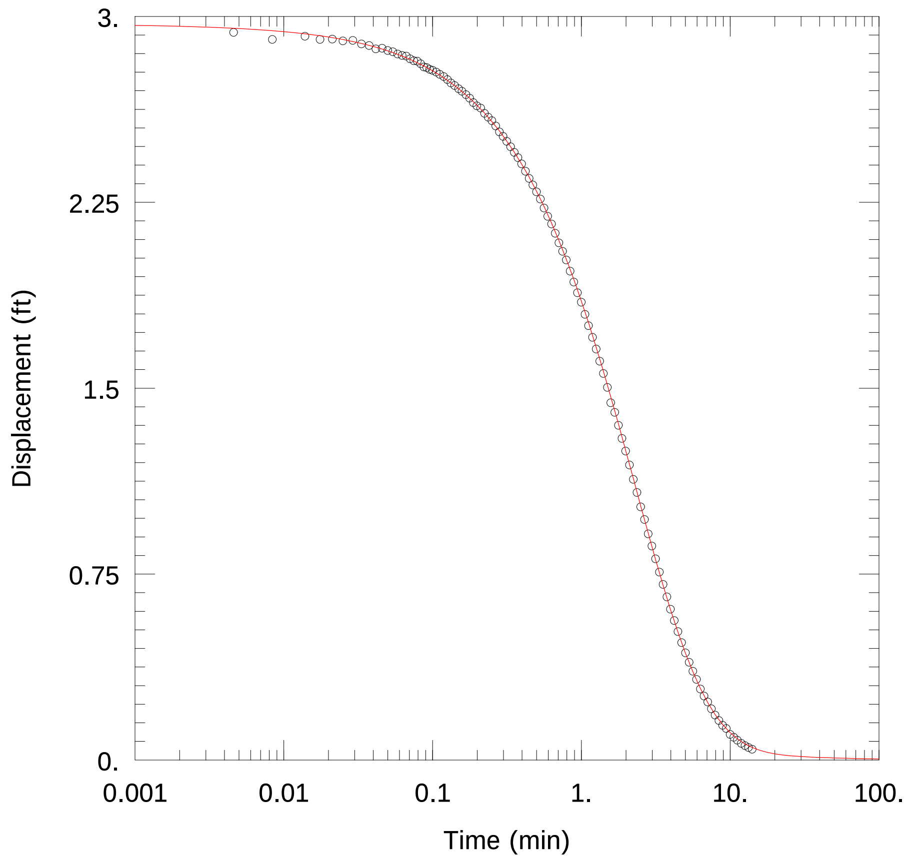
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-1.00
Ss	-0.99	1.00	0.98
Kz/Kr	-1.00	0.98	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.02827 ft^2
Variance . . . . 0.0003073 ft^2
Std. Deviation . . . . 0.01753 ft
Mean. . . . . 0.0006103 ft
No. of Residuals 95
No. of Estimates. 3



G302 @ ASH POND 1 – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G302
Test Date: 13 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00063 cm/sec
Ss = 0.0001 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 11.37 ft

WELL DATA (G302)

Initial Displacement: 2.97 ft
Total Well Penetration Depth: 11.37 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 11.37 ft
Screen Length: 4.65 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G302rh.aqt
Title: G302 @ Ash Pond 1 – Rising Head Test
Date: 11/28/16
Time: 09:32:58

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 13 Jun 2016
Test Well: G302

AQUIFER DATA

Saturated Thickness: 11.37 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G302

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.97 ft
Static Water Column Height: 11.37 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.65 ft
Total Well Penetration Depth: 11.37 ft

No. of Observations: 110

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.004617	2.935	0.224	2.609	1.88	1.297
0.0084	2.907	0.237	2.593	1.99	1.246
0.01393	2.92	0.251	2.579	2.11	1.19
0.01758	2.907	0.266	2.558	2.24	1.132
0.02123	2.908	0.282	2.534	2.37	1.079
0.02502	2.901	0.298	2.516	2.511	1.021
0.02918	2.903	0.316	2.496	2.66	0.97
0.03335	2.889	0.335	2.474	2.82	0.912
0.03752	2.882	0.355	2.451	2.98	0.863
0.04168	2.869	0.376	2.43	3.16	0.811
0.04585	2.871	0.398	2.405	3.35	0.758
0.05002	2.862	0.422	2.375	3.55	0.708
0.05418	2.857	0.447	2.346	3.763	0.658

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.05835	2.848	0.473	2.32	3.98	0.608
0.06252	2.842	0.501	2.292	4.22	0.562
0.06668	2.84	0.531	2.263	4.47	0.518
0.07085	2.829	0.562	2.227	4.73	0.473
0.07502	2.821	0.596	2.193	5.015	0.432
0.07918	2.819	0.631	2.162	5.31	0.394
0.08335	2.809	0.668	2.125	5.62	0.358
0.08752	2.796	0.708	2.086	5.96	0.325
0.09168	2.793	0.75	2.052	6.31	0.286
0.09585	2.786	0.794	2.017	6.684	0.258
0.1	2.782	0.841	1.972	7.08	0.234
0.106	2.775	0.891	1.928	7.5	0.206
0.112	2.766	0.944	1.885	7.94	0.181
0.119	2.757	1.	1.847	8.41	0.159
0.126	2.745	1.06	1.798	8.91	0.14
0.133	2.731	1.12	1.752	9.44	0.127
0.141	2.721	1.19	1.705	10.	0.103
0.15	2.708	1.26	1.658	10.6	0.091
0.158	2.698	1.33	1.609	11.2	0.08
0.168	2.684	1.41	1.559	11.9	0.067
0.178	2.67	1.5	1.503	12.6	0.058
0.188	2.652	1.58	1.441	13.3	0.05
0.199	2.639	1.68	1.402	14.1	0.043
0.211	2.63	1.78	1.35		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00063	cm/sec
Ss	0.0001	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.2183 cm^2/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.00063	2.361E-5	+/- 4.679E-5	26.69	cm/sec
Ss	0.0001057	1.773E-5	+/- 3.513E-5	5.966	ft^{-1}
Kz/Kr	1.	0.4005	+/- 0.7939	2.497	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.2183 cm²/sec

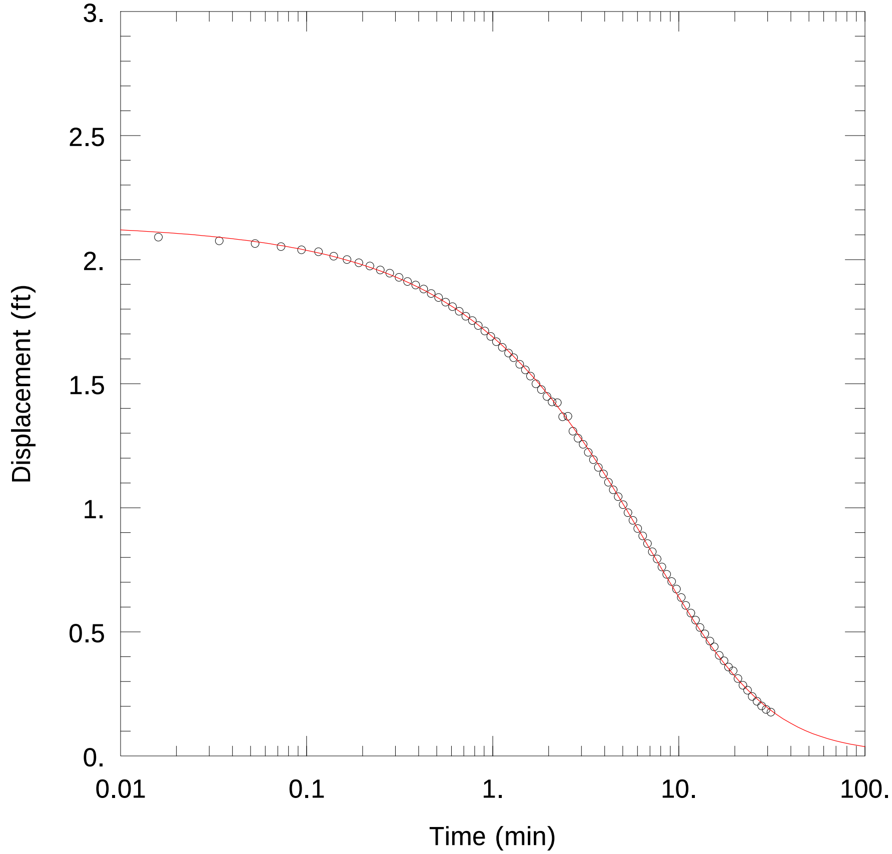
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-1.00
Ss	-0.99	1.00	0.99
Kz/Kr	-1.00	0.99	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.00378 ft^2
Variance . . . . 3.532E-5 ft^2
Std. Deviation . . . . 0.005943 ft
Mean. . . . . -0.0002972 ft
No. of Residuals 110
No. of Estimates 3



G303 @ ASH POND 1 – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G303
Test Date: 13 Jun 2016

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 5.6E-5 cm/sec
Ss = 0.002 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 17.03 ft

WELL DATA (G303)

Initial Displacement: 2.15 ft
Total Well Penetration Depth: 17.03 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 17.03 ft
Screen Length: 10. ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G303fh.aqt
Title: G303 @ Ash Pond 1 – Falling Head Test
Date: 11/28/16
Time: 09:33:23

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 13 Jun 2016
Test Well: G303

AQUIFER DATA

Saturated Thickness: 17.03 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G303

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.15 ft
Static Water Column Height: 17.03 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 10. ft
Total Well Penetration Depth: 17.03 ft

No. of Observations: 103

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
-0.1886	2.358	0.386	1.897	4.728	1.044
-0.185	2.423	0.426	1.881	5.028	1.012
-0.1813	2.411	0.468	1.863	5.338	0.98
-0.176	2.312	0.512	1.847	5.678	0.949
-0.17	2.203	0.559	1.828	6.028	0.916
-0.163	2.162	0.609	1.81	6.398	0.886
-0.156	2.193	0.662	1.791	6.798	0.855
-0.149	2.224	0.718	1.771	7.218	0.822
-0.141	2.219	0.778	1.754	7.658	0.793
-0.132	2.193	0.838	1.734	8.128	0.761
-0.124	2.178	0.908	1.712	8.628	0.731
-0.114	2.174	0.978	1.69	9.158	0.702
-0.104	2.174	1.048	1.669	9.718	0.672

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
-0.09402	2.163	1.128	1.646	10.32	0.638
-0.08302	2.151	1.218	1.623	10.92	0.606
-0.07102	2.147	1.298	1.604	11.62	0.575
-0.05802	2.138	1.398	1.578	12.32	0.547
-0.04502	2.124	1.498	1.555	13.02	0.517
-0.03102	2.118	1.598	1.53	13.82	0.491
-0.016	2.111	1.708	1.499	14.72	0.462
0.	2.094	1.828	1.476	15.52	0.439
0.016	2.09	1.958	1.448	16.52	0.405
0.034	2.075	2.088	1.426	17.52	0.383
0.053	2.064	2.228	1.423	18.52	0.358
0.073	2.052	2.378	1.366	19.62	0.342
0.09398	2.039	2.538	1.368	20.82	0.311
0.116	2.031	2.698	1.308	22.12	0.284
0.14	2.013	2.878	1.28	23.42	0.264
0.165	2.	3.068	1.255	24.82	0.239
0.191	1.987	3.268	1.223	26.32	0.22
0.219	1.974	3.478	1.193	27.92	0.201
0.249	1.958	3.698	1.162	29.52	0.187
0.28	1.945	3.938	1.136	31.32	0.176
0.314	1.928	4.188	1.102		
0.349	1.911	4.448	1.072		

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	5.6E-5	cm/sec
Ss	0.002	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.02907 cm^2/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	5.383E-5	3.02E-6	+/- 5.993E-6	17.82	cm/sec
Ss	0.002308	0.0004271	+/- 0.0008474	5.403	ft^{-1}
Kz/Kr	1.	1.674	+/- 3.321	0.5974	

C.I. is approximate 95% confidence interval for parameter

t-ratio = estimate/std. error
No estimation window

T = K*b = 0.02794 cm^2/sec

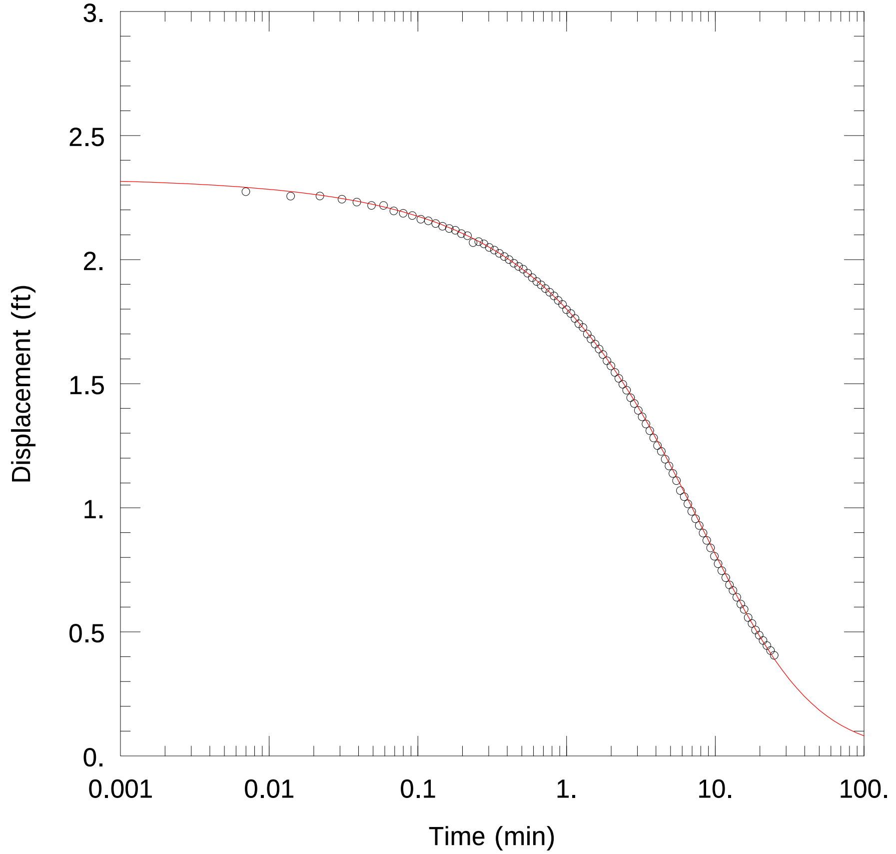
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.94	-0.51
Ss	-0.94	1.00	0.32
Kz/Kr	-0.51	0.32	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.2436 ft^2
Variance . . . . 0.002436 ft^2
Std. Deviation . . . . 0.04936 ft
Mean. . . . . 0.01078 ft
No. of Residuals 103
No. of Estimates 3



G303 @ ASH POND 1 – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G303
Test Date: 13 Jun 2016

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 3.1E-5 cm/sec
Ss = 0.0085 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 17.03 ft

WELL DATA (G303)

Initial Displacement: 2.33 ft
Total Well Penetration Depth: 17.03 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 17.03 ft
Screen Length: 10. ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G303rh.aqt
Title: G303 @ Ash Pond 1 – Rising Head Test
Date: 11/28/16
Time: 09:33:48

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 13 Jun 2016
Test Well: G303

AQUIFER DATA

Saturated Thickness: 17.03 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G303

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.33 ft
Static Water Column Height: 17.03 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 10. ft
Total Well Penetration Depth: 17.03 ft

No. of Observations: 100

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
-0.0315	2.324	0.477	1.972	4.101	1.25
-0.02733	2.297	0.512	1.961	4.351	1.227
-0.02317	2.301	0.549	1.945	4.611	1.195
-0.019	2.32	0.589	1.927	4.891	1.168
-0.013	2.313	0.631	1.911	5.191	1.138
-0.007	2.282	0.675	1.898	5.501	1.109
0.	2.279	0.722	1.883	5.841	1.069
0.007	2.273	0.772	1.868	6.191	1.044
0.014	2.255	0.825	1.853	6.561	1.015
0.022	2.256	0.881	1.835	6.961	0.985
0.031	2.243	0.941	1.819	7.381	0.955
0.039	2.231	1.001	1.798	7.821	0.928
0.049	2.218	1.071	1.782	8.291	0.898

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.059	2.218	1.141	1.762	8.791	0.868
0.069	2.196	1.211	1.741	9.321	0.838
0.08	2.186	1.291	1.726	9.881	0.804
0.092	2.177	1.381	1.7	10.48	0.774
0.105	2.162	1.461	1.68	11.08	0.746
0.118	2.156	1.561	1.659	11.78	0.718
0.132	2.145	1.661	1.639	12.48	0.689
0.147	2.134	1.761	1.617	13.18	0.666
0.163	2.125	1.871	1.592	13.98	0.639
0.179	2.118	1.991	1.571	14.88	0.611
0.197	2.104	2.121	1.545	15.68	0.59
0.216	2.096	2.251	1.521	16.68	0.557
0.236	2.068	2.391	1.497	17.68	0.533
0.257	2.072	2.541	1.473	18.68	0.507
0.279	2.063	2.701	1.443	19.78	0.486
0.303	2.049	2.861	1.42	20.98	0.465
0.328	2.038	3.041	1.392	22.28	0.444
0.354	2.025	3.231	1.366	23.58	0.424
0.382	2.012	3.431	1.337	24.98	0.405
0.412	2.	3.641	1.31		
0.443	1.985	3.861	1.281		

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	3.1E-5	cm/sec
Ss	0.0085	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.01609 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	3.152E-5	1.915E-6	+/- 3.801E-6	16.46	cm/sec
Ss	0.008559	0.0008401	+/- 0.001668	10.19	ft^{-1}
Kz/Kr	1.	7.083	+/- 14.06	0.1412	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error

No estimation window

T = K*b = 0.01636 cm^2/sec

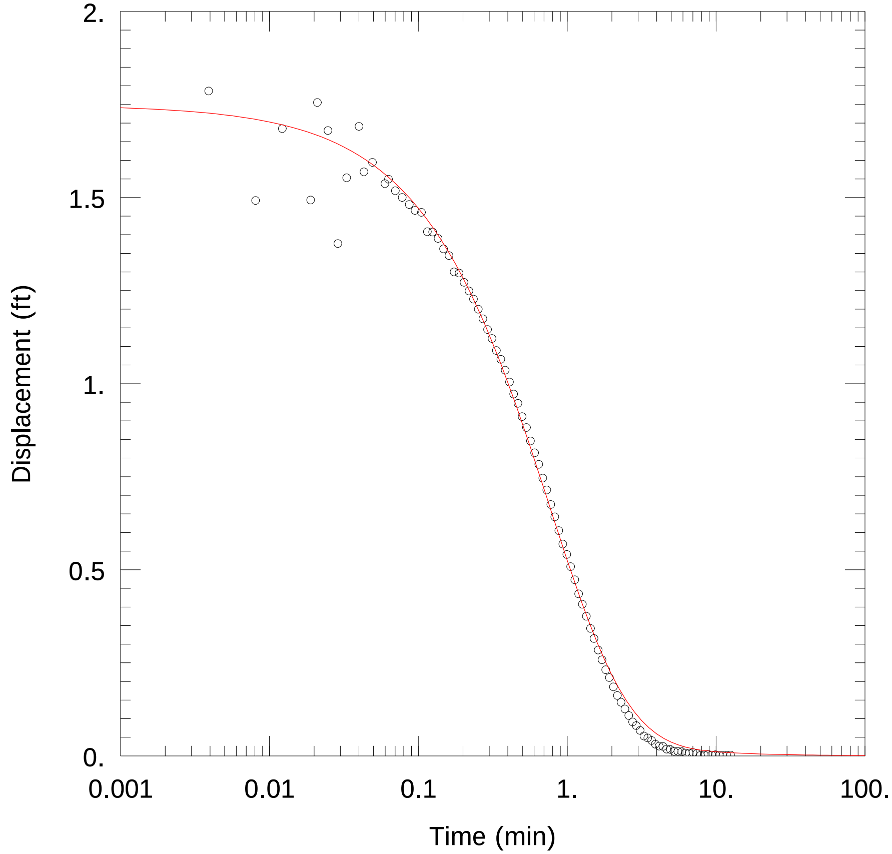
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-0.98
Ss	-0.99	1.00	0.96
Kz/Kr	-0.98	0.96	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.01115 ft^2
Variance . . . . 0.0001149 ft^2
Std. Deviation . . . . 0.01072 ft
Mean. . . . . -0.001744 ft
No. of Residuals 100
No. of Estimates 3



G304 @ ASH POND 1 – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G304
Test Date: 17 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00089 cm/sec
Ss = 7.0E-5 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 18.81 ft

WELL DATA (G304)

Initial Displacement: 1.75 ft
Total Well Penetration Depth: 18.81 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 18.81 ft
Screen Length: 10. ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G304fh.aqt
Title: G304 @ Ash Pond 1 – Falling Head Test
Date: 11/28/16
Time: 09:40:21

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 17 Jun 2016
Test Well: G304

AQUIFER DATA

Saturated Thickness: 18.81 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G304

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.75 ft
Static Water Column Height: 18.81 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 10. ft
Total Well Penetration Depth: 18.81 ft

No. of Observations: 95

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	1.867	0.3132	1.121	2.307	0.144
0.003917	1.786	0.3352	1.089	2.447	0.126
0.008083	1.492	0.3592	1.065	2.597	0.108
0.01225	1.685	0.3842	1.036	2.757	0.091
0.01897	1.493	0.4102	1.004	2.917	0.081
0.02103	1.755	0.4382	0.972	3.097	0.068
0.02475	1.68	0.4682	0.947	3.287	0.053
0.02892	1.376	0.4992	0.911	3.487	0.048
0.03308	1.553	0.5332	0.882	3.697	0.041
0.04002	1.691	0.5682	0.846	3.917	0.031
0.04323	1.569	0.6052	0.814	4.157	0.026
0.04927	1.594	0.6452	0.783	4.407	0.025
0.05982	1.537	0.6872	0.746	4.667	0.018

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.06323	1.549	0.7312	0.714	4.947	0.017
0.07023	1.518	0.7782	0.675	5.247	0.012
0.07825	1.5	0.8282	0.642	5.557	0.012
0.08723	1.481	0.8812	0.605	5.897	0.011
0.09523	1.465	0.9372	0.569	6.247	0.007
0.1052	1.46	0.9972	0.541	6.617	0.007
0.1152	1.408	1.057	0.508	7.017	0.009
0.1252	1.407	1.127	0.473	7.437	0.006
0.1362	1.39	1.197	0.435	7.877	0.001
0.1482	1.362	1.267	0.407	8.347	0.002
0.1612	1.344	1.347	0.375	8.847	0.004
0.1742	1.3	1.437	0.342	9.377	0.002
0.1882	1.297	1.517	0.315	9.937	0.003
0.2032	1.272	1.617	0.284	10.54	0.001
0.2192	1.249	1.717	0.258	11.14	0.001
0.2352	1.227	1.817	0.231	11.84	0.001
0.2532	1.2	1.927	0.21	12.54	0.002
0.2722	1.174	2.047	0.185	13.24	-0.002
0.2922	1.145	2.177	0.162		

SOLUTION

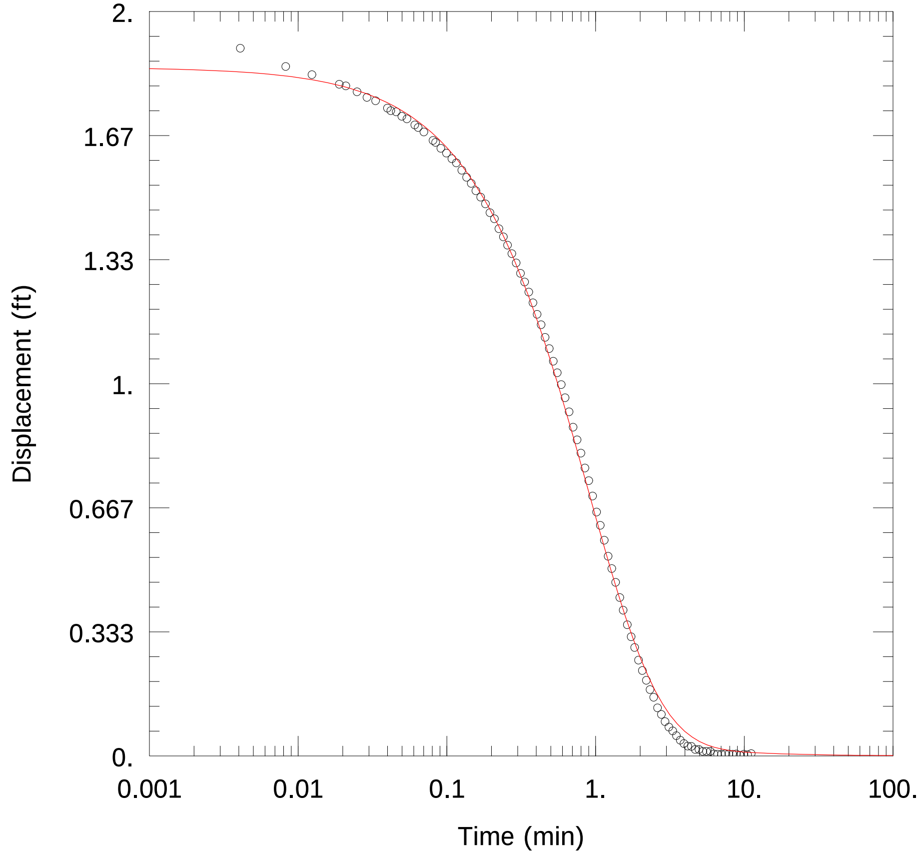
Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00089	cm/sec
Ss	7.0E-5	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.5103 cm²/sec



G304 @ ASH POND 1 – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G304
Test Date: 17 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.001 cm/sec
Ss = 1.0E-6 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 18.81 ft

WELL DATA (G304)

Initial Displacement: 1.85 ft
Total Well Penetration Depth: 18.81 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 18.81 ft
Screen Length: 10. ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G304rh.aqt
Title: G304 @ Ash Pond 1 – Rising Head Test
Date: 11/28/16
Time: 09:40:55

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 17 Jun 2016
Test Well: G304

AQUIFER DATA

Saturated Thickness: 18.81 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G304

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.85 ft
Static Water Column Height: 18.81 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 10. ft
Total Well Penetration Depth: 18.81 ft

No. of Observations: 97

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	1.977	0.2563	1.372	1.948	0.257
0.0041	1.901	0.2743	1.349	2.068	0.229
0.008267	1.852	0.2933	1.324	2.198	0.203
0.01243	1.83	0.3133	1.296	2.328	0.178
0.01895	1.804	0.3343	1.273	2.468	0.157
0.02102	1.8	0.3563	1.246	2.618	0.129
0.02493	1.784	0.3803	1.217	2.778	0.111
0.0291	1.769	0.4053	1.186	2.938	0.092
0.03327	1.76	0.4313	1.158	3.118	0.077
0.04	1.74	0.4593	1.124	3.308	0.067
0.04207	1.733	0.4893	1.094	3.508	0.054
0.04577	1.73	0.5203	1.06	3.718	0.042
0.04993	1.718	0.5543	1.029	3.938	0.033

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.0541	1.711	0.5893	0.997	4.178	0.026
0.06107	1.695	0.6263	0.962	4.428	0.025
0.06427	1.688	0.6663	0.924	4.688	0.017
0.07027	1.676	0.7083	0.883	4.968	0.017
0.08085	1.653	0.7523	0.849	5.268	0.012
0.08427	1.648	0.7993	0.813	5.578	0.012
0.09127	1.632	0.8493	0.773	5.918	0.012
0.09967	1.619	0.9023	0.739	6.268	0.005
0.1083	1.604	0.9583	0.698	6.638	0.004
0.1163	1.593	1.018	0.655	7.038	0.004
0.1263	1.573	1.078	0.619	7.458	0.005
0.1363	1.554	1.148	0.579	7.898	0.005
0.1463	1.538	1.218	0.536	8.368	0.004
0.1573	1.518	1.288	0.503	8.868	0.005
0.1693	1.501	1.368	0.466	9.398	0.001
0.1823	1.483	1.458	0.425	9.958	0.004
0.1953	1.459	1.538	0.391	10.56	0.003
0.2093	1.443	1.638	0.352	11.16	0.006
0.2243	1.416	1.738	0.32		
0.2403	1.394	1.838	0.291		

SOLUTION

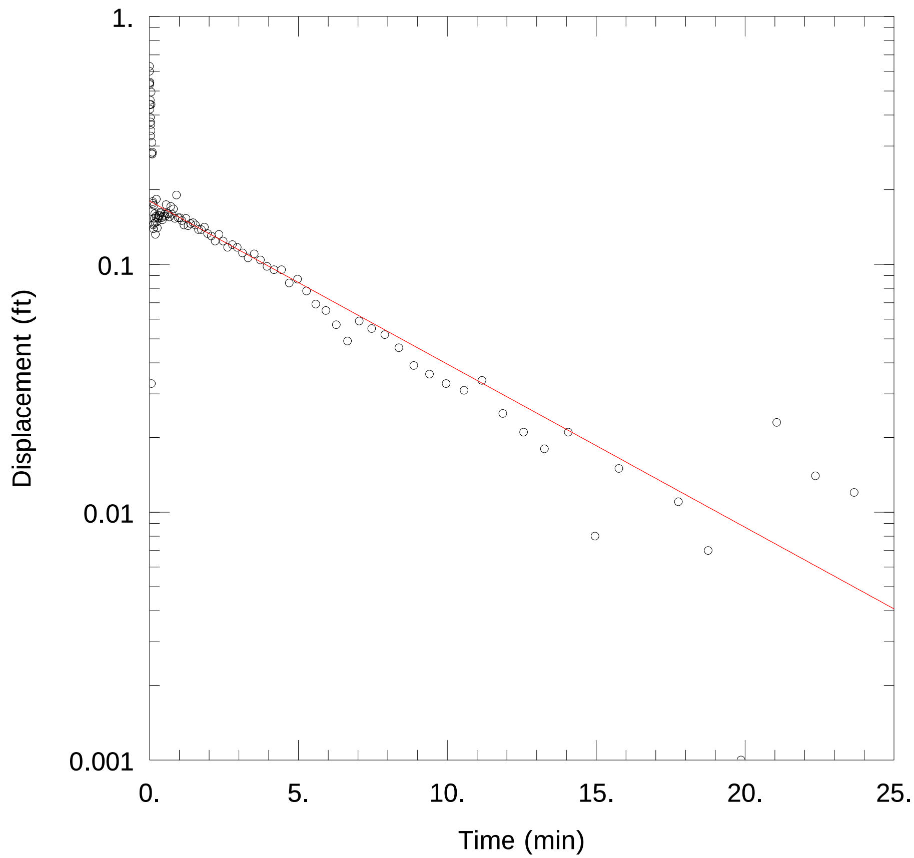
Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.001	cm/sec
Ss	1.0E-6	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.5733 cm^2/sec



G401 @ ASH POND 2 – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G401
Test Date: 13 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.00018 cm/sec
y0 = 0.18 ft

AQUIFER DATA

Saturated Thickness: 4.92 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G401)

Initial Displacement: 0.6 ft
Total Well Penetration Depth: 4.92 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 4.92 ft
Screen Length: 4.63 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G401fh.aqt
Title: G401 @ Ash Pond 2 – Falling Head Test
Date: 11/28/16
Time: 10:44:18

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 13 Jun 2016
Test Well: G401

AQUIFER DATA

Saturated Thickness: 4.92 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G401

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.6 ft
Static Water Column Height: 4.92 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.63 ft
Total Well Penetration Depth: 4.92 ft

No. of Observations: 112

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	0.629	0.3217	0.157	3.127	0.111
0.00417	0.537	0.3427	0.157	3.317	0.106
0.00834	0.531	0.3647	0.162	3.517	0.11
0.0125	0.441	0.3887	0.161	3.727	0.104
0.01667	0.542	0.4137	0.154	3.947	0.098
0.02084	0.422	0.4397	0.151	4.187	0.095
0.025	0.44	0.4677	0.156	4.437	0.095
0.02917	0.459	0.4977	0.159	4.697	0.084
0.03334	0.375	0.5287	0.156	4.977	0.087
0.0375	0.391	0.5627	0.174	5.277	0.078
0.04167	0.329	0.5977	0.16	5.587	0.069
0.04584	0.366	0.6347	0.16	5.927	0.065
0.05	0.346	0.6747	0.155	6.277	0.057

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.05417	0.441	0.7167	0.171	6.651	0.049
0.05834	0.495	0.7607	0.159	7.047	0.059
0.0625	-0.542	0.8077	0.167	7.467	0.055
0.06667	0.033	0.8577	0.153	7.907	0.052
0.07267	0.28	0.9107	0.19	8.377	0.046
0.07867	0.163	0.9667	0.154	8.877	0.039
0.08567	0.31	1.027	0.154	9.407	0.036
0.09267	0.278	1.087	0.15	9.967	0.033
0.09967	0.283	1.157	0.144	10.57	0.031
0.1077	0.179	1.227	0.153	11.17	0.034
0.1167	0.176	1.297	0.143	11.87	0.025
0.1247	0.144	1.377	0.146	12.57	0.021
0.1347	0.139	1.467	0.147	13.27	0.018
0.1447	0.146	1.547	0.144	14.07	0.021
0.1547	0.173	1.647	0.138	14.97	0.008
0.1657	0.153	1.747	0.138	15.77	0.015
0.1777	0.16	1.847	0.141	16.77	0.
0.1907	0.147	1.957	0.133	17.77	0.011
0.2037	0.132	2.077	0.13	18.77	0.007
0.2177	0.156	2.207	0.124	19.87	0.001
0.2327	0.183	2.337	0.132	21.07	0.023
0.2487	0.148	2.477	0.124	22.37	0.014
0.2647	0.14	2.627	0.117	23.67	0.012
0.2827	0.154	2.787	0.12		
0.3017	0.153	2.947	0.117		

SOLUTION

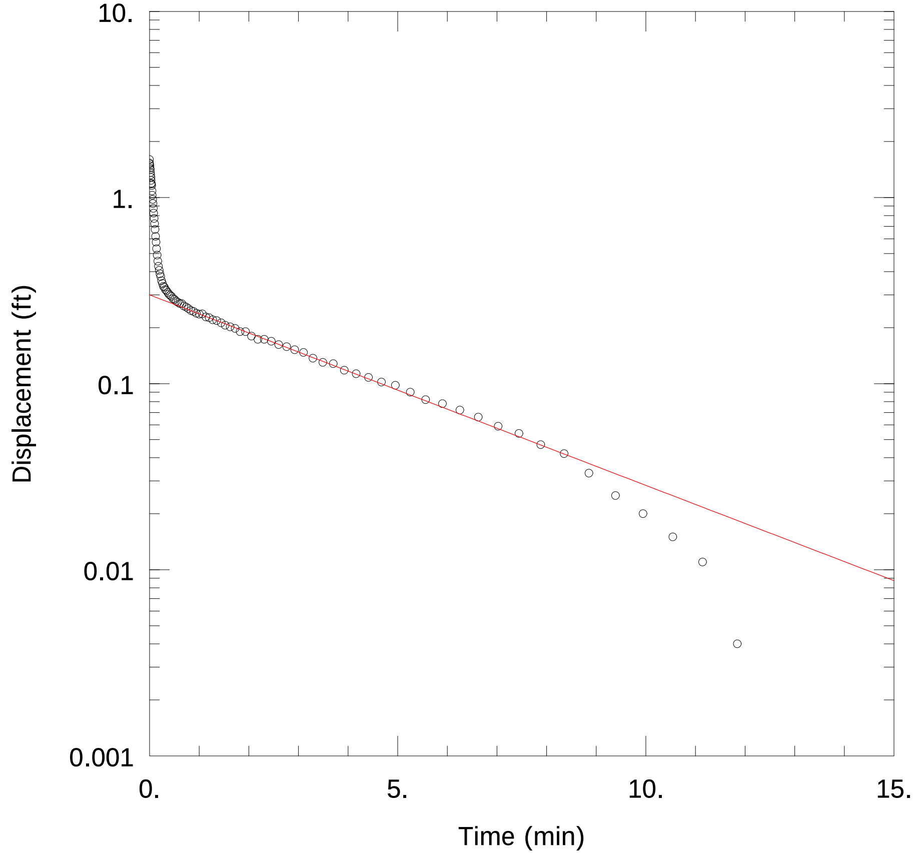
Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 3.118

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.00018	cm/sec
y0	0.18	ft

T = K*b = 0.02699 cm²/sec



G401 @ ASH POND 2 – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G401
Test Date: 13 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.00028 cm/sec
y0 = 0.3 ft

AQUIFER DATA

Saturated Thickness: 4.92 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (G401)

Initial Displacement: 1.6 ft
Total Well Penetration Depth: 4.92 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 4.92 ft
Screen Length: 4.63 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G401rh.aqt
Title: G401 @ Ash Pond 2 – Rising Head Test
Date: 11/28/16
Time: 10:45:18

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 13 Jun 2016
Test Well: G401

AQUIFER DATA

Saturated Thickness: 4.92 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G401

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.6 ft
Static Water Column Height: 4.92 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.63 ft
Total Well Penetration Depth: 4.92 ft

No. of Observations: 96

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	1.532	0.2808	0.333	2.056	0.18
0.004167	1.512	0.3008	0.33	2.187	0.173
0.008333	1.479	0.3218	0.32	2.316	0.173
0.0125	1.44	0.3438	0.316	2.456	0.169
0.01667	1.414	0.3678	0.309	2.606	0.162
0.02083	1.362	0.3928	0.302	2.766	0.158
0.025	1.322	0.4188	0.298	2.926	0.152
0.02917	1.28	0.4468	0.294	3.106	0.147
0.03333	1.237	0.4768	0.286	3.296	0.137
0.0375	1.191	0.5078	0.283	3.496	0.13
0.04167	1.182	0.5418	0.277	3.706	0.128
0.04583	1.161	0.5768	0.273	3.926	0.118
0.05183	1.085	0.6138	0.269	4.166	0.113

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.05783	1.029	0.6538	0.269	4.416	0.108
0.06483	0.977	0.6958	0.261	4.676	0.102
0.07183	0.928	0.7398	0.258	4.956	0.098
0.07883	0.874	0.7868	0.253	5.256	0.09
0.08683	0.824	0.8368	0.247	5.566	0.082
0.09583	0.771	0.8898	0.244	5.906	0.078
0.1038	0.722	0.9458	0.239	6.256	0.072
0.1138	0.673	1.006	0.236	6.626	0.066
0.1238	0.618	1.066	0.237	7.026	0.059
0.1338	0.576	1.136	0.228	7.446	0.054
0.1448	0.531	1.206	0.226	7.886	0.047
0.1568	0.49	1.276	0.22	8.356	0.042
0.1698	0.455	1.356	0.218	8.856	0.033
0.1828	0.427	1.446	0.212	9.39	0.025
0.1968	0.406	1.526	0.206	9.946	0.02
0.2118	0.389	1.626	0.202	10.55	0.015
0.2278	0.376	1.726	0.198	11.15	0.011
0.2438	0.357	1.826	0.19	11.85	0.004
0.2618	0.345	1.936	0.19	12.55	0.

SOLUTION

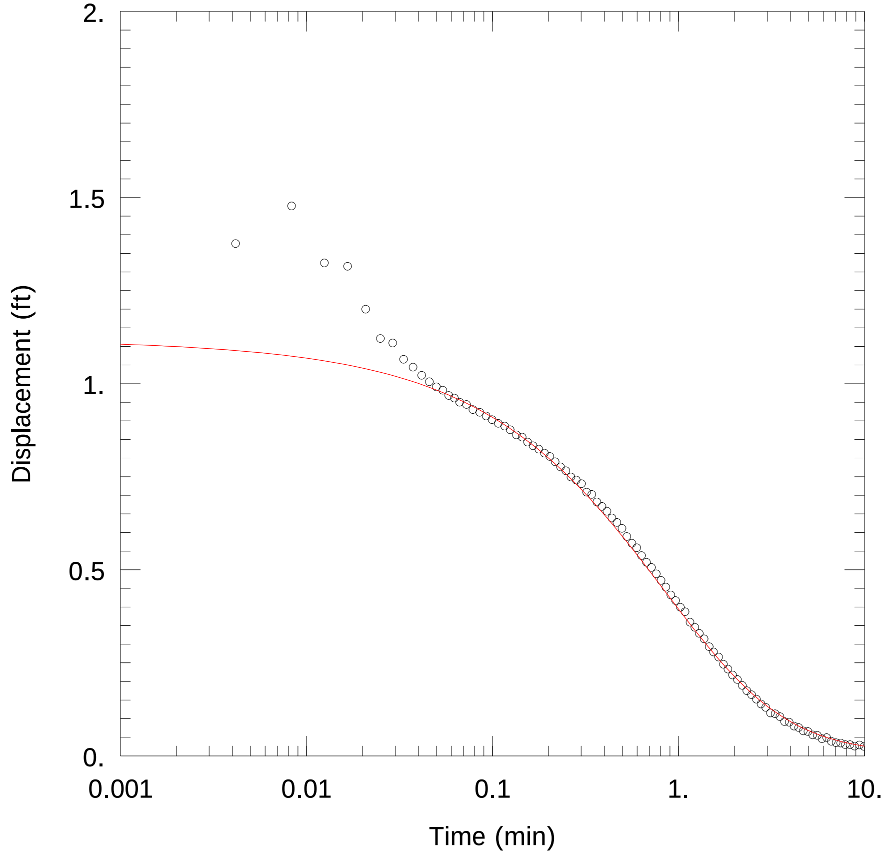
Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 3.118

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.00028	cm/sec
y0	0.3	ft

T = K*b = 0.04199 cm²/sec



G402 @ ASH POND 2 – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G402
Test Date: 13 Jun 2016

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 0.00045 cm/sec
Ss = 0.002 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 13.25 ft

WELL DATA (G402)

Initial Displacement: 1.12 ft
Total Well Penetration Depth: 13.25 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 13.25 ft
Screen Length: 10. ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G402fh.aqt
Title: G402 @ Ash Pond 2 – Falling Head Test
Date: 11/28/16
Time: 09:41:35

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 13 Jun 2016
Test Well: G402

AQUIFER DATA

Saturated Thickness: 13.25 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G402

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.12 ft
Static Water Column Height: 13.25 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 10. ft
Total Well Penetration Depth: 13.25 ft

No. of Observations: 97

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	1.302	0.2327	0.776	1.747	0.246
0.004167	1.376	0.2487	0.766	1.847	0.233
0.008333	1.477	0.2647	0.749	1.957	0.217
0.0125	1.324	0.2827	0.741	2.077	0.205
0.01667	1.315	0.3017	0.731	2.207	0.189
0.02083	1.2	0.3217	0.708	2.337	0.175
0.025	1.121	0.3427	0.702	2.477	0.164
0.02917	1.109	0.3646	0.682	2.627	0.152
0.03333	1.065	0.3887	0.67	2.787	0.139
0.0375	1.044	0.4137	0.657	2.947	0.13
0.04167	1.022	0.4396	0.639	3.127	0.115
0.04583	1.005	0.4677	0.627	3.317	0.113
0.05	0.991	0.4976	0.611	3.517	0.105

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.05417	0.982	0.5287	0.589	3.727	0.092
0.05833	0.968	0.5627	0.571	3.947	0.09
0.0625	0.961	0.5977	0.559	4.187	0.08
0.06667	0.95	0.6347	0.538	4.437	0.076
0.07267	0.944	0.6747	0.52	4.697	0.067
0.07867	0.93	0.7167	0.506	4.977	0.065
0.08567	0.923	0.7607	0.489	5.277	0.056
0.09267	0.913	0.8077	0.471	5.587	0.055
0.09967	0.903	0.8577	0.453	5.927	0.046
0.1077	0.893	0.9106	0.432	6.277	0.049
0.1167	0.886	0.9667	0.417	6.647	0.039
0.1247	0.876	1.027	0.399	7.047	0.035
0.1347	0.862	1.087	0.387	7.467	0.034
0.1447	0.856	1.157	0.359	7.907	0.03
0.1547	0.843	1.227	0.345	8.377	0.03
0.1656	0.833	1.297	0.329	8.877	0.026
0.1777	0.824	1.377	0.314	9.407	0.029
0.1906	0.813	1.467	0.293	9.967	0.025
0.2037	0.804	1.547	0.279		
0.2177	0.79	1.647	0.265		

SOLUTION

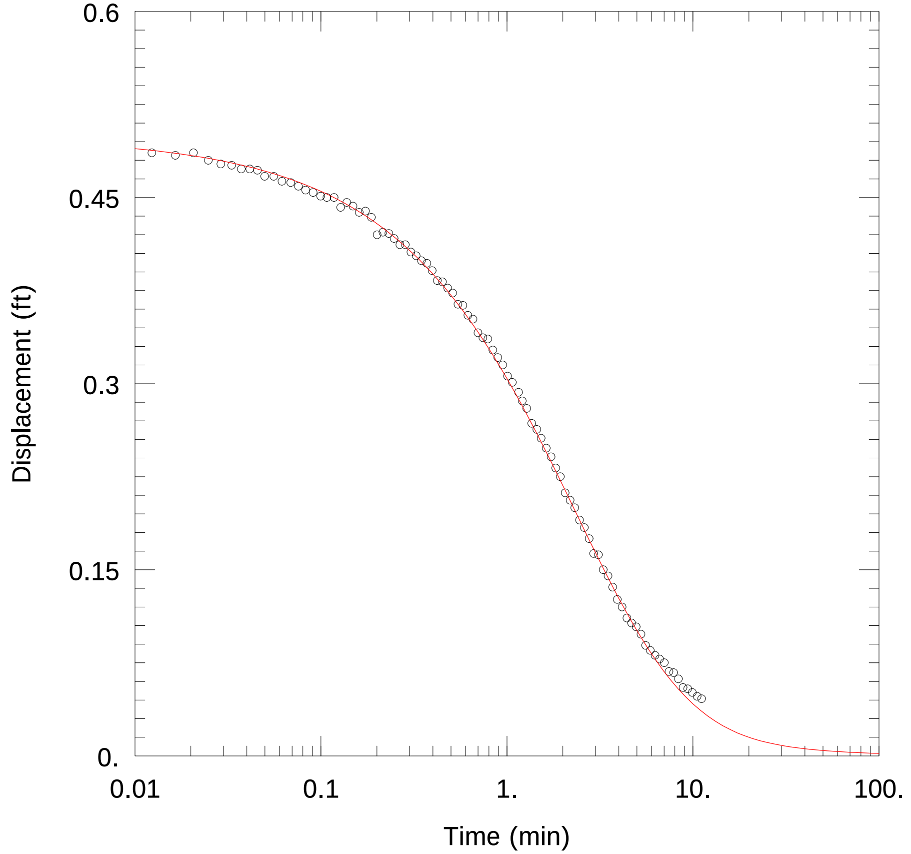
Slug Test
Aquifer Model: Unconfined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00045	cm/sec
Ss	0.002	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.1817 cm^2/sec



G402 @ ASH POND 2 – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G402
Test Date: 13 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00019 cm/sec
Ss = 0.001 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 13.25 ft

WELL DATA (G402)

Initial Displacement: 0.5 ft
Total Well Penetration Depth: 13.25 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 13.25 ft
Screen Length: 10. ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G402rh.aqt
Title: G402 @ Ash Pond 2 – Rising Head Test
Date: 11/28/16
Time: 09:41:57

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 13 Jun 2016
Test Well: G402

AQUIFER DATA

Saturated Thickness: 13.25 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G402

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.5 ft
Static Water Column Height: 13.25 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 10. ft
Total Well Penetration Depth: 13.25 ft

No. of Observations: 95

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
-0.0001503	0.49	0.2658	0.412	1.94	0.225
0.004016	0.51	0.2848	0.412	2.06	0.212
0.009716	0.481	0.3049	0.406	2.19	0.206
0.01235	0.486	0.3258	0.403	2.32	0.2
0.01652	0.484	0.3478	0.399	2.46	0.19
0.02068	0.486	0.3719	0.397	2.61	0.184
0.02485	0.48	0.3968	0.391	2.77	0.175
0.02902	0.477	0.4228	0.383	2.93	0.163
0.03318	0.476	0.4508	0.382	3.11	0.162
0.03735	0.473	0.4808	0.377	3.3	0.15
0.04152	0.473	0.5119	0.373	3.5	0.145
0.04568	0.472	0.5458	0.364	3.71	0.136
0.04985	0.467	0.5808	0.363	3.93	0.126

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.05585	0.467	0.6178	0.355	4.17	0.12
0.06185	0.463	0.6579	0.352	4.42	0.111
0.06885	0.462	0.6998	0.341	4.68	0.107
0.07585	0.459	0.7438	0.337	4.96	0.104
0.08285	0.456	0.7909	0.336	5.26	0.098
0.09085	0.454	0.8408	0.327	5.57	0.089
0.09985	0.451	0.8939	0.321	5.91	0.085
0.1079	0.45	0.9498	0.315	6.26	0.081
0.1179	0.45	1.01	0.306	6.63	0.078
0.1278	0.442	1.07	0.301	7.03	0.075
0.1379	0.446	1.157	0.293	7.45	0.068
0.1489	0.443	1.21	0.286	7.89	0.067
0.1608	0.438	1.28	0.28	8.36	0.062
0.1739	0.439	1.36	0.268	8.86	0.055
0.1868	0.434	1.45	0.263	9.39	0.054
0.2009	0.42	1.53	0.256	9.95	0.051
0.2158	0.422	1.63	0.248	10.55	0.048
0.2319	0.421	1.73	0.241	11.15	0.046
0.2478	0.417	1.83	0.232		

SOLUTION

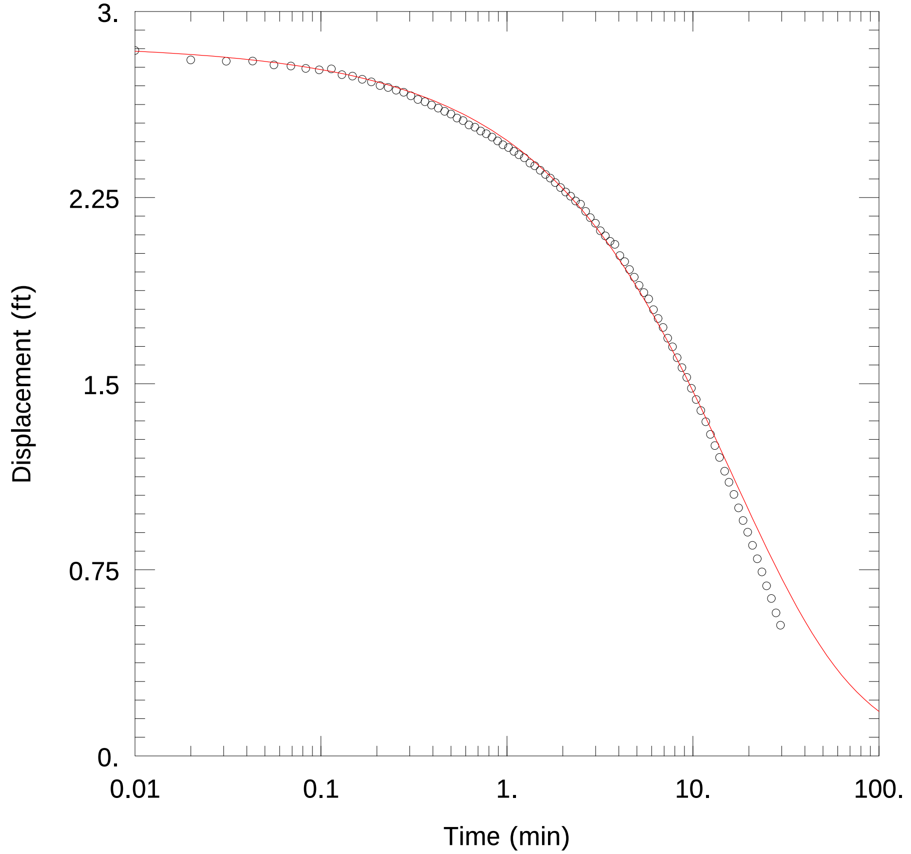
Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00019	cm/sec
Ss	0.001	ft^{-1}
Kz/Kr	1.	

$T = K*b = 0.07673\ cm^2/sec$



G403 @ ASH POND 2 – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G403
Test Date: 13 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 4.3E-5 cm/sec
Ss = 0.0075 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 13.99 ft

WELL DATA (G403)

Initial Displacement: 2.87 ft
Total Well Penetration Depth: 13.99 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 13.99 ft
Screen Length: 4.67 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G403fh.aqt
Title: G403 @ Ash Pond 2 – Falling Head Test
Date: 11/28/16
Time: 09:42:29

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 13 Jun 2016
Test Well: G403

AQUIFER DATA

Saturated Thickness: 13.99 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G403

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.87 ft
Static Water Column Height: 13.99 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.67 ft
Total Well Penetration Depth: 13.99 ft

No. of Observations: 91

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	2.798	0.832	2.493	5.792	1.841
0.01	2.842	0.892	2.478	6.142	1.798
0.02	2.804	0.952	2.462	6.512	1.762
0.031	2.799	1.022	2.451	6.912	1.726
0.043	2.8	1.092	2.436	7.332	1.683
0.056	2.784	1.162	2.422	7.772	1.648
0.069	2.78	1.242	2.41	8.242	1.604
0.083	2.77	1.332	2.389	8.742	1.564
0.098	2.764	1.412	2.378	9.272	1.525
0.114	2.768	1.512	2.36	9.832	1.481
0.13	2.745	1.612	2.343	10.43	1.436
0.148	2.739	1.712	2.328	11.03	1.391
0.167	2.726	1.822	2.31	11.73	1.346

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.187	2.716	1.942	2.29	12.43	1.295
0.208	2.701	2.072	2.272	13.13	1.25
0.23	2.693	2.202	2.255	13.93	1.202
0.254	2.682	2.342	2.236	14.83	1.147
0.279	2.674	2.492	2.223	15.63	1.102
0.305	2.66	2.652	2.194	16.63	1.053
0.333	2.645	2.812	2.169	17.63	0.999
0.363	2.636	2.992	2.146	18.63	0.948
0.394	2.622	3.182	2.116	19.73	0.901
0.428	2.61	3.382	2.095	20.93	0.848
0.463	2.597	3.592	2.073	22.23	0.794
0.5	2.586	3.812	2.061	23.53	0.741
0.54	2.57	4.052	2.016	24.93	0.685
0.582	2.56	4.302	1.991	26.43	0.634
0.626	2.542	4.562	1.96	28.03	0.576
0.673	2.533	4.842	1.929	29.63	0.526
0.723	2.518	5.142	1.896		
0.776	2.507	5.452	1.867		

SOLUTION

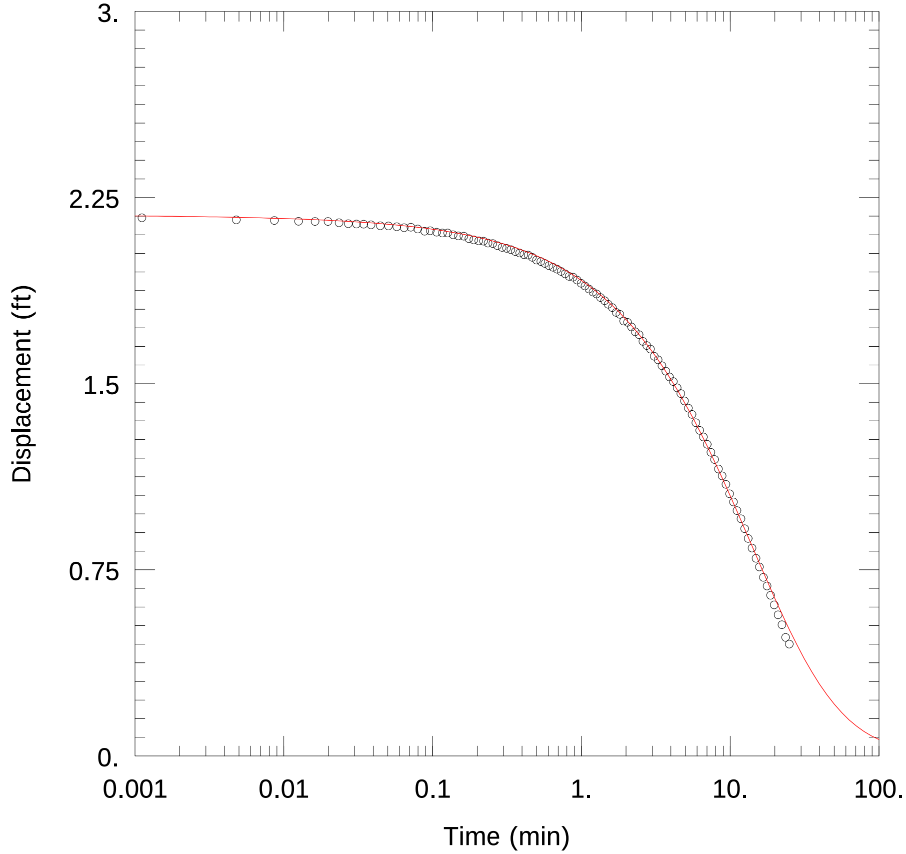
Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	4.3E-5	cm/sec
Ss	0.0075	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.01834 cm^2/sec



G403 @ ASH POND 2 – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G403
Test Date: 13 Jun 2016

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 7.2E-5 cm/sec
Ss = 0.0015 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 13.99 ft

WELL DATA (G403)

Initial Displacement: 2.18 ft
Total Well Penetration Depth: 13.99 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 13.99 ft
Screen Length: 4.67 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G403rh.aqt
Title: G403 @ Ash Pond 2 – Rising Head Test
Date: 11/28/16
Time: 09:42:50

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 13 Jun 2016
Test Well: G403

AQUIFER DATA

Saturated Thickness: 13.99 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G403

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.18 ft
Static Water Column Height: 13.99 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.67 ft
Total Well Penetration Depth: 13.99 ft

No. of Observations: 108

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	2.159	0.3607	2.032	3.289	1.596
0.001117	2.168	0.3857	2.026	3.489	1.572
0.004817	2.16	0.4117	2.02	3.699	1.55
0.008684	2.157	0.4397	2.018	3.919	1.527
0.0126	2.154	0.4697	2.009	4.159	1.508
0.01625	2.153	0.5007	1.998	4.409	1.483
0.0199	2.153	0.5347	1.992	4.669	1.46
0.02357	2.148	0.5697	1.984	4.949	1.43
0.02722	2.144	0.6067	1.975	5.249	1.401
0.03087	2.143	0.6467	1.969	5.559	1.376
0.03452	2.142	0.6887	1.961	5.899	1.342
0.03867	2.14	0.7327	1.952	6.249	1.311
0.04467	2.136	0.7797	1.942	6.619	1.285

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.05067	2.135	0.8297	1.932	7.019	1.255
0.05767	2.132	0.8827	1.929	7.439	1.223
0.06467	2.128	0.9387	1.917	7.879	1.194
0.07167	2.13	0.9987	1.904	8.349	1.156
0.07967	2.123	1.059	1.893	8.849	1.128
0.08867	2.114	1.129	1.881	9.379	1.094
0.09667	2.116	1.199	1.869	9.939	1.056
0.1067	2.11	1.269	1.861	10.54	1.023
0.1167	2.107	1.349	1.847	11.14	0.988
0.1267	2.107	1.439	1.834	11.84	0.955
0.1377	2.1	1.519	1.82	12.54	0.915
0.1497	2.095	1.619	1.806	13.24	0.876
0.1627	2.094	1.719	1.787	14.04	0.837
0.1757	2.084	1.819	1.779	14.94	0.796
0.1897	2.079	1.931	1.752	15.74	0.761
0.2047	2.075	2.049	1.747	16.74	0.719
0.2207	2.074	2.179	1.728	17.74	0.684
0.2367	2.066	2.309	1.709	18.74	0.647
0.2547	2.064	2.449	1.697	19.84	0.608
0.2737	2.056	2.599	1.67	21.04	0.568
0.2937	2.049	2.759	1.653	22.34	0.528
0.3147	2.045	2.919	1.639	23.64	0.477
0.3367	2.04	3.099	1.61	25.04	0.45

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	7.2E-5	cm/sec
Ss	0.0015	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.0307 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	7.191E-5	5.079E-6	+/- 1.007E-5	14.16	cm/sec
Ss	0.001636	0.0003018	+/- 0.0005986	5.42	ft^{-1}
Kz/Kr	1.	1.686	+/- 3.343	0.5931	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.03066 cm^2/sec

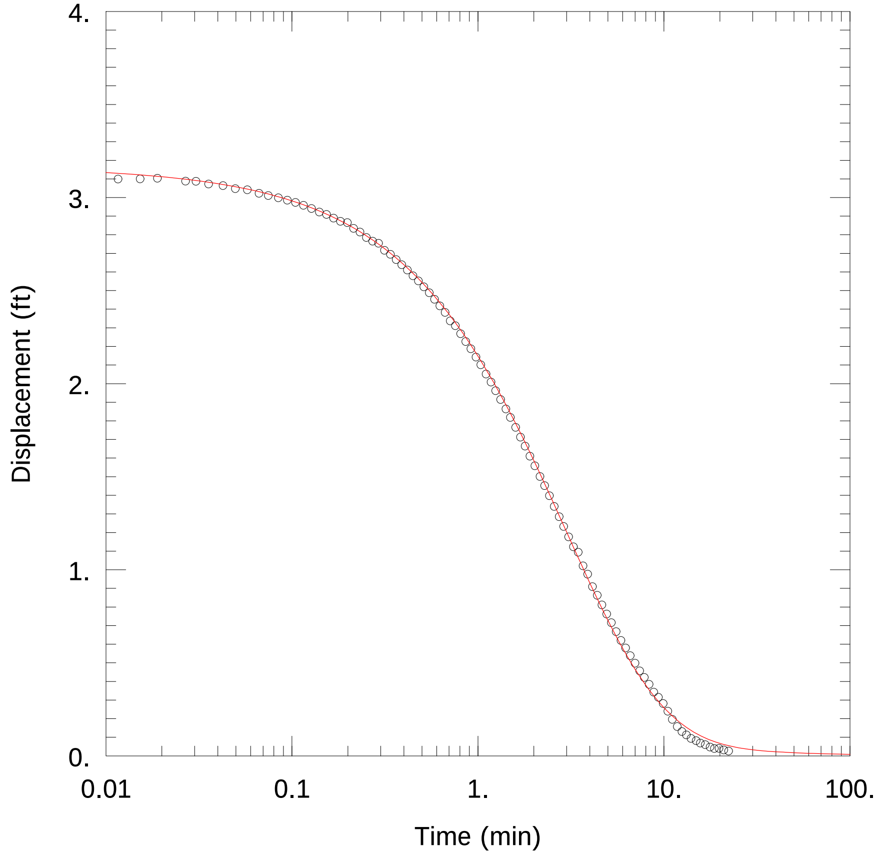
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-0.98
Ss	-0.99	1.00	0.94
Kz/Kr	-0.98	0.94	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.01972 ft^2
Variance . . . . 0.0001878 ft^2
Std. Deviation . . . . 0.01371 ft
Mean. . . . . -0.004 ft
No. of Residuals 108
No. of Estimates 3



G404 @ ASH POND 2 – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G404
Test Date: 13 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00042 cm/sec
Ss = 0.00033 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 8.95 ft

WELL DATA (G404)

Initial Displacement: 3.17 ft
Total Well Penetration Depth: 8.95 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 8.95 ft
Screen Length: 4.75 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G404fh.aqt
Title: G404 @ Ash Pond 2 – Falling Head Test
Date: 11/28/16
Time: 09:43:12

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 13 Jun 2016
Test Well: G404

AQUIFER DATA

Saturated Thickness: 8.95 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G404

X Location: 1. ft
Y Location: 0. ft

Initial Displacement: 3.17 ft
Static Water Column Height: 8.95 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.75 ft
Total Well Penetration Depth: 8.95 ft

No. of Observations: 99

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	3.136	0.4477	2.579	3.467	1.094
0.007967	3.119	0.4787	2.552	3.677	1.021
0.01163	3.099	0.5127	2.52	3.897	0.976
0.0153	3.1	0.5476	2.488	4.137	0.909
0.01895	3.103	0.5847	2.453	4.387	0.862
0.02685	3.088	0.6247	2.418	4.647	0.811
0.03055	3.087	0.6667	2.382	4.927	0.762
0.03567	3.072	0.7107	2.337	5.227	0.715
0.04267	3.064	0.7577	2.311	5.537	0.667
0.04967	3.047	0.8077	2.268	5.877	0.62
0.05767	3.041	0.8607	2.226	6.227	0.579
0.06667	3.022	0.9166	2.187	6.597	0.538
0.07467	3.01	0.9767	2.142	6.997	0.498

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.08467	2.998	1.037	2.101	7.417	0.456
0.09467	2.985	1.107	2.051	7.857	0.421
0.1047	2.973	1.177	2.008	8.327	0.384
0.1157	2.958	1.247	1.962	8.827	0.342
0.1277	2.941	1.327	1.914	9.357	0.314
0.1407	2.922	1.417	1.864	9.917	0.281
0.1537	2.909	1.497	1.818	10.52	0.24
0.1677	2.889	1.597	1.765	11.12	0.196
0.1827	2.872	1.697	1.712	11.82	0.157
0.1986	2.865	1.797	1.664	12.52	0.13
0.2147	2.834	1.907	1.61	13.22	0.112
0.2327	2.814	2.027	1.558	14.02	0.093
0.2517	2.785	2.157	1.501	14.93	0.081
0.2717	2.765	2.287	1.452	15.72	0.068
0.2927	2.754	2.427	1.397	16.72	0.06
0.3147	2.716	2.577	1.34	17.72	0.047
0.3387	2.695	2.737	1.285	18.72	0.039
0.3637	2.666	2.897	1.232	19.82	0.04
0.3897	2.639	3.077	1.176	21.02	0.031
0.4177	2.61	3.267	1.123	22.32	0.025

SOLUTION

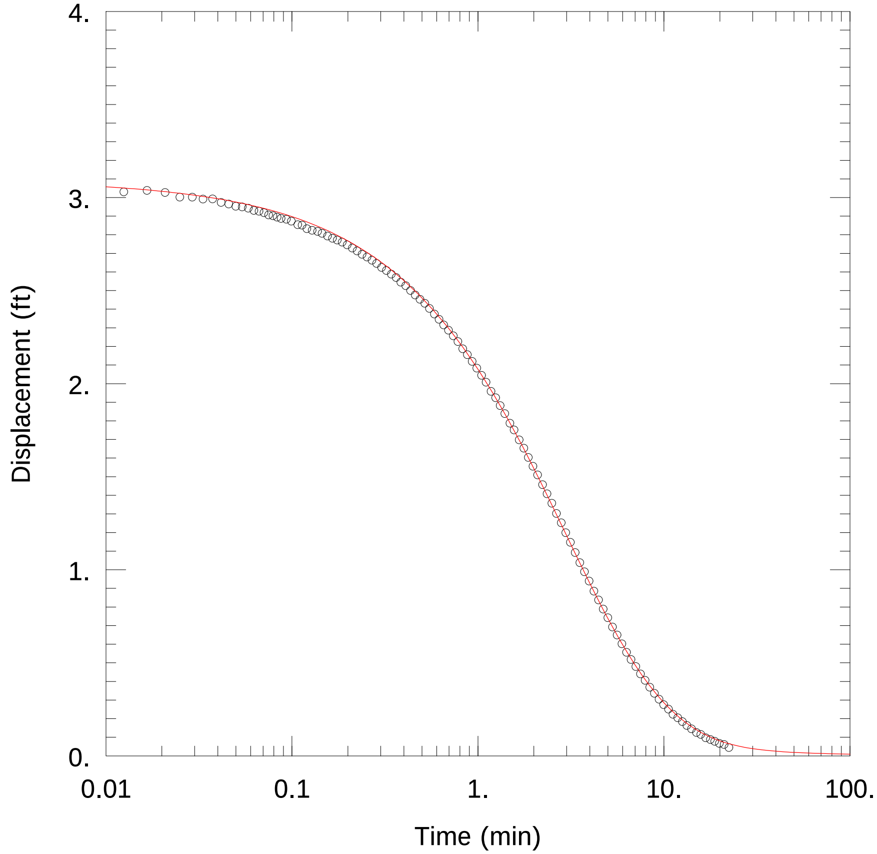
Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00042	cm/sec
Ss	0.00033	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.1146 cm^2/sec



G404 @ ASH POND 2 – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G404
Test Date: 13 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00038 cm/sec
Ss = 0.0007 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 8.95 ft

WELL DATA (G404)

Initial Displacement: 3.1 ft
Total Well Penetration Depth: 8.95 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 8.95 ft
Screen Length: 4.75 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G404rh.aqt
Title: G404 @ Ash Pond 2 – Rising Head Test
Date: 11/28/16
Time: 09:43:34

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 13 Jun 2016
Test Well: G404

AQUIFER DATA

Saturated Thickness: 8.95 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G404

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 3.1 ft
Static Water Column Height: 8.95 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.75 ft
Total Well Penetration Depth: 8.95 ft

No. of Observations: 116

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	3.022	0.2695	2.663	2.648	1.302
0.004167	3.042	0.2855	2.646	2.807	1.252
0.008333	3.052	0.3035	2.624	2.967	1.199
0.0125	3.03	0.3225	2.608	3.147	1.147
0.01667	3.038	0.3425	2.588	3.337	1.092
0.02083	3.027	0.3635	2.57	3.537	1.038
0.025	3.002	0.3855	2.545	3.747	0.989
0.02917	3.002	0.4095	2.526	3.967	0.939
0.03333	2.991	0.4345	2.5	4.207	0.885
0.0375	2.992	0.4605	2.476	4.457	0.837
0.04167	2.973	0.4885	2.453	4.717	0.788
0.04583	2.965	0.5185	2.431	4.997	0.742
0.05	2.953	0.5495	2.404	5.297	0.692

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.05417	2.949	0.5835	2.374	5.607	0.649
0.05833	2.942	0.6185	2.345	5.947	0.602
0.0625	2.93	0.6555	2.315	6.297	0.556
0.06667	2.926	0.6955	2.287	6.667	0.517
0.07083	2.918	0.7375	2.257	7.067	0.48
0.075	2.906	0.7815	2.226	7.487	0.44
0.07917	2.902	0.8285	2.187	7.927	0.406
0.08333	2.894	0.8785	2.155	8.397	0.369
0.0875	2.887	0.9315	2.119	8.897	0.336
0.0935	2.883	0.9875	2.083	9.428	0.304
0.0995	2.873	1.047	2.044	9.987	0.275
0.1075	2.854	1.107	2.007	10.59	0.251
0.1135	2.851	1.178	1.958	11.19	0.223
0.1205	2.832	1.247	1.924	11.89	0.204
0.1286	2.824	1.317	1.882	12.59	0.184
0.1375	2.818	1.397	1.839	13.29	0.163
0.1455	2.807	1.488	1.787	14.09	0.145
0.1555	2.793	1.567	1.751	14.99	0.125
0.1655	2.781	1.668	1.698	15.79	0.115
0.1755	2.771	1.767	1.653	16.79	0.097
0.1865	2.76	1.867	1.603	17.79	0.087
0.1985	2.745	1.978	1.556	18.79	0.078
0.2115	2.728	2.097	1.509	19.89	0.067
0.2245	2.713	2.227	1.457	21.09	0.061
0.2385	2.695	2.357	1.408	22.39	0.044
0.2535	2.68	2.498	1.357		

SOLUTION

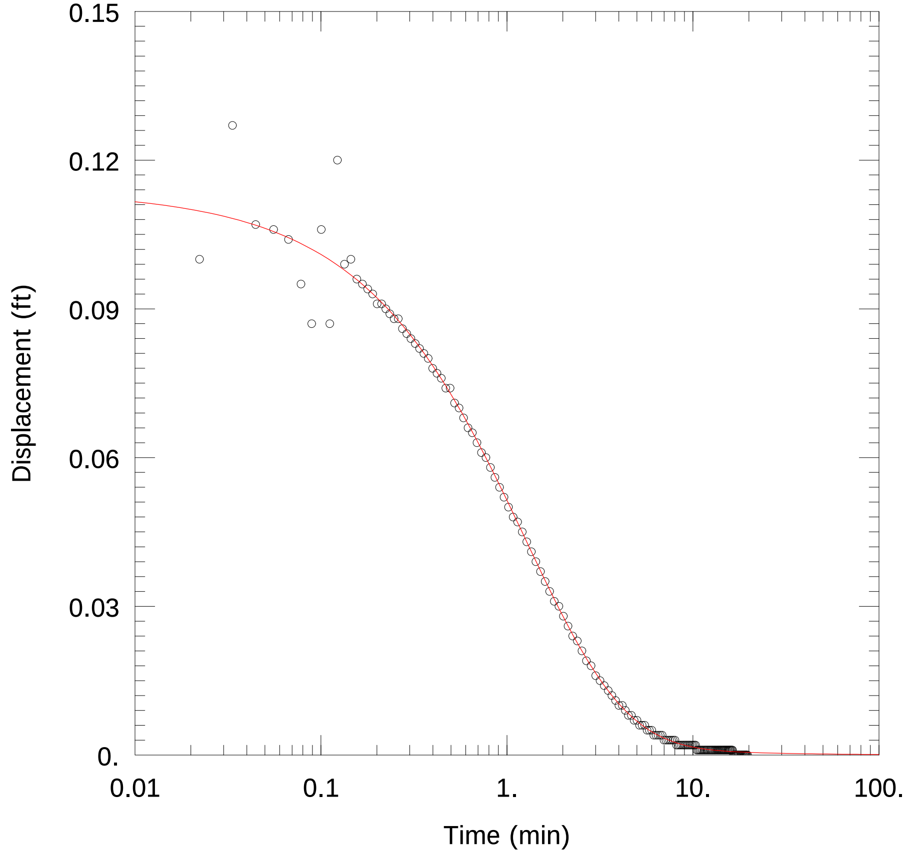
Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00038	cm/sec
Ss	0.0007	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.1037 cm^2/sec



G405 @ ASH POND 2 – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G405
Test Date: 13 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00098 cm/sec
Ss = 0.00037 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 11.12 ft

WELL DATA (G405)

Initial Displacement: 0.114 ft
Total Well Penetration Depth: 11.12 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 11.12 ft
Screen Length: 4.75 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G405fh2.aqt
Title: G405 @ Ash Pond 2 – Falling Head Test
Date: 11/28/16
Time: 09:43:55

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 13 Jun 2016
Test Well: G405

AQUIFER DATA

Saturated Thickness: 11.12 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G405

X Location: 1. ft
Y Location: 0. ft

Initial Displacement: 0.114 ft
Static Water Column Height: 11.12 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.75 ft
Total Well Penetration Depth: 11.12 ft

No. of Observations: 166

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.0223	0.1	1.799	0.031	10.84	0.001
0.0335	0.127	1.904	0.03	11.01	0.001
0.0447	0.107	2.016	0.028	11.17	0.001
0.0558	0.106	2.134	0.026	11.34	0.001
0.067	0.104	2.259	0.024	11.51	0.001
0.0782	0.095	2.392	0.023	11.67	0.001
0.0893	0.087	2.532	0.021	11.84	0.001
0.1005	0.106	2.681	0.019	12.01	0.001
0.1117	0.087	2.838	0.018	12.17	0.001
0.1228	0.12	3.005	0.016	12.34	0.001
0.134	0.099	3.172	0.015	12.51	0.001
0.1452	0.1	3.338	0.014	12.67	0.001
0.1563	0.096	3.505	0.013	12.84	0.001

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.1675	0.095	3.672	0.012	13.01	0.001
0.1787	0.094	3.838	0.011	13.17	0.001
0.1898	0.093	4.005	0.01	13.34	0.001
0.201	0.091	4.172	0.01	13.51	0.001
0.2122	0.091	4.338	0.009	13.67	0.001
0.2233	0.09	4.505	0.008	13.84	0.001
0.235	0.089	4.672	0.008	14.01	0.001
0.2475	0.088	4.838	0.007	14.17	0.001
0.2607	0.088	5.005	0.007	14.34	0.001
0.2747	0.086	5.172	0.006	14.51	0.001
0.2895	0.085	5.338	0.006	14.67	0.001
0.3052	0.084	5.505	0.006	14.84	0.001
0.3218	0.083	5.672	0.005	15.01	0.001
0.3395	0.082	5.838	0.005	15.17	0.001
0.3582	0.081	6.005	0.005	15.34	0.001
0.378	0.08	6.172	0.004	15.51	0.001
0.399	0.078	6.338	0.004	15.67	0.001
0.4212	0.077	6.505	0.004	15.84	0.001
0.4447	0.076	6.672	0.004	16.	0.001
0.4695	0.074	6.838	0.004	16.17	0.001
0.4958	0.074	7.005	0.003	16.34	0.001
0.5238	0.071	7.172	0.003	16.5	0.
0.5535	0.07	7.338	0.003	16.67	0.
0.5848	0.068	7.505	0.003	16.84	0.
0.618	0.066	7.672	0.003	17.	0.
0.6532	0.065	7.838	0.003	17.17	0.
0.6905	0.063	8.005	0.003	17.34	0.
0.73	0.061	8.172	0.002	17.5	0.
0.7718	0.06	8.338	0.002	17.67	0.
0.8162	0.058	8.505	0.002	17.84	0.
0.8632	0.056	8.672	0.002	18.	0.
0.913	0.054	8.838	0.002	18.17	0.
0.9657	0.052	9.005	0.002	18.34	0.
1.022	0.05	9.172	0.002	18.5	0.
1.081	0.048	9.338	0.002	18.67	0.
1.143	0.047	9.505	0.002	18.84	0.
1.21	0.045	9.672	0.002	19.	0.
1.28	0.043	9.838	0.002	19.17	0.
1.355	0.041	10.01	0.002	19.34	0.
1.434	0.039	10.17	0.002	19.5	0.
1.517	0.037	10.34	0.002	19.67	0.
1.606	0.035	10.51	0.001		
1.7	0.033	10.67	0.001		

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00098	cm/sec
Ss	0.00037	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.3322 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0009828	0.0002457	+/- 0.0004853	4.	cm/sec
Ss	0.0003762	0.0004077	+/- 0.0008052	0.9227	ft^{-1}
Kz/Kr	1.	2.807	+/- 5.544	0.3562	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.3331 cm²/sec

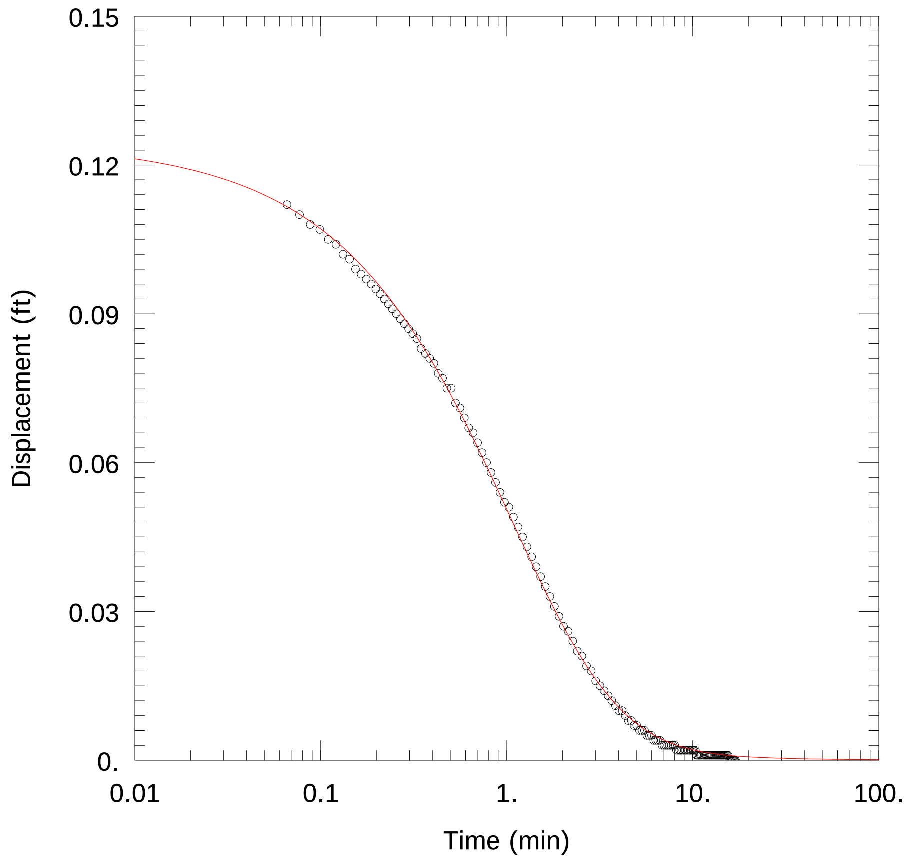
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.99	-0.99
Ss	-0.99	1.00	0.97
Kz/Kr	-0.99	0.97	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.001412 ft^2
Variance . . . . 8.661E-6 ft^2
Std. Deviation . . . . 0.002943 ft
Mean. . . . . -3.208E-5 ft
No. of Residuals 166
No. of Estimates 3



G405 @ ASH POND 2 – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G405
Test Date: 13 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.00097 cm/sec
Ss = 0.0012 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 11.12 ft

WELL DATA (G405)

Initial Displacement: 0.125 ft
Total Well Penetration Depth: 11.12 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 11.12 ft
Screen Length: 4.75 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\G405rh2.aqt
Title: G405 @ Ash Pond 2 – Rising Head Test
Date: 11/28/16
Time: 09:44:19

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 13 Jun 2016
Test Well: G405

AQUIFER DATA

Saturated Thickness: 11.12 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G405

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.125 ft
Static Water Column Height: 11.12 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.75 ft
Total Well Penetration Depth: 11.12 ft

No. of Observations: 147

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.066	0.112	1.441	0.039	9.013	0.002
0.077	0.11	1.525	0.037	9.179	0.002
0.088	0.108	1.613	0.035	9.346	0.002
0.099	0.107	1.707	0.033	9.513	0.002
0.11	0.105	1.807	0.031	9.679	0.002
0.121	0.104	1.912	0.029	9.846	0.002
0.132	0.102	2.023	0.027	10.01	0.002
0.143	0.101	2.142	0.026	10.18	0.002
0.154	0.099	2.267	0.024	10.35	0.002
0.165	0.098	2.399	0.022	10.51	0.001
0.176	0.097	2.54	0.021	10.68	0.001
0.187	0.096	2.688	0.019	10.85	0.001
0.198	0.095	2.846	0.018	11.01	0.001

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.209	0.094	3.013	0.016	11.18	0.001
0.22	0.093	3.179	0.015	11.35	0.001
0.231	0.092	3.346	0.014	11.51	0.001
0.2427	0.091	3.513	0.013	11.68	0.001
0.2552	0.09	3.679	0.012	11.85	0.001
0.2683	0.089	3.846	0.011	12.01	0.001
0.2823	0.088	4.013	0.01	12.18	0.001
0.2972	0.087	4.179	0.01	12.35	0.001
0.3128	0.086	4.346	0.009	12.51	0.001
0.3295	0.085	4.513	0.008	12.68	0.001
0.3472	0.083	4.679	0.008	12.85	0.001
0.3658	0.082	4.846	0.007	13.01	0.001
0.3857	0.081	5.013	0.007	13.18	0.001
0.4067	0.08	5.179	0.006	13.35	0.001
0.4288	0.078	5.346	0.006	13.51	0.001
0.4523	0.077	5.513	0.006	13.68	0.001
0.4772	0.075	5.679	0.005	13.85	0.001
0.5035	0.075	5.846	0.005	14.01	0.001
0.5315	0.072	6.013	0.005	14.18	0.001
0.5612	0.071	6.179	0.004	14.35	0.001
0.5925	0.069	6.346	0.004	14.51	0.001
0.6257	0.067	6.513	0.004	14.68	0.001
0.6608	0.066	6.679	0.004	14.85	0.001
0.6982	0.064	6.846	0.003	15.01	0.001
0.7377	0.062	7.013	0.003	15.18	0.001
0.7795	0.06	7.179	0.003	15.35	0.001
0.8238	0.058	7.346	0.003	15.51	0.001
0.8708	0.056	7.513	0.003	15.68	0.
0.9207	0.054	7.679	0.003	15.85	0.
0.9733	0.052	7.846	0.003	16.01	0.
1.029	0.051	8.013	0.003	16.18	0.
1.088	0.049	8.179	0.002	16.35	0.
1.151	0.047	8.346	0.002	16.51	0.
1.217	0.045	8.513	0.002	16.68	0.
1.288	0.043	8.679	0.002	16.85	0.
1.362	0.041	8.846	0.002	17.01	0.

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00097	cm/sec
Ss	0.0012	ft^{-1}

Kz/Kr	1.

T = K*b = 0.3288 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0009567	3.216E-5	+/- 6.357E-5	29.75	cm/sec
Ss	0.001278	0.0001631	+/- 0.0003224	7.835	ft^{-1}
Kz/Kr	1.	0.4379	+/- 0.8657	2.284	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.3243 cm²/sec

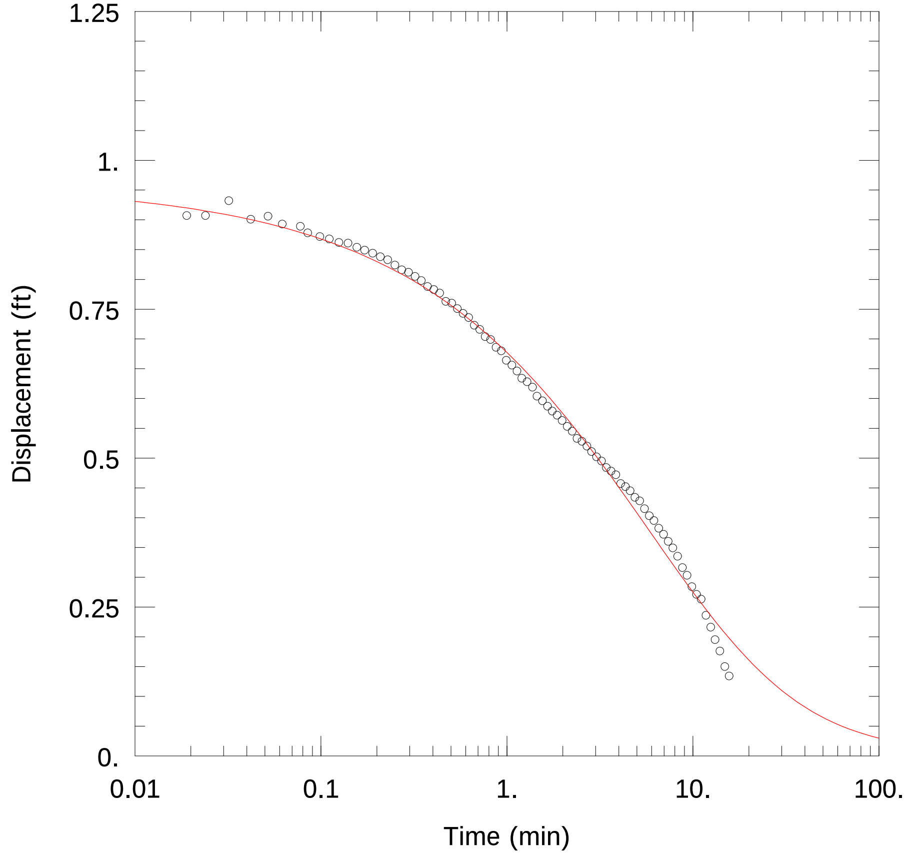
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.98	-0.96
Ss	-0.98	1.00	0.92
Kz/Kr	-0.96	0.92	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 9.007E-5 ft^2
Variance . . . . 6.255E-7 ft^2
Std. Deviation . . . . 0.0007909 ft
Mean. . . . . -0.0003511 ft
No. of Residuals 147
No. of Estimates 3



R104 @ CCR LANDFILL – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: R104
Test Date: 15 Jun 2016

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 7.0E-5 cm/sec
Ss = 0.045 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 14.17 ft

WELL DATA (R104)

Initial Displacement: 0.96 ft
Total Well Penetration Depth: 14.17 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 14.17 ft
Screen Length: 4.43 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\R104fh.aqt
Title: R104 @ CCR Landfill – Falling Head Test
Date: 11/28/16
Time: 10:46:31

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 15 Jun 2016
Test Well: R104

AQUIFER DATA

Saturated Thickness: 14.17 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: R104

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.96 ft
Static Water Column Height: 14.17 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.43 ft
Total Well Penetration Depth: 14.17 ft

No. of Observations: 91

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
-0.03432	1.004	0.405	0.783	3.034	0.502
-0.03015	0.97	0.436	0.777	3.224	0.495
-0.02598	0.932	0.47	0.763	3.424	0.484
-0.01998	0.905	0.505	0.76	3.634	0.478
-0.01398	0.897	0.542	0.751	3.854	0.472
-0.006983	0.913	0.582	0.743	4.094	0.457
0.	0.909	0.624	0.736	4.344	0.452
0.007	0.907	0.668	0.723	4.604	0.445
0.01902	0.907	0.715	0.716	4.884	0.434
0.024	0.907	0.765	0.704	5.184	0.428
0.032	0.932	0.818	0.699	5.494	0.415
0.04202	0.901	0.874	0.686	5.834	0.403
0.05202	0.906	0.934	0.68	6.184	0.395

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.062	0.893	0.994	0.664	6.554	0.382
0.07762	0.889	1.064	0.656	6.954	0.372
0.085	0.878	1.134	0.646	7.374	0.36
0.09885	0.872	1.204	0.634	7.814	0.349
0.111	0.868	1.284	0.628	8.284	0.335
0.125	0.862	1.374	0.619	8.784	0.316
0.14	0.861	1.454	0.604	9.314	0.303
0.156	0.854	1.554	0.596	9.874	0.284
0.172	0.849	1.654	0.587	10.47	0.271
0.19	0.844	1.754	0.579	11.07	0.263
0.209	0.838	1.864	0.572	11.77	0.236
0.229	0.833	1.984	0.563	12.47	0.216
0.25	0.824	2.114	0.553	13.17	0.195
0.2722	0.816	2.244	0.545	13.97	0.176
0.296	0.812	2.384	0.533	14.87	0.15
0.321	0.805	2.534	0.528	15.67	0.134
0.347	0.798	2.694	0.52		
0.375	0.788	2.854	0.511		

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	7.0E-5	cm/sec
Ss	0.045	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.03023 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	6.961E-5	2.932E-5	+/- 5.826E-5	2.374	cm/sec
Ss	0.04481	0.0257	+/- 0.05106	1.744	ft^{-1}
Kz/Kr	1.	31.19	+/- 61.98	0.03206	

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.03006 cm²/sec

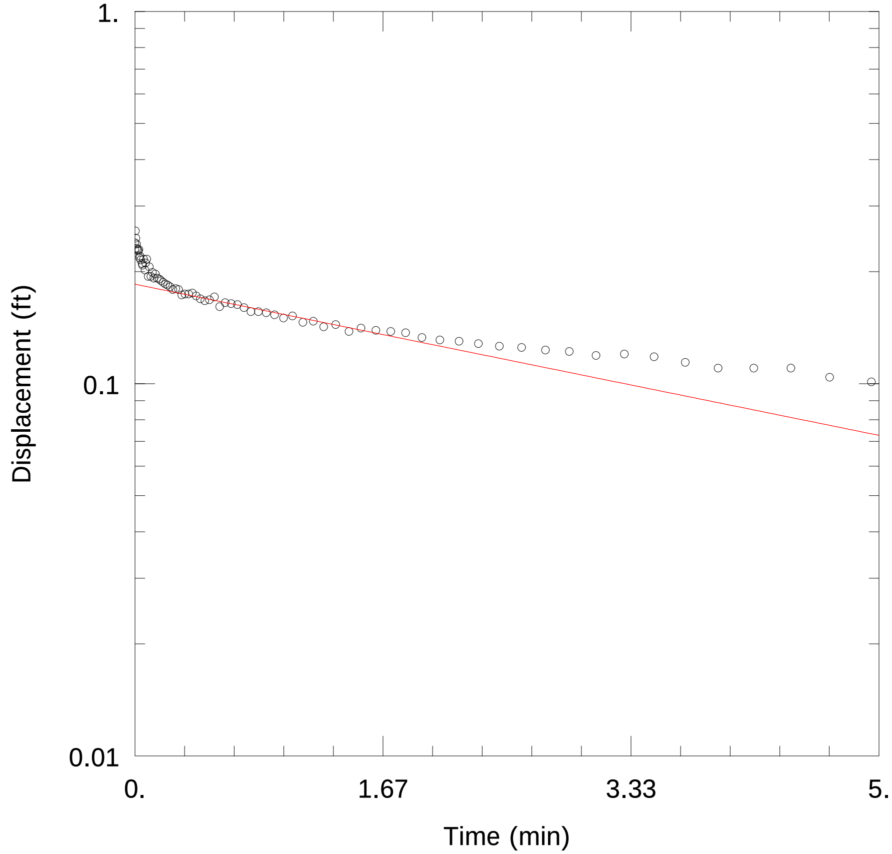
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-1.00	-0.99
Ss	-1.00	1.00	0.97
Kz/Kr	-0.99	0.97	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.04042 ft^2
Variance . . . . 0.0004593 ft^2
Std. Deviation . . . . 0.02143 ft
Mean. . . . . -0.002289 ft
No. of Residuals 91
No. of Estimates. 3



R104 @CCR LANDFILL – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: R104
Test Date: 15 Jun 2016

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.00028 cm/sec
y0 = 0.185 ft

AQUIFER DATA

Saturated Thickness: 14.17 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (R104)

Initial Displacement: 0.23 ft
Total Well Penetration Depth: 14.17 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 14.17 ft
Screen Length: 4.43 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\R104rh.aqt
Title: R104 @CCR Landfill – Rising Head Test
Date: 12/01/16
Time: 09:05:00

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 15 Jun 2016
Test Well: R104

AQUIFER DATA

Saturated Thickness: 14.17 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: R104

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.23 ft
Static Water Column Height: 14.17 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.43 ft
Total Well Penetration Depth: 14.17 ft

No. of Observations: 93

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	0.239	0.2745	0.18	1.929	0.133
0.00365	0.257	0.2945	0.179	2.049	0.131
0.007317	0.246	0.3155	0.173	2.179	0.13
0.01098	0.237	0.3375	0.174	2.309	0.128
0.01465	0.231	0.3615	0.174	2.449	0.126
0.01863	0.229	0.3865	0.175	2.599	0.125
0.0228	0.227	0.4125	0.172	2.759	0.123
0.02697	0.229	0.4405	0.169	2.919	0.122
0.03113	0.218	0.4705	0.167	3.099	0.119
0.0353	0.22	0.5015	0.168	3.289	0.12
0.03947	0.215	0.5355	0.171	3.489	0.118
0.04867	0.21	0.5705	0.161	3.699	0.114
0.05237	0.208	0.6075	0.165	3.919	0.11

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.05847	0.216	0.6475	0.164	4.159	0.11
0.06835	0.202	0.6895	0.163	4.409	0.11
0.07247	0.211	0.7335	0.16	4.669	0.104
0.08047	0.216	0.7805	0.156	4.949	0.101
0.08947	0.194	0.8305	0.156	5.249	0.1
0.09748	0.206	0.8835	0.155	5.559	0.1
0.108	0.194	0.9395	0.153	5.899	0.096
0.1175	0.199	0.9995	0.15	6.249	0.093
0.1275	0.192	1.059	0.152	6.619	0.089
0.1385	0.197	1.129	0.146	7.019	0.086
0.1505	0.192	1.199	0.147	7.439	0.085
0.1635	0.191	1.269	0.142	7.879	0.076
0.1765	0.189	1.349	0.144	8.349	0.073
0.1905	0.187	1.439	0.138	8.849	0.072
0.2055	0.185	1.519	0.141	9.379	0.066
0.2215	0.184	1.619	0.139	9.939	0.059
0.2375	0.182	1.719	0.138	10.54	0.06
0.2555	0.179	1.819	0.137	11.14	0.051

SOLUTION

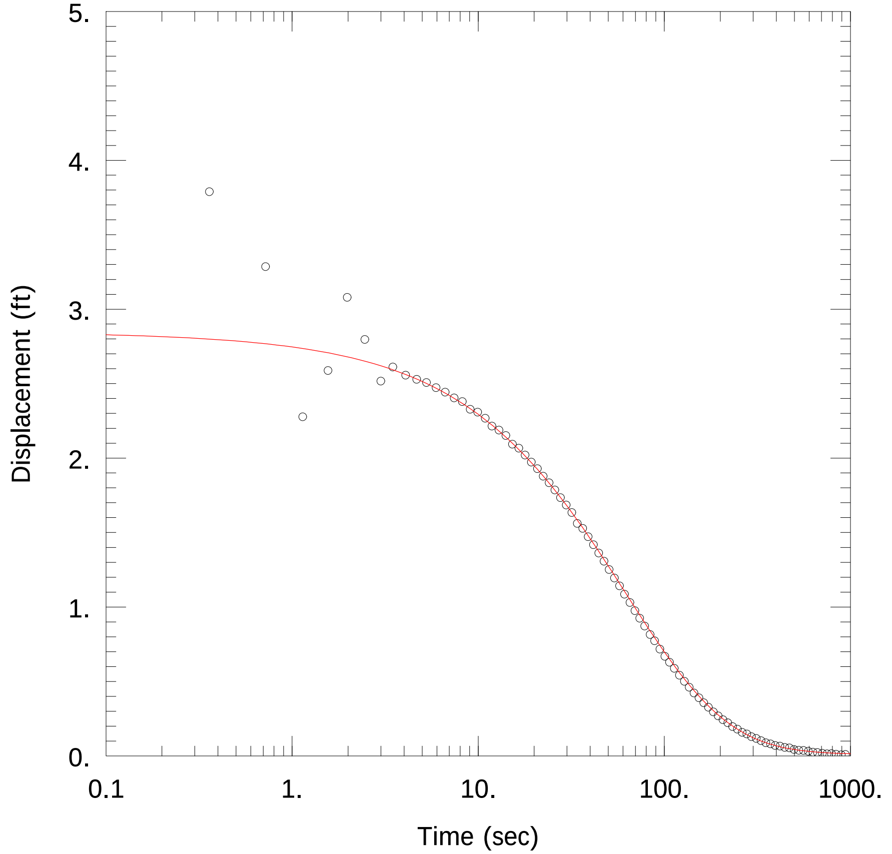
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 3.761

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.00028	cm/sec
y0	0.185	ft

T = K*b = 0.1209 cm²/sec



T127 @ CCR LANDFILL – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: T127
Test Date: 14 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 0.0012 cm/sec
Ss = 0.0005 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 10.28 ft

WELL DATA (T127)

Initial Displacement: 2.85 ft
Total Well Penetration Depth: 10.28 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 10.28 ft
Screen Length: 4.54 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\T127fh.aqt
Title: T127 @ CCR Landfill – Falling Head Test
Date: 11/28/16
Time: 09:44:57

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 14 Jun 2016
Test Well: T127

AQUIFER DATA

Saturated Thickness: 10.28 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: T127

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 2.85 ft
Static Water Column Height: 10.28 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.54 ft
Total Well Penetration Depth: 10.28 ft

No. of Observations: 89

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	4.12	27.72	1.734	183.6	0.295
0.36	3.789	29.76	1.684	195.	0.268
0.721	3.285	31.86	1.634	207.	0.242
1.141	2.277	34.08	1.561	219.6	0.222
1.56	2.588	36.48	1.527	232.8	0.196
1.98	3.079	39.	1.471	247.2	0.179
2.461	2.796	41.64	1.418	262.2	0.157
3.	2.517	44.46	1.362	278.	0.147
3.48	2.611	47.46	1.307	294.6	0.129
4.08	2.556	50.64	1.251	312.6	0.117
4.681	2.528	54.	1.194	331.2	0.102
5.28	2.507	57.6	1.141	351.6	0.088
5.94	2.473	61.2	1.086	372.6	0.08

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
6.66	2.442	65.4	1.03	394.8	0.069
7.44	2.404	69.6	0.975	418.8	0.065
8.22	2.379	73.8	0.924	444.	0.056
9.06	2.327	78.6	0.871	470.4	0.053
9.96	2.308	84.	0.815	498.6	0.042
10.92	2.267	88.8	0.773	528.6	0.037
11.88	2.214	94.8	0.717	560.4	0.036
12.96	2.188	100.8	0.668	594.	0.031
14.1	2.151	106.8	0.628	630.	0.024
15.3	2.093	113.4	0.588	666.	0.022
16.56	2.066	120.6	0.541	708.	0.017
17.88	2.02	128.4	0.501	750.	0.013
19.32	1.973	136.2	0.461	792.	0.015
20.82	1.928	144.6	0.422	840.	0.01
22.38	1.878	153.6	0.39	894.2	0.007
24.06	1.834	163.2	0.356	942.	0.009
25.86	1.786	172.8	0.326		

SOLUTION

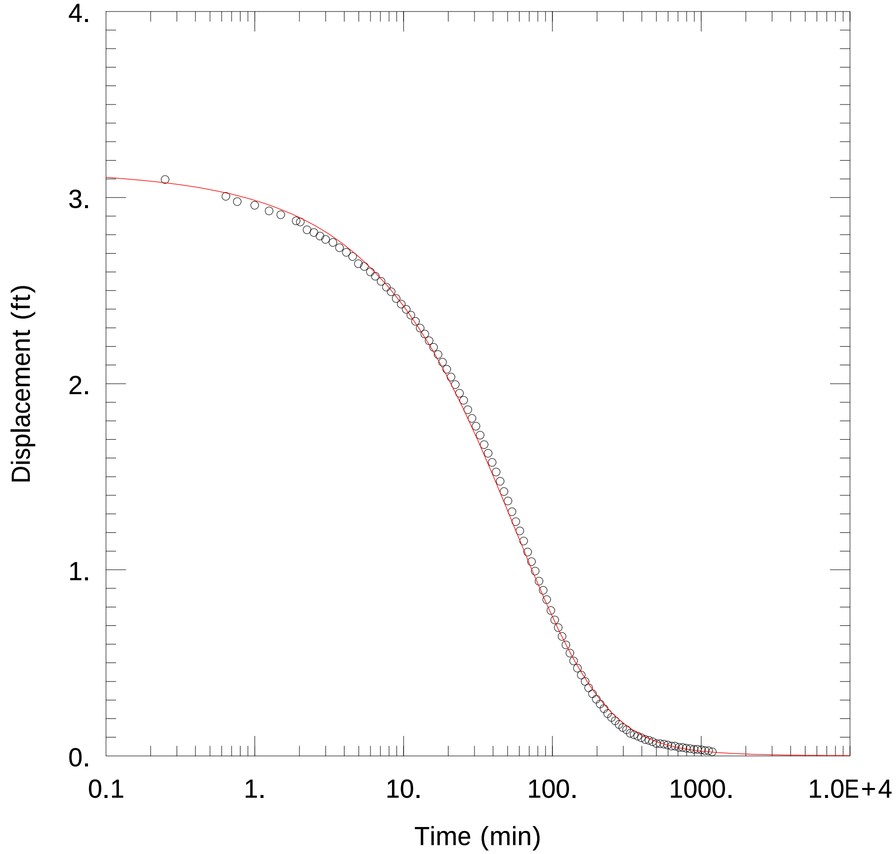
Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.0012	cm/sec
Ss	0.0005	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.376 cm²/sec



T127 @ CCR LANDFILL – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: T127
Test Date: 14 Jun 2016

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 1.7E-5 cm/sec
Ss = 0.0025 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 10.28 ft

WELL DATA (T127)

Initial Displacement: 3.15 ft
Total Well Penetration Depth: 10.28 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 10.28 ft
Screen Length: 4.54 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\T127rh.aqt
Title: T127 @ CCR Landfill – Rising Head Test
Date: 11/28/16
Time: 09:45:21

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 14 Jun 2016
Test Well: T127

AQUIFER DATA

Saturated Thickness: 10.28 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: T127

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 3.15 ft
Static Water Column Height: 10.28 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.54 ft
Total Well Penetration Depth: 10.28 ft

No. of Observations: 105

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	3.236	19.56	2.077	166.2	0.4
0.25	3.096	20.88	2.035	175.8	0.365
0.641	3.006	22.32	1.994	186.6	0.333
0.764	2.978	23.82	1.948	198.	0.304
1.	2.958	25.38	1.91	210.	0.278
1.25	2.928	27.06	1.859	222.6	0.253
1.5	2.907	28.86	1.813	235.8	0.227
1.903	2.874	30.72	1.771	250.2	0.206
2.027	2.868	32.76	1.723	265.2	0.188
2.25	2.826	34.86	1.672	280.8	0.168
2.5	2.812	37.08	1.625	297.6	0.152
2.75	2.793	39.48	1.576	315.6	0.14
3.	2.775	42.	1.525	334.2	0.121

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
3.36	2.758	44.64	1.475	354.8	0.113
3.72	2.73	47.46	1.42	375.6	0.105
4.14	2.705	50.46	1.369	397.8	0.097
4.56	2.683	53.64	1.311	421.8	0.087
4.98	2.644	57.	1.258	447.	0.083
5.46	2.629	60.6	1.208	473.4	0.075
6.	2.6	64.2	1.154	501.6	0.066
6.48	2.577	68.4	1.095	531.6	0.065
7.08	2.549	72.6	1.043	563.4	0.062
7.68	2.518	76.8	0.992	597.	0.058
8.28	2.493	81.6	0.938	633.	0.052
8.94	2.457	87.	0.889	669.	0.052
9.66	2.427	91.8	0.839	711.	0.045
10.44	2.399	97.8	0.781	753.	0.044
11.22	2.368	103.8	0.73	795.	0.041
12.06	2.334	109.8	0.689	843.	0.038
12.96	2.298	116.4	0.641	897.	0.035
13.92	2.266	123.6	0.596	945.	0.035
14.88	2.23	131.4	0.552	1005.	0.032
15.96	2.195	139.2	0.51	1065.	0.028
17.1	2.156	147.6	0.471	1125.	0.027
18.3	2.115	156.6	0.434	1191.	0.021

SOLUTION

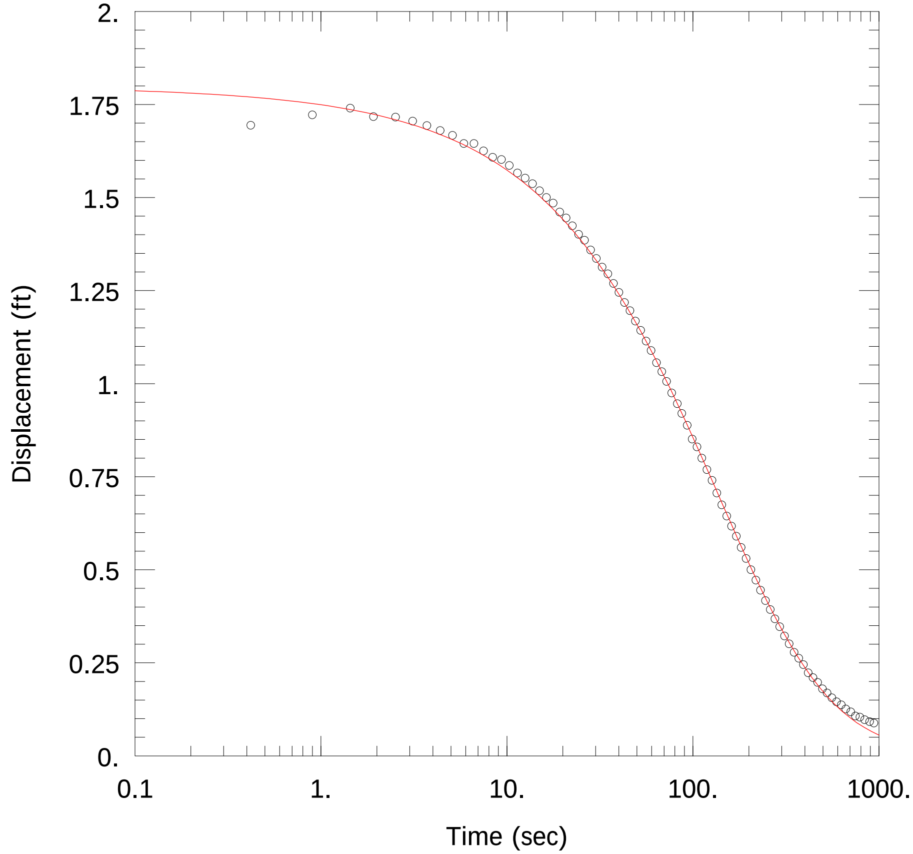
Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	1.7E-5	cm/sec
Ss	0.0025	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.005327 cm²/sec



T202 @ GMF GYPSUM POND – FALLING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: T202
Test Date: 16 Jun 2016

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 0.00045 cm/sec
Ss = 0.002 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 13.29 ft

WELL DATA (T202)

Initial Displacement: 1.8 ft
Total Well Penetration Depth: 13.29 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 13.29 ft
Screen Length: 4.38 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\T202fh.aqt
Title: T202 @ GMF Gypsum Pond – Falling Head Test
Date: 11/28/16
Time: 09:45:43

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 16 Jun 2016
Test Well: T202

AQUIFER DATA

Saturated Thickness: 13.29 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: T202

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.8 ft
Static Water Column Height: 13.29 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.38 ft
Total Well Penetration Depth: 13.29 ft

No. of Observations: 89

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.742	34.92	1.295	231.2	0.445
0.42	1.694	37.44	1.269	245.6	0.417
0.9	1.722	40.08	1.245	260.6	0.393
1.44	1.74	42.9	1.218	276.2	0.368
1.92	1.717	45.9	1.196	293.	0.347
2.52	1.716	49.08	1.168	311.	0.322
3.12	1.705	52.44	1.143	329.6	0.301
3.72	1.693	56.04	1.114	350.	0.278
4.38	1.68	59.64	1.089	371.	0.262
5.1	1.667	63.84	1.056	393.2	0.245
5.88	1.645	68.04	1.032	417.2	0.223
6.66	1.645	72.24	1.006	442.4	0.21
7.5	1.625	77.04	0.975	468.8	0.197

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
8.4	1.608	82.44	0.946	497.	0.18
9.36	1.602	87.24	0.92	527.	0.169
10.32	1.586	93.24	0.888	558.8	0.156
11.4	1.566	99.24	0.851	592.4	0.145
12.54	1.552	105.2	0.83	628.4	0.137
13.74	1.537	111.8	0.8	664.4	0.126
15.	1.518	119.	0.769	706.4	0.118
16.32	1.5	126.8	0.74	748.4	0.107
17.76	1.485	134.6	0.706	790.4	0.104
19.26	1.461	143.	0.674	838.4	0.097
20.82	1.445	152.	0.644	892.4	0.092
22.5	1.424	161.6	0.617	940.6	0.088
24.3	1.401	171.2	0.59	1000.4	0.079
26.16	1.385	182.	0.56	1060.4	0.077
28.2	1.359	193.4	0.53	1120.4	0.07
30.3	1.336	205.4	0.5	1186.4	0.069
32.52	1.313	218.	0.472		

SOLUTION

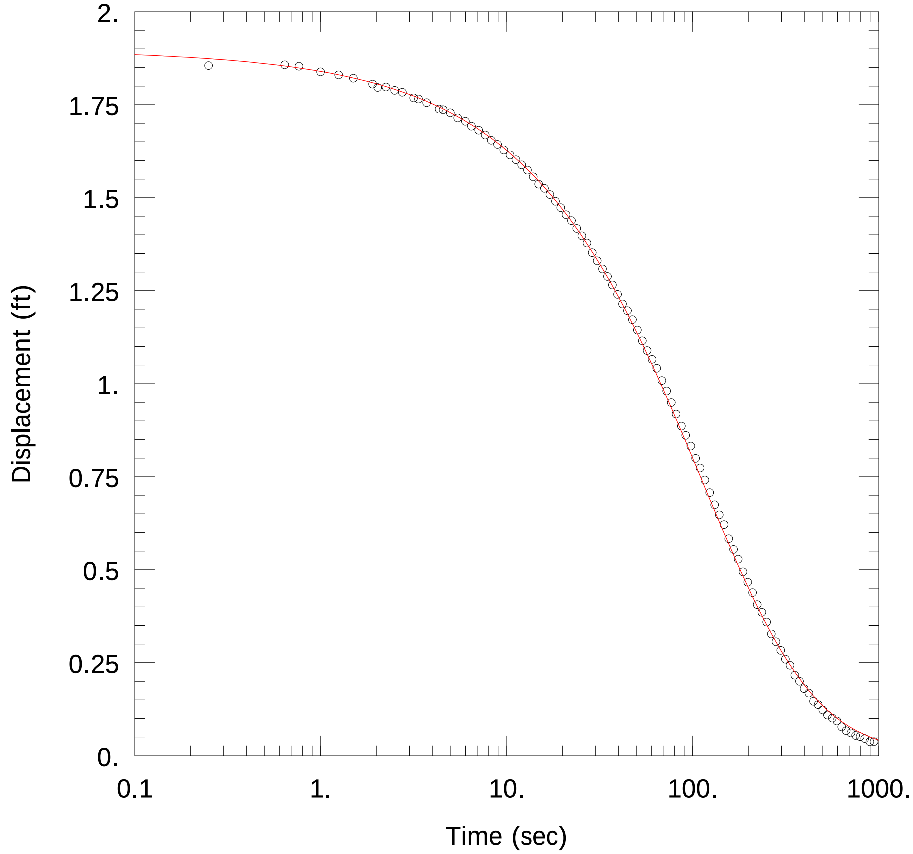
Slug Test
Aquifer Model: Unconfined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00045	cm/sec
Ss	0.002	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.1823 cm²/sec



T202 @ GMF GYPSUM POND – RISING HEAD TEST

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: T202
Test Date: 16 Jun 2016

SOLUTION

Aquifer Model: Unconfined
Solution Method: KGS Model

Kr = 0.00055 cm/sec
Ss = 0.002 ft^{-1}
Kz/Kr = 1.

AQUIFER DATA

Saturated Thickness: 13.29 ft

WELL DATA (T202)

Initial Displacement: 1.9 ft
Total Well Penetration Depth: 13.29 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 13.29 ft
Screen Length: 4.38 ft
Well Radius: 0.08333 ft

Data Set: C:\Users\ktheesfeld\AppData\Local\Temp\Temp1_CoffeenAqtesolvFiles.zip\T202rh.aqt
Title: T202 @ GMF Gypsum Pond – Rising Head Test
Date: 11/28/16
Time: 09:46:07

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 16 Jun 2016
Test Well: T202

AQUIFER DATA

Saturated Thickness: 13.29 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: T202

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.9 ft
Static Water Column Height: 13.29 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.3333 ft
Screen Length: 4.38 ft
Total Well Penetration Depth: 13.29 ft

No. of Observations: 105

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
0.	1.832	19.56	1.473	166.2	0.554
0.25	1.855	20.88	1.454	175.8	0.528
0.642	1.857	22.32	1.438	186.6	0.494
0.765	1.853	23.82	1.417	198.	0.466
1.	1.838	25.38	1.397	210.	0.438
1.25	1.83	27.06	1.378	222.6	0.406
1.5	1.821	28.86	1.352	235.8	0.385
1.903	1.805	30.72	1.33	250.2	0.359
2.027	1.796	32.76	1.308	265.2	0.327
2.25	1.797	34.86	1.288	280.8	0.306
2.5	1.788	37.08	1.265	297.6	0.283
2.75	1.783	39.48	1.24	315.6	0.259
3.167	1.768	42.	1.214	334.2	0.243

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
3.36	1.765	44.64	1.196	354.6	0.216
3.721	1.755	47.46	1.172	375.6	0.2
4.338	1.738	50.46	1.144	397.8	0.18
4.56	1.736	53.64	1.115	421.8	0.168
4.98	1.728	57.	1.089	447.	0.146
5.46	1.714	60.6	1.065	473.4	0.137
6.	1.705	64.2	1.041	501.6	0.123
6.48	1.692	68.4	1.008	531.6	0.109
7.08	1.681	72.6	0.98	563.4	0.101
7.68	1.668	76.8	0.949	597.	0.093
8.28	1.654	81.6	0.918	633.	0.077
8.94	1.643	87.	0.886	669.	0.067
9.66	1.628	91.8	0.861	711.	0.061
10.44	1.615	97.8	0.832	753.	0.054
11.22	1.602	103.8	0.799	795.	0.051
12.06	1.588	109.8	0.773	843.	0.046
12.96	1.574	116.4	0.741	897.	0.037
13.92	1.556	123.6	0.707	945.	0.037
14.88	1.536	131.4	0.674	1005.	0.031
15.96	1.525	139.2	0.647	1065.	0.026
17.1	1.508	147.6	0.621	1125.1	0.023
18.3	1.49	156.6	0.583	1191.	0.025

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	0.00055	cm/sec
Ss	0.002	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.2228 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	0.0005307	2.017E-5	+/- 4.0E-5	26.31	cm/sec
Ss	0.002349	0.0002737	+/- 0.0005428	8.581	ft^{-1}
Kz/Kr	1.	0.6606	+/- 1.31	1.514	

C.I. is approximate 95% confidence interval for parameter

t-ratio = estimate/std. error
No estimation window

T = K*b = 0.215 cm^2/sec

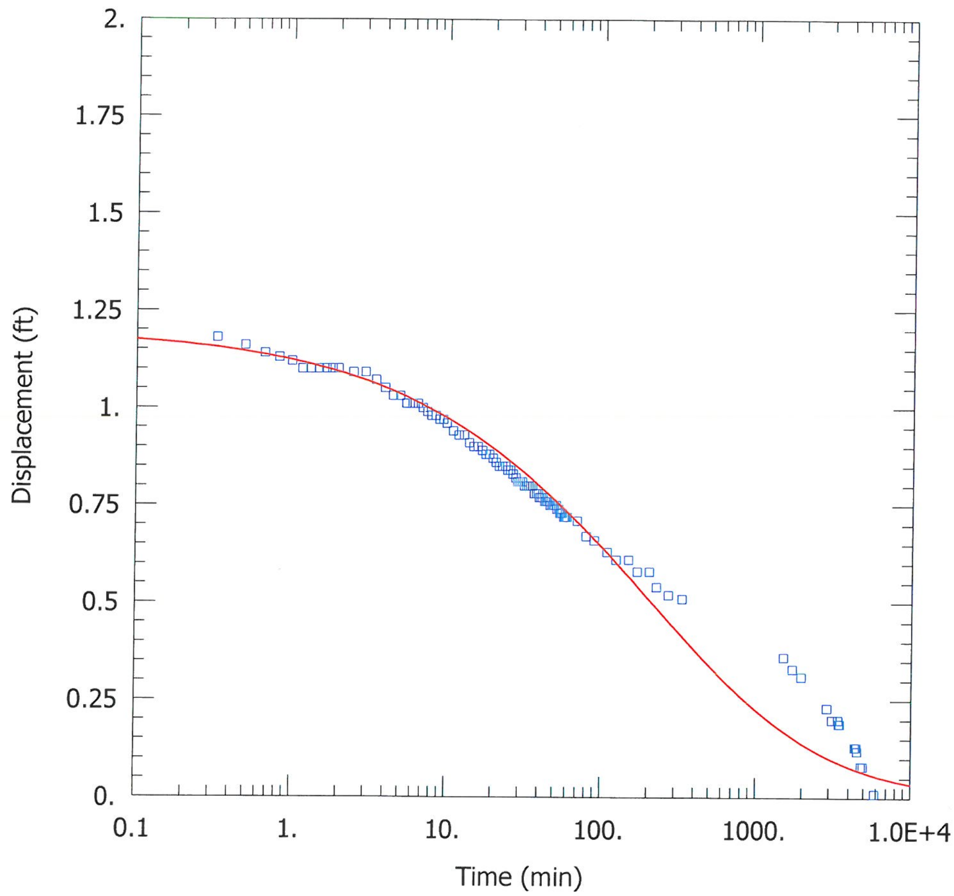
Parameter Correlations

	Kr	Ss	Kz/Kr
Kr	1.00	-0.98	-0.95
Ss	-0.98	1.00	0.89
Kz/Kr	-0.95	0.89	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.01824 ft^2
Variance . . . . 0.0001788 ft^2
Std. Deviation . . . . 0.01337 ft
Mean. . . . . -0.005597 ft
No. of Residuals 105
No. of Estimates 3



G45D FALLING HEAD #1

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G45D
Test Date: 29 Aug 2016

AQUIFER DATA

Saturated Thickness: 5.64 ft

WELL DATA (G45D)

Initial Displacement: 1.2 ft
Total Well Penetration Depth: 9.64 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 5.64 ft
Screen Length: 9.64 ft
Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Confined

Kr = 4.9E-7 cm/sec
Kz/Kr = 1.

Solution Method: KGS Model

Ss = 0.2 ft^{-1}

Data Set: I:\16jobs\16E0080\Admin\15-Field-Laboratory Data\SlugTest2\G45D_fh1.aqt
Title: G45D Falling Head #1
Date: 09/27/16
Time: 14:28:20

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 29 Aug 2016
Test Well: G45D

AQUIFER DATA

Saturated Thickness: 5.64 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G45D

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.2 ft
Static Water Column Height: 5.64 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Screen Length: 9.64 ft
Total Well Penetration Depth: 9.64 ft

No. of Observations: 104

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.33	1.18	36.	0.8
0.5	1.16	37.13	0.78
0.67	1.14	38.27	0.78
0.83	1.13	39.2	0.78
1.	1.12	40.02	0.77
1.17	1.1	41.	0.77
1.33	1.1	42.	0.77
1.5	1.1	43.37	0.76
1.67	1.1	44.2	0.76
1.83	1.1	45.	0.76
2.	1.1	46.	0.76
2.5	1.09	47.	0.75
3.	1.09	48.	0.75
3.5	1.07	49.	0.75
4.	1.05	50.	0.75
4.5	1.03	51.23	0.75
5.	1.03	52.	0.74
5.5	1.01	53.07	0.74
6.	1.01	54.03	0.73

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
6.5	1.01	55.	0.73
7.	1.	56.05	0.73
7.5	0.99	57.32	0.72
8.	0.98	58.	0.72
8.5	0.98	59.	0.72
9.	0.97	60.	0.72
9.5	0.97	70.	0.71
10.	0.96	80.	0.67
11.	0.94	90.	0.66
12.	0.93	108.6	0.63
13.	0.93	123.8	0.61
14.	0.91	149.	0.61
15.	0.9	170.4	0.58
16.	0.9	204.4	0.58
17.13	0.89	226.	0.54
18.	0.88	270.9	0.52
19.	0.88	331.8	0.51
20.	0.87	1506.	0.36
21.	0.86	1722.	0.33
22.	0.85	1960.	0.31
23.03	0.85	2879.	0.23
24.23	0.85	3117.	0.2
25.	0.84	3380.	0.2
26.	0.84	3427.	0.19
27.	0.83	3464.	0.19
28.12	0.82	4328.	0.13
29.	0.81	4405.	0.13
30.	0.81	4431.	0.13
31.	0.81	4456.	0.13
32.	0.8	4499.	0.12
33.1	0.8	4775.	0.08
34.05	0.8	4899.	0.08
35.	0.8	5848.	0.01

SOLUTION

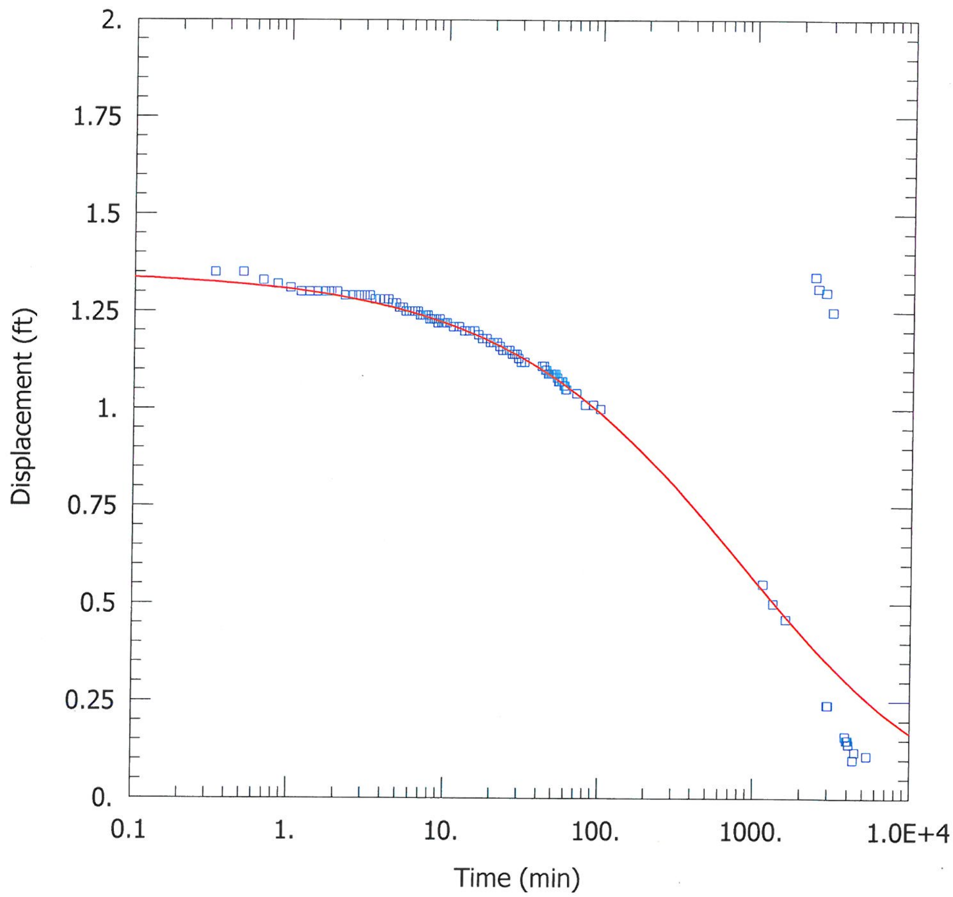
Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	4.9E-7	cm/sec
Ss	0.2	ft^{-1}
Kz/Kr	1.	

T = K*b = 8.423E-5 cm²/sec



G46D FALLING HEAD #1

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: G46D
Test Date: 29 Aug 2016

AQUIFER DATA

Saturated Thickness: 19.34 ft

WELL DATA (G46D)

Initial Displacement: 1.35 ft
Total Well Penetration Depth: 18.95 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 19.34 ft
Screen Length: 9.65 ft
Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Confined

Kr = 4.0E-8 cm/sec
Kz/Kr = 1.

Solution Method: KGS Model

Ss = 0.2 ft^{-1}

Data Set: I:\16jobs\16E0080\Admin\15-Field-Laboratory Data\SlugTest2\G46D_fh1.aqt
Title: G46D Falling Head #1
Date: 09/27/16
Time: 14:28:21

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 29 Aug 2016
Test Well: G46D

AQUIFER DATA

Saturated Thickness: 19.34 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: G46D

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.35 ft
Static Water Column Height: 19.34 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Screen Length: 9.65 ft
Total Well Penetration Depth: 18.95 ft

No. of Observations: 105

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.33	1.35	21.07	1.17
0.5	1.35	22.	1.16
0.67	1.33	23.	1.15
0.83	1.32	24.3	1.15
1.	1.31	25.35	1.15
1.17	1.3	26.47	1.14
1.33	1.3	27.33	1.14
1.5	1.3	28.28	1.14
1.67	1.3	29.13	1.13
1.83	1.3	30.25	1.12
2.	1.3	31.9	1.12
2.25	1.29	41.25	1.11
2.5	1.29	42.63	1.11
2.75	1.29	43.55	1.1
3.	1.29	44.42	1.1
3.25	1.29	45.33	1.09
3.5	1.28	46.18	1.09
3.75	1.28	47.12	1.09
4.	1.28	48.	1.09

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
4.25	1.28	49.	1.09
4.5	1.27	50.	1.09
4.75	1.27	51.	1.09
5.	1.26	52.05	1.08
5.25	1.26	53.23	1.07
5.5	1.25	54.	1.07
5.75	1.25	55.35	1.07
6.	1.25	56.57	1.07
6.25	1.25	57.48	1.06
6.5	1.25	58.28	1.06
6.75	1.24	59.	1.05
7.	1.24	60.	1.05
7.25	1.24	70.	1.04
7.5	1.24	80.	1.01
7.75	1.23	90.	1.01
8.	1.23	100.	1.
8.25	1.23	1143.	0.55
8.5	1.23	1332.	0.5
8.75	1.22	1607.	0.46
9.	1.23	2397.	1.34
9.25	1.22	2507.	1.31
9.5	1.22	2778.	1.3
9.75	1.22	2962.	0.24
10.	1.22	3001.	0.24
11.	1.21	3056.	1.25
12.	1.21	3856.	0.16
13.	1.2	3930.	0.15
14.	1.2	3975.	0.15
15.05	1.2	4012.	0.15
16.	1.19	4057.	0.14
17.	1.18	4337.	0.1
18.13	1.18	4445.	0.12
19.07	1.17	5325.	0.11
20.	1.17		

SOLUTION

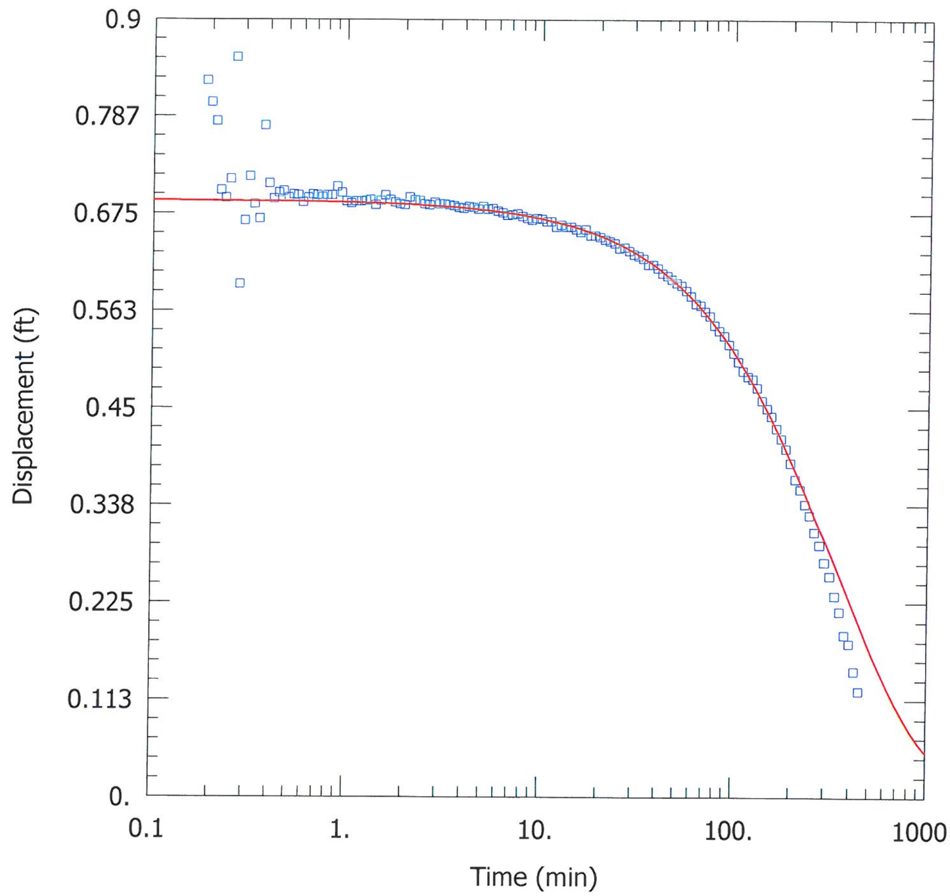
Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	4.0E-8	cm/sec
Ss	0.2	ft^{-1}
Kz/Kr	1.	

T = K*b = 2.358E-5 cm²/sec



T408 FALLING HEAD #1

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: T408
Test Date: 1 Sept 2016

AQUIFER DATA

Saturated Thickness: 22.87 ft

WELL DATA (T408)

Initial Displacement: 0.69 ft
Total Well Penetration Depth: 22.44 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 22.87 ft
Screen Length: 4.83 ft
Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Confined

Kr = 4.7E-6 cm/sec
Kz/Kr = 1.

Solution Method: KGS Model

Ss = 1.0E-7 ft^{-1}

Data Set: I:\16jobs\16E0080\Admin\15-Field-Laboratory Data\SlugTest2\T408_fh1.aqt
Title: T408 Falling Head #1
Date: 09/27/16
Time: 14:28:22

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 1 Sept 2016
Test Well: T408

AQUIFER DATA

Saturated Thickness: 22.87 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: T408

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.69 ft
Static Water Column Height: 22.87 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Screen Length: 4.83 ft
Total Well Penetration Depth: 22.44 ft

No. of Observations: 136

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.188	0.829	9.44	0.67
0.199	0.804	10.	0.669
0.211	0.782	10.6	0.666
0.224	0.702	11.2	0.666
0.237	0.693	11.9	0.66
0.251	0.715	12.6	0.662
0.266	0.856	13.3	0.66
0.282	0.593	14.1	0.66
0.298	0.667	15.	0.657
0.316	0.718	15.8	0.654
0.335	0.686	16.8	0.657
0.355	0.669	17.8	0.65
0.376	0.777	18.8	0.65
0.398	0.71	19.9	0.648
0.422	0.692	21.1	0.645
0.447	0.699	22.4	0.643
0.473	0.701	23.7	0.641
0.501	0.693	25.1	0.635
0.531	0.697	26.6	0.636

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.562	0.696	28.2	0.632
0.596	0.688	29.8	0.628
0.631	0.693	31.6	0.626
0.668	0.697	33.5	0.623
0.708	0.696	35.5	0.616
0.75	0.694	37.6	0.616
0.794	0.696	39.8	0.612
0.841	0.696	42.2	0.606
0.891	0.706	44.7	0.603
0.944	0.699	47.3	0.599
1.	0.689	50.1	0.595
1.06	0.687	53.1	0.592
1.12	0.689	56.2	0.586
1.19	0.689	59.6	0.58
1.26	0.69	63.1	0.571
1.33	0.691	66.8	0.569
1.41	0.685	70.8	0.562
1.5	0.69	75.	0.557
1.58	0.696	79.4	0.546
1.68	0.691	84.1	0.54
1.78	0.688	89.1	0.534
1.88	0.686	94.4	0.524
1.99	0.685	100.	0.514
2.11	0.694	106.	0.504
2.24	0.691	112.	0.493
2.37	0.69	119.	0.487
2.51	0.686	126.	0.484
2.66	0.685	133.	0.474
2.82	0.688	141.	0.459
2.98	0.686	150.	0.45
3.16	0.686	158.	0.441
3.35	0.685	168.	0.427
3.55	0.684	178.	0.415
3.76	0.682	188.	0.403
3.98	0.681	199.	0.387
4.22	0.683	211.	0.368
4.47	0.682	224.	0.356
4.73	0.68	237.	0.339
5.01	0.683	251.	0.326
5.31	0.68	266.	0.307
5.62	0.681	282.	0.292
5.96	0.678	298.	0.272
6.31	0.676	316.	0.256
6.68	0.673	335.	0.233
7.08	0.674	355.	0.215
7.5	0.675	376.	0.188
7.94	0.672	398.	0.178
8.41	0.67	422.	0.146
8.91	0.668	447.	0.123

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	4.7E-6	cm/sec
Ss	1.0E-7	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.003276 cm^2/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	6.277E-6	7.768E-6	+/- 1.537E-5	0.8081	cm/sec
Ss	4.0E-12	2.586E-10	+/- 5.116E-10	0.01547	ft^{-1}
Kz/Kr	1.	not estimated			

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.004376 cm^2/sec

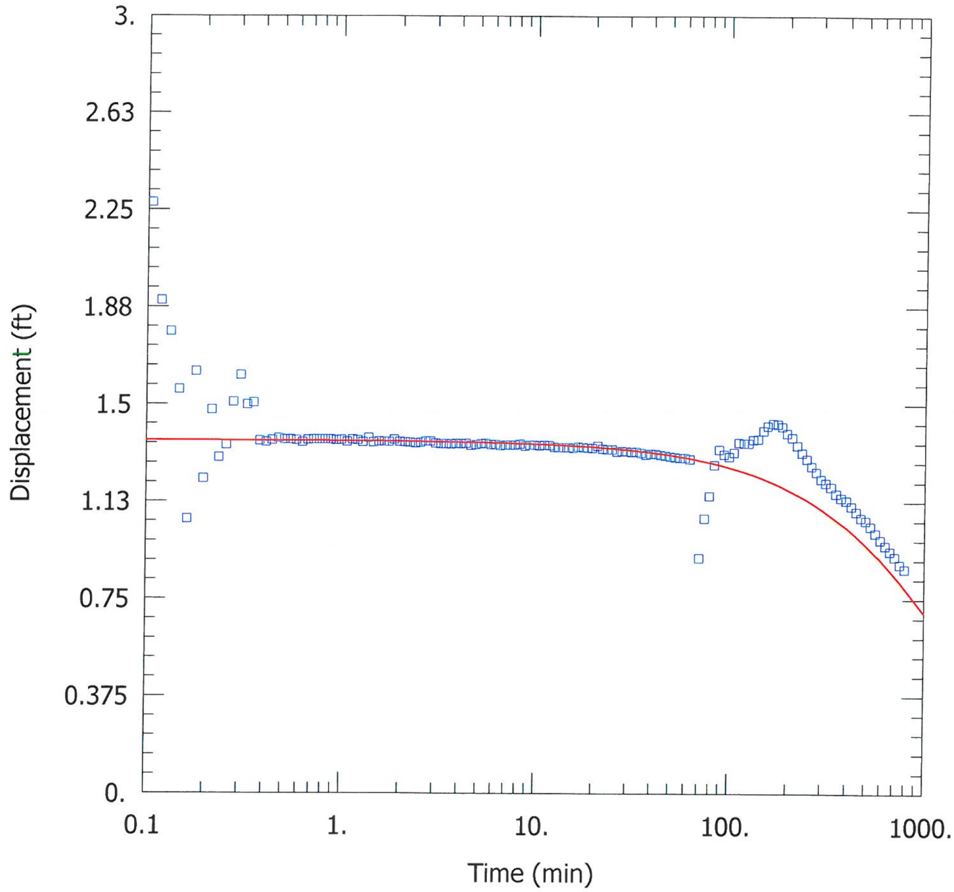
Parameter Correlations

	Kr	Ss
Kr	1.00	-1.00
Ss	-1.00	1.00

Residual Statistics

for weighted residuals

Sum of Squares . . . . 0.103 ft^2
Variance . . . . 0.0007689 ft^2
Std. Deviation . . . . 0.02773 ft
Mean. . . . . 0.006273 ft
No. of Residuals 136
No. of Estimates 2



T408 FALLING HEAD #2

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: T408
Test Date: 1 Sept 2016

AQUIFER DATA

Saturated Thickness: 22.74 ft

WELL DATA (T408)

Initial Displacement: 1.36 ft
Total Well Penetration Depth: 22.31 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 22.74 ft
Screen Length: 4.83 ft
Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 9.8E-7 cm/sec
Kz/Kr = 1.
Ss = 1.0E-5 ft^{-1}

Data Set: I:\16jobs\16E0080\Admin\15-Field-Laboratory Data\SlugTest2\T408_fh2.aqt
Title: T408 Falling Head #2
Date: 09/27/16
Time: 14:28:23

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 1 Sept 2016
Test Well: T408

AQUIFER DATA

Saturated Thickness: 22.74 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: T408

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.36 ft
Static Water Column Height: 22.74 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Screen Length: 4.83 ft
Total Well Penetration Depth: 22.31 ft

No. of Observations: 142

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.105	2.278	13.18	1.334
0.118	1.901	13.98	1.334
0.132	1.781	14.88	1.334
0.147	1.557	15.68	1.332
0.163	1.058	16.68	1.336
0.179	1.627	17.68	1.334
0.197	1.213	18.68	1.333
0.216	1.478	19.78	1.332
0.236	1.294	20.98	1.34
0.257	1.342	22.28	1.329
0.279	1.508	23.58	1.327
0.303	1.612	24.98	1.327
0.328	1.498	26.48	1.318
0.354	1.505	28.08	1.32
0.382	1.359	29.68	1.319
0.412	1.354	31.48	1.317
0.443	1.361	33.38	1.318
0.477	1.368	35.38	1.313
0.512	1.363	37.48	1.307

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.549	1.363	39.68	1.311
0.589	1.361	42.08	1.309
0.631	1.354	44.58	1.306
0.675	1.362	47.18	1.303
0.722	1.363	49.98	1.3
0.772	1.364	52.98	1.297
0.825	1.363	56.08	1.294
0.881	1.363	59.48	1.294
0.941	1.361	62.98	1.289
1.001	1.362	70.68	0.908
1.071	1.355	74.88	1.061
1.141	1.363	79.28	1.148
1.211	1.361	83.98	1.267
1.291	1.354	88.98	1.327
1.381	1.37	94.28	1.308
1.461	1.353	99.88	1.3
1.561	1.356	105.9	1.316
1.661	1.355	111.9	1.354
1.761	1.355	118.9	1.351
1.871	1.363	125.9	1.351
1.991	1.355	132.9	1.365
2.121	1.354	140.9	1.367
2.251	1.352	149.9	1.399
2.391	1.35	157.9	1.418
2.541	1.352	167.9	1.428
2.701	1.358	177.9	1.425
2.861	1.358	187.9	1.416
3.041	1.35	198.9	1.39
3.231	1.347	210.9	1.374
3.431	1.348	223.9	1.343
3.641	1.346	236.9	1.314
3.861	1.349	250.9	1.291
4.101	1.347	265.9	1.262
4.351	1.349	281.9	1.24
4.611	1.341	297.9	1.213
4.891	1.344	315.9	1.198
5.191	1.348	334.9	1.183
5.501	1.349	354.9	1.157
5.841	1.344	375.9	1.141
6.191	1.345	397.9	1.131
6.561	1.34	421.9	1.109
6.961	1.343	446.9	1.088
7.381	1.343	472.9	1.065
7.821	1.342	500.9	1.054
8.291	1.346	530.9	1.032
8.791	1.339	561.9	1.005
9.321	1.342	595.9	0.98
9.881	1.343	630.9	0.957
10.48	1.34	667.9	0.935
11.08	1.342	707.9	0.914
11.78	1.341	749.9	0.885
12.48	1.335	793.9	0.867

SOLUTION

Slug Test

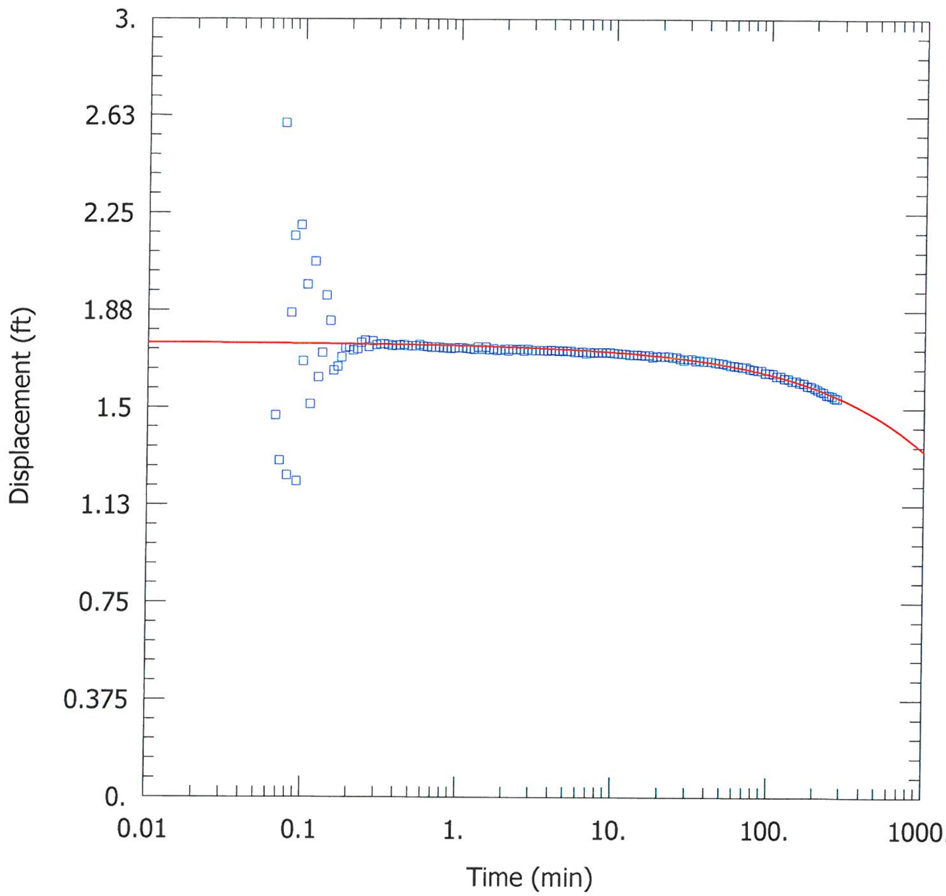
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	9.8E-7	cm/sec
Ss	1.0E-5	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.0006793 cm^2/sec



T408 RISING HEAD #1

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: T408
Test Date: 1 Sept 2016

AQUIFER DATA

Saturated Thickness: 24.46 ft

WELL DATA (T408)

Initial Displacement: 1.75 ft
Total Well Penetration Depth: 24.03 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 24.46 ft
Screen Length: 4.83 ft
Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Confined

Solution Method: KGS Model

Kr = 7.5E-8 cm/sec
Kz/Kr = 1.

Ss = 0.015 ft^{-1}

Data Set: I:\16jobs\16E0080\Admin\15-Field-Laboratory Data\SlugTest2\T408_rh1.aqt
Title: T408 Rising Head #1
Date: 09/27/16
Time: 14:28:24

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 1 Sept 2016
Test Well: T408

AQUIFER DATA

Saturated Thickness: 24.46 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: T408

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.75 ft
Static Water Column Height: 24.46 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Screen Length: 4.83 ft
Total Well Penetration Depth: 24.03 ft

No. of Observations: 149

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.06667	1.47	4.73	1.722
0.07083	1.296	5.01	1.719
0.075	2.597	5.31	1.72
0.07917	1.239	5.62	1.716
0.08333	1.865	5.96	1.716
0.0875	2.161	6.31	1.717
0.09167	1.215	6.68	1.71
0.09583	2.203	7.08	1.716
0.1	1.678	7.5	1.713
0.106	1.974	7.94	1.714
0.112	1.513	8.41	1.716
0.119	2.062	8.91	1.713
0.126	1.617	9.44	1.715
0.133	1.711	10.	1.712
0.141	1.932	10.6	1.711
0.15	1.834	11.2	1.709
0.158	1.643	11.9	1.709
0.168	1.658	12.6	1.705
0.178	1.693	13.3	1.705

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.188	1.73	14.1	1.707
0.199	1.733	15.	1.704
0.211	1.72	15.8	1.703
0.224	1.725	16.8	1.704
0.237	1.75	17.8	1.697
0.251	1.759	18.8	1.701
0.266	1.734	19.9	1.7
0.282	1.756	21.1	1.7
0.298	1.741	22.4	1.701
0.316	1.745	23.7	1.696
0.335	1.745	25.1	1.697
0.355	1.742	26.6	1.691
0.376	1.738	28.2	1.685
0.398	1.74	29.8	1.689
0.422	1.74	31.6	1.69
0.447	1.742	33.5	1.682
0.473	1.738	35.5	1.686
0.501	1.738	37.6	1.681
0.531	1.738	39.8	1.681
0.562	1.743	42.2	1.681
0.596	1.736	44.7	1.676
0.631	1.735	47.3	1.675
0.668	1.733	50.1	1.674
0.708	1.733	53.1	1.67
0.75	1.734	56.2	1.665
0.794	1.73	59.6	1.663
0.841	1.731	63.1	1.662
0.891	1.728	66.8	1.659
0.944	1.73	70.8	1.659
1.	1.731	75.	1.652
1.06	1.732	79.4	1.65
1.12	1.729	84.1	1.646
1.19	1.728	89.1	1.646
1.26	1.725	94.4	1.636
1.33	1.734	100.	1.636
1.41	1.727	106.	1.634
1.5	1.734	112.	1.624
1.58	1.724	119.	1.624
1.68	1.728	126.	1.616
1.78	1.722	133.	1.614
1.88	1.723	141.	1.605
1.99	1.727	150.	1.605
2.11	1.72	158.	1.6
2.24	1.727	168.	1.597
2.37	1.724	178.	1.587
2.51	1.726	188.	1.584
2.66	1.72	198.	1.578
2.82	1.726	208.	1.572
2.98	1.721	218.	1.566
3.16	1.722	228.	1.562
3.35	1.722	238.	1.552
3.55	1.722	248.	1.551
3.76	1.72	258.	1.547
3.98	1.723	268.	1.541
4.22	1.721	278.	1.538
4.47	1.719		

SOLUTION

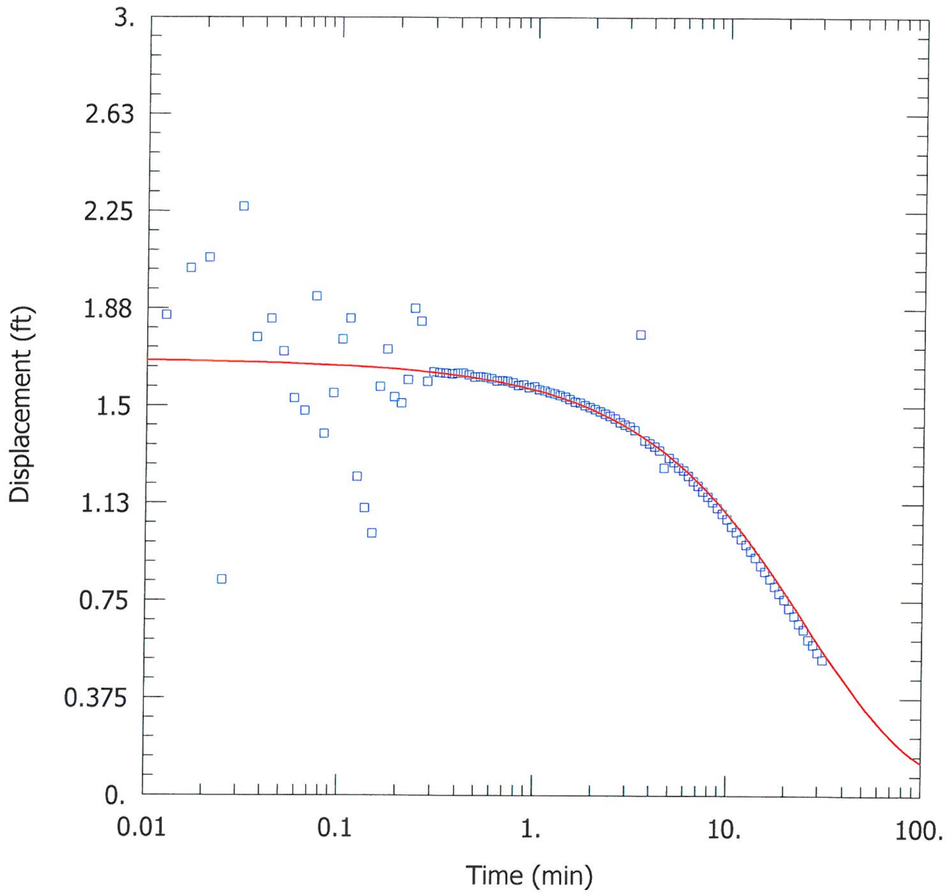
Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	7.5E-8	cm/sec
Ss	0.015	ft^{-1}
Kz/Kr	1.	

T = K*b = 5.592E-5 cm^2/sec



T409 FALLING HEAD #1

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: T409
Test Date: 31 Aug 2016

AQUIFER DATA

Saturated Thickness: 21.11 ft

WELL DATA (T409)

Initial Displacement: 1.68 ft
Total Well Penetration Depth: 20.71 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 21.11 ft
Screen Length: 4.8 ft
Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Confined

Kr = 4.0E-5 cm/sec
Kz/Kr = 1.

Solution Method: KGS Model

Ss = 0.00075 ft^{-1}

Data Set: I:\16jobs\16E0080\Admin\15-Field-Laboratory Data\SlugTest2\T409_fh1.aqt
Title: T409 Falling Head #1
Date: 09/27/16
Time: 14:28:25

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 31 Aug 2016
Test Well: T409

AQUIFER DATA

Saturated Thickness: 21.11 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: T409

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.68 ft
Static Water Column Height: 21.11 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Screen Length: 4.8 ft
Total Well Penetration Depth: 20.71 ft

No. of Observations: 107

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.	1.591	1.505	1.526
0.004167	1.749	1.605	1.517
0.008333	2.437	1.705	1.513
0.0125	1.849	1.805	1.503
0.01667	2.03	1.915	1.496
0.02083	2.071	2.035	1.488
0.025	0.829	2.165	1.48
0.031	2.267	2.295	1.471
0.037	1.763	2.435	1.462
0.044	1.835	2.585	1.453
0.051	1.709	2.745	1.438
0.058	1.529	2.905	1.429
0.066	1.481	3.085	1.421
0.075	1.922	3.275	1.408
0.083	1.392	3.475	1.777
0.093	1.549	3.685	1.368
0.103	1.756	3.905	1.357
0.113	1.836	4.145	1.345
0.124	1.226	4.395	1.33

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.136	1.106	4.655	1.264
0.149	1.008	4.935	1.302
0.162	1.574	5.235	1.286
0.176	1.718	5.545	1.265
0.191	1.534	5.885	1.254
0.207	1.511	6.235	1.233
0.223	1.601	6.605	1.212
0.241	1.876	7.005	1.195
0.26	1.826	7.425	1.172
0.28	1.595	7.865	1.153
0.301	1.632	8.335	1.132
0.323	1.628	8.835	1.109
0.347	1.627	9.365	1.087
0.372	1.624	9.925	1.066
0.398	1.626	10.53	1.038
0.426	1.626	11.13	1.017
0.456	1.62	11.82	0.989
0.487	1.612	12.53	0.967
0.521	1.613	13.23	0.943
0.556	1.611	14.03	0.918
0.593	1.605	14.93	0.886
0.633	1.597	15.73	0.863
0.675	1.598	16.73	0.835
0.719	1.596	17.73	0.807
0.766	1.589	18.73	0.78
0.816	1.58	19.82	0.756
0.869	1.582	21.02	0.721
0.925	1.571	22.32	0.693
0.985	1.575	23.63	0.664
1.045	1.563	25.02	0.64
1.115	1.559	26.52	0.602
1.185	1.553	28.13	0.582
1.255	1.548	29.73	0.553
1.335	1.541	31.52	0.525
1.425	1.535		

SOLUTION

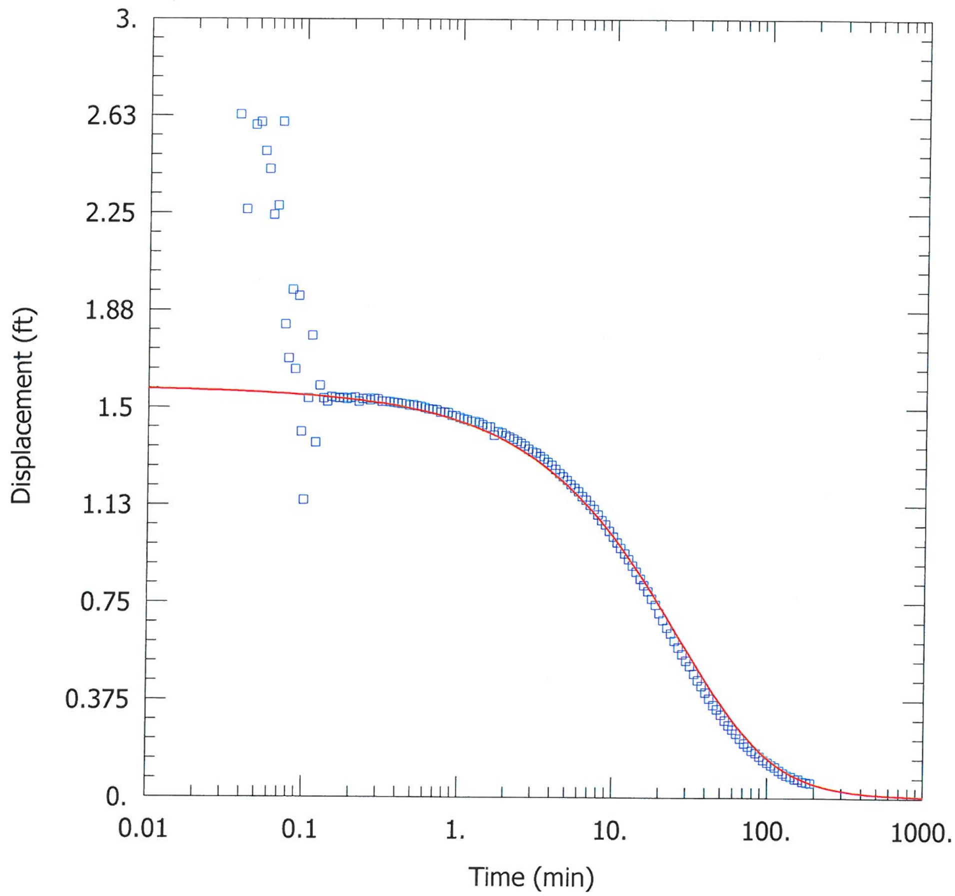
Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	4.0E-5	cm/sec
Ss	0.00075	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.02574 cm^2/sec



T409 FALLING HEAD #2

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: T409
Test Date: 31 Aug 2016

AQUIFER DATA

Saturated Thickness: 21.12 ft

WELL DATA (T409)

Initial Displacement: 1.58 ft
Total Well Penetration Depth: 20.72 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 21.12 ft
Screen Length: 4.8 ft
Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Confined

Kr = 3.2E-5 cm/sec
Kz/Kr = 1.

Solution Method: KGS Model

Ss = 0.0025 ft^{-1}

Data Set: I:\16jobs\16E0080\Admin\15-Field-Laboratory Data\SlugTest2\T409_fh2.aqt
Title: T409 Falling Head #2
Date: 09/27/16
Time: 14:28:26

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 31 Aug 2016
Test Well: T409

AQUIFER DATA

Saturated Thickness: 21.12 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: T409

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.58 ft
Static Water Column Height: 21.12 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Screen Length: 4.8 ft
Total Well Penetration Depth: 20.72 ft

No. of Observations: 147

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.0375	2.629	2.98	1.331
0.04167	2.264	3.16	1.327
0.0474	2.589	3.35	1.313
0.05112	2.601	3.55	1.303
0.0548	2.488	3.76	1.291
0.05848	2.419	3.98	1.28
0.0625	2.243	4.22	1.264
0.06667	2.278	4.47	1.248
0.07083	2.602	4.73	1.235
0.075	1.82	5.01	1.222
0.07917	1.69	5.31	1.205
0.08333	1.954	5.62	1.192
0.0875	1.648	5.96	1.178
0.09167	1.93	6.31	1.16
0.09583	1.407	6.68	1.146
0.1	1.144	7.08	1.126
0.106	1.537	7.5	1.111
0.112	1.777	7.94	1.089
0.119	1.365	8.41	1.067

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.126	1.584	8.91	1.051
0.133	1.535	9.44	1.026
0.141	1.523	10.	1.004
0.15	1.541	10.6	0.982
0.158	1.538	11.2	0.961
0.168	1.535	11.9	0.94
0.178	1.538	12.6	0.918
0.188	1.533	13.3	0.893
0.199	1.537	14.1	0.87
0.211	1.539	15.	0.843
0.224	1.523	15.8	0.818
0.237	1.533	16.8	0.795
0.251	1.534	17.8	0.766
0.266	1.528	18.8	0.742
0.282	1.534	19.9	0.711
0.298	1.531	21.1	0.683
0.316	1.523	22.4	0.655
0.335	1.523	23.7	0.633
0.355	1.521	25.1	0.604
0.376	1.518	26.6	0.579
0.398	1.517	28.2	0.552
0.422	1.514	29.8	0.528
0.447	1.513	31.6	0.507
0.473	1.508	33.5	0.477
0.501	1.51	35.5	0.453
0.531	1.505	37.6	0.43
0.562	1.504	39.8	0.406
0.596	1.499	42.2	0.382
0.631	1.494	44.7	0.357
0.668	1.493	47.3	0.341
0.708	1.491	50.1	0.32
0.75	1.482	53.1	0.298
0.794	1.483	56.2	0.28
0.841	1.481	59.6	0.263
0.891	1.47	63.1	0.247
0.944	1.469	66.8	0.229
1.	1.462	70.8	0.211
1.06	1.457	75.	0.198
1.12	1.454	79.4	0.182
1.19	1.447	84.1	0.174
1.26	1.447	89.1	0.16
1.33	1.442	94.4	0.146
1.41	1.435	100.	0.137
1.5	1.427	106.	0.126
1.58	1.426	112.	0.119
1.68	1.394	119.	0.106
1.78	1.408	126.	0.096
1.88	1.403	133.	0.087
1.99	1.393	141.	0.082
2.11	1.387	150.	0.074
2.24	1.38	158.	0.072
2.37	1.371	168.	0.064
2.51	1.364	178.	0.06
2.66	1.354	188.	0.058
2.82	1.341		

SOLUTION

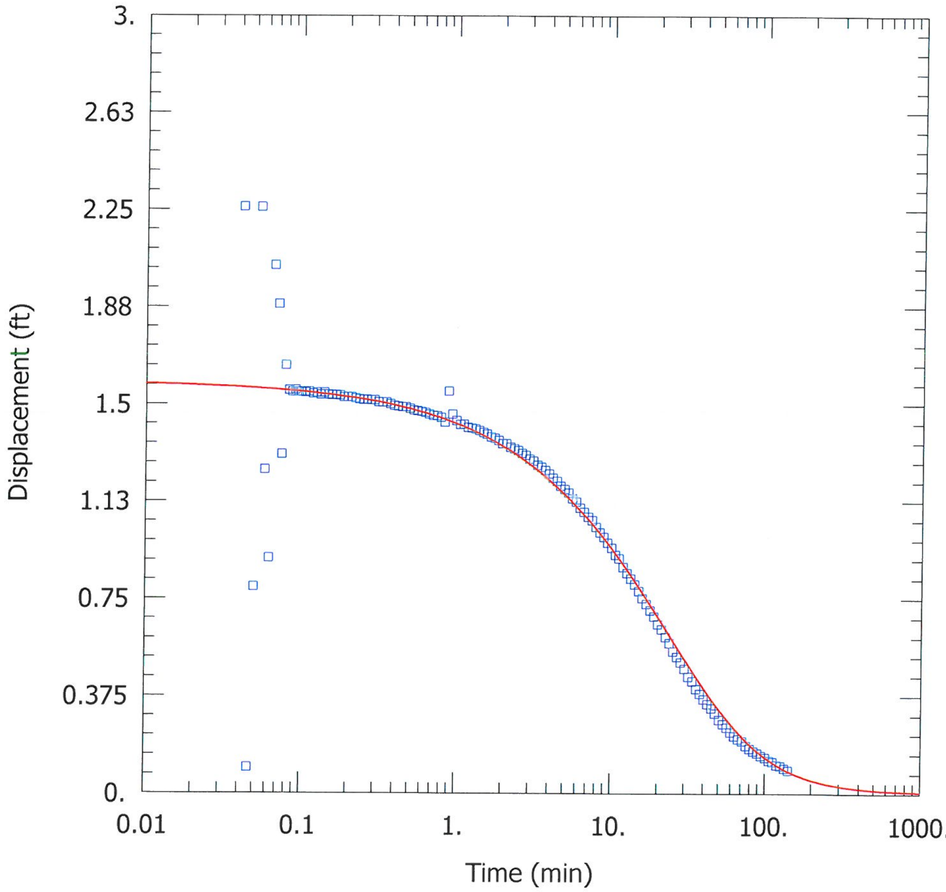
Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	3.2E-5	cm/sec
Ss	0.0025	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.0206 cm^2/sec



T409 RISING HEAD #1

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: T409
Test Date: 31 Aug 2016

AQUIFER DATA

Saturated Thickness: 21.19 ft

WELL DATA (T409)

Initial Displacement: 1.59 ft
Total Well Penetration Depth: 20.79 ft
Casing Radius: 0.08333 ft

Static Water Column Height: 21.19 ft
Screen Length: 4.8 ft
Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Confined

Kr = 3.2E-5 cm/sec
Kz/Kr = 1.

Solution Method: KGS Model

Ss = 0.005 ft^{-1}

Data Set: I:\16jobs\16E0080\Admin\15-Field-Laboratory Data\SlugTest2\T409_rh1.aqt
Title: T409 Rising Head #1
Date: 09/27/16
Time: 14:28:27

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 31 Aug 2016
Test Well: T409

AQUIFER DATA

Saturated Thickness: 21.19 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: T409

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.59 ft
Static Water Column Height: 21.19 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Screen Length: 4.8 ft
Total Well Penetration Depth: 20.79 ft

No. of Observations: 141

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.04167	2.261	2.66	1.311
0.04623	0.099	2.82	1.303
0.04998	0.796	2.98	1.288
0.05417	2.26	3.16	1.281
0.05833	1.248	3.35	1.265
0.0625	0.907	3.55	1.257
0.06667	2.035	3.76	1.245
0.07083	1.886	3.98	1.232
0.075	1.307	4.22	1.216
0.07917	1.65	4.47	1.203
0.08333	1.554	4.73	1.184
0.0875	1.548	5.01	1.172
0.09167	1.555	5.31	1.159
0.09583	1.548	5.62	1.137
0.1	1.548	5.96	1.124
0.106	1.545	6.31	1.101
0.112	1.548	6.68	1.085
0.119	1.54	7.08	1.066
0.126	1.544	7.5	1.052

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.133	1.537	7.94	1.027
0.141	1.544	8.41	1.005
0.15	1.537	8.91	0.988
0.158	1.534	9.44	0.966
0.168	1.535	10.	0.946
0.178	1.533	10.6	0.919
0.188	1.527	11.2	0.905
0.199	1.526	11.9	0.872
0.211	1.526	12.6	0.849
0.224	1.521	13.3	0.828
0.237	1.518	14.1	0.805
0.251	1.516	15.	0.78
0.266	1.517	15.8	0.753
0.282	1.514	16.8	0.73
0.298	1.514	17.8	0.705
0.316	1.507	18.8	0.682
0.335	1.506	19.9	0.652
0.355	1.505	21.1	0.633
0.376	1.5	22.4	0.603
0.398	1.493	23.7	0.58
0.422	1.491	25.1	0.548
0.447	1.488	26.6	0.526
0.473	1.488	28.2	0.506
0.501	1.482	29.8	0.481
0.531	1.476	31.6	0.45
0.562	1.473	33.5	0.433
0.596	1.471	35.5	0.403
0.631	1.467	37.6	0.384
0.668	1.461	39.8	0.363
0.708	1.456	42.2	0.345
0.75	1.455	44.7	0.329
0.794	1.449	47.3	0.309
0.841	1.43	50.1	0.285
0.891	1.55	53.1	0.269
0.944	1.461	56.2	0.255
1.	1.437	59.6	0.237
1.06	1.421	63.1	0.222
1.12	1.423	66.8	0.211
1.19	1.41	70.8	0.203
1.26	1.408	75.	0.185
1.33	1.404	79.4	0.173
1.41	1.398	84.1	0.164
1.5	1.391	89.1	0.156
1.58	1.385	94.4	0.146
1.68	1.374	100.	0.139
1.78	1.369	106.	0.128
1.88	1.36	112.	0.123
1.99	1.348	119.	0.11
2.11	1.347	126.	0.107
2.24	1.334	133.	0.097
2.37	1.328	141.	0.09
2.51	1.321		

SOLUTION

Slug Test

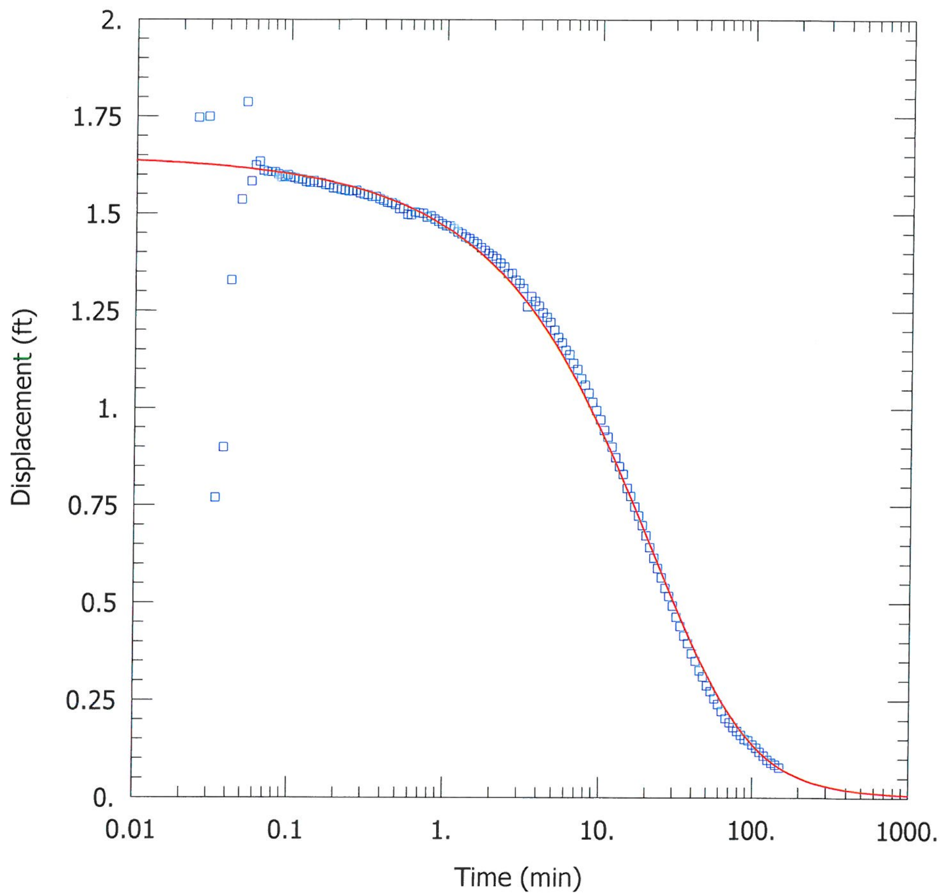
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	3.2E-5	cm/sec
Ss	0.005	ft^{-1}
Kz/Kr	1.	

$T = K*b = 0.02067\ cm^2/sec$



T409 RISING HEAD #2

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Well: T409
Test Date: 31 Aug 2016

AQUIFER DATA

Saturated Thickness: 21.18 ft

WELL DATA (T409)

Initial Displacement: 1.65 ft
Total Well Penetration Depth: 20.78 ft
Casing Radius: 0.08333 ft
Static Water Column Height: 21.18 ft
Screen Length: 4.8 ft
Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Confined
Solution Method: KGS Model

Kr = 3.3E-5 cm/sec
Kz/Kr = 1.
Ss = 0.006 ft^{-1}

Data Set: I:\16jobs\16E0080\Admin\15-Field-Laboratory Data\SlugTest2\T409_rh2.aqt
Title: T409 Rising Head #2
Date: 09/27/16
Time: 14:28:28

PROJECT INFORMATION

Company: Hanson Professional Services
Client: Natural Resources Technology,
Project: 16E0080
Location: Coffeen Power Station
Test Date: 31 Aug 2016
Test Well: T409

AQUIFER DATA

Saturated Thickness: 21.18 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: T409

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.65 ft
Static Water Column Height: 21.18 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.25 ft
Screen Length: 4.8 ft
Total Well Penetration Depth: 20.78 ft

No. of Observations: 146

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.02502	1.747	2.37	1.363
0.02918	1.749	2.512	1.346
0.03335	0.77	2.66	1.347
0.03752	0.899	2.82	1.33
0.04168	1.329	2.98	1.321
0.04823	1.536	3.16	1.308
0.05192	1.787	3.35	1.261
0.05568	1.583	3.55	1.288
0.05937	1.624	3.76	1.275
0.06303	1.634	3.98	1.263
0.0667	1.611	4.22	1.246
0.07085	1.608	4.47	1.234
0.07502	1.607	4.73	1.221
0.07918	1.607	5.01	1.201
0.08335	1.601	5.31	1.182
0.08752	1.594	5.62	1.168
0.09168	1.596	5.96	1.149
0.09585	1.6	6.31	1.138
0.1	1.594	6.68	1.116

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.106	1.592	7.08	1.1
0.112	1.589	7.5	1.076
0.119	1.588	7.94	1.06
0.126	1.582	8.41	1.039
0.133	1.58	8.91	1.015
0.141	1.585	9.44	0.995
0.15	1.58	10.	0.971
0.158	1.579	10.6	0.944
0.168	1.575	11.2	0.926
0.178	1.573	11.9	0.901
0.188	1.566	12.6	0.874
0.199	1.565	13.3	0.851
0.211	1.562	14.1	0.831
0.224	1.56	15.	0.795
0.237	1.558	15.8	0.774
0.251	1.558	16.8	0.747
0.266	1.559	17.8	0.724
0.282	1.553	18.8	0.699
0.298	1.549	19.9	0.673
0.316	1.548	21.1	0.642
0.335	1.544	22.4	0.615
0.355	1.544	23.7	0.589
0.376	1.538	25.1	0.565
0.398	1.534	26.6	0.538
0.422	1.529	28.2	0.517
0.447	1.527	29.8	0.493
0.473	1.523	31.6	0.464
0.501	1.512	33.5	0.44
0.531	1.513	35.5	0.415
0.564	1.498	37.6	0.396
0.596	1.497	39.8	0.37
0.631	1.504	42.2	0.351
0.668	1.502	44.7	0.326
0.708	1.501	47.3	0.311
0.75	1.491	50.1	0.288
0.794	1.494	53.1	0.273
0.841	1.486	56.2	0.255
0.891	1.48	59.6	0.24
0.944	1.474	63.1	0.222
1.	1.469	66.8	0.204
1.06	1.468	70.8	0.193
1.12	1.461	75.	0.181
1.19	1.453	79.4	0.171
1.26	1.448	84.1	0.161
1.33	1.44	89.1	0.15
1.41	1.436	94.4	0.147
1.5	1.428	100.	0.136
1.58	1.423	106.	0.128
1.68	1.413	112.	0.117
1.78	1.405	119.	0.107
1.88	1.398	126.	0.097
1.99	1.391	133.	0.089
2.11	1.385	141.	0.084
2.24	1.373	150.	0.077

SOLUTION

Slug Test
Aquifer Model: Confined
Solution Method: KGS Model

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
Kr	3.3E-5	cm/sec
Ss	0.006	ft^{-1}
Kz/Kr	1.	

T = K*b = 0.0213 cm²/sec

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
Kr	3.2E-5	3.191E-6	+/- 6.309E-6	10.03	cm/sec
Ss	0.006332	0.002124	+/- 0.0042	2.981	ft^{-1}
Kz/Kr	1.	not estimated			

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

T = K*b = 0.02066 cm²/sec

Parameter Correlations

	Kr	Ss
Kr	1.00	-0.93
Ss	-0.93	1.00

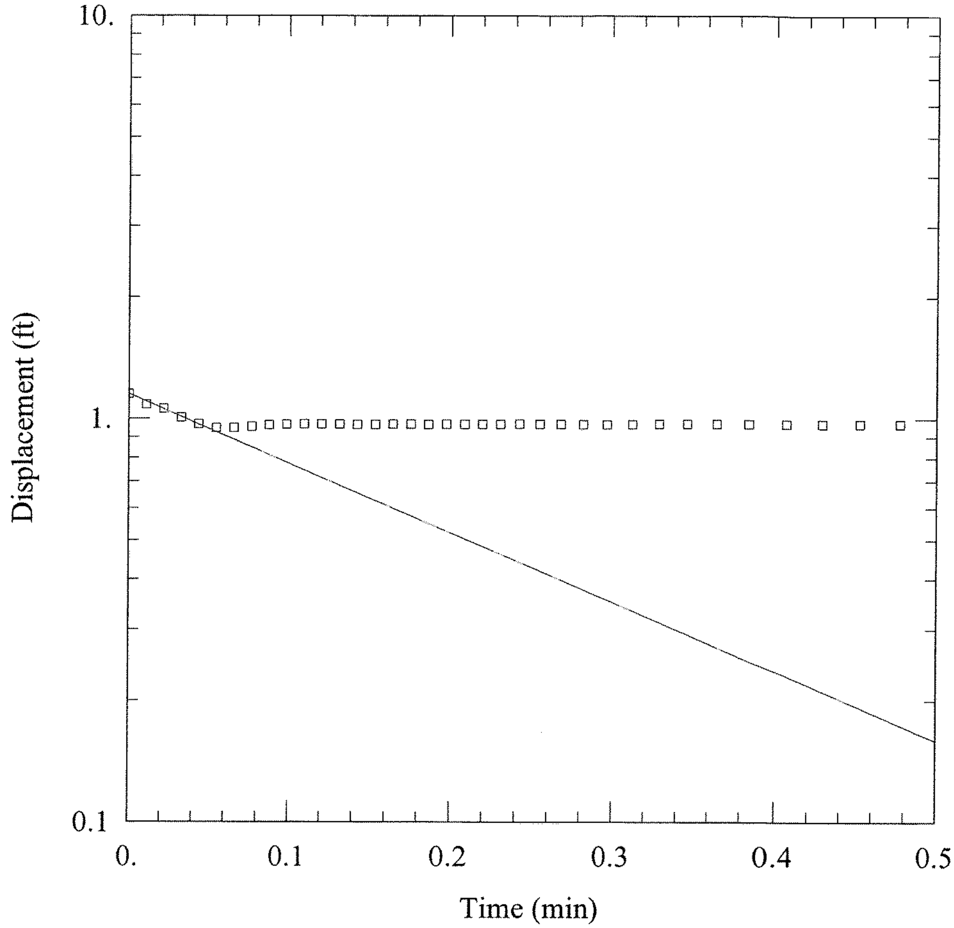
Residual Statistics

for weighted residuals

Sum of Squares . . . . 1.445 ft^2
Variance . . . . 0.01003 ft^2
Std. Deviation . . . . 0.1002 ft
Mean. . . . . -0.01263 ft
No. of Residuals 146
No. of Estimates 2

APPENDIX B2

HYDRAULIC CONDUCTIVITY ANALYSES
(ASH POND PIEZOMETERS)



FALLING HEAD TEST

Data Set: I:\...\CPS_OW1_FH.aqt
Date: 11/11/16 Time: 13:53:32

PROJECT INFORMATION

Company: Hanson Professional Services
Client: AEG Coffeen Power Station
Project: 09E0045/3001
Location: Coffeen, IL
Test Well: OW1
Test Date: 9 Jun 2009

AQUIFER DATA

Saturated Thickness: 16.8 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (OW1)

Initial Displacement: 1.15 ft
Total Well Penetration Depth: 20. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 16.8 ft
Screen Length: 13. ft
Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.00225 cm/sec
y0 = 1.15 ft

Data Set: I:\09jobs\09E0045\Admin\15-Field-Laboratory Data\AshPond2_Slug_Tests\CPS_OW1_FH.aqt
Title: Falling Head Test
Date: 11/11/16
Time: 13:53:32

PROJECT INFORMATION

Company: Hanson Professional Services
Client: AEG Coffeen Power Station
Project: 09E0045/3001
Location: Coffeen, IL
Test Date: 9 Jun 2009
Test Well: OW1

AQUIFER DATA

Saturated Thickness: 16.8 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: OW1

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.15 ft
Static Water Column Height: 16.8 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.333 ft
Screen Length: 13. ft
Total Well Penetration Depth: 20. ft

No. of Observations: 87

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.011	1.082	0.8238	0.972
0.022	1.057	0.8708	0.972
0.033	1.006	0.9207	0.972
0.044	0.969	0.9733	0.972
0.055	0.948	1.029	0.973
0.066	0.948	1.088	0.973
0.077	0.955	1.151	0.972
0.088	0.963	1.217	0.973
0.099	0.967	1.288	0.973
0.11	0.969	1.362	0.973
0.121	0.969	1.441	0.973
0.132	0.969	1.525	0.973
0.143	0.967	1.613	0.975
0.154	0.967	1.707	0.973
0.165	0.969	1.807	0.973
0.176	0.969	1.912	0.973
0.187	0.967	2.023	0.973
0.198	0.969	2.142	0.973

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.209	0.969	2.267	0.973
0.22	0.969	2.399	0.973
0.231	0.969	2.54	0.973
0.2427	0.97	2.688	0.973
0.2552	0.969	2.846	0.975
0.2683	0.969	3.013	0.975
0.2823	0.969	3.179	0.975
0.2972	0.969	3.346	0.975
0.3128	0.969	3.513	0.976
0.3295	0.97	3.679	0.975
0.3472	0.97	3.846	0.976
0.3658	0.97	4.013	0.975
0.3857	0.97	4.179	0.975
0.4067	0.97	4.346	0.975
0.4288	0.97	4.513	0.975
0.4523	0.97	4.679	0.975
0.4772	0.97	4.846	0.976
0.5035	0.972	5.013	0.976
0.5315	0.972	5.179	0.975
0.5612	0.972	5.346	0.975
0.5925	0.972	5.513	0.975
0.6257	0.972	5.679	0.976
0.6608	0.972	5.846	0.975
0.6982	0.972	6.013	0.976
0.7377	0.972	6.179	0.975
0.7795	0.972		

SOLUTION

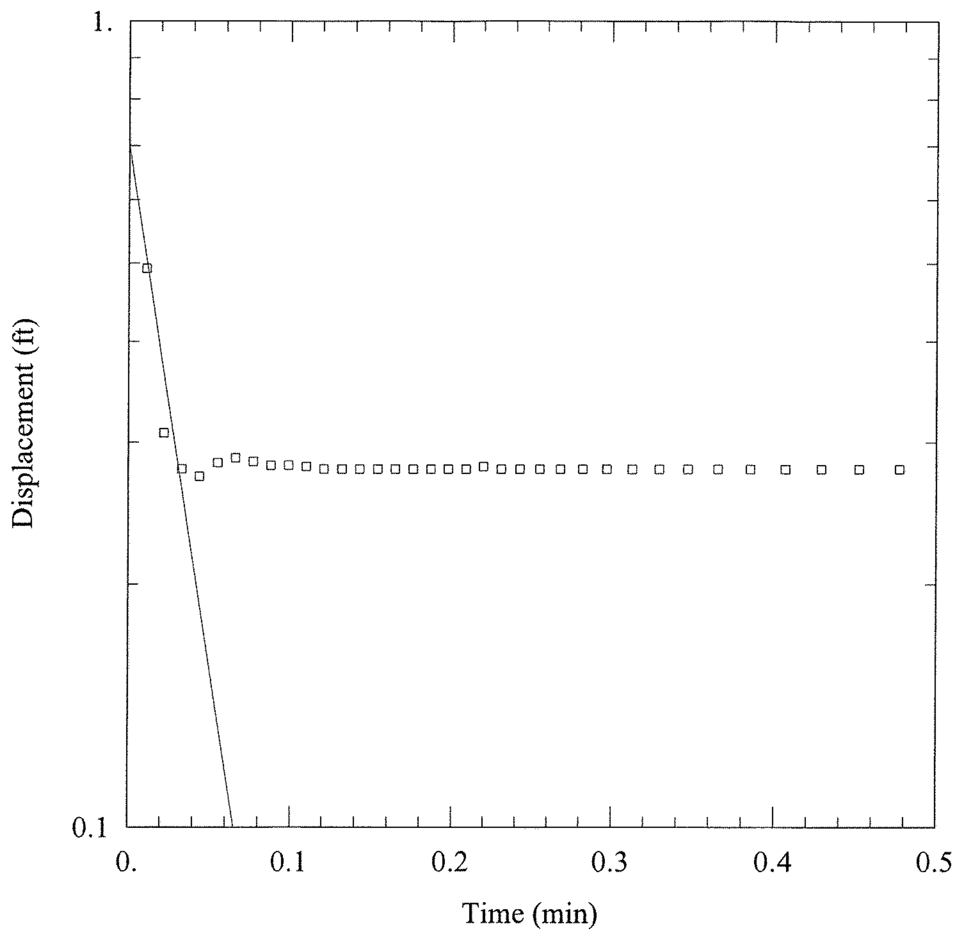
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 4.192

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.00225	cm/sec
y0	1.15	ft

T = K*b = 1.152 cm^2/sec



RISING HEAD TEST

Data Set: I:\...\CPS_OW1_RH.aqt
Date: 11/11/16 Time: 13:53:33

PROJECT INFORMATION

Company: Hanson Professional Services
Client: AEG Coffeen Power Station
Project: 09E0045/3001
Location: Coffeen, IL
Test Well: OW1
Test Date: 9 Jun 2009

AQUIFER DATA

Saturated Thickness: 16.8 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (OW1)

Initial Displacement: 1.1 ft Static Water Column Height: 16.8 ft
Total Well Penetration Depth: 20. ft Screen Length: 13. ft
Casing Radius: 0.08333 ft Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.017 cm/sec y0 = 0.7 ft

Data Set: I:\09jobs\09E0045\Admin\15-Field-Laboratory Data\AshPond2_Slug_Tests\CPS_OW1_RH.aqt
Title: Rising Head Test
Date: 11/11/16
Time: 13:53:33

PROJECT INFORMATION

Company: Hanson Professional Services
Client: AEG Coffeen Power Station
Project: 09E0045/3001
Location: Coffeen, IL
Test Date: 9 Jun 2009
Test Well: OW1

AQUIFER DATA

Saturated Thickness: 16.8 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: OW1

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.1 ft
Static Water Column Height: 16.8 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.333 ft
Screen Length: 13. ft
Total Well Penetration Depth: 20. ft

No. of Observations: 88

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.011	0.493	0.8238	0.278
0.022	0.308	0.8708	0.278
0.033	0.278	0.9207	0.278
0.044	0.272	0.9733	0.278
0.055	0.283	1.029	0.278
0.066	0.287	1.088	0.278
0.077	0.284	1.151	0.28
0.088	0.281	1.217	0.28
0.099	0.281	1.288	0.28
0.11	0.28	1.362	0.28
0.121	0.278	1.441	0.278
0.132	0.278	1.525	0.28
0.143	0.278	1.613	0.28
0.154	0.278	1.707	0.278
0.165	0.278	1.807	0.28
0.176	0.278	1.912	0.281
0.187	0.278	2.023	0.28
0.198	0.278	2.142	0.28

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.209	0.278	2.267	0.28
0.22	0.28	2.399	0.28
0.231	0.278	2.54	0.28
0.2427	0.278	2.688	0.281
0.2552	0.278	2.846	0.281
0.2683	0.278	3.013	0.281
0.2823	0.278	3.179	0.281
0.2972	0.278	3.346	0.281
0.3128	0.278	3.513	0.283
0.3295	0.278	3.679	0.281
0.3472	0.278	3.846	0.283
0.3658	0.278	4.013	0.281
0.3857	0.278	4.179	0.281
0.4067	0.278	4.346	0.281
0.4288	0.278	4.513	0.283
0.4523	0.278	4.679	0.281
0.4772	0.278	4.846	0.281
0.5035	0.28	5.013	0.283
0.5315	0.28	5.179	0.281
0.5612	0.28	5.346	0.283
0.5925	0.281	5.513	0.283
0.6257	0.28	5.679	0.281
0.6608	0.28	5.846	0.283
0.6982	0.28	6.013	0.281
0.7377	0.278	6.179	0.283
0.7795	0.277	6.346	0.283

SOLUTION

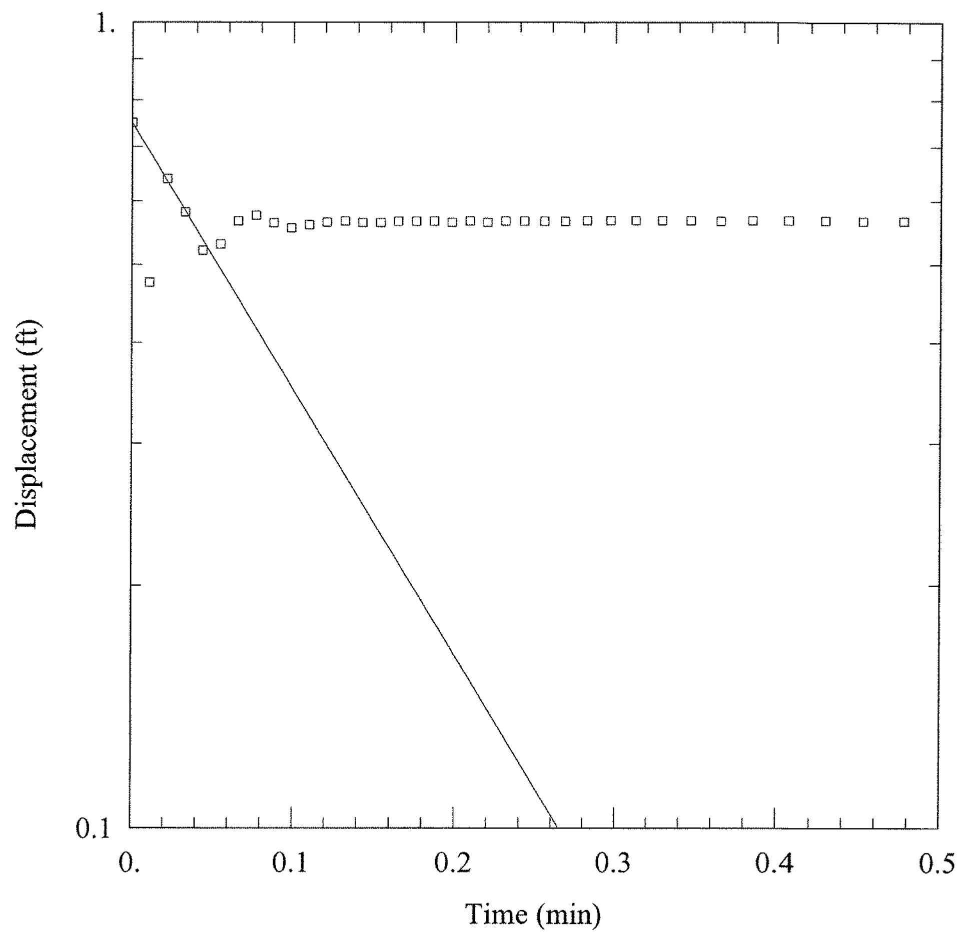
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 4.192

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.017	cm/sec
y0	0.7	ft

T = K*b = 8.705 cm^2/sec



FALLING HEAD TEST

Data Set: I:\...\CPS_OW2_FH.aqt
Date: 11/11/16 Time: 13:53:34

PROJECT INFORMATION

Company: Hanson Professional Services
Client: AEG Coffeen Power Station
Project: 09E0045/3001
Location: Coffeen, IL
Test Well: OW2
Test Date: 9 Jun 2009

AQUIFER DATA

Saturated Thickness: 22.7 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (OW2)

Initial Displacement: 0.75 ft
Total Well Penetration Depth: 26. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 22.7 ft
Screen Length: 13. ft
Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0045 cm/sec
y0 = 0.75 ft

Data Set: I:\09jobs\09E0045\Admin\15-Field-Laboratory Data\AshPond2_Slug_Tests\CPS_OW2_FH.aqt
Title: Falling Head Test
Date: 11/11/16
Time: 13:53:34

PROJECT INFORMATION

Company: Hanson Professional Services
Client: AEG Coffeen Power Station
Project: 09E0045/3001
Location: Coffeen, IL
Test Date: 9 Jun 2009
Test Well: OW2

AQUIFER DATA

Saturated Thickness: 22.7 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: OW2

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.75 ft
Static Water Column Height: 22.7 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.333 ft
Screen Length: 13. ft
Total Well Penetration Depth: 26. ft

No. of Observations: 80

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.011	0.475	0.6608	0.567
0.022	0.639	0.6982	0.567
0.033	0.581	0.7377	0.567
0.044	0.521	0.7795	0.567
0.055	0.53	0.8238	0.567
0.066	0.566	0.8708	0.567
0.077	0.575	0.9207	0.567
0.088	0.563	0.9733	0.567
0.099	0.555	1.029	0.567
0.11	0.56	1.088	0.567
0.121	0.564	1.151	0.567
0.132	0.566	1.217	0.567
0.143	0.564	1.288	0.567
0.154	0.564	1.362	0.567
0.165	0.566	1.441	0.566
0.176	0.566	1.525	0.566
0.187	0.566	1.613	0.567
0.198	0.564	1.707	0.566

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.209	0.566	1.807	0.567
0.22	0.564	1.912	0.567
0.231	0.566	2.023	0.567
0.2427	0.566	2.142	0.567
0.2552	0.566	2.267	0.567
0.2683	0.566	2.399	0.567
0.2823	0.567	2.54	0.567
0.2972	0.567	2.688	0.567
0.3128	0.567	2.846	0.567
0.3295	0.567	3.013	0.567
0.3472	0.567	3.179	0.567
0.3658	0.566	3.346	0.567
0.3857	0.567	3.513	0.567
0.4067	0.567	3.679	0.567
0.4288	0.567	3.846	0.567
0.4523	0.566	4.013	0.569
0.4772	0.566	4.179	0.569
0.5035	0.567	4.346	0.567
0.5315	0.567	4.513	0.567
0.5612	0.567	4.679	0.567
0.5925	0.567	4.846	0.569
0.6257	0.567	5.013	0.569

SOLUTION

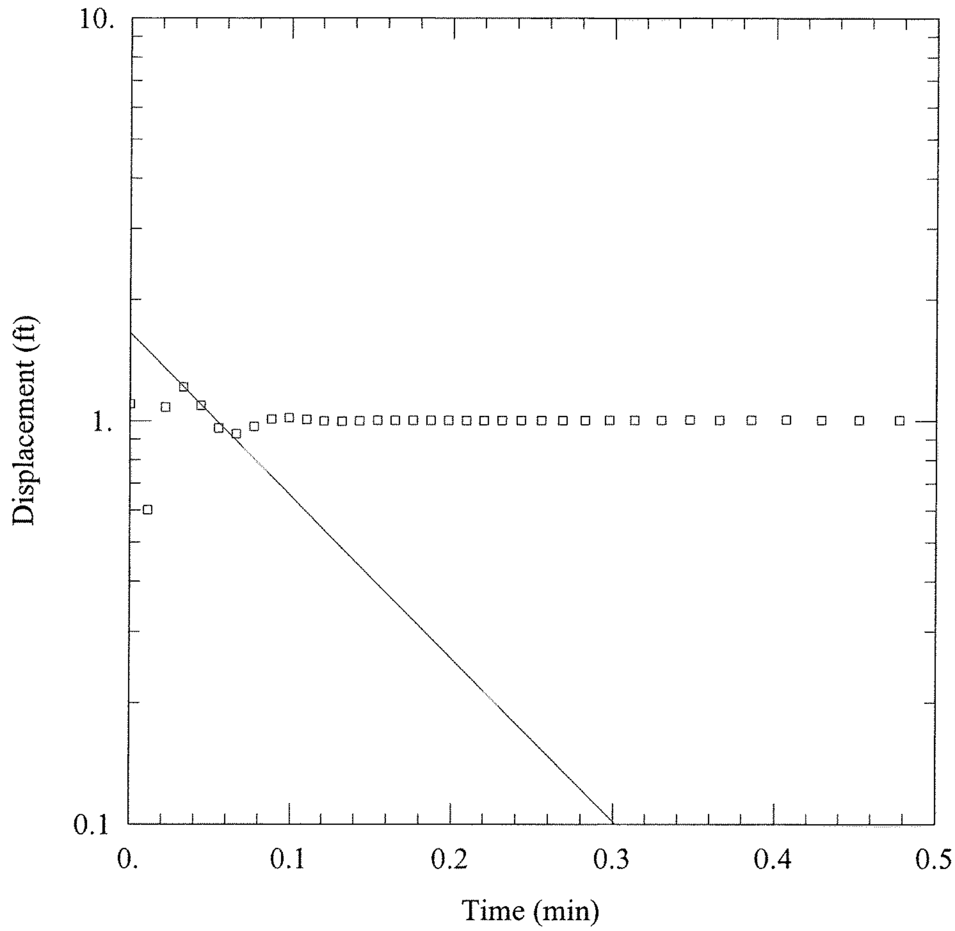
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 4.359

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0045	cm/sec
y0	0.75	ft

T = K*b = 3.114 cm^2/sec



RISING HEAD TEST

Data Set: I:\...\CPS_OW2_RH.aqt
Date: 11/11/16 Time: 13:53:34

PROJECT INFORMATION

Company: Hanson Professional Services
Client: AEG Coffeen Power Station
Project: 09E0045/3001
Location: Coffeen, IL
Test Well: OW2
Test Date: 9 Jun 2009

AQUIFER DATA

Saturated Thickness: 22.7 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (OW2)

Initial Displacement: 1.1 ft
Total Well Penetration Depth: 26. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 22.7 ft
Screen Length: 13. ft
Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.0055 cm/sec y0 = 1.65 ft

Data Set: I:\09jobs\09E0045\Admin\15-Field-Laboratory Data\AshPond2_Slug_Tests\CPS_OW2_RH.aqt
Title: Rising Head Test
Date: 11/11/16
Time: 13:53:35

PROJECT INFORMATION

Company: Hanson Professional Services
Client: AEG Coffeen Power Station
Project: 09E0045/3001
Location: Coffeen, IL
Test Date: 9 Jun 2009
Test Well: OW2

AQUIFER DATA

Saturated Thickness: 22.7 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: OW2

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.1 ft
Static Water Column Height: 22.7 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.333 ft
Screen Length: 13. ft
Total Well Penetration Depth: 26. ft

No. of Observations: 86

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.011	0.601	0.7795	1.005
0.022	1.081	0.8238	1.005
0.033	1.212	0.8708	1.005
0.044	1.093	0.9207	1.005
0.055	0.959	0.9733	1.005
0.066	0.929	1.029	1.005
0.077	0.969	1.088	1.005
0.088	1.011	1.151	1.005
0.099	1.017	1.217	1.005
0.11	1.009	1.288	1.005
0.121	1.	1.362	1.005
0.132	0.997	1.441	1.003
0.143	1.	1.525	1.005
0.154	1.002	1.613	1.005
0.165	1.003	1.707	1.005
0.176	1.003	1.807	1.005
0.187	1.003	1.912	1.005
0.198	1.003	2.023	1.005

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.209	1.003	2.142	1.003
0.22	1.003	2.267	1.003
0.231	1.003	2.399	1.005
0.2427	1.003	2.54	1.003
0.2552	1.003	2.688	1.005
0.2683	1.003	2.846	1.003
0.2823	1.003	3.013	1.005
0.2972	1.005	3.179	1.003
0.3128	1.005	3.346	1.005
0.3295	1.005	3.513	1.008
0.3472	1.006	3.679	1.008
0.3658	1.005	3.846	1.008
0.3857	1.005	4.013	1.006
0.4067	1.006	4.179	1.005
0.4288	1.005	4.346	1.005
0.4523	1.005	4.513	1.005
0.4772	1.005	4.679	1.005
0.5035	1.005	4.846	1.003
0.5315	1.005	5.013	1.003
0.5612	1.003	5.179	1.003
0.5925	1.005	5.346	1.003
0.6257	1.005	5.513	1.003
0.6608	1.005	5.679	1.003
0.6982	1.005	5.846	1.005
0.7377	1.005	6.013	1.005

SOLUTION

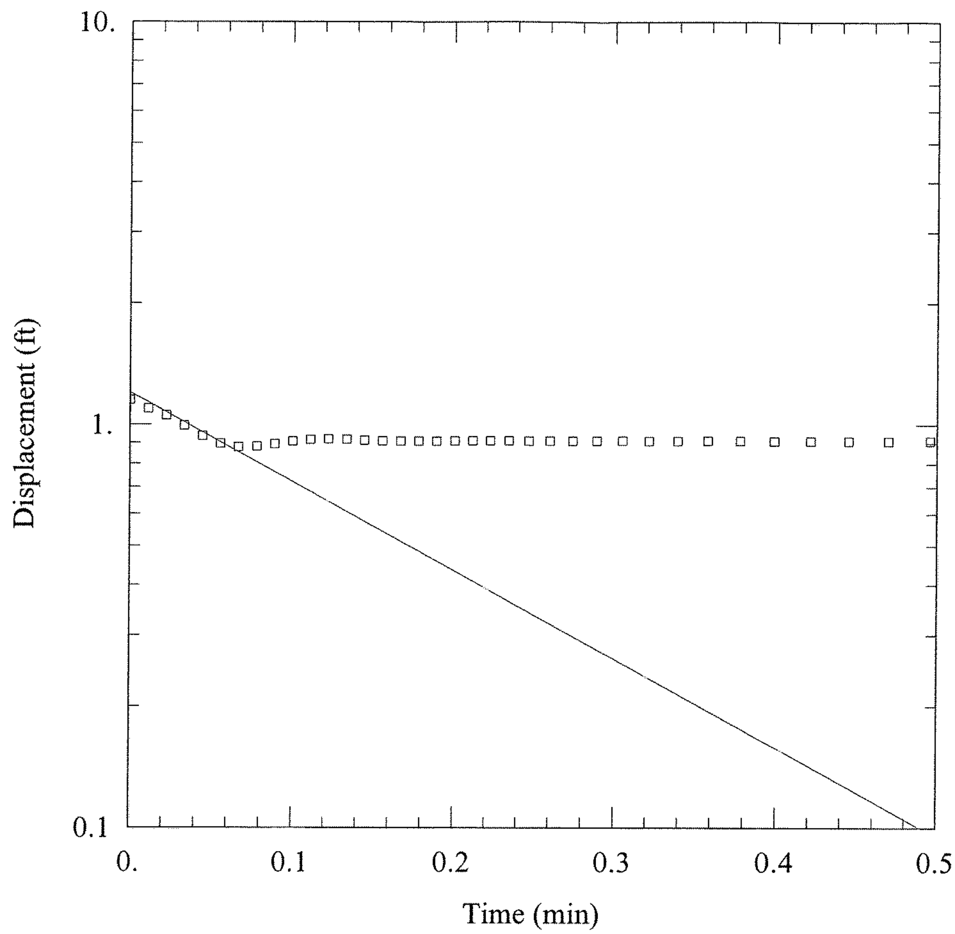
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 4.359

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0055	cm/sec
y0	1.65	ft

T = K*b = 3.805 cm^2/sec



FALLING HEAD TEST

Data Set: I:\...\CPS_OW3_FH.aqt
Date: 11/11/16 Time: 13:53:35

PROJECT INFORMATION

Company: Hanson Professional Services
Client: AEG Coffeen Power Station
Project: 09E0045/3001
Location: Coffeen, IL
Test Well: OW3
Test Date: 9 Jun 2009

AQUIFER DATA

Saturated Thickness: 21.9 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (OW3)

Initial Displacement: 1.15 ft Static Water Column Height: 21.9 ft
Total Well Penetration Depth: 26. ft Screen Length: 13. ft
Casing Radius: 0.08333 ft Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 0.003 cm/sec y0 = 1.2 ft

Data Set: I:\09jobs\09E0045\Admin\15-Field-Laboratory Data\AshPond2_Slug_Tests\CPS_OW3_FH.aqt
Title: Falling Head Test
Date: 11/11/16
Time: 13:53:36

PROJECT INFORMATION

Company: Hanson Professional Services
Client: AEG Coffeen Power Station
Project: 09E0045/3001
Location: Coffeen, IL
Test Date: 9 Jun 2009
Test Well: OW3

AQUIFER DATA

Saturated Thickness: 21.9 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: OW3

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.15 ft
Static Water Column Height: 21.9 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.333 ft
Screen Length: 13. ft
Total Well Penetration Depth: 26. ft

No. of Observations: 75

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.0112	1.095	0.618	0.911
0.0223	1.054	0.6532	0.911
0.0335	0.994	0.6905	0.912
0.0447	0.937	0.73	0.911
0.0558	0.897	0.7718	0.912
0.067	0.879	0.8162	0.912
0.0782	0.882	0.8632	0.911
0.0893	0.894	0.913	0.912
0.1005	0.909	0.9657	0.912
0.1117	0.917	1.022	0.912
0.1228	0.92	1.081	0.912
0.134	0.918	1.143	0.911
0.1452	0.914	1.21	0.912
0.1563	0.911	1.28	0.912
0.1675	0.908	1.355	0.912
0.1787	0.908	1.434	0.912
0.1898	0.909	1.517	0.912
0.201	0.911	1.606	0.912

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.2122	0.912	1.7	0.912
0.2233	0.912	1.799	0.914
0.235	0.912	1.904	0.914
0.2475	0.911	2.016	0.914
0.2607	0.911	2.134	0.914
0.2747	0.911	2.259	0.914
0.2895	0.911	2.392	0.912
0.3052	0.912	2.532	0.914
0.3218	0.911	2.681	0.914
0.3395	0.911	2.838	0.914
0.3582	0.912	3.005	0.914
0.378	0.912	3.172	0.914
0.399	0.911	3.338	0.914
0.4212	0.911	3.505	0.914
0.4447	0.911	3.672	0.915
0.4695	0.911	3.838	0.914
0.4958	0.912	4.005	0.914
0.5238	0.911	4.172	0.914
0.5535	0.912	4.338	0.915
0.5848	0.912		

SOLUTION

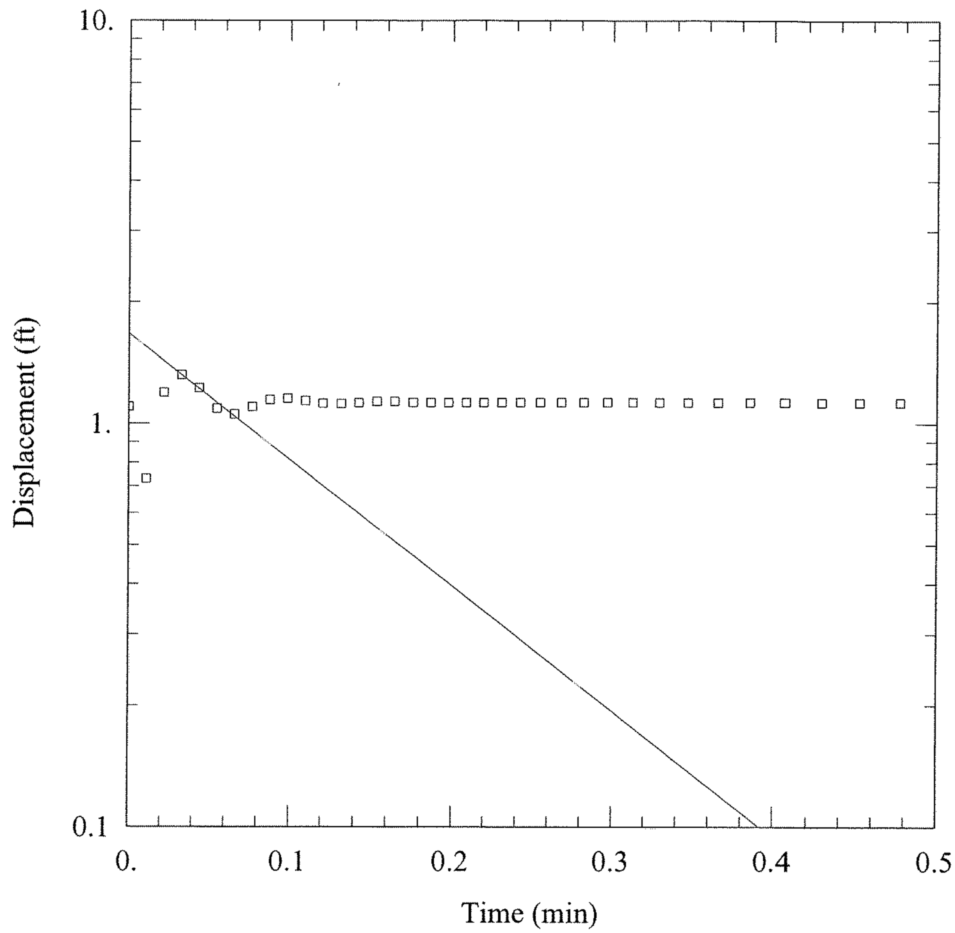
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 4.359

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.003	cm/sec
y0	1.2	ft

T = K*b = 2.003 cm^2/sec



RISING HEAD TEST

Data Set: I:\...\CPS_OW3_RH.aqt
Date: 11/11/16 Time: 13:53:36

PROJECT INFORMATION

Company: Hanson Professional Services
Client: AEG Coffeen Power Station
Project: 09E0045/3001
Location: Coffeen, IL
Test Well: OW3
Test Date: 9 Jun 2009

AQUIFER DATA

Saturated Thickness: 21.9 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (OW3)

Initial Displacement: 1.1 ft
Total Well Penetration Depth: 26. ft
Casing Radius: 0.08333 ft
Static Water Column Height: 21.9 ft
Screen Length: 13. ft
Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.00425 cm/sec
y0 = 1.67 ft

Data Set: I:\09jobs\09E0045\Admin\15-Field-Laboratory Data\AshPond2_Slug_Tests\CPS_OW3_RH.aqt
Title: Rising Head Test
Date: 11/11/16
Time: 13:53:37

PROJECT INFORMATION

Company: Hanson Professional Services
Client: AEG Coffeen Power Station
Project: 09E0045/3001
Location: Coffeen, IL
Test Date: 9 Jun 2009
Test Well: OW3

AQUIFER DATA

Saturated Thickness: 21.9 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: OW3

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1.1 ft
Static Water Column Height: 21.9 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.333 ft
Screen Length: 13. ft
Total Well Penetration Depth: 26. ft

No. of Observations: 72

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.011	0.729	0.5315	1.127
0.022	1.192	0.5612	1.127
0.033	1.32	0.5925	1.127
0.044	1.223	0.6257	1.128
0.055	1.088	0.6608	1.128
0.066	1.054	0.6982	1.127
0.077	1.098	0.7377	1.127
0.088	1.144	0.7795	1.127
0.099	1.153	0.8238	1.127
0.11	1.137	0.8708	1.127
0.121	1.121	0.9207	1.127
0.132	1.118	0.9733	1.128
0.143	1.125	1.029	1.127
0.154	1.133	1.088	1.127
0.165	1.133	1.151	1.127
0.176	1.128	1.217	1.128
0.187	1.127	1.288	1.127
0.198	1.127	1.362	1.127

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.209	1.128	1.441	1.127
0.22	1.128	1.525	1.127
0.231	1.128	1.613	1.127
0.2427	1.128	1.707	1.127
0.2552	1.128	1.807	1.127
0.2683	1.128	1.912	1.127
0.2823	1.128	2.023	1.128
0.2972	1.128	2.142	1.128
0.3128	1.128	2.267	1.127
0.3295	1.128	2.399	1.127
0.3472	1.128	2.54	1.128
0.3658	1.128	2.688	1.128
0.3857	1.128	2.846	1.128
0.4067	1.128	3.013	1.128
0.4288	1.128	3.179	1.137
0.4523	1.128	3.346	1.137
0.4772	1.128	3.513	1.137
0.5035	1.127	3.679	1.137

SOLUTION

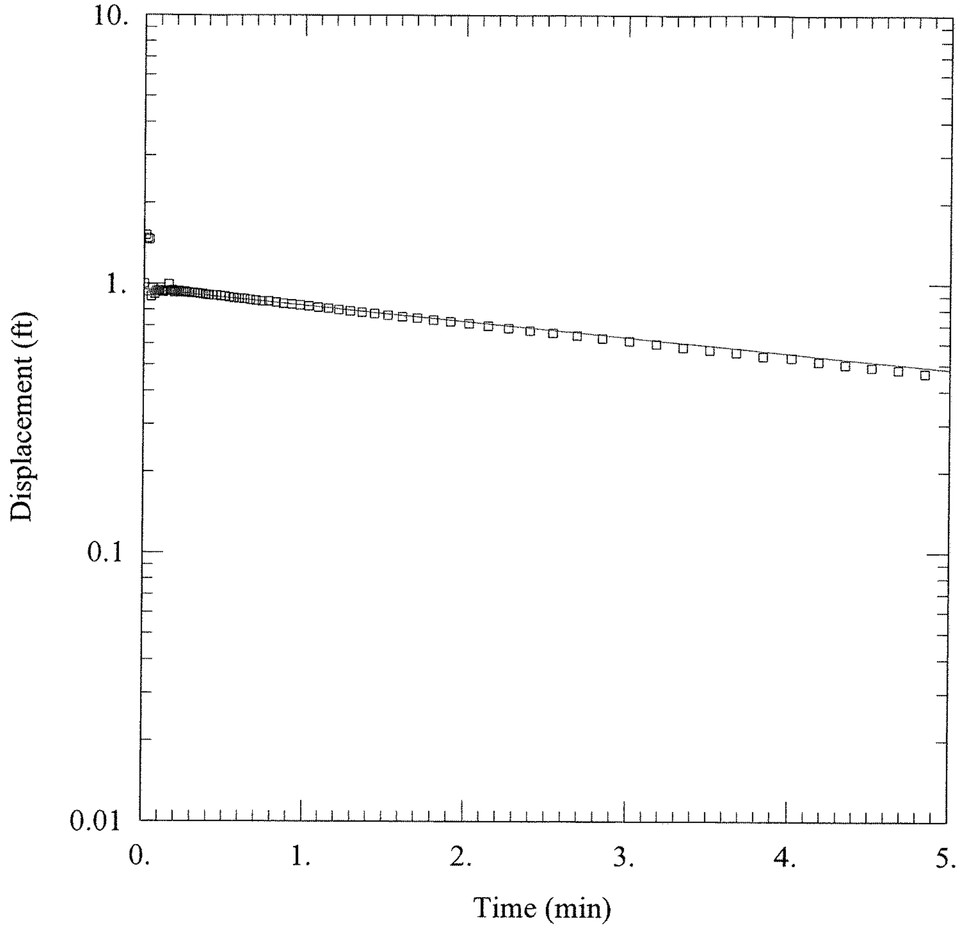
Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 4.359

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.00425	cm/sec
y0	1.67	ft

$T = K*b = 2.837\ cm^2/sec$



FALLING HEAD TEST

Data Set: I:\...\CPS_OW5_FH.aqt
Date: 11/11/16 Time: 13:53:37

PROJECT INFORMATION

Company: Hanson Professional Services
Client: AEG Coffeen Power Station
Project: 09E0045/3001
Location: Coffeen, IL
Test Well: OW5
Test Date: 9 Jun 2009

AQUIFER DATA

Saturated Thickness: 26.89 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (OW5)

Initial Displacement: 1. ft
Total Well Penetration Depth: 30. ft
Casing Radius: 0.08333 ft

Static Water Column Height: 26.89 ft
Screen Length: 20. ft
Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Confined Solution Method: Bouwer-Rice

K = 5.5E-5 cm/sec y0 = 0.95 ft

Data Set: I:\09jobs\09E0045\Admin\15-Field-Laboratory Data\AshPond2_Slug_Tests\CPS_OW5_FH.aqt
Title: Falling Head Test
Date: 11/11/16
Time: 13:53:38

PROJECT INFORMATION

Company: Hanson Professional Services
Client: AEG Coffeen Power Station
Project: 09E0045/3001
Location: Coffeen, IL
Test Date: 9 Jun 2009
Test Well: OW5

AQUIFER DATA

Saturated Thickness: 26.89 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: OW5

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 1. ft
Static Water Column Height: 26.89 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.333 ft
Screen Length: 20. ft
Total Well Penetration Depth: 30. ft

No. of Observations: 145

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.011	1.516	4.013	0.532
0.022	1.474	4.179	0.514
0.033	1.459	4.346	0.502
0.044	0.895	4.513	0.49
0.055	0.962	4.679	0.479
0.066	0.914	4.846	0.465
0.077	0.938	5.013	0.456
0.088	0.944	5.179	0.446
0.099	0.937	5.346	0.435
0.11	0.932	5.513	0.426
0.121	0.931	5.679	0.414
0.132	0.941	5.846	0.405
0.143	0.941	6.013	0.395
0.154	0.992	6.179	0.386
0.165	0.938	6.346	0.376
0.176	0.946	6.513	0.365
0.187	0.928	6.679	0.358
0.198	0.932	6.846	0.35

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.209	0.935	7.013	0.341
0.22	0.937	7.179	0.332
0.231	0.925	7.346	0.323
0.2427	0.932	7.513	0.317
0.2552	0.932	7.679	0.307
0.2683	0.928	7.846	0.298
0.2823	0.925	8.013	0.291
0.2972	0.923	8.179	0.283
0.3128	0.922	8.346	0.276
0.3295	0.919	8.513	0.268
0.3472	0.917	8.679	0.262
0.3658	0.914	8.846	0.255
0.3857	0.911	9.013	0.247
0.4067	0.908	9.179	0.241
0.4288	0.905	9.346	0.234
0.4523	0.904	9.513	0.226
0.4772	0.901	9.679	0.219
0.5035	0.898	9.846	0.213
0.5315	0.89	10.01	0.206
0.5612	0.884	10.18	0.2
0.5925	0.88	10.35	0.194
0.6257	0.877	10.51	0.188
0.6608	0.871	10.68	0.182
0.6982	0.866	10.85	0.174
0.7377	0.86	11.01	0.168
0.7795	0.86	11.18	0.165
0.8238	0.852	11.35	0.161
0.8708	0.843	11.51	0.152
0.9207	0.838	11.68	0.147
0.9733	0.831	11.85	0.141
1.029	0.825	12.01	0.135
1.088	0.816	12.18	0.131
1.151	0.808	12.35	0.125
1.217	0.799	12.51	0.121
1.288	0.79	12.68	0.116
1.362	0.783	12.85	0.112
1.441	0.774	13.01	0.106
1.525	0.764	13.18	0.103
1.613	0.753	13.35	0.095
1.707	0.744	13.51	0.091
1.807	0.732	13.68	0.086
1.912	0.723	13.85	0.08
2.023	0.71	14.01	0.077
2.142	0.698	14.18	0.073
2.267	0.684	14.35	0.068
2.399	0.67	14.51	0.064
2.54	0.656	14.68	0.059
2.688	0.643	14.85	0.053
2.846	0.626	15.01	0.05
3.013	0.613	15.18	0.044
3.179	0.598	15.35	0.041
3.346	0.58	15.51	0.037
3.513	0.567	15.68	0.034
3.679	0.555	15.85	0.03
3.846	0.538		

SOLUTION

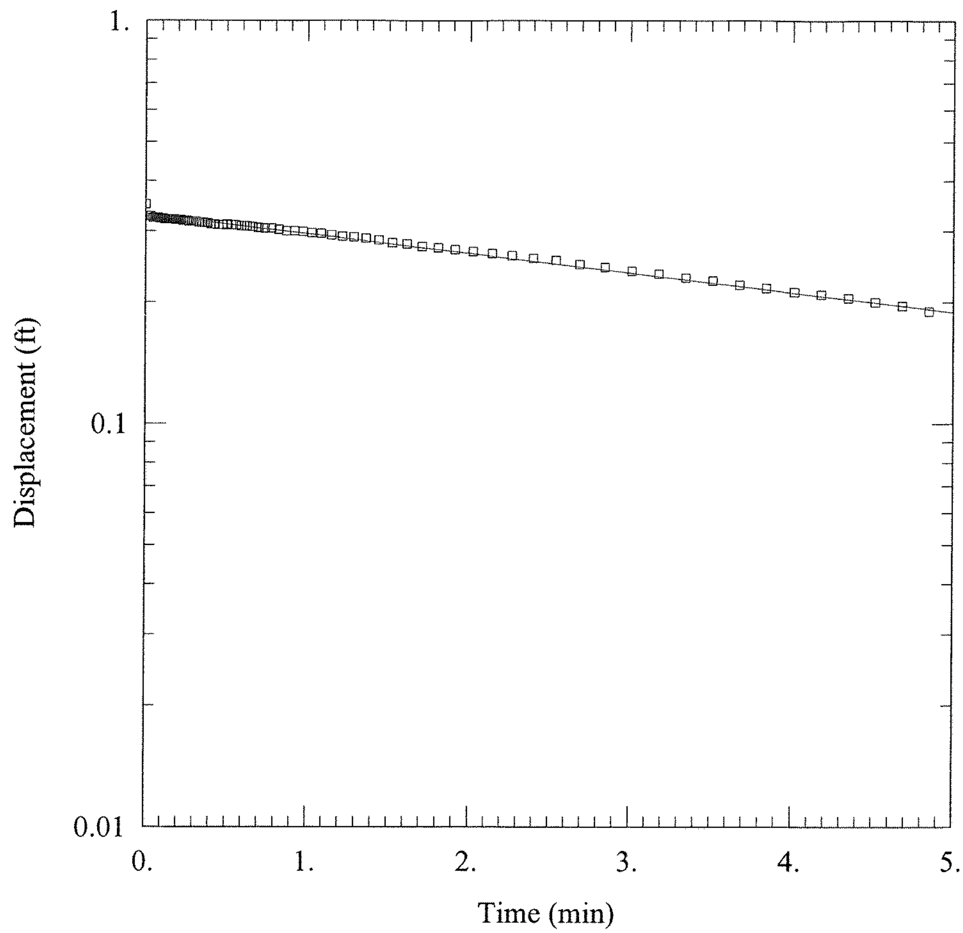
Slug Test
Aquifer Model: Confined
Solution Method: Bouwer-Rice
ln(Re/rw): 4.57

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	5.5E-5	cm/sec
y0	0.95	ft

T = K*b = 0.04508 cm^2/sec



RISING HEAD TEST

Data Set: I:\...\CPS_OW5_RH.aqt
Date: 11/11/16 Time: 13:53:38

PROJECT INFORMATION

Company: Hanson Professional Services
Client: AEG Coffeen Power Station
Project: 09E0045/3001
Location: Coffeen, IL
Test Well: OW5
Test Date: 9 Jun 2009

AQUIFER DATA

Saturated Thickness: 26.89 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (OW5)

Initial Displacement: 0.35 ft
Static Water Column Height: 26.89 ft
Total Well Penetration Depth: 30. ft
Screen Length: 20. ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 4.5E-5 cm/sec
y0 = 0.33 ft

Data Set: I:\09jobs\09E0045\Admin\15-Field-Laboratory Data\AshPond2_Slug_Tests\CPS_OW5_RH.aqt
Title: Rising Head Test
Date: 11/11/16
Time: 13:53:38

PROJECT INFORMATION

Company: Hanson Professional Services
Client: AEG Coffeen Power Station
Project: 09E0045/3001
Location: Coffeen, IL
Test Date: 9 Jun 2009
Test Well: OW5

AQUIFER DATA

Saturated Thickness: 26.89 ft
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: OW5

X Location: 0. ft
Y Location: 0. ft

Initial Displacement: 0.35 ft
Static Water Column Height: 26.89 ft
Casing Radius: 0.08333 ft
Well Radius: 0.08333 ft
Well Skin Radius: 0.333 ft
Screen Length: 20. ft
Total Well Penetration Depth: 30. ft

No. of Observations: 122

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.011	0.327	2.142	0.264
0.022	0.327	2.267	0.261
0.033	0.327	2.399	0.257
0.044	0.324	2.54	0.254
0.055	0.324	2.688	0.248
0.066	0.324	2.846	0.244
0.077	0.324	3.013	0.239
0.088	0.323	3.179	0.235
0.099	0.323	3.346	0.23
0.11	0.323	3.513	0.226
0.121	0.321	3.679	0.221
0.132	0.321	3.846	0.217
0.143	0.321	4.013	0.212
0.154	0.321	4.179	0.209
0.165	0.321	4.346	0.205
0.176	0.321	4.513	0.2
0.187	0.32	4.679	0.196
0.198	0.32	4.846	0.19

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.209	0.32	5.013	0.185
0.22	0.32	5.179	0.181
0.231	0.318	5.346	0.178
0.2427	0.318	5.513	0.173
0.2552	0.318	5.679	0.169
0.2683	0.317	5.846	0.165
0.2823	0.317	6.013	0.162
0.2972	0.317	6.179	0.157
0.3128	0.317	6.346	0.153
0.3295	0.315	6.513	0.147
0.3472	0.315	6.679	0.142
0.3658	0.315	6.846	0.139
0.3857	0.314	7.013	0.135
0.4067	0.312	7.179	0.132
0.4288	0.312	7.346	0.127
0.4523	0.311	7.513	0.123
0.4772	0.311	7.679	0.118
0.5035	0.312	7.846	0.115
0.5315	0.311	8.013	0.112
0.5612	0.311	8.179	0.108
0.5925	0.309	8.346	0.105
0.6257	0.309	8.513	0.099
0.6608	0.308	8.679	0.096
0.6982	0.306	8.846	0.091
0.7377	0.305	9.013	0.088
0.7795	0.305	9.179	0.084
0.8238	0.303	9.346	0.08
0.8708	0.3	9.513	0.077
0.9207	0.3	9.679	0.074
0.9733	0.299	9.846	0.071
1.029	0.297	10.01	0.066
1.088	0.296	10.18	0.062
1.151	0.293	10.35	0.059
1.217	0.291	10.51	0.054
1.288	0.29	10.68	0.05
1.362	0.288	10.85	0.047
1.441	0.285	11.01	0.044
1.525	0.281	11.18	0.041
1.613	0.279	11.35	0.038
1.707	0.275	11.51	0.033
1.807	0.273	11.68	0.03
1.912	0.27	11.85	0.026
2.023	0.267	12.01	0.023

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 4.57

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	4.5E-5	cm/sec
y0	0.33	ft

T = K*b = 0.03688 cm^2/sec

APPENDIX B3

LABORATORY HYDRAULIC CONDUCTIVITY TESTS

HISTORICAL LABORATORY RESULTS

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

ASTM D5084

JOB NUMBER:	05S3004A	TEST DATE:	7/10/2006
CLIENT:	AEG Coffeen Power Station	BORING #:	SB-7
JOB DESCRIPTION:	CCB Management Facility	SAMPLE #:	17B
SAMPLE DESCRIPTION:	Gray vf. sandy silty clay.	DEPTH (FT):	53.0-53.5
		FILE NAME:	05S3004A

			BEFORE TEST	AFTER TEST
		WATER CONTENT OF TRIMMINGS		
SPECIMEN WEIGHT (G)	693.83			
SPECIMEN HEIGHT (IN)	3.442			
DIAMETER (IN)	2.766	TARE + WET SOIL (G)	74.53	752.87
AREA (SQ IN)	6.009	TARE + DRY SOIL (G)	60.94	613.65
VOLUME (CU IN)	20.683	TARE (G)	3.68	50.10
WET DENSITY (PCF)	127.80	WATER (G)	13.59	139.22
DRY DENSITY (PCF)	103.28	DRY SOIL (G)	57.26	563.55
WT. DRY SOIL (G)	560.74	WATER CONTENT (%)	23.73	24.70
VOLUME DRY SOIL (CU IN)	12.674			
SP.GR. ASSUMED	2.70			
POROSITY (%)	38.72	STD. MAX. DEN.(LBS/CU.FT.)	112.00	
HEIGHT OF HEAD (PSI)	3.70	OPTIMUM MOISTURE (%)	14.70	
HYDRAULIC GRADIANT	29.8	% COMPACTION	92.22	
1/4 PORE VOLUME	32.81	PRESSURE HEAD (CM H2O)	260.17	
		PANEL NUMBER	6	
TEST METHOD USED:	IEPA ASTM D5084	PERMEANT USED:	TAP WATER	

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER:	05S3004A	TEST DATE:	7/10/2006
CLIENT:	AEG Coffeen Power Station	BORING #:	SB-7
JOB DESCRIPTION:	CCB Management Facility	SAMPLE #:	17B
SAMPLE DESCRIPTION:	Gray vf. sandy silty clay.	DEPTH (FT):	53.0-53.5
SPECIMEN HEIGHT (IN)	3.442	HEIGHT OF HEAD (PSI)	3.70
DIAMETER (IN)	2.766	PRESSURE HEAD (CM H2O)	260.17
AREA (SQ IN)	6.009	PANEL NUMBER	6
1/4 PORE VOLUME	32.81	FILE NAME:	05S3004A

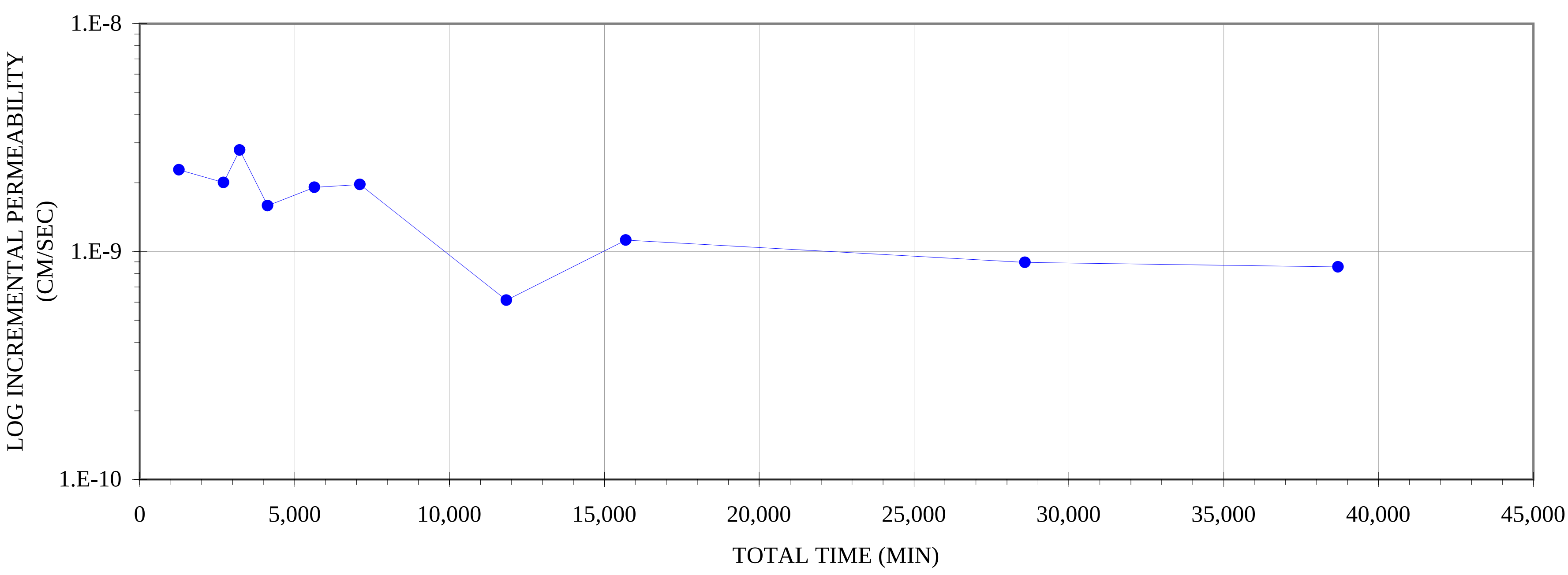
				INCREMENT.	TOTAL	INCREMENT.	TOTAL	PERMEABILITY (cm/sec)	
START DATE	START TIME	STOP DATE	STOP TIME	FLOW (CC)	FLOW (CC)	TIME (MIN)	TIME (MIN)	INCREMENTAL	MOVING AVG. GEOMEAN
7/17/2006	10:56:30	7/18/2006	8:03:00	0.20	0.2000	1266.50	1266.50	2.28E-09	2.28E-09
7/18/2006	8:03:00	7/19/2006	8:02:00	0.20	0.4000	1439.00	2705.50	2.01E-09	2.14E-09
7/19/2006	8:02:00	7/19/2006	16:41:00	0.10	0.5000	519.00	3224.50	2.78E-09	2.34E-09
7/19/2006	16:41:00	7/20/2006	7:49:00	0.10	0.6000	908.00	4132.50	1.59E-09	2.12E-09
7/20/2006	7:49:00	7/21/2006	9:00:45	0.20	0.8000	1511.75	5644.25	1.91E-09	2.03E-09
7/31/2006	9:20:35	8/1/2006	9:48:00	0.20	1.0000	1467.42	7111.67	1.97E-09	2.02E-09
8/1/2006	9:48:00	8/4/2006	16:36:15	0.20	1.2000	4728.25	11839.92	6.11E-10	1.38E-09
8/4/2006	16:36:15	8/7/2006	8:56:38	0.30	1.5000	3860.38	15700.30	1.12E-09	1.27E-09
8/7/2006	8:56:38	8/16/2006	7:41:00	0.80	2.3000	12884.37	28584.67	8.97E-10	1.05E-09
8/16/2006	7:41:00	8/23/2006	8:12:52	0.60	2.9000	10111.87	38696.53	8.57E-10	8.52E-10

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER:	05S3004A	TEST DATE:	7/10/2006
CLIENT:	AEG Coffeen Power Station	BORING #:	SB-7
JOB DESCRIPTION:	CCB Management Facility	SAMPLE #:	17B
SAMPLE DESCRIPTION:	Gray vf. sandy silty clay.	DEPTH (FT):	53.0-53.5

SPECIMEN HEIGHT (IN)	3.442	HEIGHT OF HEAD (PSI)	3.70
DIAMETER (IN)	2.766	PRESSURE HEAD (CM H2O)	260.17
AREA (SQ IN)	6.009	PANEL NUMBER	6
1/4 PORE VOLUME	32.81	FILE NAME:	05S3004A



Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

ASTM D5084

JOB NUMBER:	05S3004A	TEST DATE:	7/7/2006
CLIENT:	AEG Coffeen Power Station	BORING #:	SB-9
JOB DESCRIPTION:	CCB Management Facility	SAMPLE #:	14
SAMPLE DESCRIPTION:	Gray vf. sandy silt / so. clay (tr. c. sand	DEPTH (FT):	26.5-27.0
	& sm. gravel).	FILE NAME:	05S3004A

		WATER CONTENT OF TRIMMINGS	BEFORE TEST	AFTER TEST
SPECIMEN WEIGHT (G)	438.57			
SPECIMEN HEIGHT (IN)	1.951			
DIAMETER (IN)	2.775	TARE + WET SOIL (G)	112.90	56.90
AREA (SQ IN)	6.048	TARE + DRY SOIL (G)	104.63	50.64
VOLUME (CU IN)	11.800	TARE (G)	3.69	3.67
WET DENSITY (PCF)	141.59	WATER (G)	8.27	6.26
DRY DENSITY (PCF)	130.87	DRY SOIL (G)	100.94	46.97
WT. DRY SOIL (G)	405.36	WATER CONTENT (%)	8.19	13.33
VOLUME DRY SOIL (CU IN)	9.162			
SP.GR. ASSUMED	2.70			
POROSITY (%)	22.36	STD. MAX. DEN.(LBS/CU.FT.)		N/A
HEIGHT OF HEAD (PSI)	2.10	OPTIMUM MOISTURE (%)		N/A
HYDRAULIC GRADIANT	29.8	% COMPACTION		N/A
1/4 PORE VOLUME	10.81	PRESSURE HEAD (CM H2O)		147.67
		PANEL NUMBER		5
TEST METHOD USED:	IEPA ASTM D5084	PERMEANT USED:	TAP WATER	

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER: 05S3004A
CLIENT: AEG Coffeen Power Station
JOB DESCRIPTION: CCB Management Facility
SAMPLE DESCRIPTION: Gray vf. sandy silt / so. clay (tr. c. sand & sm. gravel).

TEST DATE: 8/30/2007
BORING #: SB-9
SAMPLE #: 14
DEPTH (FT): 26.5-27.0

SPECIMEN HEIGHT (IN) 1.951
DIAMETER (IN) 2.775
AREA (SQ IN) 6.048
1/4 PORE VOLUME 10.81

HEIGHT OF HEAD (PSI) 2.10
PRESSURE HEAD (CM H2O) 147.67
PANEL NUMBER 5
FILE NAME: 05S3004A

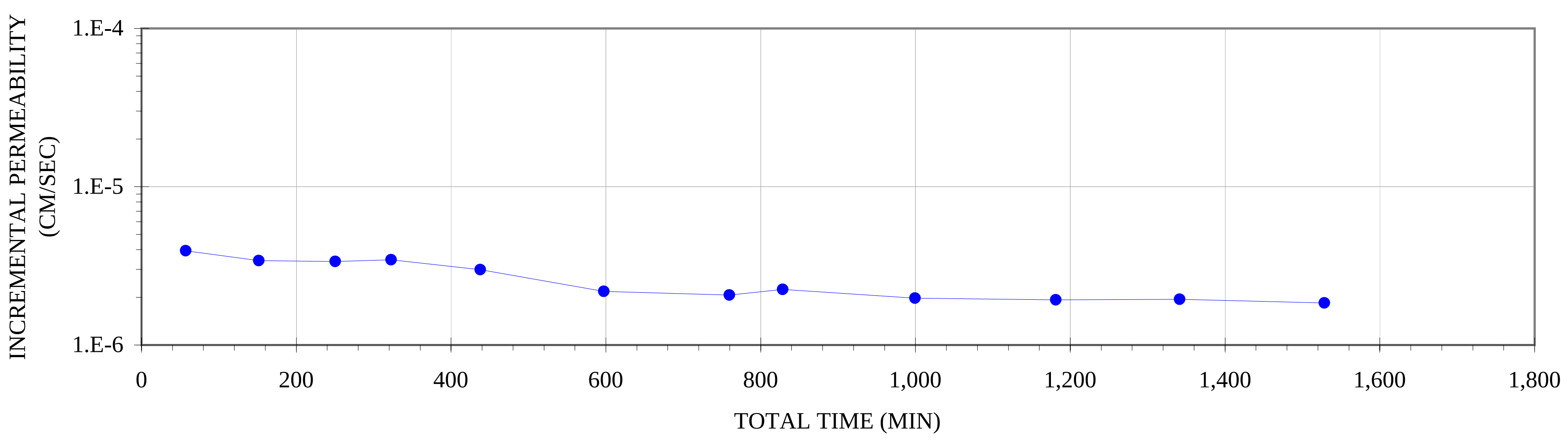
START DATE	START TIME	STOP DATE	STOP TIME	INCREMENT. FLOW (CC)	TOTAL FLOW (CC)	INCREMENT. TIME (MIN)	TOTAL TIME (MIN)	PERMEABILITY (cm/sec) INCREMENTAL	PERMEABILITY (cm/sec) MOVING AVG. GEOMEAN
7/17/2006	10:39:00	7/17/2006	11:36:15	15.70	15.7000	57.25	57.25	3.93E-06	3.93E-06
7/17/2006	11:39:00	7/17/2006	13:13:30	22.50	38.2000	94.50	151.75	3.41E-06	3.66E-06
7/17/2006	13:16:30	7/17/2006	14:55:00	23.20	61.4000	98.50	250.25	3.38E-06	3.56E-06
7/17/2006	14:57:30	7/17/2006	16:10:00	17.50	78.9000	72.50	322.75	3.46E-06	3.54E-06
7/18/2006	8:02:00	7/18/2006	9:57:00	24.00	102.9000	115.00	437.75	2.99E-06	3.30E-06
7/18/2006	9:58:40	7/18/2006	12:38:30	24.30	127.2000	159.83	597.58	2.18E-06	2.95E-06
7/18/2006	12:41:00	7/18/2006	15:23:00	23.40	150.6000	162.00	759.58	2.07E-06	2.61E-06
7/18/2006	15:27:00	7/18/2006	16:36:00	10.80	161.4000	69.00	828.58	2.24E-06	2.35E-06
7/19/2006	8:01:00	7/19/2006	10:52:00	23.60	185.0000	171.00	999.58	1.98E-06	2.12E-06
7/19/2006	10:53:30	7/19/2006	13:55:30	24.50	209.5000	182.00	1181.58	1.93E-06	2.05E-06
7/19/2006	13:59:00	7/19/2006	16:39:00	21.70	231.2000	160.00	1341.58	1.94E-06	2.02E-06
7/20/2006	12:57:00	7/20/2006	16:04:00	24.00	255.2000	187.00	1528.58	1.84E-06	1.92E-06

HANSON

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER:	05S3004A	TEST DATE:	8/30/2007
CLIENT:	AEG Coffeen Power Station	BORING #:	SB-9
JOB DESCRIPTION:	CCB Management Facility	SAMPLE #:	14
SAMPLE DESCRIPTION:	Gray vf. sandy silt / so. clay (tr. c. sand & sm. gravel).	DEPTH (FT):	26.5-27.0
SPECIMEN HEIGHT (IN)	1.951	HEIGHT OF HEAD (PSI)	2.10
DIAMETER (IN)	2.775	PRESSURE HEAD (CM H2O):	147.67
AREA (SQ IN)	6.048	PANEL NUMBER	5
1/4 PORE VOLUME	10.81	FILE NAME:	05S3004A



Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

ASTM D5084

JOB NUMBER:	05S3004A	TEST DATE:	4/3/2006
CLIENT:	AEG Coffeen Power Station	BORING #:	SB-11
JOB DESCRIPTION:	CCB Management Facility	SAMPLE #:	BAG
SAMPLE DESCRIPTION:	Dk. brn. vf. sandy silty clay.	DEPTH (FT):	4.0-8.0
		FILE NAME:	05S3004A

		WATER CONTENT OF TRIMMINGS		
SPECIMEN WEIGHT (G)	349.45		BEFORE TEST	AFTER TEST
SPECIMEN HEIGHT (IN)	3.998			
DIAMETER (IN)	1.879	TARE + WET SOIL (G)	219.92	369.93
AREA (SQ IN)	2.773	TARE + DRY SOIL (G)	208.47	305.36
VOLUME (CU IN)	11.086	TARE (G)	138.74	3.72
WET DENSITY (PCF)	120.08	WATER (G)	11.45	64.57
DRY DENSITY (PCF)	103.14	DRY SOIL (G)	69.73	301.64
WT. DRY SOIL (G)	300.16	WATER CONTENT (%)	16.42	21.41
VOLUME DRY SOIL (CU IN)	6.784			
SP.GR. ASSUMED	2.70			
POROSITY (%)	38.81	STD. MAX. DEN.(LBS/CU.FT.)	108.80	
HEIGHT OF HEAD (PSI)	4.30	OPTIMUM MOISTURE (%)	16.10	
HYDRAULIC GRADIANT	29.8	% COMPACTION	94.80	
1/4 PORE VOLUME	17.62	PRESSURE HEAD (CM H2O)	302.36	
		PANEL NUMBER	7	
TEST METHOD USED:	IEPA ASTM D5084	PERMEANT USED:	Tap Water	

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER: 05S3004A
CLIENT: AEG Coffeen Power Station
JOB DESCRIPTION: CCB Management Facility

TEST DATE: 4/3/2006
BORING #: SB-11
SAMPLE #: BAG
DEPTH (FT): 4.0-8.0

SPECIMEN HEIGHT (IN): 3.998
DIAMETER (IN): 1.879
AREA (SQ IN): 2.773
1/4 PORE VOLUME: 17.62

HEIGHT OF HEAD (PSI): 4.30
PRESSURE HEAD (CM H2O): 302.36
PANEL NUMBER: 7
FILE NAME: 05S3004A

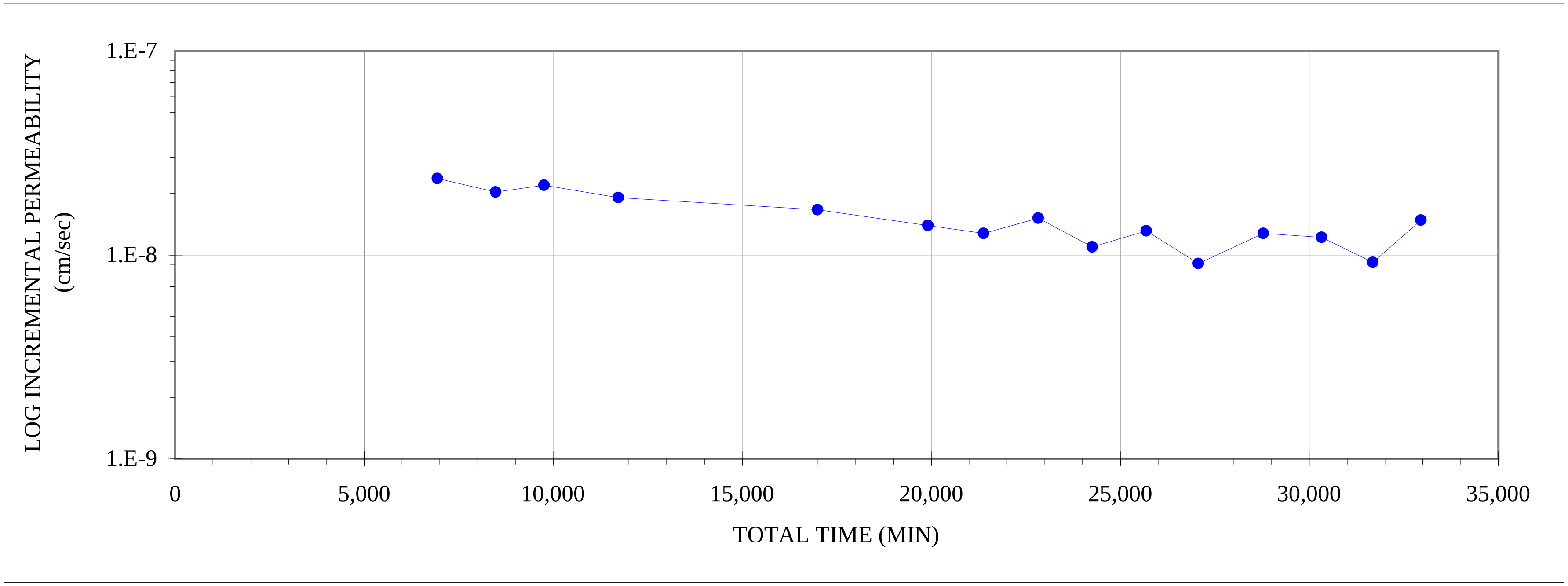
START DATE	START TIME	STOP DATE	STOP TIME	INCREMENT. FLOW (CC)	TOTAL FLOW (CC)	INCREMENT. TIME (MIN)	TOTAL TIME (MIN)	PERMEABILITY (cm/sec) INCREMENTAL	PERMEABILITY (cm/sec) MOVING AVG. GEOMEAN
5/10/2006	13:14:25	5/11/2006	8:22:00	0.80	0.8000	1147.58	1147.58	2.18E-08	2.18E-08
5/11/2006	8:22:00	5/12/2006	8:11:35	1.90	2.7000	1429.58	2577.17	4.16E-08	3.01E-08
5/12/2006	8:11:35	5/15/2006	8:53:00	3.30	6.0000	4361.42	6938.58	2.37E-08	2.78E-08
5/15/2006	8:53:00	5/16/2006	10:31:25	1.00	7.0000	1538.42	8477.00	2.03E-08	2.57E-08
5/16/2006	10:31:25	5/17/2006	7:53:35	0.90	7.9000	1282.17	9759.17	2.20E-08	2.58E-08
5/17/2006	7:53:35	5/18/2006	16:41:40	1.20	9.1000	1968.08	11727.25	1.91E-08	2.12E-08
5/18/2006	16:41:40	5/22/2006	8:25:20	2.80	11.9000	5263.67	16990.92	1.66E-08	1.94E-08
5/22/2006	8:25:20	5/24/2006	9:06:25	1.30	13.2000	2921.08	19912.00	1.39E-08	1.77E-08
5/24/2006	9:06:25	5/25/2006	9:36:40	0.60	13.8000	1470.25	21382.25	1.28E-08	1.54E-08
5/25/2006	9:36:40	5/26/2006	9:44:45	0.70	14.5000	1448.08	22830.33	1.51E-08	1.45E-08
5/26/2006	9:44:45	5/27/2006	9:31:35	0.50	15.0000	1426.83	24257.17	1.10E-08	1.31E-08
5/27/2006	9:31:35	5/28/2006	9:24:15	0.60	15.6000	1432.67	25689.83	1.31E-08	1.29E-08
5/28/2006	9:24:15	5/29/2006	8:21:20	0.40	16.0000	1377.08	27066.92	9.09E-09	1.19E-08
5/29/2006	8:21:20	5/30/2006	12:56:30	0.70	16.7000	1715.17	28782.08	1.28E-08	1.14E-08
5/30/2006	12:56:30	5/31/2006	14:36:35	0.60	17.3000	1540.08	30322.17	1.22E-08	1.17E-08
5/31/2006	14:36:35	6/1/2006	13:16:30	0.40	17.7000	1359.92	31682.08	9.20E-09	1.07E-08
6/1/2006	13:16:30	6/2/2006	10:24:00	0.60	18.3000	1267.50	32949.58	1.48E-08	1.21E-08

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER:	05S3004A	TEST DATE:	4/3/2006
CLIENT:	AEG Coffeen Power Station	BORING #:	SB-11
JOB DESCRIPTION:	CCB Management Facility	SAMPLE #:	BAG
		DEPTH (FT):	4.0-8.0

SPECIMEN HEIGHT (IN)	3.998	HEIGHT OF HEAD (PSI)	4.30
DIAMETER (IN)	1.879	PRESSURE HEAD (CM H2O)	302.36
AREA (SQ IN)	2.773	PANEL NUMBER	7
1/4 PORE VOLUME	17.62	FILE NAME:	05S3004A



Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

ASTM D5084

JOB NUMBER:	05S3004A	TEST DATE:	7/7/2006
CLIENT:	AEG Coffeen Power Station	BORING #:	SB-12
JOB DESCRIPTION:	CCB Management Facility	SAMPLE #:	6B
SAMPLE DESCRIPTION:	Gray vf. sandy silty clay (tr. c. sand).	DEPTH (FT):	45.0-50.0
		FILE NAME:	05S3004A

		WATER CONTENT OF TRIMMINGS	BEFORE TEST	AFTER TEST
SPECIMEN WEIGHT (G)	459.74			
SPECIMEN HEIGHT (IN)	3.419			
DIAMETER (IN)	2.347	TARE + WET SOIL (G)	65.87	513.41
AREA (SQ IN)	4.326	TARE + DRY SOIL (G)	54.60	427.45
VOLUME (CU IN)	14.792	TARE (G)	3.70	50.03
WET DENSITY (PCF)	118.40	WATER (G)	11.27	85.96
DRY DENSITY (PCF)	96.94	DRY SOIL (G)	50.90	377.42
WT. DRY SOIL (G)	376.40	WATER CONTENT (%)	22.14	22.78
VOLUME DRY SOIL (CU IN)	8.507			
SP.GR. ASSUMED	2.70			
POROSITY (%)	42.49	STD. MAX. DEN.(LBS/CU.FT.)	112.00	
HEIGHT OF HEAD (PSI)	3.60	OPTIMUM MOISTURE (%)	14.70	
HYDRAULIC GRADIANT	29.1	% COMPACTION	86.55	
1/4 PORE VOLUME	25.75	PRESSURE HEAD (CM H2O)	253.14	
		PANEL NUMBER	8	
TEST METHOD USED:	IEPA ASTM D5084	PERMEANT USED:	TAP WATER	

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER: 05S3004A
CLIENT: AEG Coffeen Power Station
JOB DESCRIPTION: CCB Management Facility
SAMPLE DESCRIPTION: Gray vf. sandy silty clay (tr. c. sand).

TEST DATE: 7/7/2006
BORING #: SB-12
SAMPLE #: 6B
DEPTH (FT): 45.0-50.0

SPECIMEN HEIGHT (IN) 3.419
DIAMETER (IN) 2.347
AREA (SQ IN) 4.326
1/4 PORE VOLUME 25.75

HEIGHT OF HEAD (PSI) 3.60
PRESSURE HEAD (CM H2O) 253.14
PANEL NUMBER 8
FILE NAME: 05S3004A

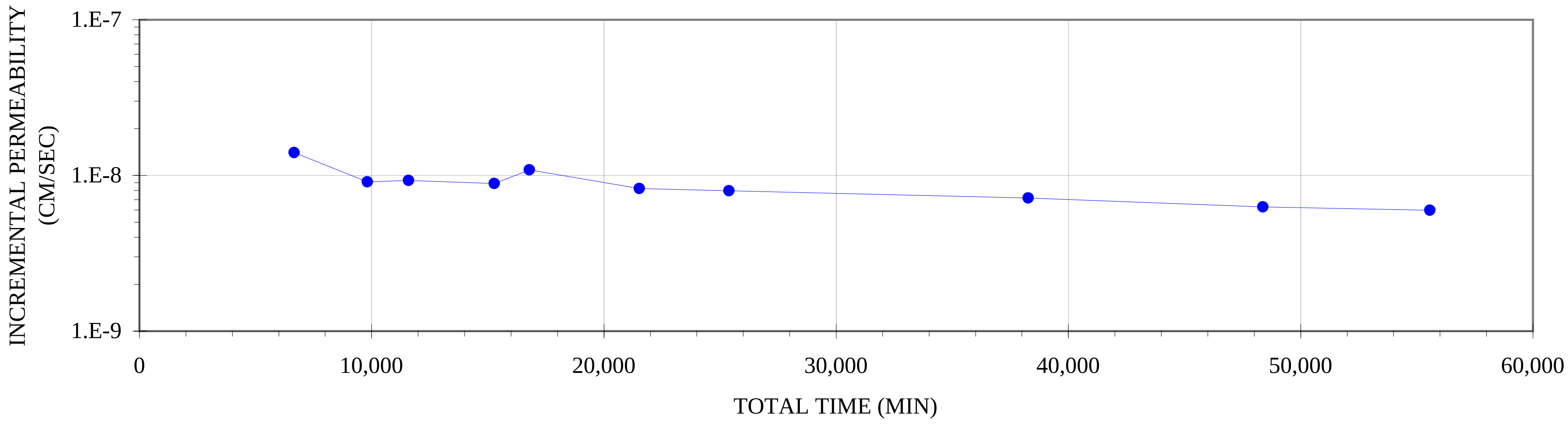
				INCREMENT.	TOTAL	INCREMENT.	TOTAL	PERMEABILITY (cm/sec)	
START DATE	START TIME	STOP DATE	STOP TIME	FLOW (CC)	FLOW (CC)	TIME (MIN)	TIME (MIN)	INCREMENTAL	MOVING AVG. GEOMEAN
7/17/2006	13:26:30	7/18/2006	8:11:00	0.40	0.4000	1124.50	1124.50	7.29E-09	7.29E-09
7/18/2006	8:11:00	7/19/2006	8:09:30	0.30	0.7000	1438.50	2563.00	4.27E-09	5.58E-09
7/19/2006	8:09:30	7/20/2006	7:57:30	0.20	0.9000	1428.00	3991.00	2.87E-09	4.47E-09
7/20/2006	7:57:30	7/21/2006	9:07:45	0.20	1.1000	1510.25	5501.25	2.71E-09	3.95E-09
7/24/2006	13:38:15	7/25/2006	9:05:25	0.80	1.9000	1167.17	6668.42	1.40E-08	4.65E-09
7/25/2006	9:05:25	7/27/2006	13:38:00	1.40	3.3000	3152.58	9821.00	9.10E-09	5.62E-09
7/27/2006	13:38:00	7/28/2006	19:03:30	0.80	4.1000	1765.50	11586.50	9.28E-09	7.53E-09
7/28/2006	19:03:30	7/31/2006	8:43:30	1.60	5.7000	3700.00	15286.50	8.86E-09	1.01E-08
7/31/2006	8:43:30	8/1/2006	9:52:15	0.80	6.5000	1508.75	16795.25	1.09E-08	9.49E-09
8/1/2006	9:52:15	8/4/2006	16:38:10	1.90	8.4000	4725.92	21521.17	8.24E-09	9.26E-09
8/4/2006	16:38:10	8/7/2006	8:58:40	1.50	9.9000	3860.50	25381.67	7.96E-09	8.91E-09
8/7/2006	8:58:40	8/16/2006	7:49:00	4.50	14.4000	12890.33	38272.00	7.15E-09	8.45E-09
8/16/2006	7:49:00	8/23/2006	8:14:00	3.10	17.5000	10105.00	48377.00	6.28E-09	7.37E-09
8/23/2006	8:14:00	8/28/2006	8:02:30	2.10	19.6000	7188.50	55565.50	5.98E-09	6.80E-09

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER:	05S3004A	TEST DATE:	7/7/2006
CLIENT:	AEG Coffeen Power Station	BORING #:	SB-12
JOB DESCRIPTION:	CCB Management Facility	SAMPLE #:	6B
SAMPLE DESCRIPTION:	Gray vf. sandy silty clay (tr. c. sand).	DEPTH (FT):	45.0-50.0

SPECIMEN HEIGHT (IN)	3.419	HEIGHT OF HEAD (PSI)	3.60
DIAMETER (IN)	2.347	PRESSURE HEAD (CM H2O)	253.14
AREA (SQ IN)	4.326	PANEL NUMBER	8
1/4 PORE VOLUME	25.75	FILE NAME:	05S3004A



Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

ASTM D5084

JOB NUMBER:	05S3004A	TEST DATE:	7/10/2006
CLIENT:	AEG Coffeen Power Station	BORING #:	SB-13
JOB DESCRIPTION:	CCB Management Facility	SAMPLE #:	12
SAMPLE DESCRIPTION:	Gray vf. sandy silty clay (tr. c. sand & sm. gravel).	DEPTH (FT):	25.0-30.0
		FILE NAME:	05S3004A

		WATER CONTENT OF TRIMMINGS	BEFORE TEST	AFTER TEST
SPECIMEN WEIGHT (G)	483.73			
SPECIMEN HEIGHT (IN)	3.259			
DIAMETER (IN)	2.279	TARE + WET SOIL (G)	125.78	534.14
AREA (SQ IN)	4.079	TARE + DRY SOIL (G)	112.15	475.18
VOLUME (CU IN)	13.294	TARE (G)	3.75	50.14
WET DENSITY (PCF)	138.62	WATER (G)	13.63	58.96
DRY DENSITY (PCF)	123.13	DRY SOIL (G)	108.40	425.04
WT. DRY SOIL (G)	429.70	WATER CONTENT (%)	12.57	13.87
VOLUME DRY SOIL (CU IN)	9.712			
SP.GR. ASSUMED	2.70			
POROSITY (%)	26.95	STD. MAX. DEN.(LBS/CU.FT.)		N/A
HEIGHT OF HEAD (PSI)	3.50	OPTIMUM MOISTURE (%)		N/A
HYDRAULIC GRADIANT	29.7	% COMPACTION		
1/4 PORE VOLUME	14.68	PRESSURE HEAD (CM H2O)		246.11
		PANEL NUMBER		1
TEST METHOD USED:	IEPA ASTM D5084	PERMEANT USED:	TAP WATER	

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER: 05S3004A
CLIENT: AEG Coffeen Power Station
JOB DESCRIPTION: CCB Management Facility
SAMPLE DESCRIPTION: Gray vf. sandy silty clay (tr. c. sand & sm. gravel).

TEST DATE: 7/10/2006
BORING #: SB-13
SAMPLE #: 12
DEPTH (FT): 25.0-30.0

SPECIMEN HEIGHT (IN) 3.259
DIAMETER (IN) 2.279
AREA (SQ IN) 4.079
1/4 PORE VOLUME 14.68

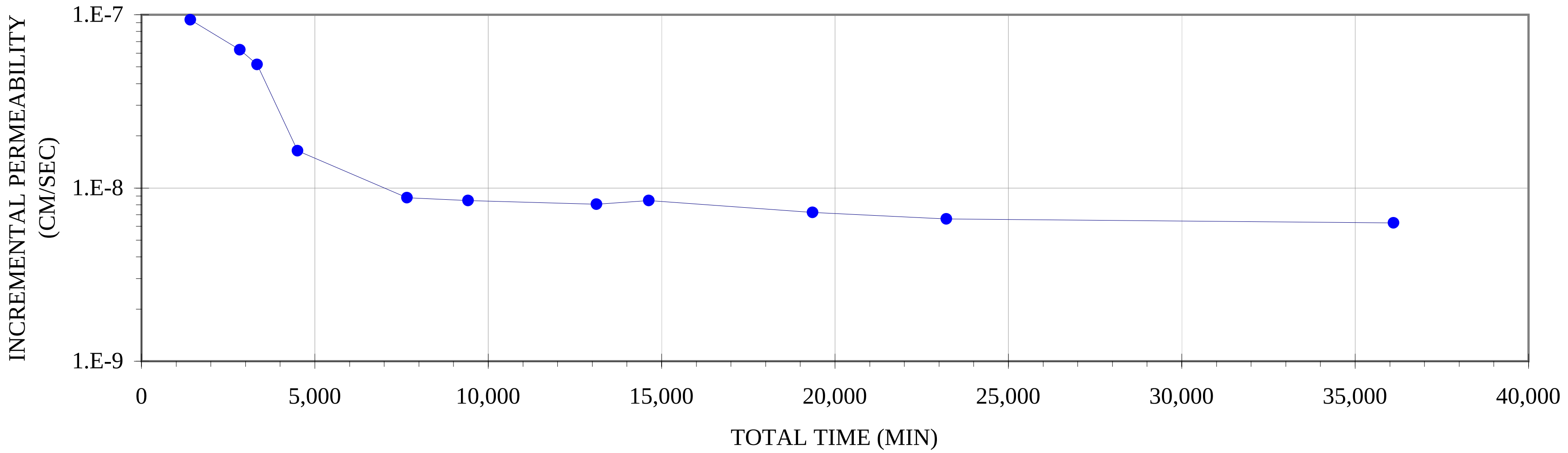
HEIGHT OF HEAD (PSI) 3.50
PRESSURE HEAD (CM H2O) 246.11
PANEL NUMBER 1
FILE NAME: 05S3004A

START DATE	START TIME	STOP DATE	STOP TIME	INCREMENT. FLOW (CC)	TOTAL FLOW (CC)	INCREMENT. TIME (MIN)	TOTAL TIME (MIN)	PERMEABILITY (cm/sec) INCREMENTAL	PERMEABILITY (cm/sec) MOVING AVG. GEOMEAN
7/19/2006	8:38:00	7/20/2006	8:11:10	6.20	6.2000	1413.17	1413.17	9.35E-08	9.35E-08
7/20/2006	8:11:10	7/21/2006	7:58:00	4.20	10.4000	1426.83	2840.00	6.27E-08	7.65E-08
7/21/2006	7:58:00	7/21/2006	16:13:00	1.20	11.6000	495.00	3335.00	5.16E-08	6.71E-08
7/24/2006	13:37:50	7/25/2006	9:06:10	0.90	12.5000	1168.33	4503.33	1.64E-08	4.72E-08
7/25/2006	9:06:10	7/27/2006	13:38:40	1.30	13.8000	3152.50	7655.83	8.78E-09	2.61E-08
7/27/2006	13:38:40	7/28/2006	19:01:35	0.70	14.5000	1762.92	9418.75	8.46E-09	1.58E-08
7/28/2006	19:01:35	7/31/2006	8:44:10	1.40	15.9000	3702.58	13121.33	8.05E-09	9.95E-09
7/31/2006	8:44:10	8/1/2006	9:53:15	0.60	16.5000	1509.08	14630.42	8.47E-09	8.44E-09
8/1/2006	9:53:15	8/4/2006	16:38:45	1.60	18.1000	4725.50	19355.92	7.21E-09	8.03E-09
8/4/2006	16:38:45	8/7/2006	8:59:19	1.20	19.3000	3860.57	23216.48	6.62E-09	7.55E-09
8/7/2006	8:59:19	8/16/2006	7:49:30	3.80	23.1000	12890.18	36106.67	6.28E-09	7.10E-09

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER:	05S3004A	TEST DATE:	7/10/2006
CLIENT:	AEG Coffeen Power Station	BORING #:	SB-13
JOB DESCRIPTION:	CCB Management Facility	SAMPLE #:	12
SAMPLE DESCRIPTION:	Gray vf. sandy silty clay (tr. c. sand & sm. gravel).	DEPTH (FT):	25.0-30.0
SPECIMEN HEIGHT (IN)	3.259	HEIGHT OF HEAD (PSI)	3.50
DIAMETER (IN)	2.279	PRESSURE HEAD (CM H2O)	246.11
AREA (SQ IN)	4.079	PANEL NUMBER	1
1/4 PORE VOLUME	14.68	FILE NAME:	05S3004A



H:\USERS\LAB\PERMEABILITY\05 Projects\05S3004A_ver1.xls

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

ASTM D5084

JOB NUMBER:	05S3004A	TEST DATE:	5/5/2006
CLIENT:	AEG Coffeen Power Station	BORING #:	SB-14
JOB DESCRIPTION:	CCB Management Facility	SAMPLE #:	BAG
SAMPLE DESCRIPTION:	Brn. vf. sandy silty clay (tr. sm. gravel).	DEPTH (FT):	5.0-10.0
		FILE NAME:	05S3004A

WATER CONTENT OF TRIMMINGS

			BEFORE TEST	AFTER TEST
SPECIMEN WEIGHT (G)	356.11			
SPECIMEN HEIGHT (IN)	3.998			
DIAMETER (IN)	1.879	TARE + WET SOIL (G)	214.34	378.18
AREA (SQ IN)	2.773	TARE + DRY SOIL (G)	204.66	316.21
VOLUME (CU IN)	11.086	TARE (G)	138.73	3.78
WET DENSITY (PCF)	122.37	WATER (G)	9.68	61.97
DRY DENSITY (PCF)	106.70	DRY SOIL (G)	65.93	312.43
WT. DRY SOIL (G)	310.52	WATER CONTENT (%)	14.68	19.83
VOLUME DRY SOIL (CU IN)	7.018			
SP.GR. ASSUMED	2.70			

POROSITY (%)	36.69	STD. MAX. DEN.(LBS/CU.FT.)	111.80
HEIGHT OF HEAD (PSI)	4.30	OPTIMUM MOISTURE (%)	14.90
HYDRAULIC GRADIANT	29.8	% COMPACTION	95.44
1/4 PORE VOLUME	16.67	PRESSURE HEAD (CM H2O)	302.36
		PANEL NUMBER	3
TEST METHOD USED:	IEPA ASTM D5084	PERMEANT USED:	TAP WATER

H:\USERS\LAB\PERMEABILITY\05 Projects\05S3004A_ver1.xls

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER:	05S3004A	TEST DATE:	5/5/2006
CLIENT:	AEG Coffeen Power Station	BORING #:	SB-14
JOB DESCRIPTION:	CCB Management Facility	SAMPLE #:	BAG
		DEPTH (FT):	5.0-10.0

SPECIMEN HEIGHT (IN)	3.998	HEIGHT OF HEAD (PSI)	4.30
DIAMETER (IN)	1.879	PRESSURE HEAD (CM H2O)	302.36
AREA (SQ IN)	2.773	PANEL NUMBER	3
1/4 PORE VOLUME	16.67	FILE NAME:	05S3004A

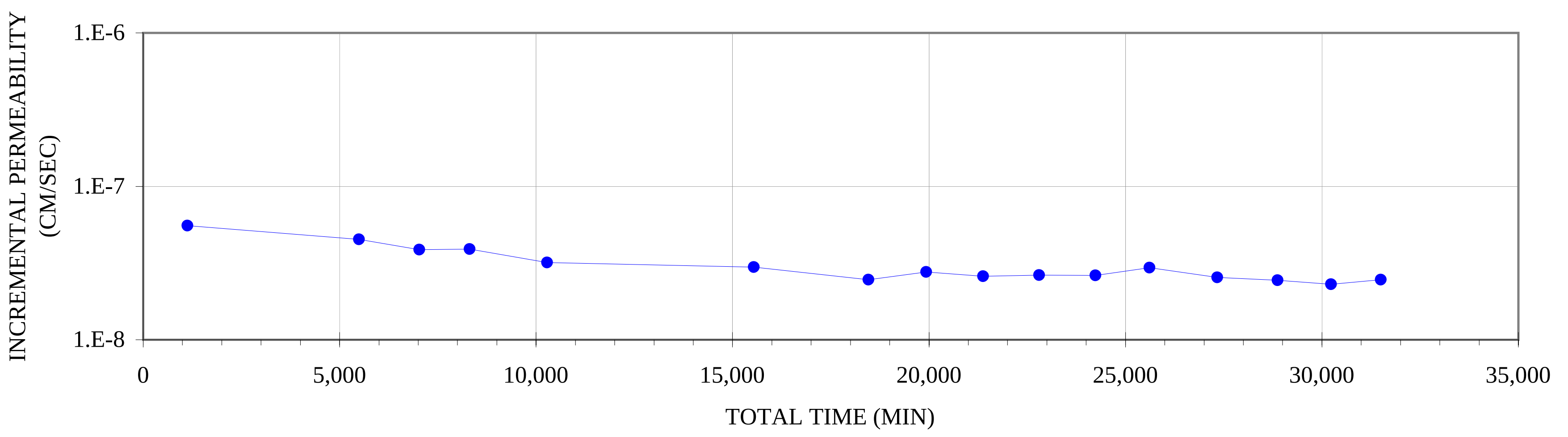
START DATE	START TIME	STOP DATE	STOP TIME	INCREMENT. FLOW (CC)	TOTAL FLOW (CC)	INCREMENT. TIME (MIN)	TOTAL TIME (MIN)	PERMEABILITY (cm/sec) INCREMENTAL	PERMEABILITY (cm/sec) MOVING AVG. GEOMEAN
5/11/2006	13:24:00	5/12/2006	8:13:00	2.00	2.0000	1129.00	1129.00	5.54E-08	5.54E-08
5/12/2006	8:13:00	5/15/2006	8:54:20	6.30	8.3000	4361.33	5490.33	4.52E-08	5.01E-08
5/15/2006	8:54:20	5/16/2006	10:33:00	1.90	10.2000	1538.67	7029.00	3.86E-08	4.59E-08
5/16/2006	10:33:00	5/17/2006	7:54:30	1.60	11.8000	1281.50	8310.50	3.91E-08	4.41E-08
5/17/2006	7:54:30	5/18/2006	16:42:10	2.00	13.8000	1967.67	10278.17	3.18E-08	3.84E-08
5/18/2006	16:42:10	5/22/2006	8:26:15	5.00	18.8000	5264.08	15542.25	2.97E-08	3.46E-08
5/22/2006	8:27:45	5/24/2006	9:07:00	2.30	21.1000	2919.25	18461.50	2.47E-08	3.09E-08
5/24/2006	9:07:00	5/25/2006	9:37:25	1.30	22.4000	1470.42	19931.92	2.77E-08	2.83E-08
5/25/2006	9:37:25	5/26/2006	9:45:15	1.20	23.6000	1447.83	21379.75	2.59E-08	2.69E-08
5/26/2006	9:45:15	5/27/2006	9:30:50	1.20	24.8000	1425.58	22805.33	2.63E-08	2.61E-08
5/27/2006	9:30:50	5/28/2006	9:22:30	1.20	26.0000	1431.67	24237.00	2.62E-08	2.65E-08
5/28/2006	9:22:30	5/29/2006	8:22:00	1.30	27.3000	1379.50	25616.50	2.95E-08	2.70E-08
5/29/2006	8:22:00	5/30/2006	13:01:00	1.40	28.7000	1719.00	27335.50	2.55E-08	2.68E-08
5/30/2006	13:01:00	5/31/2006	14:38:00	1.20	29.9000	1537.00	28872.50	2.44E-08	2.63E-08
5/31/2006	14:38:00	6/1/2006	13:19:00	1.00	30.9000	1361.00	30233.50	2.30E-08	2.55E-08
6/1/2006	13:19:00	6/2/2006	10:27:00	1.00	31.9000	1268.00	31501.50	2.47E-08	2.44E-08

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER:	05S3004A	TEST DATE:	5/5/2006
CLIENT:	AEG Coffeen Power Station	BORING #:	SB-14
JOB DESCRIPTION:	CCB Management Facility	SAMPLE #:	BAG
		DEPTH (FT):	5.0-10.0

SPECIMEN HEIGHT (IN)	3.998	HEIGHT OF HEAD (PSI)	4.30
DIAMETER (IN)	1.879	PRESSURE HEAD (CM H2O)	302.36
AREA (SQ IN)	2.773	PANEL NUMBER	3
1/4 PORE VOLUME	16.67	FILE NAME:	05S3004A



HANSON®

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

ASTM D5084

JOB NUMBER:	05S3004A	TEST DATE:	7/7/2006
CLIENT:	AEG Coffeen Power Station	BORING #:	SB-16
JOB DESCRIPTION:	CCB Management Facility	SAMPLE #:	18A
SAMPLE DESCRIPTION:	Brn. & gray f. sandy silt (tr. clay) / so.	DEPTH (FT):	37.0-37.5
	c. sand & sm. gravel.	FILE NAME:	05S3004A

		WATER CONTENT OF TRIMMINGS		
SPECIMEN WEIGHT (G)	855.13		BEFORE TEST	AFTER TEST
SPECIMEN HEIGHT (IN)	3.811			
DIAMETER (IN)	2.735	TARE + WET SOIL (G)	128.66	124.70
AREA (SQ IN)	5.875	TARE + DRY SOIL (G)	117.35	113.65
VOLUME (CU IN)	22.389	TARE (G)	3.72	3.71
WET DENSITY (PCF)	145.50	WATER (G)	11.31	11.05
DRY DENSITY (PCF)	132.33	DRY SOIL (G)	113.63	109.94
WT. DRY SOIL (G)	777.72	WATER CONTENT (%)	9.95	10.05
VOLUME DRY SOIL (CU IN)	17.578			
SP.GR. ASSUMED	2.70			
POROSITY (%)	21.49	STD. MAX. DEN.(LBS/CU.FT.)	112.00	
HEIGHT OF HEAD (PSI)	4.10	OPTIMUM MOISTURE (%)	14.70	
HYDRAULIC GRADIANT	29.8	% COMPACTION	118.15	
1/4 PORE VOLUME	19.71	PRESSURE HEAD (CM H2O)	288.30	
		PANEL NUMBER	3	
TEST METHOD USED:	IEPA ASTM D5084	PERMEANT USED:	TAP WATER	

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER: 05S3004A
CLIENT: AEG Coffeen Power Station
JOB DESCRIPTION: CCB Management Facility
SAMPLE DESCRIPTION: Brn. & gray f. sandy silt (tr. clay) / so. c. sand & sm. gravel.

TEST DATE: 7/7/2006
BORING #: SB-16
SAMPLE #: 18A
DEPTH (FT): 37.0-37.5

SPECIMEN HEIGHT (IN) 3.811
DIAMETER (IN) 2.735
AREA (SQ IN) 5.875
1/4 PORE VOLUME 19.71

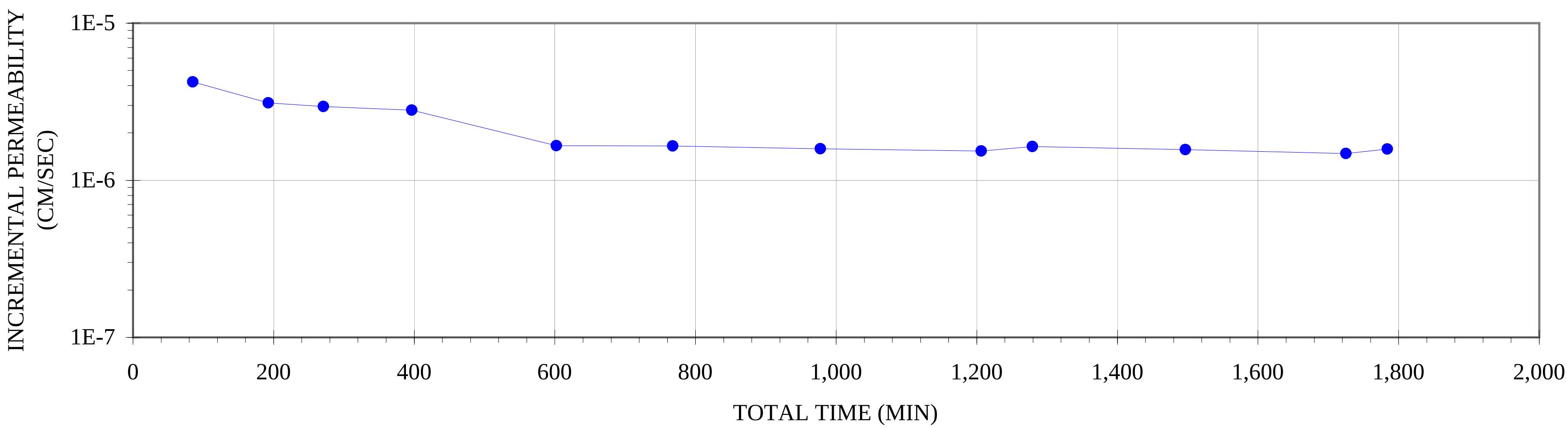
HEIGHT OF HEAD (PSI) 4.10
PRESSURE HEAD (CM H2O) 288.30
PANEL NUMBER 3
FILE NAME: 05S3004A

START DATE	START TIME	STOP DATE	STOP TIME	INCREMENT. FLOW (CC)	TOTAL FLOW (CC)	INCREMENT. TIME (MIN)	TOTAL TIME (MIN)	PERMEABILITY (cm/sec) INCREMENTAL	PERMEABILITY (cm/sec) MOVING AVG. GEOMEAN
7/17/2006	11:36:30	7/17/2006	13:01:30	24.30	24.3000	85.00	85.00	4.22E-06	4.22E-06
7/17/2006	13:04:30	7/17/2006	14:52:00	22.60	46.9000	107.50	192.50	3.10E-06	3.62E-06
7/17/2006	14:54:00	7/17/2006	16:12:15	15.60	62.5000	78.25	270.75	2.94E-06	3.38E-06
7/18/2006	8:08:00	7/18/2006	10:14:00	23.80	86.3000	126.00	396.75	2.79E-06	3.22E-06
7/18/2006	10:21:30	7/18/2006	13:47:00	23.10	109.4000	205.50	602.25	1.66E-06	2.55E-06
7/18/2006	13:48:30	7/18/2006	16:34:00	18.50	127.9000	165.50	767.75	1.65E-06	2.18E-06
7/19/2006	8:08:00	7/19/2006	11:38:00	22.60	150.5000	210.00	977.75	1.59E-06	1.87E-06
7/19/2006	11:40:00	7/19/2006	15:28:30	23.80	174.3000	228.50	1206.25	1.54E-06	1.61E-06
7/19/2006	15:30:30	7/19/2006	16:43:30	8.10	182.4000	73.00	1279.25	1.64E-06	1.60E-06
7/20/2006	7:55:00	7/20/2006	11:32:30	23.10	205.5000	217.50	1496.75	1.57E-06	1.58E-06
7/20/2006	11:35:30	7/20/2006	15:23:50	22.90	228.4000	228.33	1725.08	1.48E-06	1.56E-06
7/20/2006	15:27:00	7/20/2006	16:26:00	6.30	234.7000	59.00	1784.08	1.58E-06	1.56E-06

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER:	05S3004A	TEST DATE:	7/7/2006
CLIENT:	AEG Coffeen Power Station	BORING #:	SB-16
JOB DESCRIPTION:	CCB Management Facility	SAMPLE #:	18A
SAMPLE DESCRIPTION:	Brn. & gray f. sandy silt (tr. clay) / so. c. sand & sm. gravel.	DEPTH (FT):	37.0-37.5
SPECIMEN HEIGHT (IN)	3.811	HEIGHT OF HEAD (PSI)	4.10
DIAMETER (IN)	2.735	PRESSURE HEAD (CM H2O)	288.30
AREA (SQ IN)	5.875	PANEL NUMBER	3
1/4 PORE VOLUME	19.71	FILE NAME:	05S3004A



Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

ASTM D5084

JOB NUMBER:	05S3004A	TEST DATE:	7/10/2006
CLIENT:	AEG Coffeen Power Station	BORING #:	SB-16
JOB DESCRIPTION:	CCB Management Facility	SAMPLE #:	32A
SAMPLE DESCRIPTION:	Yel. brn. vf.-f. sandy silty clay / so. c.	DEPTH (FT):	78.0-78.5
	sand & sm. gravel & cobbles.	FILE NAME:	05S3004A

			WATER CONTENT OF TRIMMINGS	
			BEFORE TEST	AFTER TEST
SPECIMEN WEIGHT (G)	203.47			
SPECIMEN HEIGHT (IN)	1.873			
DIAMETER (IN)	1.949	TARE + WET SOIL (G)	159.86	258.48
AREA (SQ IN)	2.983	TARE + DRY SOIL (G)	140.04	227.76
VOLUME (CU IN)	5.588	TARE (G)	3.71	50.15
WET DENSITY (PCF)	138.71	WATER (G)	19.82	30.72
DRY DENSITY (PCF)	121.11	DRY SOIL (G)	136.33	177.61
WT. DRY SOIL (G)	177.64	WATER CONTENT (%)	14.54	17.30
VOLUME DRY SOIL (CU IN)	4.015			
SP.GR. ASSUMED	2.70			
POROSITY (%)	28.15	STD. MAX. DEN.(LBS/CU.FT.)	112.00	
HEIGHT OF HEAD (PSI)	2.00	OPTIMUM MOISTURE (%)	14.70	
HYDRAULIC GRADIANT	29.6	% COMPACTION	108.13	
1/4 PORE VOLUME	6.44	PRESSURE HEAD (CM H2O)	140.63	
		PANEL NUMBER	4	
TEST METHOD USED:	IEPA ASTM D5084	PERMEANT USED:	TAP WATER	

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER: 05S3004A
CLIENT: AEG Coffeen Power Station
JOB DESCRIPTION: CCB Management Facility
SAMPLE DESCRIPTION: Yel. brn. vf.-f. sandy silty clay / so. c. sand & sm. gravel & cobbles.

TEST DATE: 7/10/2006
BORING #: SB-16
SAMPLE #: 32A
DEPTH (FT): 78.0-78.5

SPECIMEN HEIGHT (IN) 1.873
DIAMETER (IN) 1.949
AREA (SQ IN) 2.983
1/4 PORE VOLUME 6.444

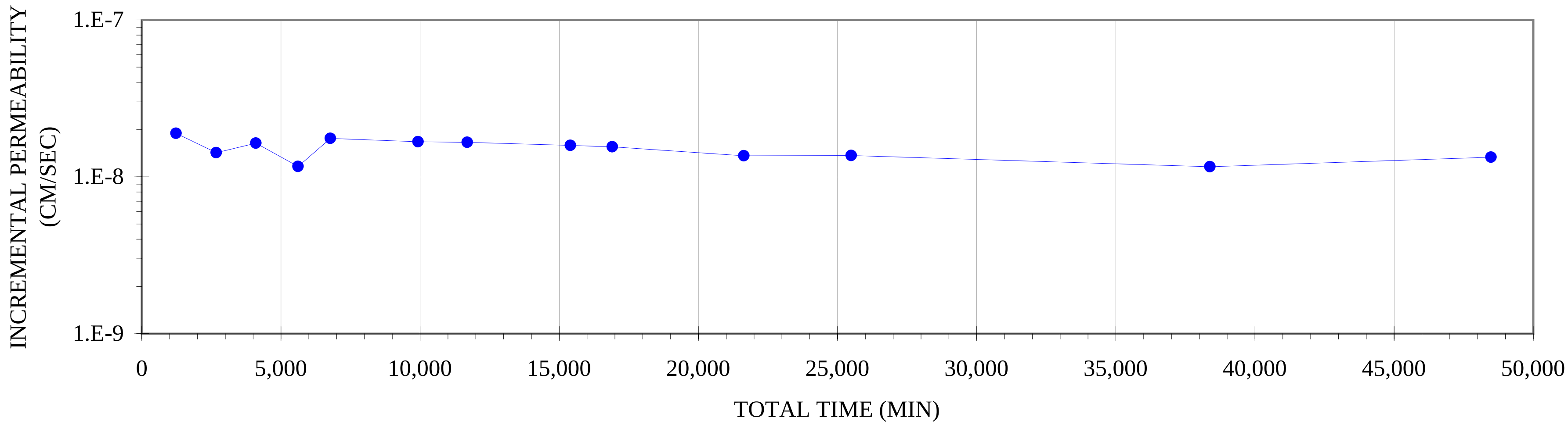
HEIGHT OF HEAD (PSI) 2.00
PRESSURE HEAD (CM H2O) 140.63
PANEL NUMBER 4
FILE NAME: 05S3004A

START DATE	START TIME	STOP DATE	STOP TIME	INCREMENT. FLOW (CC)	TOTAL FLOW (CC)	INCREMENT. TIME (MIN)	TOTAL TIME (MIN)	PERMEABILITY (cm/sec) INCREMENTAL	PERMEABILITY (cm/sec) MOVING AVG. GEOMEAN
7/17/2006	11:33:00	7/18/2006	8:09:00	0.80	0.8000	1236.00	1236.00	1.90E-08	1.90E-08
7/18/2006	8:09:00	7/19/2006	8:09:00	0.70	1.5000	1440.00	2676.00	1.42E-08	1.64E-08
7/19/2006	8:09:00	7/20/2006	7:56:00	0.80	2.3000	1427.00	4103.00	1.64E-08	1.64E-08
7/20/2006	7:56:00	7/21/2006	9:06:10	0.60	2.9000	1510.17	5613.17	1.16E-08	1.51E-08
7/24/2006	13:37:15	7/25/2006	9:04:50	0.70	3.6000	1167.58	6780.75	1.76E-08	1.48E-08
7/25/2006	9:04:50	7/27/2006	13:37:20	1.80	5.4000	3152.50	9933.25	1.67E-08	1.54E-08
7/27/2006	13:37:20	7/28/2006	19:03:10	1.00	6.4000	1765.83	11699.08	1.66E-08	1.54E-08
7/28/2006	19:03:10	7/31/2006	8:43:10	2.00	8.4000	3700.00	15399.08	1.58E-08	1.67E-08
7/31/2006	8:43:10	8/1/2006	9:51:30	0.80	9.2000	1508.33	16907.42	1.55E-08	1.62E-08
8/1/2006	9:51:30	8/4/2006	16:37:45	2.20	11.4000	4726.25	21633.67	1.36E-08	1.54E-08
8/4/2006	16:37:45	8/7/2006	8:58:05	1.80	13.2000	3860.33	25494.00	1.37E-08	1.46E-08
8/7/2006	8:58:05	8/16/2006	7:45:30	5.10	18.3000	12887.42	38381.42	1.16E-08	1.35E-08
8/16/2006	7:45:30	8/23/2006	8:13:36	4.60	22.9000	10108.10	48489.52	1.33E-08	1.30E-08

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER:	05S3004A	TEST DATE:	7/10/2006
CLIENT:	AEG Coffeen Power Station	BORING #:	SB-16
JOB DESCRIPTION:	CCB Management Facility	SAMPLE #:	32A
SAMPLE DESCRIPTION:	Yel. brn. vf.-f. sandy silty clay / so. c. sand & sm. gravel & cobbles.	DEPTH (FT):	78.0-78.5
SPECIMEN HEIGHT (IN)	1.873	HEIGHT OF HEAD (PSI)	2.00
DIAMETER (IN)	1.949	PRESSURE HEAD (CM H2O)	140.63
AREA (SQ IN)	2.983	PANEL NUMBER	4
1/4 PORE VOLUME	6.444	FILE NAME:	05S3004A



Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

ASTM D5084

JOB NUMBER:	05S3004A	TEST DATE:	7/7/2006
CLIENT:	AEG Coffeen Power Station	BORING #:	SB-18
JOB DESCRIPTION:	CCB Management Facility	SAMPLE #:	12
SAMPLE DESCRIPTION:	Gray f. sandy silt / so. c. sand	DEPTH (FT):	22.5-23.0
	& sm. gravel.	FILE NAME:	05S3004A

			WATER CONTENT OF TRIMMINGS	
			BEFORE TEST	AFTER TEST
SPECIMEN WEIGHT (G)	733.77			
SPECIMEN HEIGHT (IN)	3.163			
DIAMETER (IN)	2.746	TARE + WET SOIL (G)	87.91	784.05
AREA (SQ IN)	5.922	TARE + DRY SOIL (G)	82.64	736.02
VOLUME (CU IN)	18.732	TARE (G)	3.73	49.33
WET DENSITY (PCF)	149.22	WATER (G)	3.69	48.03
DRY DENSITY (PCF)	142.56	DRY SOIL (G)	78.91	686.69
WT. DRY SOIL (G)	700.99	WATER CONTENT (%)	4.68	6.99
VOLUME DRY SOIL (CU IN)	15.843			
SP.GR. ASSUMED	2.70			
POROSITY (%)	15.42	STD. MAX. DEN.(LBS/CU.FT.)	112.00	
HEIGHT OF HEAD (PSI)	3.40	OPTIMUM MOISTURE (%)	14.70	
HYDRAULIC GRADIANT	29.8	% COMPACTION	127.28	
1/4 PORE VOLUME	11.83	PRESSURE HEAD (CM H2O)	239.08	
		PANEL NUMBER	7	
TEST METHOD USED:	IEPA ASTM D5084	PERMEANT USED:	TAP WATER	

HANSON®

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER: 05S3004A
CLIENT: AEG Coffeen Power Station
JOB DESCRIPTION: CCB Management Facility
SAMPLE DESCRIPTION: Gray f. sandy silt / so. c. sand & sm. gravel.

TEST DATE: 7/7/2006
BORING #: SB-18
SAMPLE #: 12
DEPTH (FT): 22.5-23.0

SPECIMEN HEIGHT (IN) 3.163
DIAMETER (IN) 2.746
AREA (SQ IN) 5.922
1/4 PORE VOLUME 11.83

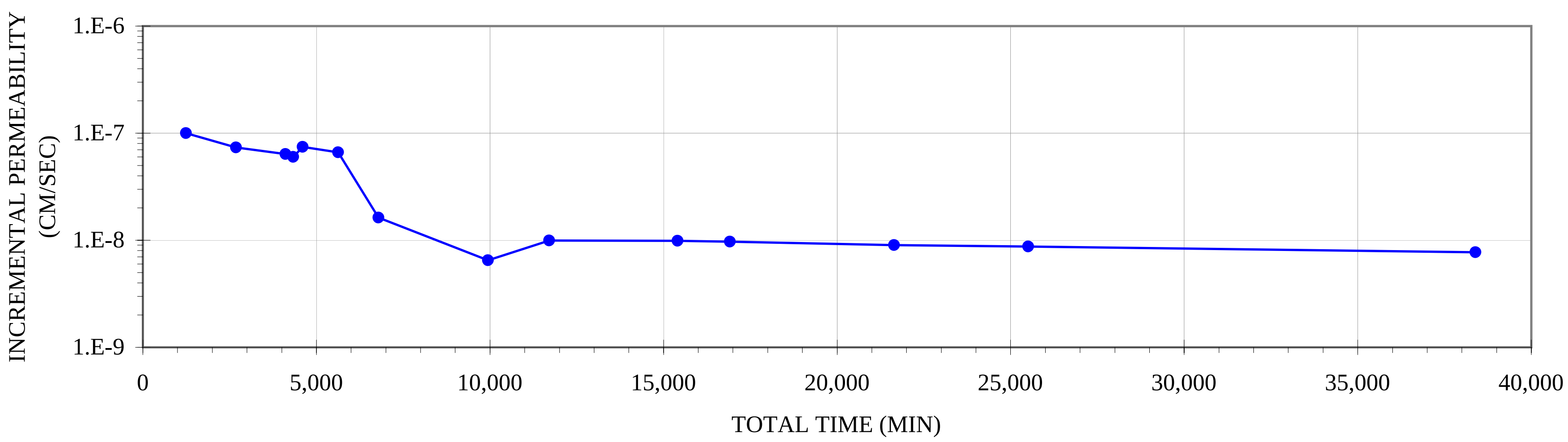
HEIGHT OF HEAD (PSI) 3.40
PRESSURE HEAD (CM H2O) 239.08
PANEL NUMBER 7
FILE NAME: 05S3004A

START DATE	START TIME	STOP DATE	STOP TIME	INCREMENT. FLOW (CC)	TOTAL FLOW (CC)	INCREMENT. TIME (MIN)	TOTAL TIME (MIN)	PERMEABILITY (cm/sec) INCREMENTAL	PERMEABILITY (cm/sec) MOVING AVG. GEOMEAN
7/17/2006	11:18:00	7/18/2006	8:05:00	8.50	8.5000	1247.00	1247.00	9.99E-08	9.99E-08
7/18/2006	8:05:00	7/19/2006	8:03:00	7.20	15.7000	1438.00	2685.00	7.34E-08	8.56E-08
7/19/2006	8:03:00	7/20/2006	7:50:00	6.20	21.9000	1427.00	4112.00	6.37E-08	7.76E-08
7/20/2006	7:50:00	7/20/2006	11:29:30	0.90	22.8000	219.50	4331.50	6.01E-08	7.28E-08
7/20/2006	11:31:30	7/20/2006	16:07:00	1.40	24.2000	275.50	4607.00	7.45E-08	6.76E-08
7/20/2006	16:07:00	7/21/2006	9:03:20	4.60	28.8000	1016.33	5623.33	6.63E-08	6.59E-08
7/24/2006	13:35:30	7/25/2006	9:04:20	1.30	30.1000	1168.83	6792.17	1.63E-08	4.69E-08
7/25/2006	9:04:20	7/27/2006	13:36:50	1.40	31.5000	3152.50	9944.67	6.51E-09	2.69E-08
7/27/2006	13:36:50	7/28/2006	19:02:50	1.20	32.7000	1766.00	11710.67	9.96E-09	1.63E-08
7/28/2006	19:02:50	7/31/2006	8:42:30	2.50	35.2000	3699.67	15410.33	9.91E-09	1.01E-08
7/31/2006	8:42:30	8/1/2006	9:50:45	1.00	36.2000	1508.25	16918.58	9.72E-09	8.89E-09
8/1/2006	9:50:45	8/4/2006	16:37:20	2.90	39.1000	4726.58	21645.17	8.99E-09	9.64E-09
8/4/2006	16:37:20	8/7/2006	8:57:34	2.30	41.4000	3860.23	25505.40	8.73E-09	9.33E-09
8/7/2006	8:57:34	8/16/2006	7:43:30	6.80	48.2000	12885.93	38391.33	7.74E-09	8.77E-09

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER:	05S3004A	TEST DATE:	7/7/2006
CLIENT:	AEG Coffeen Power Station	BORING #:	SB-18
JOB DESCRIPTION:	CCB Management Facility	SAMPLE #:	12
SAMPLE DESCRIPTION:	Gray f. sandy silt / so. c. sand & sm. gravel.	DEPTH (FT):	22.5-23.0
SPECIMEN HEIGHT (IN)	3.163	HEIGHT OF HEAD (PSI)	3.40
DIAMETER (IN)	2.746	PRESSURE HEAD (CM H2O)	239.08
AREA (SQ IN)	5.922	PANEL NUMBER	7
1/4 PORE VOLUME	11.83	FILE NAME:	05S3004A



Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

ASTM D5084

JOB NUMBER:	05S3004A	TEST DATE:	7/10/2006
CLIENT:	AEG Coffeen Power Station	BORING #:	SB-19
JOB DESCRIPTION:	CCB Management Facility	SAMPLE #:	18
SAMPLE DESCRIPTION:	Brn. & gray vf. sandy silty clay.	DEPTH (FT):	55.0-60.0
		FILE NAME:	05S3004A

		WATER CONTENT OF TRIMMINGS	BEFORE TEST	AFTER TEST
SPECIMEN WEIGHT (G)	438.75			
SPECIMEN HEIGHT (IN)	3.586			
DIAMETER (IN)	2.165	TARE + WET SOIL (G)	103.57	491.35
AREA (SQ IN)	3.681	TARE + DRY SOIL (G)	84.68	406.17
VOLUME (CU IN)	13.201	TARE (G)	3.71	49.88
WET DENSITY (PCF)	126.61	WATER (G)	18.89	85.18
DRY DENSITY (PCF)	102.66	DRY SOIL (G)	80.97	356.29
WT. DRY SOIL (G)	355.75	WATER CONTENT (%)	23.33	23.91
VOLUME DRY SOIL (CU IN)	8.041			
SP.GR. ASSUMED	2.70			

POROSITY (%)	39.09	STD. MAX. DEN.(LBS/CU.FT.)	N/A
HEIGHT OF HEAD (PSI)	3.90	OPTIMUM MOISTURE (%)	N/A
HYDRAULIC GRADIANT	30.1	% COMPACTION	
1/4 PORE VOLUME	21.14	PRESSURE HEAD (CM H2O)	274.24
		PANEL NUMBER	2
TEST METHOD USED:	IEPA ASTM D5084	PERMEANT USED:	TAP WATER

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER: 05S3004A
CLIENT: AEG Coffeen Power Station
JOB DESCRIPTION: CCB Management Facility
SAMPLE DESCRIPTION: Brn. & gray vf. sandy silty clay.

TEST DATE: 7/10/2006
BORING #: SB-19
SAMPLE #: 18
DEPTH (FT): 55.0-60.0

SPECIMEN HEIGHT (IN) 3.586
DIAMETER (IN) 2.165
AREA (SQ IN) 3.681
1/4 PORE VOLUME 21.142

HEIGHT OF HEAD (PSI) 3.90
PRESSURE HEAD (CM H2O) 274.24
PANEL NUMBER 2
FILE NAME: 05S3004A

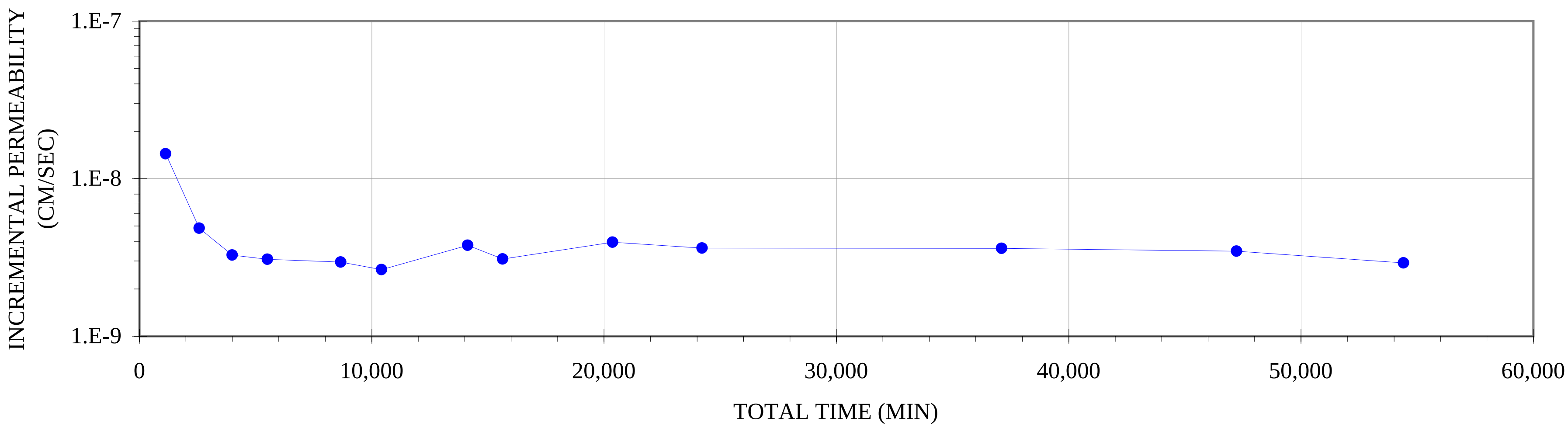
START DATE	START TIME	STOP DATE	STOP TIME	INCREMENT. FLOW (CC)	TOTAL FLOW (CC)	INCREMENT. TIME (MIN)	TOTAL TIME (MIN)	PERMEABILITY (cm/sec) INCREMENTAL	PERMEABILITY (cm/sec) MOVING AVG. GEOMEAN
7/17/2006	13:19:45	7/18/2006	8:13:00	0.70	0.7000	1133.25	1133.25	1.44E-08	1.44E-08
7/18/2006	8:13:00	7/19/2006	8:12:30	0.30	1.0000	1439.50	2572.75	4.86E-09	8.36E-09
7/19/2006	8:12:30	7/20/2006	7:59:00	0.20	1.2000	1426.50	3999.25	3.27E-09	6.11E-09
7/20/2006	7:59:00	7/21/2006	9:12:50	0.20	1.4000	1513.83	5513.08	3.08E-09	5.15E-09
7/25/2006	9:06:45	7/27/2006	13:39:04	0.40	1.8000	3152.32	8665.40	2.96E-09	3.47E-09
7/27/2006	13:39:04	7/28/2006	19:02:15	0.20	2.0000	1763.18	10428.58	2.64E-09	2.98E-09
7/28/2006	19:02:15	7/31/2006	8:44:30	0.60	2.6000	3702.25	14130.83	3.78E-09	3.09E-09
7/31/2006	8:44:30	8/1/2006	9:54:00	0.20	2.8000	1509.50	15640.33	3.09E-09	3.09E-09
8/1/2006	9:54:00	8/4/2006	16:39:20	0.80	3.6000	4725.33	20365.67	3.95E-09	3.32E-09
8/4/2006	16:39:20	8/7/2006	8:59:50	0.60	4.2000	3860.50	24226.17	3.62E-09	3.59E-09
8/7/2006	8:59:50	8/16/2006	7:51:30	2.00	6.2000	12891.67	37117.83	3.62E-09	3.55E-09
8/16/2006	7:51:30	8/23/2006	8:15:00	1.50	7.7000	10103.50	47221.33	3.46E-09	3.66E-09
8/23/2006	8:15:00	8/28/2006	8:03:30	0.90	8.6000	7188.50	54409.83	2.92E-09	3.39E-09

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER:	05S3004A	TEST DATE:	7/10/2006
CLIENT:	AEG Coffeen Power Station	BORING #:	SB-19
JOB DESCRIPTION:	CCB Management Facility	SAMPLE #:	18
SAMPLE DESCRIPTION:	Brn. & gray vf. sandy silty clay.	DEPTH (FT):	55.0-60.0

SPECIMEN HEIGHT (IN)	3.586	HEIGHT OF HEAD (PSI)	3.90
DIAMETER (IN)	2.165	PRESSURE HEAD (CM H2O)	274.24
AREA (SQ IN)	3.681	PANEL NUMBER	2
1/4 PORE VOLUME	21.142	FILE NAME:	05S3004A



AECOM 2015 LABORATORY RESULTS

MEASUREMENT OF HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIALS
USING A FLEXIBLE WALL PERMEAMETER
ASTM D 5084 - 03 METHOD C TEST WITH INCREASING TAILWATER LEVEL
FLUID: DEAIRED TAP WATER WITH 0.005 N $CaSO_4$

PROJECT NAME:	DYNEGY	PROJECT NUMBER:	15151122
LOCATION:	COFFEEN, ILLINOIS	DATE:	7/30/2015
		PANEL IDENTIFICATION:	Lenexa Perm Board
SAMPLE ID:	COF-B001 S7 21.0 - 23.0 feet	BURETTE AREA:	0.312 cm^2
SAMPLE DESCR.:	FAT CLAY WITH SAND, GRAY WITH YELLOWISH BROWN	BURETTE INCREMENT LENGTH:	1.000 cm
		VOLUME PER INCREMENT:	0.312 cm^3

INITIAL

MOISTURE%		DENSITY			
W & T, g	145.02	WET WT, g	475.6		
D & T, g	123.94	DIA, in	2.872	7.29	cm
T, g	33.98	HT, in	2.225	5.65	cm
		AREA		41.80	cm^2
MOIST-		DENSITY:	125.7	PCF WET	
URE, %	**23.4**	DENSITY:	**101.8**	PCF DRY	

ADDITIONAL DATA

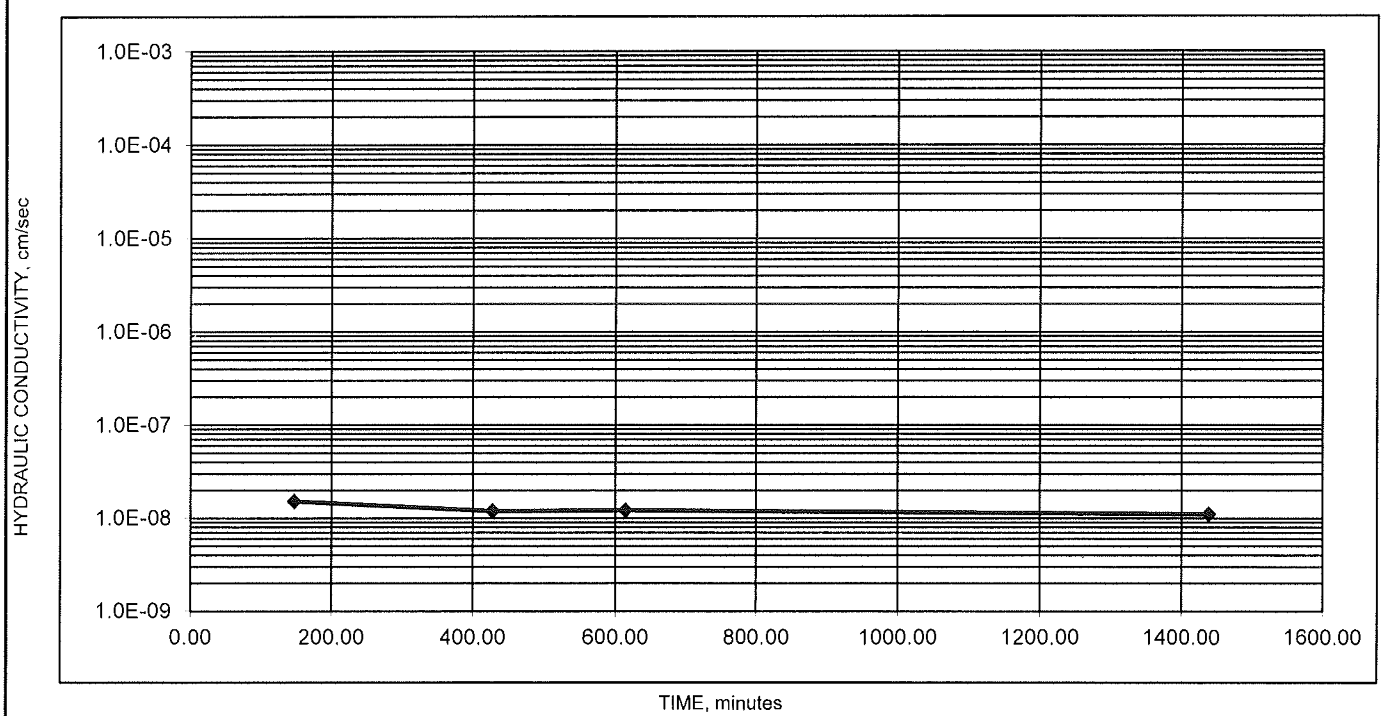
SPECIFIC GRAVITY:	2.70	RECOMPACTED?:	NO
SPECIFIC GRAVITY:	ASSUMED	PROCTOR, pcf:	NA
POROSITY, %:	39.6	OPTIMUM, %:	NA
SATURATION, %:	96.6	COMPACTION, %:	NA
VOID RATIO:	0.66	OVER OPTIMUM, %:	NA

SATURATION:	LATERAL PRESS.: 104.0 psi	BACK PRESSURE (=UPPER=LOWER):	100.0 psi		
DURING TEST:	LATERAL PRESS.: 104.0 psi	H2:	100.0 psi	H1:	100.0 psi
				BIAS PRESSURE (=H1-H2)	0.0 psi

H1 VALUE	H2 VALUE	ELAPSED TIME, min	DELTA H cm	Ln H1/H2	HYD CON k, cm/sec	OUT FLOW cm^3	IN FLOW cm^3	OUT/IN RATIO	HYD GRAD	% FROM MEAN k	TEMP.: C	TEMP. CORR.:
8.8	67.6	0.00	58.8									
9.0	67.4	147.00	58.4	0.006826	1.52E-08	0.06	0.06	1.00	10.3	21	23.0	0.931
9.3	67.1	428.00	57.8	0.010327	1.20E-08	0.09	0.09	1.00	10.2	5	23.3	0.925
9.5	66.9	614.00	57.4	0.006944	1.22E-08	0.06	0.06	1.00	10.2	3	23.2	0.927
10.3	66.1	1439.00	55.8	0.028270	1.11E-08	0.25	0.25	1.00	9.9	12	23.6	0.918

HYDRAULIC CONDUCTIVITY (k_{20}) = AVERAGE 1.3E-08 cm/sec

MAXIMUM	1.0E-03 TO 1.0E-04	2	0.75<	30	% < 25 AT
HYDRAULIC	1.0E-04 TO 1.0E-05	5	RATIO	MAX	> 1.0E-8
GRADIENT	1.0E-05 TO 1.0E-06	10	<1.25	HYDRAULIC	OR
	1.0E-06 TO 1.0E-07	20		GRADIENT	% < 50 AT
	less than 1.0E-07	30		ALLOWED	< 1.0E-8



MEASUREMENT OF HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIALS
USING A FLEXIBLE WALL PERMEAMETER
ASTM D 5084 - 03 METHOD C TEST WITH INCREASING TAILWATER LEVEL
FLUID: DEAIRED TAP WATER WITH 0.005 N $CaSO_4$

PROJECT NAME:	DYNEGY	PROJECT NUMBER:	15151122
LOCATION:	COFFEEN, ILLINOIS	DATE:	7/30/2015
		PANEL IDENTIFICATION:	Lenexa Perm Board
SAMPLE ID:	COF-B002 S4 8.5 - 10.5 feet	BURETTE AREA:	0.312 cm^2
SAMPLE DESCR.:	LEAN CLAY WITH SAND, GRAY WITH YELLOWISH BROWN	BURETTE INCREMENT LENGTH:	1.000 cm
		VOLUME PER INCREMENT:	0.312 cm^3

INITIAL

MOISTURE%		DENSITY			
W & T, g	143.03	WET WT, g	495.1		
D & T, g	126.58	DIA, in	2.861	7.27	cm
T, g	33.92	HT, in	2.182	5.54	cm
		AREA		41.48	cm^2
MOIST-		DENSITY:	134.5	PCF WET	
URE, %	**17.8**	DENSITY:	**114.2**	PCF DRY	

ADDITIONAL DATA

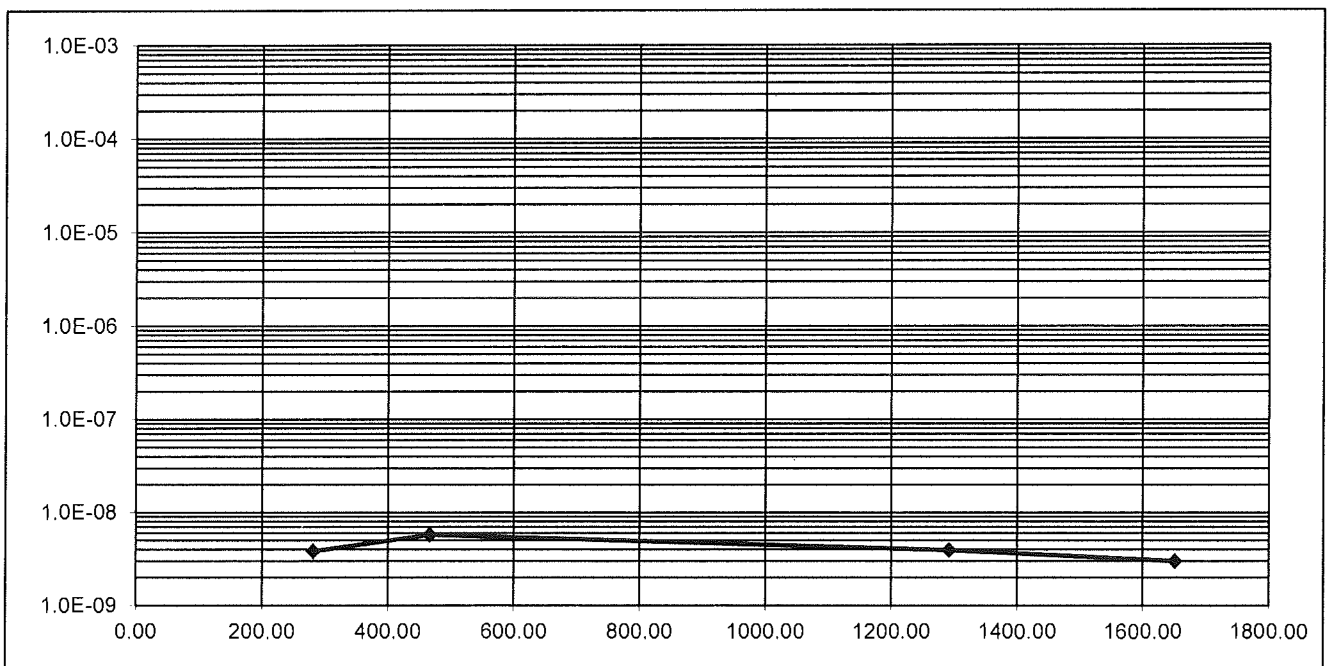
SPECIFIC GRAVITY:	2.70	RECOMPACTED?:	NO
SPECIFIC GRAVITY:	ASSUMED	PROCTOR, pcf:	NA
POROSITY, %:	32.3	OPTIMUM, %:	NA
SATURATION, %:	100.7	COMPACTION, %:	NA
VOID RATIO:	0.48	OVER OPTIMUM, %:	NA

SATURATION:	LATERAL PRESS.: 104.0 psi	BACK PRESSURE (=UPPER=LOWER): 100.0 psi	
DURING TEST:	LATERAL PRESS.: 104.0 psi	H2: 100.0 psi	H1: 100.0 psi
		BIAS PRESSURE (=H1-H2) 0.0 psi	

H1 VALUE	H2 VALUE	ELAPSED TIME, min	DELTA H cm	Ln H1/H2	HYD CON k, cm/sec	OUT FLOW cm^3	IN FLOW cm^3	OUT/IN RATIO	HYD GRAD	% FROM MEAN k	TEMP.: C	TEMP. CORR.:
7.4	67.7	0.00	60.3									
7.5	67.6	281.00	60.1	0.003322	3.83E-09	0.03	0.03	1.00	10.8	7	23.0	0.931
7.6	67.5	467.00	59.9	0.003333	5.76E-09	0.03	0.03	1.00	10.8	39	23.3	0.925
7.9	67.2	1292.00	59.3	0.010067	3.93E-09	0.09	0.09	1.00	10.7	5	23.2	0.927
8.0	67.1	1651.00	59.1	0.003378	3.01E-09	0.03	0.03	1.00	10.7	27	23.6	0.918

HYDRAULIC CONDUCTIVITY (k_{20}) = AVERAGE 4.1E-09 cm/sec

MAXIMUM	1.0E-03 TO 1.0E-04	2	0.75<	30	% < 25 AT
HYDRAULIC	1.0E-04 TO 1.0E-05	5	RATIO	MAX	> 1.0E-8
GRADIENT	1.0E-05 TO 1.0E-06	10	<1.25	HYDRAULIC	OR
	1.0E-06 TO 1.0E-07	20		GRADIENT	% < 50 AT
	less than 1.0E-07	30		ALLOWED	< 1.0E-8



N:\CM\LAB_DATA\00 Projects in Progress\2015 Projects in Progress\15151122 Lab Data\[15151122 Permeability D5084-C COF-B002-S4-8.5.x

Terracon

MEASUREMENT OF HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIALS
USING A FLEXIBLE WALL PERMEAMETER
ASTM D 5084 - 03 METHOD C TEST WITH INCREASING TAILWATER LEVEL
FLUID: DEAIRED TAP WATER WITH 0.005 N CaSO4

PROJECT NAME:	DYNEGY	PROJECT NUMBER:	15151122
LOCATION:	COFFEEN, ILLINOIS	DATE:	9/9/2015
		PANEL IDENTIFICATION:	Lenexa Perm Board
SAMPLE ID:	COF-B003 S9 30.0 - 30.0 feet	BURETTE AREA:	0.312 cm^2
SAMPLE DESCR.:	SILTY SAND, DARK YELLOWISH BROWN WITH GRAYISH BROWN	BURETTE INCREMENT LENGTH:	1.000 cm
		VOLUME PER INCREMENT:	0.312 cm^3

INITIAL

MOISTURE%		DENSITY			
W & T, g	170.46	WET WT, g	482.1		
D & T, g	155.96	DIA, in	2.858	7.26	cm
T, g	32.90	HT, in	2.022	5.14	cm
		AREA		41.39	cm^2
MOIST-		DENSITY:	141.6	PCF WET	
URE, %	**11.8**	DENSITY:	**126.7**	PCF DRY	

ADDITIONAL DATA

SPECIFIC GRAVITY:	2.70	RECOMPACTED?:	NO
SPECIFIC GRAVITY:	ASSUMED	PROCTOR, pcf:	NA
POROSITY, %:	24.9	OPTIMUM, %:	NA
SATURATION, %:	96.2	COMPACTION, %:	NA
VOID RATIO:	0.33	OVER OPTIMUM, %:	NA

SATURATION: LATERAL PRESS.: 104.0 psi | BACK PRESSURE (=UPPER=LOWER): 100.0 psi

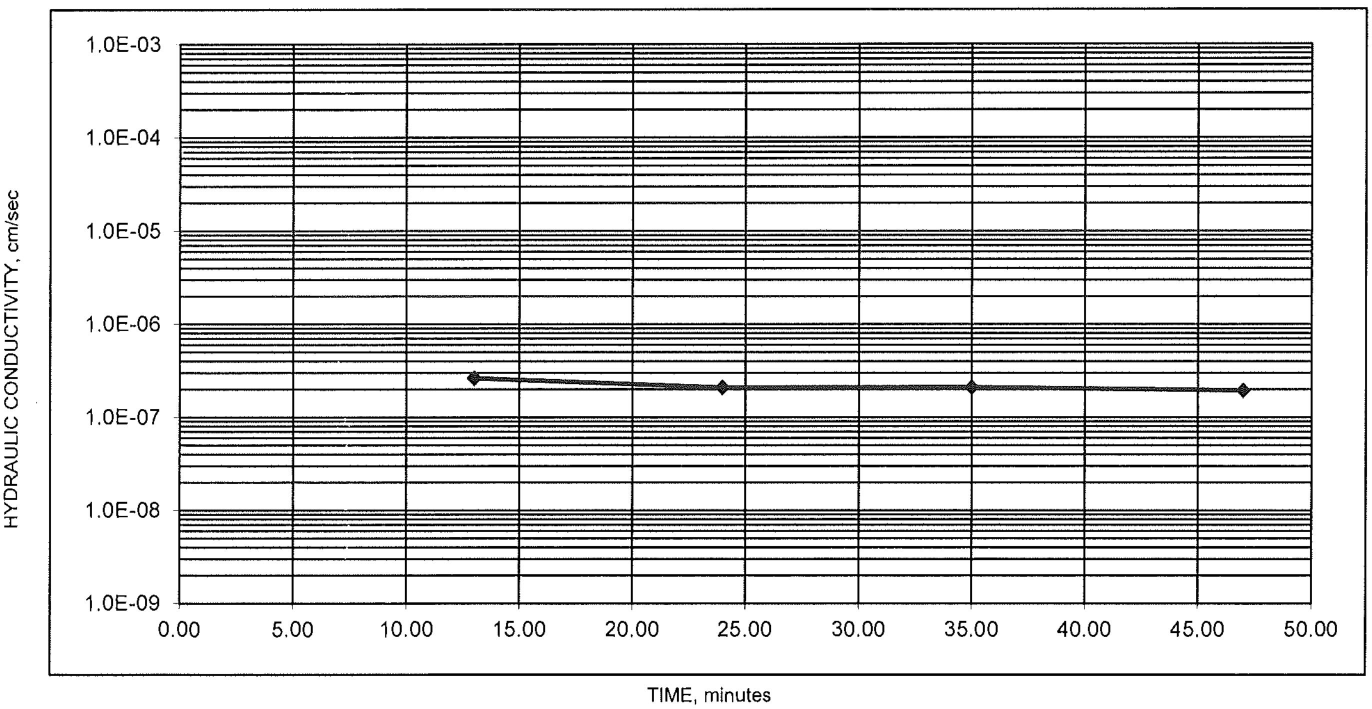
DURING TEST: LATERAL PRESS.: 104.0 psi | H2: 100.0 psi | H1: 100.0 psi

BIAS PRESSURE (=H1-H2) 0.0 psi

H1 VALUE	H2 VALUE	ELAPSED TIME, min	DELTA H cm	Ln H1/H2	HYD CON k, cm/sec	OUT FLOW cm^3	IN FLOW cm^3	OUT/IN RATIO	HYD GRAD	% FROM MEAN k	TEMP.: C	TEMP. CORR.:
11.8	64.6	0.00	52.8									
12.1	64.3	13.00	52.2	0.011429	2.63E-07	0.09	0.09	1.00	10.2	20	23.3	0.925
12.3	64.1	24.00	51.8	0.007692	2.09E-07	0.06	0.06	1.00	10.1	5	23.3	0.925
12.5	63.9	35.00	51.4	0.007752	2.10E-07	0.06	0.06	1.00	10.0	4	23.3	0.925
12.7	63.7	47.00	51.0	0.007813	1.94E-07	0.06	0.06	1.00	9.9	11	23.3	0.925

HYDRAULIC CONDUCTIVITY (k_{20}) = AVERAGE 2.2E-07 cm/sec

MAXIMUM	1.0E-03 TO 1.0E-04	2	0.75<	20	% < 25 AT
HYDRAULIC	1.0E-04 TO 1.0E-05	5	RATIO	MAX	> 1.0E-8
GRADIENT	1.0E-05 TO 1.0E-06	10	<1.25	HYDRAULIC	OR
	1.0E-06 TO 1.0E-07	20		GRADIENT	% < 50 AT
	less than 1.0E-07	30		ALLOWED	< 1.0E-8



N:\CM\LAB_DATA\00 Projects in Progress\2015 Projects in Progress\15151122 Lab Data\15151122 Permeability D5084-C COF-B003-S9-30.0

Terracon

MEASUREMENT OF HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIALS
USING A FLEXIBLE WALL PERMEAMETER
ASTM D 5084 - 03 METHOD C TEST WITH INCREASING TAILWATER LEVEL
FLUID: DEAIRED TAP WATER WITH 0.005 N CaSO4

PROJECT NAME:	DYNEGY	PROJECT NUMBER:	15151122
LOCATION:	COFFEEN, ILLINOIS	DATE:	9/4/2015
		PANEL IDENTIFICATION:	Lenexa Perm Board
SAMPLE ID:	COF-B004 S7 23.5.0 - 25.5 feet	BURETTE AREA:	0.312 cm^2
SAMPLE DESCR.:	SANDY FAT CLAY, REDDISH BROWN WITH DARK GRAY	BURETTE INCREMENT LENGTH:	1.000 cm
		VOLUME PER INCREMENT:	0.312 cm^3

INITIAL

MOISTURE%		DENSITY			
W & T, g	140.98	WET WT, g	438.0		
D & T, g	122.69	DIA, in	2.857	7.26	cm
T, g	33.88	HT, in	2.010	5.11	cm
		AREA		41.36	cm^2
MOIST-		DENSITY:	129.5	PCF WET	
URE, %	**20.6**	DENSITY:	**107.4**	PCF DRY	

ADDITIONAL DATA

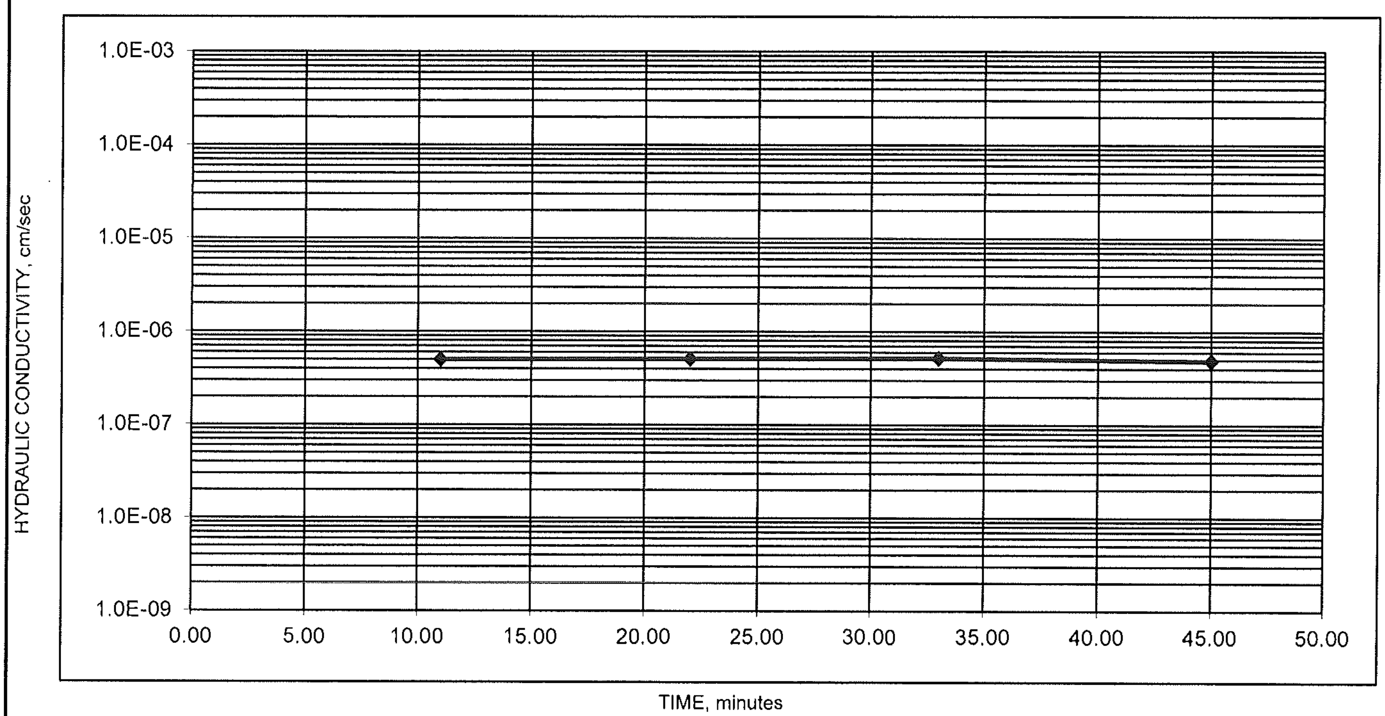
SPECIFIC GRAVITY:	2.70	RECOMPACTED?:	NO
SPECIFIC GRAVITY:	ASSUMED	PROCTOR, pcf:	NA
POROSITY, %:	36.3	OPTIMUM, %:	NA
SATURATION, %:	97.6	COMPACTION, %:	NA
VOID RATIO:	0.57	OVER OPTIMUM, %:	NA

SATURATION:	LATERAL PRESS.: 104.0 psi	BACK PRESSURE (=UPPER=LOWER): 100.0 psi	
DURING TEST:	LATERAL PRESS.: 104.0 psi	H2: 100.0 psi	H1: 100.0 psi
		BIAS PRESSURE (=H1-H2) 0.0 psi	

H1 VALUE	H2 VALUE	ELAPSED TIME, min	DELTA H cm	Ln H1/H2	HYD CON k, cm/sec	OUT FLOW cm^3	IN FLOW cm^3	OUT/IN RATIO	HYD GRAD	% FROM MEAN k	TEMP.: C	TEMP. CORR.:
15.6	59.2	0.00	43.6									
16.0	58.8	11.00	42.8	0.018519	5.00E-07	0.12	0.12	1.00	8.4	1	23.3	0.925
16.4	58.4	22.00	42.0	0.018868	5.10E-07	0.12	0.12	1.00	8.2	1	23.3	0.925
16.8	58.0	33.00	41.2	0.019231	5.19E-07	0.12	0.12	1.00	8.1	3	23.3	0.925
17.2	57.6	45.00	40.4	0.019608	4.85E-07	0.12	0.12	1.00	7.9	4	23.3	0.925

HYDRAULIC CONDUCTIVITY (k_{20}) = AVERAGE 5.0E-07 cm/sec

MAXIMUM	1.0E-03 TO 1.0E-04	2	0.75<	20	% < 25 AT
HYDRAULIC	1.0E-04 TO 1.0E-05	5	RATIO	MAX	> 1.0E-8
GRADIENT	1.0E-05 TO 1.0E-06	10	<1.25	HYDRAULIC	OR
	1.0E-06 TO 1.0E-07	20		GRADIENT	% < 50 AT
	less than 1.0E-07	30		ALLOWED	< 1.0E-8



MEASUREMENT OF HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIALS USING A FLEXIBLE WALL PERMEAMETER
ASTM D 5084 - 03 METHOD C TEST WITH INCREASING TAILWATER LEVEL
FLUID: DEAIRED TAP WATER WITH 0.005 N $CaSO_4$

PROJECT NAME:	DYNEGY	PROJECT NUMBER:	15151122
LOCATION:	COFFEEN, ILLINOIS	DATE:	9/4/2015
		PANEL IDENTIFICATION:	Lenexa Perm Board
SAMPLE ID:	COF-B005 S2 3.5 - 5.5 feet	BURETTE AREA:	0.312 cm^2
SAMPLE DESCR.:	SANDY LEAN CLAY, BROWN	BURETTE INCREMENT LENGTH:	1.000 cm
		VOLUME PER INCREMENT:	0.312 cm^3

INITIAL

MOISTURE%		DENSITY			
W & T, g	177.91	WET WT, g	409.4		
D & T, g	167.15	DIA, in	2.882	7.32	cm
T, g	33.00	HT, in	1.750	4.45	cm
		AREA		42.09	cm^2
MOIST-		DENSITY:	136.6	PCF WET	
URE, %	**8.0**	DENSITY:	**126.5**	PCF DRY	

ADDITIONAL DATA

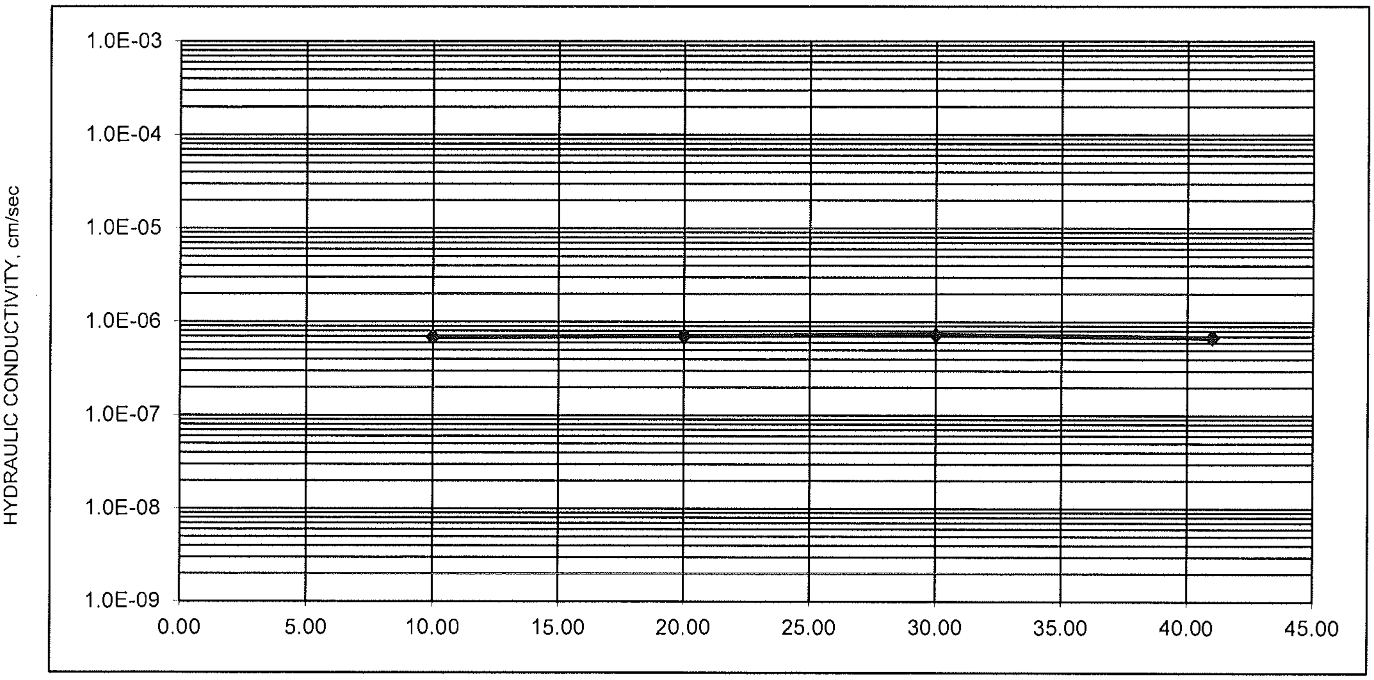
SPECIFIC GRAVITY:	2.70	RECOMPACTED?:	NO
SPECIFIC GRAVITY:	ASSUMED	PROCTOR, pcf:	NA
POROSITY, %:	25.0	OPTIMUM, %:	NA
SATURATION, %:	65.1	COMPACTION, %:	NA
VOID RATIO:	0.33	OVER OPTIMUM, %:	NA

SATURATION:	LATERAL PRESS.: 104.0 psi	BACK PRESSURE (=UPPER=LOWER): 100.0 psi		
DURING TEST:	LATERAL PRESS.: 104.0 psi	H2: 100.0 psi	H1: 100.0 psi	
			BIAS PRESSURE (=H1-H2)	0.0 psi

H1 VALUE	H2 VALUE	ELAPSED TIME, min	DELTA H cm	Ln H1/H2	HYD CON k, cm/sec	OUT FLOW cm^3	IN FLOW cm^3	OUT/IN RATIO	HYD GRAD	% FROM MEAN k	TEMP.: C	TEMP. CORR.:
18.5	55.8	0.00	37.3									
19.0	55.3	10.00	36.3	0.027176	6.88E-07	0.16	0.16	1.00	8.2	2	23.5	0.920
19.5	54.8	20.00	35.3	0.027935	7.07E-07	0.16	0.16	1.00	7.9	1	23.5	0.920
20.0	54.3	30.00	34.3	0.028738	7.29E-07	0.16	0.16	1.00	7.7	4	23.4	0.923
20.5	53.8	41.00	33.3	0.029588	6.82E-07	0.16	0.16	1.00	7.5	3	23.4	0.923

HYDRAULIC CONDUCTIVITY (k_{20}) = **AVERAGE 7.0E-07 cm/sec**

MAXIMUM	1.0E-03 TO 1.0E-04	2	0.75<	20	% < 25 AT
HYDRAULIC	1.0E-04 TO 1.0E-05	5	RATIO	MAX	> 1.0E-8
GRADIENT	1.0E-05 TO 1.0E-06	10	<1.25	HYDRAULIC	OR
	1.0E-06 TO 1.0E-07	20		GRADIENT	% < 50 AT
	less than 1.0E-07	30		ALLOWED	< 1.0E-8



MEASUREMENT OF HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIALS USING A FLEXIBLE WALL PERMEAMETER
ASTM D 5084 - 03 METHOD C TEST WITH INCREASING TAILWATER LEVEL
FLUID: DEAIRED TAP WATER WITH 0.005 N $CaSO_4$

PROJECT NAME:	DYNEGY	PROJECT NUMBER:	15151122
LOCATION:	COFFEEN, ILLINOIS	DATE:	7/30/2015
		PANEL IDENTIFICATION:	Lenexa Perm Board
SAMPLE ID:	COF-B007 S8 22.0 - 24.0 feet	BURETTE AREA:	0.312 cm^2
SAMPLE DESCR.:	SANDY LEAN CLAY, YELLOWISH BROWN	BURETTE INCREMENT LENGTH:	1.000 cm
		VOLUME PER INCREMENT:	0.312 cm^3

INITIAL

MOISTURE%		DENSITY			
W & T, g	142.44	WET WT, g	432.7		
D & T, g	125.52	DIA, in	2.863	7.27	cm
T, g	33.26	HT, in	1.992	5.06	cm
		AREA		41.53	cm^2
MOIST-		DENSITY:	128.5	PCF WET	
URE, %	**18.3**	DENSITY:	**108.6**	PCF DRY	

ADDITIONAL DATA

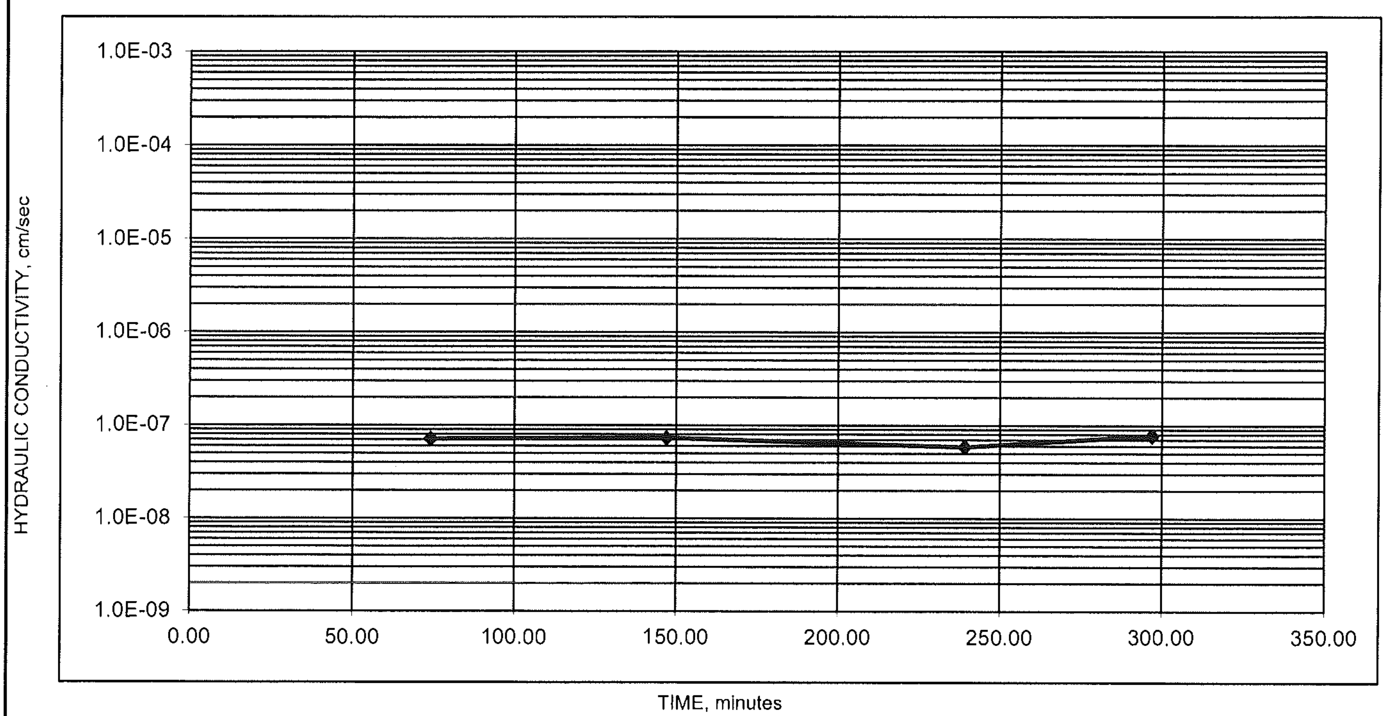
SPECIFIC GRAVITY:	2.70	RECOMPACTED?:	NO
SPECIFIC GRAVITY:	ASSUMED	PROCTOR, pcf:	NA
POROSITY, %:	35.6	OPTIMUM, %:	NA
SATURATION, %:	89.7	COMPACTION, %:	NA
VOID RATIO:	0.55	OVER OPTIMUM, %:	NA

SATURATION:	LATERAL PRESS.: 104.0 psi	BACK PRESSURE (=UPPER=LOWER): 100.0 psi		
DURING TEST:	LATERAL PRESS.: 104.0 psi	H2: 100.0 psi	H1: 100.0 psi	BIAS PRESSURE (=H1-H2) 0.0 psi

H1 VALUE	H2 VALUE	ELAPSED TIME, min	DELTA H cm	Ln H1/H2	HYD CON k, cm/sec	OUT FLOW cm^3	IN FLOW cm^3	OUT/IN RATIO	HYD GRAD	% FROM MEAN k	TEMP.: C	TEMP. CORR.:
9.2	64.7	0.00	55.5									
9.7	64.2	74.00	54.5	0.018182	7.14E-08	0.16	0.16	1.00	10.8	2	23.7	0.916
10.2	63.7	147.00	53.5	0.018519	7.32E-08	0.16	0.16	1.00	10.6	4	24.0	0.910
10.7	63.2	239.00	52.5	0.018868	5.88E-08	0.16	0.16	1.00	10.4	16	24.3	0.904
11.1	62.8	297.00	51.7	0.015355	7.76E-08	0.12	0.12	1.00	10.2	11	23.3	0.925

HYDRAULIC CONDUCTIVITY (k_{20}) = AVERAGE 7.0E-08 cm/sec

MAXIMUM	1.0E-03 TO	1.0E-04	2	0.75<	30	% < 25 AT
HYDRAULIC	1.0E-04 TO	1.0E-05	5	RATIO	MAX	> 1.0E-8
GRADIENT	1.0E-05 TO	1.0E-06	10	<1.25	HYDRAULIC	OR
	1.0E-06 TO	1.0E-07	20		GRADIENT	% < 50 AT
	less than	1.0E-07	30		ALLOWED	< 1.0E-8



MEASUREMENT OF HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIALS
USING A FLEXIBLE WALL PERMEAMETER
ASTM D 5084 - 03 METHOD C TEST WITH INCREASING TAILWATER LEVEL
FLUID: DEAIRED TAP WATER WITH 0.005 N CaSO4

PROJECT NAME:	DYNEGY	PROJECT NUMBER:	15151122
LOCATION:	COFFEEN, ILLINOIS	DATE:	9/4/2015
		PANEL IDENTIFICATION:	Lenexa Perm Board
SAMPLE ID:	COF-B004 S7 23.5.0 - 25.5 feet	BURETTE AREA:	0.312 cm^2
SAMPLE DESCR.:	SANDY FAT CLAY, REDDISH BROWN WITH DARK GRAY	BURETTE INCREMENT LENGTH:	1.000 cm
		VOLUME PER INCREMENT:	0.312 cm^3

INITIAL

MOISTURE%		DENSITY			
W & T, g	140.98	WET WT, g	438.0		
D & T, g	122.69	DIA, in	2.857	7.26	cm
T, g	33.88	HT, in	2.010	5.11	cm
		AREA		41.36	cm^2
MOIST-		DENSITY:	129.5	PCF WET	
URE, %	**20.6**	DENSITY:	**107.4**	PCF DRY	

ADDITIONAL DATA

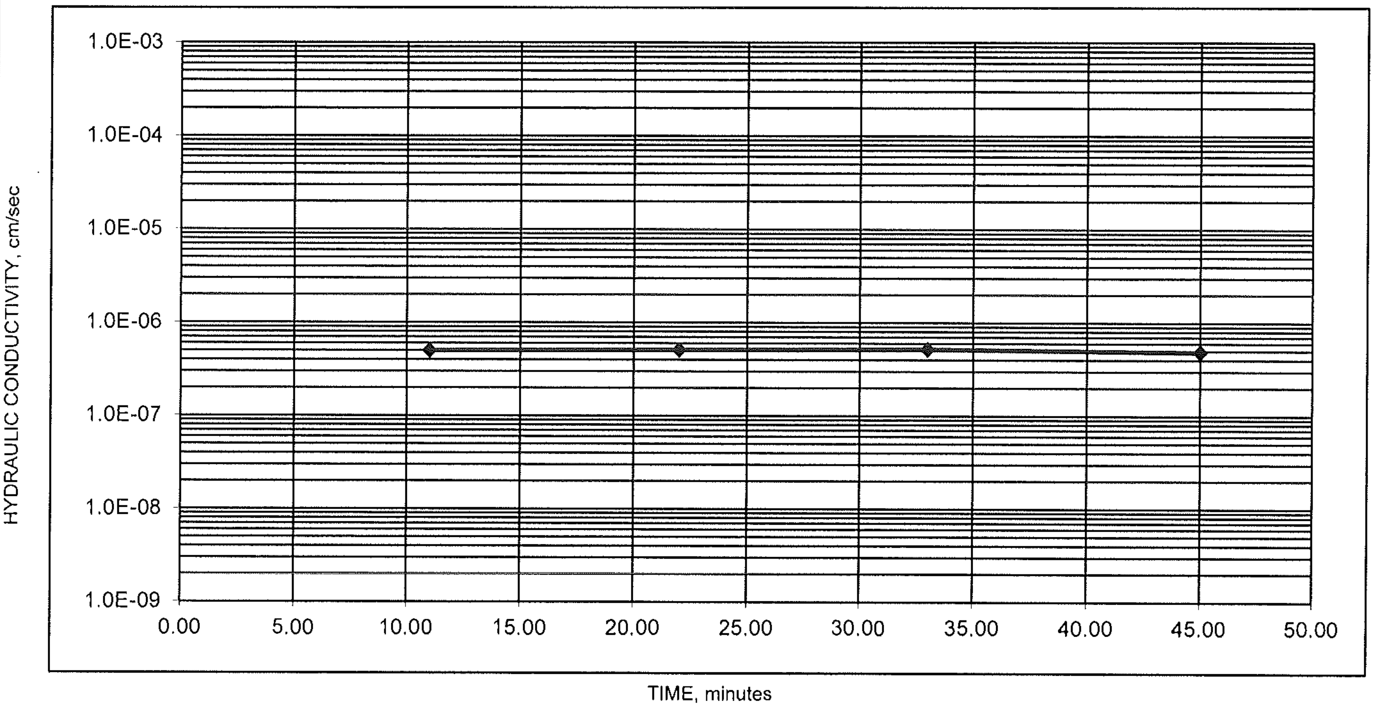
SPECIFIC GRAVITY:	2.70	RECOMPACTED?:	NO
SPECIFIC GRAVITY:	ASSUMED	PROCTOR, pcf:	NA
POROSITY, %:	36.3	OPTIMUM, %:	NA
SATURATION, %:	97.6	COMPACTION, %:	NA
VOID RATIO:	0.57	OVER OPTIMUM, %:	NA

SATURATION:	LATERAL PRESS.: 104.0 psi	BACK PRESSURE (=UPPER=LOWER): 100.0 psi	
DURING TEST:	LATERAL PRESS.: 104.0 psi	H2: 100.0 psi	H1: 100.0 psi
			BIAS PRESSURE (=H1-H2) 0.0 psi

H1 VALUE	H2 VALUE	ELAPSED TIME, min	DELTA H cm	Ln H1/H2	HYD CON k, cm/sec	OUT FLOW cm^3	IN FLOW cm^3	OUT/IN RATIO	HYD GRAD	% FROM MEAN k	TEMP.: C	TEMP. CORR.:
15.6	59.2	0.00	43.6									
16.0	58.8	11.00	42.8	0.018519	5.00E-07	0.12	0.12	1.00	8.4	1	23.3	0.925
16.4	58.4	22.00	42.0	0.018868	5.10E-07	0.12	0.12	1.00	8.2	1	23.3	0.925
16.8	58.0	33.00	41.2	0.019231	5.19E-07	0.12	0.12	1.00	8.1	3	23.3	0.925
17.2	57.6	45.00	40.4	0.019608	4.85E-07	0.12	0.12	1.00	7.9	4	23.3	0.925

HYDRAULIC CONDUCTIVITY (k_{20}) = AVERAGE 5.0E-07 cm/sec

MAXIMUM	1.0E-03 TO 1.0E-04	2	0.75<	20	% < 25 AT
HYDRAULIC	1.0E-04 TO 1.0E-05	5	RATIO	MAX	> 1.0E-8
GRADIENT	1.0E-05 TO 1.0E-06	10	<1.25	HYDRAULIC	OR
	1.0E-06 TO 1.0E-07	20		GRADIENT	% < 50 AT
	less than 1.0E-07	30		ALLOWED	< 1.0E-8



N:\CM\LAB_DATA\00 Projects in Progress\2015 Projects in Progress\15151122 Lab Data\[15151122 Permeability D5084-C COF-B004-S7-23.5

Terracon

MEASUREMENT OF HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIALS USING A FLEXIBLE WALL PERMEAMETER
ASTM D 5084 - 03 METHOD C TEST WITH INCREASING TAILWATER LEVEL
FLUID: DEAIRED TAP WATER WITH 0.005 N $CaSO_4$

PROJECT NAME:	DYNEGY	PROJECT NUMBER:	15151122
LOCATION:	COFFEEN, ILLINOIS	DATE:	9/4/2015
		PANEL IDENTIFICATION:	Lenexa Perm Board
SAMPLE ID:	COF-B005 S2 3.5 - 5.5 feet	BURETTE AREA:	0.312 cm^2
SAMPLE DESCR.:	SANDY LEAN CLAY, BROWN	BURETTE INCREMENT LENGTH:	1.000 cm
		VOLUME PER INCREMENT:	0.312 cm^3

INITIAL

MOISTURE%		DENSITY			
W & T, g	177.91	WET WT, g	409.4		
D & T, g	167.15	DIA, in	2.882	7.32	cm
T, g	33.00	HT, in	1.750	4.45	cm
		AREA		42.09	cm^2
MOIST-		DENSITY:	136.6	PCF WET	
URE, %	**8.0**	DENSITY:	**126.5**	PCF DRY	

ADDITIONAL DATA

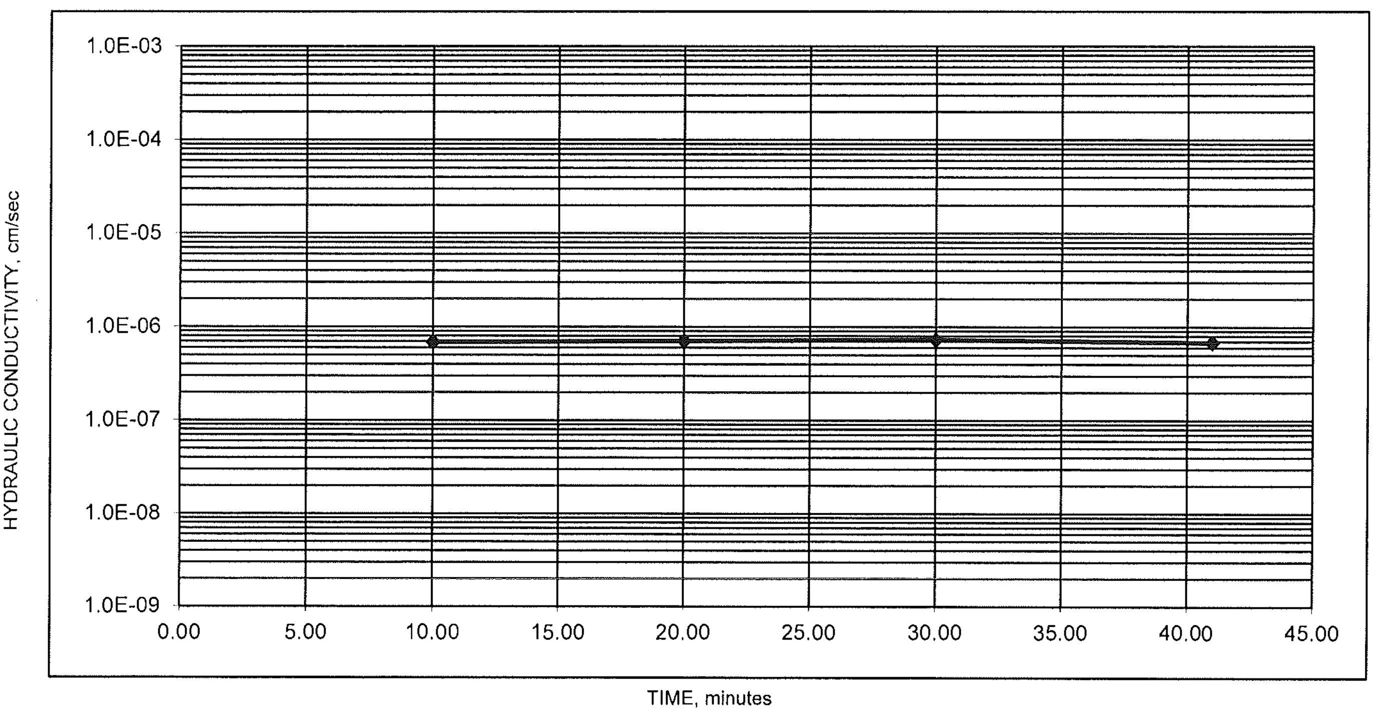
SPECIFIC GRAVITY:	2.70	RECOMPACTED?:	NO
SPECIFIC GRAVITY:	ASSUMED	PROCTOR, pcf:	NA
POROSITY, %:	25.0	OPTIMUM, %:	NA
SATURATION, %:	65.1	COMPACTION, %:	NA
VOID RATIO:	0.33	OVER OPTIMUM, %:	NA

SATURATION:	LATERAL PRESS.: 104.0 psi	BACK PRESSURE (=UPPER=LOWER): 100.0 psi	
DURING TEST:	LATERAL PRESS.: 104.0 psi	H2: 100.0 psi	H1: 100.0 psi
		BIAS PRESSURE (=H1-H2) 0.0 psi	

H1 VALUE	H2 VALUE	ELAPSED TIME, min	DELTA H cm	Ln H1/H2	HYD CON k, cm/sec	OUT FLOW cm^3	IN FLOW cm^3	OUT/IN RATIO	HYD GRAD	% FROM MEAN k	TEMP.: C	TEMP. CORR.:
18.5	55.8	0.00	37.3									
19.0	55.3	10.00	36.3	0.027176	6.88E-07	0.16	0.16	1.00	8.2	2	23.5	0.920
19.5	54.8	20.00	35.3	0.027935	7.07E-07	0.16	0.16	1.00	7.9	1	23.5	0.920
20.0	54.3	30.00	34.3	0.028738	7.29E-07	0.16	0.16	1.00	7.7	4	23.4	0.923
20.5	53.8	41.00	33.3	0.029588	6.82E-07	0.16	0.16	1.00	7.5	3	23.4	0.923

HYDRAULIC CONDUCTIVITY (k_{20}) = **AVERAGE 7.0E-07 cm/sec**

MAXIMUM	1.0E-03 TO 1.0E-04	2	0.75<	20	% < 25 AT
HYDRAULIC	1.0E-04 TO 1.0E-05	5	RATIO	MAX	> 1.0E-8
GRADIENT	1.0E-05 TO 1.0E-06	10	<1.25	HYDRAULIC	OR
	1.0E-06 TO 1.0E-07	20		GRADIENT	% < 50 AT
	less than 1.0E-07	30		ALLOWED	< 1.0E-8



N:\CM\LAB_DATA\00 Projects in Progress\2015 Projects in Progress\15151122 Lab Data\15151122 Permeability D5084-C COF-B005-S2-3.5.x

Terracon

MEASUREMENT OF HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIALS
USING A FLEXIBLE WALL PERMEAMETER
ASTM D 5084 - 03 METHOD C TEST WITH INCREASING TAILWATER LEVEL
FLUID: DEAIRED TAP WATER WITH 0.005 N CaSO4

PROJECT NAME:	DYNEGY	PROJECT NUMBER:	15151122
LOCATION:	COFFEEN, ILLINOIS	DATE:	7/30/2015
		PANEL IDENTIFICATION:	Lenexa Perm Board
SAMPLE ID:	COF-B007 S8 22.0 - 24.0 feet	BURETTE AREA:	0.312 cm^2
SAMPLE DESCR.:	SANDY LEAN CLAY, YELLOWISH BROWN	BURETTE INCREMENT LENGTH:	1.000 cm
		VOLUME PER INCREMENT:	0.312 cm^3

INITIAL

MOISTURE%		DENSITY			
W & T, g	142.44	WET WT, g	432.7		
D & T, g	125.52	DIA, in	2.863	7.27	cm
T, g	33.26	HT, in	1.992	5.06	cm
		AREA		41.53	cm^2
MOIST-		DENSITY:	128.5	PCF WET	
URE, %	**18.3**	DENSITY:	**108.6**	PCF DRY	

ADDITIONAL DATA

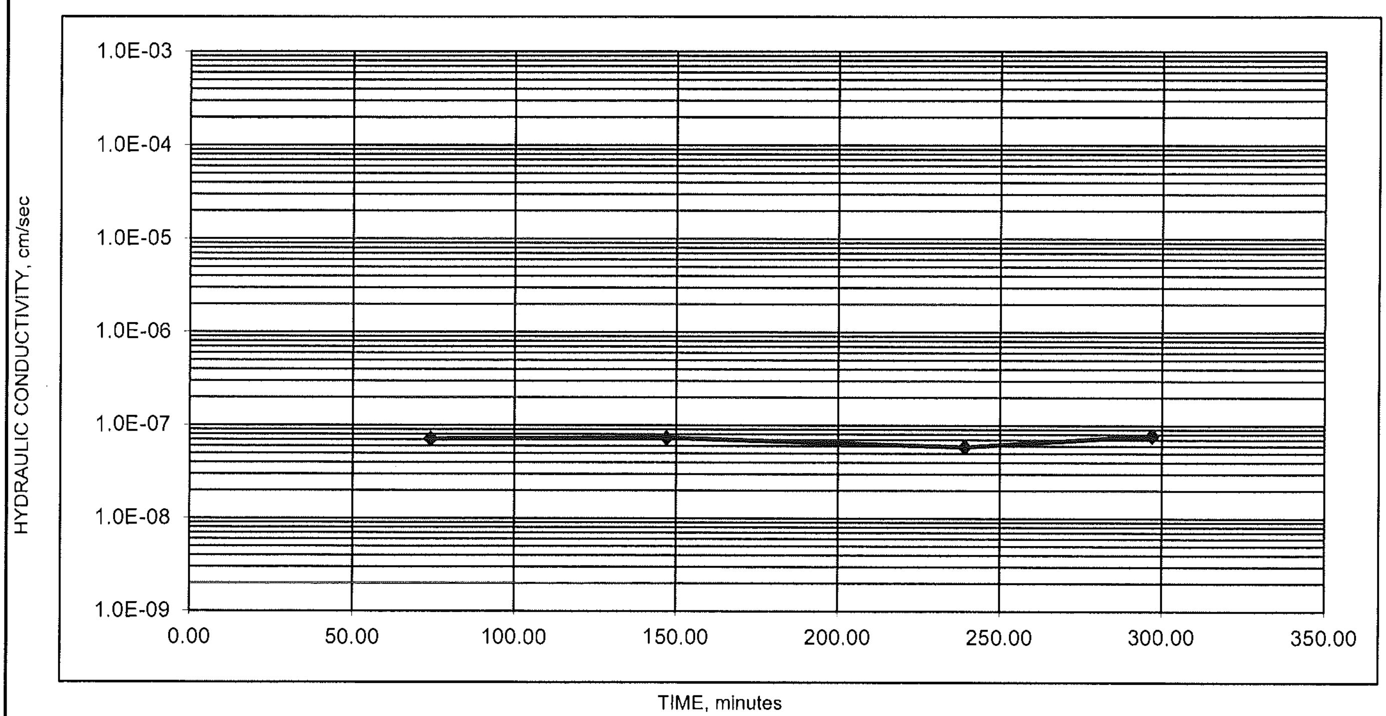
SPECIFIC GRAVITY:	2.70	RECOMPACTED?:	NO
SPECIFIC GRAVITY:	ASSUMED	PROCTOR, pcf:	NA
POROSITY, %:	35.6	OPTIMUM, %:	NA
SATURATION, %:	89.7	COMPACTION, %:	NA
VOID RATIO:	0.55	OVER OPTIMUM, %:	NA

SATURATION:	LATERAL PRESS.:	104.0	psi	BACK PRESSURE (=UPPER=LOWER):	100.0	psi	
DURING TEST:	LATERAL PRESS.:	104.0	psi	H2: 100.0 psi	H1:	100.0	psi
					BIAS PRESSURE (=H1-H2)	0.0	psi

H1 VALUE	H2 VALUE	ELAPSED TIME, min	DELTA H cm	Ln H1/H2	HYD CON k, cm/sec	OUT FLOW cm^3	IN FLOW cm^3	OUT/IN RATIO	HYD GRAD	% FROM MEAN k	TEMP.: C	TEMP. CORR.:
9.2	64.7	0.00	55.5									
9.7	64.2	74.00	54.5	0.018182	7.14E-08	0.16	0.16	1.00	10.8	2	23.7	0.916
10.2	63.7	147.00	53.5	0.018519	7.32E-08	0.16	0.16	1.00	10.6	4	24.0	0.910
10.7	63.2	239.00	52.5	0.018868	5.88E-08	0.16	0.16	1.00	10.4	16	24.3	0.904
11.1	62.8	297.00	51.7	0.015355	7.76E-08	0.12	0.12	1.00	10.2	11	23.3	0.925

HYDRAULIC CONDUCTIVITY (k_{20}) = AVERAGE 7.0E-08 cm/sec

MAXIMUM	1.0E-03 TO 1.0E-04	2	0.75<	30	% < 25 AT
HYDRAULIC	1.0E-04 TO 1.0E-05	5	RATIO	MAX	> 1.0E-8
GRADIENT	1.0E-05 TO 1.0E-06	10	<1.25	HYDRAULIC	OR
	1.0E-06 TO 1.0E-07	20		GRADIENT	% < 50 AT
	less than 1.0E-07	30		ALLOWED	< 1.0E-8



N:\CM\LAB_DATA\00 Projects in Progress\2015 Projects in Progress\15151122 Lab Data\[15151122 Permeability D5084-C COF-B007-S8-22.0

Terracon

MEASUREMENT OF HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIALS
USING A FLEXIBLE WALL PERMEAMETER
ASTM D 5084 - 03 METHOD C TEST WITH INCREASING TAILWATER LEVEL
FLUID: DEAIRED TAP WATER WITH 0.005 N $CaSO_4$

PROJECT NAME:	DYNEGY	PROJECT NUMBER:	15151122
LOCATION:	COFFEEN, ILLINOIS	DATE:	9/10/2015
		PANEL IDENTIFICATION:	Lenexa Perm Board
SAMPLE ID:	COF-B008 S5 11.0 - 13.0 feet	BURETTE AREA:	0.312 cm^2
SAMPLE DESCR.:	LEAN CLAY WITH SAND, DARK GRAY WITH GRAY TRACE GRAYISH BROWN	BURETTE INCREMENT LENGTH:	1.000 cm
		VOLUME PER INCREMENT:	0.312 cm^3

INITIAL

MOISTURE%		DENSITY			
W & T, g	125.65	WET WT, g	468.5		
D & T, g	112.54	DIA, in	2.865	7.28	cm
T, g	33.72	HT, in	2.105	5.35	cm
		AREA		41.59	cm^2
MOIST-		DENSITY:	131.5	PCF WET	
URE, %	16.6	DENSITY:	112.8	PCF DRY	

ADDITIONAL DATA

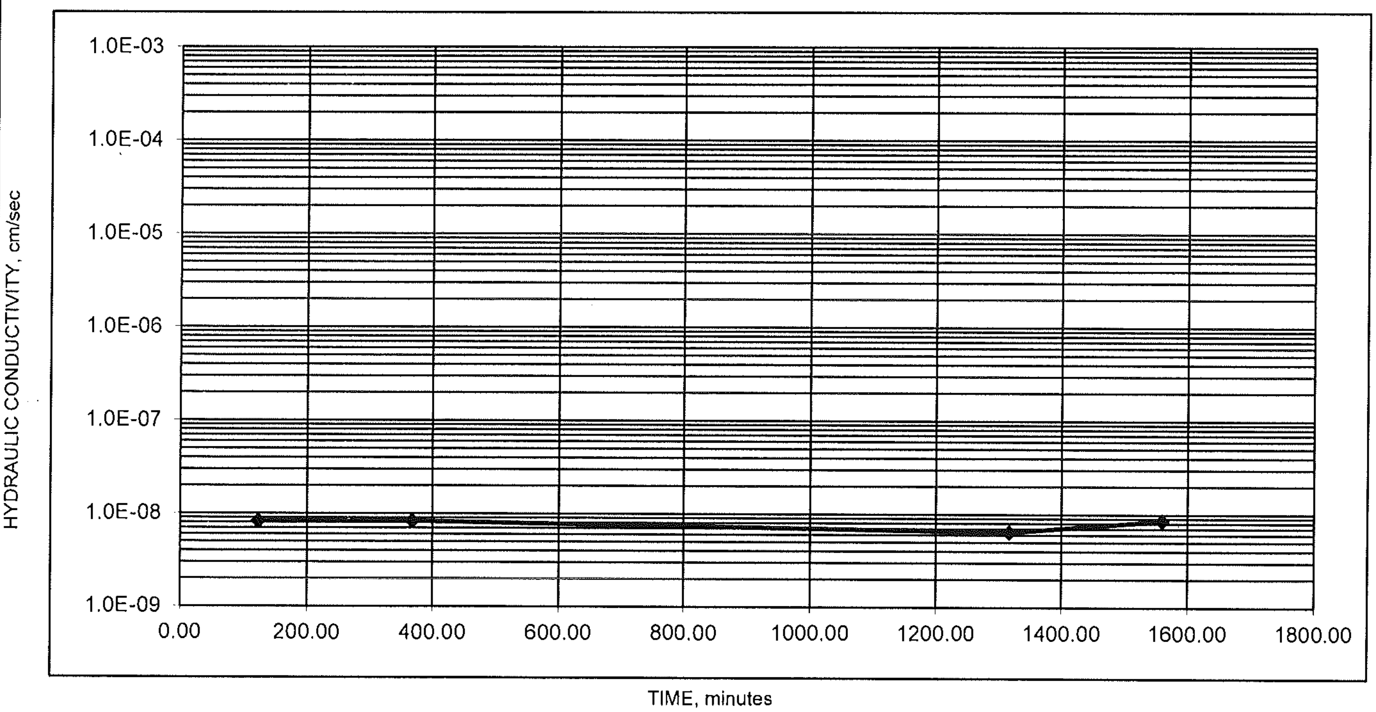
SPECIFIC GRAVITY:	2.70	RECOMPACTED?:	NO
SPECIFIC GRAVITY:	ASSUMED	PROCTOR, pcf:	NA
POROSITY, %:	33.1	OPTIMUM, %:	NA
SATURATION, %:	90.8	COMPACTION, %:	NA
VOID RATIO:	0.49	OVER OPTIMUM, %:	NA

SATURATION:	LATERAL PRESS.: 104.0 psi	BACK PRESSURE (=UPPER=LOWER): 100.0 psi	
DURING TEST:	LATERAL PRESS.: 104.0 psi	H2: 100.0 psi	H1: 100.0 psi
			BIAS PRESSURE (=H1-H2) 0.0 psi

H1 VALUE	H2 VALUE	ELAPSED TIME, min	DELTA H cm	Ln H1/H2	HYD CON k, cm/sec	OUT FLOW cm^3	IN FLOW cm^3	OUT/IN RATIO	HYD GRAD	% FROM MEAN k	TEMP.: C	TEMP. CORR.:
7.4	69.0	0.00	61.6									
7.5	68.9	123.00	61.4	0.003252	8.22E-09	0.03	0.03	1.00	11.5	4	23.1	0.929
7.7	68.7	368.00	61.0	0.006536	8.29E-09	0.06	0.06	1.00	11.4	5	23.1	0.929
8.3	68.1	1317.00	59.8	0.019868	6.43E-09	0.19	0.19	1.00	11.2	18	23.6	0.918
8.5	67.9	1560.00	59.4	0.006711	8.55E-09	0.06	0.06	1.00	11.1	9	23.3	0.925

HYDRAULIC CONDUCTIVITY (k_{20}) = AVERAGE 7.9E-09 cm/sec

MAXIMUM	1.0E-03 TO	1.0E-04	2	0.75<	30	% < 25 AT
HYDRAULIC	1.0E-04 TO	1.0E-05	5	RATIO	MAX	> 1.0E-8
GRADIENT	1.0E-05 TO	1.0E-06	10	<1.25	HYDRAULIC	OR
	1.0E-06 TO	1.0E-07	20		GRADIENT	% < 50 AT
	less than	1.0E-07	30		ALLOWED	< 1.0E-8



N:\CM\LAB_DATA\00 Projects in Progress\2015 Projects in Progress\15151122 Lab Data\[15151122 Permeability D5084-C COF-B008-S5-11.0

Terracon

MEASUREMENT OF HYDRAULIC CONDUCTIVITY OF SATURATED POROUS MATERIALS
USING A FLEXIBLE WALL PERMEAMETER
ASTM D 5084 - 03 METHOD C TEST WITH INCREASING TAILWATER LEVEL
FLUID: DEAIRED TAP WATER WITH 0.005 N $CaSO_4$

PROJECT NAME:	DYNEGY	PROJECT NUMBER:	15151122
LOCATION:	COFFEEN, ILLINOIS	DATE:	9/4/2015
		PANEL IDENTIFICATION:	Lenexa Perm Board
SAMPLE ID:	COF-B011 S6 13.5 - 15.5 feet	BURETTE AREA:	0.312 cm^2
SAMPLE DESCR.:	SANDY LEAN CLAY, YELLOWISH BROWN WITH GRAYISH BROWN	BURETTE INCREMENT LENGTH:	1.000 cm
		VOLUME PER INCREMENT:	0.312 cm^3

INITIAL

MOISTURE%		DENSITY			
W & T, g	151.23	WET WT, g	464.3		
D & T, g	139.17	DIA, in	2.861	7.27	cm
T, g	33.87	HT, in	1.975	5.02	cm
		AREA		41.48	cm^2
MOIST-		DENSITY:	139.3	PCF WET	
URE, %	**11.5**	DENSITY:	**125.0**	PCF DRY	

ADDITIONAL DATA

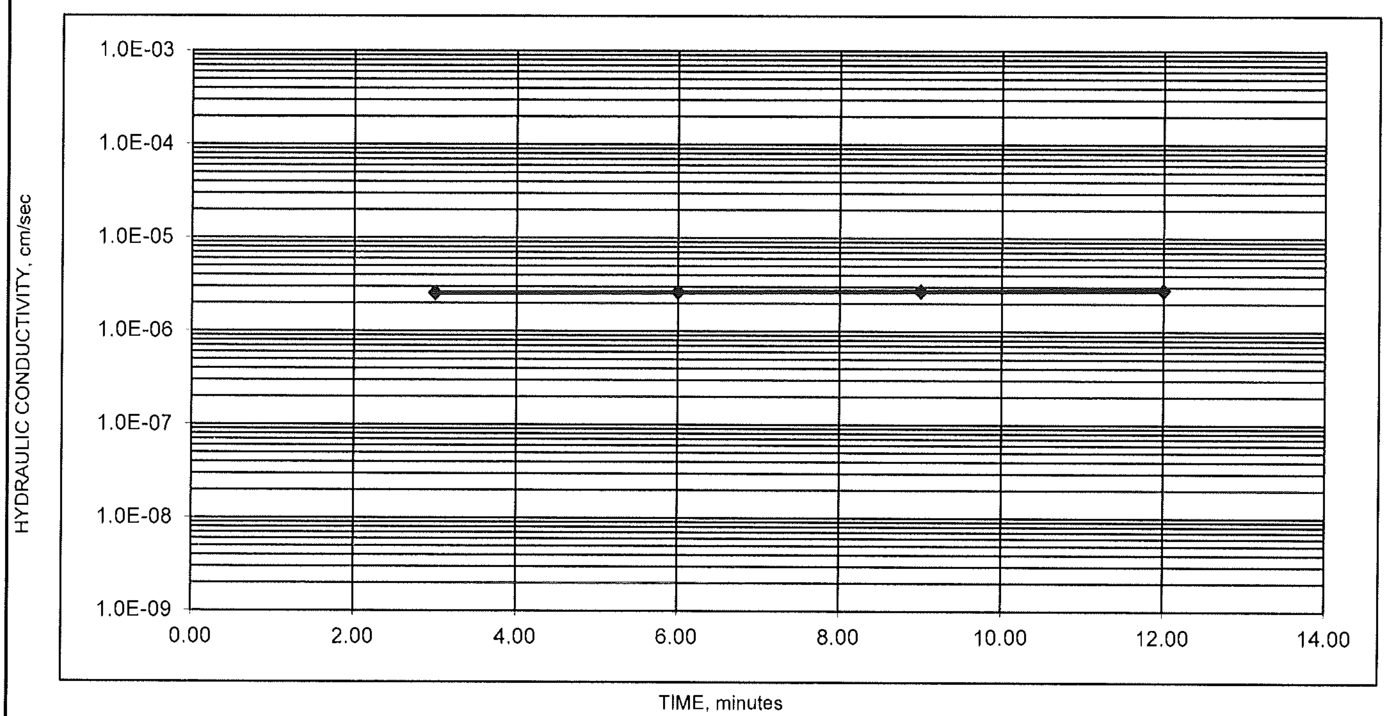
SPECIFIC GRAVITY:	2.70	RECOMPACTED?:	NO
SPECIFIC GRAVITY:	ASSUMED	PROCTOR, pcf:	NA
POROSITY, %:	25.8	OPTIMUM, %:	NA
SATURATION, %:	88.7	COMPACTION, %:	NA
VOID RATIO:	0.35	OVER OPTIMUM, %:	NA

SATURATION:	LATERAL PRESS.: 104.0 psi	BACK PRESSURE (=UPPER=LOWER): 100.0 psi	
DURING TEST:	LATERAL PRESS.: 104.0 psi	H2: 100.0 psi	H1: 100.0 psi
			BIAS PRESSURE (=H1-H2) 0.0 psi

H1 VALUE	H2 VALUE	ELAPSED TIME, min	DELTA H cm	Ln H1/H2	HYD CON k, cm/sec	OUT FLOW cm^3	IN FLOW cm^3	OUT/IN RATIO	HYD GRAD	% FROM MEAN k	TEMP.: C	TEMP. CORR.:
8.5	23.9	0.00	15.4									
8.7	23.7	3.00	15.0	0.026317	2.55E-06	0.06	0.06	1.00	3.0	4	23.4	0.923
8.9	23.5	6.00	14.6	0.027029	2.62E-06	0.06	0.06	1.00	2.9	1	23.4	0.923
9.1	23.3	9.00	14.2	0.027780	2.69E-06	0.06	0.06	1.00	2.8	1	23.4	0.923
9.3	23.1	12.00	13.8	0.028573	2.77E-06	0.06	0.06	1.00	2.8	4	23.4	0.923

HYDRAULIC CONDUCTIVITY (k_{20}) = **AVERAGE 2.7E-06 cm/sec**

MAXIMUM	1.0E-03 TO 1.0E-04	2	0.75<	10	% < 25 AT
HYDRAULIC	1.0E-04 TO 1.0E-05	5	RATIO	MAX	> 1.0E-8
GRADIENT	1.0E-05 TO 1.0E-06	10	<1.25	HYDRAULIC	OR
	1.0E-06 TO 1.0E-07	20		GRADIENT	% < 50 AT
	less than 1.0E-07	30		ALLOWED	< 1.0E-8



N:\CM\LAB_DATA\00 Projects in Progress\2015 Projects in Progress\15151122 Lab Data\15151122 Permeability D5084-C COF-B011-S6-13.5

Terracon

HANSON 2016 LABORATORY RESULTS

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

ASTM D5084

JOB NUMBER:	16E0080	TEST DATE:	08/23/2016
CLIENT:	Natural Resource Technology, Inc.	BORING #:	G405D
JOB DESCRIPTION:	Coffeen Ash Pond 2	SAMPLE #:	11-2
SAMPLE DESCRIPTION:	Gray silty CLAY, trace coarse sand and small gravel.	DEPTH (FT):	34.5-35.0

FOR ESTIMATING PORE VOLUME ONLY			WATER CONTENT OF TRIMMINGS	BEFORE TEST	AFTER TEST
SPECIMEN WEIGHT (G)	868.38				
SPECIMEN HEIGHT (IN)	3.748		TARE + WET SOIL (G)	280.51	924.55
DIAMETER (IN)	2.861		TARE + DRY SOIL (G)	245.00	806.34
AREA (SQ IN)	6.429		TARE (G)	3.75	50.12
VOLUME (CU IN)	24.095		WET SOIL(G)	n/a	874.43
WET DENSITY (PCF)	137.30		WATER (G)	35.51	118.21
DRY DENSITY (PCF)	119.68	*	DRY SOIL (G)	241.25	756.22
WT. DRY SOIL (G)	756.96	*	WATER CONTENT (%)	14.72	15.63
WT. DRY SOIL (G)	756.22		INITIAL DEGREE OF SATURATION		102.03
VOLUME DRY SOIL (CU IN)	17.431	*	FINAL DEGREE OF SATURATION		107.98
SP.GR. ASSUMED	2.65				
POROSITY (%)	27.66	*	STD. MAX. DEN.(LBS/CU.FT.)		N/A
HEIGHT OF HEAD (PSI)	4.00		OPTIMUM MOISTURE (%)		N/A
HYDRAULIC GRADIANT	29.5	*	% COMPACTION		N/A
PRESSURE HEAD (CM H2O)	281.27		SAMPLE PREPARATION		Tube
			PANEL NUMBER		5

TEST METHOD USED: ASTM D5084 PERMEANT USED: Tap Water

* **Estimates Only**

Remarks:

HANSON
Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER: 16E0080
CLIENT: Dynegy
JOB DESCRIPTION: Coffeen Ash Pond 2

TEST DATE: 8/25/2016
BORING #: G405D
SAMPLE #: 11-2
DEPTH (FT): 34.5-35.0

SPECIMEN HEIGHT (IN) 3.748
DIAMETER (IN) 2.861
AREA (SQ IN) 6.429
INITIAL DEGREE OF SATURATION 102.03

HEIGHT OF HEAD (PSI) 4.00
PRESSURE HEAD (CM H2O) 281.27
PANEL NUMBER 5

* 4 Readings - Ratio of Outflow to Inflow is between .75 to 1.25 or Steady.
** Mean Ratio is Steady if 4 or more incremental readings are ±25% or better of the mean, or within ± 50% or better for *k* < 1 x 10^{-8} cm/sec.

START DATE	START TIME	STOP DATE	STOP TIME	INC. INFLOW (CC)	INC. OUTFLOW (CC)	TEMP. (°C)	AVG, INC. FLOW (CC)	OUTFLOW INFLOW (RATIO) *	INC. TIME (MIN)	TOTAL TIME (MIN)	INC. PERM. (CM/SEC)	AVG. PERM. (CM/SEC)	INC. MEAN RATIO **
08/25/2016	9:21:00	08/25/2016	15:24:00	9.50	10.6	23.4	10.0500	1.116	363.	363.	3.47E-07	3.47E-07	1.000
08/25/2016	15:30:00	08/26/2016	8:19:00	9.10	9.0	24.4	9.0500	0.989	1009.	1372.	1.10E-07	2.29E-07	0.481
08/26/2016	8:19:00	08/26/2016	13:58:00	3.00	3.0	23.4	3.0000	1.000	339.	1711.	1.11E-07	1.89E-07	0.586
08/29/2016	8:01:00	08/29/2016	16:19:00	10.90	10.5	23.4	10.7000	0.963	498.	2209.	2.70E-07	2.09E-07	1.287
8/29/2016	16:22:00	08/30/2016	7:51:00	18.80	18.7	24.2	18.7500	0.995	929.	3138.	2.49E-07	1.85E-07	1.345
08/30/2016	7:53:00	08/31/2016	8:19:00	21.70	21.8	24.2	21.7500	1.005	1466.	4604.	1.83E-07	2.03E-07	0.900
08/31/2016	8:22:00	09/01/2016	8:05:00	15.20	15.2	23.8	15.2000	1.000	1423.	6027.	1.33E-07	2.08E-07	0.637
09/01/2016	8:07:00	09/02/2016	8:02:00	13.60	13.7	23.8	13.6500	1.007	1435.	7462.	1.18E-07	1.71E-07	0.693
09/02/2016	8:02:00	09/02/2016	14:59:00	3.10	3.0	23.4	3.0500	0.968	417.	7879.	9.18E-08	1.31E-07	0.698
09/06/2016	8:14:00	09/07/2016	8:19:00	13.20	13.3	24.4	13.2500	1.008	1445.	9324.	1.12E-07	1.14E-07	0.988
09/07/2016	8:24:00	09/08/2016	7:56:00	10.20	10.2	24.4	10.2000	1.000	1412.	10736.	8.86E-08	1.03E-07	0.862
09/08/2016	7:56:00	09/09/2016	8:18:00	6.30	6.4	24.2	6.3500	1.016	1462.	12198.	5.35E-08	8.66E-08	0.618
09/09/2016	8:18:00	09/09/2016	14:26:00	1.40	1.2	23.6	1.3000	0.857	368.	12566.	4.41E-08	7.47E-08	0.591
09/12/2016	8:37:00	09/13/2016	8:10:00	7.40	7.4	23.6	7.4000	1.000	1413.	13979.	6.54E-08	6.29E-08	1.040
09/14/2016	8:52:00	09/15/2016	8:10:00	1.50	2.7	24.2	2.1000	1.800	1398.	15377.	1.85E-08	4.54E-08	0.408
09/15/2016	16:00:00	09/16/2016	8:12:00	0.50	0.8	24.2	0.6500	1.600	972.	16349.	8.24E-09	3.41E-08	0.242

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER: 16E0080
CLIENT: Dynegy
JOB DESCRIPTION: Coffeen Ash Pond 2

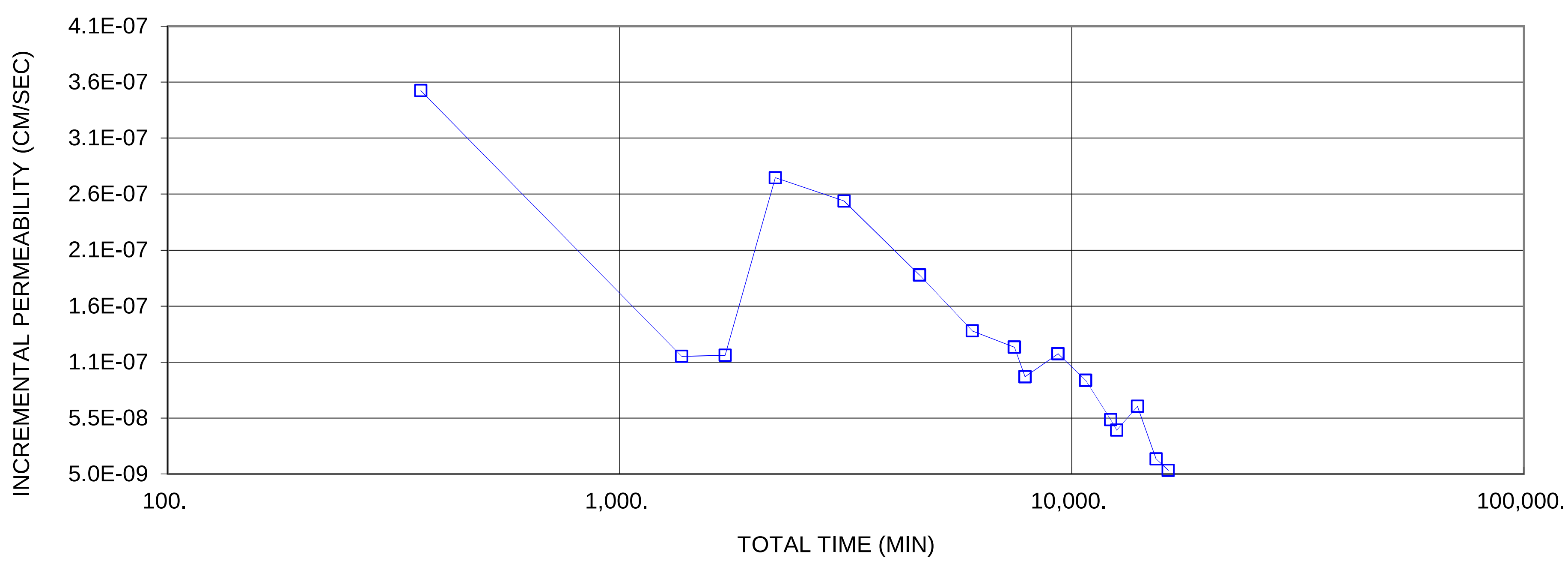
TEST DATE: 8/25/2016
BORING #: G405D
SAMPLE #: 11-2
DEPTH (FT): 34.5-35.0

SPECIMEN HEIGHT (IN) 3.748
DIAMETER (IN) 2.861
AREA (SQ IN) 6.429
INITIAL DEGREE OF SATURATION 102.03

HEIGHT OF HEAD (PSI) 4.00
PRESSURE HEAD (CM H2O) 281.27
PANEL NUMBER 5

* 4 Readings - Ratio of Outflow to Inflow is between .75 to 1.25 or Steady.

** Mean Ratio is Steady if 4 or more incremental readings are ±25% or better of the mean, or within ± 50% or better for *k* < 1 x 10^{-8} cm/sec.



Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

ASTM D5084

JOB NUMBER:	16E0080	TEST DATE:	08/23/2016
CLIENT:	Natural Resource Technology, Inc.	BORING #:	G406D
JOB DESCRIPTION:	Coffeen Ash Pond 2	SAMPLE #:	23-3
SAMPLE DESCRIPTION:	Gray silty CLAY, trace coarse sand and small gravel	DEPTH (FT):	43.0-43.5

FOR ESTIMATING PORE VOLUME ONLY

SPECIMEN WEIGHT (G)	827.45
SPECIMEN HEIGHT (IN)	3.592
DIAMETER (IN)	2.861
AREA (SQ IN)	6.429
VOLUME (CU IN)	23.092
WET DENSITY (PCF)	136.51
DRY DENSITY (PCF)	117.59 *
WT. DRY SOIL (G)	712.77 *
WT. DRY SOIL (G)	713.55
VOLUME DRY SOIL (CU IN)	16.414 *
SP.GR. ASSUMED	2.65
POROSITY (%)	28.92 *
HEIGHT OF HEAD (PSI)	3.80
HYDRAULIC GRADIANT	29.3 *
PRESSURE HEAD (CM H2O)	267.21

WATER CONTENT OF TRIMMINGS

	BEFORE TEST	AFTER TEST
TARE + WET SOIL (G)	333.17	880.57
TARE + DRY SOIL (G)	287.51	763.54
TARE (G)	3.71	49.99
WET SOIL(G)	329.46	830.58
WATER (G)	45.66	117.03
DRY SOIL (G)	283.80	713.55
WATER CONTENT (%)	16.09	16.40
INITIAL DEGREE OF SATURATION		104.79
FINAL DEGREE OF SATURATION		107.22

STD. MAX. DEN.(LBS/CU.FT.)	N/A
OPTIMUM MOISTURE (%)	N/A
% COMPACTION	N/A
SAMPLE PREPARATION	Tube
PANEL NUMBER	6

TEST METHOD USED: ASTM D5084

PERMEANT USED: Tap Water

*** Estimates Only**

Remarks:

HANSON

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER: 16E0080
CLIENT: Natural Resource Technology, Inc.
JOB DESCRIPTION: Coffeen Ash Pond 2

TEST DATE: 8/23/2016
BORING #: G406D
SAMPLE #: 23-3
DEPTH (FT): 43.0-43.5

SPECIMEN HEIGHT (IN) 3.592
DIAMETER (IN) 2.861
AREA (SQ IN) 6.429
INITIAL DEGREE OF SATURATION 104.79

HEIGHT OF HEAD (PSI) 3.80
PRESSURE HEAD (CM H2O) 267.21
PANEL NUMBER 6

* 4 Readings - Ratio of Outflow to Inflow is between .75 to 1.25 or Steady.

** Mean Ratio is Steady if 4 or more incremental readings are ±25% or better of the mean, or within ± 50% or better for $k < 1 \times 10^{-8}$ cm/sec.

START DATE	START TIME	STOP DATE	STOP TIME	INC. INFLOW (CC)	INC. OUTFLOW (CC)	TEMP. (°C)	AVG, INC. FLOW (CC)	OUTFLOW INFLOW (RATIO) *	INC. TIME (MIN)	TOTAL TIME (MIN)	INC. PERM. (CM/SEC)	AVG. PERM. (CM/SEC)	INC. MEAN RATIO **
08/25/2016	9:27:00	08/25/2016	15:25:00	3.20	5.4	23.4	4.3000	1.688	358.	358.	1.52E-07	1.52E-07	1.000
08/25/2016	16:18:00	08/26/2016	8:20:00	3.90	2.1	24.2	3.0000	0.538	962.	1320.	3.88E-08	9.54E-08	0.406
08/26/2016	8:20:00	08/26/2016	14:00:00	1.10	1.0	23.4	1.0500	0.909	340.	1660.	3.91E-08	7.66E-08	0.510
08/29/2016	8:03:00	08/29/2016	16:22:00	1.30	1.0	23.4	1.1500	0.769	499.	2159.	2.92E-08	6.48E-08	0.450
08/29/2016	16:22:00	08/30/2016	7:54:00	1.90	1.9	24.2	1.9000	1.000	932.	3091.	2.53E-08	3.31E-08	0.766
08/30/2016	7:54:00	08/31/2016	8:22:00	2.60	2.7	24.2	2.6500	1.038	1468.	4559.	2.24E-08	2.90E-08	0.773
08/31/2016	8:22:00	09/01/2016	8:08:00	2.40	2.3	23.8	2.3500	0.958	1426.	5985.	2.07E-08	2.44E-08	0.847
09/01/2016	8:08:00	09/02/2016	8:04:00	2.10	2.1	23.8	2.1000	1.000	1436.	7421.	1.83E-08	2.17E-08	0.845
09/02/2016	8:04:00	09/02/2016	15:00:00	0.60	0.5	23.4	0.5500	0.833	416.	7837.	1.67E-08	1.95E-08	0.856
09/06/2016	8:16:00	09/07/2016	8:25:00	2.00	2.0	24.6	2.0000	1.000	1449.	9286.	1.70E-08	1.82E-08	0.935

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER: 16E0080
CLIENT: Natural Resource Technology, Inc.
JOB DESCRIPTION: Coffeen Ash Pond 2

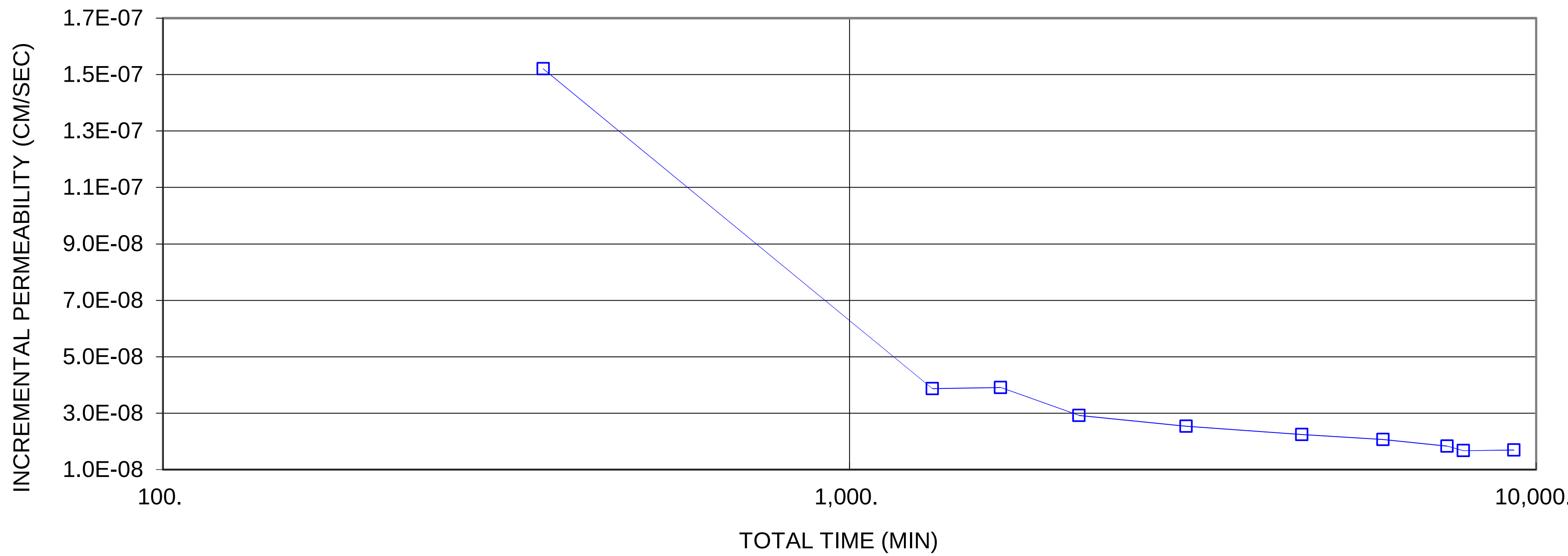
TEST DATE: 8/23/2016
BORING #: G406D
SAMPLE #: 23-3
DEPTH (FT): 43.0-43.5

SPECIMEN HEIGHT (IN) 3.592
DIAMETER (IN) 2.861
AREA (SQ IN) 6.429
INITIAL DEGREE OF SATURATION 104.79

HEIGHT OF HEAD (PSI) 3.80
PRESSURE HEAD (CM H2O) 267.21
PANEL NUMBER 6

* 4 Readings - Ratio of Outflow to Inflow is between .75 to 1.25 or Steady.

** Mean Ratio is Steady if 4 or more incremental readings are ±25% or better of the mean, or within ± 50% or better for *k* < 1 x 10^{-8} cm/sec.



HANSON®

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

ASTM D5084

JOB NUMBER:	16E0080	TEST DATE:	08/30/2016
CLIENT:	Natural Resource Technology, Inc.	BORING #:	G406D
JOB DESCRIPTION:	Coffeen Ash Pond 2	SAMPLE #:	13-2
SAMPLE DESCRIPTION:	Brn & gray fine sandy SILT, some clay, coarse sand and small gravel.	DEPTH (FT):	22.75-23.25

FOR ESTIMATING PORE VOLUME ONLY			WATER CONTENT OF TRIMMINGS BEFORE TEST	AFTER TEST
SPECIMEN WEIGHT (G)	560.94			
SPECIMEN HEIGHT (IN)	3.605	TARE + WET SOIL (G)	95.16	615.02
DIAMETER (IN)	2.301	TARE + DRY SOIL (G)	88.98	568.27
AREA (SQ IN)	4.158	TARE (G)	14.31	49.99
VOLUME (CU IN)	14.991	WET SOIL(G)	80.85	565.03
WET DENSITY (PCF)	142.55	WATER (G)	6.18	46.75
DRY DENSITY (PCF)	131.65 *	DRY SOIL (G)	74.67	518.28
WT. DRY SOIL (G)	518.06 *	WATER CONTENT (%)	8.28	9.02
WT. DRY SOIL (G)	518.28	INITIAL DEGREE OF SATURATION		79.72
VOLUME DRY SOIL (CU IN)	11.709 *	FINAL DEGREE OF SATURATION		87.06
SP.GR. ASSUMED	2.70			
POROSITY (%)	21.89 *	STD. MAX. DEN.(LBS/CU.FT.)	N/A	
HEIGHT OF HEAD (PSI)	3.90	OPTIMUM MOISTURE (%)	N/A	
HYDRAULIC GRADIANT	29.9 *	% COMPACTION	N/A	
PRESSURE HEAD (CM H2O)	274.24	SAMPLE PREPARATION	Tube	
		PANEL NUMBER	8	

TEST METHOD USED: ASTM D5084 PERMEANT USED: Tap Water

*** Estimates Only**

Remarks:

HANSON

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER: 16E0080
CLIENT: Natural Resource Technology, Inc.
JOB DESCRIPTION: Coffeen Ash Pond 2

TEST DATE: 08/30/16
BORING #: G406D
SAMPLE #: 13-2
DEPTH (FT): 22.75-23.25

SPECIMEN HEIGHT (IN) 3.605
DIAMETER (IN) 2.301
AREA (SQ IN) 4.158
INITIAL DEGREE OF SATURATION 79.72

HEIGHT OF HEAD (PSI) 3.90
PRESSURE HEAD (CM H2O) 274.24
PANEL NUMBER 8

* 4 Readings - Ratio of Outflow to Inflow is between .75 to 1.25 or Steady.

** Mean Ratio is Steady if 4 or more incremental readings are ±25% or better of the mean, or within ± 50% or better for *k* < 1 x 10^{-8} cm/sec.

START DATE	START TIME	STOP DATE	STOP TIME	INC. INFLOW (CC)	INC. OUTFLOW (CC)	TEMP. (°C)	AVG, INC. FLOW (CC)	OUTFLOW INFLOW (RATIO) *	INC. TIME (MIN)	TOTAL TIME (MIN)	INC. PERM. (CM/SEC)	AVG. PERM. (CM/SEC)	INC. MEAN RATIO **
09/01/2016	9:10:00	09/01/2016	9:33:00	24.00	24.7	24.2	24.3500	1.029	23.	23.	1.99E-05	1.99E-05	1.000
09/01/2016	13:39:00	09/01/2016	16:17:00	66.78	65.2	24.0	65.9900	0.976	158.	181.	7.88E-06	1.39E-05	0.568
09/02/2016	8:21:00	09/02/2016	15:18:00	121.80	116.8	23.8	119.3000	0.959	417.	598.	5.42E-06	1.11E-05	0.490
09/06/2016	8:27:00	09/06/2016	13:56:00	91.14	90.0	25.6	90.5700	0.987	329.	927.	5.01E-06	9.55E-06	0.524
09/06/2016	14:04:00	09/06/2016	16:25:00	32.34	31.6	24.2	31.9700	0.977	141.	1068.	4.26E-06	5.64E-06	0.755
09/07/2016	8:54:00	09/07/2016	16:06:00	81.48	79.6	25.0	80.5400	0.977	432.	1500.	3.44E-06	4.53E-06	0.759
09/08/2016	8:02:00	09/08/2016	16:19:00	61.32	60.0	25.2	60.6600	0.978	497.	1997.	2.24E-06	3.74E-06	0.600
09/09/2016	8:23:00	09/09/2016	14:35:00	41.16	41.4	23.8	41.2800	1.006	372.	2369.	2.10E-06	3.01E-06	0.699
09/14/2016	9:45:00	09/15/2016	8:30:00	17.22	17.2	24.2	17.2100	0.999	1365.	3734.	2.37E-07	2.01E-06	0.118
09/15/2016	8:30:00	09/15/2016	16:10:00	4.62	4.8	25.2	4.7100	1.039	460.	4194.	1.88E-07	1.19E-06	0.158
09/15/2016	16:10:00	09/16/2016	8:29:00	9.66	9.2	24.2	9.4300	0.952	979.	5173.	1.81E-07	6.77E-07	0.267

HANSON

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER: 16E0080

CLIENT: Natural Resource Technology, Inc.

JOB DESCRIPTION: Coffeen Ash Pond 2

TEST DATE: 08/30/16

BORING #: G406D

SAMPLE #: 13-2

DEPTH (FT): 22.75-23.25

SPECIMEN HEIGHT (IN) 3.605

DIAMETER (IN) 2.301

AREA (SQ IN) 4.158

INITIAL DEGREE OF SATURATION 79.72

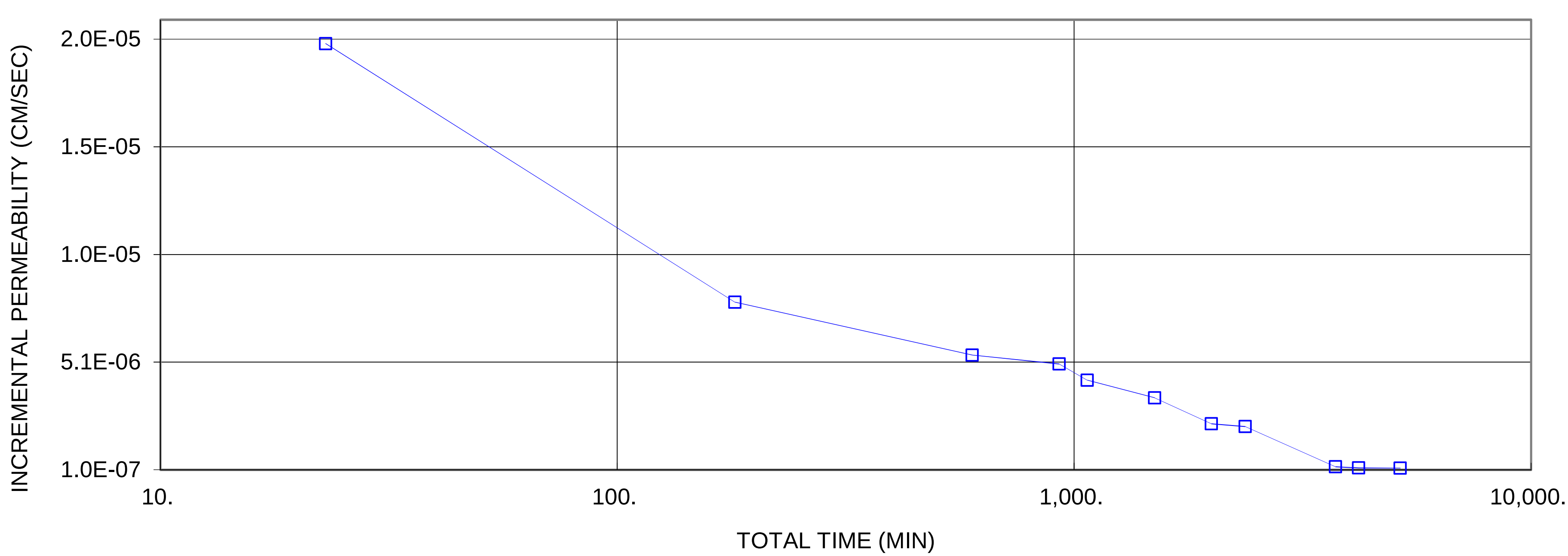
HEIGHT OF HEAD (PSI) 3.90

PRESSURE HEAD (CM H2O) 274.24

PANEL NUMBER 8

* 4 Readings - Ratio of Outflow to Inflow is between .75 to 1.25 or Steady.

** Mean Ratio is Steady if 4 or more incremental readings are ±25% or better of the mean, or within ± 50% or better for *k* $< 1 \times 10^{-8}$ cm/sec.



Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

ASTM D5084

JOB NUMBER:	16E0080	TEST DATE:	09/02/2016
CLIENT:	Natural Resource Technology, Inc.	BORING #:	T408
JOB DESCRIPTION:	Coffeen Ash Pond 2	SAMPLE #:	7-2A
SAMPLE DESCRIPTION:	Brn & gray fine sandy SILT, some clay, coarse sand and small gravel.	DEPTH (FT):	23.5-24.0

FOR ESTIMATING PORE VOLUME ONLY

SPECIMEN WEIGHT (G)	474.47
SPECIMEN HEIGHT (IN)	3.491
DIAMETER (IN)	2.165
AREA (SQ IN)	3.681
VOLUME (CU IN)	12.852
WET DENSITY (PCF)	140.64
DRY DENSITY (PCF)	129.82 *
WT. DRY SOIL (G)	437.96 *
WT. DRY SOIL (G)	437.59
VOLUME DRY SOIL (CU IN)	9.898 *
SP.GR. ASSUMED	2.70
POROSITY (%)	22.98 *
HEIGHT OF HEAD (PSI)	3.70
HYDRAULIC GRADIANT	29.3 *
PRESSURE HEAD (CM H2O)	260.17

WATER CONTENT OF TRIMMINGS

	BEFORE TEST	AFTER TEST
TARE + WET SOIL (G)	99.67	523.99
TARE + DRY SOIL (G)	92.29	487.75
TARE (G)	3.77	50.16
WET SOIL(G)	95.90	473.83
WATER (G)	7.38	36.24
DRY SOIL (G)	88.52	437.59
WATER CONTENT (%)	8.34	8.28

INITIAL DEGREE OF SATURATION	75.45
FINAL DEGREE OF SATURATION	74.68
STD. MAX. DEN.(LBS/CU.FT.)	N/A
OPTIMUM MOISTURE (%)	N/A
% COMPACTION	N/A
SAMPLE PREPARATION	Tube
PANEL NUMBER	7

TEST METHOD USED: ASTM D5084

PERMEANT USED: Tap Water

*** Estimates Only**

Remarks:

HANSON

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER: 16E0080
CLIENT: Natural Resource Technology, Inc.
JOB DESCRIPTION: Coffeen Ash Pond 2

TEST DATE: 9/2/2016
BORING #: T408
SAMPLE #: 7-2A
DEPTH (FT): 23.5-24.0

SPECIMEN HEIGHT (IN) 3.491
DIAMETER (IN) 2.165
AREA (SQ IN) 3.681
INITIAL DEGREE OF SATURATION 79.72

HEIGHT OF HEAD (PSI) 3.70
PRESSURE HEAD (CM H2O) 260.17
PANEL NUMBER 7

* 4 Readings - Ratio of Outflow to Inflow is between .75 to 1.25 or Steady.

** Mean Ratio is Steady if 4 or more incremental readings are ±25% or better of the mean, or within ± 50% or better for $k < 1 \times 10^{-8}$ cm/sec.

START DATE	START TIME	STOP DATE	STOP TIME	INC. INFLOW (CC)	INC. OUTFLOW (CC)	TEMP. (°C)	AVG, INC. FLOW (CC)	OUTFLOW INFLOW (RATIO) *	INC. TIME (MIN)	TOTAL TIME (MIN)	INC. PERM. (CM/SEC)	AVG. PERM. (CM/SEC)	INC. MEAN RATIO **
09/06/2016	8:53:00	09/06/2016	16:18:00	19.70	20.2	24.2	19.9500	1.025	445.	445.	9.71E-07	9.71E-07	1.000
09/06/2016	16:30:00	09/07/2016	8:33:00	32.76	29.52	26.2	31.1400	0.901	963.	1408.	6.69E-07	8.20E-07	0.816
09/07/2016	16:29:00	09/08/2016	7:58:00	4.29	4.32	25.6	4.3050	1.007	929.	2337.	9.72E-08	5.79E-07	0.168
09/08/2016	8:24:00	09/09/2016	8:20:00	7.80	8.0	25.2	7.9000	1.026	1436.	3773.	1.16E-07	4.64E-07	0.251
09/09/2016	8:20:00	09/09/2016	14:31:00	9.80	10.0	24.2	9.9000	1.020	371.	4144.	5.78E-07	3.65E-07	1.582
09/12/2016	8:38:00	09/13/2016	8:12:00	7.20	7.5	23.8	7.3500	1.042	1414.	5558.	1.14E-07	2.26E-07	0.502
09/14/2016	8:58:00	09/15/2016	8:21:00	10.60	10.8	24.4	10.7000	1.019	1403.	6961.	1.64E-07	2.43E-07	0.676
09/15/2016	8:21:00	09/15/2016	16:05:00	3.60	3.7	25.2	3.6500	1.028	464.	7425.	1.67E-07	2.56E-07	0.651
09/15/2016	16:05:00	09/16/2016	8:16:00	7.40	7.3	24.2	7.3500	0.986	971.	8396.	1.64E-07	1.52E-07	1.078

Hanson Professional Services Inc.

CONSTANT HEAD PERMEABILITY TEST

JOB NUMBER: 16E0080
CLIENT: Natural Resource Technology, Inc.
JOB DESCRIPTION: Coffeen Ash Pond 2

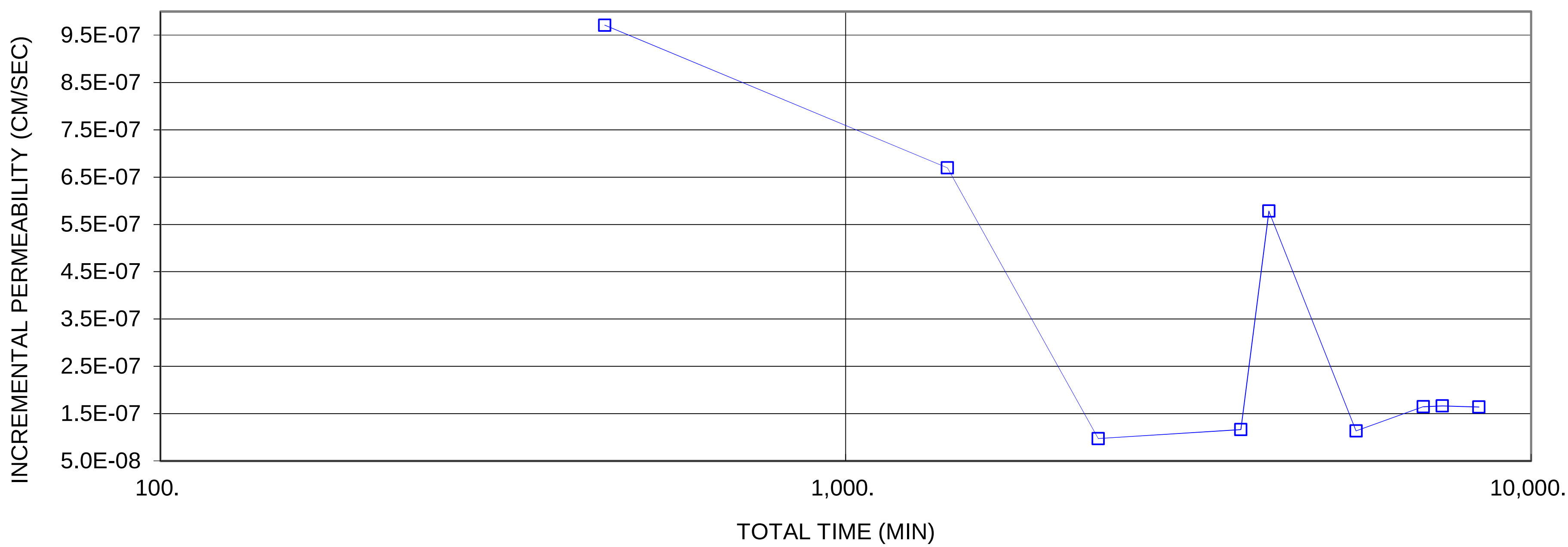
TEST DATE: 9/2/2016
BORING #: T408
SAMPLE #: 7-2A
DEPTH (FT): 23.5-24.0

SPECIMEN HEIGHT (IN) 3.491
DIAMETER (IN) 2.165
AREA (SQ IN) 3.681
INITIAL DEGREE OF SATURATION 79.72

HEIGHT OF HEAD (PSI) 3.70
PRESSURE HEAD (CM H2O) 260.17
PANEL NUMBER 7

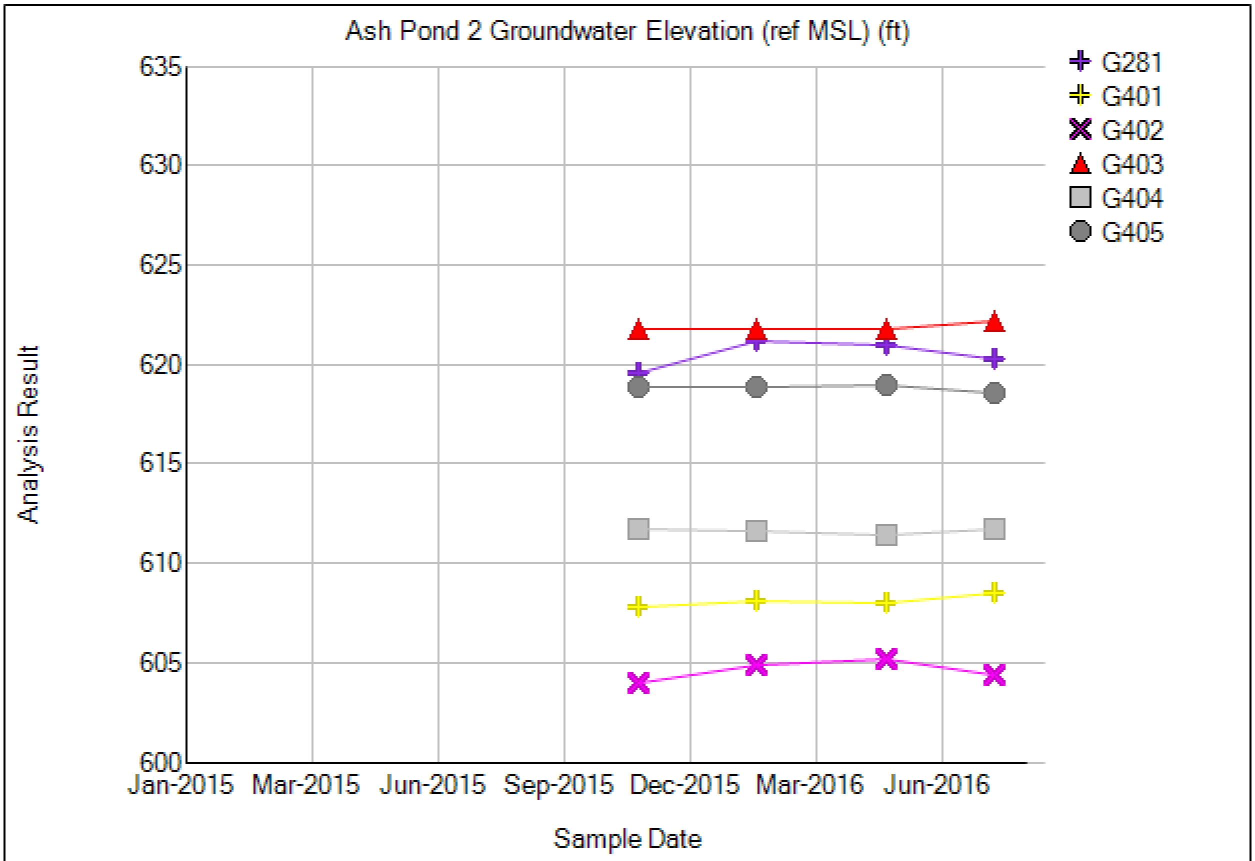
* 4 Readings - Ratio of Outflow to Inflow is between .75 to 1.25 or Steady.

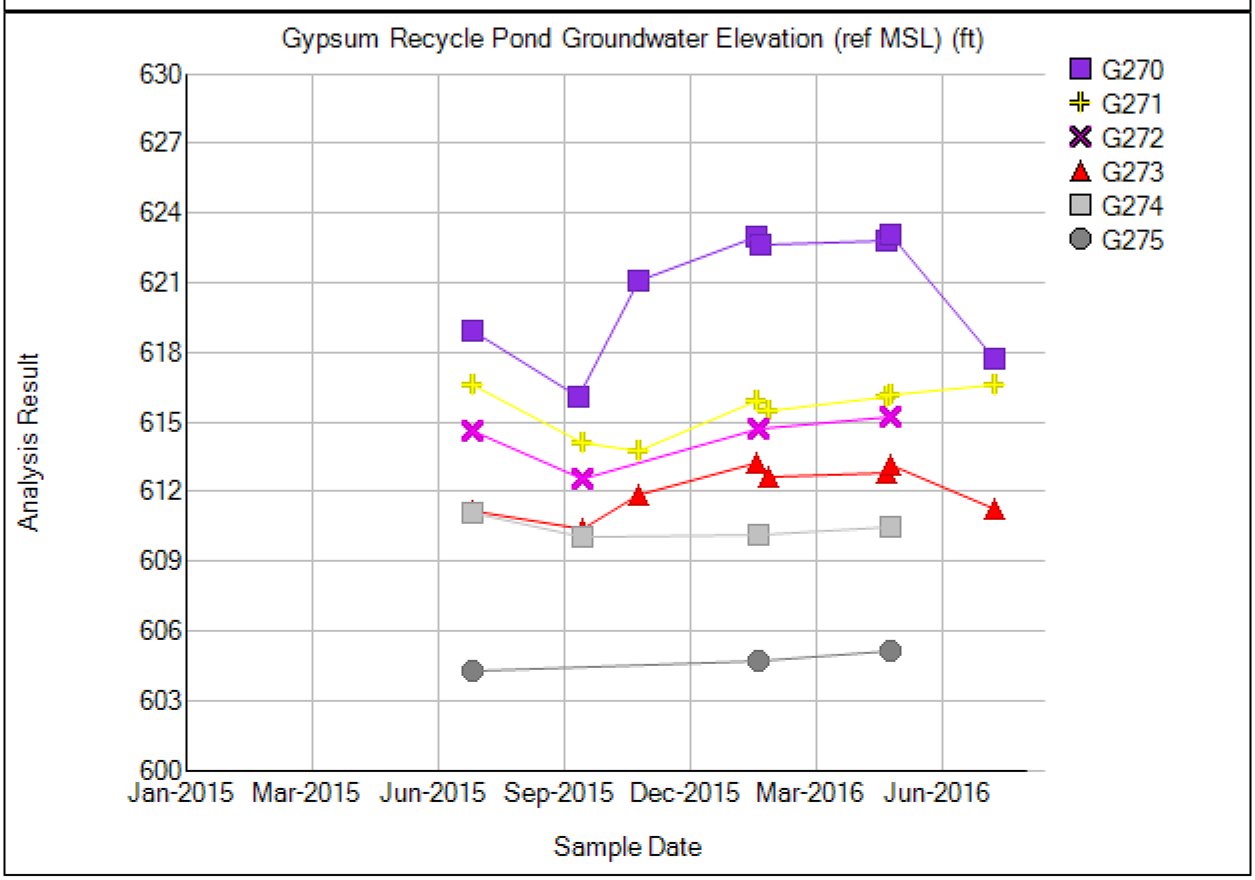
** Mean Ratio is Steady if 4 or more incremental readings are ±25% or better of the mean, or within ± 50% or better for $k < 1 \times 10^{-8}$ cm/sec.

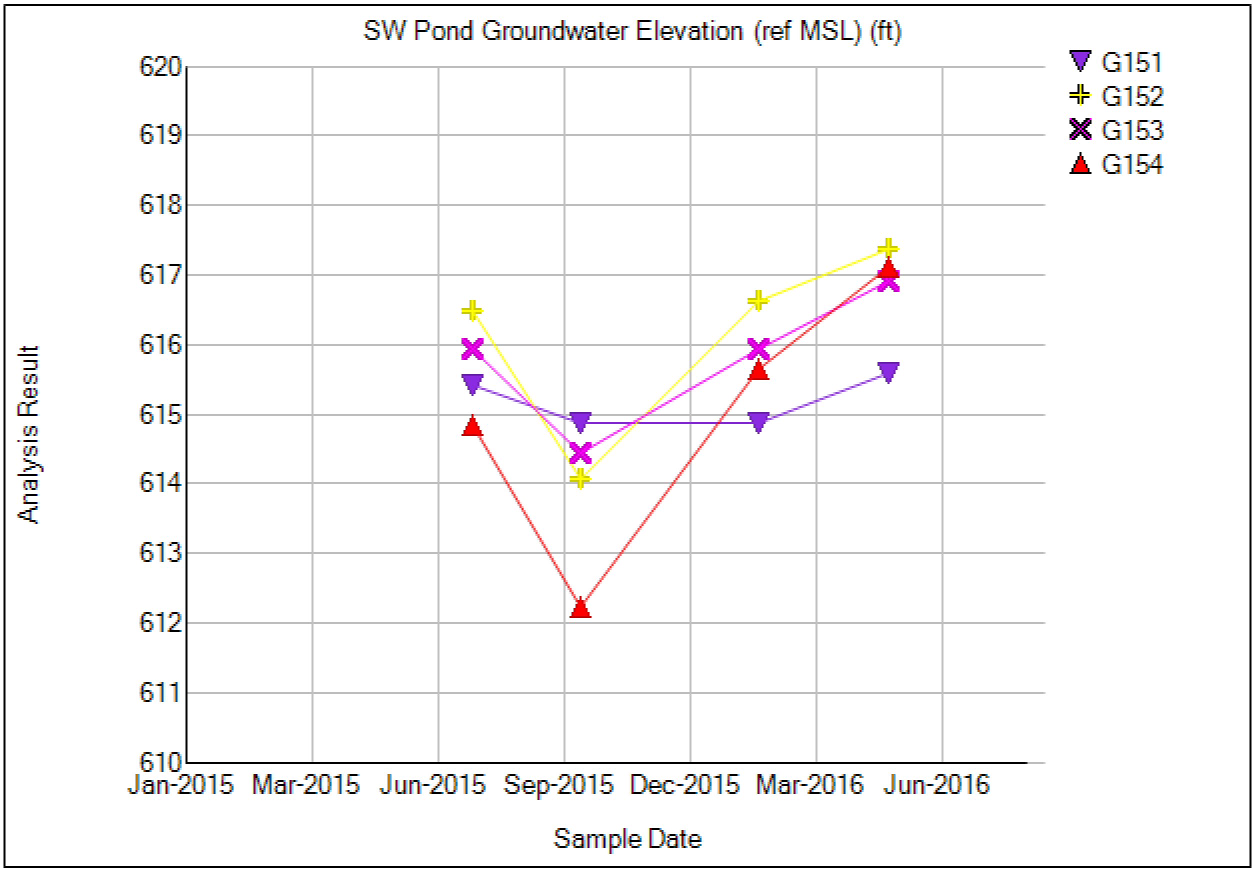


APPENDIX C

MONITORING WELL HYDROGRAPHS
(2015-2016)


Ash Pond 2 Groundwater Elevation (ref MSL) (ft)
Analysis Result
635
630
625
620
615
610
605
600
Jan-2015
Mar-2015
Jun-2015
Sep-2015
Dec-2015
Mar-2016
Jun-2016
Sample Date
G281
G401
G402
G403
G404
G405


Gypsum Recycle Pond Groundwater Elevation (ref MSL) (ft)
Analysis Result
630
627
624
621
618
615
612
609
606
603
600
Jan-2015
Mar-2015
Jun-2015
Sep-2015
Dec-2015
Mar-2016
Jun-2016
Sample Date
G270
G271
G272
G273
G274
G275



SW Pond Groundwater Elevation (ref MSL) (ft)
G151
G152
G153
G154
Analysis Result
620
619
618
617
616
615
614
613
612
611
610
Jan-2015
Mar-2015
Jun-2015
Sep-2015
Dec-2015
Mar-2016
Jun-2016
Sample Date

APPENDIX D

DISCHARGE TO SURFACE WATER CALCULATIONS

Problem Statement:

Calculate the flux of impacted groundwater into the unnamed creek located east of Coffeen Ash Pond No. 2.

Assumptions:

1. Groundwater can enter the creek through the eastern berm as shown in conceptualized cross-sections.
2. Coal Combustion Residuals (CCR) are in contact with Hagarstown Formation within Ash Pond No. 2.
3. Groundwater flow is through Hagarstown Formation only:
   a. Hydraulic conductivity of Hagarstown Formation = $1x10^{-4}$ cm/s (Subsection 2.2.3)
   b. Hydraulic conductivity of Ash Pond No. 2 embankment fill = $5.4x10^{-8}$ cm/s (AECOM, 2015; from samples of embankment fill from Ash Pond No. 1)
4. Hagarstown Formation discharges directly to unnamed creek throughout 75% of eastern edge of Ash Pond No. 2 (as shown in conceptualized cross-section C-C') and Hagarstown Formation daylights to bottom of Ash Pond No. 2 with CCR in contact with Hagarstown Formation (absence of clay layer between bottom of Ash Pond No. 2 and Hagarstown Formation).

Calculations:

$$Conc_{(creek)} = \frac{Q_{(GW)}\ x\ Conc_{(GW)} + \left(Q_{(creek)} - Q_{(GW)}\right) x\ Conc_{(creek)}}{Q_{(creek)}}$$

Where:

$$Q_{(GW)} = KIA$$

$K = Hydraulic\ Conductivity\ of\ Hagarstown\ Formation\ (ft/min)$
$I = Hydraulic\ Gradient$

$$I = \frac{Ash\ Pond\ No.2\ water\ elev - elev\ of\ top\ of\ Hagarstown\ Formation}{width\ of\ berm}$$

$$I = \frac{631\ ft - 601\ ft}{30\ ft}$$

$$I = 1$$

$A = Area\ of\ Flow\ (ft^2)$

$$A = L\ x\ t$$

L = length (ft)
t = thickness (ft)

$$A = 1{,}400\ ft\ x\ 0.75\ x\ 2\ ft$$

$$A = 2{,}100\ ft^2$$

$$Q_{(GW)} = 5x10^{-4}\ cm/\sec x\ 1\ x\ 2{,}100\ ft^2$$

$$Q_{(GW)} = 0.000016\ ft/s\ x\ 2{,}100\ ft^2$$

$$Q_{(GW)} = 0.0336\ cfs\ or\ 0.95\ L/sec$$

$$Q_{(creek)} = \frac{1.49}{n} A\, R^{\frac{2}{3}} \sqrt{S}$$

A = Flow Area (ft²)
n = Manning's Roughness Coefficient (~0.05)
R = Hydraulic Radius (ft)
S = Channel Slope (ft/ft) (see attached Google Earth calculation)

$$Q_{(creek)} = \frac{1.49}{0.05} x 18\, ft^2\ x\ 1.44\, ft^{\frac{2}{3}} \sqrt{0.004}$$

$$Q_{(creek)} = 29.8\ x\ 18\ x\ 1.28\ x\ 0.063$$

$$Q_{(creek)} = 43.3\ cfs\ or\ 1{,}226\ L/sec$$

$$R = \frac{A}{P}$$

A = Flow Area of creek channel (ft²)
P = Wetted Perimeter of creek channel (ft)

$$R = \frac{18\, ft^2}{12.5\, ft}$$

$$R = 1.44\, ft$$

$$P = b + 2\sqrt{(\frac{T-b}{2})^2 + h^2}$$

b = channel width at base of creek (ft) (see assumed geometry at discharge to lake)
T = channel width at top of creek (ft) (see assumed geometry at discharge to lake)
h = depth of creek channel (ft) (see assumed geometry at discharge to lake)

$$P = 8\, ft + 2\sqrt{(\frac{10\, ft - 8\, ft}{2})^2 + 2\, ft^2}$$

$$P = 8\, ft + 2\sqrt{5 ft^2}$$

$$P = 12.5\, ft$$

Boron

$$Conc_{(creek)} = \frac{0.95\ L/sec\ x\ 20\ mg/L + (1{,}226\ L/\mathrm{sec} - 0.95\ L/sec)\ x\ 0.1\ mg/L}{1{,}226\ L/sec}$$

$$Conc_{(creek)} = \frac{19\ mg/sec + 122.5\ \ mg/sec}{1{,}226\ L/sec}$$

$$Conc_{(creek)} = 0.115\ mg/L$$

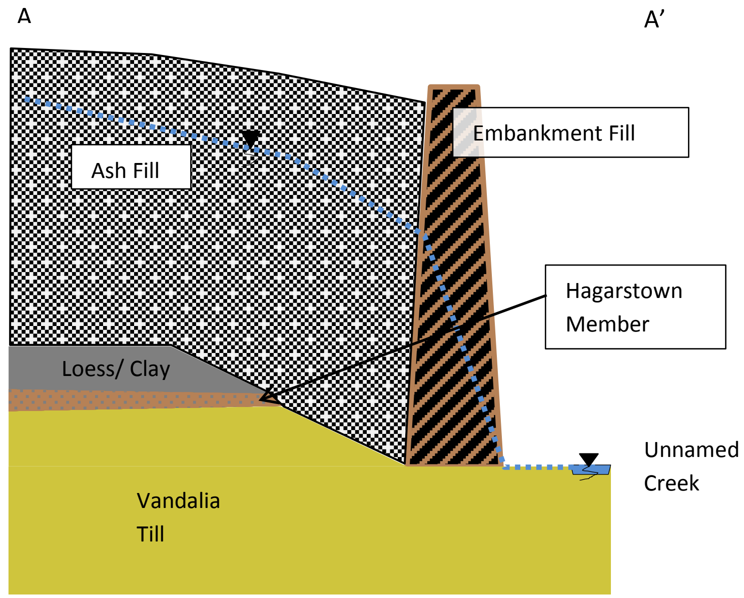
Sulfate

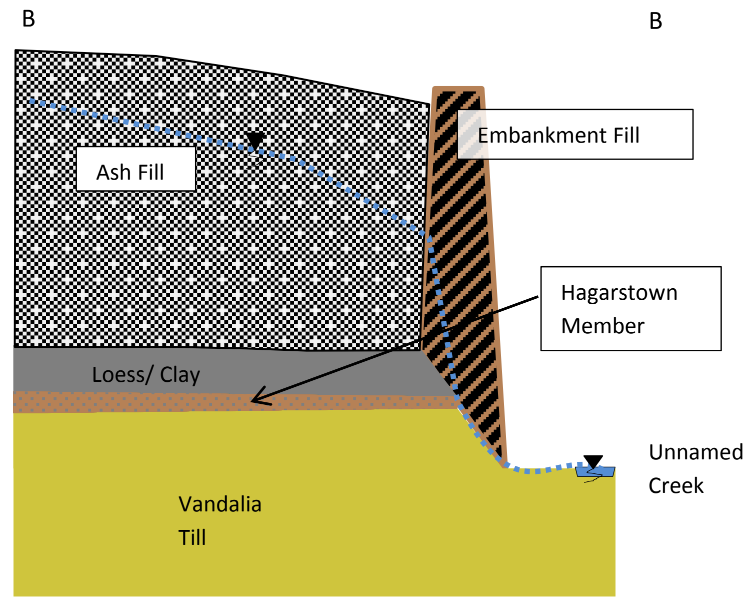
$$Conc_{(creek)} = \frac{0.95\ L/sec\ x\ 2{,}400\ mg/L + (1{,}226\ L/\mathrm{sec} - 0.95\ L/sec)\ x\ 0.05\ mg/L}{1{,}226\ L/sec}$$

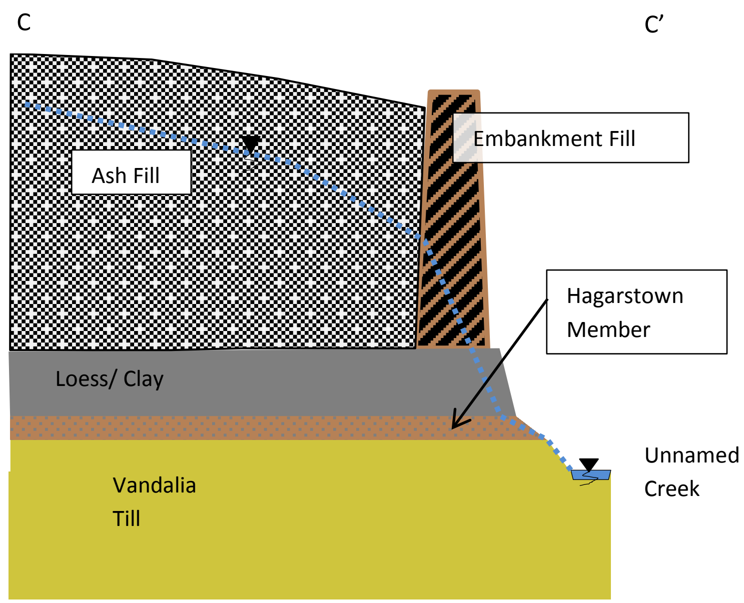
$$Conc_{(creek)} = \frac{2{,}280\ mg/sec + 61.3\ mg/sec}{1{,}226\ L/sec}$$

$$Conc_{(creek)} = 1.9\ mg/L$$

APPENDIX D – ASH POND 2 EAST BERM CONCEPTUAL CROSS SECTIONS







Problem Statement:

Calculate the flux of impacted groundwater into the Condenser Cooling Water Discharge Flume located south of Ash Pond No. 2.

Assumptions:

1. Average flow in flume per NPDES permit is ~500 MGD or approximately 21,900 L/sec.
2. Groundwater can enter the flume through the southern berm as shown in cross-section A-A'.
3. Coal Combustion Residuals (CCR) are in contact with Hagarstown Formation within Ash Pond No. 2.
4. Groundwater flow is through Hagarstown Formation only:
   a. Hydraulic conductivity of Hagarstown Formation = 1×10^{-4} cm/s (Subsection 2.2.3, this report)
   b. Hydraulic conductivity of Ash Pond No. 2 embankment fill = 5.4×10^{-8} cm/s (AECOM, 2015; from samples of embankment fill from Ash Pond No. 1)
5. Hagarstown Formation discharges directly to flume throughout entire southern edge of Ash Pond No. 2 (as shown in conceptualized cross-section C-C') and Hagarstown Formation daylights to bottom of Ash Pond No. 2 with CCR in contact with Hagarstown Formation (absence of clay layer between bottom of Ash Pond No. 2 and Hagarstown Formation).

Calculations:

$$Conc_{(flume)} = \frac{Q_{(GW)}\ x\ Conc_{(GW)} + \left(Q_{(flume)} - Q_{(GW)}\right)\ x\ Conc_{(flume)}}{Q_{(flume)}}$$

Where:

$$Q_{(GW)} = KIA$$

$K = Hydraulic\ Conductivity\ of\ Hagarstown\ Formation\ (ft/min)$
$I = Hydraulic\ Gradient$

$$I = \frac{Ash\ Pond\ No.2\ water\ elev - elev\ of\ top\ of\ Hagarstown\ Formation}{width\ of\ berm}$$

$$I = \frac{610\ ft - 600\ ft}{20\ ft}$$

$$I = 0.5$$

$A = Area\ of\ Flow\ (ft^2)$

$$A = L\ x\ t$$

L = length (ft)
t = thickness (ft)

$$A = 1{,}950\ ft\ \ x\ 2\ ft$$

$$A = 3{,}900\ ft^2$$

$$Q_{(GW)} = 5x10^{-4}\ cm/\sec x\ 0.5\ x\ 3{,}900\ ft^2$$
$$Q_{(GW)} = 1.6x10^{-5}\ ft/\sec x\ 1{,}950\ ft^2$$
$$Q_{(GW)} = 0.03\ ft^3/sec\ or\ 0.88\ L/sec$$

$$Q_{(flume)} = 21{,}900\ L/sec$$

$$SO_4\ Conc_{(flume)} = \frac{\frac{0.88L}{sec} x \frac{3{,}000mg}{L} + \left(\frac{21{,}900L}{sec} - \frac{0.88L}{sec}\right) x \frac{50mg}{L}}{21{,}900\ \frac{L}{sec}}$$

$$= \frac{2640\ mg/\sec +\ 1.1\ x\ 10^6\ mg/sec}{21{,}900\ \frac{L}{sec}}$$

$$= 50.1\ mg/L$$

Summary and Conclusions:

Since $Q_{(flume)}$ is so much larger in magnitude than $Q_{(GW)}$, the flux of impacted groundwater into the flume is negligible.

APPENDIX E

WATER WELL LOCATIONS AND RECORDS WITHIN 2,500-FOOT RADIUS OF COFFEEN ASH POND 2

E WELL SEARCH

E.1 Well Search Overview

The following sources of information were utilized in order to determine community water source and water well locations:

- Illinois State Geological Survey's Illinois Water Well (ILWATER) Internet Map Service
- Illinois State Water Survey Domestic Well Database
- Illinois EPA web-based Geographic Information System (GIS) files
- Illinois Department of Public Health
- Montgomery County Health Department

E.2 Illinois State Geological Survey (ISGS)

The ISGS website provided an ArcIMS View Map as well as a database query for water wells. ISGS database information including any boring logs and well construction information is provided in this Appendix.

E.3 Illinois State Water Survey (ISWS)

All of the wells found on-line through the ISWS Domestic Well Database were previously identified on the ISGS website. Hard copy records contained within the ISWS database, consisting of public, industrial, and commercial water wells, were not all received as of the date of this report. Since the ISWS database generally contains the same well information as the ISGS and Illinois EPA databases, some ISWS well entries on the Appendix E-1 Table were marked as pending. Should any new information be acquired from the ISWS including additional water wells not previously identified from the on-line sources of well information, it will be provided as an addendum to this report. Table E-2 lists wells located by RAPPS (2009) that were not located and identified in the on-line search for this report.

E.4 Illinois Environmental Protection Agency (IEPA)

The Illinois EPA database website provided ArcIMS Viewer Maps showing information on community, non-community, and public water supply wells as defined on the Illinois EPA website:

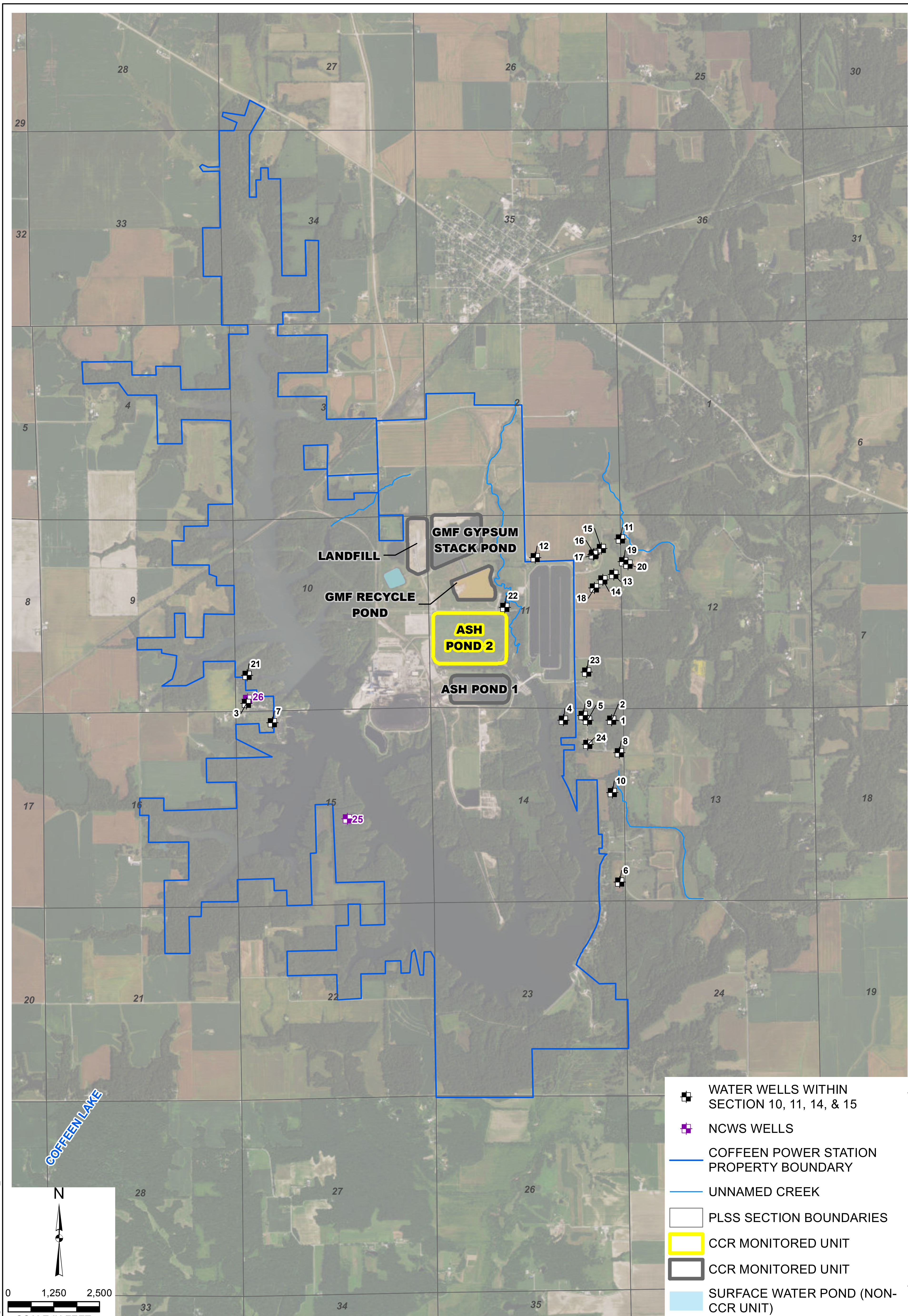
- Community Water Supply: a public water supply that serves or is intended to serve at least 15 service connections used by residents or regularly serves at least 25 residents.

- Non-Community Water Supply: a public water supply that is not a community water supply.
- Public Water Supply: all mains, pipes and structures through which water is obtained and distributed to the public, including wells and well structures, intakes and cribs, pumping stations, treatment plants, reservoirs, storage tanks and appurtenances, collectively or severally, actually used or intended for use for the purpose of furnishing water for drinking or general domestic use and which serve at least 15 service connections or which regularly serve at least 25 persons at least 60 days per year. A public water supply is either a community water supply or a non-community water supply.

Based on the IEPA maps, two non-CWS wells are located within Sections 10 and 15. Both non-CWS were identified in the ISGS records.

E.5 Montgomery County Health Department

Personnel from the Montgomery County Health Department confirmed the two non-CWS well systems were present within the area and noted that they were used at a campground and wildlife preserve. No additional information was provided about the area.



Y:\Mapping\Projects\23\2380\MXD\HGCR\Figure E-1 Well Search Results-Coffeen_1117.mxd Author: sstolz; Date/Time: 12/21/2016, 3:40:12 PM

DRAWN BY/DATE: SDS 11/3/16 REVIEWED BY/DATE: JJW 11/3/16 APPROVED BY/DATE: SJC 12/21/16 **DRAFT**	WATER WELL LOCATION MAP HYDROGEOLOGIC CHARACTERIZATION REPORT ASH POND 2 COFFEEN POWER STATION COFFEEN, IL	PROJECT NO: 2285 FIGURE NO: 1 Natural Resource Technology

Table E-1. Well Search Results
Hydrogeologic Characterization Report
Coffeen Energy Center

Map Well #	Source of Well Information: ISGS	ISWS***	IEPA	Other	Location Name at Time of Well Completion	Well Depth	County	Location: Township	Range	Section	Subsection	Year Drilled	Aquifer Type	Formation	Well Use*
1	121352182400	115230	21824	--	Hueitt, Bill	32	Montgomery	7N	3W	14	NE,NE,NE	1974	Unconsolidated	clay	FD
2	121352182500	115229	21825	--	Stahl, Louis	32	Montgomery	7N	3W	14	NE,NE,NE	1974	Unconsolidated	clay	FD
3	121350164400	115213	1644	--	Flori, Eugene	20	Montgomery	7N	3W	10	--	1969	Unconsolidated	sand	FD
4	121350171700	115228	1717	--	Marfield, Mac	29	Montgomery	7N	3W	14	NE,NW,NE	1970	Unconsolidated	clay	FD
5	121350172600	115224	1726	--	Schuler, Paul	32	Montgomery	7N	3W	14	NW,NE,NE	1971	Unconsolidated	sand	FD
6	121352300600	115226	23006	--	Jump, James	41	Montgomery	7N	3W	14	SE,SE,SE	1986	Unconsolidated	ground-clay	FD
7	121352310800	***	23108	--	Dept. of Conservation	70	Montgomery	7N	3W	15	NE,NW,NW	1987	Unconsolidated	sandy clay	IC
8	121352221300	115222	22213	--	Gadshlen, Clarence	156	Montgomery	7N	3W	14	SE,NE,NE	1977	Bedrock	sandstone	FD
9	121352221400	115223	22214	--	Warfield, William	151	Montgomery	7N	3W	14	NE	1978	Bedrock	sandstone	FD
10	121352334900	243174	23349	--	Monk, Lawrence & Anita	382	Montgomery	7N	3W	14	SE,SE,NE	1993	Bedrock	gray sandstone	FD
11	121352361400	***	23614	--	White & Brewer	40	Montgomery	7N	3W	11	SE,NE,NE	1993	Unconsolidated	silt	MW
12	121352361500	***	23615	--	White & Brewer	35	Montgomery	7N	3W	11	NE	1993	Unconsolidated	silt	MW
13	121352361600	***	23616	--	White & Brewer	17	Montgomery	7N	3W	11	--	--	Unconsolidated	silt	MW
14	121352361700	***	23617	--	White & Brewer	25	Montgomery	7N	3W	11	--	--	Unconsolidated	silty clay	MW
15	121352361800	***	23618	--	White & Brewer	23	Montgomery	7N	3W	11	--	--	Unconsolidated	silty clay	MW
16	121352361900	***	23619	--	White & Brewer	40	Montgomery	7N	3W	11	--	--	Unconsolidated	sandy silt	MW
17	121352362000	***	23620	--	White & Brewer	20	Montgomery	7N	3W	11	--	--	Unconsolidated	sandy silt	MW
18	121352362100	***	23621	--	White & Brewer	33	Montgomery	7N	3W	11	--	--	Unconsolidated	sandy silt	MW
19	121352362300	***	23623	--	White & Brewer	48	Montgomery	7N	3W	12	--	--	Unconsolidated	clay and silt	MW
20	121352362400	***		--	White & Brewer	24	Montgomery	7N	3W	12	--	--	Unconsolidated	sandy silt	MW
21	121352283100	115350	22831	--	Sidner, Joe	50	Montgomery	7N	3W	10	NW,SW,SW	1984	Unconsolidated	gravel	FD
22	121352283200	115215	22832	--	Wibel, William	39	Montgomery	7N	3W	11	SE,SE,NW (A)	1981	Unconsolidated	sand and gravel	FD
23	121352380200	290232	23802	--	O'Dell, Kenneth & Chong	363	Montgomery	7N	3W	11	NW,SE,SE	1996	Bedrock	light gray sandstone	FD
24	121352380300	290231	23803	--	Childers, Joe	401	Montgomery	7N	3W	14	SW,NE,NE	1996	Bedrock	light gray sandstone	FD
25	121352396900	***	13500061	--	Coffeen Lake Fish & Wildlife	--	Montgomery	7N	3W	15	NW,NW,SE	--	--	--	NCWS
26	121352400700	***	13500012	--	Indian Grove Campground	--	Montgomery	7N	3W	10	SW,SW,SW	--	--	--	NCWS

Sources of Information

IEPA	Illinois Environmental Protection Agency
ISGS	Illinois State Geological Survey
ISWS	Illinois State Water Survey (Private Well Database)
SWA	IEPA Source Water Assessment

*Well Use

FD	Farm and/or Domestic Water Well
IC	Industrial/Commercial Water Well
CWS	Community Water Supply
NCWS	Non-Community Water Supply
MW	Monitoring well

Notes

- -	Not applicable or no information available
***	ISWS data pending
(A)	Well is mislocated in ISGS and/or IEPA databases

Table E-2. Other Water Wells, Precise Location Not Available
Hydrogeologic Characterization Report
Coffeen Energy Center

Well ID	Depth	Location			Well Use	Driller	Date Drilled
		Township	Range	Section			
400397		7N	3W	10	IC		//
43308	16	7N	3W	10	IC	DAN KOHNEN	//
433123	20	7N	3W	10	IC	DAN KOHNEN	//
115214	500	7N	3W	11	IC		7/14/1996
250603	40	7N	3W	11	MO	FOX DRILLING INC.	11/17/1993
250604	35	7N	3W	11	MO	FOX DRILLING INC.	11/18/1993
250605	17	7N	3W	11	MO	FOX DRILLING INC.	1/28/1994
250610	25	7N	3W	11	MO	FOX DRILLING INC.	1/28/1994
250611	23	7N	3W	11	MO	FOX DRILLING INC.	1/28/1994
250612	40	7N	3W	11	MO	FOX DRILLING INC.	1/28/1994
250613	20	7N	3W	11	MO	FOX DRILLING INC.	1/28/1994
250614	33	7N	3W	11	MO	FOX DRILLING INC.	2/3/1994
433009	15	7N	3W	11	MO	DAN KOHNEN	//
290231	401	7N	3W	14	IC	KOHEN CONCR.	8/5/1996
377373	483	7N	3W	14	IC	SCWHARTZ	1997
377374	504	7N	3W	14	IC	SCWHARTZ	1997
377375	490	7N	3W	14	IC	SCWHARTZ	1997
377376	408	7N	3W	14	IC	SCWHARTZ	1997
377377	417	7N	3W	14	IC	SCWHARTZ	1997
377378	418	7N	3W	14	IC	SCWHARTZ	1997
377380	416	7N	3W	14	IC	SCWHARTZ	1997
403162		7N	3W	14			//
403163		7N	3W	14			//
115231	70	7N	3W	15	ST	H LINK	6/23/1987

Well Use

DO	Domestic
MO	not specified
IC	not specified
ST	not specified

These wells are listed in RAPPS (2009). NRT has ordered but not yet received these records from the ISWS Domestic Wells Database.

NATURAL RESOURCE TECHNOLOGY

APPENDIX F

GROUNDWATER QUALITY DATA

Summary of Groundwater Data
Units: mg/L

Well ID	Date	Arsenic, dissolved	Arsenic, total	Barium, total	Beryllium, total	Boron, dissolved	Boron, total	Cadmium, total	Calcium, total L	Chloride, total	Chromium, total	Cobalt, total	Fluoride, total	Lead, dissolved	Lead, total	Lithium, total	Manganese, dissolved	Mercury, total	Molybdenum, total	Selenium, total	Sulfate, total	Thallium, total	Total Dissolved Solids
G151	12/21/2011	< 0.003				0.0218								< 0.002			0.257						510
G151	01/25/2012		0.0012	0.057	< 0.001		0.026	< 0.001		50	< 0.004	< 0.002	0.691		< 0.001			< 0.0002		0.0021	95	< 0.001	510
G151	03/13/2012		< 0.001	0.069	< 0.001		0.019	< 0.001		67	< 0.004	< 0.002	0.486		< 0.001			< 0.0002		0.0029	120	< 0.001	580
G151	05/22/2012	0.0014				0.052								< 0.001			0.11						520
G151	07/23/2012		< 0.001	0.067	< 0.001		0.01	< 0.001		58	< 0.004	< 0.002	0.649		< 0.001			< 0.0002		0.0024	98	< 0.001	570
G151	11/14/2012	< 0.001				0.013								< 0.001			0.091						660
G151	01/30/2013	< 0.001				< 0.02								< 0.001			0.071						560
G151	05/20/2013	< 0.001				< 0.005								< 0.001			0.031						520
G151	07/22/2013	< 0.001				0.02								< 0.001			0.12						500
G151	02/19/2014	< 0.001				0.014								< 0.001			0.072						
G151	05/12/2014	< 0.001				0.024								< 0.001			0.069						
G151	08/11/2014	< 0.001				< 0.01								< 0.001			0.14						560
G151	10/14/2014	< 0.001				< 0.01								< 0.001			0.031						570
G151	01/21/2015	< 0.001				< 0.01								< 0.001			0.066						500
G151	04/08/2015	< 0.002				< 0.02								< 0.002			0.19						600
G151	07/23/2015	< 0.001				0.018								< 0.001			0.093						550
G151	10/06/2015	< 0.001				0.036								< 0.001			0.56						600
G151	02/09/2016	< 0.001				< 0.01								< 0.001			0.18						560
G151	05/11/2016	< 0.002				< 0.02								< 0.002			0.011						500
G152	12/21/2011	< 0.003				0.0513								< 0.002			0.927						494
G152	01/25/2012		0.0023	0.13	< 0.001		0.047	< 0.001		40	0.008	0.0023	0.642		0.0026			< 0.0002		0.003	110	< 0.001	520
G152	03/13/2012		0.0014	0.13	< 0.001		0.036	< 0.001		42	< 0.004	< 0.002	0.422		< 0.001			< 0.0002		0.0043	130	< 0.001	580
G152	05/22/2012	0.0011				0.044								< 0.001			0.21						580
G152	07/23/2012		0.0011	0.1	< 0.001		0.032	< 0.001		45	< 0.004	< 0.002	0.587		< 0.001			< 0.0002		0.0035	120	< 0.001	670
G152	11/14/2012	< 0.001				0.031								< 0.001			0.14						620
G152	01/30/2013	< 0.001				0.033								< 0.001			0.14						600
G152	05/20/2013	< 0.001				0.015								< 0.001			0.034						570
G152	07/22/2013	< 0.001				0.024								0.0014			0.21						580
G152	02/19/2014	< 0.001				0.038								< 0.001			0.12						
G152	05/12/2014	< 0.001				0.044								< 0.001			0.05						
G152	08/11/2014	< 0.001				0.044								< 0.001			0.31						820
G152	10/14/2014	< 0.001				0.034								< 0.001			0.15						620
G152	01/21/2015	< 0.001				0.03								< 0.001			0.15						620
G152	04/08/2015	< 0.002				0.025								< 0.002			0.07						680
G152	07/23/2015	0.0078				0.079								< 0.001			0.89						730
G152	10/06/2015	0.0054				0.11								< 0.001			0.53						1100
G152	02/09/2016	0.0034				0.082								< 0.001			0.47						920
G152	05/11/2016	< 0.002				0.066								< 0.002			0.31						800
G152	11/19/2016			0.073			0.017			51			0.509								130		680
G153	12/21/2011	< 0.003				0.0575								< 0.002			1.02						3150
G153	01/25/2012		0.0056	0.036	< 0.001		0.064	< 0.001		130	0.0053	0.0068	0.369		< 0.001			< 0.0002		0.021	1500	< 0.001	3000
G153	03/13/2012		0.0059	0.022	< 0.001		0.036	< 0.001		160	0.0041	0.0034	0.293		< 0.001			< 0.0002		0.027	1900	< 0.001	3200
G153	05/22/2012	0.004				0.032								< 0.001			0.42						3100
G153	07/23/2012		0.0052	0.016	< 0.001		0.031	< 0.001		130	0.0041	< 0.002	0.341		< 0.001			< 0.0002		0.021	1500	< 0.001	3200
G153	11/14/2012	0.0023				0.04								< 0.001			0.19						3300
G153	01/30/2013	0.0022				0.039								< 0.001			0.28						3000
G153	05/20/2013	< 0.001				0.012								< 0.001			0.13						2800
G153	07/22/2013	0.0027				0.028								< 0.001			0.1						3000
G153	02/19/2014	< 0.001				0.042							0.4	< 0.001			0.16						
G153	05/12/2014	< 0.001				0.021							0.41	< 0.001			0.05						

Well ID	Date	Arsenic, dissolved	Arsenic, total	Barium, total	Beryllium, total	Boron, dissolved	Boron, total	Cadmium, total	Calcium, total L	Chloride, total	Chromium, total	Cobalt, total	Fluoride, total	Lead, dissolved	Lead, total	Lithium, total	Manganese, dissolved	Mercury, total	Molybdenum, total	Selenium, total	Sulfate, total	Thallium, total	Total Dissolved Solids
G153	08/11/2014	< 0.001				0.026								< 0.001			0.24						3500
G153	10/14/2014	0.0016				0.028								< 0.001			0.51						3400
G153	01/21/2015	< 0.001				0.02								< 0.001			0.2						3600
G153	04/08/2015	0.003				0.02								< 0.002			0.024						3700
G153	07/23/2015	< 0.001				0.015								< 0.001			0.16						3900
G153	10/06/2015	< 0.001				0.03								< 0.001			0.19						3700
G153	02/09/2016	< 0.001				0.016								< 0.001			0.046						3800
G153	05/11/2016	0.0035				0.026								< 0.002			0.037						3800
G153	11/19/2016			0.017			0.013			230			0.491								2500		4000
G154	12/21/2011	< 0.003				0.0452								< 0.002			0.462						624
G154	01/25/2012		0.0014	0.037	< 0.001		0.031	< 0.001		10	< 0.004	< 0.002	1.01		< 0.001			< 0.0002		0.0042	93	< 0.001	410
G154	03/13/2012		< 0.001	0.032	< 0.001		0.021	< 0.001		4.6	< 0.004	< 0.002	0.971		< 0.001			< 0.0002		0.0062	93	< 0.001	440
G154	05/22/2012	0.0017				0.025								< 0.001			0.038						470
G154	07/23/2012		< 0.001	0.033	< 0.001		0.038	< 0.001		4.9	< 0.004	< 0.002	1.06		< 0.001			< 0.0002		0.0058	110	< 0.001	490
G154	11/14/2012	< 0.001				0.04								< 0.001			0.043						500
G154	01/30/2013	< 0.001				0.043								< 0.001			0.032						440
G154	05/20/2013	< 0.001				0.021								< 0.001			0.046						460
G154	07/22/2013	< 0.001				0.035								< 0.001			0.045						500
G154	02/19/2014	< 0.001				0.043								< 0.001			0.018						
G154	05/12/2014	< 0.001				0.044								< 0.001			0.014						
G154	08/11/2014	< 0.001				0.035								< 0.001			0.081						480
G154	10/14/2014	< 0.001				0.035								< 0.001			0.0077						440
G154	01/21/2015	< 0.001				0.037								< 0.001			0.0092						450
G154	04/08/2015	< 0.002				0.023								< 0.002			0.003						440
G154	07/23/2015	< 0.001				0.024								< 0.001			0.14						430
G154	10/06/2015	< 0.001				0.044								< 0.001			0.01						500
G154	02/09/2016	< 0.001				0.041								< 0.001			0.041						560
G154	05/11/2016	< 0.002				0.037								< 0.002			0.0085						460
G270	03/11/2008	< 0.005	< 0.005	0.076	< 0.005	< 0.25	< 0.25	< 0.0025	77	9.5	< 0.025	< 0.005	0.36	< 0.0025	< 0.0025		0.19	< 0.0002		< 0.012	2.3	< 0.002	440
G270	04/21/2008	< 0.001	0.0016	0.076	< 0.001	0.078	0.071	< 0.0005	72	11	< 0.005	0.0017	0.36	< 0.0005	0.0021		0.21	< 0.0002		< 0.0025	2.4	< 0.002	420
G270	06/11/2008	< 0.001	0.0012	0.072	< 0.001	< 0.05	< 0.05	< 0.0005	70	< 10	< 0.005	0.001	0.33	< 0.0005	0.0021		0.21	< 0.0002		< 0.0025	2.8	< 0.002	430
G270	08/13/2008	< 0.001	< 0.001	0.069	< 0.001	0.052	< 0.05	< 0.0005	67	8.9	< 0.005	< 0.001	0.38	< 0.0005	< 0.0005		0.26	< 0.0002		< 0.0025	4.2	< 0.002	440
G270	10/14/2008	< 0.001	< 0.001	0.068	< 0.001	0.073	< 0.05	< 0.0005	71	9.4	< 0.005	< 0.001	0.35	< 0.0005	< 0.0005		0.22	< 0.0002		< 0.0025	4.7	< 0.002	440
G270	12/02/2008	< 0.001	< 0.001	0.068	< 0.001	0.052	0.051	< 0.0005	69	9.6	< 0.005	< 0.001	0.31	< 0.0005	0.00054		0.22	< 0.0002		< 0.0025	4.4	< 0.002	400
G270	09/21/2009	< 0.001	0.001			0.054	0.058	< 0.0005	77	9.4				< 0.0005	0.0011		0.26				3.2		430
G270	11/10/2009	< 0.001	0.001			0.054	0.057	< 0.0005	75	11				< 0.0005	0.0011		0.23				5.1		450
G270	01/28/2010	< 0.001	< 0.001			0.053	0.052	< 0.0005	74	19				< 0.0005	0.0031		0.14				8.2		430
G270	02/11/2010			0.056	< 0.001						< 0.005	< 0.001	0.3					< 0.0002		< 0.0025		< 0.002	460
G270	06/09/2010	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	61	39				< 0.001	< 0.001		0.058				6.8		470
G270	07/27/2010	< 0.001	< 0.001			0.011	< 0.01	< 0.001	58	40				< 0.001	< 0.001		0.062				9.1		480
G270	11/15/2010	< 0.001	0.0011			0.013	0.016	< 0.001	60	40				< 0.001	0.0021		0.069				7.6		490
G270	01/28/2011	< 0.001	< 0.001	0.064	< 0.001	< 0.01	0.012	< 0.001	80	45	< 0.004	0.002	0.36	< 0.001	0.0041		0.032	< 0.0002		0.002	9.6	< 0.001	470
G270	05/03/2011	< 0.001	< 0.001			0.01	< 0.01	< 0.001	57	57				< 0.001	< 0.001		0.023				13		430
G270	07/27/2011	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	59	57				< 0.001	< 0.001		0.046				18		480
G270	11/11/2011	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	61	64				< 0.001	< 0.001		0.05				23		440
G270	01/26/2012	< 0.001	< 0.001	0.049	< 0.001	< 0.01	< 0.01	< 0.001	64	73	< 0.004	< 0.002	0.363	< 0.001	< 0.001		0.0094	< 0.0002		0.0046	40	< 0.001	420
G270	05/22/2012	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	67	83				< 0.001	< 0.001		0.04				57		460
G270	07/24/2012	< 0.001	< 0.001			0.092	0.018	< 0.001	73	66				< 0.001	< 0.001		0.045				43		480
G270	11/14/2012	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	65	76				< 0.001	< 0.001		0.017				77		500
G270	01/30/2013	< 0.001	0.001	0.062	< 0.001	< 0.01	< 0.01	< 0.001	65	91	< 0.004	< 0.002	0.372	< 0.001	< 0.001		0.011	< 0.0002		0.0078	96	< 0.001	540
G270	05/20/2013	0.0011	< 0.001			< 0.01	< 0.01	< 0.001	72	85				< 0.001	< 0.001		0.025				120		480
G270	07/22/2013	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	70	79				< 0.001	< 0.001		0.045				120		500
G270	10/14/2013	< 0.001	< 0.001			0.014	< 0.01	< 0.001	81	72				< 0.001	< 0.001		0.041				85		520

Well ID	Date	Arsenic, dissolved	Arsenic, total	Barium, total	Beryllium, total	Boron, dissolved	Boron, total	Cadmium, total	Calcium, total L	Chloride, total	Chromium, total	Cobalt, total	Fluoride, total	Lead, dissolved	Lead, total	Lithium, total	Manganese, dissolved	Mercury, total	Molybdenum, total	Selenium, total	Sulfate, total	Thallium, total	Total Dissolved Solids
G270	02/19/2014	< 0.001	< 0.001	0.041	< 0.001	< 0.01	< 0.01	< 0.001	67	56	< 0.004	< 0.002	0.279	< 0.001	< 0.001		0.0029	< 0.0002		0.0022	140	< 0.001	
G270	05/13/2014	< 0.001	0.0013			0.026	0.025	< 0.001	68	30				< 0.001	< 0.001		0.016				140		
G270	08/11/2014	< 0.001	0.0034			< 0.01	< 0.01	< 0.001	62	34				< 0.001	< 0.001		0.04				130		500
G270	10/14/2014	< 0.001	0.011			0.12	0.057	0.008	67	21				< 0.001	0.0073		0.04				140		500
G270	01/20/2015	< 0.001	< 0.001			0.011	< 0.01	< 0.001	70	18				< 0.001	< 0.001		0.011				140		500
G270	04/13/2015	< 0.002	< 0.001	0.05	< 0.001	0.025	0.047	< 0.001	70	20	< 0.004	< 0.002	0.334	< 0.002	< 0.001		0.0055	< 0.0002		0.0016	120	< 0.001	540
G270	07/22/2015	< 0.001	< 0.001	0.049	< 0.001	< 0.01	< 0.01	< 0.001		15	< 0.004	< 0.002	0.427	< 0.001	0.0018		0.47	< 0.0002	0.0011	< 0.001	110	< 0.001	550
G270	10/05/2015	< 0.001	< 0.001	0.037	< 0.001	0.013	< 0.01	< 0.001		11	< 0.004	< 0.002	0.411	< 0.001	< 0.001		0.056	< 0.0002	< 0.001	< 0.001	82	< 0.001	480
G270	11/20/2015		0.001	0.045	< 0.001		< 0.01	< 0.001	59	12	< 0.004	< 0.002	0.362		0.0015	< 0.01		< 0.0002	0.001	< 0.001	89	< 0.001	400
G270	02/10/2016	< 0.001	< 0.001	0.037	< 0.001	0.02	< 0.01	< 0.001	49	16	< 0.004	< 0.002	0.472	< 0.001	< 0.001	< 0.01	0.012	< 0.0002	< 0.001	0.0013	77	< 0.001	400
G270	05/12/2016	< 0.002	< 0.001	0.034	< 0.001	< 0.02	< 0.01	< 0.001	57	15	< 0.004	< 0.002	0.504	< 0.002	< 0.001	< 0.01	0.029	< 0.0002	< 0.001	< 0.001	77	< 0.001	370
G270	08/01/2016		< 0.001	0.037	< 0.001		< 0.01	< 0.001	50	15	< 0.004	< 0.002	0.397		< 0.001	< 0.01		< 0.0002	< 0.001	< 0.001	76	< 0.001	360
G271	09/22/2009		0.003	0.08	< 0.001		0.33	< 0.0005	110	37	0.0064	0.0023	0.46		0.0054			< 0.0002		0.0038	230	< 0.002	770
G271	11/09/2009		0.0049	0.11	< 0.001		0.33	< 0.0005	140	34	0.014	0.0047	0.41		0.011			< 0.0002		0.0034	290	< 0.002	770
G271	11/10/2009	< 0.001				0.34								< 0.0005			0.11						
G271	01/19/2010	< 0.001	0.001	0.055	< 0.001	0.18	0.24	< 0.0005	110	33	< 0.005	< 0.001	0.34	< 0.0005	0.0018		0.007	< 0.0002		0.0035	320	< 0.002	860
G271	03/08/2010	< 0.001	< 0.001	0.055	< 0.001	0.25	0.23	< 0.0005	120	36	< 0.005	< 0.001	0.39	0.00061	0.0023		< 0.0025	< 0.0002		0.0053	300	< 0.002	880
G271	05/27/2010	< 0.001	0.0016	0.053	< 0.001	0.26	0.16	< 0.001	130	40	0.0056	< 0.002	0.42	< 0.001	0.0029		0.028	< 0.0002		0.0051	330	< 0.001	870
G271	07/27/2010	< 0.001	< 0.001	0.041	< 0.001	0.24	0.15	< 0.001	120	40	< 0.004	< 0.002	0.34	< 0.001	< 0.001		0.016	< 0.0002		0.005	350	< 0.001	840
G271	09/20/2010	< 0.001				0.16								< 0.001			0.0015						
G271	11/16/2010	< 0.001	< 0.001			0.14	0.15	< 0.001	110	44				< 0.001	< 0.001		< 0.001				280		830
G271	01/28/2011	< 0.001	0.0015	0.05	< 0.001	0.17	0.14	< 0.001	110	44	< 0.004	< 0.002	0.48	< 0.001	0.0035		0.0013	< 0.0002		0.0079	270	< 0.001	730
G271	05/04/2011	< 0.001	< 0.001			0.16	0.11	< 0.001	100	53				< 0.001	< 0.001		< 0.001				240		750
G271	07/27/2011	< 0.001	< 0.001			0.13	0.17	< 0.001	96	49				< 0.001	< 0.001		< 0.001				240		800
G271	11/14/2011	< 0.001	0.0013			0.15	0.21	< 0.001	110	50				< 0.001	< 0.001		< 0.001				250		710
G271	01/26/2012	< 0.001	0.0013	0.034	< 0.001	0.19	0.18	< 0.001	110	44	< 0.004	< 0.002	0.393	< 0.001	< 0.001		< 0.001	< 0.0002		0.0099	240	< 0.001	750
G271	05/22/2012	< 0.001	< 0.001			0.16	0.14	< 0.001	110	5.1				< 0.001	< 0.001		< 0.001				240		710
G271	07/24/2012	< 0.001	< 0.001			0.18	0.13	< 0.001	110	45				< 0.001	< 0.001		< 0.001				280		770
G271	11/14/2012	< 0.001	0.0014			0.28	0.19	< 0.001	130	50				< 0.001	0.0012		0.0021				300		940
G271	01/31/2013	< 0.001	0.0031	0.063	< 0.001	0.32	0.32	< 0.001	150	58	0.0066	0.0026	0.458	< 0.001	0.005		0.024	< 0.0002		0.005	380	< 0.001	880
G271	05/20/2013	0.0013	< 0.001			0.17	0.19	< 0.001	120	47				< 0.001	< 0.001		< 0.001				350		790
G271	07/22/2013	< 0.001	< 0.001			0.16	0.15	< 0.001	99	49				< 0.001	< 0.001		< 0.001				360		800
G271	10/14/2013	< 0.001	< 0.001			0.3	0.18	< 0.001	120	47				< 0.001	< 0.001		< 0.001				390		840
G271	02/19/2014	< 0.001	0.0028	0.062	< 0.001	0.26	0.24	< 0.001	150	51	0.0087	0.0023	0.298	< 0.001	0.0056		< 0.001	< 0.0002		0.0045	420	< 0.001	
G271	05/13/2014	0.16	0.0017			0.45	0.33	< 0.001	140	47				0.15	0.0018		0.22				440		
G271	08/11/2014	< 0.001	0.0027			0.39	0.44	< 0.001	140	42				< 0.001	0.0061		< 0.001				500		1000
G271	10/14/2014	< 0.001	0.0019			0.44	0.5	< 0.001	150	45				< 0.001	0.0062		0.0021				480		940
G271	01/21/2015	< 0.001	< 0.001			0.42	0.51	< 0.001	120	39				< 0.001	0.0014		< 0.001				490		870
G271	04/10/2015	< 0.002	< 0.001	0.029	< 0.001	0.37	0.31	< 0.001	130	45	< 0.004	< 0.002	0.406	< 0.002	< 0.001		< 0.002	< 0.0002		0.0035	440	< 0.001	1000
G271	07/22/2015	< 0.001	< 0.001	0.028	< 0.001	0.32	0.24	< 0.001		35	< 0.004	< 0.002	0.406	0.0017	0.0036		0.001	< 0.0002	< 0.001	0.0026	350	< 0.001	1000
G271	10/08/2015	< 0.001	< 0.001	0.03	< 0.001	0.44	0.33	< 0.001		38	< 0.004	< 0.002	0.402	< 0.001	< 0.001		< 0.001	< 0.0002	0.0036	0.0035	400	< 0.001	1000
G271	11/23/2015		< 0.001	0.031	< 0.001		0.5	< 0.001	130	38	< 0.004	< 0.002	0.347		0.0012	< 0.01		< 0.0002	0.0012	0.0024	420	< 0.001	860
G271	02/16/2016	< 0.001	< 0.001	0.029	< 0.001	0.51	0.61	< 0.001	130	38	< 0.004	< 0.002	0.481	< 0.001	< 0.001	< 0.01	< 0.001	< 0.0002	< 0.001	0.0032	440	< 0.001	980
G271	05/12/2016	< 0.002	< 0.001	0.028	< 0.001	0.61	0.98	< 0.001	170	39	< 0.004	< 0.002	0.562	< 0.002	< 0.001	< 0.01	< 0.002	< 0.0002	< 0.001	0.0021	540	< 0.001	940
G271	08/05/2016		< 0.001	0.032	< 0.001		0.63	< 0.001	110	37	< 0.004	< 0.002	0.414		0.0027	< 0.01		< 0.0002	< 0.001	0.0022	440	< 0.001	840
G271	11/21/2016		< 0.001	0.031	< 0.001		0.4	< 0.001		29	< 0.004	< 0.002	0.484		< 0.001	< 0.01		< 0.0002	< 0.001	0.0029	400	< 0.001	910
G272	09/22/2009		0.0012	0.079	< 0.001		0.06	< 0.0005	84	53	< 0.005	0.0017	0.48		0.0039			< 0.0002		< 0.0025	120	< 0.002	570
G272	11/10/2009	< 0.001	< 0.001	0.073	< 0.001	0.057	< 0.05	< 0.0005	88	46	< 0.005	0.0012	0.5	< 0.0005	0.0025		0.056	< 0.0002		< 0.0025	130	< 0.002	610
G272	01/19/2010	< 0.001	< 0.001	0.068	< 0.001	< 0.05	0.051	< 0.0005	85	45	< 0.005	< 0.001	0.42	< 0.0005	0.002		0.006	< 0.0002		< 0.0025	160	< 0.002	610
G272	03/04/2010	< 0.001	< 0.001	0.061	< 0.001	< 0.05	0.05	< 0.0005	93	44	< 0.005	< 0.001	0.41	< 0.0005	0.00058		< 0.0025	< 0.0002		< 0.0025	160	< 0.002	630
G272	05/27/2010	< 0.001	< 0.001	0.062	< 0.001	< 0.01	< 0.01	< 0.001	92	46	0.0049	< 0.002	0.41	< 0.001	0.0011		0.0029	< 0.0002		0.0021	190	< 0.001	670
G272	07/27/2010	< 0.001	< 0.001	0.062	< 0.001	< 0.01	< 0.01	< 0.001	92	44	< 0.004	< 0.002	0.43	< 0.001	< 0.001		0.0019	< 0.0002		0.0039	210	< 0.001	690

Well ID	Date	Arsenic, dissolved	Arsenic, total	Barium, total	Beryllium, total	Boron, dissolved	Boron, total	Cadmium, total	Calcium, total L	Chloride, total	Chromium, total	Cobalt, total	Fluoride, total	Lead, dissolved	Lead, total	Lithium, total	Manganese, dissolved	Mercury, total	Molybdenum, total	Selenium, total	Sulfate, total	Thallium, total	Total Dissolved Solids
G272	09/20/2010	< 0.001				< 0.01								< 0.001			< 0.001						
G272	11/16/2010	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	84	42				< 0.001	< 0.001		< 0.001				200		670
G272	01/31/2011	< 0.001	< 0.001	0.07	< 0.001	< 0.01	0.013	< 0.001	98	43	< 0.004	< 0.002	0.48	< 0.001	< 0.001		< 0.001	< 0.0002		0.0042	230	< 0.001	660
G272	05/04/2011	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	92	42				< 0.001	< 0.001		< 0.001				210		690
G272	07/27/2011	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	99	< 100				< 0.001	< 0.001		< 0.001				250		740
G272	11/14/2011	< 0.001	< 0.001			< 0.01	0.01	< 0.001	98	41				< 0.001	< 0.001		< 0.001				230		670
G272	01/26/2012	< 0.001	0.001	0.068	< 0.001	< 0.01	< 0.01	< 0.001	98	43	< 0.004	< 0.002	0.459	< 0.001	< 0.001		< 0.001	< 0.0002		0.0021	240	< 0.001	660
G272	05/22/2012	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	82	42				< 0.001	< 0.001		< 0.001				190		750
G272	07/24/2012	< 0.001	< 0.001			0.032	< 0.01	< 0.001	100	43				< 0.001	< 0.001		< 0.001				220		710
G272	11/14/2012	< 0.001	0.0011			< 0.01	< 0.01	< 0.001	110	40				< 0.001	0.0011		0.0012				220		780
G272	01/31/2013	< 0.001	< 0.001	0.072	< 0.001	< 0.01	< 0.01	< 0.001	110	44	< 0.004	< 0.002	0.461	< 0.001	< 0.001		< 0.001	< 0.0002		0.0029	330	< 0.001	760
G272	05/20/2013	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	98	37				< 0.001	< 0.001		< 0.001				280		680
G272	07/22/2013	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	100	35				< 0.001	< 0.001		< 0.001				260		680
G272	10/14/2013	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	100	32				< 0.001	< 0.001		< 0.001				300		740
G272	02/19/2014	< 0.001	< 0.001	0.06	< 0.001	< 0.01	< 0.01	< 0.001	110	40	< 0.004	< 0.002	0.355	< 0.001	< 0.001		< 0.001	< 0.0002		< 0.001	340	< 0.001	
G272	05/13/2014	0.17	< 0.001			0.27	0.015	< 0.001	93	36				0.15	< 0.001		0.23				310		
G272	08/11/2014	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	110	34				< 0.001	0.0014		< 0.001				330		740
G272	10/14/2014	< 0.001	< 0.001			0.036	0.022	< 0.001	110	37				< 0.001	0.0026		< 0.001				310		840
G272	01/21/2015	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	99	31				< 0.001	0.0022		< 0.001				380		790
G272	04/10/2015	< 0.002	< 0.001	0.059	< 0.001	< 0.02	< 0.01	< 0.001	110	37	< 0.004	< 0.002	0.399	< 0.002	< 0.001		< 0.002	< 0.0002		0.0012	340	< 0.001	800
G272	07/23/2015	< 0.001	< 0.001	0.06	< 0.001	< 0.01	0.031	< 0.001		29	< 0.004	< 0.002	0.493	< 0.001	< 0.001		< 0.001	< 0.0002	< 0.001	< 0.001	270	< 0.001	840
G272	10/08/2015	< 0.001	< 0.001	0.058	< 0.001	< 0.01	0.046	< 0.001		33	< 0.004	< 0.002	0.361	< 0.001	< 0.001		< 0.001	< 0.0002	0.0024	0.0016	340	< 0.001	660
G272	02/09/2016	< 0.001	0.0013	0.099	< 0.001	< 0.01	< 0.01	< 0.001		29	0.011	0.0022	0.516	< 0.001	0.0049		0.0013	< 0.0002	0.0013	< 0.001	290	< 0.001	660
G272	05/12/2016	< 0.001	< 0.001	0.059	< 0.001	< 0.01	< 0.01	< 0.001		29	< 0.004	< 0.002	0.561	< 0.001	< 0.001		< 0.001	< 0.0002	< 0.001	< 0.001	310	< 0.001	680
G273	09/23/2009		< 0.001	0.094	< 0.001		< 0.05	< 0.0005	120	35	< 0.005	< 0.001	0.38		< 0.0005			< 0.0002		< 0.0025	340	< 0.002	890
G273	11/10/2009	< 0.001	< 0.001	0.09	< 0.001	< 0.05	0.051	< 0.0005	140	28	< 0.005	< 0.001	0.33	< 0.0005	0.00093		0.097	< 0.0002		< 0.0025	400	< 0.002	980
G273	01/21/2010	< 0.001	< 0.001	0.085	< 0.001	0.054	< 0.05	< 0.0005	150	30	< 0.005	< 0.001	0.29	< 0.0005	< 0.0005		0.063	< 0.0002		< 0.0025	560	< 0.002	1200
G273	03/04/2010	< 0.001	< 0.001	0.079	< 0.001	< 0.05	< 0.05	< 0.0005	190	25	< 0.005	< 0.001	0.26	< 0.0005	< 0.0005		0.055	< 0.0002		< 0.0025	570	< 0.002	1300
G273	05/27/2010	< 0.001	0.0011	0.055	< 0.001	0.019	0.016	< 0.001	180	31	0.034	< 0.002	0.33	< 0.001	< 0.001		0.041	< 0.0002		0.0016	620	< 0.001	1300
G273	07/27/2010	< 0.001	< 0.001	0.048	< 0.001	0.023	0.023	< 0.001	160	30	< 0.004	< 0.002	0.37	< 0.001	< 0.001		0.048	< 0.0002		< 0.001	490	< 0.001	1100
G273	09/20/2010	< 0.001				0.024								< 0.001			0.052						
G273	11/16/2010	< 0.001	< 0.001			0.035	0.039	< 0.001	130	27				< 0.001	< 0.001		0.058				420		960
G273	01/31/2011	< 0.001	0.001	0.05	< 0.001	0.16	0.21	< 0.001	170	33	< 0.004	< 0.002	0.38	< 0.001	< 0.001		0.047	< 0.0002		< 0.001	520	< 0.001	1100
G273	05/03/2011	< 0.001	< 0.001			0.16	0.14	< 0.001	160	59				< 0.001	< 0.001		0.042				640		1200
G273	07/27/2011	< 0.001	< 0.001			0.097	0.12	< 0.001	150	29				< 0.001	< 0.001		0.029				510		1100
G273	11/14/2011	< 0.001	0.0013			0.13	0.15	< 0.001	150	29				< 0.001	< 0.001		0.041				510		990
G273	01/26/2012	< 0.001	0.001	0.043	< 0.001	0.27	0.26	< 0.001	180	27	< 0.004	< 0.002	0.359	< 0.001	< 0.001		0.033	< 0.0002		0.0012	750	< 0.001	1300
G273	05/22/2012	< 0.001	< 0.001			0.21	0.2	< 0.001	160	27				< 0.001	< 0.001		0.028				470		1100
G273	07/24/2012	< 0.001	< 0.001			0.12	0.094	< 0.001	140	32				< 0.001	< 0.001		0.022				360		910
G273	11/14/2012	0.0016	0.0034			0.27	0.2	< 0.001	160	33				< 0.001	0.0037		0.026				630		1100
G273	01/31/2013	< 0.001	< 0.001	0.046	< 0.001	0.48	0.46	< 0.001	180	37	< 0.004	< 0.002	0.33	< 0.001	< 0.001		0.03	< 0.0002		< 0.002	740	< 0.001	1300
G273	05/20/2013	0.0014	< 0.001			0.18	0.29	< 0.001	180	4				< 0.001	< 0.001		0.013				670		1100
G273	07/22/2013	< 0.001	< 0.001			0.21	0.25	< 0.001	160	35				< 0.001	< 0.001		0.022				510		980
G273	10/14/2013	< 0.001	< 0.001			0.18	0.18	< 0.001	140	37				< 0.001	< 0.001		0.015				450		900
G273	02/19/2014	< 0.001	< 0.001	0.039	< 0.001	0.52	0.36	< 0.001	150	38	< 0.004	< 0.002	0.286	< 0.001	< 0.001		0.015	< 0.0002		< 0.001	570	< 0.001	
G273	05/13/2014	0.24	< 0.001			0.62	0.35	< 0.001	160	47				0.22	< 0.001		0.33				620		
G273	08/11/2014	< 0.001	< 0.001			0.25	0.26	< 0.001	140	37				< 0.001	< 0.001		0.01				530		1000
G273	10/14/2014	< 0.001	0.0011			0.32	0.29	< 0.001	150	37				< 0.001	0.0011		0.013				500		1100
G273	01/21/2015	< 0.001	< 0.001			0.58	0.45	< 0.001	150	46				< 0.001	< 0.001		0.018				650		1200
G273	04/13/2015	< 0.002	< 0.001	0.028	< 0.001	0.29	0.48	< 0.001	200	41	< 0.004	< 0.002	0.32	< 0.002	< 0.001		0.019	< 0.0002		< 0.001	690	< 0.001	1300
G273	07/23/2015	< 0.001	< 0.001	0.044	< 0.001	0.4	0.12	< 0.001		39	< 0.004	< 0.002	0.382	< 0.001	< 0.001		0.0011	< 0.0002	< 0.001	< 0.001	390	< 0.001	1200
G273	10/08/2015	< 0.001	< 0.001	0.039	< 0.001	0.1	0.15	< 0.001		46	< 0.004	< 0.002	< 0.25	< 0.001	< 0.001		0.014	< 0.0002	0.0019	< 0.001	450	< 0.001	930
G273	11/24/2015		< 0.001	0.049	< 0.001		0.2	< 0.001	140	41	< 0.004	< 0.002	< 0.25		0.0011	< 0.01		< 0.0002	< 0.001	< 0.001	420	< 0.001	890

Well ID	Date	Arsenic, dissolved	Arsenic, total	Barium, total	Beryllium, total	Boron, dissolved	Boron, total	Cadmium, total	Calcium, total L	Chloride, total	Chromium, total	Cobalt, total	Fluoride, total	Lead, dissolved	Lead, total	Lithium, total	Manganese, dissolved	Mercury, total	Molybdenum, total	Selenium, total	Sulfate, total	Thallium, total	Total Dissolved Solids
G273	02/16/2016	< 0.001	< 0.001	0.043	< 0.001	0.43	0.42	< 0.001	150	45	< 0.004	< 0.002	0.401	< 0.001	< 0.001	< 0.01	0.01	< 0.0002	< 0.001	< 0.001	550	< 0.001	1200
G273	05/12/2016	< 0.001	< 0.001	0.031	< 0.001	0.31	0.29	< 0.001	170	44	< 0.004	< 0.002	0.537	< 0.001	< 0.001	< 0.01	0.012	< 0.0002	< 0.001	< 0.001	520	< 0.001	980
G273	08/05/2016		< 0.001	0.032	< 0.001		0.17	< 0.001	120	46	< 0.004	< 0.002	0.294		< 0.001	< 0.01		< 0.0002	< 0.001	< 0.001	400	< 0.001	840
G273	11/21/2016		< 0.001	0.036	< 0.001		0.15	< 0.001		48	< 0.004	< 0.002	0.39		< 0.001	< 0.01		< 0.0002	< 0.001	< 0.001	440	< 0.001	900
G274	09/24/2009		0.0024	0.12	< 0.001		0.053	< 0.0005	100	55	0.0059	0.0028	0.34		0.0091			< 0.0002		< 0.0025	230	< 0.002	830
G274	11/11/2009	< 0.001	< 0.001	0.092	< 0.001	0.057	< 0.05	< 0.0005	100	54	< 0.005	< 0.001	0.35	< 0.0005	0.0012		0.007	< 0.0002		< 0.0025	250	< 0.002	820
G274	01/27/2010	< 0.001	< 0.001	0.09	< 0.001	< 0.05	< 0.05	< 0.0005	100	50	< 0.005	< 0.001	0.32	< 0.0005	< 0.0005		0.0039	< 0.0002		< 0.0025	260	< 0.002	850
G274	03/08/2010	< 0.001	< 0.001	0.091	< 0.001	< 0.05	< 0.05	< 0.0005	110	49	< 0.005	< 0.001	0.32	< 0.0005	< 0.0005		0.0056	< 0.0002		< 0.0025	270	< 0.002	870
G274	05/27/2010	< 0.001	< 0.001	0.09	< 0.001	< 0.01	< 0.01	< 0.001	110	45	< 0.004	< 0.002	0.32	< 0.001	0.0015		< 0.001	< 0.0002		0.0022	300	< 0.001	910
G274	07/27/2010	< 0.001	< 0.001	0.08	< 0.001	< 0.01	< 0.01	< 0.001	110	44	< 0.004	< 0.002	0.35	< 0.001	< 0.001		< 0.001	< 0.0002		< 0.001	320	< 0.001	900
G274	09/20/2010	< 0.001				< 0.01								< 0.001			< 0.001						
G274	11/16/2010	< 0.001	< 0.001			< 0.01	0.012	< 0.001	120	38				< 0.001	< 0.001		< 0.001				360		940
G274	01/31/2011	< 0.001	0.0023	0.077	0.0018	< 0.01	0.012	0.0014	110	39	< 0.004	< 0.002	0.36	< 0.001	0.0018		< 0.001	< 0.0002		< 0.001	370	0.0013	950
G274	05/03/2011	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	120	36				< 0.001	< 0.001		< 0.001				400		980
G274	07/27/2011	< 0.001	< 0.001			0.013	< 0.01	< 0.001	120	37				< 0.001	< 0.001		< 0.001				370		980
G274	11/14/2011	< 0.001	< 0.001			0.035	0.039	< 0.001	120	37				< 0.001	< 0.001		< 0.001				370		900
G274	01/26/2012	< 0.001	< 0.001	0.068	< 0.001	0.076	0.052	< 0.001	110	34	< 0.004	< 0.002	0.379	< 0.001	< 0.001		0.001	< 0.0002		0.0014	370	< 0.001	880
G274	05/22/2012	< 0.001	< 0.001			0.12	0.11	< 0.001	120	36				< 0.001	< 0.001		< 0.001				330		920
G274	07/24/2012	< 0.001	< 0.001			0.15	0.13	< 0.001	120	40				< 0.001	< 0.001		< 0.001				300		880
G274	11/14/2012	< 0.001	0.0022			0.18	0.16	< 0.001	120	37				< 0.001	0.0031		< 0.001				420		910
G274	01/31/2013	< 0.001	< 0.001	0.059	< 0.001	0.26	0.25	< 0.001	130	36	< 0.004	< 0.002	0.382	< 0.001	< 0.001		< 0.001	< 0.0002		0.0015	460	< 0.001	870
G274	05/20/2013	0.001	< 0.001			0.25	0.27	< 0.001	120	3.6				< 0.001	< 0.001		0.0073				350		800
G274	07/22/2013	< 0.001	< 0.001			0.31	0.31	< 0.001	110	32				< 0.001	0.0015		< 0.001				330		820
G274	10/14/2013	< 0.001	< 0.001			0.52	0.46	< 0.001	110	31				< 0.001	< 0.001		< 0.001				380		840
G274	02/19/2014	< 0.001	< 0.001	0.063	< 0.001	0.79	0.47	< 0.001	110	32	< 0.004	< 0.002	0.262	< 0.001	< 0.001		< 0.001	< 0.0002		< 0.001	300	< 0.001	
G274	05/13/2014	0.0055	< 0.001			0.52	0.52	< 0.001	98	27				0.0034	< 0.001		0.0059				370		
G274	08/11/2014	< 0.001	< 0.001			0.57	0.61	< 0.001	120	25				< 0.001	< 0.001		< 0.001				400		880
G274	10/14/2014	< 0.001	0.004			0.62	0.55	< 0.001	100	23				< 0.001	0.01		< 0.001				320		770
G274	01/21/2015	< 0.001	0.0011			0.68	0.5	< 0.001	110	19				< 0.001	0.0029		0.0036				260		770
G274	04/13/2015	< 0.002	< 0.001	0.052	< 0.001	0.57	0.53	< 0.001	110	24	< 0.004	< 0.002	0.341	< 0.002	< 0.001		< 0.002	< 0.0002		< 0.001	390	< 0.001	770
G274	07/23/2015	< 0.001	< 0.001	0.068	< 0.001	0.48	0.49	< 0.001		24	< 0.004	< 0.002	0.403	< 0.001	0.0018		0.0015	< 0.0002	< 0.001	0.0014	320	< 0.001	890
G274	10/08/2015	< 0.001	< 0.001	0.061	< 0.001	0.43	0.74	< 0.001		22	< 0.004	< 0.002	0.265	< 0.001	< 0.001		< 0.001	< 0.0002	0.0012	< 0.001	320	< 0.001	770
G274	02/09/2016	< 0.001	< 0.001	0.07	< 0.001	0.87	0.65	< 0.001		22	< 0.004	< 0.002	0.455	< 0.001	0.001		< 0.001	< 0.0002	< 0.001	< 0.001	290	< 0.001	820
G274	05/12/2016	< 0.001	< 0.001	0.057	< 0.001	0.97	0.63	< 0.001		22	< 0.004	< 0.002	0.417	< 0.001	< 0.001		0.046	< 0.0002	< 0.001	< 0.001	350	< 0.001	770
G275	09/22/2009		< 0.005	0.12	< 0.001		4.5	< 0.0005	300	14	< 0.025	< 0.005	0.22		0.01			< 0.0002		< 0.012	990	< 0.002	2000
G275	11/11/2009	< 0.001	< 0.001	0.032	< 0.001	2.4	2.5	< 0.0005	140	12	< 0.005	< 0.001	0.32	< 0.0005	< 0.0005		0.032	< 0.0002		< 0.0025	350	< 0.002	910
G275	01/21/2010	< 0.001	< 0.001	0.032	< 0.001	1.2	1.2	< 0.0005	120	13	< 0.005	< 0.001	0.32	< 0.0005	< 0.0005		0.023	< 0.0002		< 0.0025	390	< 0.002	870
G275	03/08/2010	< 0.001	< 0.001	0.035	< 0.001	1.3	1.3	< 0.0005	160	23	< 0.005	< 0.001	0.27	< 0.0005	0.00053		0.029	< 0.0002		< 0.0025	460	< 0.002	1100
G275	05/28/2010	< 0.001	0.0016	0.047	< 0.001	2.9	2.9	< 0.001	180	18	0.0087	< 0.002	0.33	< 0.001	0.0017		0.018	< 0.0002		0.0014	540	< 0.001	1200
G275	07/26/2010	< 0.001	< 0.001	0.038	< 0.001	2.9	2.8	< 0.001	180	9.9	< 0.004	< 0.002	0.4	< 0.001	< 0.001		0.019	< 0.0002		< 0.001	550	< 0.001	1200
G275	09/20/2010	< 0.001				2.6								< 0.001			0.026						
G275	11/16/2010	< 0.001	0.0028			3.7	4.1	< 0.001	260	9.7				< 0.001	0.0045		0.16				970		1700
G275	01/31/2011	< 0.001	0.0015	0.046	< 0.001	3.6	3.6	< 0.001	230	11	< 0.004	< 0.002	0.34	< 0.001	< 0.001		0.016	< 0.0002		< 0.001	840	< 0.001	1500
G275	05/03/2011	< 0.001	< 0.001			3.6	3.8	< 0.001	240	13				< 0.001	< 0.001		0.04				790		1600
G275	07/27/2011	< 0.001	< 0.001			4.3	4.2	< 0.001	200	9.2				< 0.001	< 0.001		0.03				720		1300
G275	11/14/2011	0.0015	0.0041			4.3	4.4	< 0.001	260	17				< 0.001	0.0059		0.09				820		1500
G275	01/31/2012	< 0.001	0.0011	0.039	< 0.001	3.8	3.6	< 0.001	310	15	0.0047	< 0.002	0.281	< 0.001	< 0.001		0.0081	< 0.0002		0.0015	370	< 0.001	1300
G275	05/22/2012	< 0.001	0.0017			3.7	3.4	< 0.001	240	11				< 0.001	0.0015		0.01				670		1500
G275	07/24/2012	< 0.001	0.0018			4.6	4.2	< 0.001	260	13				< 0.001	0.0024		0.09				900		1600
G275	11/14/2012	< 0.001	0.0025			3.7	3.9	< 0.001	270	19				< 0.001	0.0037		0.28				950		1600
G275	05/20/2013	0.0013	0.0025			3.4	3.8	< 0.001	250	24				< 0.001	0.0015		< 0.001				840		1400
G275	07/22/2013	< 0.001	< 0.001			3.5	3.1	< 0.001	210	19				< 0.001	0.0013		0.0017				700		1400
G275	05/13/2014	0.25	0.0019			2.8	3.4	< 0.001	210	20				0.2	0.0037		0.34				750		

Well ID	Date	Arsenic, dissolved	Arsenic, total	Barium, total	Beryllium, total	Boron, dissolved	Boron, total	Cadmium, total	Calcium, total L	Chloride, total	Chromium, total	Cobalt, total	Fluoride, total	Lead, dissolved	Lead, total	Lithium, total	Manganese, dissolved	Mercury, total	Molybdenum, total	Selenium, total	Sulfate, total	Thallium, total	Total Dissolved Solids
G275	08/11/2014	< 0.001	0.0043			4.2	4.1	< 0.001	240	20				< 0.001	0.0078		< 0.001				880		1500
G275	10/14/2014	< 0.001	0.0011			1.9	3.5	< 0.001	200	16				< 0.001	0.0012		0.003				500		840
G275	01/21/2015	< 0.001	0.0043			4.6	4.6	< 0.001	230	20				< 0.001	0.0079		0.025				940		1500
G275	04/13/2015	< 0.002	< 0.001	0.056	< 0.001	0.91	1.8	< 0.001	180	22	< 0.004	< 0.002	< 0.25	< 0.002	< 0.001		0.0024	< 0.0002		0.0012	650	< 0.001	1500
G275	07/23/2015	< 0.001	< 0.001	0.035	< 0.001	3	4	< 0.001		30	< 0.004	< 0.002	0.307	< 0.001	0.001		0.012	< 0.0002	0.0014	0.0014	750	< 0.001	1500
G275	02/09/2016	< 0.001	< 0.001	0.042	< 0.001	4	2.3	< 0.001		26	< 0.004	< 0.002	0.349	0.0044	0.0016		0.0064	< 0.0002	< 0.001	< 0.001	470	< 0.001	1500
G275	05/12/2016	< 0.001	< 0.001	0.039	< 0.001	2.5	2.4	< 0.001		14	< 0.004	< 0.002	0.452	< 0.001	< 0.001		0.0036	< 0.0002	< 0.001	< 0.001	310	< 0.001	1300
G276	09/23/2009		< 0.005	0.16	0.0026		0.087	< 0.0025	94	38	< 0.025	< 0.005	0.75		0.035			< 0.0002		< 0.012	170	< 0.002	620
G276	11/11/2009	< 0.001	< 0.001	0.079	< 0.001	0.057	0.062	< 0.0005	91	40	0.0059	< 0.001	0.57	< 0.0005	0.0037		0.03	< 0.0002		< 0.0025	170	< 0.002	670
G276	01/21/2010	< 0.001	< 0.001	0.075	< 0.001	0.057	0.052	< 0.0005	91	36	< 0.005	< 0.001	0.53	< 0.0005	0.00079		0.0093	< 0.0002		< 0.0025	190	< 0.002	660
G276	03/09/2010									38			0.51								180		650
G276	03/10/2010	< 0.001	< 0.001	0.083	< 0.001	0.057	0.058	< 0.0005	110		< 0.005	< 0.001		< 0.0005	0.0016		0.01	< 0.0002		< 0.0025		< 0.002	
G276	05/28/2010	< 0.001	< 0.001	0.067	< 0.001	0.035	0.033	< 0.001	100	40	0.0051	< 0.002	0.49	< 0.001	< 0.001		0.012	< 0.0002		0.0014	190	< 0.001	720
G276	07/26/2010	< 0.001	< 0.001	0.063	< 0.001	0.023	0.022	< 0.001	93	40	< 0.004	< 0.002	0.54	< 0.001	< 0.001		0.0054	< 0.0002		< 0.001	230	< 0.001	710
G276	09/20/2010	< 0.001				0.024								< 0.001			0.005						
G276	11/16/2010	< 0.001	< 0.001			0.013	0.044	< 0.001	96	35				< 0.001	< 0.001		0.0018				200		670
G276	01/31/2011	< 0.001	0.0026	0.078	< 0.001	0.036	0.052	< 0.001	96	36	< 0.004	< 0.002	0.53	< 0.001	0.001		0.0041	< 0.0002		< 0.001	200	< 0.001	710
G276	05/03/2011	< 0.001	< 0.001			0.043	0.039	< 0.001	95	36				< 0.001	< 0.001		0.0016				200		650
G276	07/27/2011	< 0.001	< 0.001			0.011	< 0.01	< 0.001	96	37				< 0.001	< 0.001		0.001				170		670
G276	11/14/2011	< 0.001	0.0013			0.081	0.08	< 0.001	94	35				< 0.001	< 0.001		< 0.001				180		620
G276	01/31/2012	< 0.001	< 0.001	0.075	< 0.001	< 0.01	0.06	< 0.001	130	32	0.0052	< 0.002	0.501	< 0.001	< 0.001		< 0.001	< 0.0002		0.0022	190	< 0.001	650
G276	05/22/2012	< 0.001	0.0011			0.066	0.073	< 0.001	97	38				< 0.001	< 0.001		0.0014				160		660
G276	07/24/2012	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	100	38				< 0.001	< 0.001		< 0.001				190		680
G276	11/14/2012	< 0.001	0.0015			0.012	0.083	< 0.001	100	36				< 0.001	< 0.001		< 0.001				190		680
G276	01/31/2013	< 0.001	< 0.001	0.081	< 0.001	0.014	0.023	< 0.001	110	35	< 0.004	< 0.002	0.51	< 0.001	0.0011		< 0.001	< 0.0002		0.0031	250	< 0.001	680
G276	05/20/2013	< 0.001	< 0.001			0.036	0.031	< 0.001	99	3.8				< 0.001	< 0.001		< 0.001				180		640
G276	07/22/2013	< 0.001	< 0.001			0.022	< 0.01	< 0.001	100	32				< 0.001	< 0.001		< 0.001				220		670
G276	05/13/2014	< 0.001	0.0013			< 0.01	0.021	< 0.001	130	31				< 0.001	< 0.001		< 0.001				230		
G276	08/12/2014	< 0.001	0.0013			0.018	0.027	< 0.001	120	29				< 0.001	0.006		< 0.001				220		640
G276	10/14/2014	< 0.001	< 0.001			0.028	0.019	< 0.001	100	28				< 0.001	0.0024		< 0.001				220		700
G276	01/21/2015	< 0.001	< 0.001			0.015	0.021	< 0.001	100	30				< 0.001	< 0.001		< 0.001				260		700
G276	04/13/2015	< 0.002	0.0057	0.34	0.0016	< 0.02	0.036	< 0.001	170	34	0.043	0.0047	0.486	< 0.002	0.022		< 0.002	< 0.0002		0.0034	310	< 0.001	780
G276	07/23/2015	< 0.001	< 0.001	0.096	< 0.001	0.037	0.015	< 0.001		26	< 0.004	< 0.002	0.377	< 0.001	0.0012		< 0.001	< 0.0002	0.0012	0.001	180	< 0.001	800
G276	11/24/2015		< 0.001	0.077	< 0.001		0.043	< 0.001	120	28	< 0.004	< 0.002	0.345		< 0.001	0.013		< 0.0002	0.0017	< 0.001	190	< 0.001	710
G276	02/16/2016		< 0.001	0.09	< 0.001		0.021	< 0.001	120	23	< 0.004	< 0.002	0.456		0.0014	0.015		< 0.0002	0.0013	0.0018	230	< 0.001	760
G276	02/17/2016	< 0.001	< 0.001	0.089	< 0.001	0.027	0.029	< 0.001		28	< 0.004	< 0.002	0.456	< 0.001	< 0.001		< 0.001	< 0.0002	< 0.001	< 0.001	230	< 0.001	700
G276	05/12/2016	< 0.001	< 0.001	0.079	< 0.001	0.013	< 0.01	< 0.001	130	22	< 0.004	< 0.002	0.549	< 0.001	< 0.001	0.012	< 0.001	< 0.0002	< 0.001	0.0017	240	< 0.001	720
G276	08/03/2016		< 0.001	0.085	< 0.001		0.019	< 0.001	110	23	< 0.004	< 0.002	0.443		< 0.001	< 0.01		< 0.0002	< 0.001	0.0017	1900	< 0.001	680
G276	11/21/2016		< 0.001	0.081	< 0.001		< 0.01	< 0.001		23	< 0.004	< 0.002	0.445		< 0.001	0.011		< 0.0002	< 0.001	0.002	210	< 0.001	720
G277	09/23/2009		0.027	0.61	0.0027		0.11	< 0.0025	190	41	0.052	0.04	0.79		0.072			0.00023		< 0.012	79	< 0.002	
G277	09/24/2009																						430
G277	11/11/2009	0.021	0.02	0.22	0.0011	< 0.05	0.074	< 0.0005	110	43	0.037	0.017	0.47	0.028	0.029		1.6	< 0.0002		< 0.0025	49	< 0.002	680
G277	01/19/2010	< 0.001	0.0019	0.093	< 0.001	< 0.05	0.062	< 0.0005	92	39	0.0094	0.0019	0.41	< 0.0005	0.0037		0.02	< 0.0002		< 0.0025	63	< 0.002	
G277	01/20/2010																						550
G277	03/08/2010		< 0.001	0.075	< 0.001		0.065	< 0.0005	93	43	< 0.005	< 0.001	0.4		0.00092			< 0.0002		< 0.0025	49	< 0.002	540
G277	03/09/2010	< 0.001				0.073								< 0.0005			0.0037						
G277	05/28/2010	< 0.001	0.0023	0.092	< 0.001	0.02	0.021	< 0.001	100	46	0.033	< 0.002	0.4	< 0.001	0.0031		0.0011	< 0.0002		0.0032	58	< 0.001	580
G277	07/26/2010	< 0.001	0.0018	0.085	< 0.001	0.015	0.019	< 0.001	85	46	0.0092	< 0.002	0.42	< 0.001	0.0029		0.003	< 0.0002		0.0021	58	< 0.001	790
G277	09/20/2010	< 0.001				0.012								< 0.001			0.0055						
G277	11/16/2010	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	86					< 0.001	< 0.001		0.0021						
G277	01/31/2011	< 0.001	0.0015	0.085	< 0.001	0.016	0.025	< 0.001	97	40	< 0.004	< 0.002	0.38	< 0.001	0.0024		0.0031	< 0.0002		0.003	52	< 0.001	610
G277	05/03/2011	< 0.001	< 0.001			0.02	0.02	< 0.001	100	42				< 0.001	< 0.001		< 0.001				56		600
G277	07/27/2011	< 0.001	< 0.001			0.012	< 0.01	< 0.001	110	49				< 0.001	< 0.001		< 0.001				61		650

Well ID	Date	Arsenic, dissolved	Arsenic, total	Barium, total	Beryllium, total	Boron, dissolved	Boron, total	Cadmium, total	Calcium, total L	Chloride, total	Chromium, total	Cobalt, total	Fluoride, total	Lead, dissolved	Lead, total	Lithium, total	Manganese, dissolved	Mercury, total	Molybdenum, total	Selenium, total	Sulfate, total	Thallium, total	Total Dissolved Solids
G277	11/14/2011	< 0.001	0.0039			0.031	0.044	< 0.001	110	36				< 0.001	0.0056		0.0054				51		580
G277	01/31/2012		0.003	0.12	< 0.001		0.027	< 0.001	160	37	0.012	0.0022	0.326		0.0035			< 0.0002		0.0014	45	< 0.001	
G277	05/22/2012	< 0.001	< 0.001			0.021	0.026	< 0.001	110	30				< 0.001	< 0.001		0.0052				49		580
G277	07/24/2012									34											52		580
G277	07/25/2012	< 0.001	0.0011			< 0.01	< 0.01	< 0.001	110					< 0.001	0.0011		0.013						
G277	11/14/2012		0.001				< 0.01	< 0.001	120	11					0.0012						42		
G277	05/20/2013	< 0.001	< 0.001			0.022	0.018	< 0.001	110	3.3				< 0.001	< 0.001		< 0.001				5.7		520
G277	07/22/2013	< 0.001	< 0.001			0.02	0.021	< 0.001	93	18				< 0.001	< 0.001		< 0.001				45		500
G277	05/13/2014	< 0.001	0.0021			0.012	0.053	< 0.001	130	30				< 0.001	0.0019		< 0.001				60		
G277	10/15/2014		0.0023				0.024	< 0.001	84	3.6					0.0033						18		
G277	10/16/2014	< 0.001				0.032								< 0.001			0.003						360
G277	05/12/2016	< 0.001	0.0011	0.09	< 0.001	0.047	0.025	< 0.001		1.2	< 0.004	< 0.002	0.495	< 0.001	0.0013		0.0017	< 0.0002	0.001	< 0.001	15	< 0.001	460
G278	05/26/2010		0.0011	0.078	< 0.001		0.026	< 0.001	93	82	0.016	< 0.002	0.41		< 0.001			< 0.0002		0.0058	87	< 0.001	640
G278	05/28/2010	< 0.001				0.012								< 0.001			0.052						
G278	03/23/2011	< 0.001	0.0026	0.069	< 0.001	0.014	0.014	< 0.001	90	55	0.0063	< 0.002	0.55	< 0.001	0.0025		0.1	< 0.0002		0.0019	91	< 0.001	630
G278	05/03/2011	< 0.001	0.0056	0.15	< 0.001	< 0.01	0.026	< 0.001	97	60	0.022	0.0055	0.43	< 0.001	0.013		0.027	< 0.0002		0.0032	110	< 0.001	670
G278	07/25/2011	< 0.001	0.016	0.34	0.0018	< 0.01	0.023	< 0.001	170	62	0.034	0.018	0.42	< 0.001	0.033		0.032	< 0.0002		0.0029	100	< 0.001	690
G278	09/19/2011	< 0.001	0.0018	0.086	< 0.001	0.093	0.023	< 0.001	100	85	0.048	< 0.002	0.51	< 0.001	0.0031		0.04	< 0.0002		0.012	120	< 0.001	640
G278	05/22/2012	< 0.001	0.0032	0.098	< 0.001	0.017	0.017	< 0.001	110	82	0.007	0.0028	0.359	< 0.001	0.0059		0.46	< 0.0002		0.0025	120	< 0.001	730
G278	02/09/2016	< 0.001	0.004	0.11	< 0.001	0.54	0.54	< 0.001		310	0.0092	0.0034	0.336	< 0.001	0.008		0.14	< 0.0002	0.0014	0.041	680	< 0.001	1800
G278	05/13/2016	< 0.001	0.0067	0.19	< 0.001	0.5	0.2	< 0.001		180	0.017	0.0066	0.441	< 0.001	0.015		0.39	< 0.0002	0.0026	0.014	450	< 0.001	1500
G279	09/23/2009		0.0064	0.095	< 0.001		0.062	< 0.0005	90	59	0.01	0.0059	0.5		0.0092			< 0.0002		< 0.0025	99	< 0.002	620
G279	11/09/2009	< 0.001	< 0.001	0.065	< 0.001	0.062	0.056	< 0.0005	81	50	< 0.005	< 0.001	0.5	< 0.0005	0.00068		0.26	< 0.0002		< 0.0025	92	< 0.002	620
G279	01/27/2010	< 0.001	< 0.001	0.067	< 0.001	< 0.05	0.057	< 0.0005	80	54	< 0.005	< 0.001	0.43	< 0.0005	0.0013		0.094	< 0.0002		< 0.0025	88	< 0.002	630
G279	03/04/2010	< 0.001	< 0.001	0.065	< 0.001	< 0.05	< 0.05	< 0.0005	85	57	< 0.005	< 0.001	0.42	< 0.0005	0.00068		0.059	< 0.0002		< 0.0025	83	< 0.002	610
G279	05/26/2010	< 0.001	< 0.001	0.068	< 0.001	< 0.01	0.01	< 0.001	89	69	0.011	< 0.002	0.42	< 0.001	< 0.001		0.022	< 0.0002		0.005	100	< 0.001	680
G279	07/26/2010	< 0.001	< 0.001	0.062	< 0.001	< 0.01	< 0.01	< 0.001	91	64	< 0.004	< 0.002	0.43	< 0.001	< 0.001		0.019	< 0.0002		0.0015	88	< 0.001	670
G279	09/20/2010	< 0.001				< 0.01								< 0.001			0.014						
G279	11/16/2010	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	89	52				< 0.001	< 0.001		0.0088				96		600
G279	01/28/2011	< 0.001	0.0026	0.098	< 0.001	< 0.01	0.016	< 0.001	100	50	< 0.004	0.0029	0.44	< 0.001	0.0052		0.014	< 0.0002		0.0038	93	< 0.001	600
G279	05/04/2011	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	130	49				< 0.001	< 0.001		0.0033				100		630
G279	07/27/2011	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	83	51				< 0.001	< 0.001		0.0071				95		600
G279	11/14/2011	< 0.001	< 0.001			0.017	0.019	< 0.001	84	53				< 0.001	< 0.001		0.0035				95		580
G279	01/30/2012	< 0.001	< 0.001	0.05	< 0.001	< 0.01	< 0.01	< 0.001	120	51	< 0.004	< 0.002	0.54	< 0.001	< 0.001		0.0049	< 0.0002		0.0041	160	< 0.001	630
G279	05/22/2012	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	69	54				< 0.001	< 0.001		0.042				96		590
G279	07/24/2012	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	98	71				< 0.001	< 0.001		0.002				130		660
G279	11/14/2012	0.0019	0.0018			< 0.01	< 0.01	< 0.001	97	62				< 0.001	0.001		0.019				140		750
G279	01/31/2013	0.0014	< 0.001	0.06	< 0.001	< 0.01	< 0.01	< 0.001	120	60	< 0.004	< 0.002	0.418	< 0.001	< 0.001		0.0019	< 0.0002		0.0034	390	< 0.001	1200
G279	05/20/2013	< 0.001	0.0012			0.01	0.011	< 0.001	87	56				< 0.001	< 0.001		0.0011				180		600
G279	07/22/2013	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	88	55				< 0.001	< 0.001		0.0078				140		560
G279	10/14/2013	< 0.001	< 0.001			0.015	0.011	< 0.001	97	55				< 0.001	< 0.001		0.078				120		640
G279	02/19/2014	< 0.001	< 0.001	0.058	< 0.001	0.022	0.015	< 0.001	86	54	< 0.004	< 0.002	0.331	< 0.001	< 0.001		0.029	< 0.0002		< 0.001	110	< 0.001	
G279	05/13/2014	0.017	< 0.001			0.038	0.016	< 0.001	94	50				0.022	< 0.001		0.034				110		
G279	08/12/2014	< 0.001	< 0.001			0.015	0.11	< 0.001	97	56				< 0.001	< 0.001		0.024				120		600
G279	10/14/2014	< 0.001	< 0.001			0.025	0.012	< 0.001	92	63				< 0.001	< 0.001		0.026				140		650
G279	01/21/2015	< 0.001	< 0.001			0.032	0.031	< 0.001	100	74				< 0.001	< 0.001		0.017				230		810
G279	04/13/2015	< 0.002	0.0013	0.029	< 0.001	0.047	0.016	< 0.001	170	46	< 0.004	< 0.002	0.518	< 0.002	< 0.001		0.0033	0.00024		0.0056	470	< 0.001	800
G279	07/23/2015	< 0.001	0.002	0.11	< 0.001	0.031	0.065	< 0.001		96	0.0042	0.0025	0.361	< 0.001	0.0041		0.013	< 0.0002	0.0015	0.02	470	< 0.001	1200
G279	10/08/2015	< 0.001	0.0015	0.096	< 0.001	1.3	1.4	< 0.001		120	0.0047	0.0033	< 0.25	< 0.001	0.0025		0.032	< 0.0002	0.0015	0.017	810	< 0.001	1700
G279	11/24/2015		< 0.001	0.053	< 0.001		0.63	< 0.001	140	61	< 0.004	< 0.002	0.334		0.0015	0.014		< 0.0002	< 0.001	0.0041	520	< 0.001	1100
G279	02/16/2016	< 0.001	< 0.001	0.082	< 0.001	0.29	0.26	< 0.001	180	130	< 0.004	< 0.002	0.392	< 0.001	< 0.001	0.012	0.011	< 0.0002	0.043	0.017	610	< 0.001	1500
G279	05/13/2016	< 0.001	< 0.001	0.055	< 0.001	0.11	0.073	< 0.001	120	31	< 0.004	< 0.002	0.608	< 0.001	< 0.001	< 0.01	0.0061	< 0.0002	0.024	0.0043	270	< 0.001	700
G279	08/03/2016		< 0.001	0.069	< 0.001		0.24	< 0.001	210	110	< 0.004	< 0.002	0.394		< 0.001	< 0.01		< 0.0002	< 0.001	0.02	570	< 0.001	1300

Well ID	Date	Arsenic, dissolved	Arsenic, total	Barium, total	Beryllium, total	Boron, dissolved	Boron, total	Cadmium, total	Calcium, total L	Chloride, total	Chromium, total	Cobalt, total	Fluoride, total	Lead, dissolved	Lead, total	Lithium, total	Manganese, dissolved	Mercury, total	Molybdenum, total	Selenium, total	Sulfate, total	Thallium, total	Total Dissolved Solids
G279	11/22/2016		< 0.001	0.057	< 0.001		0.49	< 0.001		130	< 0.004	< 0.002	0.272		< 0.001	0.011		< 0.0002	< 0.001	0.017	720	< 0.001	1300
G280	03/11/2008	< 0.01	< 0.01	0.049	< 0.01	< 0.5	< 0.5	< 0.005	63	47	< 0.05	< 0.01	0.37	< 0.005	< 0.005		0.11	< 0.0002		< 0.025	60	< 0.002	420
G280	04/21/2008	< 0.001	< 0.001	0.058	< 0.001	0.06	0.062	< 0.0005	59	51	< 0.005	< 0.001	0.37	< 0.0005	0.00055		0.18	< 0.0002		0.0028	58	< 0.002	400
G280	06/11/2008	< 0.001	< 0.001	0.052	< 0.001	< 0.05	< 0.05	< 0.0005	66	43	< 0.005	< 0.001	0.33	< 0.0005	< 0.0005		0.13	< 0.0002		0.0027	62	< 0.002	430
G280	08/13/2008	< 0.001	< 0.001	0.053	< 0.001	0.05	< 0.05	< 0.0005	63	44	< 0.005	< 0.001	0.39	< 0.0005	< 0.0005		0.13	< 0.0002		0.0026	59	< 0.002	410
G280	10/13/2008	< 0.001	< 0.001	0.05	< 0.001	< 0.05	< 0.05	< 0.0005	69	45	< 0.005	< 0.001	0.35	< 0.0005	< 0.0005		0.078	< 0.0002		< 0.0025	60	< 0.002	450
G280	12/03/2008	< 0.001	< 0.001	0.11	< 0.001	< 0.05	< 0.05	< 0.0005	120	110	< 0.005	< 0.001	0.26	< 0.0005	0.0007		0.24	< 0.0002		< 0.0025	230	< 0.002	760
G280	09/21/2009	< 0.001	< 0.001			< 0.05	< 0.05	< 0.0005	59	40				< 0.0005	< 0.0005		0.012				43		380
G280	11/12/2009	< 0.001	< 0.001			< 0.05	< 0.05	< 0.0005	61	40				< 0.0005	< 0.0005		0.019				42		370
G280	01/28/2010	< 0.001	< 0.001			< 0.05	< 0.05	< 0.0005	60	41				< 0.0005	0.0006		0.0069				47		400
G280	02/11/2010			0.039	< 0.001						< 0.005	< 0.001	0.32					< 0.0002		0.0042		< 0.002	440
G280	06/09/2010	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	66	65				< 0.001	< 0.001		0.0031				82		510
G280	07/27/2010	< 0.001	< 0.001			0.01	< 0.01	< 0.001	60	60				< 0.001	< 0.001		< 0.001				80		520
G280	11/16/2010	< 0.001	0.001			< 0.01	< 0.01	< 0.001	58	35				< 0.001	< 0.001		0.018				43		370
G280	01/28/2011	< 0.001	0.0012	0.082	< 0.001	< 0.01	0.012	< 0.001	100	57	< 0.004	0.0024	0.36	< 0.001	0.0055		< 0.001	< 0.0002		0.0051	76	< 0.001	500
G280	05/04/2011	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	< 0.1	87				< 0.001	< 0.001		< 0.001				98		560
G280	07/27/2011	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	63	45				< 0.001	< 0.001		0.015				54		420
G280	11/11/2011	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	60	51				< 0.001	< 0.001		0.0033				59		390
G280	01/30/2012	< 0.001	< 0.001	0.047	< 0.001	< 0.01	< 0.01	< 0.001	81	54	< 0.004	< 0.002	0.44	< 0.001	< 0.001		< 0.001	< 0.0002		0.0055	68	< 0.001	440
G280	05/22/2012	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	65	67				< 0.001	< 0.001		< 0.001				93		470
G280	07/24/2012	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	72	48				< 0.001	0.0026		0.0073				51		360
G280	11/14/2012	0.0013	0.0021			< 0.01	< 0.01	< 0.001	63	46				< 0.001	0.0014		0.0081				48		440
G280	01/31/2013	< 0.001	< 0.001	0.036	< 0.001	< 0.01	< 0.01	< 0.001	63	46	< 0.004	< 0.002	0.423	< 0.001	< 0.001		< 0.001	< 0.0002		0.0042	54	< 0.001	380
G280	05/20/2013	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	67	59				< 0.001	< 0.001		< 0.001				71		410
G280	07/22/2013	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	73	52				< 0.001	< 0.001		< 0.001				67		400
G280	10/14/2013	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	72	51				< 0.001	< 0.001		< 0.001				65		480
G280	02/19/2014	< 0.001	< 0.001	0.041	< 0.001	< 0.01	< 0.01	< 0.001	69	56	< 0.004	< 0.002	0.338	< 0.001	< 0.001		< 0.001	< 0.0002		0.0031	74	< 0.001	
G280	05/13/2014	< 0.001	0.0014			0.017	0.029	< 0.001	73	55				< 0.001	0.001		< 0.001				78		
G280	08/12/2014	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	75	55				< 0.001	< 0.001		< 0.001				76		490
G280	10/14/2014	< 0.001	0.0012			0.013	< 0.01	< 0.001	76	60				< 0.001	0.002		< 0.001				83		480
G280	01/21/2015	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	74	62				< 0.001	< 0.001		< 0.001				87		540
G280	04/13/2015	< 0.002	< 0.001	0.045	< 0.001	0.025	< 0.01	< 0.001	71	67	< 0.004	< 0.002	0.358	< 0.002	< 0.001		0.026	< 0.0002		0.0037	86	< 0.001	480
G280	07/23/2015	< 0.001	< 0.001	0.049	< 0.001	0.01	< 0.01	< 0.001		53	< 0.004	< 0.002	0.415	< 0.001	< 0.001		0.074	< 0.0002	0.0019	0.0033	74	< 0.001	480
G280	10/08/2015	< 0.001	< 0.001	0.056	< 0.001	0.025	0.024	< 0.001		54	< 0.004	< 0.002	0.318	< 0.001	< 0.001		0.0035	< 0.0002	0.0074	0.0017	92	< 0.001	450
G280	11/24/2015		0.0066	0.11	< 0.001		0.029	< 0.001	120	54	0.019	0.0059	0.343		0.012	0.019		< 0.0002	0.0045	0.0032	94	< 0.001	460
G280	02/10/2016	< 0.001	< 0.001	0.048	< 0.001	0.012	< 0.01	< 0.001	60	55	< 0.004	< 0.002	0.466	< 0.001	0.0019	< 0.01	< 0.001	< 0.0002	0.0016	0.0033	84	< 0.001	410
G280	05/10/2016		< 0.001	0.045	< 0.001		< 0.01	< 0.001	63	50	< 0.004	< 0.002	0.429		< 0.001	< 0.01		< 0.0002	0.0014	0.0044	80	< 0.001	350
G280	05/13/2016	< 0.001	< 0.001	0.044	< 0.001	< 0.01	< 0.01	< 0.001		45	< 0.004	< 0.002	0.497	< 0.001	0.0014		< 0.001	< 0.0002	0.0014	0.0035	75	< 0.001	410
G280	08/03/2016		< 0.001	0.045	< 0.001		< 0.01	< 0.001	65	46	< 0.004	< 0.002	0.397		0.0014	< 0.01		< 0.0002	0.0016	0.0048	55	< 0.001	350
G280	11/20/2016		< 0.001	0.044	< 0.001		< 0.01	< 0.001		49	< 0.004	< 0.002	0.473		< 0.001	< 0.01		< 0.0002	0.0014	0.0034	67	< 0.001	430
G281	11/20/2015		0.0043	0.14	< 0.001		< 0.01	< 0.001	150	74	0.011	0.0056	0.349		0.0063	0.013		< 0.0002	0.0015	< 0.001	300	< 0.001	820
G281	02/11/2016		< 0.001	0.067	< 0.001		0.01	< 0.001	120	55	< 0.004	< 0.002	0.411		< 0.001	< 0.01		< 0.0002	< 0.001	< 0.001	340	< 0.001	740
G281	05/10/2016		< 0.001	0.072	< 0.001		< 0.01	< 0.001	130	72	< 0.004	< 0.002	0.405		< 0.001	< 0.01		< 0.0002	< 0.001	< 0.001	370	< 0.001	740
G281	08/01/2016		< 0.001	0.078	< 0.001		0.012	< 0.001	140	70	< 0.004	< 0.002	0.368		0.0011	< 0.01		< 0.0002	< 0.001	< 0.001	310	< 0.001	780
G281	08/31/2016	< 0.001				< 0.01								< 0.001			0.48						800
G401	11/21/2015		0.0046	0.037	< 0.001		3.3	< 0.001	440	3.6	0.0053	0.25	< 0.25		0.0031	0.055		< 0.0002	< 0.001	0.002	2300	< 0.001	3000
G401	02/22/2016		< 0.002	0.015	< 0.001		3.4	< 0.001	330	6	< 0.004	0.24	< 0.25		< 0.001	0.05		< 0.0002	< 0.001	< 0.002	2500	< 0.001	3000
G401	05/19/2016		0.0015	0.014	< 0.001		3.5	< 0.001	380	3	< 0.004	0.27	0.758		< 0.001	0.046		< 0.0002	< 0.001	< 0.001	2200	< 0.001	2800
G401	08/01/2016		0.004	0.053	< 0.001		4.1	0.0012	450	5.3	0.0096	0.28	< 0.25		0.0048	0.051		0.00093	< 0.001	0.0055	2100	< 0.001	2900
G401	11/17/2016		0.0027	0.021	< 0.001		4	0.0013		< 5	< 0.004	0.27	< 0.25		0.0029	0.054		< 0.0002	< 0.001	0.001	3400	< 0.001	3200
G402	11/21/2015		0.024	0.082	< 0.001		6.6	0.001	270	2.8	0.019	0.014	< 0.25		0.015	0.054		< 0.0002	0.006	0.002	1200	< 0.001	1700
G402	02/22/2016		0.027	0.11	< 0.001		5.7	< 0.001	220	2.8	0.031	0.015	0.355		0.018	0.057		< 0.0002	0.0049	0.0033	1000	< 0.001	1700
G402	05/19/2016		0.023	0.085	< 0.001		6.3	< 0.001	270	1.5	0.022	0.019	0.367		0.015	0.036		< 0.0002	0.0044	0.0016	960	< 0.001	1500

Well ID	Date	Arsenic, dissolved	Arsenic, total	Barium, total	Beryllium, total	Boron, dissolved	Boron, total	Cadmium, total	Calcium, total L	Chloride, total	Chromium, total	Cobalt, total	Fluoride, total	Lead, dissolved	Lead, total	Lithium, total	Manganese, dissolved	Mercury, total	Molybdenum, total	Selenium, total	Sulfate, total	Thallium, total	Total Dissolved Solids
G402	08/02/2016		0.01	0.047	< 0.001		7.4	< 0.001	240	2.2	0.0085	0.0074	0.33		0.0072	0.033		< 0.0002	0.0033	< 0.001	890	< 0.001	1500
G402	11/17/2016		0.012	0.054	< 0.001		6.9	< 0.001		2.6	0.011	0.007	0.463		0.0079	0.047		< 0.0002	0.0034	0.0012	1100	< 0.001	1700
G403	11/23/2015		0.0017	0.14	< 0.001		0.039	< 0.001	78	6.8	0.0062	< 0.002	0.442		0.0021	< 0.01		< 0.0002	0.004	< 0.001	35	< 0.001	320
G403	02/22/2016		< 0.001	0.13	< 0.001		0.064	< 0.001	69	4.1	< 0.004	< 0.002	0.518		< 0.001	< 0.01		< 0.0002	< 0.001	< 0.001	17	< 0.001	340
G403	05/18/2016		< 0.001	0.16	< 0.001		0.014	< 0.001	71	2.7	< 0.004	< 0.002	0.478		< 0.001	< 0.01		< 0.0002	0.0012	< 0.001	11	< 0.001	320
G403	08/01/2016		0.0033	0.24	< 0.001		0.027	< 0.001	140	4.5	0.0073	0.0029	0.485		0.0021	< 0.01		< 0.0002	0.0055	0.0068	9.9	< 0.001	320
G403	11/17/2016		0.0026	0.2	< 0.001		0.042	< 0.001		4	< 0.004	0.0024	0.539		< 0.001	< 0.01		< 0.0002	0.001	< 0.001	8.9	< 0.001	350
G404	11/21/2015		< 0.001	0.05	< 0.001		2.1	< 0.001	110	53	< 0.004	< 0.002	< 0.25		< 0.001	< 0.01		< 0.0002	< 0.001	< 0.001	180	< 0.001	580
G404	02/15/2016		< 0.001	0.043	< 0.001		1.6	< 0.001	110	49	< 0.004	< 0.002	< 0.25		< 0.001	< 0.01		< 0.0002	< 0.001	< 0.001	150	< 0.001	560
G404	05/19/2016		< 0.001	0.041	< 0.001		1.4	< 0.001	89	46	< 0.004	< 0.002	0.287		< 0.001	< 0.01		< 0.0002	< 0.001	< 0.001	140	< 0.001	460
G404	08/02/2016		< 0.001	0.055	< 0.001		3.2	< 0.001	120	62	< 0.004	< 0.002	< 0.25		< 0.001	< 0.01		< 0.0002	< 0.001	< 0.001	190	< 0.001	620
G404	11/22/2016		< 0.001	0.052	< 0.001		3.4	< 0.001		61	< 0.004	< 0.002	< 0.25		< 0.001	< 0.01		< 0.0002	< 0.001	< 0.001	380	< 0.001	880
G405	11/21/2015		0.014	0.051	< 0.001		17	0.0012	330	14	0.0051	0.0034	0.454		0.0085	< 0.01		< 0.0002	0.001	< 0.001	1700	< 0.001	2400
G405	02/15/2016		0.0028	0.018	< 0.001		16	< 0.001	320	11	< 0.004	< 0.002	0.459		0.0023	< 0.01		< 0.0002	< 0.001	< 0.001	1700	< 0.001	2500
G405	05/18/2016		0.0025	0.02	< 0.001		15	< 0.001	320	9.3	< 0.004	< 0.002	0.544		0.0011	< 0.01		< 0.0002	< 0.001	< 0.001	1800	< 0.001	2200
G405	08/02/2016		0.0063	0.028	< 0.001		17	< 0.001	280	3.4	< 0.004	0.0038	< 0.25		0.0018	< 0.01		< 0.0002	0.0016	< 0.001	1600	< 0.001	2200
G405	11/22/2016		0.0024	0.022	< 0.001		13	< 0.001		19	< 0.004	0.0021	0.525		0.0023	< 0.01		< 0.0002	0.0011	< 0.001	1400	< 0.001	2100
G406	08/30/2016	< 0.001				1.6								< 0.001			5.5						1300
G406	11/18/2016			0.024			1.9			4.4			0.345								910		1400
G407	08/30/2016	< 0.001				0.052								< 0.001			0.21						1400
G407	11/18/2016			0.024			0.078			14			0.289								830		1400
G45D	09/02/2016	0.0014				0.35								< 0.001			0.035						370
G46D	09/02/2016	0.0028				0.14								< 0.001			0.094						460

Coffeen
Ash Pond 2 - Statistical Summary for Select Monitoring Wells

User Supplied Information

Date Range: 03/11/2008 to 08/16/2016 **Option for LT Pts:** **x 0.5**

Locations: **APW-2,G151,G152,G153,G154,G270,G271,G272,G273,G274,G275,G281,G401,G402,G403,G404,G405**

Location **Type** **Class**

APW-2

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope Units/yr	Normal / Log Normal	% of Non-Detects
B, diss	mg/L	8	7.245	7.180	8.100	6.300	0.626	0.27	Yes / Yes	0.00
Mn, diss	mg/L	8	0.432	0.414	0.730	0.130	0.166	0.01	Yes / No	0.00
SO4, diss	mg/L	8	805.375	840.000	1,100.000	500.000	173.105	5.17	Yes / Yes	12.50
TDS	mg/L	8	1,651.250	1,600.000	1,810.000	1,600.000	78.456	0.00	No / No	0.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

Coffeen
Ash Pond 2 - Statistical Summary for Select Monitoring Wells

User Supplied Information

Date Range: 03/11/2008 to 08/16/2016 **Option for LT Pts:** **x 0.5**
Locations: **APW-2,G151,G152,G153,G154,G270,G271,G272,G273,G274,G275,G281,G401,G402,G403,G404,G405**
Location **Type** **Class**
G151

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope Units/yr	Normal / Log Normal	% of Non-Detects
As, tot	mg/L	3	0.0007	0.0005	0.0012	0.0005	0.0004	0.00	No / No	66.67
B, diss	mg/L	16	0.016	0.012	0.052	0.003	0.013	0.00	No / Yes	50.00
B, tot	mg/L	3	0.0183	0.0190	0.0260	0.0100	0.0080	-0.03	Yes / Yes	0.00
Ba, tot	mg/L	3	0.0643	0.0670	0.0690	0.0570	0.0064	0.02	Yes / Yes	0.00
Be, tot	mg/L	3	0.00050	0.00050	0.00050	0.00050	0.00000	0.00	No / No	100.00
Cd,tot	mg/L	3	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00
Cl, tot	mg/L	3	58.333	58.000	67.000	50.000	8.505	16.23	Yes / Yes	0.00
Co, tot	mg/L	3	0.0010	0.0010	0.0010	0.0010	0.0000	0.00	No / No	100.00
Cr, tot	mg/L	3	0.0020	0.0020	0.0020	0.0020	0.0000	0.00	No / No	100.00
F, tot	mg/L	3	0.609	0.649	0.691	0.486	0.108	-0.09	Yes / Yes	0.00
Hg, tot	mg/L	3	0.00010	0.00010	0.00010	0.00010	0.00000	0.00	No / No	100.00
Mn, diss	mg/L	16	0.131	0.092	0.560	0.011	0.131	0.00	No / Yes	0.00
Mn, tot	mg/L	3	0.225	0.230	0.360	0.086	0.137	0.56	Yes / Yes	0.00
Pb, tot	mg/L	3	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00
Sb, tot	mg/L	3	0.0015	0.0015	0.0015	0.0015	0.0000	0.00	No / No	100.00
Se, tot	mg/L	3	0.0025	0.0024	0.0029	0.0021	0.0004	0.00	Yes / Yes	0.00
SO4, diss	mg/L	16	111.563	110.000	140.000	100.000	11.213	4.79	No / No	0.00
SO4, tot	mg/L	3	104.333	98.000	120.000	95.000	13.650	6.09	Yes / Yes	0.00
TDS	mg/L	17	551.176	560.000	660.000	500.000	44.424	0.00	Yes / Yes	0.00
Tl, tot	mg/L	3	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

Coffeen
Ash Pond 2 - Statistical Summary for Select Monitoring Wells

User Supplied Information

Date Range: 03/11/2008 to 08/16/2016 **Option for LT Pts:** **x 0.5**
Locations: **APW-2,G151,G152,G153,G154,G270,G271,G272,G273,G274,G275,G281,G401,G402,G403,G404,G405**
Location **Type** **Class**
G152

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope Units/yr	Normal / Log Normal	% of Non-Detects
As, tot	mg/L	3	0.0016	0.0014	0.0023	0.0011	0.0006	0.00	Yes / Yes	0.00
B, diss	mg/L	16	0.047	0.041	0.110	0.015	0.025	0.01	No / Yes	0.00
B, tot	mg/L	3	0.0383	0.0360	0.0470	0.0320	0.0078	-0.03	Yes / Yes	0.00
Ba, tot	mg/L	3	0.1200	0.1300	0.1300	0.1000	0.0173	-0.06	No / No	0.00
Be, tot	mg/L	3	0.00050	0.00050	0.00050	0.00050	0.00000	0.00	No / No	100.00
Cd,tot	mg/L	3	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00
Cl, tot	mg/L	3	42.333	42.000	45.000	40.000	2.517	10.15	Yes / Yes	0.00
Co, tot	mg/L	3	0.0014	0.0010	0.0023	0.0010	0.0008	0.00	No / No	66.67
Cr, tot	mg/L	3	0.0040	0.0020	0.0080	0.0020	0.0035	-0.01	No / No	66.67
F, tot	mg/L	3	0.550	0.587	0.642	0.422	0.114	-0.11	Yes / Yes	0.00
Hg, tot	mg/L	3	0.00010	0.00010	0.00010	0.00010	0.00000	0.00	No / No	100.00
Mn, diss	mg/L	16	0.294	0.180	0.927	0.034	0.277	0.07	No / Yes	0.00
Mn, tot	mg/L	3	0.317	0.310	0.370	0.270	0.050	0.12	Yes / Yes	0.00
Pb, tot	mg/L	3	0.0012	0.0005	0.0026	0.0005	0.0012	0.00	No / No	66.67
Sb, tot	mg/L	3	0.0015	0.0015	0.0015	0.0015	0.0000	0.00	No / No	100.00
Se, tot	mg/L	3	0.0036	0.0035	0.0043	0.0030	0.0007	0.00	Yes / Yes	0.00
SO4, diss	mg/L	16	161.063	135.000	300.000	107.000	61.151	26.31	No / No	0.00
SO4, tot	mg/L	3	120.000	120.000	130.000	110.000	10.000	20.29	Yes / Yes	0.00
TDS	mg/L	17	676.706	620.000	1,100.000	494.000	156.107	72.77	No / Yes	0.00
Tl, tot	mg/L	3	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

Coffeen
Ash Pond 2 - Statistical Summary for Select Monitoring Wells

User Supplied Information

Date Range: 03/11/2008 to 08/16/2016 **Option for LT Pts:** **x 0.5**
Locations: **APW-2,G151,G152,G153,G154,G270,G271,G272,G273,G274,G275,G281,G401,G402,G403,G404,G405**
Location **Type** **Class**
G153

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope Units/yr	Normal / Log Normal	% of Non-Detects
As, tot	mg/L	3	0.0056	0.0056	0.0059	0.0052	0.0004	0.00	Yes / Yes	0.00
B, diss	mg/L	16	0.028	0.027	0.058	0.012	0.012	-0.01	Yes / Yes	0.00
B, tot	mg/L	3	0.0437	0.0360	0.0640	0.0310	0.0178	-0.07	Yes / Yes	0.00
Ba, tot	mg/L	3	0.0247	0.0220	0.0360	0.0160	0.0103	-0.04	Yes / Yes	0.00
Be, tot	mg/L	3	0.00050	0.00050	0.00050	0.00050	0.00000	0.00	No / No	100.00
Cd,tot	mg/L	3	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00
Cl, tot	mg/L	3	140.000	130.000	160.000	130.000	17.321	0.00	No / No	0.00
Co, tot	mg/L	3	0.0037	0.0034	0.0068	0.0010	0.0029	-0.01	Yes / Yes	33.33
Cr, tot	mg/L	3	0.0045	0.0041	0.0053	0.0041	0.0007	0.00	No / No	0.00
F, tot	mg/L	5	0.363	0.369	0.410	0.293	0.047	-0.01	Yes / Yes	0.00
Hg, tot	mg/L	3	0.00010	0.00010	0.00010	0.00010	0.00000	0.00	No / No	100.00
Mn, diss	mg/L	16	0.235	0.175	1.020	0.024	0.249	-0.12	No / Yes	0.00
Mn, tot	mg/L	3	0.673	0.510	1.300	0.210	0.563	-2.21	Yes / Yes	0.00
Pb, tot	mg/L	3	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00
Sb, tot	mg/L	3	0.0015	0.0015	0.0015	0.0015	0.0000	0.00	No / No	100.00
Se, tot	mg/L	3	0.0230	0.0210	0.0270	0.0210	0.0035	0.00	No / No	0.00
SO4, diss	mg/L	16	1,823.750	1,800.000	2,100.000	1,500.000	206.458	184.47	Yes / Yes	0.00
SO4, tot	mg/L	3	1,633.333	1,500.000	1,900.000	1,500.000	230.940	0.00	No / No	0.00
TDS	mg/L	17	3,361.765	3,300.000	3,900.000	2,800.000	340.739	42.47	Yes / Yes	0.00
Tl, tot	mg/L	3	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

Coffeen
Ash Pond 2 - Statistical Summary for Select Monitoring Wells

User Supplied Information

Date Range: 03/11/2008 to 08/16/2016 **Option for LT Pts:** **x 0.5**
Locations: **APW-2,G151,G152,G153,G154,G270,G271,G272,G273,G274,G275,G281,G401,G402,G403,G404,G405**
Location **Type** **Class**
G154

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope Units/yr	Normal / Log Normal	% of Non-Detects
As, tot	mg/L	3	0.0008	0.0005	0.0014	0.0005	0.0005	0.00	No / No	66.67
B, diss	mg/L	16	0.036	0.037	0.045	0.021	0.008	0.00	No / No	0.00
B, tot	mg/L	3	0.0300	0.0310	0.0380	0.0210	0.0085	0.01	Yes / Yes	0.00
Ba, tot	mg/L	3	0.0340	0.0330	0.0370	0.0320	0.0026	-0.01	Yes / Yes	0.00
Be, tot	mg/L	3	0.00050	0.00050	0.00050	0.00050	0.00000	0.00	No / No	100.00
Cd,tot	mg/L	3	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00
Cl, tot	mg/L	3	6.500	4.900	10.000	4.600	3.035	-10.35	Yes / Yes	0.00
Co, tot	mg/L	3	0.0010	0.0010	0.0010	0.0010	0.0000	0.00	No / No	100.00
Cr, tot	mg/L	3	0.0020	0.0020	0.0020	0.0020	0.0000	0.00	No / No	100.00
F, tot	mg/L	3	1.014	1.010	1.060	0.971	0.045	0.10	Yes / Yes	0.00
Hg, tot	mg/L	3	0.00010	0.00010	0.00010	0.00010	0.00000	0.00	No / No	100.00
Mn, diss	mg/L	16	0.062	0.035	0.462	0.003	0.112	0.00	No / Yes	0.00
Mn, tot	mg/L	3	0.157	0.160	0.160	0.150	0.006	0.02	No / No	0.00
Pb, tot	mg/L	3	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00
Sb, tot	mg/L	3	0.0015	0.0015	0.0015	0.0015	0.0000	0.00	No / No	100.00
Se, tot	mg/L	3	0.0054	0.0058	0.0062	0.0042	0.0011	0.00	Yes / Yes	0.00
SO4, diss	mg/L	16	110.250	105.000	175.000	82.000	23.601	-11.96	No / Yes	0.00
SO4, tot	mg/L	3	98.667	93.000	110.000	93.000	9.815	34.50	No / No	0.00
TDS	mg/L	17	476.118	460.000	624.000	410.000	52.309	17.11	No / No	0.00
Tl, tot	mg/L	3	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

Coffeen
Ash Pond 2 - Statistical Summary for Select Monitoring Wells

User Supplied Information

Date Range: 03/11/2008 to 08/16/2016 **Option for LT Pts:** **x 0.5**
Locations: **APW-2,G151,G152,G153,G154,G270,G271,G272,G273,G274,G275,G281,G401,G402,G403,G404,G405**
Location **Type** **Class**
G270

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope Units/yr	Normal / Log Normal	% of Non-Detects
As, tot	mg/L	38	0.0010	0.0005	0.0110	0.0005	0.0018	0.00	No / No	73.68
B, diss	mg/L	34	0.029	0.012	0.125	0.005	0.034	0.00	No / No	47.06
B, tot	mg/L	38	0.0207	0.0050	0.1250	0.0050	0.0264	0.00	No / No	68.42
Ba, tot	mg/L	20	0.0527	0.0495	0.0760	0.0320	0.0155	0.00	Yes / Yes	0.00
Be, tot	mg/L	20	0.00060	0.00050	0.00250	0.00050	0.00045	0.00	No / No	100.00
Ca, tot	mg/L	34	66.588	67.000	81.000	49.000	7.785	-0.34	Yes / Yes	0.00
Cd,tot	mg/L	38	0.0007	0.0005	0.0080	0.0003	0.0012	0.00	No / No	97.37
Cl, tot	mg/L	38	35.521	20.500	91.000	5.000	27.343	2.03	No / No	2.63
Co, tot	mg/L	20	0.0011	0.0010	0.0025	0.0005	0.0005	0.00	No / No	85.00
Cr, tot	mg/L	20	0.0027	0.0020	0.0125	0.0020	0.0023	0.00	No / No	100.00
F, tot	mg/L	20	0.373	0.361	0.504	0.279	0.058	0.00	Yes / Yes	0.00
Hg, tot	mg/L	20	0.00010	0.00010	0.00010	0.00010	0.00000	0.00	No / No	100.00
Li, tot	mg/L	4	0.0050	0.0050	0.0050	0.0050	0.0000	0.00	No / No	100.00
Mn, diss	mg/L	34	0.094	0.045	0.470	0.003	0.108	-0.02	No / Yes	0.00
Mn, tot	mg/L	34	0.146	0.083	0.620	0.021	0.134	-0.03	No / No	0.00
Mo, tot	mg/L	8	0.0007	0.0005	0.0011	0.0005	0.0003	0.00	No / No	62.50
Pb, tot	mg/L	38	0.0011	0.0005	0.0073	0.0003	0.0013	0.00	No / No	68.42
Ra-226,228, tot	pCi/L	4	0.5815	0.5340	0.9970	0.2610	0.3415	0.82	Yes / Yes	25.00
Sb, tot	mg/L	20	0.0013	0.0015	0.0015	0.0010	0.0002	0.00	No / No	100.00
Se, tot	mg/L	20	0.0019	0.0013	0.0078	0.0005	0.0020	0.00	No / No	60.00
SO4, diss	mg/L	34	54.312	42.500	140.000	2.100	50.372	15.70	No / No	0.00
SO4, tot	mg/L	38	58.747	65.000	140.000	2.300	50.239	15.58	No / No	0.00
TDS	mg/L	37	453.514	460.000	550.000	340.000	52.769	10.59	Yes / Yes	0.00
Tl, tot	mg/L	20	0.0007	0.0005	0.0010	0.0005	0.0002	0.00	No / No	100.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

Coffeen
Ash Pond 2 - Statistical Summary for Select Monitoring Wells

User Supplied Information

Date Range: 03/11/2008 to 08/16/2016 **Option for LT Pts:** **x 0.5**

Locations: **APW-2,G151,G152,G153,G154,G270,G271,G272,G273,G274,G275,G281,G401,G402,G403,G404,G405**

Location **Type** **Class**

G271

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope Units/yr	Normal / Log Normal	% of Non-Detects
As, tot	mg/L	33	0.0012	0.0005	0.0049	0.0005	0.0011	0.00	No / No	60.61
B, diss	mg/L	29	0.281	0.260	0.610	0.130	0.128	0.05	No / Yes	0.00
B, tot	mg/L	33	0.3088	0.2400	0.9800	0.1100	0.1904	0.03	No / Yes	0.00
Ba, tot	mg/L	19	0.0456	0.0340	0.1100	0.0280	0.0220	0.00	No / No	0.00
Be, tot	mg/L	19	0.00050	0.00050	0.00050	0.00050	0.00000	0.00	No / No	100.00
Ca, tot	mg/L	29	123.276	120.000	170.000	96.000	17.834	2.68	Yes / Yes	0.00
Cd,tot	mg/L	33	0.0005	0.0005	0.0005	0.0003	0.0001	0.00	No / No	100.00
Cl, tot	mg/L	33	41.427	42.000	58.000	5.100	9.067	0.00	No / No	0.00
Co, tot	mg/L	19	0.0014	0.0010	0.0047	0.0005	0.0010	0.00	No / No	78.95
Cr, tot	mg/L	19	0.0037	0.0020	0.0140	0.0020	0.0032	0.00	No / No	73.68
F, tot	mg/L	19	0.415	0.410	0.562	0.298	0.062	0.01	Yes / Yes	0.00
Hg, tot	mg/L	19	0.00010	0.00010	0.00010	0.00010	0.00000	0.00	No / No	100.00
Li, tot	mg/L	4	0.0050	0.0050	0.0050	0.0050	0.0000	0.00	No / No	100.00
Mn, diss	mg/L	29	0.015	0.001	0.220	0.001	0.045	0.00	No / No	62.07
Mn, tot	mg/L	29	0.058	0.021	0.270	0.001	0.075	-0.01	No / Yes	0.00
Mo, tot	mg/L	8	0.0010	0.0005	0.0036	0.0005	0.0011	0.00	No / No	62.50
Pb, tot	mg/L	33	0.0022	0.0012	0.0110	0.0005	0.0024	0.00	No / No	45.45
Ra-226,228, tot	pCi/L	4	0.5905	0.5785	1.0200	0.1850	0.4251	-1.19	Yes / Yes	0.00
Sb, tot	mg/L	19	0.0014	0.0015	0.0015	0.0010	0.0002	0.00	No / No	100.00
Se, tot	mg/L	19	0.0040	0.0035	0.0099	0.0018	0.0021	0.00	No / Yes	0.00
SO4, diss	mg/L	29	354.483	360.000	520.000	220.000	87.447	35.77	Yes / Yes	0.00
SO4, tot	mg/L	33	356.970	350.000	540.000	230.000	87.446	28.25	Yes / Yes	0.00
TDS	mg/L	31	861.935	860.000	1,000.000	710.000	96.035	29.19	No / No	0.00
Tl, tot	mg/L	19	0.0006	0.0005	0.0010	0.0005	0.0002	0.00	No / No	100.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

Coffeen
Ash Pond 2 - Statistical Summary for Select Monitoring Wells

User Supplied Information

Date Range: 03/11/2008 to 08/16/2016 **Option for LT Pts:** **x 0.5**

Locations: **APW-2,G151,G152,G153,G154,G270,G271,G272,G273,G274,G275,G281,G401,G402,G403,G404,G405**

Location	**Type**	**Class**
G272	**Groundwater**	

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope Units/yr	Normal / Log Normal	% of Non-Detects
As, tot	mg/L	29	0.0006	0.0005	0.0013	0.0005	0.0002	0.00	No / No	86.21
B, diss	mg/L	29	0.019	0.005	0.270	0.005	0.050	0.00	No / No	86.21
B, tot	mg/L	29	0.0144	0.0050	0.0600	0.0050	0.0167	0.00	No / No	68.97
Ba, tot	mg/L	15	0.0673	0.0620	0.0990	0.0580	0.0108	0.00	No / No	0.00
Be, tot	mg/L	15	0.00050	0.00050	0.00050	0.00050	0.00000	0.00	No / No	100.00
Ca, tot	mg/L	25	97.400	98.000	110.000	82.000	9.000	3.90	No / No	0.00
Cd,tot	mg/L	29	0.0005	0.0005	0.0005	0.0003	0.0001	0.00	No / No	100.00
Cl, tot	mg/L	29	39.552	41.000	53.000	29.000	6.294	-2.64	Yes / Yes	3.45
Co, tot	mg/L	15	0.0011	0.0010	0.0022	0.0005	0.0004	0.00	No / No	80.00
Cr, tot	mg/L	15	0.0029	0.0020	0.0110	0.0020	0.0024	0.00	No / No	86.67
F, tot	mg/L	15	0.449	0.459	0.561	0.355	0.058	0.00	Yes / Yes	0.00
Hg, tot	mg/L	15	0.00010	0.00010	0.00010	0.00010	0.00000	0.00	No / No	100.00
Mn, diss	mg/L	29	0.011	0.001	0.230	0.001	0.043	0.00	No / No	75.86
Mn, tot	mg/L	29	0.029	0.011	0.150	0.002	0.040	0.00	No / Yes	0.00
Mo, tot	mg/L	4	0.0012	0.0009	0.0024	0.0005	0.0009	0.00	Yes / Yes	50.00
Pb, tot	mg/L	29	0.0011	0.0005	0.0049	0.0005	0.0011	0.00	No / No	65.52
Sb, tot	mg/L	15	0.0014	0.0015	0.0015	0.0010	0.0002	0.00	No / No	100.00
Se, tot	mg/L	15	0.0017	0.0013	0.0042	0.0005	0.0012	0.00	No / Yes	53.33
SO4, diss	mg/L	29	264.483	270.000	380.000	140.000	62.996	28.10	Yes / Yes	0.00
SO4, tot	mg/L	29	253.448	250.000	380.000	120.000	68.935	30.52	Yes / Yes	0.00
TDS	mg/L	27	702.963	680.000	840.000	570.000	68.770	25.54	Yes / Yes	0.00
Tl, tot	mg/L	15	0.0006	0.0005	0.0010	0.0005	0.0002	0.00	No / No	100.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

Coffeen
Ash Pond 2 - Statistical Summary for Select Monitoring Wells

User Supplied Information

Date Range: 03/11/2008 to 08/16/2016 **Option for LT Pts:** **x 0.5**
Locations: **APW-2,G151,G152,G153,G154,G270,G271,G272,G273,G274,G275,G281,G401,G402,G403,G404,G405**
Location **Type** **Class**
G273

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope Units/yr	Normal / Log Normal	% of Non-Detects
As, tot	mg/L	33	0.0008	0.0005	0.0045	0.0005	0.0009	0.00	No / No	75.76
B, diss	mg/L	29	0.224	0.180	0.620	0.019	0.176	0.06	No / No	6.90
B, tot	mg/L	33	0.2084	0.2000	0.4800	0.0160	0.1368	0.05	Yes / No	9.09
Ba, tot	mg/L	19	0.0503	0.0440	0.0940	0.0280	0.0210	-0.01	No / Yes	0.00
Be, tot	mg/L	19	0.00050	0.00050	0.00050	0.00050	0.00000	0.00	No / No	100.00
Ca, tot	mg/L	29	156.207	150.000	200.000	120.000	19.533	0.00	Yes / Yes	0.00
Cd,tot	mg/L	33	0.0005	0.0005	0.0005	0.0003	0.0001	0.00	No / No	100.00
Cl, tot	mg/L	33	35.788	37.000	59.000	4.000	9.591	2.49	Yes / No	0.00
Co, tot	mg/L	19	0.0009	0.0010	0.0010	0.0005	0.0002	0.00	No / No	100.00
Cr, tot	mg/L	19	0.0038	0.0020	0.0340	0.0020	0.0073	0.00	No / No	94.74
F, tot	mg/L	19	0.335	0.330	0.537	0.125	0.099	0.01	Yes / No	10.53
Hg, tot	mg/L	19	0.00010	0.00010	0.00010	0.00010	0.00000	0.00	No / No	100.00
Li, tot	mg/L	4	0.0050	0.0050	0.0050	0.0050	0.0000	0.00	No / No	100.00
Mn, diss	mg/L	29	0.042	0.028	0.330	0.001	0.059	-0.01	No / No	0.00
Mn, tot	mg/L	29	0.057	0.043	0.190	0.019	0.043	-0.01	No / Yes	0.00
Mo, tot	mg/L	8	0.0007	0.0005	0.0019	0.0005	0.0005	0.00	No / No	87.50
Pb, tot	mg/L	33	0.0006	0.0005	0.0037	0.0003	0.0006	0.00	No / No	87.88
Ra-226,228, tot	pCi/L	4	1.2503	1.1420	2.0600	0.6570	0.6588	-2.20	Yes / Yes	0.00
Sb, tot	mg/L	19	0.0014	0.0015	0.0015	0.0010	0.0002	0.00	No / No	100.00
Se, tot	mg/L	19	0.0010	0.0005	0.0051	0.0005	0.0011	0.00	No / No	84.21
SO4, diss	mg/L	29	524.000	520.000	700.000	46.000	131.055	8.97	No / No	0.00
SO4, tot	mg/L	33	529.697	520.000	750.000	340.000	105.874	6.45	Yes / Yes	0.00
TDS	mg/L	31	1,085.484	1,100.000	1,300.000	840.000	140.139	0.00	No / No	0.00
Tl, tot	mg/L	19	0.0006	0.0005	0.0010	0.0005	0.0002	0.00	No / No	100.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

Coffeen
Ash Pond 2 - Statistical Summary for Select Monitoring Wells

User Supplied Information

Date Range: 03/11/2008 to 08/16/2016 **Option for LT Pts:** **x 0.5**

Locations: **APW-2,G151,G152,G153,G154,G270,G271,G272,G273,G274,G275,G281,G401,G402,G403,G404,G405**

Location	**Type**	**Class**
G274	**Groundwater**	

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope Units/yr	Normal / Log Normal	% of Non-Detects
As, tot	mg/L	29	0.0008	0.0005	0.0040	0.0005	0.0008	0.00	No / No	82.76
B, diss	mg/L	29	0.295	0.180	0.970	0.005	0.302	0.13	No / No	27.59
B, tot	mg/L	29	0.2636	0.1600	0.7400	0.0050	0.2533	0.11	No / No	24.14
Ba, tot	mg/L	15	0.0759	0.0700	0.1200	0.0520	0.0181	-0.01	Yes / Yes	0.00
Be, tot	mg/L	15	0.00059	0.00050	0.00180	0.00050	0.00034	0.00	No / No	93.33
Ca, tot	mg/L	25	112.320	110.000	130.000	98.000	8.440	0.00	No / No	0.00
Cd,tot	mg/L	29	0.0005	0.0005	0.0014	0.0003	0.0002	0.00	No / No	96.55
Cl, tot	mg/L	29	33.572	36.000	55.000	3.600	11.500	-4.55	Yes / No	0.00
Co, tot	mg/L	15	0.0010	0.0010	0.0028	0.0005	0.0005	0.00	No / No	93.33
Cr, tot	mg/L	15	0.0024	0.0020	0.0059	0.0020	0.0010	0.00	No / No	93.33
F, tot	mg/L	15	0.351	0.350	0.455	0.262	0.052	0.01	Yes / Yes	0.00
Hg, tot	mg/L	15	0.00010	0.00010	0.00010	0.00010	0.00000	0.00	No / No	100.00
Mn, diss	mg/L	29	0.003	0.001	0.046	0.001	0.009	0.00	No / No	68.97
Mn, tot	mg/L	29	0.049	0.022	0.370	0.003	0.087	0.00	No / Yes	0.00
Mo, tot	mg/L	4	0.0007	0.0005	0.0012	0.0005	0.0003	0.00	No / No	75.00
Pb, tot	mg/L	29	0.0015	0.0005	0.0100	0.0003	0.0024	0.00	No / No	65.52
Sb, tot	mg/L	15	0.0014	0.0015	0.0015	0.0010	0.0002	0.00	No / No	100.00
Se, tot	mg/L	15	0.0010	0.0013	0.0022	0.0005	0.0005	0.00	No / No	73.33
SO4, diss	mg/L	29	340.000	350.000	400.000	240.000	41.748	0.00	No / No	0.00
SO4, tot	mg/L	29	336.552	330.000	460.000	230.000	54.725	6.69	Yes / Yes	0.00
TDS	mg/L	27	862.593	870.000	980.000	770.000	64.307	-16.05	Yes / Yes	0.00
Tl, tot	mg/L	15	0.0007	0.0005	0.0013	0.0005	0.0003	0.00	No / No	93.33

Shapiro-Wilk Normality test performed at 0.05 significance level.

Coffeen
Ash Pond 2 - Statistical Summary for Select Monitoring Wells

User Supplied Information

Date Range: 03/11/2008 to 08/16/2016 **Option for LT Pts:** **x 0.5**
Locations: **APW-2,G151,G152,G153,G154,G270,G271,G272,G273,G274,G275,G281,G401,G402,G403,G404,G405**
Location **Type** **Class**
G275 **Groundwater**

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope Units/yr	Normal / Log Normal	% of Non-Detects
As, tot	mg/L	25	0.0016	0.0011	0.0043	0.0005	0.0013	0.00	No / No	48.00
B, diss	mg/L	25	3.176	3.500	4.600	0.910	1.040	0.10	Yes / No	0.00
B, tot	mg/L	25	3.3360	3.6000	4.6000	1.2000	0.9652	0.04	No / No	0.00
Ba, tot	mg/L	12	0.0468	0.0390	0.1200	0.0320	0.0241	0.00	No / No	0.00
Be, tot	mg/L	12	0.00050	0.00050	0.00050	0.00050	0.00000	0.00	No / No	100.00
Ca, tot	mg/L	22	221.364	230.000	310.000	120.000	48.726	5.01	Yes / Yes	0.00
Cd,tot	mg/L	25	0.0005	0.0005	0.0005	0.0003	0.0001	0.00	No / No	100.00
Cl, tot	mg/L	25	16.752	16.000	30.000	9.200	5.504	1.57	Yes / Yes	0.00
Co, tot	mg/L	12	0.0010	0.0010	0.0025	0.0005	0.0005	0.00	No / No	100.00
Cr, tot	mg/L	12	0.0038	0.0023	0.0125	0.0020	0.0034	0.00	No / No	83.33
F, tot	mg/L	12	0.310	0.320	0.452	0.125	0.083	0.01	Yes / No	8.33
Hg, tot	mg/L	12	0.00010	0.00010	0.00010	0.00010	0.00000	0.00	No / No	100.00
Mn, diss	mg/L	25	0.051	0.019	0.340	0.001	0.086	0.00	No / Yes	8.00
Mn, tot	mg/L	25	0.168	0.085	0.780	0.012	0.203	0.01	No / Yes	0.00
Mo, tot	mg/L	3	0.0008	0.0005	0.0014	0.0005	0.0005	0.00	No / No	66.67
Pb, tot	mg/L	25	0.0024	0.0013	0.0100	0.0003	0.0028	0.00	No / Yes	36.00
Sb, tot	mg/L	12	0.0014	0.0015	0.0015	0.0010	0.0002	0.00	No / No	100.00
Se, tot	mg/L	12	0.0014	0.0013	0.0060	0.0005	0.0015	0.00	No / No	66.67
SO4, diss	mg/L	25	677.600	720.000	920.000	280.000	183.627	30.33	No / No	0.00
SO4, tot	mg/L	25	684.000	720.000	990.000	310.000	213.288	0.84	Yes / No	0.00
TDS	mg/L	24	1,388.333	1,500.000	2,000.000	840.000	270.373	0.00	Yes / No	0.00
Tl, tot	mg/L	12	0.0007	0.0005	0.0010	0.0005	0.0002	0.00	No / No	100.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

Coffeen
Ash Pond 2 - Statistical Summary for Select Monitoring Wells

User Supplied Information

Date Range: 03/11/2008 to 08/16/2016 **Option for LT Pts:** **x 0.5**
Locations: **APW-2,G151,G152,G153,G154,G270,G271,G272,G273,G274,G275,G281,G401,G402,G403,G404,G405**
Location **Type** **Class**
G281

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope Units/yr	Normal / Log Normal	% of Non-Detects
As, tot	mg/L	4	0.0015	0.0005	0.0043	0.0005	0.0019	0.00	No / No	75.00
B, tot	mg/L	4	0.0080	0.0075	0.0120	0.0050	0.0036	0.01	Yes / Yes	50.00
Ba, tot	mg/L	4	0.0893	0.0750	0.1400	0.0670	0.0341	-0.03	Yes / Yes	0.00
Be, tot	mg/L	4	0.00050	0.00050	0.00050	0.00050	0.00000	0.00	No / No	100.00
Ca, tot	mg/L	4	135.000	135.000	150.000	120.000	12.910	13.36	Yes / Yes	0.00
Cd,tot	mg/L	4	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00
Cl, tot	mg/L	4	67.750	71.000	74.000	55.000	8.655	-4.99	Yes / Yes	0.00
Co, tot	mg/L	4	0.0022	0.0010	0.0056	0.0010	0.0023	0.00	No / No	75.00
Cr, tot	mg/L	4	0.0043	0.0020	0.0110	0.0020	0.0045	-0.01	No / No	75.00
F, tot	mg/L	4	0.383	0.387	0.411	0.349	0.030	0.00	Yes / Yes	0.00
Hg, tot	mg/L	4	0.00010	0.00010	0.00010	0.00010	0.00000	0.00	No / No	100.00
Li, tot	mg/L	4	0.0070	0.0050	0.0130	0.0050	0.0040	-0.01	No / No	75.00
Mo, tot	mg/L	4	0.0008	0.0005	0.0015	0.0005	0.0005	0.00	No / No	75.00
Pb, tot	mg/L	4	0.0021	0.0008	0.0063	0.0005	0.0028	0.00	No / Yes	50.00
Ra-226,228, tot	pCi/L	4	0.7225	0.5910	1.4900	0.2180	0.5416	0.80	Yes / Yes	25.00
Sb, tot	mg/L	4	0.0015	0.0015	0.0015	0.0015	0.0000	0.00	No / No	100.00
Se, tot	mg/L	4	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00
SO4, tot	mg/L	4	330.000	325.000	370.000	300.000	31.623	68.72	Yes / Yes	0.00
TDS	mg/L	4	770.000	760.000	820.000	740.000	38.297	-28.65	Yes / Yes	0.00
Tl, tot	mg/L	4	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

Coffeen
Ash Pond 2 - Statistical Summary for Select Monitoring Wells

User Supplied Information

Date Range: 03/11/2008 to 08/16/2016 **Option for LT Pts:** **x 0.5**
Locations: **APW-2,G151,G152,G153,G154,G270,G271,G272,G273,G274,G275,G281,G401,G402,G403,G404,G405**
Location **Type** **Class**
G401

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope Units/yr	Normal / Log Normal	% of Non-Detects
As, tot	mg/L	4	0.0028	0.0028	0.0046	0.0010	0.0018	0.00	Yes / Yes	25.00
B, tot	mg/L	4	3.5750	3.4500	4.1000	3.3000	0.3594	0.79	Yes / Yes	0.00
Ba, tot	mg/L	4	0.0298	0.0260	0.0530	0.0140	0.0188	0.01	Yes / Yes	0.00
Be, tot	mg/L	4	0.00050	0.00050	0.00050	0.00050	0.00000	0.00	No / No	100.00
Ca, tot	mg/L	4	400.000	410.000	450.000	330.000	55.976	112.15	Yes / Yes	0.00
Cd,tot	mg/L	4	0.0007	0.0005	0.0012	0.0005	0.0003	0.00	No / No	75.00
Cl, tot	mg/L	4	4.475	4.450	6.000	3.000	1.408	0.61	Yes / Yes	0.00
Co, tot	mg/L	4	0.2600	0.2600	0.2800	0.2400	0.0183	0.05	Yes / Yes	0.00
Cr, tot	mg/L	4	0.0047	0.0037	0.0096	0.0020	0.0036	0.00	Yes / Yes	50.00
F, tot	mg/L	4	0.283	0.125	0.758	0.125	0.317	0.00	No / No	75.00
Hg, tot	mg/L	4	0.00031	0.00010	0.00093	0.00010	0.00042	0.00	No / No	75.00
Li, tot	mg/L	4	0.0505	0.0505	0.0550	0.0460	0.0037	-0.01	Yes / Yes	0.00
Mo, tot	mg/L	4	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00
Pb, tot	mg/L	4	0.0022	0.0018	0.0048	0.0005	0.0021	0.00	Yes / Yes	50.00
Ra-226,228, tot	pCi/L	4	1.3010	1.3150	1.6300	0.9440	0.3593	-0.17	Yes / Yes	0.00
Sb, tot	mg/L	4	0.0015	0.0015	0.0015	0.0015	0.0000	0.00	No / No	100.00
Se, tot	mg/L	4	0.0023	0.0015	0.0055	0.0005	0.0023	0.00	Yes / Yes	50.00
SO4, tot	mg/L	4	2,275.000	2,250.000	2,500.000	2,100.000	170.783	-390.59	Yes / Yes	0.00
TDS	mg/L	4	2,925.000	2,950.000	3,000.000	2,800.000	95.743	-185.33	Yes / Yes	0.00
Tl, tot	mg/L	4	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

Coffeen
Ash Pond 2 - Statistical Summary for Select Monitoring Wells

User Supplied Information

Date Range: 03/11/2008 to 08/16/2016 **Option for LT Pts:** **x 0.5**
Locations: **APW-2,G151,G152,G153,G154,G270,G271,G272,G273,G274,G275,G281,G401,G402,G403,G404,G405**
Location **Type** **Class**
G402

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope Units/yr	Normal / Log Normal	% of Non-Detects
As, tot	mg/L	4	0.0210	0.0235	0.0270	0.0100	0.0075	-0.02	Yes / Yes	0.00
B, tot	mg/L	4	6.5000	6.4500	7.4000	5.7000	0.7071	1.83	Yes / Yes	0.00
Ba, tot	mg/L	4	0.0810	0.0835	0.1100	0.0470	0.0259	-0.08	Yes / Yes	0.00
Be, tot	mg/L	4	0.00050	0.00050	0.00050	0.00050	0.00000	0.00	No / No	100.00
Ca, tot	mg/L	4	250.000	255.000	270.000	220.000	24.495	-21.49	Yes / Yes	0.00
Cd,tot	mg/L	4	0.0006	0.0005	0.0010	0.0005	0.0003	0.00	No / No	75.00
Cl, tot	mg/L	4	2.325	2.500	2.800	1.500	0.618	-1.11	Yes / Yes	0.00
Co, tot	mg/L	4	0.0139	0.0145	0.0190	0.0074	0.0048	0.00	Yes / Yes	0.00
Cr, tot	mg/L	4	0.0201	0.0205	0.0310	0.0085	0.0093	-0.03	Yes / Yes	0.00
F, tot	mg/L	4	0.294	0.343	0.367	0.125	0.114	0.17	No / No	25.00
Hg, tot	mg/L	4	0.00010	0.00010	0.00010	0.00010	0.00000	0.00	No / No	100.00
Li, tot	mg/L	4	0.0450	0.0450	0.0570	0.0330	0.0122	-0.03	Yes / Yes	0.00
Mo, tot	mg/L	4	0.0047	0.0047	0.0060	0.0033	0.0011	0.00	Yes / Yes	0.00
Pb, tot	mg/L	4	0.0138	0.0150	0.0180	0.0072	0.0046	-0.01	Yes / Yes	0.00
Ra-226,228, tot	pCi/L	4	3.1500	3.5500	4.4600	1.0400	1.5553	-2.49	Yes / Yes	0.00
Sb, tot	mg/L	4	0.0015	0.0015	0.0015	0.0015	0.0000	0.00	No / No	100.00
Se, tot	mg/L	4	0.0019	0.0018	0.0033	0.0005	0.0012	0.00	Yes / Yes	25.00
SO4, tot	mg/L	4	1,012.500	980.000	1,200.000	890.000	133.010	-392.46	Yes / Yes	0.00
TDS	mg/L	4	1,600.000	1,600.000	1,700.000	1,500.000	115.470	-346.15	No / No	0.00
Tl, tot	mg/L	4	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

Coffeen
Ash Pond 2 - Statistical Summary for Select Monitoring Wells

User Supplied Information

Date Range: 03/11/2008 to 08/16/2016 **Option for LT Pts:** **x 0.5**
Locations: **APW-2,G151,G152,G153,G154,G270,G271,G272,G273,G274,G275,G281,G401,G402,G403,G404,G405**
Location **Type** **Class**
G403

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope Units/yr	Normal / Log Normal	% of Non-Detects
As, tot	mg/L	4	0.0015	0.0011	0.0033	0.0005	0.0013	0.00	Yes / Yes	50.00
B, tot	mg/L	4	0.0360	0.0330	0.0640	0.0140	0.0213	-0.03	Yes / Yes	0.00
Ba, tot	mg/L	4	0.1675	0.1500	0.2400	0.1300	0.0499	0.14	Yes / Yes	0.00
Be, tot	mg/L	4	0.00050	0.00050	0.00050	0.00050	0.00000	0.00	No / No	100.00
Ca, tot	mg/L	4	89.500	74.500	140.000	69.000	33.887	49.18	No / Yes	0.00
Cd,tot	mg/L	4	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00
Cl, tot	mg/L	4	4.525	4.300	6.800	2.700	1.702	-4.64	Yes / Yes	0.00
Co, tot	mg/L	4	0.0015	0.0010	0.0029	0.0010	0.0010	0.00	No / No	75.00
Cr, tot	mg/L	4	0.0044	0.0041	0.0073	0.0020	0.0028	0.00	Yes / Yes	50.00
F, tot	mg/L	4	0.481	0.482	0.518	0.442	0.031	0.05	Yes / Yes	0.00
Hg, tot	mg/L	4	0.00010	0.00010	0.00010	0.00010	0.00000	0.00	No / No	100.00
Li, tot	mg/L	4	0.0050	0.0050	0.0050	0.0050	0.0000	0.00	No / No	100.00
Mo, tot	mg/L	4	0.0028	0.0026	0.0055	0.0005	0.0024	0.00	Yes / Yes	25.00
Pb, tot	mg/L	4	0.0013	0.0013	0.0021	0.0005	0.0009	0.00	No / No	50.00
Ra-226,228, tot	pCi/L	4	0.3674	0.1973	0.9680	0.1070	0.4057	0.85	Yes / Yes	25.00
Sb, tot	mg/L	4	0.0015	0.0015	0.0015	0.0015	0.0000	0.00	No / No	100.00
Se, tot	mg/L	4	0.0021	0.0005	0.0068	0.0005	0.0032	0.00	No / No	75.00
SO4, tot	mg/L	4	18.225	14.000	35.000	9.900	11.610	-30.93	Yes / Yes	0.00
TDS	mg/L	4	325.000	320.000	340.000	320.000	10.000	0.00	No / No	0.00
Tl, tot	mg/L	4	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

Coffeen
Ash Pond 2 - Statistical Summary for Select Monitoring Wells

User Supplied Information

Date Range: 03/11/2008 to 08/16/2016 **Option for LT Pts:** **x 0.5**
Locations: **APW-2,G151,G152,G153,G154,G270,G271,G272,G273,G274,G275,G281,G401,G402,G403,G404,G405**
Location **Type** **Class**
G404

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope Units/yr	Normal / Log Normal	% of Non-Detects
As, tot	mg/L	4	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00
B, tot	mg/L	4	2.0750	1.8500	3.2000	1.4000	0.8057	0.40	Yes / Yes	0.00
Ba, tot	mg/L	4	0.0473	0.0465	0.0550	0.0410	0.0064	0.00	Yes / Yes	0.00
Be, tot	mg/L	4	0.00050	0.00050	0.00050	0.00050	0.00000	0.00	No / No	100.00
Ca, tot	mg/L	4	107.250	110.000	120.000	89.000	13.048	7.16	Yes / Yes	0.00
Cd,tot	mg/L	4	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00
Cl, tot	mg/L	4	52.500	51.000	62.000	46.000	6.952	0.62	Yes / Yes	0.00
Co, tot	mg/L	4	0.0010	0.0010	0.0010	0.0010	0.0000	0.00	No / No	100.00
Cr, tot	mg/L	4	0.0020	0.0020	0.0020	0.0020	0.0000	0.00	No / No	100.00
F, tot	mg/L	4	0.166	0.125	0.287	0.125	0.081	0.00	No / No	75.00
Hg, tot	mg/L	4	0.00010	0.00010	0.00010	0.00010	0.00000	0.00	No / No	100.00
Li, tot	mg/L	4	0.0050	0.0050	0.0050	0.0050	0.0000	0.00	No / No	100.00
Mo, tot	mg/L	4	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00
Pb, tot	mg/L	4	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00
Ra-226,228, tot	pCi/L	4	1.1275	1.0655	2.0700	0.3090	0.8526	2.14	Yes / Yes	25.00
Sb, tot	mg/L	4	0.0015	0.0015	0.0015	0.0015	0.0000	0.00	No / No	100.00
Se, tot	mg/L	4	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00
SO4, tot	mg/L	4	165.000	165.000	190.000	140.000	23.805	-12.27	Yes / Yes	0.00
TDS	mg/L	4	555.000	570.000	620.000	460.000	68.069	-13.82	Yes / Yes	0.00
Tl, tot	mg/L	4	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

Coffeen
Ash Pond 2 - Statistical Summary for Select Monitoring Wells

User Supplied Information

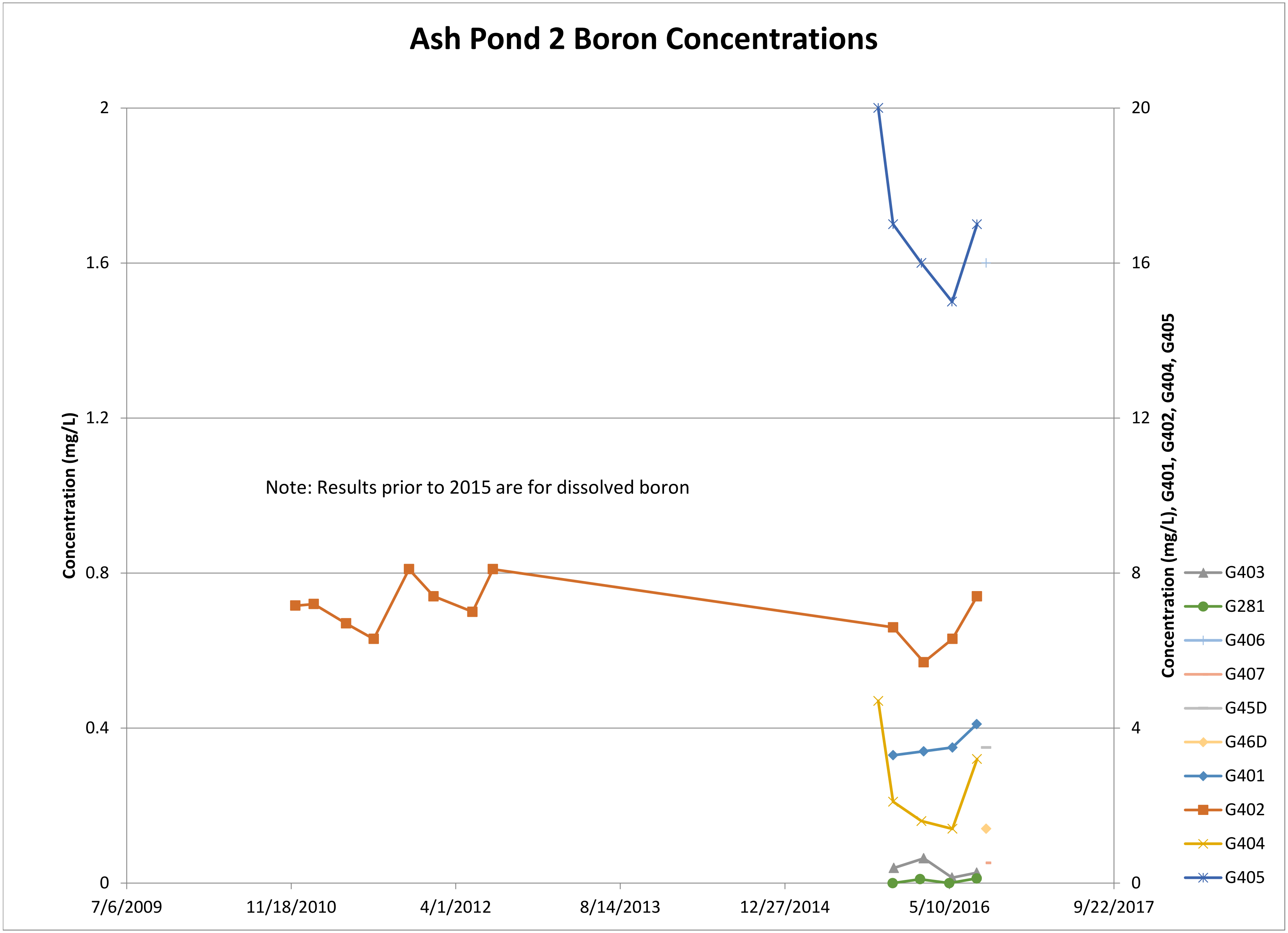
Date Range: 03/11/2008 to 08/16/2016 **Option for LT Pts:** **x 0.5**
Locations: **APW-2,G151,G152,G153,G154,G270,G271,G272,G273,G274,G275,G281,G401,G402,G403,G404,G405**
Location **Type** **Class**
G405

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope Units/yr	Normal / Log Normal	% of Non-Detects
As, tot	mg/L	4	0.0064	0.0046	0.0140	0.0025	0.0054	-0.01	Yes / Yes	0.00
B, tot	mg/L	4	16.2500	16.5000	17.0000	15.0000	0.9574	-1.96	Yes / Yes	0.00
Ba, tot	mg/L	4	0.0293	0.0240	0.0510	0.0180	0.0151	-0.01	Yes / Yes	0.00
Be, tot	mg/L	4	0.00050	0.00050	0.00050	0.00050	0.00000	0.00	No / No	100.00
Ca, tot	mg/L	4	312.500	320.000	330.000	280.000	22.174	-57.04	Yes / Yes	0.00
Cd,tot	mg/L	4	0.0007	0.0005	0.0012	0.0005	0.0003	0.00	No / No	75.00
Cl, tot	mg/L	4	9.425	10.150	14.000	3.400	4.462	-13.96	Yes / Yes	0.00
Co, tot	mg/L	4	0.0023	0.0022	0.0038	0.0010	0.0015	0.00	Yes / Yes	50.00
Cr, tot	mg/L	4	0.0028	0.0020	0.0051	0.0020	0.0016	0.00	No / No	75.00
F, tot	mg/L	4	0.396	0.457	0.544	0.125	0.185	-0.23	Yes / No	25.00
Hg, tot	mg/L	4	0.00010	0.00010	0.00010	0.00010	0.00000	0.00	No / No	100.00
Li, tot	mg/L	4	0.0050	0.0050	0.0050	0.0050	0.0000	0.00	No / No	100.00
Mo, tot	mg/L	4	0.0009	0.0008	0.0016	0.0005	0.0005	0.00	Yes / Yes	50.00
Pb, tot	mg/L	4	0.0034	0.0021	0.0085	0.0011	0.0034	-0.01	Yes / Yes	0.00
Ra-226,228, tot	pCi/L	4	0.6429	0.4678	1.3700	0.2660	0.4976	1.01	Yes / Yes	25.00
Sb, tot	mg/L	4	0.0015	0.0015	0.0015	0.0015	0.0000	0.00	No / No	100.00
Se, tot	mg/L	4	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00
SO4, tot	mg/L	4	1,700.000	1,700.000	1,800.000	1,600.000	81.650	-71.62	Yes / Yes	0.00
TDS	mg/L	4	2,325.000	2,300.000	2,500.000	2,200.000	150.000	-347.29	Yes / Yes	0.00
Tl, tot	mg/L	4	0.0005	0.0005	0.0005	0.0005	0.0000	0.00	No / No	100.00

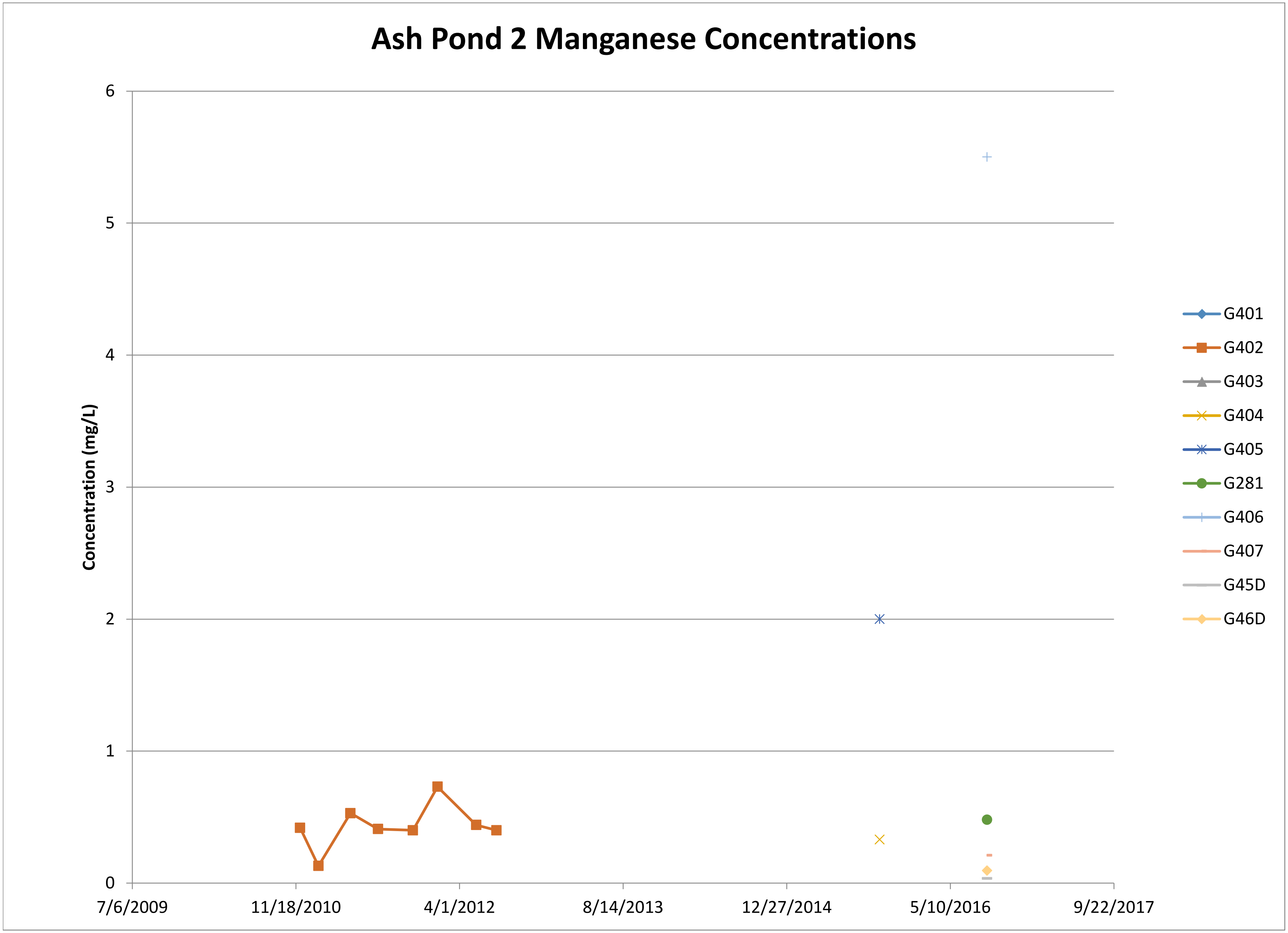
Shapiro-Wilk Normality test performed at 0.05 significance level.

APPENDIX G

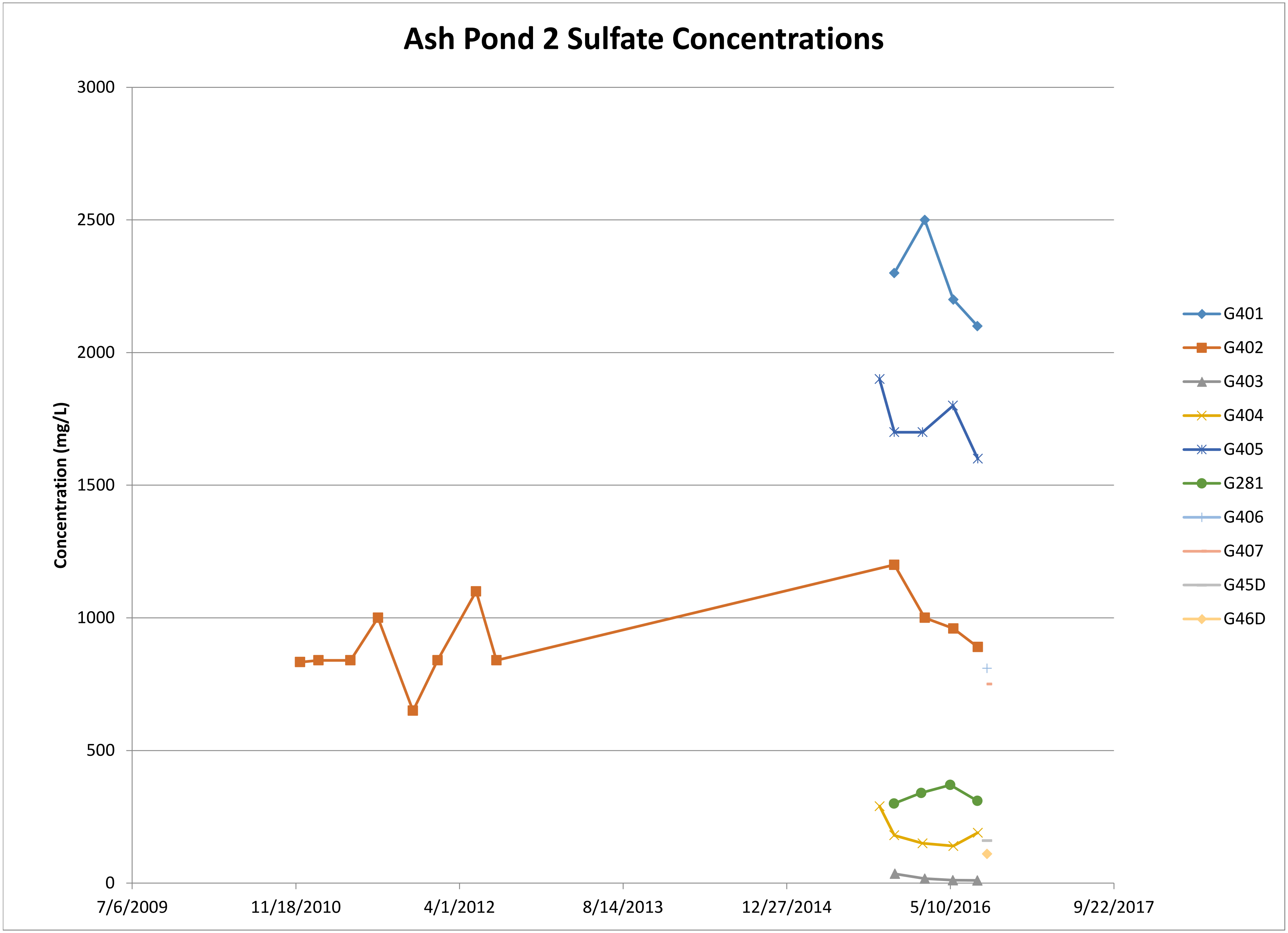
WATER QUALITY TREND GRAPHS



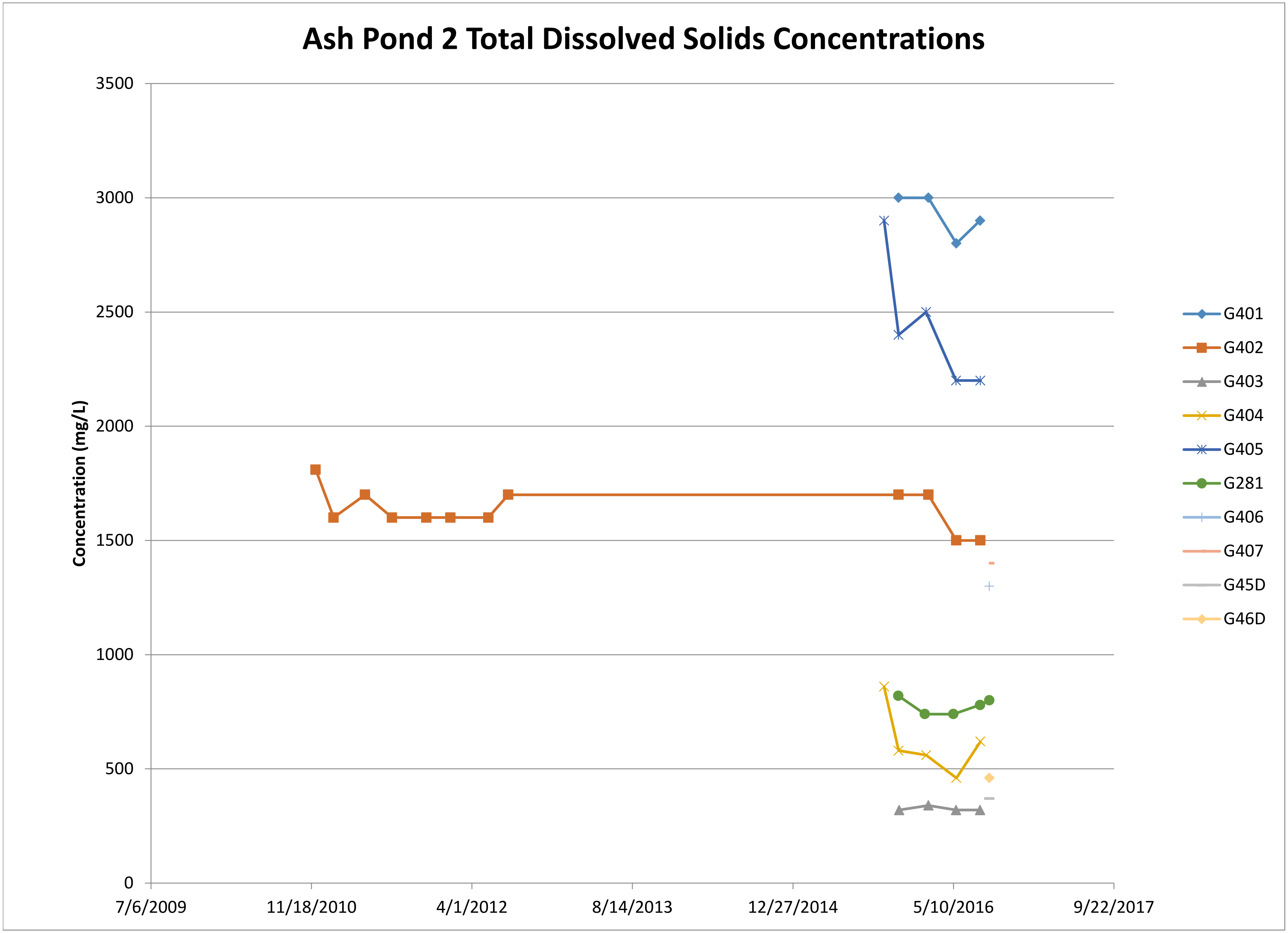
Ash Pond 2 Boron Concentrations
Note: Results prior to 2015 are for dissolved boron
Concentration (mg/L)
Concentration (mg/L), G401, G402, G404, G405
2
1.6
1.2
0.8
0.4
0
20
16
12
8
4
0
7/6/2009
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
G403
G281
G406
G407
G45D
G46D
G401
G402
G404
G405



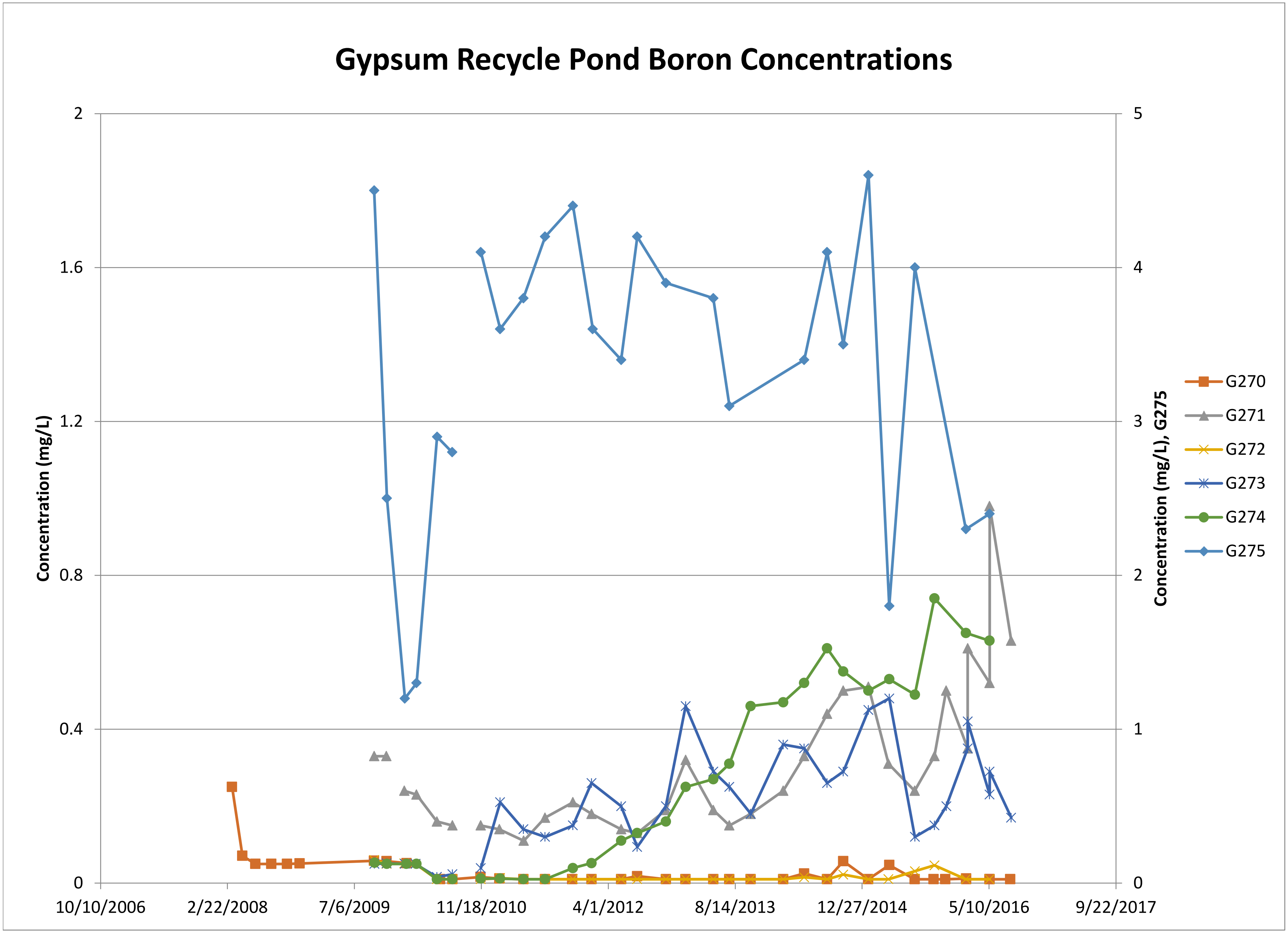
Ash Pond 2 Manganese Concentrations
Concentration (mg/L)
0
1
2
3
4
5
6
7/6/2009
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
G401
G402
G403
G404
G405
G281
G406
G407
G45D
G46D



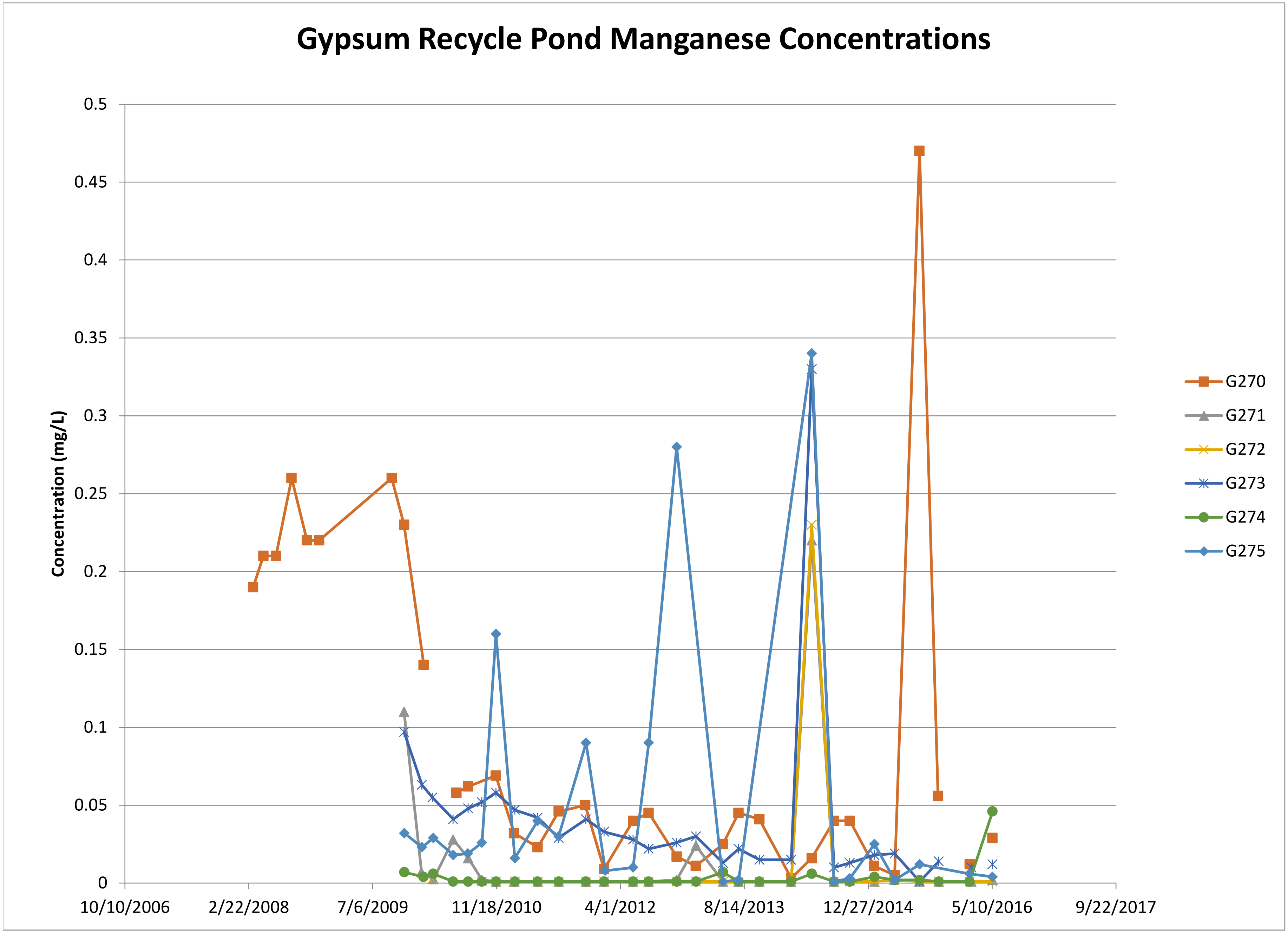
Ash Pond 2 Sulfate Concentrations
Concentration (mg/L)
3000
2500
2000
1500
1000
500
0
7/6/2009
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
G401
G402
G403
G404
G405
G281
G406
G407
G45D
G46D

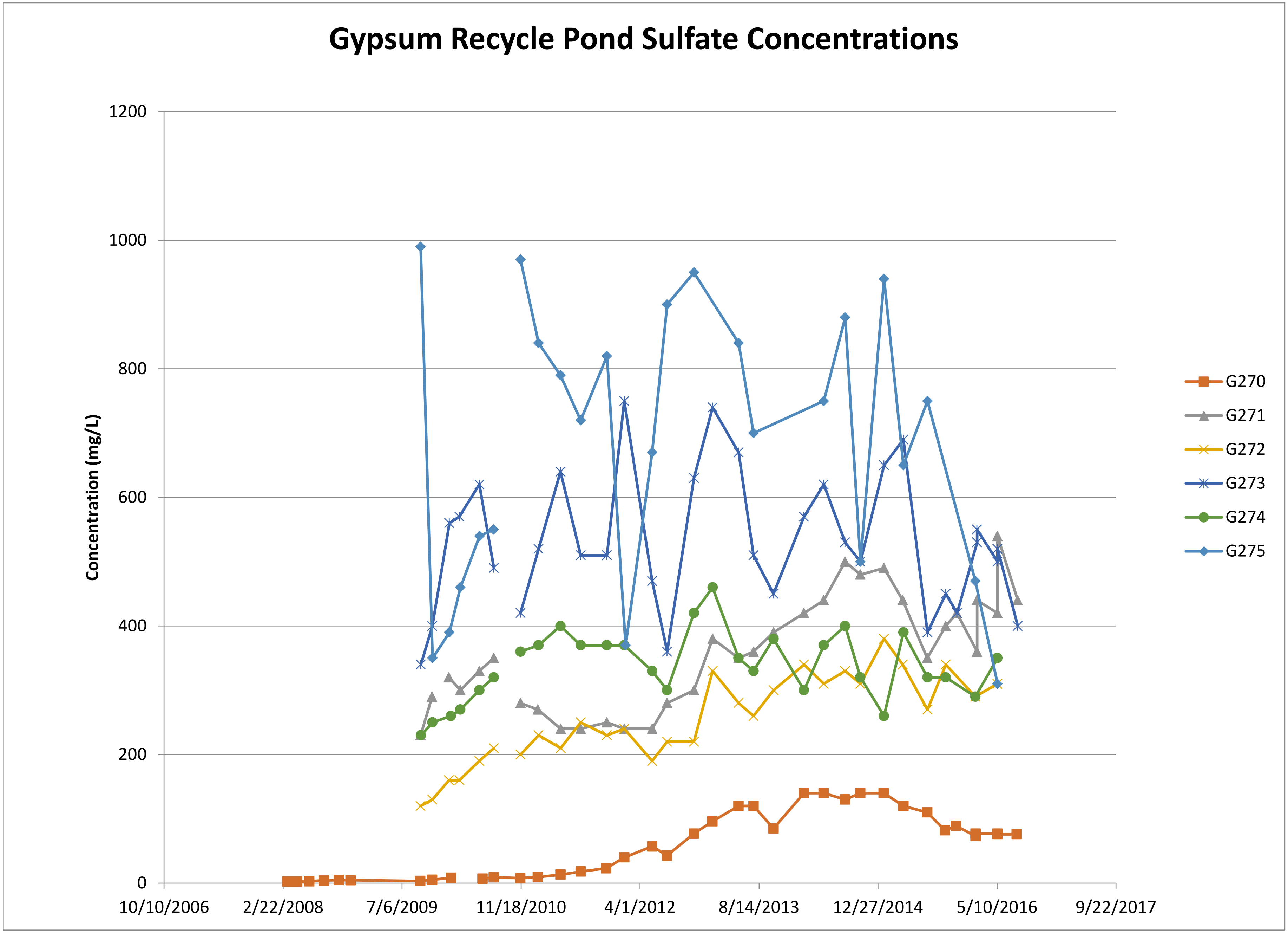


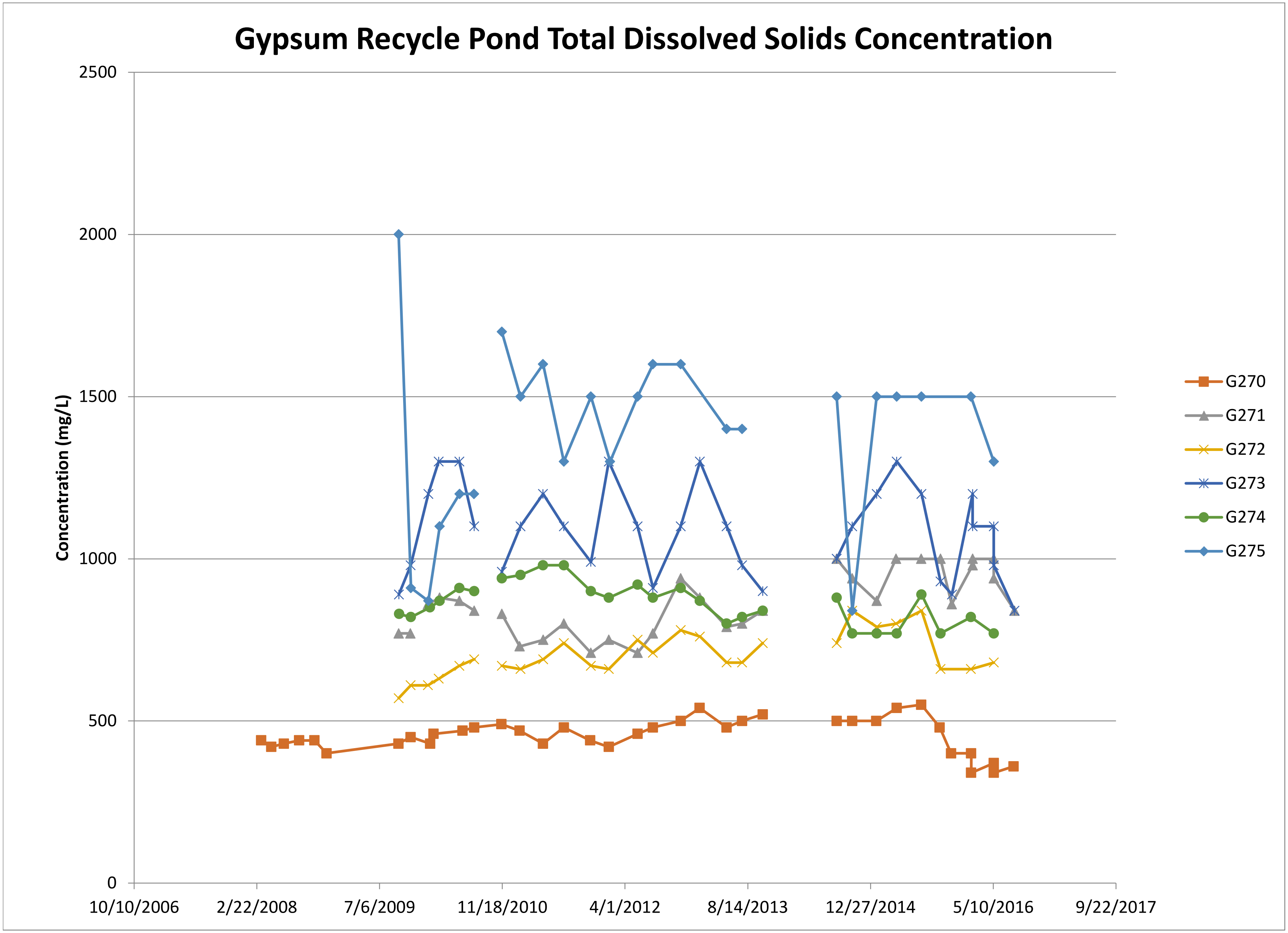
Ash Pond 2 Total Dissolved Solids Concentrations
Concentration (mg/L)
3500
3000
2500
2000
1500
1000
500
0
7/6/2009
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
G401
G402
G403
G404
G405
G281
G406
G407
G45D
G46D



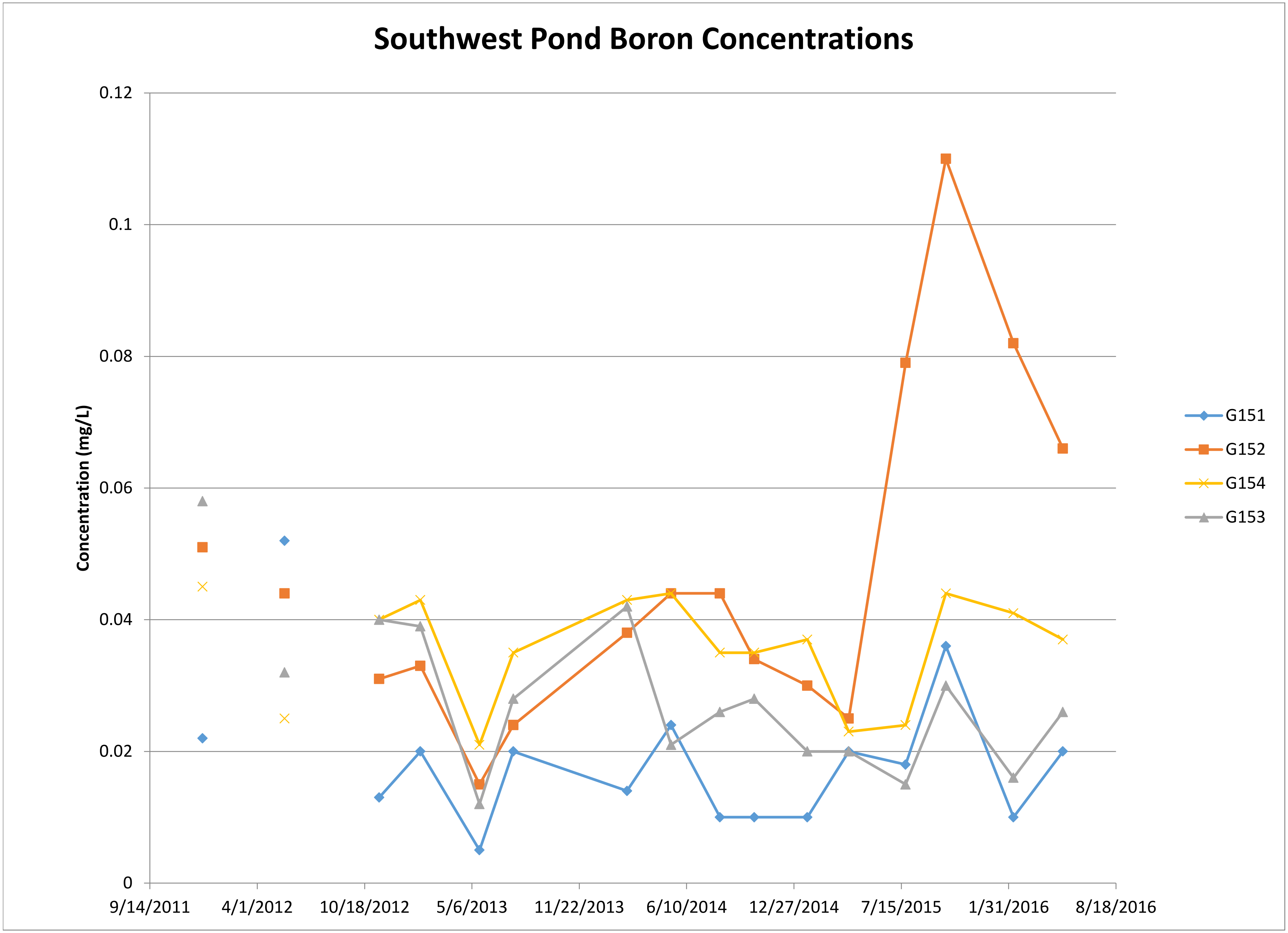
Gypsum Recycle Pond Boron Concentrations
Concentration (mg/L)
Concentration (mg/L), G275
2
1.6
1.2
0.8
0.4
0
5
4
3
2
1
0
10/10/2006
2/22/2008
7/6/2009
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
G270
G271
G272
G273
G274
G275


Gypsum Recycle Pond Manganese Concentrations
Concentration (mg/L)
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
10/10/2006
2/22/2008
7/6/2009
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
G270
G271
G272
G273
G274
G275

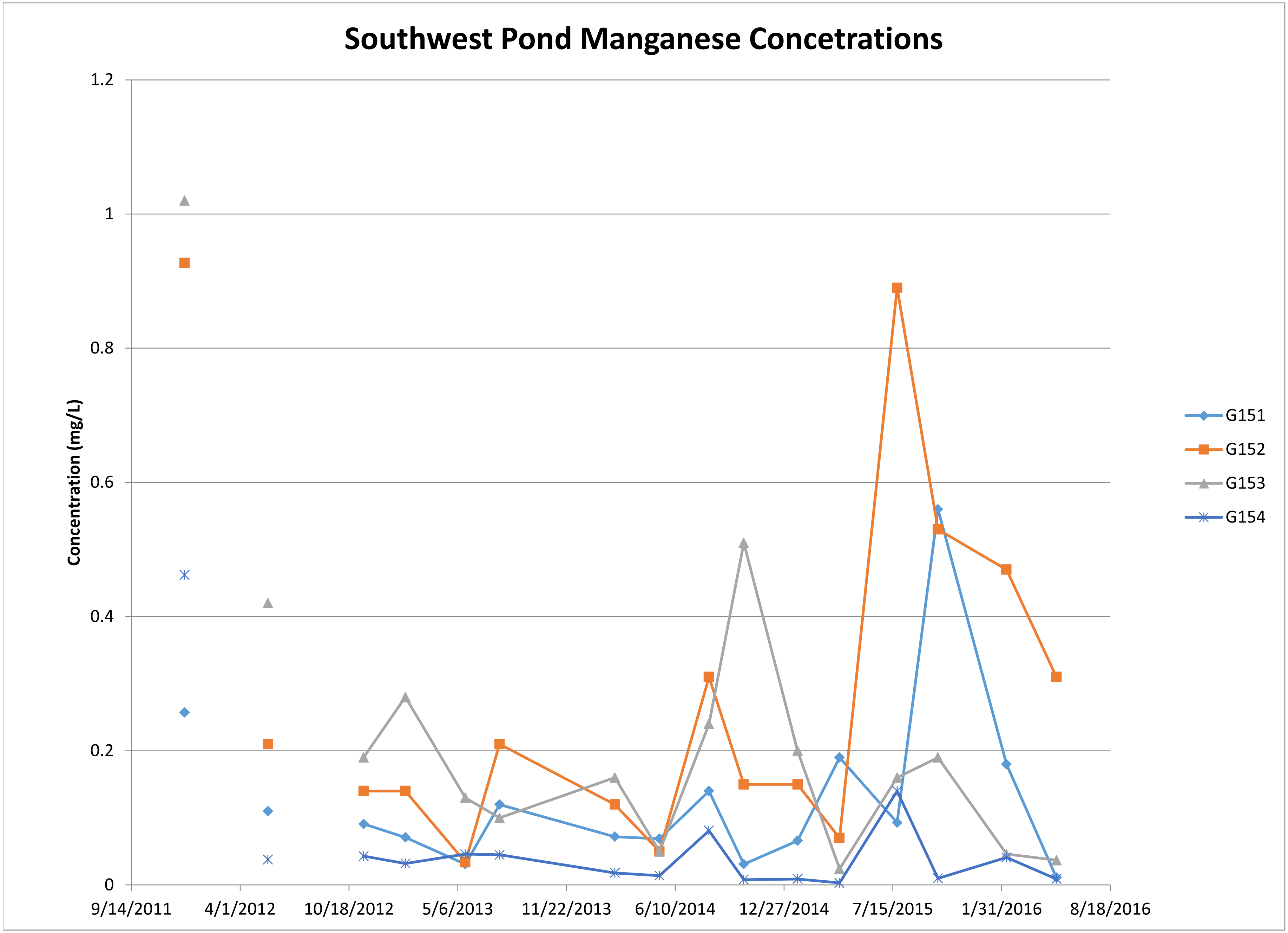

Gypsum Recycle Pond Sulfate Concentrations
Concentration (mg/L)
0
200
400
600
800
1000
1200
10/10/2006
2/22/2008
7/6/2009
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
G270
G271
G272
G273
G274
G275



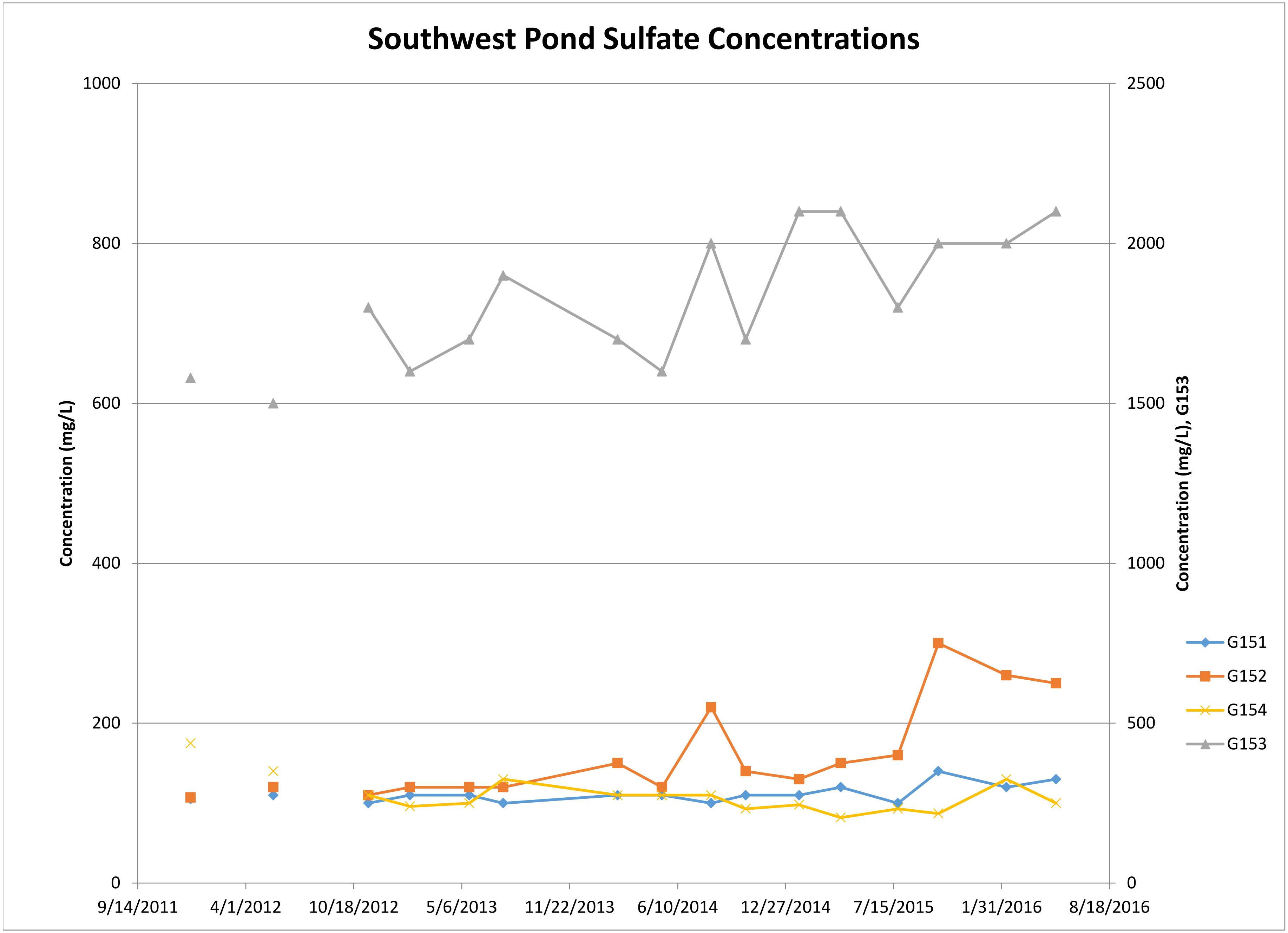
Gypsum Recycle Pond Total Dissolved Solids Concentration
Concentration (mg/L)
2500
2000
1500
1000
500
0
10/10/2006
2/22/2008
7/6/2009
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
G270
G271
G272
G273
G274
G275



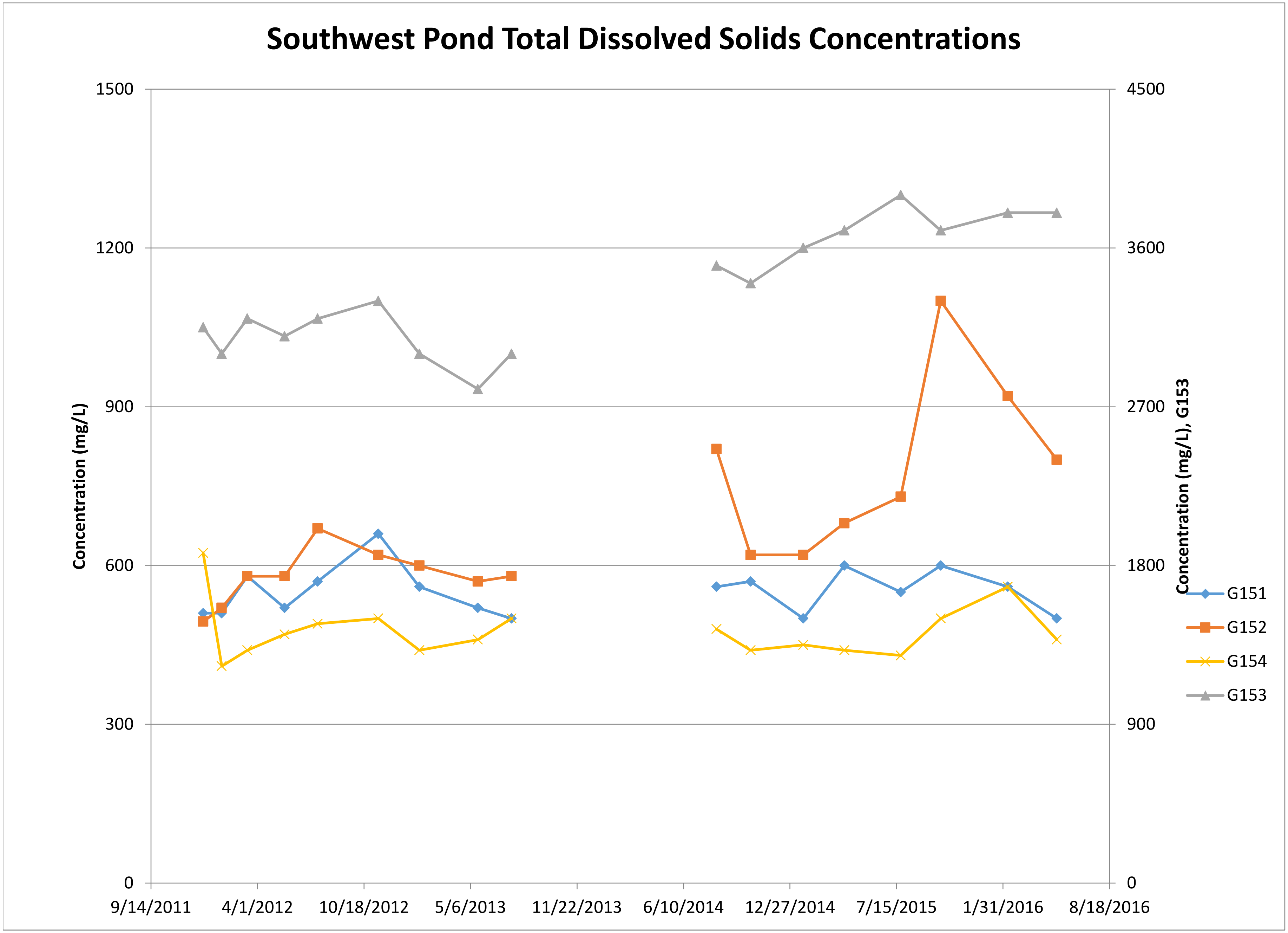
Southwest Pond Boron Concentrations
Concentration (mg/L)
0.12
0.1
0.08
0.06
0.04
0.02
0
9/14/2011
4/1/2012
10/18/2012
5/6/2013
11/22/2013
6/10/2014
12/27/2014
7/15/2015
1/31/2016
8/18/2016
G151
G152
G154
G153



Southwest Pond Manganese Concetrations
Concentration (mg/L)
1.2
1
0.8
0.6
0.4
0.2
0
9/14/2011
4/1/2012
10/18/2012
5/6/2013
11/22/2013
6/10/2014
12/27/2014
7/15/2015
1/31/2016
8/18/2016
G151
G152
G153
G154



Southwest Pond Sulfate Concentrations
Concentration (mg/L)
Concentration (mg/L), G153
1000
800
600
400
200
0
2500
2000
1500
1000
500
0
9/14/2011
4/1/2012
10/18/2012
5/6/2013
11/22/2013
6/10/2014
12/27/2014
7/15/2015
1/31/2016
8/18/2016
G151
G152
G154
G153



Southwest Pond Total Dissolved Solids Concentrations
1500
1200
900
600
300
0
4500
3600
2700
1800
900
0
Concentration (mg/L)
Concentration (mg/L), G153
9/14/2011
4/1/2012
10/18/2012
5/6/2013
11/22/2013
6/10/2014
12/27/2014
7/15/2015
1/31/2016
8/18/2016
G151
G152
G154
G153

ATTACHMENT I

ENVIRONMENT
& HEALTH

Illinois Power Generating Company
134 CIPS Lane
Coffeen, IL 62017

Groundwater Monitoring Plan Addendum for Ash Pond No. 2
Coffeen Power Plant, Coffeen, IL

October 25, 2021

Ramboll
234 W. Florida Street
Fifth Floor
Milwaukee, WI 53204
USA

T 414-837-3607
F 414-837-3608
www.ramboll.com

Ref. 1940100806-002

Ramboll Americas Engineering Solutions, Inc. (Ramboll) is providing the attached Addendum to the Groundwater Monitoring Plan (GMP) for inclusion in the Operating Permit Applications as required under Title 35 of the Illinois Administrative Code (35 I.A.C.), § 845.230 and allowed under 35 I.A.C. § 845.210(d)(1). The GMP was previously submitted to and approved by Illinois Environmental Protection Agency (IEPA) as part of the *Closure and Post-Closure Care Plan for the Coffeen Ash Pond No. 2* (Closure Plan; AECOM, 2017) submitted for Coffeen Power Plant (CPP) Ash Pond Number (No.) 2 (AP2), Vistra Identification (ID) No. 102, IEPA ID No. W1350150004-02, National Inventory of Dams (NID) No. IL50723.

In addition to the historical documents, Ramboll is providing an Addendum to the CPP AP2 GMP (Attachment 1), that modifies the existing monitoring program and network to align with Part 845. Upon issuance of the Operating Permit, groundwater monitoring will be performed as specified in the Addendum.

BACKGROUND

AECOM submitted the Closure Plan, dated January 26, 2017. Included in Appendix A and B of the Closure Plan were the Hydrogeologic Site Characterization Report and GMP. IEPA provided comments on the Closure Plan in a letter dated October 27, 2017. A response to comment letter submitted by Illinois Power Generating Company (IPGC) dated November 27, 2017 included revisions to the GMP, which defined groundwater monitoring for AP2 following approval of the Closure Plan (Attachment 2). The Closure Plan was approved by IEPA in a letter dated January 30, 2018. Closure of AP2 was completed on November 17, 2020.

On April 21, 2021, 35 I.A.C. § 845 became effective, and 35 I.A.C. § 845.100(i) provides the following with respect to certain CCR units closed prior to the effective date:

> *i) If a CCR surface impoundment has completed an Agency-approved closure before April 21, 2021, this Part does not require the owner or operator of the CCR surface impoundment to resubmit to the Agency any closure plan, closure report, or closure certification for that completed closure.*

SUBMITTALS

The attached documents are being provided to address requirements of 35 I.A.C. § 845.230 as follows:

- Addendum to the CPP AP2 Groundwater Monitoring Plan (new submittal, Attachment 1). This Addendum includes revisions to the monitoring well network, analytical parameters, and statistical procedures included in the previously submitted Groundwater Monitoring Plan (Natural Resource Technology, Inc. [NRT], 2016). These modifications are proposed to meet and fulfill the requirements in 35 I.A.C. § 845.630 and 35 I.A.C. § 845.640 (Groundwater Monitoring Systems and Statistical Procedures); and 35 I.A.C. § 845.650(b) (background samples). The proposed modifications were identified and developed using existing and previously approved documents, but additional information has been provided where necessary.
- Groundwater Monitoring Plan, dated January 24, 2017, and subsequent Response to Comments (Attachment 2). This attachment provides a copy of the existing groundwater monitoring plan as it was approved by IEPA.

Sincerely,

Eric J. Tlachac, PE
Senior Managing Engineer

D +1 414 837 3541
M +1 262 719 4526
eric.tlachac@ramboll.com

Brian G. Hennings, PG
Senior Managing Hydrogeologist

D +1 414 837 3524
M +1 262 719 4512
brian.hennings@ramboll.com

ATTACHMENTS:

Attachment 1	Addendum to the Groundwater Monitoring Plan
Attachment 2	Groundwater Monitoring Plan, dated January 24, 2017 and Response to Comment Letter dated November 27, 2017

ATTACHMENT 1
ADDENDUM TO THE GROUNDWATER MONITORING PLAN

Intended for
Illinois Power Generating Company

Date
October 25, 2021

Project No.
1940100806-002

ADDENDUM TO THE GROUNDWATER MONITORING PLAN

ASH POND NO. 2
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL Bright ideas. Sustainable change.

ADDENDUM TO THE GROUNDWATER MONITORING PLAN COFFEEN POWER PLANT ASH POND NO. 2

Project name	**Coffeen Power Plant Ash Pond No. 2**
Project no.	**1940100806-002**
Recipient	**Illinois Power Generating Company**
Document type	**Addendum to the Groundwater Monitoring Plan**
Revision	**FINAL**
Date	**October 25, 2021**
Prepared by	**Kristen L. Theesfeld**

Ramboll
234 W. Florida Street
Fifth Floor
Milwaukee, WI 53204
USA

T 414-837-3607
F 414-837-3608
https://ramboll.com

Brian G. Hennings, PG
Senior Managing Hydrogeologist

Eric J. Tlachac, PE
Senior Managing Engineer

Nathaniel R. Keller
Senior Hydrogeologist

Kristen L. Theesfeld
Hydrogeologist

LICENSED PROFESSIONAL CERTIFICATIONS

35 I.A.C. § 845.630 Groundwater Monitoring Systems (PE)

I, Eric J. Tlachac, a qualified professional engineer in good standing in the State of Illinois, certify that the groundwater monitoring system described in this document (Addendum to the Groundwater Monitoring Plan, Coffeen Power Plant Ash Pond No. 2), meets the intent of 35 I.A.C. § 845.630. The monitoring system was developed based on information included in the IEPA approved Hydrogeologic Site Characterization Report submitted with the IEPA approved Closure and Post Closure Care Plan.

____

Eric J. Tlachac
Qualified Professional Engineer
062-063091
Illinois
Date: October 25, 2021

35 I.A.C. § 845.630 Groundwater Monitoring Systems (PG)

I, Brian G. Hennings, a qualified professional geologist in good standing in the State of Illinois, certify that the groundwater monitoring system described in this document (Addendum to the Groundwater Monitoring Plan, Coffeen Power Plant Ash Pond No. 2), meets the intent of 35 I.A.C. § 845.630. The monitoring system was developed based on information included in the IEPA approved Hydrogeologic Site Characterization Report submitted with the IEPA approved Closure and Post Closure Care Plan.

____

Brian G. Hennings
Professional Geologist
196.001482
Illinois
Date: October 25, 2021

CONTENTS

TABLES (IN TEXT)

TABLES (ATTACHED)

FIGURES (ATTACHED)

APPENDICES

ACRONYMS AND ABBREVIATIONS

§	Section
35 I.A.C.	Title 35 of the Illinois Administrative Code
77 I.A.C.	Title 77 of the Illinois Administrative Code
40 C.F.R.	Title 40 of the Code of Federal Regulations
AP2	Ash Pond No. 2
ASD	Alternate Source Demonstration
bgs	below ground surface
CCR	coal combustion residuals
Closure Plan	*Closure and Post-Closure Care Plan for the Coffeen Ash Pond No. 2*
cm/s	centimeters per second
CPP	Coffeen Power Plant
GMF	Gypsum Management Facility
GMP	Groundwater Monitoring Plan
GWPS	Groundwater Protection Standard
ID	Identification
IEPA	Illinois Environmental Protection Agency
IPGC	Illinois Power Generating Company
LCU	lower confining unit
mg/L	milligrams per liter
NA	not applicable
NID	National Inventory of Dams
No.	Number
NRT	Natural Resource Technology, Inc.
Part 845	Residuals in Surface Impoundments: Title 35 of the Illinois Administrative Code § 845
QA/QC	quality assurance/quality control
Ramboll	Ramboll Americas Engineering Solutions, Inc.
RL	Reporting Limit
SI	Surface Impoundment
SW	surface water
TDS	total dissolved solids
UA	uppermost aquifer
USEPA	United States Environmental Protection Agency
WLO	water level only

1. INTRODUCTION

1.1 Overview

In accordance with requirements of the Standards for the Disposal of Coal Combustion Residuals (CCR) in Surface Impoundments (SIs): Title 35 of the Illinois Administrative Code (35 I.A.C.) Section (§) 845 (Part 845) (Illinois Environmental Protection Agency [IEPA], April 15 2021), Ramboll Americas Engineering Solutions, Inc. (Ramboll) has prepared this Addendum to the Groundwater Monitoring Plan (GMP) on behalf of Coffeen Power Plant (CPP) (**Figure 1-1**), operated by Illinois Power Generating Company (IPGC). This Addendum applies specifically to the CCR Unit referred to as Ash Pond Number (No.) 2 (AP2; Vistra identification [ID] No. 102, IEPA ID No. W1350150004-02, and National Inventory of Dams [NID] No. IL50723) (**Figure 1-2**). AP2 is a closed, unlined CCR SI that was previously used to manage CCR and non-CCR waste streams at the CPP.

AECOM submitted the *Closure and Post-Closure Care Plan for the Coffeen Ash Pond No. 2* (Closure Plan) dated January 26, 2017, which was approved by the IEPA on January 30, 2018. The Groundwater Monitoring Plan (Natural Resource Technology, Inc. [NRT], 2017a) defined groundwater monitoring for AP2 following approval of the Closure Plan. Closure of AP2 was completed on November 17, 2020.

On April 21, 2021, Part 845 became effective, and for CCR units closed prior to the effective date the following section was included (35 I.A.C. § 845.100(i)):

> *If a CCR surface impoundment has completed an Agency-approved closure before April 21, 2021, this Part does not require the owner or operator of the CCR surface impoundment to resubmit to the Agency any closure plan, closure report, or closure certification for that completed closure.*

This Addendum includes modifications to the previously approved GMP to provide content required by 35 I.A.C. § 845.630 (Groundwater Monitoring System), 35 I.A.C. 845.640 (Groundwater Sampling and Analysis), and 35 I.A.C. 845.650 (Groundwater Monitoring Program) for AP2. Specifically, this Addendum incorporates additional monitoring wells and monitoring parameters specified in 35 I.A.C. § 845.600.

1.2 Purpose and Scope

The purpose of this Addendum is to provide updated GMP text, tables, and figures to incorporate modifications made to the existing monitoring program to comply with Part 845. Following issuance of the Part 845 Operating Permit, the application for which this Addendum is attached, groundwater monitoring at AP2 will include the following:

- Monitoring required by Title 40 of the Code of Federal Regulations (40 C.F.R.) § 257 Subpart D (pre-existing with no modifications)
- Part 845 Monitoring (proposed)

Details of the monitoring programs (schedules and parameters), monitoring well networks, and analysis (statistical methods) are included in this Addendum. No changes are proposed to the monitoring networks utilized for the current 40 C.F.R. § 257 Subpart D monitoring; however, those details have been included for completeness. Additional information regarding the hydrogeology and groundwater quality were included with the Closure Plan and are not reproduced in this Addendum.

2. GROUNDWATER MONITORING SYSTEMS

The Part 845 groundwater monitoring network for AP2 was developed to monitor post-closure groundwater quality and trends and demonstrate compliance with the applicable groundwater quality standards identified in **Section 3**. The existing and 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 40 C.F.R. § 257 and 35 I.A.C. § 845.600.

The monitoring wells are designed and constructed in a manner consistent with the standards of 40 C.F.R. § 257 and Title 77 of the Illinois Administrative Code (77 I.A.C.) § 920.170, as required by 35 I.A.C. § 845.630(e), 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.

Consistent with applicable standards, the 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 AP2.
- 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.

Groundwater monitoring at AP2 is currently being performed in accordance with the GMP that was approved in the Closure Plan. The Closure Plan specified one monitoring network, that complies with both the IEPA Closure Plan monitoring requirements and the 40 C.F.R. § 257 monitoring requirements. This Addendum proposes additions to that network which were developed to comply with the requirements of Part 845. It is anticipated that upon acceptance and approval of the Operating Permit application (and by extension the GMP) for the CPP and upon acceptance and approval of Part 845 by the United States Environmental Protection Agency (USEPA) as a State CCR Permit Program, the Part 845 monitoring program will supersede the Closure Plan and 40 C.F.R. § 257 monitoring program.

2.1 IEPA Closure Plan Monitoring Program

The approved IEPA Closure Plan monitoring well network consists of fourteen groundwater monitoring wells used to monitor the uppermost aquifer, including three background wells (G270, G280, and G281) and eleven compliance wells (G154, G279, G401, G402, G403, G404, G405, G406, G407, G410, and G411). These wells are monitored in accordance with Water Pollution Control Permit 2020-EA-65027-1 Special Condition No. 6. The well locations are shown on **Figure 2-1**.

The GMP established a monitoring program that meets the requirements of 35 I.A.C. § 620.410 and groundwater samples are collected quarterly and analyzed for the parameters listed in **Table A** below.

Table A. IEPA Closure Plan Groundwater Monitoring Program Parameters

Field Parameters		
pH	Temperature	Turbidity
Dissolved Oxygen	Oxidation/Reduction Potential	Specific Conductance
Static Water Elevation	Depth of Well	Depth to Water
Elevation of Groundwater Surface		
Inorganics (Total, except Total Dissolved Solids [TDS])		
Chloride	Fluoride	Sulfate
Cyanide	Nitrate-Nitrogen	TDS
Metals (Total)		
Antimony	Cadmium	Lithium
Arsenic	Calcium	Mercury
Barium	Chromium	Molybdenum
Beryllium	Cobalt	Selenium
Boron	Lead	Thallium
Metals (Dissolved)		
Aluminum	Iron	Silver
Arsenic	Lead	Vanadium
Boron	Manganese	Zinc
Copper	Nickel	
Other (Total)		
Radium 226 and 228 combined		

2.2 40 C.F.R. § 257 Monitoring Program

The 40 C.F.R. § 257 monitoring well network consists of seven of the same groundwater monitoring wells used to monitor the uppermost aquifer, including two background wells (G270 and G281) and five compliance wells (G401, G402, G403, G404, and G405).

Assessment monitoring in accordance with 40 C.F.R. § 257.95 was initiated on April 9, 2018. Details on the procedures and techniques used to fulfill the groundwater sampling and analysis program requirements are found in the Sampling and Analysis Plan for AP2 (NRT, 2017b).

Groundwater samples are collected semi-annually and analyzed for the following laboratory and field parameters from Appendix III and Appendix IV of 40 C.F.R. § 257, summarized in **Table B** below.

Table B. 40 C.F.R. § 257 Groundwater Monitoring Program Parameters

Field Parameters[1]			
Groundwater Elevation	pH		
Appendix III Parameters (Total, except TDS)			
Boron	Chloride	Sulfate	
Calcium	Fluoride	TDS	
Appendix IV Parameters (Total)			
Antimony	Cadmium	Lithium	Selenium
Arsenic	Chromium	Mercury	Thallium
Barium	Cobalt	Molybdenum	Radium 226 and 228 combined
Beryllium	Lead		

[1]Dissolved oxygen, temperature, specific conductance, oxidation/reduction potential, and turbidity are recorded during sample collection.

2.3 Proposed Part 845 Monitoring Well Network

2.3.1 Proposed Additional Wells to the Current IEPA Closure Plan Monitoring

The land between AP2 and the Unnamed Tributary underwent significant improvement during closure construction which made areas, that were previously inaccessible, available for monitoring well construction. In 2021, additional monitoring wells G1001 and G1003 were completed between the eastern edge of AP2 and the Unnamed Tributary (**Figure 2-1**) targeting the uppermost aquifer (Hagarstown Member), which is classified as primarily sandy to gravelly silts and clays with thin beds of sands. No sand layers were observed in the soil boring at G1001 (**Appendix A**); however, a well was screened from 6 to 11 feet below ground surface (bgs) within the LCU and yields water. Sand layers were observed in the soil boring at G1003 (**Appendix A**) and the well was screened across sandy deposits from 8 to 12 feet bgs; however, this well has not yielded water (no measurable groundwater) since construction in May of 2021. Well G1001 is proposed as an additional well to the network for monitoring groundwater downgradient of AP2. Well G1003 will continue to be monitored for the presence of groundwater.

2.3.2 Proposed Reduction of Wells from Current IEPA Closure Plan Monitoring

Monitoring wells G154, G279, G407, G410, and G411 were included in the IEPA groundwater monitoring plan to monitor sulfate in groundwater that could be attributed to AP2. With the exception of well G407, these wells are proposed for removal from the AP2 monitoring well network as described below:

- Monitoring wells G154, G410, and G411. Groundwater elevation measurements collected from these wells confirm the presence of a groundwater divide located west of AP2 (**Figure 2-2**). Groundwater on the east side of the divide flows toward the Unnamed Tributary while groundwater on the west side of the divide flows toward the western lobe of Coffeen Lake. AP2 is located on the eastern side of the divide; therefore, these wells on the west side of the divide are not downgradient of AP2. Additionally, minimum, maximum, and median sulfate concentrations observed from March 2018 to August 2021 in wells (G154, G410, and G411) have not had concentrations greater than the groundwater protection standard (GWPS) of 400 milligrams per liter (mg/L) as presented in **Table C** below.

- Monitoring well G279. This well is located along the eastern edge of another CCR unit, the Gypsum Management Facility [GMF] Recycle Pond (Vistra ID No. 104, IEPA ID No. W1350150004-04, and NID No. IL50578). G279 is part of the 40 C.F.R. § 257 monitoring well network and the proposed Part 845 monitoring well network for the GMF Recycle Pond; therefore, this well will be removed from the AP2 monitoring network.

Table C. Summary of Sulfate Concentrations for Wells G154, G407, G410, and G411 from March 2018 through August 2021.

Location	Count	Minimum (mg/L)	Maximum (mg/L)	Median (mg/L)
G154	16	74	160	79
G407	16	400	1600	1100
G410	16	31	55	41
G411	16	110	300	250

Groundwater monitoring well G407 is also located on the east side of the groundwater divide and sulfate concentrations have been steadily decreasing since the well was installed; however, this well will be retained in the proposed monitoring network to continue to monitor potential sulfate exceedances consistent with the existing permit.

2.3.3 Proposed Monitoring Network

The groundwater monitoring network proposed in this plan will include eleven wells screened in the uppermost aquifer, or the LCU where the uppermost aquifer is absent (G270, G280, G281, G401, G402, G403, G404, G405, G406, G407, and G1001). The proposed network is summarized in **Table D** below and displayed on **Figure 2-3**. Eleven wells (three background and eight compliance) will be used to monitor groundwater concentrations within the uppermost aquifer, or the LCU where the uppermost aquifer is absent. Surface water elevations will be monitored at three staff gauges: SG02, monitoring the former discharge flume; SG03, monitoring the eastern lobe of Coffeen Lake; and SG04, monitoring the Unnamed Tributary.

The groundwater samples collected from the eleven wells will be 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 proposed monitoring wells will 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)). Monitoring well depths and construction details are listed in **Table 2-1** and summarized in **Table D** below.

Table D. Proposed Part 845 Monitoring Well Network

Well ID	Monitored Unit	Well Screen Interval (feet bgs)	Well Type [1]
G270	UA	13.1-17.9	Background
G280	UA	12.8-17.6	Background
G281	UA	15.5-20.2	Background
G401	UA	14.4-18.8	Compliance
G402	UA	10-20	Compliance
G403	UA	13.1-17.8	Compliance
G404	UA	6.4-11.2	Compliance
G405	UA	9.0-13.8	Compliance
G406	UA	13.6-18.4	Compliance
G407	UA	13.8-18.6	Compliance
G1001	LCU	6-11	Compliance
SG02	SW	NA	WLO
SG03	SW	NA	WLO
SG04	SW	NA	WLO

[1] Well type refers to the role of the well in the monitoring network.
bgs = below ground surface
LCU = lower confining unit
NA = not applicable
SW = surface water
UA = uppermost aquifer
WLO = water level only

2.4 Well Abandonment

No wells are currently proposed for abandonment.

3. APPLICABLE GROUNDWATER QUALITY STANDARDS

3.1 Groundwater Classification

The 35 I.A.C. § 620 groundwater classification at AP2 was presented in the GMP (NRT, 2017a) and is summarized here. Groundwater at AP2 meets the definition of Class I - Potable Resource Groundwater (35 I.A.C. § 620.210) based on the following criteria:

- Groundwater in the uppermost aquifer is located 10 feet or more below the land surface and within,
- A geologic material which is capable of a hydraulic conductivity of 1 x 10^{-4} centimeters per second (cm/s) or greater using a slug test.

3.2 Statistical Evaluation of Background Groundwater Data

A Statistical Analysis Plan (**Appendix B**) has been developed to describe procedures that will be used to establish background conditions and implement compliance monitoring as necessary and required by 35 I.A.C. § 845.640 and 35 I.A.C. § 845.650. The 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 USEPA's *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (*Unified Guidance,* March 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 was either the tolerance interval or the prediction 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). A comparison of the statistical background concentrations and groundwater quality standards listed in 35 I.A.C. § 845.600(a)(1) and the resulting GWPSs are summarized in **Table 3-1**.

3.3 Applicable Groundwater Protection Standards

The applicable 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 results of the statistical analysis of background groundwater data (**Table 3-1**) indicate that background concentrations in the uppermost aquifer are less than the groundwater quality standards listed in 35 I.A.C. § 845.600(a)(1) with the exception of lead. Therefore, for these parameters, the groundwater quality standards listed in 35 I.A.C. § 845.600(a)(1) will be applied to the results from the proposed groundwater monitoring network. The background concentration for lead will be applied to the lead results from the proposed groundwater monitoring network.

Under most circumstances, the GWPS will be compared to the lower confidence limit for the observed concentrations for each constituent in each compliance well. Exceptions are when there are high percentages (greater than 50 percent) of non-detects in compliance well data, for which a future mean (for 50 to 70 percent non-detects) or median (for greater than 70 percent non-detects) will be compared to the GWPS. 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.

Evaluation of the applicable standards will occur in conjunction with the analysis of groundwater quality results. Background calculations and the resulting concentrations may be updated as appropriate, in accordance with the Statistical Analysis Plan included in **Appendix B**.

4. GROUNDWATER MONITORING PLAN

The groundwater monitoring plan will monitor and evaluate groundwater quality to demonstrate compliance with the groundwater quality standards included in 40 C.F.R. § 257.94(e), 40 C.F.R. § 257.95(h), and 35 I.A.C. § 845.600(a). The groundwater monitoring program will include sampling and analysis procedures that are consistent and provide an accurate representation of groundwater quality at the background and compliance wells as required by 35 I.A.C. § 845.630. As discussed within **Section 2**, three monitoring programs specific to AP2 exist, the Closure Plan monitoring program, the 40 C.F.R. § 257 monitoring program, and the proposed Part 845 monitoring program. It is expected that upon acceptance and approval of the Operating Permit applications (and by extension the GMPs) for the CPP and upon acceptance and approval of Part 845 by the USEPA as a State CCR Permit Program, the proposed Part 845 monitoring program will supersede the Closure Plan and 40 C.F.R. § 257 monitoring programs.

4.1 Monitoring Networks and Parameters

4.1.1 IEPA Closure Plan Monitoring

The existing IEPA-approved Closure Plan monitoring program was discussed in detail in **Section 2.1**. Fourteen groundwater monitoring wells are used to monitor the uppermost aquifer, including three background wells (G270, G280, and G281) and eleven compliance wells (G154, G279, G401, G402, G403, G404, G405, G406, G407, G410, and G411), and are sampled on a quarterly frequency for the parameters listed in the GMP (NRT, 2017a). Well locations and parameters will continue to be monitored and reported as required by the Closure Plan until IEPA approves the proposed Part 845 monitoring network.

4.1.2 40 C.F.R. § 257 Monitoring

The existing 40 C.F.R. § 257 monitoring program was discussed in detail in **Section 2.2**. Seven groundwater monitoring wells, including two background wells (G270 and G281) and five compliance wells (G401, G402, G403, G404, and G405) are sampled for Appendix III and Appendix IV parameters on a semi-annual frequency. Well locations and parameters will continue to be monitored and reported as required by 40 C.F.R. § 257 until USEPA approves Part 845.

4.1.3 Part 845 Groundwater Monitoring

The proposed Part 845 Monitoring Network will consist of eleven monitoring wells, three background monitoring wells (G270, G280, and G281), eight compliance wells (G401, G402, G403, G404, G405, G406, G407, and G1001), to monitor potential impacts from AP2 (**Figure 2-2**). These monitoring wells are screened within the uppermost aquifer, or the LCU where the uppermost aquifer is absent, along the perimeter of or near AP2 and include G407, located west of AP2, which is retained to continue monitoring sulfate as described in **Sections 2.3.1** and **2.3.2**. Three staff gauges (SG02, SG03, and SG04) will be used to monitor surface water elevations adjacent to AP2. Groundwater samples will be collected and analyzed for the laboratory and field parameters summarized in **Table E** below.

Table E. Part 845 Groundwater Monitoring Program Parameters

Field Parameters[1]			
Groundwater Elevation	pH	Turbidity	
Metals (Total)			
Antimony	Boron	Cobalt	Molybdenum
Arsenic	Cadmium	Lead	Selenium
Barium	Calcium	Lithium	Thallium
Beryllium	Chromium	Mercury	
Inorganics (Total)			
Chloride	Fluoride	Sulfate	TDS
Other (Total)			
Radium 226 and 228 combined			

[1] Dissolved oxygen, temperature, specific conductance, and oxidation/reduction potential will be recorded during sample collection.

4.2 Sampling Schedule

Groundwater sampling for the approved Closure Plan will be maintained until IEPA approval of the Part 845 GMP. Groundwater sampling for the Part 845 monitoring well network will initially be performed quarterly according to the following schedule:

Table F. Part 845 Sampling Schedule

Frequency	Duration
Monthly (groundwater elevations only)	Begins: the quarter following approval of this plan and issuance of the Operating Permit.
	Ends: Following the 30-year post closure care period and following IEPA approval of documentation that groundwater concentrations are below standards in 35 I.A.C. § 845.600 and concentrations exceeding background are not increasing and meet requirements in 35 I.A.C. § 845.780 (c)(2)(B)(i) and (ii).
Quarterly (groundwater quality)	Begins: the quarter following approval of this plan and issuance of the Operating Permit.
	Ends: Following the 30-year post closure care period and following IEPA approval of documentation that groundwater concentrations are below standards in 35 I.A.C. § 845.600 and concentrations exceeding background are not increasing and meet requirements in 35 I.A.C. § 845.780 (c)(2)(B)(i) and (ii), or upon IEPA approval of an alternate schedule as allowed by 35 I.A.C. § 845.650(b)(4).
Semi-annual (groundwater quality)	Begins: Following 5 years of quarterly groundwater monitoring and IEPA approval of a demonstration that groundwater concentrations are below standards in 35 I.A.C. § 845.600 and not exhibiting statistically-significant increasing trends, monitoring effectiveness is not compromised by a semi-annual schedule, and sufficient data has been collected to characterize groundwater.
	Ends: Following detection of a statistically-significant increasing trend in groundwater concentrations or an exceedance of the standards in 35 I.A.C. § 845.600 (quarterly monitoring shall be resumed in these circumstances), or following the 30-year post closure care period and following IEPA approval of documentation that groundwater concentrations are below standards in 35 I.A.C. § 845.600 and concentrations exceeding background are not increasing and meet requirements in 35 I.A.C. § 845.780 (c)(2)(B)(i) and (ii).

Groundwater monitoring for the 40 C.F.R. § 257.94 well network will continue to follow a schedule in accordance with the requirements of 40 C.F.R. § 257.94 and 40 C.F.R. § 257.95. Upon USEPA approval of Part 845 as a State CCR Permit Program, the 40 C.F.R. § 257.94 monitoring will be discontinued, and replaced by the Part 845 monitoring.

4.3 Groundwater Sample Collection

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 4.5** (**Table 4-1**).

4.4 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. RLs for the applicable parameters are summarized in **Table 4-2**. Concentrations lower than the RL will be reported as less than the RL.

4.5 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

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.

4.6 Groundwater Monitoring System Maintenance Plan

Consistent with the requirements of 35 I.A.C. § 845.630(e)(2), 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; 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 to assure 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.

4.7 Statistical Analysis

Statistical analysis will be consistent with procedures listed in 35 I.A.C. § 845.640(f). A Statistical Analysis Plan, provided in **Appendix B**, has been developed to summarize the statistical procedures that will be used to evaluate the groundwater results.

4.8 Data Reporting

Data reporting for the 40 C.F.R. § 257 monitoring program will be consistent with recordkeeping, notification, and internet posting requirements described in 40 C.F.R. § 257.105 through 40 C.F.R. § 257.107.

Groundwater monitoring and analysis completed as part of the Part 845 monitoring under an approved monitoring program will be reported to IEPA within 60 days after completion of sampling and place the data in the facility's operating record as required by 35 I.A.C. § 845.610(b)(3)(D). Within 14 days of posting to the operating record, information will be posted to the publicly accessible internet site "Illinois CCR Rule Compliance Data and Information" as required by 35 I.A.C. § 845.810(d). Information will also be provided to IEPA annually, by January 31 for data collected the preceding year. The report will include the status of the groundwater monitoring and corrective action plan for the CPP AP2 in addition to other requirements detailed in 35 I.A.C. § 845.610(e).

4.9 Compliance with Applicable On-site Groundwater Quality Standards

In accordance with 35 I.A.C. § 845.600(a)(1), the groundwater protection standard at the waste boundary will be the higher of either the 35 I.A.C. § 845.600 standard or the concentration determined by background groundwater monitoring.

As provided in 35 I.A.C. § 845.780(c)(2), at the end of the 30-year post-closure care period, groundwater monitoring will continue to be conducted in post-closure care until the groundwater results show the concentrations are:

- Below the GWPS in 35 I.A.C. § 845.600; and
- Not increasing for those constituents over background, using the statistical procedures and performance standards in 35 I.A.C. § 845.640(f) and (g), provided that:
  - Concentrations have been reduced to the maximum extent feasible; and
  - Concentrations are protective of human health and the environment.

Following detection of an exceedance of the GWPS, an Alternate Source Demonstration (ASD) will be evaluated as described in **Section 4.10**.

4.10 Alternate Source Demonstrations

As allowed in 35 I.A.C. § 845.650(e), following detection of an exceedance of the GWPS, an ASD will be evaluated and, if completed, submitted to IEPA within 60 days. The ASD will provide lines of evidence that a source other than AP2 caused the contamination and AP2 did not contribute to the contamination, 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.

The ASD will include information and analysis that supports the conclusions and a certification of accuracy by a qualified professional engineer. Once the ASD is approved by IEPA, the Part 845 groundwater monitoring will continue as defined in **Section 4.1.3**.

If an ASD is not completed and submitted, or IEPA does not approve the ASD, a notification of the exceedance will be provided to IEPA and placed in the operating record. Additional actions will also be completed as required by 35 I.A.C § 845.650(d)(1) through (3), including initiation of an assessment of corrective measures under 35 I.A.C § 845.660. As allowed in 35 I.A.C § 845.650(e)(7), a petition for review of IEPA's non-concurrence under 35 I.A.C. § 105 may also be filed.

5. REFERENCES

AECOM, 2017. *Closure and Post-Closure Care Plan for the Coffeen Ash Pond No. 2 at Illinois Power Generating Company, Coffeen Power Station, 134 Cips Lane, Coffeen, IL 62107*, January 26, 2017.

Illinois Environmental Protection Agency, 2021. *Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments: Title 35 of the Illinois Administrative Code § 845*, April 15, 2021.

Natural Resource Technology, Inc. (NRT), 2017a. *Groundwater Monitoring Plan, Ash Pond No. 2, Coffeen Power Station*, January 24, 2017.

Natural Resource Technology, Inc. (NRT), 2017b. *Sampling and Analysis Plan, Final, Coffeen Ash Pond No. 2, Coffeen Power Station, Coffeen, Illinois, Project No. 2285, Revision 0*. October 17, 2017

United States Environmental Protection Agency (USEPA), March 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. Office of Resource Conservation and Recovery, Program Implementation and Information Division, United States Environmental Protection Agency, Washington D.C. EPA/530/R-09/007.

TABLES

TABLE 2-1. MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS
GROUNDWATER MONITORING PLAN
COFFEEN POWER PLANT
ASH POND NO. 2
COFFEEN, ILLINOIS

Well Number	Type	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)
G1001	C	UA	04/05/2021	597.61	--	Top of PVC	594.82	6.00	11.00	588.82	583.82	11.00	562.82	5	4	39.063324	-89.391236
G270	B	UA	02/26/2008	--	625.86	Top of Disk	623.73	13.13	17.92	610.60	605.81	18.27	605.50	4.8	2	39.066564	-89.397403
G280	B	UA	02/26/2008	625.35	625.35	Top of Riser	623.11	12.79	17.63	610.32	605.48	17.98	605.10	4.8	2	39.067216	-89.394992
G281	B	UA	09/08/2015	--	626.36	Top of Disk	623.82	15.51	20.16	608.31	603.66	20.30	603.50	4.7	2	39.065405	-89.399322
G401	C	UA	09/14/2015	--	625.57	Top of Disk	623.03	14.36	18.79	608.67	604.24	19.29	603.70	4.4	2	39.060259	-89.395295
G402	C	UA	08/27/2010	--	613.37	Top of Disk	610.36	10.00	20.00	600.36	590.36	20.40	590.00	10	2	39.060207	-89.391712
G403	C	UA	09/11/2015	--	626.47	Top of Disk	623.81	13.11	17.78	610.70	606.03	18.15	605.70	4.7	2	39.063167	-89.398779
G404	C	UA	05/01/2007	--	615.67	Top of Disk	613.57	6.42	11.17	607.15	602.40	11.62	601.60	4.8	2	39.064329	-89.392493
G405	C	UA	05/01/2007	--	623.63	Top of Disk	621.40	9.01	13.76	612.39	607.64	14.21	607.20	4.8	2	39.064345	-89.396234
G406	C	UA	08/19/2016	625.36	625.36	Top of PVC	621.86	13.56	18.37	608.30	603.49	18.75	603.10	4.8	2	39.060309	-89.398508
G407	C	UA	08/16/2016	621.32	621.32	Top of PVC	618.35	13.78	18.61	604.57	599.74	19.04	598.40	4.8	2	39.061574	-89.402004
SG-02	WLO	SW	--	--	605.87	Top of Prot Casing	605.87	--	--	--	--	--	--	--	--	39.059695	-89.391429
SG-03	WLO	SW	--	--	594.94	Top of Prot Casing	594.94	--	--	--	--	--	--	--	--	39.059092	-89.390342
SG-04	WLO	SW	--	--	599.52	Top of Prot Casing	599.52	--	--	--	--	--	--	--	--	39.064146	-89.390504

Notes:
All elevation data are presented relative to the North American Vertical Datum 1988 (NAVD88), GEOID 12A
Type refers to the role of the well in the monitoring network: background (B), compliance (C), or water level measurements only (WLO)
WLO wells are temporary pending implementation of impoundment closure per an approved Construction Permit application
-- = data not available
BGS = below ground surface
ft = foot or feet
HSU = Hydrostratigraphic Unit
PVC = polyvinyl chloride
SW = surface water
UA = uppermost aquifer

generated 10/05/2021, 3:12:20 PM CDT

TABLE 3-1. BACKGROUND GROUNDWATER QUALITY AND STANDARDS
GROUNDWATER MONITORING PLAN
COFFEEN POWER PLANT
ASH POND NO. 2
COFFEEN, ILLINOIS

Parameter	Background Concentration	845 Limit	Groundwater Protection Standard	Unit
Antimony, total	0.003	0.006	0.006	mg/L
Arsenic, total	0.0066	0.010	0.010	mg/L
Barium, total	0.14	2.0	2.0	mg/L
Beryllium, total	0.001	0.004	0.004	mg/L
Boron, total	0.029	2	2	mg/L
Cadmium, total	0.001	0.005	0.005	mg/L
Chloride, total	75	200	200	mg/L
Chromium, total	0.019	0.1	0.1	mg/L
Cobalt, total	0.0059	0.006	0.006	mg/L
Fluoride, total	0.513	4.0	4.0	mg/L
Lead, total	0.012	0.0075	0.012	mg/L
Lithium, total	0.019	0.04	0.04	mg/L
Mercury, total	0.0002	0.002	0.002	mg/L
Molybdenum, total	0.0045	0.1	0.1	mg/L
pH (field)	7.5 / 6.6	9.0 / 6.5	9.0 / 6.5	SU
Radium 226 and 228 combined	1.89	5	5	pCi/L
Selenium, total	0.0048	0.05	0.05	mg/L
Sulfate, total	370	400	400	mg/L
Thallium, total	0.001	0.002	0.002	mg/L
Total Dissolved Solids	840	1200	1200	mg/L

Notes:
For pH, the values presented are the upper / lower limits
GWPS for calcium and turbidity do not apply per 35 I.A.C. § 845.600(b)
mg/L = milligrams per liter
SU = standard units
pCi/L = picocuries per liter

generated 10/06/2021, 4:21:50 PM CDT

TABLE 4-1. SAMPLING AND ANALYSIS SUMMARY
ADDENDUM TO THE GROUNDWATER MONITORING PLAN
COFFEEN POWER PLANT
ASH POND NO. 2
COFFEEN, ILLINOIS

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
Metals											
Metals [6]	6020, Li - EPA 200.7	11	2	0	0	1	14	plastic	600 mL	HNO_3 to pH<2	6 months
Mercury	7470A or 6020	11	2	0	0	1	14	plastic	400 mL	HNO_3 to pH<2	28 days
Inorganic Parameters											
Fluoride	9214 or EPA 300	11	2	0	0	1	14	plastic	300 mL	Cool to 4 °C	28 days
Chloride	9251 or EPA 300	11	2	0	0	1	14	plastic	100 mL	Cool to 4 °C	28 days
Sulfate	9036 or EPA 300	11	2	0	0	1	14	plastic	50 mL	Cool to 4 °C	28 days
Total Dissolved Solids	SM 2540 C	11	2	0	0	1	14	plastic	200 mL	Cool to 4 °C	7 days
Radium											
Radium 226	9315 or EPA 903	11	0	0	0	0	11	plastic	1000 mL	HNO_3 to pH<2	6 months
Radium 228	9320 or EPA 904	11	0	0	0	0	11	plastic	1000 mL	HNO_3 to pH<2	6 months
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 2580 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 [7]	SM 2130 B	11	NA	NA	NA	NA	11	flow-through cell or hand-held turbidity meter	NA	none	immediately

[O: CJC 08/18/21; C: LDC 08/31/21][U:KLT 10/4/21; C: CJC 10/4/21]

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] Metals = antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chromium, cobalt, lead, lithium, molybdenum, selenium, thallium. Metals may be analyzed via ICP/ ICP-MS USEPA methods 6010 or 6020 depending on laboratory instrument availability.
[7] If turbidity exceeds 10 NTUs, a duplicate sample filtered through a .45 micron filter may be collected for metals analysis in addition to the unfiltered sample. Both samples would be submitted for analysis.
[8] Parameter collected for quality assurance and quality control for field sampling purposes only; not required to be collected or reported under Part 845; collection of parameter may be discontinued without notification.
< = less than
°C = degrees Celsius
HNO_3 = nitric acid
mL = milliliter
NA = not applicable
NTU = nephelometric turbidity unit

TABLE 4-2. DETECTION AND REPORTING LIMITS FOR PART 845 PARAMETERS

ADDENDUM TO THE GROUNDWATER MONITORING PLAN

COFFEEN POWER PLANT

ASH POND NO. 2

COFFEEN, ILLINOIS

Constituent	CAS	Unit	Analytical Methods [1]	USEPA MCL [2]	35 I.A.C. § 845.600	RL [4, 5]	MDL [5]
Metals							
Antimony	7440-36-0	mg/L	6020	0.006	0.006	0.003	0.00036
Arsenic	7440-38-2	mg/L	6020	0.01	0.01	0.001	0.00013
Barium	7440-39-3	mg/L	6020	2	2	0.001	0.00028
Beryllium	7440-41-7	mg/L	6020	0.004	0.004	0.001	0.000017
Boron	7440-42-8	mg/L	6020	NS	2	0.01	0.0023
Cadmium	7440-43-9	mg/L	6020	0.005	0.005	0.001	0.000042
Calcium	7440-70-2	mg/L	6020	NS	NS	0.15	0.15
Chromium	7440-47-3	mg/L	6020	0.1	0.1	0.004	0.00027
Cobalt	7440-48-4	mg/L	6020	0.006	0.006	0.002	0.000017
Lead	7439-92-1	mg/L	6020	0.015	0.0075	0.001	0.000025
Lithium	7439-93-2	mg/L	6020 or EPA 200.7	0.04	0.04	0.02	0.0001
Mercury	7439-97-6	mg/L	6020 or 7470A	0.002	0.002	0.0002	0.000078
Molybdenum	7439-98-7	mg/L	6020	0.1	0.1	0.001	0.000063
Selenium	7782-49-2	mg/L	6020	0.05	0.05	0.001	0.00032
Thallium	7440-28-0	mg/L	6020	0.002	0.002	0.001	0.000062
Inorganics							
Fluoride	7681	mg/L	9214 or EPA 300	4	4	0.25	0.065
Chloride	16887-00-6	mg/L	9251 or EPA 300	250 [3]	200	1	0.15
Sulfate	18785-72-3	mg/L	9036 or EPA 300	250 [3]	400	1	0.24
Total Dissolved Solids	10052	mg/L	SM 2540C	500 [3]	1200	17	--
Other							
Radium 226 and 226 combined	7440-14-4	pCi/L	9315/9320 or EPA 903/904	5	5	-- [6]	-- [7]
Field							
pH	NA	SU	SM 4500-H+ B	NS	6.5-9.0	NA	NA
Oxidation/Reduction Potential	NA	mV	SM 2580 B	NS	NS	NA	NA
Dissolved Oxygen	NA	mg/L	SM 4500-O/405.1	NS	NS	NA	NA
Temperature	NA	°C	SM 2550	NS	NS	NA	NA
Specific Conductivity	NA	µS/cm	SM 2510 B	NS	NS	NA	NA

TABLE 4-2. DETECTION AND REPORTING LIMITS FOR PART 845 PARAMETERS

ADDENDUM TO THE GROUNDWATER MONITORING PLAN

COFFEEN POWER PLANT

ASH POND NO. 2

COFFEEN, ILLINOIS

Constituent	CAS	Unit	Analytical Methods [1]	USEPA MCL [2]	35 I.A.C. § 845.600	RL [4, 5]	MDL [5]
Turbidity	NA	NTU	SM 2130 B	NS	NS	NA	NA

[O: CJC 08/18/21; C: LDC 08/31/21],[U:KLT 9/23/21; C: CJC 10/4/21]

Notes:

[1] Analytical method numbers are from SW-846 unless otherwise indicated. Metals will be analyzed via Method 6020 or 6010 depending on laboratory equipment availability. Selected method will ensure reporting limits (RL) are below Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845.600 groundwater protection standards.

[2] USEPA MCL = United States Environmental Protection Agency Maximum Contaminant Level.

[3] USEPA SMCL = United States Environmental Protection Agency Secondary Maximum Contaminant Level.

[4] RLs will be less than the 35 I.A.C. § 845.600 groundwater protection standards.

[5] RLs and method detection limits (MDL) will vary depending on the laboratory performing the work.

[6] All radium results will be reported (values may be positive or negative) and will include uncertainty and the calculated MDC.

[7] Laboratories calculate a minimum detectable concentration (MDC) based on the sample.

°C = degrees Celsius

µS/cm = microSiemens per centimeter

CAS = Chemical Abstract Number

MDL = Method detection limit as established by the laboratory

mg/L = milligrams per liter

mV = millivolts

NA = Not applicable

NS = No standard

NTU = nephelometric turbidity unit

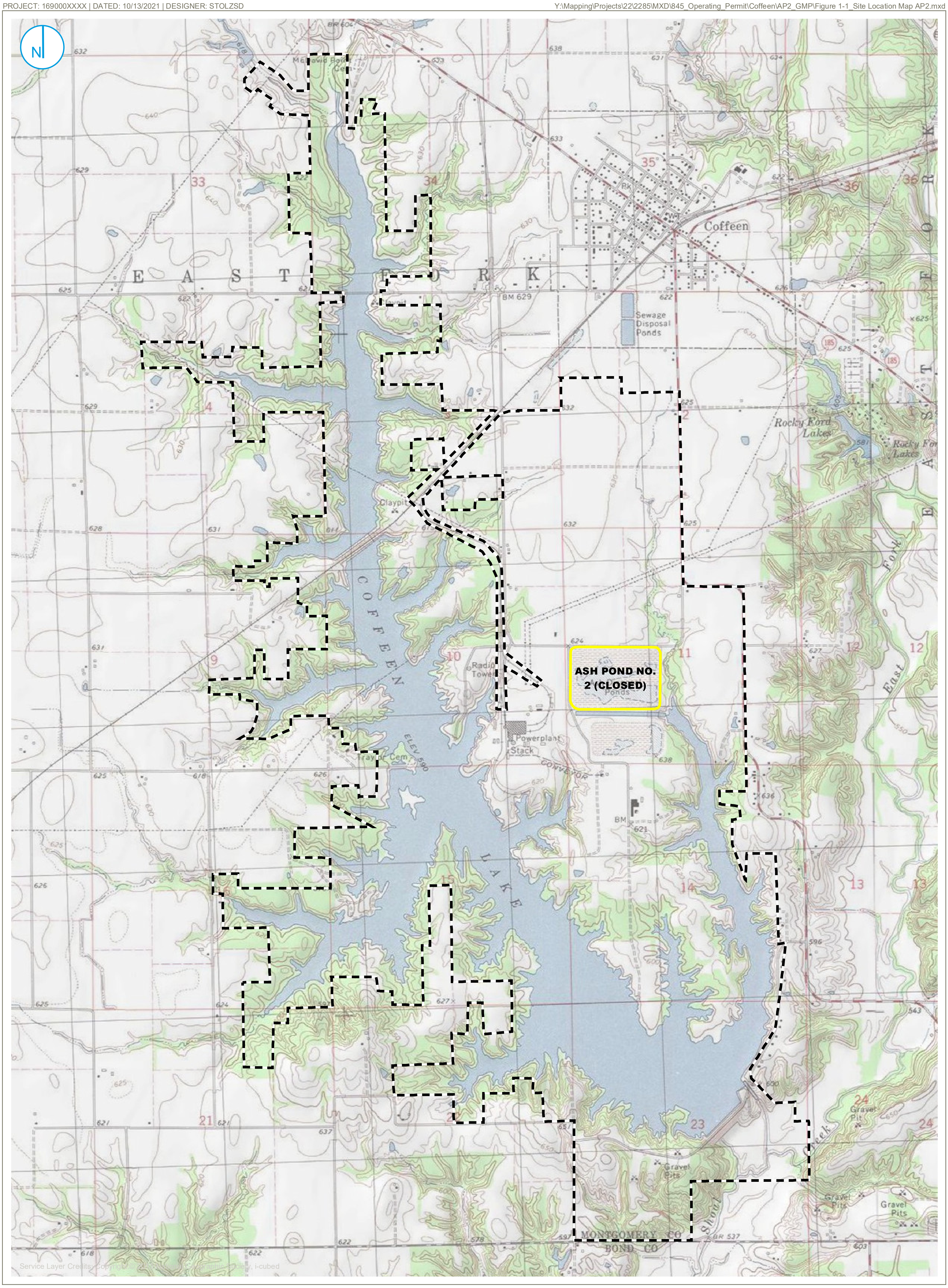
pCi/L = picoCuries per liter

RL = Reporting limit as established by the laboratory

SM = Standard Methods for the Examination of Water and Wastewater

SU = standard units

FIGURES



PART 845 REGULATED UNIT (SUBJECT UNIT)
PROPERTY BOUNDARY

0 1,000 2,000 Feet

SITE LOCATION MAP

FIGURE 1-1

ADDENDUM TO THE GROUNDWATER MONITORING PLAN
ASH POND NO.2
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

PART 845 REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
LIMITS OF FINAL COVER
PROPERTY BOUNDARY

0 275 550 Feet

SITE MAP

FIGURE 1-2

ADDENDUM TO THE GROUNDWATER MONITORING PLAN
ASH POND NO. 2
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL

PROJECT: 169000XXXX | DATED: 10/6/2021 | DESIGNER: STOLZSD

Y:\Mapping\Projects\22\2285\MXD\845_Operating_Permit\Coffeen\AP2_GMP\Figure 2-1 IEPA Program.mxd

IEPA MONITORING WELL
MONITORING WELL
PART 845 REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
LIMITS OF FINAL COVER
PROPERTY BOUNDARY

0 200 400 Feet

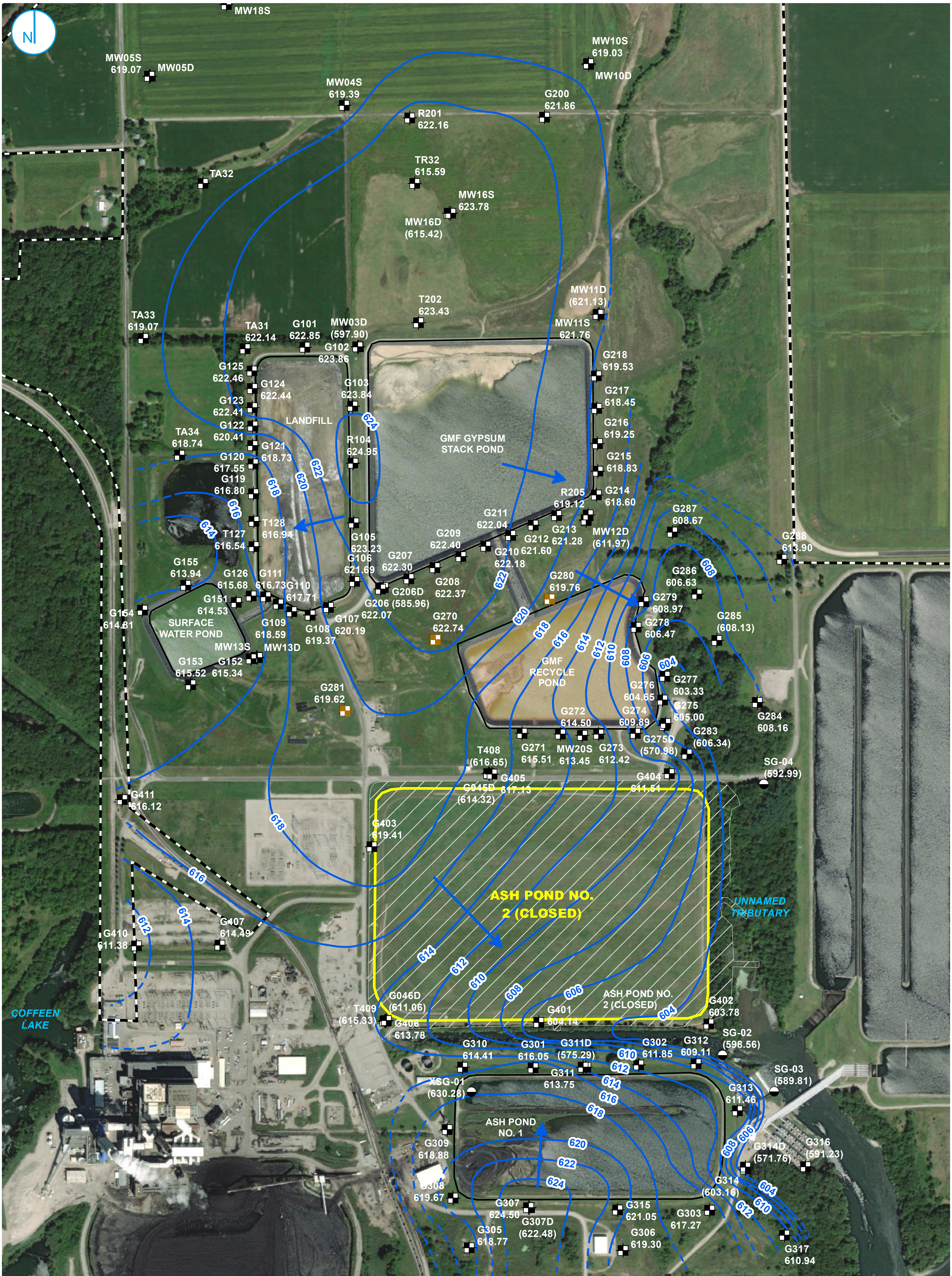
IEPA MONITORING WELL LOCATIONS AND WELLS G1001 AND G1003

ADDENDUM TO THE GROUNDWATER MONITORING PLAN
ASH POND NO. 2
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

FIGURE 2-1

RAMBOLL AMERICAS
ENGINEERING SOLUTIONS, INC.

RAMBOLL



BACKGROUND WELL
MONITORING WELL
STAFF GAGE
GROUNDWATER ELEVATION CONTOUR (2-FT CONTOUR INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION

PART 845 REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
LIMITS OF FINAL COVER
PROPERTY BOUNDARY

0 275 550 Feet

NOTE:
ELEVATIONS IN PARENTHESES WERE NOT USED FOR CONTOURING.
NM = NOT MEASURED

UPPERMOST AQUIFER GROUNDWATER ELEVATION CONTOURS APRIL 20, 2021

ADDENDUM TO THE GROUNDWATER MONITORING PLAN
ASH POND NO. 2
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

FIGURE 2-2

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL

Y:\Mapping\Projects\22\2285\MXD\845_Operating_Permit\Coffeen\AP2_GMP\Figure 2-1_Proposed Monitoring Well Network.mxd

PROJECT: 169000XXXX | DATED: 10/6/2021 | DESIGNER: STOLZSD

COMPLIANCE WELL
BACKGROUND WELL
MONITORING WELL
STAFF GAGE
PART 845 REGULATED UNIT (SUBJECT UNIT)
SITE FEATURE
LIMITS OF FINAL COVER
PROPERTY BOUNDARY

0 200 400 Feet

PROPOSED 845 GROUNDWATER MONITORING WELL NETWORK

ADDENDUM TO THE GROUNDWATER MONITORING PLAN
ASH POND NO. 2
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

FIGURE 2-3

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL

APPENDICES

APPENDIX A
G1001 & G1003 BORING AND WELL CONSTRUCTION LOGS

Geosyntec consultants

engineers | scientists | innovators

Client: Dynegy		**WELL LOG**
Project: GLP8005, Coffeen Power Station		Well No. G1001
Address: Coffeen, IL 62017		

Drilling Start Date:	**04/05/2021**	Boring Depth (ft):	**32**	Well Depth (ft):	**12**
Drilling End Date:	**04/05/2021**	Boring Diameter (in):	**6**	Well Diameter (in):	**1**
Drilling Company:	**Roberts Drilling**	DTW During Drilling (ft):		Screen Slot (in):	**0.010**
Drilling Method:	**Direct Push**	DTW After Drilling (ft):		Riser Material:	**Sch 40 PVC**
Drilling Equipment:	**Geoprobe**	Top of Casing Elev. (ft)		Screen Material:	**Sch 40 PVC Slotted**
Driller:		Ground Elev. (ft):		Seal Material(s):	**Bentonite Chips**
Logged By:	**A. Toye**	Northing, Easting (NAD83):		Filter Pack:	**Sand**

DEPTH (ft)	LITHOLOGY	WATER LEVEL	WELL COMPLETION	COLLECT: Sample Type	COLLECT: Recovery (in)	COLLECT: Blow Counts	COLLECT: N Value RQD (%)	SOIL/ROCK VISUAL DESCRIPTION	MEASURE: Lab Sample	DEPTH (ft)
0				DP	24/48			(0') SILT (ML); very dark grayish brown (2.5Y 3/2), medium soft, moist, trace gravel 2-2.5' bgs.		0
4				DP	48/48			(4') CLAY (CL); with trace sand, yellowish brown (10YR 5/6), stiff, moist, trace gravel.		
5										5
6									Chem (6-11')	
8				DP	48/48			(8') As above: medium stiff, brown (10YR 4/3) with yellowish brown (10YR 5/6) mottling.		
10										10
12				DP	48/48			(12') CLAY (CL); dark gray (10YR 4/1), medium stiff, moist.		
15										15
16				DP	48/48			(16') As above: dark gray (2.5Y 4/1).		
20										20

NOTES: No groundwater encountered.

Geosyntec consultants
engineers | scientists | innovators

Client: Dynegy
Project: GLP8005, Coffeen Power Station
Address: Coffeen, IL 62017

WELL LOG
Well No. G1001

Drilling Start Date:	**04/05/2021**	Boring Depth (ft):	**32**	Well Depth (ft):	**12**
Drilling End Date:	**04/05/2021**	Boring Diameter (in):	**6**	Well Diameter (in):	**1**
Drilling Company:	**Roberts Drilling**	DTW During Drilling (ft):		Screen Slot (in):	**0.010**
Drilling Method:	**Direct Push**	DTW After Drilling (ft):		Riser Material:	**Sch 40 PVC**
Drilling Equipment:	**Geoprobe**	Top of Casing Elev. (ft)		Screen Material:	**Sch 40 PVC Slotted**
Driller:		Ground Elev. (ft):		Seal Material(s):	**Bentonite Chips**
Logged By:	**A. Toye**	Northing, Easting (NAD83):		Filter Pack:	**Sand**

DEPTH (ft)	LITHOLOGY	WATER LEVEL	WELL COMPLETION	COLLECT: Sample Type	COLLECT: Recovery (in)	COLLECT: Blow Counts	COLLECT: N Value RQD (%)	SOIL/ROCK VISUAL DESCRIPTION	MEASURE: Lab Sample	DEPTH (ft)
20				DP	48/48			(20') As above: gravel at 1 ft.		20
24				DP	48/48			(24') As above: dry pocket at 2.8 ft.		
25										25
28				DP	18/48			(28') As above: trace gravel and silt at 2 ft.		
30										30
32								(32') End of Boring.		
35										35

NOTES: No groundwater encountered.

Geosyntec consultants

SOIL BORING LOG

BORING NUMBER:	G1002-2

PROJECT: GLP8005		PROJECT NO.: Coffeen MNA		E —	N —
LOCATION: Coffeen, IL		PHASE NO.: 2		G. S. ELEVATION: —	
CLIENT: Vistra		TASK NO.: —		BORING DEPTH: 21.0'	
DRILLING CO: Roberts Env		DRILLER:		DRILLING METHOD: DP	
LOGGED BY: A Toye		STARTED: 5/25/21		COMPLETED: 5/25/21	

Depth (ft)	Elevation (ft)	Sample No.	Recovery / Attempted	Strata Change	Soil/Rock Description	Notes	Unit Weight (pcf)	Qp (tsf)	Qu (tsf)	Wc (%)
			16/36"		1.3' of SILTY CLAY, med grey, soft, moist					
2										
3										
4		Chem Sample	36/36"		24" of CLAYEY SAND, orange brown to light grey, soft, moist	Swapped to Split Spoon				
6										
8		Chem Sample			12" of CLAY w SOME SAND, orange brown w light grey mottlings, low plastic, dry		Screen	8		
10		Chem Sample	36/36		0.6' of Sand, orange, fine grained, slightly moist					
					3.7' of SAND w Some SILT, greyish brown, dry					
12		Chem Sample			0.7' of SAND, orange, slightly moist			12		
13										
14		Chem Sample	14/24		1.5' of SILTY SAND, orange w grey mottling, dry					
16			0/24"		NO RECOVERY					
18			20/24"		1.8' SILT w SAND & CLAY, ~~grey, dry~~ grey, low plastic, dry					
19										
20			24/24"		2' CLAY, grey, med plastic, moist					
21					EOB 21'					
22										

Geosyntec consultants

1420 Kensington Rd., Suite 103
Oak Brook, Illinois 60523
(630) 203-3340

MONITORING WELL CONSTRUCTION DETAIL

Well ID	G1001	Site Location	Coffeen, IL
Project Name	Coffeen Power Station	Field Personnel	A Toye, C Luttrell
Project Number	GLP8005	Recorded By	A Toye

Permit Number ______

Installation Date(s) 4-05-2021

Drilling Method Direct Push

Borehole Diameter 6.00"

Drilling Contractor Roberts Environmental

Driller ______

Drilling Fluid N/A

Fluid Loss During Drilling N/A Gallons

Materials Used

Riser Pipe:
Diameter 4 inches
Construction
☑ PVC schedule 40
☐ Stainless Steel
☐ Other ______

Slotted Area:
Length 5.00 feet
Diameter 4.00 inches
Slot Size .010 inches
Construction
☑ PVC schedule 40
☐ Stainless Steel
☐ Other ______
Silt Trap Used ☐ Yes ☐ No

Bottom End Cap:
☐ Male ☐ Female ☐ Slip
☐ PVC
☐ Stainless Steel
☐ Other ______

Top Cap:
☐ Male ☐ Female ☐ Slip ☐ J Plug
☐ PVC
☐ Stainless Steel
☐ Other ______

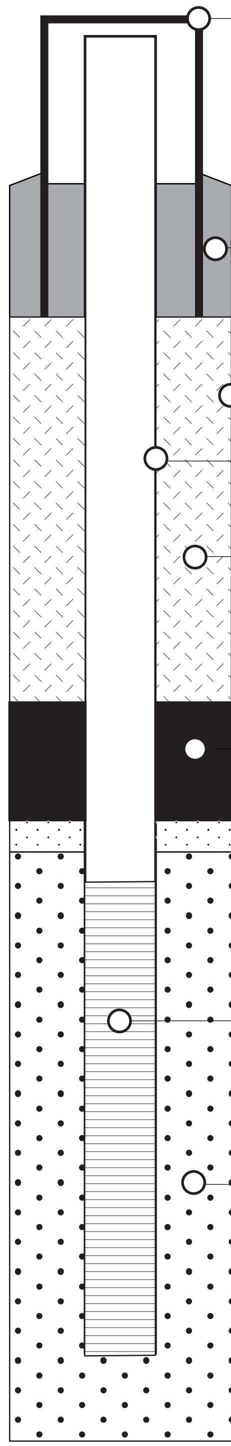
Protective Casing:
Length 5 feet
Diameter 6 inches
Construction ☐ Cast Aluminum
☑ Cast Steel
☐ Other ______

Casing Installation:
Length 11 feet
Diameter 4 inches
Material PVC

Sandpack: Filter Sil
Coarse Sand: __ bags of __ lb per bag Size ______
Fine Sand: 4 bags of 50 lb per bag Size ______

Seal:
Bentonite Pellets: 2 bags of 50 lb per bag Type Bentonite Plug
Bentonite Slurry: __ bags of __ lb per bag Type ______

Grout:
Cement: __ bags of __ lb per bag Type ______
Bentonite: __ bags of __ lb per bag Type ______



Measuring Point is Top of Well Casing
Unless Otherwise Noted

* Depth Below Ground Surface

Geosyntec consultants

SOIL BORING LOG

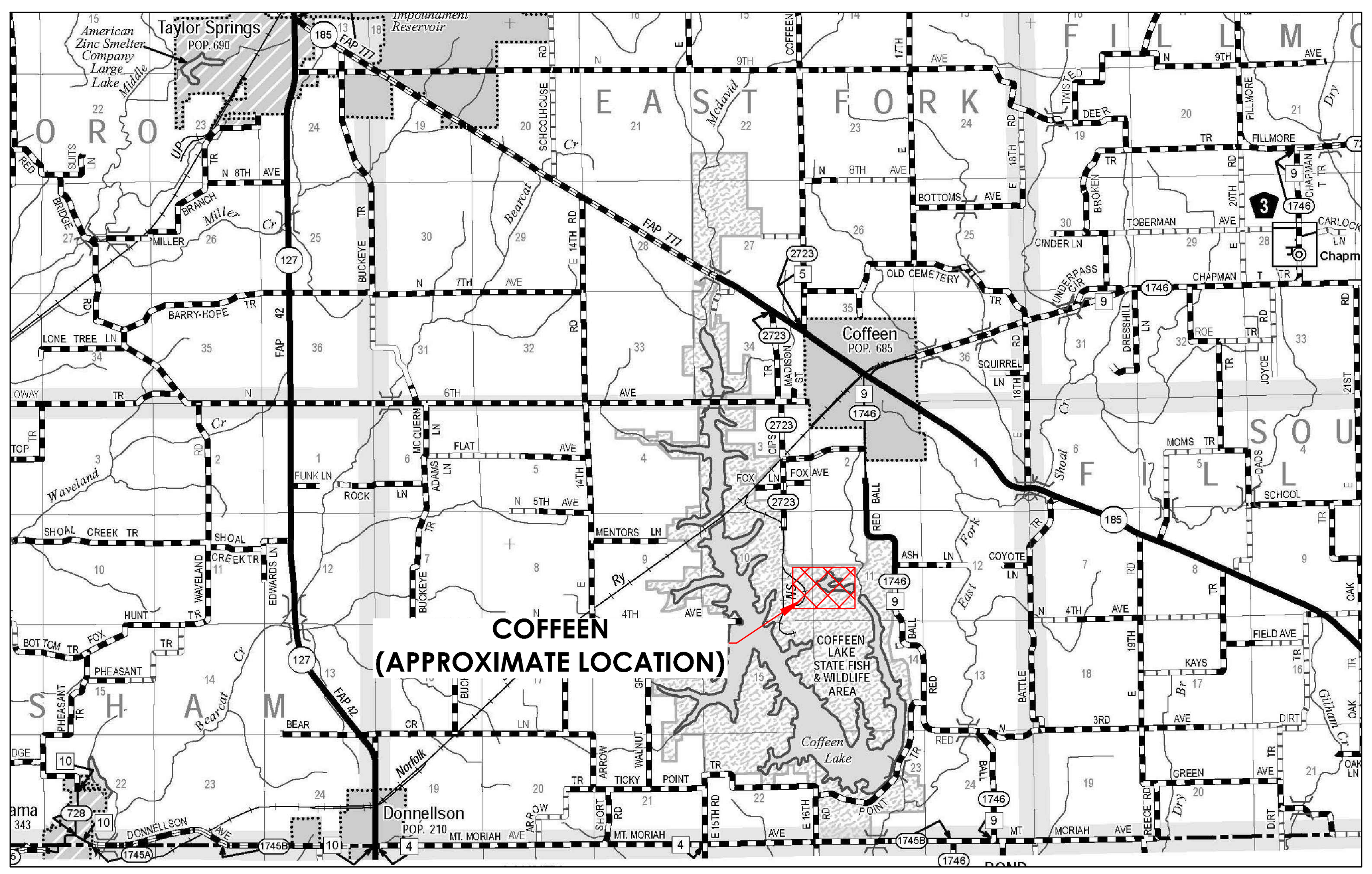
PROJECT: GLP8005	PROJECT NO.: Coffeen MNA	BORING NUMBER: G1002-2			
LOCATION: Coffeen, IL	PHASE NO.: 2	E —	N —		
CLIENT: Vistra	TASK NO.: —	G. S. ELEVATION: —			
DRILLING CO: Roberts Env	DRILLER:	BORING DEPTH: 21.0'			
LOGGED BY: A Toye	STARTED: 5/25/21	DRILLING METHOD: DP			
		COMPLETED: 5/25/21			

Depth (ft)	Elevation (ft)	Sample No.	Recovery / Attempted	Strata Change	Soil/Rock Description	Notes ~~Blow Count N~~	~~Unit Weight (pcf)~~	Qp (tsf)	Qu (tsf)	Wc (%)
2, 3			16 / 36"		1.3' of SILTY CLAY, med grey, soft, moist					
4, 6		Chem Sample	36 / 36"		24" of CLAYEY SAND, orange brown to light grey, soft, moist	← Swapped to Split Spoon				
8, 10, 12, 13		Chem Sample; Chem Sample; Chem Sample	36 / 36		12" of CLAY w SOME SAND, orange brown w light grey Mottlings, low Plastic, dry 0.6' of Sand, orange, fine grained, slightly moist 3.7' of SAND w Some SILT, greyish brown, dry 0.7' of SAND, orange, slightly moist		Screen	8 – 12		
14		Chem Sample	14 / 24		1.5' of SILTY SAND, orange w grey mottling, dry					
16			0 / 24"		NO RECOVERY					
18, 19			20 / 24"		1.8' SILT W SAND & CLAY, ~~grey, dry~~ grey, low plastic, dry					
20, 21			24 / 24"		2' CLAY, grey, med Plastic, moist					
22					EOB 21'					

ILLINOIS POWER GENERATING COMPANY
COFFEEN POWER STATION
DECEMBER 2020 TOPOGRAPHY

COFFEEN, ILLINOIS

ADDRESS
134 CIPS LANE
COFFEEN, ILLINOIS 62017



PROJECT LOCATION MAP
N.T.S.

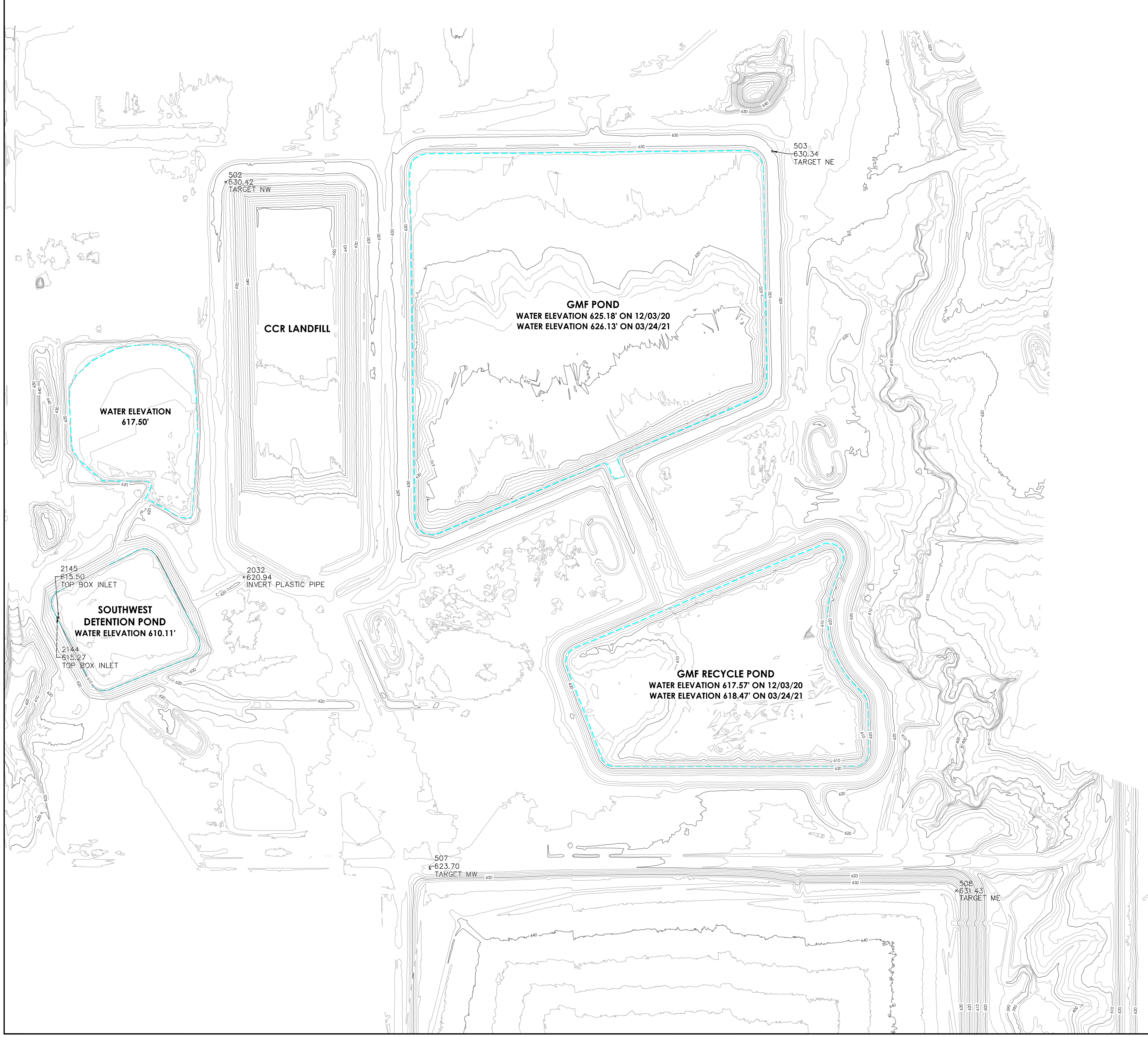
VICINITY MAP
N.T.S.

LIST OF DRAWINGS

1	-	COVER SHEET
2	-	EXISTING TOPOGRAPHY NORTH
3	-	EXISTING TOPOGRAPHY SOUTH
4	-	AERIAL TOPOGRAPHY NORTH
5	-	AERIAL TOPOGRAPHY SOUTH

PREPARED BY:

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



LEGEND

- EXISTING CONTOUR (2' INTERVAL)
- EXISTING CONTOUR (10' INTERVAL)
- LIMITS OF BATHYMETRIC SURVEY
- PIPING
- CONCRETE
- MANHOLE
- INLET

NOTES:

1. THIS EXHIBIT REPRESENTS A TOPOGRAPHIC FIELD SURVEY AND IS NOT INTENDED TO BE A BOUNDARY SURVEY.
2. EXISTING CONTOURS SHOWN ARE FROM AERIAL SURVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 12/03/2020 AND TOPOGRAPHIC/BATHYMETRIC SURVEYS COMPLETED BY INGENAE DATED 12/03/2020 & 12/04/2020. ASH POND 1 BATHYMETRIC SURVEY WAS COMPLETED BY INGENAE ON 04/15/2020.
3. NO UNDERGROUND OR OVERHEAD UTILITIES WERE LOCATED DURING THIS SURVEY.
4. THE ACCUMULATED DATA FROM AERIAL DRONE SURVEYS, GROUND TRUTHING FIELD DATA COLLECTION SURVEYS AND TOPOGRAPHIC/BATHYMETRIC SURVEYS USED TO PRODUCE THE TOPOGRAPHIC DRAWING AS SHOWN HEREON IS BASE ON ILLINOIS STATE PLANE COORDINATE-ZONE WEST NAD 1983 AND NAVD 88 ELEVATION DATUM.

TARGET POINT TABLE

POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
502	876457.9	2513942.9	630.43	TARGET NW
503	876570.4	2515939.4	630.34	TARGET NE
504	871464.3	2515211.1	637.22	TARGET SW
505	871534.1	2516666.1	635.99	TARGET SE
507	873944.5	2514681.3	623.70	TARGET MW
508	873867.4	2516612.2	631.43	TARGET ME

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

Submissions / Revisions:	Date:
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	

Luminant

Project Name & Location:

COFFEEN
POWER STATION

134 CIPS Lane
Coffeen, IL 62017

Drawing Name:
EXISTING TOPOGRAPHY NORTH

Date: 5/28/2021
Project No.
Type: SITE
Drawing No. 2
Drawn By: CB
Approved By: BH
Scale: AS NOTED

MNA WELLS				
POINT NO.	NORTHING	EASTING	ELEVATION	DESCRIPTION
1113	873636.91	2516757.78	594.82	G-1001 GROUND
1112	873636.91	2516757.78	597.95	G-1001 TOP METAL CASING
1111	873636.91	2516757.78	597.61	G-1001 TOP PVC WELL
1121	872676.88	2516735.78	607.02	G-1002 GROUND
1119	872676.88	2516735.78	610.47	G-1002 TOP METAL CASING
1120	872676.88	2516735.78	609.97	G-1002 TOP PVC WELL
1116	872510.86	2515601.43	625.77	SB-401A GROUND
1101	874781.00	2515020.93	623.53	SB-270A GROUND

AS SURVEY BY INGENAE 4/20/21

LEGEND

EXISTING CONTOUR (2' INTERVAL)
EXISTING CONTOUR (10' INTERVAL)
LIMITS OF BATHYMETRIC SURVEY
PIPING
CONCRETE
MANHOLE
INLET
WELL
SOIL BEARING
MNA WELL

N

0' 175' 350'

NOTES:

1. EXISTING AERIAL SHOWN ARE FROM AERIAL SURVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 12/03/2020.
2. THE WELL LOCATIONS AND ELEVATIONS, BORING LOCATIONS AND BENCHMARK DATA WAS RETRIEVED IN A SUBSEQUENT SURVEY DONE BY INGENAE DATED MARCH 24, 2021.

TARGET POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
502	876457.9	2513942.9	630.43	TARGET NW
503	876570.4	2515939.4	630.34	TARGET NE
504	871464.3	2515211.1	637.22	TARGET SW
505	871534.1	2516666.1	635.99	TARGET SE
507	873944.5	2514681.3	623.70	TARGET MW
508	873867.4	2516612.2	631.43	TARGET ME

SOIL BORING TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1075	876525.9	2515953.9	630.82	SB-289 GROUND

WELL LOCATION POINT TABLE				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1071	875111.4	2514684.6	631.41	G-206D GROUND
1072	875111.4	2514684.6	634.35	G-206D TOP METAL CASING
1074	875111.4	2514684.6	634.14	G-206D TOP PVC WELL
1082	874285.3	2516366.5	617.52	G-275D GROUND
1083	874285.3	2516366.5	620.69	G-275D TOP METAL CASING
1084	874285.3	2516366.5	620.31	G-275D TOP PVC WELL
1105	874113.0	2516503.0	608.30	G-283 GROUND
1106	874113.0	2516503.0	611.07	G-283 TOP METAL CASING
1107	874113.0	2516503.0	610.75	G-283 TOP PVC WELL
1086	874423.6	2516922.9	615.33	G-284 GROUND
1087	874423.6	2516922.9	618.66	G-284 TOP METAL CASING
1088	874423.6	2516922.9	618.42	G-284 TOP PVC WELL
1094	874795.0	2516680.4	610.54	G-285 GROUND
1095	874795.0	2516680.4	613.90	G-285 TOP METAL CASING
1097	874795.0	2516680.4	613.52	G-285 TOP PVC WELL
1098	875072.2	2516561.8	609.97	G-286 GROUND
1099	875072.2	2516561.8	613.57	G-286 TOP METAL CASING
1100	875072.2	2516561.8	613.13	G-286 TOP PVC WELL
1078	875442.8	2516415.5	614.34	G-287 GROUND
1079	875442.8	2516415.5	617.88	G-287 TOP METAL CASING
1080	875442.8	2516415.5	617.45	G-287 TOP PVC WELL
1090	875279.6	2517071.4	617.08	G-288 GROUND
1091	875279.6	2517071.4	620.37	G-288 TOP METAL CASING
1092	875279.6	2517071.4	620.07	G-288 TOP PVC WELL
1009	872235.1	2515583.1	620.88	G-301 GROUND
1010	872235.1	2515583.1	623.18	G-301 TOP METAL CASING
1011	872235.0	2515583.0	622.99	G-301 TOP PVC COUPLING WELL
1003	872252.9	2516214.1	618.52	G-302 GROUND
1017	872252.9	2516214.1	620.53	G-302 TOP METAL CASING
1018	872252.9	2516214.1	620.34	G-302 TOP PVC COUPLING WELL
1047	871382.1	2516639.5	619.33	G-303 GROUND
1048	871382.1	2516639.5	622.38	G-303 TOP METAL CASING
1049	871382.1	2516639.5	622.18	G-303 TOP PVC WELL COUPLING
1068	871156.4	2515199.5	623.23	G-305 GROUND
1069	871156.4	2515199.5	626.06	G-305 TOP METAL CASING
1070	871156.4	2515199.5	625.67	G-305 TOP PVC WELL
1056	871140.9	2516120.4	623.57	G-306 GROUND
1057	871140.9	2516120.4	626.38	G-306 TOP METAL CASING
1058	871140.9	2516120.4	625.91	G-306 TOP PVC WELL
1067	871398.6	2515553.4	624.73	G-307 GROUND
1066	871398.6	2515553.4	624.91	G-307 TOP METAL CASING
1065	871398.6	2515553.4	624.60	G-307 TOP PVC WELL
1062	871397.2	2515560.3	622.51	G-307D GROUND
1063	871397.2	2515560.3	625.29	G-307D TOP METAL CASING
1064	871397.2	2515560.3	624.88	G-307D TOP PVC WELL
1027	871454.7	2515101.4	621.59	G-308 GROUND
1028	871454.7	2515101.4	624.96	G-308 TOP METAL CASING
1029	871454.7	2515101.4	624.59	G-308 TOP PVC WELL
1030	871865.8	2515067.1	622.77	G-309 GROUND
1031	871865.8	2515067.1	626.20	G-309 TOP METAL CASING
1032	871865.8	2515067.1	625.88	G-309 TOP PVC WELL
1006	872239.4	2515159.4	619.89	G-310 GROUND
1007	872239.4	2515159.4	623.32	G-310 TOP METAL CASING
1008	872239.4	2515159.4	622.87	G-310 TOP PVC WELL
1012	872238.7	2515881.8	618.32	G-311 GROUND
1015	872238.7	2515881.8	618.39	G-311 GROUND
1013	872238.7	2515881.8	621.55	G-311 TOP METAL CASING
1014	872238.7	2515881.8	621.04	G-311 TOP PVC WELL
1016	872238.8	2515896.2	621.75	G-311D TOP METAL CASING
1002	872238.8	2515896.2	621.24	G-311D TOP PVC WELL
1019	872260.9	2516557.4	616.92	G-312 GROUND
1020	872260.9	2516557.4	620.11	G-312 TOP METAL CASING
1021	872260.9	2516557.4	619.78	G-312 TOP PVC WELL
1038	871976.8	2516803.7	611.51	G-313 GROUND
1039	871976.8	2516803.7	614.62	G-313 TOP METAL CASING
1040	871976.8	2516803.7	614.30	G-313 TOP PVC WELL
2015	871630.2	2516852.1	611.11	G-314 GROUND
2014	871630.2	2516852.1	614.28	G-314 TOP METAL CASING
2013	871630.2	2516852.1	613.88	G-314 TOP PVC WELL
2010	871642.0	2516853.9	610.87	G-314D GROUND
2011	871642.0	2516853.9	614.10	G-314D TOP METAL CASING
2012	871642.0	2516853.9	613.70	G-314D TOP PVC WELL
1059	871385.0	2516086.6	620.94	G-315 GROUND
1060	871385.0	2516086.6	623.89	G-315 TOP METAL CASING
1061	871385.0	2516086.6	623.52	G-315 TOP PVC WELL
1050	871643.1	2517211.6	599.64	G-316 GROUND
1051	871643.1	2517211.6	603.06	G-316 TOP METAL CASING
1052	871643.1	2517211.6	602.59	G-316 TOP PVC WELL
1053	871234.2	2517087.4	638.85	G-317 GROUND
1054	871234.2	2517087.4	642.26	G-317 TOP METAL CASING
1055	871234.2	2517087.4	641.93	G-317 TOP PVC WELL
1023	872312.0	2516714.4	605.87	SG-02 TOP METAL WELL
1022	872095.1	2517025.0	594.94	SG-03 TOP METAL WELL
1085	873935.3	2516963.3	599.52	SG-04 TOP METAL WELL
1024	871638.7	2515366.3	631.85	XPW-01 GROUND
1025	871638.7	2515366.3	634.92	XPW-01 TOP METAL CASING
1026	871638.7	2515366.3	634.57	XPW-01 TOP PVC WELL
1001	871987.1	2515627.3	636.64	XPW-02 GROUND
1101	871987.1	2515627.3	640.02	XPW-02 TOP METAL
1102	871987.1	2515627.3	639.69	XPW-02 TOP PVC WELL
1004	872095.3	2515211.8	635.52	XSG-01 TOP PVC WELL

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

Submissions / Revisions: Date:

1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		

Luminant

Project Name & Location:

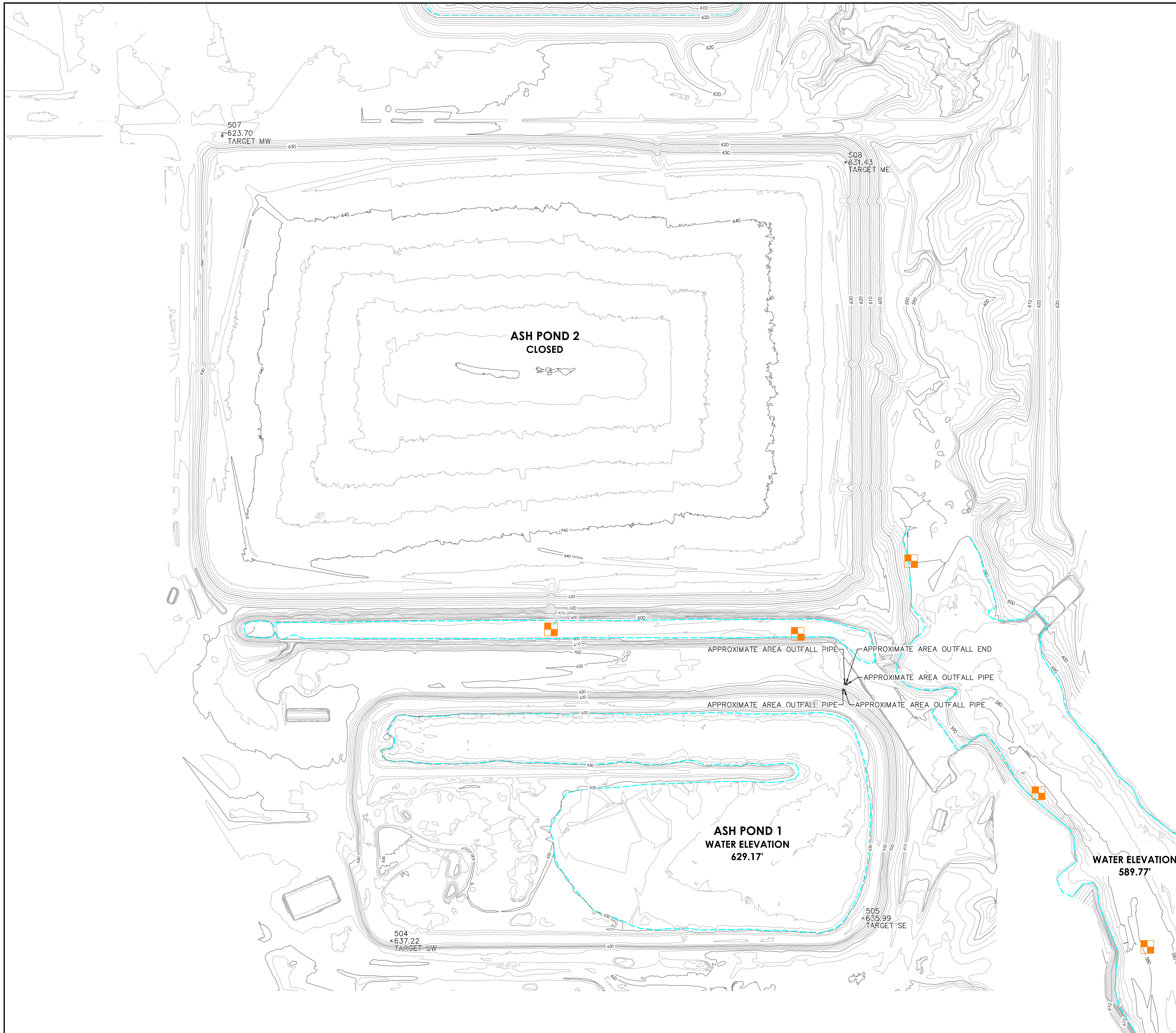
COFFEEN
POWER STATION

134 CIPS Lane
Coffeen, IL 62017

Drawing Name:

AERIAL
PHOTOGRAPHY
NORTH

Date: 5/28/2021
Project No.
Type: SITE
Drawn By: CB
Approved By: BH
Scale: AS NOTED
Drawing No. 3



N

0' 150' 300'

LEGEND

- EXISTING CONTOUR (2' INTERVAL)
- EXISTING CONTOUR (10' INTERVAL)
- LIMITS OF BATHYMETRIC SURVEY
- PIPING
- CONCRETE
- MANHOLE
- INLET
- PROPOSED MNA SAMPLE SITE

NOTES:

1. THIS EXHIBIT REPRESENTS A TOPOGRAPHIC FIELD SURVEY AND IS NOT INTENDED TO BE A BOUNDARY SURVEY.
2. EXISTING CONTOURS SHOWN ARE FROM AERIAL SURVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 12/03/2020 AND TOPOGRAPHIC/BATHYMETRIC SURVEYS COMPLETED BY INGENAE DATED 12/03/2020 & 12/04/2020. ASH POND 1 BATHYMETRIC SURVEY WAS COMPLETED BY INGENAE ON 04/15/2020.
3. NO UNDERGROUND OR OVERHEAD UTILITIES WERE LOCATED DURING THIS SURVEY.
4. THE ACCUMULATED DATA FROM AERIAL DRONE SURVEYS, GROUND TRUTHING FIELD DATA COLLECTION SURVEYS AND TOPOGRAPHIC/BATHYMETRIC SURVEYS USED TO PRODUCE THE TOPOGRAPHIC DRAWING AS SHOWN HEREON IS BASE ON ILLINOIS STATE PLANE COORDINATE-ZONE WEST NAD 1983 AND NAVD 88 ELEVATION DATUM.
5. ADDITIONAL MNA SAMPLING SITES GROUND BATHYMETRIC SURVEY PERFORMED ON 04/22/2021.

TARGET POINT TABLE

POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
502	876457.9	2513942.9	630.43	TARGET NW
503	876570.4	2515939.4	630.34	TARGET NE
504	871464.3	2515211.1	637.22	TARGET SW
505	871534.1	2516666.1	635.99	TARGET SE
507	873944.5	2514681.3	623.70	TARGET MW
508	873867.4	2516612.2	631.43	TARGET ME

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

Submissions / Revisions:	Date:
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	

Luminant

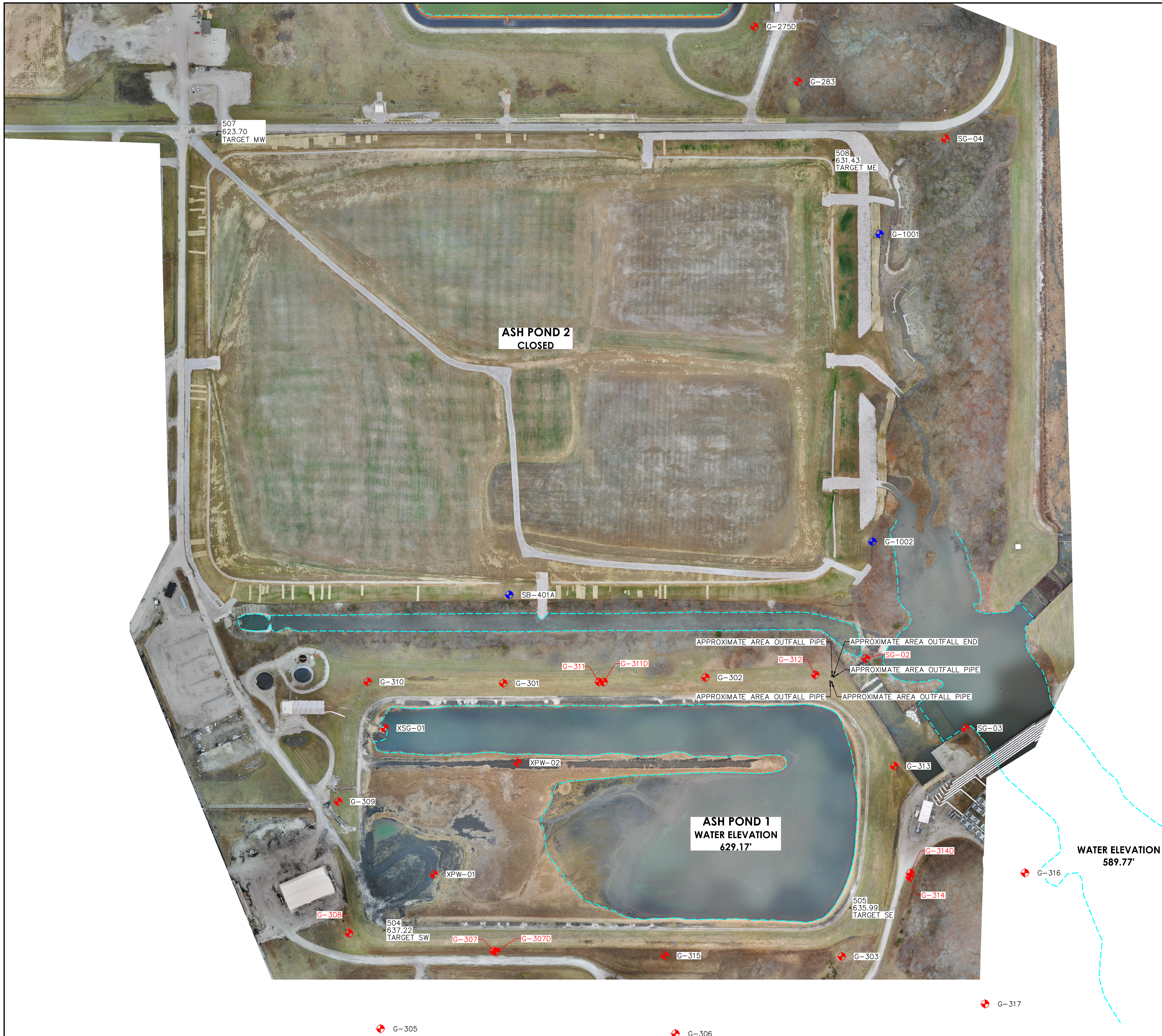
Project Name & Location:

COFFEEN
POWER STATION

134 CIPS Lane
Coffeen, IL 62017

Drawing Name:
EXISTING TOPOGRAPHY SOUTH

Date: 5/28/2021
Project No.:
Type: SITE
Drawing No.: 4
Drawn By: CB
Approved By: BH
Scale: AS NOTED



N

0' 150' 300'

LEGEND

- EXISTING CONTOUR (2' INTERVAL)
- EXISTING CONTOUR (10' INTERVAL)
- LIMITS OF BATHYMETRIC SURVEY
- PIPING
- CONCRETE
- MANHOLE
- INLET
- WELL
- MNA WELL

NOTES:

1. EXISTING AERIAL SHOWN ARE FROM AERIAL SURVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 12/03/2020.
2. APPROXIMATE LOCATION OF OUTFALL PIPE LOCATED BY OTHERS.
3. THE WELL LOCATIONS AND ELEVATIONS, BORING LOCATIONS AND BENCHMARK DATA WAS RETRIEVED IN A SUBSEQUENT SURVEY DONE BY INGENAE DATED MARCH 24, 2021.

TARGET POINT TABLE

POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
502	876457.9	2513942.9	630.43	TARGET NW
503	876570.4	2515939.4	630.34	TARGET NE
504	871464.3	2515211.1	637.22	TARGET SW
505	871534.1	2516666.1	635.99	TARGET SE
507	873944.5	2514681.3	623.70	TARGET MW
508	873867.4	2516612.2	631.43	TARGET ME

MNA WELLS

POINT NO.	NORTHING	EASTING	ELEVATION	DESCRIPTION
1113	873636.91	2516757.78	594.82	G-1001 GROUND
1112	873636.91	2516757.78	597.95	G-1001 TOP METAL CASING
1111	873636.91	2516757.78	597.61	G-1001 TOP PVC WELL
1121	872676.88	2516735.78	607.02	G-1002 GROUND
1119	872676.88	2516735.78	610.47	G-1002 TOP METAL CASING
1120	872676.88	2516735.78	609.97	G-1002 TOP PVC WELL
1116	872510.86	2515601.43	625.77	SB-401A GROUND
1101	874781.00	2515020.93	623.53	SB-270A GROUND

AS SURVEY BY INGENAE 4/20/21

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

Submissions / Revisions:	Date:
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	

Luminant

Project Name & Location:

COFFEEN
POWER STATION

134 CIPS Lane
Coffeen, IL 62017

Drawing Name:

AERIAL PHOTOGRAPHY SOUTH

Date: 5/28/2021	Project No.
Type: SITE	Drawing No. 5
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

APPENDIX B
STATISTICAL ANALYSIS PLAN

Prepared for
Illinois Power Generating Company

Date
October 25, 2021

Project No.
1940100806-002

STATISTICAL ANALYSIS PLAN

ASH POND NO. 2
COFFEEN POWER PLANT
COFFEEN, ILLINOIS

RAMBOLL Bright ideas. Sustainable change.

STATISTICAL ANALYSIS PLAN
COFFEEN POWER PLANT ASH POND NO. 2

Project Name	**Coffeen Power Plant Ash Pond No. 2**
Project No.	**1940100806-005**
Recipient	**Illinois Power Generating Company**
Document type	**Statistical Analysis Plan**
Version	**FINAL**
Date	**October 25, 2021**

Ramboll
234 W. Florida Street
Fifth Floor
Milwaukee, WI 53204
USA

T 414-837-3607
F 414-837-3608
https://ramboll.com

Brian G. Hennings, PG
Senior Managing Hydrogeologist

Eric J. Tlachac, PE
Senior Managing Engineer

Rachel A. Banoff, EIT
Project Statistician

LICENSED PROFESSIONAL CERTIFICATIONS

This certification is based on the description of the statistical methods selected to evaluate groundwater as presented in the following Statistical Analysis Plan; Coffeen Power Plant Ash Pond No. 2. The procedures described in the plan will be used to establish background conditions and implement compliance monitoring as necessary and required by 35 I.A.C. § 845.640 and 35 I.A.C. § 845.650. The 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,* March 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 will be either the tolerance interval or the prediction 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 lower confidence limit 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 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 (Statistical Analysis Plan; Coffeen Power Plant Ash Pond No. 2) 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: October 25, 2021

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 (Statistical Analysis Plan; Coffeen Power Plant Ash Pond No. 2) 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: October 25, 2021

LICENSED PROFESSIONAL GEOLOGIST
BRIAN G. HENNINGS
196.001482
ILLINOIS

35 I.A.C. § 845.640 Statistical Analysis

I, Rachel A. Banoff, a qualified professional, certify that the statistical methods described in this document (Statistical Analysis Plan; Coffeen Power Plant Ash Pond No. 2), 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: October 25, 2021

CONTENTS

TABLES (IN TEXT)

ACRONYMS AND ABBREVIATIONS

§	Section
35 I.A.C.	Title 35 of the Illinois Administrative Code
ANOVA	analysis of variance
CCR	coal combustion residuals
COC	constituents of concern
GWPS	groundwater protection standard
IEPA	Illinois Environmental Protection Agency
LCL	lower confidence limit
LTL	lower tolerance limit
MSE	mean squared error
P	probability
Part 845	Residuals in Surface Impoundments: Title 35 of the Illinois Administrative Code § 845
RCRA	Resource Conservation and Recovery Act
RL	reporting limit
ROS	regression on order statistics
SI	surface impoundment
SSI	statistically significant increase
SWFPR	site-wide false positive rate
Unified Guidance	*Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (USEPA, 2009)
UPL	upper prediction limit
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 (Part 845). Facilities regulated under Part 845 are required to develop and sample a groundwater monitoring well network to evaluate whether impounded CCR materials are impacting downgradient groundwater quality. The groundwater quality evaluation must include selection and certification by a qualified professional engineer of the statistical procedures to be used. 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 and 35 I.A.C. § 845.650. 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*) (March 2009).

This Statistical Analysis Plan does not include procedures for groundwater sample collection and analysis, as these activities are conducted in accordance with the Sampling and Analysis Plan prepared for each CCR unit in accordance with 35 I.A.C. § 845.640. This Statistical Analysis Plan will be used as the primary reference for evaluating groundwater quality during operation and post-closure care.

1.1 Statistical Analysis Objectives

This Statistical Analysis Plan is intended to provide a logical process and framework for conducting the statistical analyses of data obtained during groundwater monitoring conducted in accordance with the Sampling and Analysis Plan for each CCR unit. The Statistical Analysis Plan will enable a qualified professional engineer to certify that the selected statistical methods are appropriate for evaluating the groundwater monitoring data for the applicable CCR unit(s).

1.2 Statistical Analysis Plan Approach

The main sections of this Statistical Analysis Plan should be viewed as a "generic" outline of statistical methods utilized for each CCR unit and constituent required to be monitored. The statistical analysis of the groundwater monitoring data, however, will be conducted on an individual-constituent or well basis, and may involve the use of appropriate statistical procedures depending on multiple factors such as detection frequency and normality distributions.

The CCR Rule outlines two phases of groundwater monitoring:

- Background Monitoring in accordance with 35 I.A.C. § 845.650(b)(1)
- Compliance Monitoring in accordance with 35 I.A.C. § 845.650

Each phase of the groundwater monitoring program requires specific statistical procedures to accomplish the intended purpose. During the background monitoring phase, background groundwater quality will be established utilizing upgradient and background wells and downgradient groundwater quality data will be collected to facilitate statistics in subsequent phases. Compliance Monitoring is then initiated through the evaluation of the downgradient groundwater monitoring data for exceedances of the groundwater protection standard (GWPS) established by Part 845 (concentration specified in 35 I.A.C. § 845.600 or an IEPA-approved background concentration). The developed statistical analysis plan will be implemented for each monitoring phase and in accordance with the statistical procedures.

2. BACKGROUND MONITORING AND DATA PREPARATION

The background and compliance monitoring wells were sampled and analyzed for constituents, as listed in Part 845 (antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chloride, chromium, cobalt, fluoride, lead, lithium, mercury, molybdenum, pH, radium 226 and 228 combined, selenium, sulfate, thallium, total dissolved solids, and turbidity), during the baseline phase of the groundwater monitoring program.

The background monitoring well(s) were placed upgradient of the CCR unit, or at an alternative background location, where they are not affected by potential leakage from the CCR unit. Compliance monitoring wells were placed at the waste boundary of the CCR unit, along the same groundwater flow path. As 35 I.A.C. § 845.630(a) specifies, the location of these wells ensures that background accurately represents the quality of unaffected groundwater, while compliance wells accurately represent groundwater quality at the waste boundary and monitor all potential contaminant pathways.

As required by 35 I.A.C. § 845.650(a)(1), eight sampling events were completed within 180 days of April 21, 2021. As outlined, groundwater sampling procedures included sampling of the background and compliance wells using low-flow sampling methods, collection of one field quality control sample per event, and groundwater samples were not field filtered before laboratory analysis of total recoverable metals.

Following completion of the eight sampling events, background groundwater quality was established for Part 845 constituents. Groundwater monitoring will be conducted quarterly for at least the first five years. In accordance with 35 I.A.C. § 845.650(b)(4), after the first five years, a request to reduce the monitoring frequency to semiannual may be submitted to IEPA if all of the following can be demonstrated:

- Groundwater monitoring effectiveness will not be compromised by the reduced frequency
- Sufficient data has been collected to characterize groundwater
- Monitoring to date does not show any statistically significant increasing trends
- The concentrations of monitored constituents at the compliance monitoring wells are below the applicable GWPSs established in 35 I.A.C. § 845.600

The following subsections outline the statistical tests and procedures (methods) that will be utilized to evaluate data collected for each constituent in both background and compliance wells for Background and Compliance Monitoring. When necessary and contingent upon equivalent statistical power, an alternative test not included in this Statistical Analysis Plan may be chosen due to site-specific data requirements.

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. The sampling schedules for both the baseline and compliance monitoring periods are specified in 35 I.A.C. § 845.650(b) and may conflict with the statistical assumption of independence of sample results.

2.2 Non-Detect Data Processing

The reporting limit (RL) will be used as the lower level for the reporting of non-detected groundwater quality data. For all summary statistics (box plots, timeseries, etc.), the RL will be substituted for concentrations reported below the RL, including non-detects. With professional judgement, analytical results between the RL and the method detection limit, *i.e.,* estimated values, typically identified with a "J" flag, may be utilized if provided by the laboratory.

For all statistical test procedures:

- 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 between 15 percent and 50 percent, either the Kaplan-Meier or robust regression on order statistics (ROS) 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 percent, a non-parametric test will be used
- If only one background result is detected that value will be used as the non-parametric upper prediction limit (UPL)

2.3 Testing for Normality

Many statistical analyses assume that sample data are normally distributed (parametric). However, environmental data are frequently not normally distributed (nonparametric). 35 I.A.C. § 845.640(g) requires the knowledge of the background data distribution for comparison to compliance results. 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.

When possible, transformation of datasets to achieve normal distributions is preferred.

2.4 Testing for Outliers

Part 845 constituents will be screened for the existence of outliers using a method 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.
- Time series, box-whisker plots, and probability plots provide visual tools to identify potential outliers, and evaluation of seasonal, spatial, or temporal variability for both normally and non-normally distributed data.

Data quality control, groundwater geochemistry, and sampling procedures will be evaluated as potential sources of error leading to an outlier result. The outlier tests cannot be used alone to determine whether a value is a true outlier that should be excluded from future statistical analysis. Corroborating evidence needed to exclude values includes a discrete data reporting or analytical error, or potential laboratory bias. Absent corroborating evidence, the flagged values are considered true, but extreme, values in the data set. Professional judgement will be used to exclude extreme outliers from further statistical analyses. Outliers will be retained in the database.

With professional judgement, a confirmatory sample may be collected to allow for the distinction between an outlier and a true representation of groundwater quality at the monitoring point. If re-sampling is conducted, this sample will be collected within 90 days following outlier identification. If the confirmatory sample indicates the original result as an outlier, it will be reported as such.

2.5 Trend Analysis

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

A linear regression, coupled with a t-test for slope significance at a 95 percent confidence level (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 percent confidence level (0.05 significance level), will 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 unit being monitored was 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. 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 as 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.

Hydrologic factors such as drought, recharge patterns or regular (*e.g.,* seasonal) water table fluctuations may be responsible for the temporal variation. In these cases, it may be useful to test for the presence of a significant temporal effect by first constructing a parallel time series plot and then running a formal one-way analysis of variance (ANOVA) ($\alpha = 0.05$) for temporal effects. A one-way ANOVA for temporal effects considers multiple well data sets for individual sampling events or seasons as the relevant statistical factor. If event-specific analytical differences or seasonality appear to be an important temporal factor, the one-way ANOVA for temporal effects can be used to formally identify seasonality, parallel trends, or changes in lab performance that affect other temporal effects. The one-way ANOVA for temporal effects assumes that the data groups are normally distributed with constant variance. It is also assumed that for each of a series of background wells, measurements are collected at each well on sampling events or dates common to all the wells. Results of the ANOVA can also be used to create temporally stationary residuals, where the temporal effect has been 'subtracted from' the original measurements. These stationary residuals may be used to replace the original data in subsequent statistical testing.

If the data cannot be normalized, a similar test for a temporal or seasonal effect can be performed using the Kruskal-Wallis test ($\alpha = 0.05$). Each sampling event should be treated as a separate 'well,' while each well is treated as a separate 'sampling event.' In this case, no residuals can be computed since the Kruskal-Wallis test employs ranks of the data rather than the measurements themselves.

Where both spatial and temporal variation occur, two-way ANOVA can be considered where both well location and sampling event/season are treated as statistical factors. This procedure is described in Davis (1994).

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 1 to 2 years under a quarterly monitoring program), are available for comparison to historical data. Professional judgement will be used to evaluate whether any background data appear to be affected by a release and need to be excluded from a background update. A t-test for equal means (if normal data distribution) or appropriate non-parametric test (if non-normal data distribution) such as a Mann-Whitney (or Wilcoxon) rank-sum or box-whisker plots, will be conducted to evaluate whether 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 they are equivalent. In addition, time series graphs or other trend evaluation statistics 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 (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. In accordance with the *Unified Guidance*, continual background updates will not be conducted due to the lack of sufficient samples for a statistical comparison.

3. COMPLIANCE MONITORING

Compliance monitoring is designed to monitor groundwater for evidence of a release by comparing Part 845 constituents in compliance wells to both background concentrations and the GWPS. Compliance Monitoring will begin the quarter following approval of this groundwater monitoring plan and issuance of the Operating Permit. The selected Compliance Monitoring statistical method used to compare compliance groundwater quality data for each constituent to the GWPS will provide for adequate statistical power, error levels and individual test false positive rates, and be appropriate for the distribution and detection frequency of the background dataset. Statistical power is the ability of a statistical test to detect a true exceedance.

In accordance with 35 I.A.C. § 845.610(b)(3)(D), compliance monitoring statistical analyses will be completed and submitted to IEPA within 60 days after completion of sampling.

3.1 GWPS Establishment and Exceedance Determination

In accordance with 35 I.A.C. § 845.600(a), the GWPS will be the constituent concentrations specified in 35 I.A.C. § 845.600(a)(1) except for when the background concentration is greater, or no concentration is specified (*i.e.,* for calcium and turbidity), in which case the GWPS will be the background concentration. The GWPS based on background concentration will be calculated using a parametric upper tolerance limit (UTL), a parametric UPL for a future mean, or a non-parametric UPL for a future median.

Statistical calculations that will be utilized in Compliance Monitoring procedures are summarized in **Table A** below and listed in **Sections 3.1.1** through **3.1.7**. Depending on the distribution of the data and the percentage of non-detects, it may be more appropriate to use a parametric model over a non-parametric model. As necessary, other techniques as mentioned in the *Unified Guidance* and/or new methods will be implemented.

Table A. Statistical Calculations Used in Compliance Monitoring Procedures

Compliance Monitoring						
Significant Trend?	Background Data			Compliance Data		
	Percent Non-Detects	Distribution	GWPS Determination	Percent Non-Detects	Distribution	Method to Determine Exceedance
No	0 ≤ 50	Normal	35 I.A.C § 845.600(a)(1) constituent concentration or The Upper Tolerance Limit	≤75	Normal	Parametric Lower Confidence Limit around a Normal Mean
				≤75	Log-Normal	Parametric Lower Confidence Limit around a Lognormal Geometric Mean
				NA	Non-Normal	Non-Parametric Lower Confidence Limit around a Median
				>75	Unknown/ Cannot be determined	
	50 ≤ 70	Normal	The Upper Prediction Limit for a Future Mean	NA	NA	Future mean
	>70	Non-Normal	Upper Prediction Limit for a Future Median	NA	NA	Future median
	100	Non-Normal	Double Quantification Rule	NA	NA	Individual Retesting Values
Yes	0 ≤ 50	Normal	UCL of Confidence Band around Linear Regression	≤75	Residuals after subtracting trend are normal, equal variance	Lower Limit from Confidence Band around Linear Regression
	50 ≤ 100	Non-Normal	UCL of Confidence Band around Thiel-Sen trend line	≤75	Residuals not normal	Lower Limit from Confidence Band around Thiel-Sen

3.1.1 The Upper Tolerance Limit

The UTL will be used to calculate the GWPS when pooled background data are normally distributed, with a non-detect frequency of 50 percent or less. When non-detect frequency is 15 percent or less, half the RL will be substituted for non-detects. The *Unified Guidance* recommends 95 percent confidence level and 95 percent coverage (95/95 tolerance interval).

- When non-detect frequency is 15 percent 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 or the ROS method will be used when the detection frequency is between 15 percent and 50 percent. 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 or ROS estimate of the mean and standard deviation will be substituted for the sample mean and standard deviation.
- If background normality cannot be achieved, non-parametric UTLs will not be calculated until a minimum of 60 background samples have been collected (to achieve 95 percent coverage).

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 are tabulated in Table 17-3 in Appendix D of the *Unified Guidance*. If exact values are not provided, then κ values can be estimated by linear interpolation.

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:

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

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

s_y = background sample log-standard deviation

When the GWPS is based on the 35 I.A.C. § 845.600(a)(1) constituent concentrations or a UTL derived from the background dataset, an exceedance in compliance wells relative to the GWPS will be evaluated using confidence intervals. A confidence interval defines the upper and lower bound of the true mean of a constituent concentration in groundwater within a specified confidence range.

- Non-detects in compliance data will be handled similarly to upgradient analyses, with half the RL substituted for non-detects when the frequency is 15 percent or less.
- The Kaplan-Meier, or the ROS method, will be used when the detection frequency is between 15 percent and 50 percent to compute estimates of the mean and standard deviation adjusted for the presence of left-censored values. These estimates will then be substituted for the sample mean and standard deviation.

Once the GWPS is established for background data using the UTL, either parametric or non-parametric confidence intervals will be computed for each constituent in compliance wells to identify GWPS exceedances.

3.1.2 Parametric Confidence Intervals around a Mean

If compliance data are approximately normal, one-sided parametric confidence intervals around a sample mean will be constructed for each constituent and well pair. The lower confidence limit (LCL) will be calculated as:

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

$\bar{x}$ = 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 (Table 16-1 in Appendix D of the *Unified Guidance*)

The chosen t value will aim to achieve both a low false-positive rate, and high statistical power. Minimum ɑ values are tabulated in Table 22-2 of Appendix D of the *Unified Guidance*. The selected minimum ɑ value, from which the t value will be derived, will have at least 80 percent power (1-β = 0.8) when the underlying mean concentration is twice the GWPS.

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

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

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

s_y = compliance sample log-standard deviation

3.1.3 Non-Parametric Confidence Intervals around a Median

Non-parametric confidence intervals around the median will be computed if the compliance data contain greater than 50 percent non-detects or are not normally distributed. The mathematical algorithm used to construct non-parametric confidence intervals 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.

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 close to the product of (n+1) x 0.50. If the result of (n+1) x 0.50 is a fraction (for even-numbered sample sizes), the rank values immediately above and below will be selected as possible candidate endpoints. If the result of (n+1) x 0.50 is an integer (for odd-numbered sample sizes), one will be added to and subtracted from the result to get the upper and lower candidate endpoints. The ranks of the endpoints will be denoted L* and U*. For a one-sided LCL, the confidence level associated with endpoint L* will be computed as:

$$1 - \alpha = Bin(L^* - 1; n, 0.50) = \sum_{x=L^*}^{n} \binom{n}{x} \left(\frac{1}{2}\right)^n$$

If the candidate endpoint(s) do not achieve the desired confidence level, new candidate endpoints (L*–1) and (U*+1) and achieved confidence levels will be calculated. If one candidate endpoint equals the data minimum or maximum, only the rank of the other endpoint will be changed. Achievable confidence levels are tabulated using these equations in Table 21-11 in Appendix D of the *Unified Guidance*.

Both parametric and non-parametric confidence limits will then be compared to the GWPS. The CCR unit is considered to be in compliance if the LCL is equal to or lower than the GWPS for all detected constituents at all compliance monitoring wells. A GWPS exceedance is determined if the LCL exceeds the GWPS.

3.1.4 The Upper Prediction Limit for a Future Mean

The parametric UPL for a future mean will be used to calculate the GWPS if the pooled background data contain 50 to 70 percent non-detects and normality can be achieved. The Kaplan-Meier or ROS methods will be used to estimate the mean and standard deviation. The non-parametric UPL for a future median will be calculated as the GWPS if background samples cannot be normalized or contain greater than 70 percent non-detects. The parametric UPL for a future mean will be calculated from the background dataset at follows:

$$UPL_{1-\alpha} = \overline{x} + \kappa s$$

$\overline{x}$ = background sample mean

s = background standard deviation

κ = multiplier based on the order (p) of the future mean to be predicted, the number of compliance wells to be tested (w), the background sample size (n) the number (c) of constituents of concern (COCs), the "1-of-m" retesting scheme, and the evaluation schedule (annual, semi-annual, quarterly). Values are tabulated in 19-5 to 19-9 in Appendix D of the *Unified Guidance*.

The mean of order p will be computed for each well and compared against the UPL. For any compliance point mean that exceeds the limit, p additional resamples may be collected at that well for a 1-of-2 retesting scheme. Resample means will then be compared to the UPL. A GWPS exceedance has been deemed to occur at a compliance well when the initial mean and all resample means exceed the UPL.

3.1.5 The Non-Parametric Upper Prediction Limit for a Future Median

The non-parametric UPL for a future median will be used to calculate the GWPS if the pooled background data contain greater than 70 percent non-detects and normality cannot be achieved. Non-parametric methods assume that the data does not have an underlying distribution. To calculate the non-parametric UPL on a future value, the target per-constituent false positive rate (α_{const}) will be determined as follows:

$$\alpha_{const} = 1 - (1 - \alpha)^{1/c}$$

α = the site-wide false positive rate (SWFPR) of 0.10 recommended by the *Unified Guidance*

c = the number of monitoring constituents

The number of yearly statistical evaluation (nE) will be multiplied by the number of compliance wells (w) to determine the look-up table entry, w*. The background sample size (n) and w* will be used to select an achievable per-constituent false positive rate value in Table 19-24 of Appendix D in the *Unified Guidance*. The chosen achievable per-constituent false positive rate value will determine the type of non-parametric prediction limit (maximum or 2nd highest value in background) and a retesting scheme for a future median. The background data will be sorted in ascending order, and the upper prediction limit will be set to the appropriate order statistic previously determined by the achievable per-constituent false positive rate value in Table 19-24. If all constituent measurements in a background sample are non-detect, the Double Quantification rule will be used. The use of the Double Quantification rule in Compliance Monitoring will only be applicable if the RL is above the 35 I.A.C. § 845.600(a)(1) constituent concentration or a constituent concentration is not specified in § 845.600(a)(1). This scenario is highly unlikely. The constituent will also be removed from calculations identifying the target false positive rate.

Two initial measurements per compliance well will be collected. If both do not exceed the upper prediction limit, a third initial measurement will not be collected since the median of order 3 will also not exceed the limit. If both exceed the prediction limit, a third initial measurement will not be collected since the median will also exceed the limit. If one initial measurement is above and one below the limit, a third initial observation may be collected to determine the position of the median relative to the UPL. Up to three resamples will be collected in order to assess the resample median. In all cases, if two or more of the compliance point observations are non-detect, the median will be set equal to the RL. The median value for each compliance well will be compared to the UPL. For the 1-of-2 retesting scheme, if any compliance point median exceeds the limit, up to three additional resamples will may be collected from that well. The resample median will be computed and compared to the UPL. A GWPS exceedance has been deemed to occur at a compliance well when either the initial median, or both the initial median and resample median exceed the UPL.

If the concentrations of detected constituents are below the established GWPS, Compliance Monitoring will continue.

3.1.6 Parametric Linear Regression and Confidence Band

If the t-test detects a significant trend in the parametric linear regression line using either background or compliance data for a particular constituent, confidence bands accounting for trends will be constructed to account for the trend-induced variation. If this is not accounted for, a wider confidence interval will inevitably be calculated for a given confidence level and sample size (n). A wider confidence interval 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 confidence intervals 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 does also to reflect this change at that point in time.

Linear regression will be used when background or compliance data are approximately normally distributed, with a constant sample variance around the mean, and the frequency of non-detects is low. The linear regression of concentration against sampling date (time) will be computed as follows:

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

x_i = i^{th} concentration value and

t_i = i^{th} sampling date

$\overline{t}$ = sampling mean date

s_t^2 = variance of the sampling dates

This estimate leads to the following regression equation:

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

$\overline{x}$ = 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 (MSE) will be computed as follows:

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

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

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

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

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

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

For background data, the UCL around the linear regression line will be used as the GWPS for the trending constituent. For compliance data, confidence bands around the linear regression line will be compared to the GWPS. The CCR unit is considered to be in compliance if the LCL is equal to or lower than the GWPS for all detected constituents at all compliance wells. A GWPS exceedance is determined when the LCL based on the trend line first exceeds the GWPS.

3.1.7 Non-Parametric Thiel-Sen Trend Line and Confidence Band

If the Mann-Kendall test detects a significant trend in the non-parametric Thiel-Sen line using either background or compliance data for a particular constituent, confidence bands accounting for trends will be constructed to account for the trend-induced variation. The Thiel-Sen trend line will be used as a non-parametric alternative to linear regression when trend residuals cannot be normalized or if there are a higher percentage of non-detects in either background or compliance data. 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 x1, x2, xn. 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-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 (ti, xi) will be formed with a sample date (ti) and the concentration measurement from that date (xi). 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 time points (tj) 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 ($\hat{x}_j^B$). An LCL will be constructed for the lower α^{th} percentile $\hat{x}_j^{[\alpha]}$ from the distribution of estimated concentrations at each time point (tj). For a UCL, compute the upper $(1-\alpha)^{th}$ percentile, $\hat{x}_j^{[1-\alpha]}$ at each time point (tj).

For background data, the UCL around the Thiel-Sen trend line will be used as the GWPS for the trending constituent. For compliance data, confidence bands around the Thiel-Sen trend line will be compared to the GWPS. The CCR unit is considered to be in compliance if the LCL is equal to or lower than the GWPS for all detected constituents at all compliance wells. A GWPS exceedance is confirmed when the LCL based on the trend line first exceeds the GWPS.

3.2 Determination of Statistically Significant Increases over Background

In accordance with 35 I.A.C. §§ 845.610(b)(3)(B) and 845.640(h), individual monitoring event concentrations for each constituent detected in the compliance monitoring wells during compliance monitoring sampling events will be compared to the background concentration as determined by the methods described above. An exceedance of the background concentration for any constituent measured at any compliance monitoring well, or constituent detection if not detected in the background samples, constitutes a Statistically Significant Increase (SSI). An exception to this method is pH, where two-sided (upper and lower) tolerance limits are established from the distribution of the background groundwater quality data. An exceedance of either the UTL or lower tolerance limit (LTL) would constitute an SSI for pH.

4. REFERENCES

Davis, C.B., 1994. *Environmental Regulatory Statistics.* In GP Patil & CR Rao (Eds.) *Handbook of Statistics, Volume 12: Environmental Statistics*, Chapter 26. New York: Elsevier Science B.V.

United States Environmental Protection Agency (USEPA), 2009. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Unified Guidance*. EPA 530-R-09-007. March 2009.

ATTACHMENT 2
GROUNDWATER MONITORING PLAN DATED JANUARY 24, 2017; AND RESPONSE TO COMMENT LETTER DATED NOVEMBER 27, 2017

ILLINOIS POWER GENERATING COMPANY
Coffeen Power Station
134 CIPS Lane
Coffeen, IL 62017
Montgomery County

By UPS

November 27, 2017

William E. Buscher, P.G.
Manager, Hydrogeology and Compliance Unit
Groundwater Section, Division of Public Water Supplies, Bureau of Water
Illinois Environmental Protection Agency
1021 North Grand Avenue East
Springfield, IL 62794-9276

Re: Coffeen Power Station
Inactive Ash Pond No. 2
Responses to IEPA's October 27, 2017 Comments on IPGC's February 1, 2017 Closure and Post-Closure Care Plans

Dear Mr. Buscher:

The enclosed document has been prepared to respond to the eight comments in your October 27, 2017 letter regarding our February 1, 2017 Closure and Post-Closure Care plans for inactive ash pond no. 2. The comments are based in part upon the telephone conference call discussion with you and your staff and Natural Resources Technology staff on November 7, 2017.

Please let us know if you would like to meet with us, or have another telephone conference call to discuss these responses. My telephone no. is 618-343-7761.

Sincerely,

Rick Diericx
Managing Director – Environmental Compliance Group

Enclosures

bcc: M. Ballance / J. Frierdich / V. Modeer – Collinsville
T. Davis – Collinsville
Stu Cravens – NRT (Bloomington, IL)
Rick Diericx Reading File - Collinsville

November 21, 2017

Mr. Rick Diericx
Managing Director – Environmental Compliance Group
Dynegy Operating Company
1500 Eastport Plaza Drive
Collinsville, IL 62234-6135

Subject: Response to IEPA Comments – Coffeen Station Inactive Ash Pond No. 2
Closure and Post-Closure Care Plan for the Coffeen Ash Pond No. 2
NRT Project No. 2380

Dear Mr. Diericx:

Natural Resource Technology, Inc., an OBG Company (NRT) is providing this letter to Dynegy Operating Company (Dynegy) in response to comments received from the Illinois Environmental Protection Agency (IEPA) dated October 27, 2017 regarding the *Closure and Post-Closure Care Plan for the Coffeen Ash Pond No. 2* (Closure Plan; AECOM, January, 2017) at Illinois Power Generating Company Coffeen Power Station, in Coffeen, IL.

This Response to Comments will serve as Addendum 1 to the Closure Plan dated January 2017. For ease of review, IEPA comments are presented below in italics, followed by responses. Supplemental information to support the responses, when required, is included as Attachments 1-3. This document provides responses to all IEPA comments numbered 1 - 8.

Comment 1

> *It is mentioned multiple times in the closure and post-closure care plans that there are coal mines in the vicinity at depth. Please provide additional information on the locations and depths of the coal mines in the vicinity of Ash Pond No. 2.*

Response: The Truax-Traer Coal Company and the Consolidation Coal Company extracted coal underlying Ash Pond No. 2 from 1964 to 1983 (Attachment 1 – Mine Index 871). The mine was originally known as the "Hillsboro" Mine and after Consolidation Coal Company took over the mining operation it was renamed "Consolidation No. 63, Hillsboro". Herrin No. 6 Coal was mined from depths of 500-510 feet below ground surface. The coal seam was 5.8-7.1 feet thick and an estimated 26,800,000 tons of coal were removed from the mine during the operational period (see Reference 1) with an extraction ratio of approximately 25% based on an estimate of volume removed from the recorded mine maps. A Mine Workings Map dated 1969 is overlaid on an aerial of Ash Pond No. 2 and included in Attachment 1 (Figure 1 – Overlay of Historic Mine). Comparison of the mine extents from 1969 with the extent of the mine included in Reference 1and shown on the Coal Mines in Illinois, Coffeen Quadrangle map included in Attachment 1 indicates there was no additional mining below Ash Pond No. 2 between 1969 and 1983 when the mine closed. As stated in Mine Index 871 (Attachment 1) the Coal Section of the Illinois State Geologic Survey (ISGS) has been assured that the extents included in Reference and Attachment 1 are final and complete.

Comment 2

The Agency requests the addition of a groundwater monitoring well on the east side of Inactive Ash Pond No. 2.

Response: NRT has evaluated the site conditions in the area east of Ash Pond No. 2 and has determined that there is no feasible access to install a monitoring well outside of the embankment because of steep slopes, heavy vegetation, and the presence of wetlands. In addition, several borings along the east side of Ash Pond No. 2 (B403A, P010, and G402) did not encounter the uppermost aquifer during drilling. Given significant access concerns and the limited nature of the aquifer NRT does not recommend installation of a monitoring well.

However, if required or deemed necessary in the future by the IEPA, a boring could be advanced through the berm following completion of closure construction activities to determine if the uppermost aquifer (Hagarstown) is present. Assuming the uppermost aquifer is present, a well could be installed through the berm if requested.

Comment 3

The two new groundwater monitoring wells to the west of the Inactive Ash Pond No. 2 are approved.

Response: A schedule for installation of the wells will be developed following approval of this Closure Plan. Appropriate documentation will be submitted to the IEPA upon completion of installation.

Comment 4

Will changes need to be made to the NPDES permit as part of the implementation of the closure plan?

Response: Yes, an application to modify the Coffeen NPDES permit (IL0000108) is being prepared to authorize the discharge of "dewatering" wastewaters from Ash Pond No. 2 to Coffeen Lake. The application will include an Antidegradation Assessment for Coffeen Lake in support of that modification request.

Comment 5

Calibration of the MODFLOW model was completed using only November 2016 groundwater elevations. Further calibration using more groundwater elevation data over a larger span of time should be completed.

Response: November 2016 groundwater elevations were used to calibrate the MODFLOW model because this was the first and only complete data set available for model development that included groundwater elevations from monitoring wells set in the uppermost aquifer, including wells G406 and G407 installed in August 2016. In order to address IEPA concerns about the efficacy of the groundwater elevation data range used for the model calibration, a comparison of observed versus predicted groundwater elevation values and groundwater flow directions will be provided in post-closure annual reports to assess model performance. If the predictive model does not adequately represent groundwater elevation and flow directions, the model will be recalibrated using available groundwater elevation data collected after November 2016. Similarly, post-closure groundwater quality data will be compared to transport model predictions to assess model performance in post-closure annual reports.

Comment 6

In the Application for a GMZ, it is noted that the problem with groundwater was identified via sampling in 2015. The Agency notes that the Coffeen Power Station received a Violation Notice in 2012 for groundwater standards violations in groundwater around Inactive Ash Pond No. 2.

Response: The GMZ application was revised to include reference to Violation Notice W-2012-00064 (Attachment 2).

Comment 7

Also in the GMZ application, no other remedies to groundwater violations are considered other than to state they are not deemed practical or cost effective. Please discuss other remedies considered and why they are not practical for mitigation relative to the nature of the subsurface or cost-effective.

Response: The GMZ Application was revised to include the following text (Attachment 2):

> "Previous experience at similar sites developing and evaluating alternative remedial options and determining costs indicates capping is often the most cost-effective and cost-efficient remedy. Therefore, dewatering and capping were initially evaluated. Based on the results of the evaluation and predictive modeling, the selected remedy successfully mitigates groundwater impacts. Groundwater monitoring will continue to be performed to evaluate the effectiveness of the remedy. If the selected remedy is not demonstrated as successful through collection of data and comparison to predictive values and applicable groundwater quality standards, then other remedial options will be evaluated."

Comment 8

All monitoring wells must be sampled for the parameters listed in 35 IAC 620.410 (a) and (d), with the exception of perchlorate. Statistical analysis for each well's parameters using approved methods listed in 40 CFR 257 should be included.

Response: Tables 2 - 5 of the Groundwater Monitoring Plan, which was included as Appendix B of the Closure Plan, have been revised to include all parameters of 35 IAC 620.410 (a) and (d) with the exception of perchlorate. Revised tables are included in Attachment 3. Note these tables also include aluminum and proposed changes to groundwater standards which are included in IEPA's Proposed Changes to 35 IAC Part 620.

Please don't hesitate to contact us if you have any questions regarding these responses to comments and associated attachments provided herein.

Sincerely,
NRT | An OBG Company

Nathaniel R. Keller

Nathaniel R. Keller, PG
Hydrogeologist

Stuart J. Cravens

Stu J. Cravens, PG
Principal Hydrogeologist

Attachments:

Attachment 1: Comment 1 – Historic Mine Documentation
Attachment 2: Comment 2 – Revised GMZ Application
Attachment 3: Comment 8 – Revised Tables 2,3,4, and 5 from Appendix B: Groundwater Monitoring Plan

cc: Ms. Amy Zimmer – IEPA, Hydrogeology and Compliance Unit
Mr. Tom Davis, PE - Dynegy, Inc.
Mr. Jason Frierdich, PE – Dynegy, Inc.
Mr. Matt Ballance, PE – Dynegy, Inc.
Mr. Vic Modeer, PE – Dynegy, Inc.
Mr. John Romang, - Illinois Power Generating Company

References:

1 Obrad, Jennifer M., 2011. Directory of Coal Mines in 7.5-Minute Quadrangle Series, Coffeen Quadrangle Montgomery and Bond Counties. The Board of Trustees of the University of Illinois.

Attachment 1

Comment 1-
Historic Mine Documentation

Mine Index 871
Consolidation Coal Company, Hillsboro Mine (Consolidation No. 63 Mine)

Type: Underground   Total mined-out acreage shown: 4,841

SHAFT, SLOPE, DRIFT or TIPPLE LOCATIONS

Type	County	Township-Range	Section	Quarters-Footage
Man shaft	Montgomery	7N 3W	14	SW NE NW
Air shaft	Montgomery	7N 2W	18	SE NE NE
Hoist & air shaft	Montgomery	7N 3W	14	NE NW NW

GEOLOGY

		Thickness (ft)			Mining
Seam(s) Mined	Depth (ft)	Min	Max	Ave	Method
Herrin	500-510			5.83-7.17	RPP

Geologic Problems Reported: Roof problems were widespread, the sites characterized by slickensided fault planes that cut irregularly through the roof shales and claystones. Small clay dikes were also associated with this small-scale faulting. Floor heaving was slight, but had been a larger problem in the past.

PRODUCTION HISTORY

Company	Mine Name	Years	Production (tons)
Truax-Traer Coal Company	Hillsboro	1964-1970	5,605,812
Consolidation Coal Company	Consolidation No. 63, Hillsboro	1971-1983	21,173,542
			26,779,354

Last reported production: July 1983

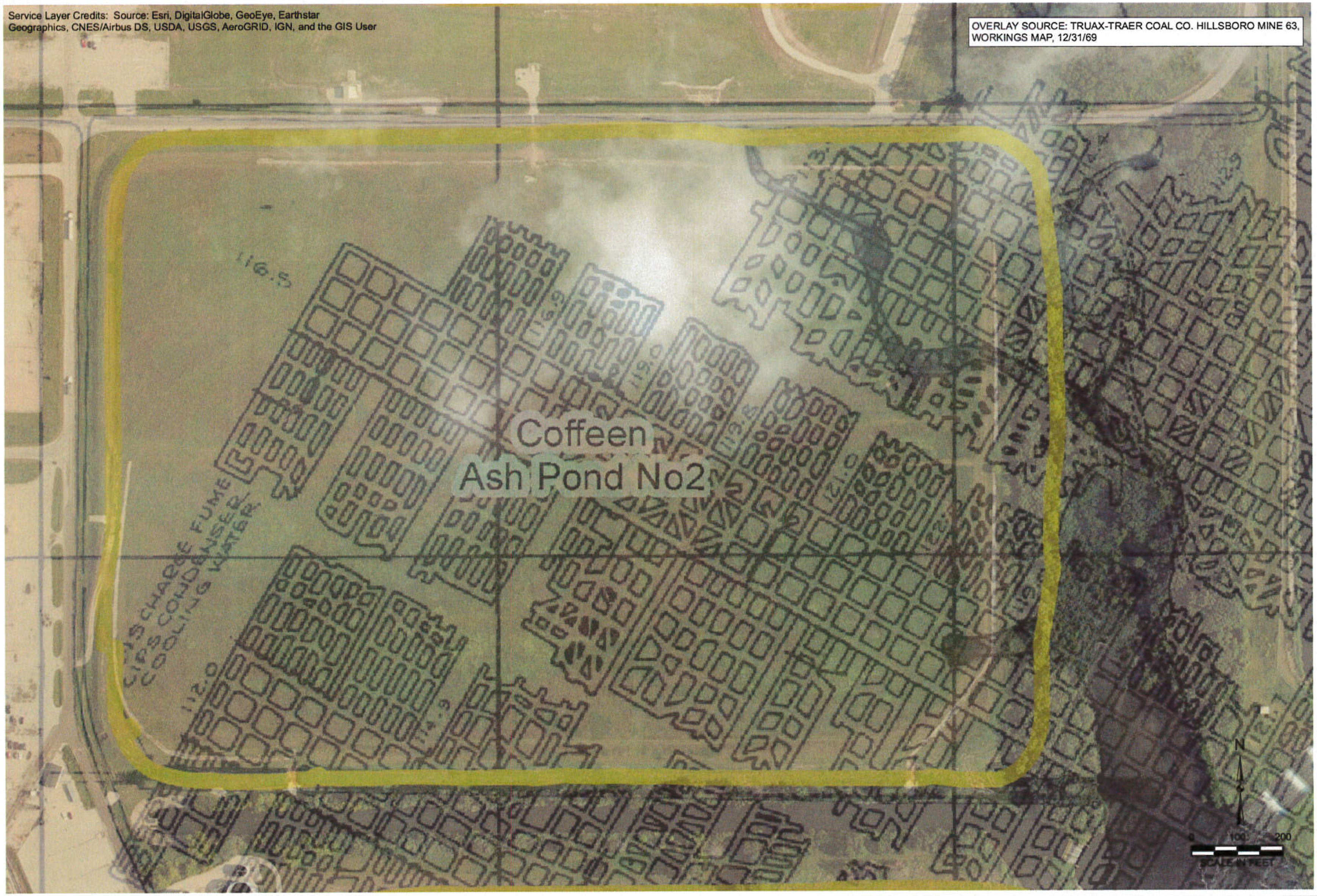
SOURCES OF DATA

Source Map	Date	Original Scale	Digitized Scale	Map Type
Company, Coal Section files	2-1-1983	1:12000	1:2170	Final *

* The map date is before mine closure, but the Coal Section has been assured that the workings shown on the map are indeed final. The mined area shown on the accompanying map is the approximate size expected for the reported production. This suggests that the mine outline is complete.

Annotated Bibliography (data source, brief description of information)

Coal Reports - Production, ownership, years of operation, mine type, depth, thickness.
Directory of Illinois Coal Mines (Montgomery County) - Mine names, mine index, ownership, years of operation.
Mine notes (Montgomery County) - Shaft location, seam, depth, thickness, geologic problems.
Company map, Coal Section files, 1983 Line Project - Shaft locations, mine outline, mining method.



DRAWN BY/DATE:
SDS 11/8/17
REVIEWED BY/DATE:
NRK 11/8/17
APPROVED BY/DATE:
SJC 11/10/17

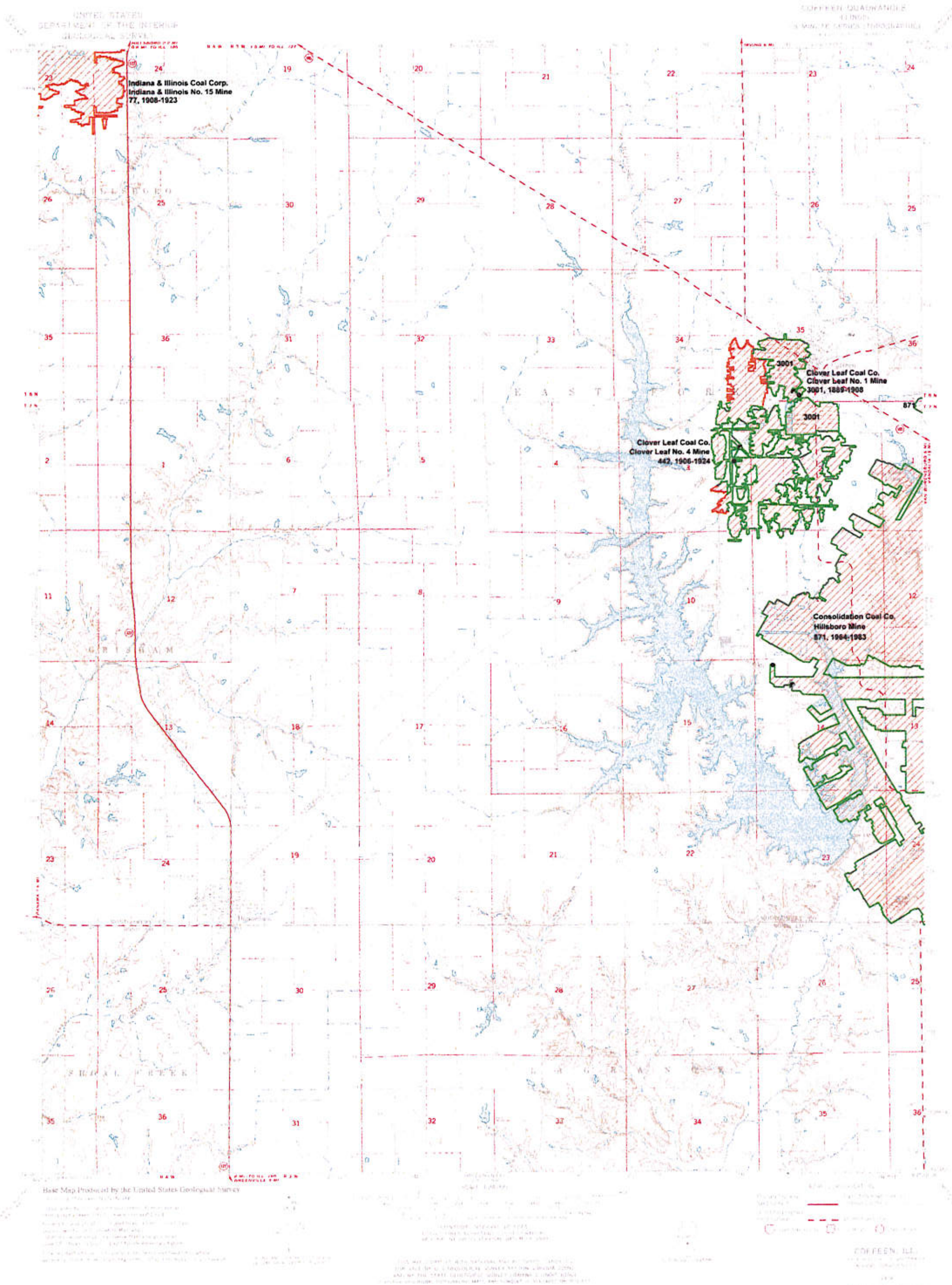
OVERLAY OF HISTORIC MINE

RESPONSE TO IEPA COMMENTS - CLOSURE AND POST-CLOSURE CARE PLAN FOR THE COFFEEN ASH POND NO. 2
COFFEEN POWER STATION
COFFEEN, ILLINOIS

PROJECT NO: 2380

FIGURE NO: 1

Natural Resource Technology
AN OBG COMPANY



Coal Mines in Illinois
Coffeen Quadrangle

Montgomery & Bond Counties, Illinois

This map accompanies the Coal Mines Directory for the Coffeen Quadrangle. Consult the directory for a complete explanation of the information shown on this map.

Mining Method
- Room & Pillar (RP)
- Room & Pillar Basic (RPB)
- Modified Room & Pillar (MRP)
- Room & Pillar Panel (RPP)
- Blind Room & Pillar (BRP)
- Checkerboard Room & Pillar (CRP)
- High Extraction Retreat (HER)
- Longwall (LW)
- Underground, Method Unknown
- Strip Mine
- Auger Mine
- General Area of Mining

Source of Mine Outline
- Final Mine Map
- Not Final Mine Map
- Undated Mine Map
- Incomplete Mine Map
- Secondary Source Map

Tipple, Shaft, Slope, Drift Locations
- Strip Mine Tipple - Active
- Strip Mine Tipple - Abandoned
- Mine Shaft - Active
- Mine Shaft - Abandoned
- Mine Slope - Active
- Mine Slope - Abandoned
- Mine Drift - Active
- Mine Drift - Abandoned
- Air Shaft
- Uncertain Location
- Uncertain Type of Opening

Mine Annotation
(space permiting)
Company
Mine Name
ISGS Index No., Years of Operation

Location

Disclaimer
Please check the Coal Section at the Illinois State Geological Survey's web site at http://www.isgs.illinois.edu for the most up-to-date version of these products.

Note that each quadrangle scale mined-out area map requires the use of the associated text directory for full explanation of map features and mine attributes. Also note that some quadrangles have multiple seams of mining and therefore more than one map may be available for a particular quadrangle. Please take care to check for multiple maps, as extensive mining may exist in the other seams.

The maps and digital files used for these studies were compiled from data obtained from a variety of public and private sources and have varying degrees of completeness and accuracy. This compilation map presents reasonable interpretation of the geology of the area and is based on available data. Locations of some mine features may be offset by 500 feet or more due to errors in the original source maps, the compilation process, digitizing, or a combination of these factors. These data are not intended for use in site-specific screening or decision-making. Use of these documents does not eliminate the need for detailed studies to fully understand the geology of a specific site. The Illinois State Geological Survey, Institute of Natural Resource Sustainability, or the University of Illinois make no guarantee, expressed or implied, regarding the correctness of the interpretations presented in this data set and accept no liability for the consequences of decisions made by others on the basis of the information presented here.

These maps were designed for use at 1:24,000. Enlarging the map may reduce accuracy, as the original scale of the source maps used to compile the outlines shown varies from 1:400 to 1:150,000, and some mine locations are known only from text descriptions. See the accompanying mine directory for the original scale of the source map used for a specific mine to check accuracy of a given portion of the map. Areas with no mines shown may still be undermined: see the unlocated mines list at the back of each mine directory.

The image of the U.S.G.S. topographic base map was projected from the original UTM to Lambert Conformal Conic.

ILLINOIS
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Institute of Natural Resource Sustainability
Illinois State Geological Survey
615 E. Peabody Dr.
Champaign, IL 61820

Mine Outlines Compiled by
Jennifer M. Obrad

November 21, 2011

Attachment 2

Comment 2 – Revised GMZ Application

Title 35, Illinois Admin. Code, Part 620 – APPENDIX D
Confirmation of an Adequate Corrective Action Pursuant to 35 Ill. Adm. Code 620.250(a)(2)

Pursuant to 35 Ill. Adm. Code 620.250(a) if an owner or operator provides a written confirmation to the Agency that an adequate corrective action, equivalent to a corrective action process approved by the Agency, is being undertaken in a timely and appropriate manner, then a groundwater management zone may be established as a three-dimensional region containing groundwater being managed to mitigate impairment caused by the release of contaminants from a site. This document provides the form in which the written confirmation is to be submitted to the Agency.

Note 1. Parts I and II are to be submitted to IEPA at the time that the facility claims the alternative groundwater standards. Part III is to be submitted at the completion of the site investigation. At the completion of the corrective process, a final report is to be filed which includes the confirmation statement included in Part IV.

Note 2. The issuance of a permit by IEPA's Division of Air Pollution Control or Water Pollution Control for a treatment system does not imply that the Agency has approved the corrective action process.

Note 3. If the facility is conducting a cleanup of a unit which is subject to the requirements of the Resource Conservation and Recovery Act (RCRA) or the 35 Ill. Adm. Code 731 regulations for Underground Storage Tanks, this confirmation process is not applicable and cannot be used.

Note 4. If the answers to any of these questions require explanation or clarification, provide such in an attachment to this document.

Information provided in the following technical documents is referenced within this form:

- AECOM, 2016c. Revised 30% Closure Design Package for Coffeen Power Station Ash Pond No. 2. April 16, 2016.
- Natural Resource Technology, Inc., 2016a. Hydrogeologic Characterization Report. Coffeen Ash Pond No. 2, Illinois Power Generating Company Coffeen Power Station, Coffeen, IL.
- Natural Resource Technology, Inc., 2016b. Groundwater Monitoring Plan. Coffeen Ash Pond No. 2, Illinois Power Generating Company Coffeen Power Station, Coffeen, IL.
- Natural Resource Technology, Inc., 2016c. Groundwater Model Report. Coffeen Ash Pond No. 2, Illinois Power Generating Company Coffeen Power Station, Coffeen, IL.
- Natural Resource Technology, Inc., 2016d. Hydrostatic Modeling Report. Coffeen Ash Pond No. 2, Illinois Power Generating Company Coffeen Power Station, Coffeen, IL.

A legal description and map of the proposed GMZ is provided in Appendix A of this GMZ Application. The GMZ will extend vertically through all water-bearing strata through the Hagarstown Member and upper weathered portions of the Vandalia Till Member at an estimated elevation ranging from approximately 604 to 608 ft MSL.

Part I. Facility Information

Facility Name Coffeen Power Station

Facility Address 134 CIPS Lane, Coffeen, IL 62017

County Montgomery

Standard Industrial Code (SIC) 4911

1. Provide a general description of the type of industry, products manufactured, raw materials used, location and size of the facility. ***Electric power generation and coal combustion residual (CCR) disposal. Ash Pond 2 is located within the Coffeen Power Station which encompasses approximately 4,000 acres including a 1,100-acre lake.***

2. What specific units (operating or closed) are present at the facility which are or were used to manage waste, hazardous waste, hazardous substances or petroleum?

	YES	NO
Landfill	X	
Surface Impoundment	X	
Land Treatment		X
Spray Irrigation		X
Waste Pile		X
Incinerator		X
Storage Tank (above ground)	X	
Storage Tank (underground)	X	
Container Storage Area	X	
Injection Well	X	
Water Treatment Units	X	
Septic Tanks	X	
French Drains	X	
Transfer Station		X
Other Units (please describe)		

3. Provide an extract from a USGS topographic or county map showing the location of the site and a more detailed scaled map of the facility with each waste management unit identified in Question 2 or known/suspected source clearly identified. Map scale must be specified and the location of the facility must be provided with respect to Township, Range and Section. ***Facility is located in Sections 10 and 11, Tier 7 N, Range 3 W, of the 3rd PM. Figure 1 has the facility located on a USGS topographic map (7½ minute).***

4. Has the facility ever conducted operations which involved the generation, manufacture, processing, transportation, treatment, storage or handling of "hazardous substances" as defined by the Illinois Environmental Protection Act? Yes ☒ No ☐
   If the answer to this question is "yes" generally describe these operations. ***Storage and handling of anhydrous ammonia, sulfuric acid, 50% sodium hydroxide, and chlorine gas.***

5. Has the facility generated, stored or treated hazardous waste as defined by the Resource Conservation and Recovery Act? Yes ☒ No ☐
   If the answer to this question is "yes" generally describe these operations. ***Small quantity TSD.***

6. Has the facility conducted operations which involved the processing, storage or handling of petroleum? Yes ☒ No ☐ If the answer to this question is "yes" generally describe these operations. ***Store, load, and unload diesel fuel and kerosene.***

7. Has the facility ever held any of the following permits?

   a. Permits for any waste storage, waste treatment or waste disposal operation. Yes ☒ No ☐
      If the answer to this question is "yes", identify the IEPA permit numbers. ***IL0000108 and 1998-289- UIC.***

   b. Interim Status under the Resources Conservation and Recovery Act (filing of a RCRA Part A application). Yes ☐ No ☒
      If the answer to this question is "yes", attach a copy of the last approved Part A application.

   c. RCRA Part B Permits. Yes ☐ No ☒
      If the answer to this question is "yes", identify the permit log number.

8. Has the facility ever conducted the closure of a RCRA hazardous waste management unit? Yes ☐ No ☒

9. Have any of the following State or federal government actions taken place for a release at the facility?

   a. Written notification regarding known, suspected or alleged contamination on or emanating from the property (e.g., a Notice pursuant to Section 4(q) of the Environment Protection Act)? Yes ☒ No ☐
      If the to this question is "yes", identify the caption and date of issuance. ***Violation Notice No. W-2012-00064 was issued on June 27, 2012 for boron, manganese, sulfate, and total dissolved solids concentrations which exceeded Class I GW Standards at APW-2/G402.***

   b. Consent Decree or Order under RCRA, CERCLA, EPAct Section 22.2 (State Superfund), or EPAct Section 21(f) (State RCRA). Yes ☐ No ☒

   c. If either of Items a. or b. were answered by checking "yes", is the notice, order or decree still in effect? Yes ☒ No ☐ ***Concentrations remain above Class I GW Standards which is why this GMZ is being requested.***

10. What groundwater classification will the facility be subject to at the completion of the remediation?

    Class I ☒ Class II ☐ Class III ☐ Class IV ☐

    If more than one Class applies, please explain.

11. Describe the circumstances which the release to groundwater was identified. ***Groundwater sampling at Ash Pond 2 was initiated in 2015. Exceedances of Class I groundwater quality standards in monitoring wells associated with Ash Pond 2 include the parameters arsenic, boron, lead, manganese, sulfate, and total dissolved solids.***

Based on my inquiry of those persons directly responsible for gathering the information, I certify that the information submitted is, to the best of my knowledge and belief, true and accurate.

Coffeen Power Station	
Facility Name	Signature of Owner/Operator
134 CIPS Lane, Coffeen, IL 62017	**Illinois Power Generating Company**
Location of Facility	Name of Owner/Operator
1358030005	
Illinois EPA Identification Number	Date

PART II: Release Information

1. Identify the chemical constituents release to the groundwater. Attach additional documents as necessary.

Chemical Description	Chemical Abstract No.
Arsenic	*7440-38-2*
Boron	*7440-42-8*
Lead	*7439-92-1*
Manganese	*7439-96-5*
Sulfate	*14808-79-8*
Total Dissolved Solids	*10052*

2. Describe how the site will be investigated to determine the source or sources of the release.
Ash Pond 2 has been investigated as described in the Hydrogeologic Characterization Report (Natural Resource Technology, Inc. [NRT], 2016a).

3. Describe how groundwater will be monitored to determine the rate and extent of the release.
The monitoring network to monitor the rate and extent of the release is described in the Groundwater Monitoring Plan (NRT, 2016b).

4. Has the release been contained on-site at the facility? ***The release is contained within the facility boundary. Migration of CCR constituents is limited by Coffeen Lake, which acts as a groundwater discharge area and hydraulic barrier.***

5. Describe the groundwater monitoring network and groundwater and soil sampling protocols in place at the facility. ***The groundwater monitoring network and sampling protocols are described in the Groundwater Monitoring Plan (NRT, 2016b).***

6. Provide the schedule for investigation and monitoring. ***The site investigation is complete and groundwater monitoring will continue for the required/permitted frequency and monitoring period as described in the Groundwater Monitoring Plan Section 4.2: Sampling Schedule (NRT, 2016b).***

7. Describe the laboratory quality assurance program utilized for the investigation. ***Laboratory quality assurance is described in the Groundwater Monitoring Plan Sections 4.4: Laboratory Analysis and 4.5: Quality Assurance (NRT, 2016b). The quality assurance/quality control procedures described in the Groundwater Monitoring Plan will be supplemented by the selected Illinois EPA-approved laboratory's QA Manual.***

8. Provide a summary of the results of available soil testing and groundwater monitoring associated with the release at the facility. The summary or results should provide the following information: dates of sampling; types of samples taken (soil or water); locations and depths of samples; sampling and analytical methods; analytical laboratories used; chemical constituents for which analyses were performed; analytical detection limits; and concentrations of chemical constituents in ppm (levels below detection should be identified as "ND"). ***A narrative summary of the results of groundwater monitoring is discussed in the Hydrogeologic Characterization Report Section 3: Groundwater Quality (NRT, 2016a). Analytical data summary tables and graphs are available in the Hydrogeologic Characterization Report Appendix F: Groundwater Quality Data and Appendix G: Water Quality Trend Graphs (NRT, 2016a). Lab reports for all monitoring events have previously been submitted to the Agency.***

PART II: Release Information (Continued)

Based on my inquiry of those persons directly responsible for gathering the information, I certify that the information submitted is, to the best of knowledge and belief, true and accurate and confirm that the actions identified herein will be undertaken in accordance with the schedule set forth herein.

Coffeen Power Station	
Facility Name	Signature of Owner/Operator
134 CIPS Lane, Coffeen, IL 62017	**Illinois Power Generating Company**
Location of Facility	Name of Owner/Operator
1358030005	
Illinois EPA Identification Number	Date

Part III: Remedy Selection Information

1. Describe the selected remedy. ***The remedy includes ash dewatering, relocating/reshaping the CCR within Ash Pond 2 to achieve acceptable grades, construction of a geomembrane cover system and establishing a vegetative cover to minimize long-term erosion (AECOM, 2016).***

2. Describe other remedies which were considered and why they were rejected. ***Previous experience at similar sites developing and evaluating remedial alternatives and costs indicate capping is often the most cost effective and cost-efficient. Therefore, dewatering and capping were initially evaluated. Based on the results of the evaluation and modeling, the selected remedy successfully mitigates groundwater impacts. If the selected remedy is not shown successful through collection of data and comparison to predictive values, then other remedial options will be evaluated.***

3. Will waste, contaminated soil or contaminated groundwater be removed from the site in the course of this remediation? Yes ☐ No ☒
   If the answer to this question is "yes", where will the contaminated material be taken?

4. Describe how the selected remedy will accomplish the maximum practical restoration of beneficial use of groundwater. ***The dewatering and installation of a geomembrane cover system will control the potential for water infiltration into the closed CCR unit and will allow drainage of surface water off of the cover system. These actions will reduce leachate generation and migration and groundwater quality will improve over time, as described in the Groundwater Model Report (NRT, 2016c).***

5. Describe how the selected remedy will minimize any threat to public health or the environment. ***The currently defined extent of the release does not threaten public health. As discussed in the Hydrogeologic Characterization Report Section 2.5 (NRT, 2016a), there are currently no impairments to groundwater usage on the Coffeen Power Station property or surrounding properties associated with Ash Pond 2. No impairments to groundwater usage resulting from establishment of the proposed GMZ are anticipated. CCR dewatering and the geomembrane cover system will reduce leachate generation and migration from Ash Pond 2 and minimize CCR constituents entering the environment, as described in the Groundwater Model Report (NRT, 2016c).***

6. Describe how the selected remedy will result in compliance with the applicable groundwater standards. ***The in place closure of Ash Pond 2, as proposed, will result in a reduction of leachate production, decreasing CCR constituent concentrations and contraction of the groundwater plume. A Groundwater Model Report (NRT, 2016c), included in Appendix D of AECOM 2016, suggests that the geosynthetic cover system will control recharge and subsequent leachate generation within the limits of the Site and reduce concentrations of boron below Class I standards. Concentration reductions are expected to begin approximately one year after completion of the cover system.***

7. Provide a schedule for design, construction and operation of the remedy, including dates for the start and completion. ***A schedule for implementing the remedies is included in Section 1.3 in AECOM, 2016.***

8. Describe how the remedy will be operated and maintained. ***The operation and maintenance of the remedy is described in Section 3: Post-Closure Care Plan (AECOM, 2016).***

9. Have any of the following permits been issued for the remediation?

   a. Construction or Operating permit from the Division of Water Pollution Control. Yes ☐ No ☒

   b. Land treatment permit from the Division of Water Pollution Control. Yes ☐ No ☒
      If the answer to this question is "yes", identify the permit number.

   c. Construction or Operating permit from the Division of Air Pollution Control. Yes ☐ No ☒

If the answer to this question is "yes", identify the permit number.

10. How will groundwater at the facility be monitored following completion of the remedy to ensure that the groundwater standards have been attained? ***Groundwater monitoring procedures are described in Section 4 of the Groundwater Monitoring Plan (NRT, 2016b).***

Based on my inquiry of those persons directly responsible for gathering the information, I certify that the information submitted is, to the best of my knowledge and belief, true and accurate and confirm that the actions identified herein will be undertaken in accordance with the schedule set forth herein.

Coffeen Power Station	
Facility Name	Signature of Owner/Operator
134 CIPS Lane, Coffeen, IL 62017	**Illinois Power Generating Company**
Location of Facility	Name of Owner/Operator
1358030005	
Illinois EPA Identification Number	Date

Attachment 3

Comment 8 – Revised Tables 2,3,4, and 5 from Appendix B: Groundwater Monitoring Plan

Table 2. Proposed Monitoring Well Network and Analyses
Groundwater Monitoring Plan
Coffeen Power Station - Ash Pond 2

Boring/ Well ID	Ground Surface at Time of Install	Measuring Point Elevation (2015)	Top of Screen Elevation	Bottom of Screen Elevation	Screen length	Screen Top	Screen Bottom	Proposed Analyses for IEPA Monitoring	Additional Monitoring Programs Performed at Well	Other Analyses (USEPA CCR Rule or IEPA)
G270	622.92	625.92	609.79	605	5	16.1	20.9	IEPA 620.410 (a), and (d), no perchlorate[3]	Ash Pond 2 & GRP - CCR	40 CFR 257 - Appendix III and Appendix IV Parameters, Groundwater Elevation
G281	623.82	626.36	608.31	603.66	5	18.1	22.7		Ash Pond 2 CCR	
G401	623.03	625.57	608.67	604.24	4	16.9	21.3			
G402	610.56	613.37	600.60	590.6	10	12.8	22.8			
G403	623.81	626.47	610.70	606.03	5	15.8	20.4			
G404	613.10	615.67	606.68	601.93	5	9.0	13.7			
G405	620.90	623.63	611.89	607.14	5	11.7	16.5			
G406	621.86	621.86	608.30	603.49	5	13.6	18.4		None	None
G407	618.35	621.32	604.57	599.74	5	16.8	21.6			
G410[1]	TBD	TBD	TBD	TBD	TBD	TBD	TBD			
G411[1]	TBD	TBD	TBD	TBD	TBD	TBD	TBD			
G154	623.52	626.35	609.26	604.76	5	17.1	21.6		SW Pond - IEPA	IEPA Approved Parameters
G279	629.19	632.04	606.79	602.40	4	25.3	29.6		GRP - IEPA and CCR	40 CFR 257 - Appendix III and Appendix IV Parameters, Groundwater Elevation
G280	622.95	625.85	610.16	605.32	5	15.7	20.5			

Notes:
[1] Proposed wells to be installed upon approval of Closure Plan and GMZ application
[2] Field parameters include: pH, oxidation -reduction potential, specific conductance, temperature, and dissolved oxygen
[3] Groundwater samples collected for metals analyses will be field filtered.
Groundwater quality analyses including methods and sampling details are included in Table 4.

Natural Resource Technology
AN OBG COMPANY

Table 3. Background Groundwater Quality and Applicable Groundwater Quality Standards
Groundwater Monitoring Plan
Coffeen Power Station - Ash Pond 2

Parameters (totals)[6]	Sampling Program	IL Class I Std[1] (mg/L)	Background Concentration[2] for IEPA (mg/L)	Applicable Groundwater Standard[3] for IEPA (mg/L)	Maximum[5] (mg/L)	Minimum[5] (mg/L)
Aluminum (d) [4]	IEPA	3.5	**tbd**	**tbd**	0.1	<0.005
Antimony	CCR, IEPA	0.006	**tbd**	**tbd**	<0.003	<0.003
Arsenic	CCR, IEPA	0.01	**tbd**	**tbd**	**0.25**	<0.001
Barium	CCR, IEPA	2.0	**tbd**	**tbd**	0.24	0.014
Beryllium	CCR, IEPA	0.004	**tbd**	**tbd**	0.0018	<0.001
Boron	CCR, IEPA	2.0	**tbd**	**tbd**	**17**	<0.01
Calcium	CCR	NS	**tbd**	**tbd**	450	<0.1
Cadmium	CCR, IEPA	0.005	**tbd**	**tbd**	0.008	<0.001
Chloride	CCR, IEPA	200	**tbd**	**tbd**	160	1.5
Chromium	CCR, IEPA	0.1	**tbd**	**tbd**	0.034	<0.004
Cobalt	CCR, IEPA	1, 0.002[4]	**tbd**	**tbd**	0.28	<0.001
Copper (d)	IEPA	0.65, 0.2[4]	**tbd**	**tbd**	0.021	<0.001
Cyanide	IEPA	0.2	**tbd**	**tbd**	<0.005	<0.003
Fluoride	CCR, IEPA	4	**tbd**	**tbd**	1.06	0.031
Iron (d)	IEPA	5	**tbd**	**tbd**	**13**	<0.005
Lead	CCR, IEPA	0.0075	**tbd**	**tbd**	**0.220**	<0.001
Lithium	CCR	NS	**tbd**	**tbd**	0.057	<0.01
Manganese(d)	IEPA	0.15	**tbd**	**tbd**	**1.02**	<0.018
Mercury	CCR, IEPA	0.002	**tbd**	**tbd**	0.00093	<0.0002
Molybdenum	CCR, IEPA	NS	**tbd**	**tbd**	0.043	<0.001
Nickel (d)	IEPA	0.1	**tbd**	**tbd**	0.035	<0.003
Nitrate-N	IEPA	10	**tbd**	**tbd**	8.8	<0.01
Selenium	CCR, IEPA	0.05	**tbd**	**tbd**	0.027	<0.001
Silver (d)	IEPA	0.05	**tbd**	**tbd**	<0.005	<0.003
Sulfate	CCR, IEPA	400	**tbd**	**tbd**	**2,500**	2.3
Thallium	CCR, IEPA	0.002	**tbd**	**tbd**	0.0013	<0.001
TDS (d)	CCR, IEPA	1,200	**tbd**	**tbd**	**3,900**	320
Vanadium (d)	IEPA	0.049, 0.00049[4]	**tbd**	**tbd**	**0.025**	<0.003
Zinc (d)	IEPA	5	**tbd**	**tbd**	0.59	<0.002
Field pH	CCR, IEPA	6.5 - 9.0	**tbd**	**tbd**	8.03	**5.80**
Radium 226/228[*]	CCR, IEPA	20/20, 5[4]	**tbd**	**tbd**	4.46	0.185

Notes:
All parameters are totals unless noted. Standards apply to dissolved or total concentrations
(d) Dissolved
tbd = To Be Determined for Illinois EPA monitoring program; CCR Appendix III and IV parameters based on future monitoring , started in November 2015
Bold = Background Concentration exceeds Class I Groundwater Standard
Red = Exceeds Applicable Groundwater Standard
NS = No Class II Groundwater Standard   USEPA (t) = background concentration for parameter [total] required under USEPA program (40 CFR Part 257)
[1] IPCB 620 Class I: Potable Resource Groundwater Standard
[2] Background Concentration to be calculated following 8 sampling events at all wells in accordance with 40 CFR 257
[3] Applicable Groundwater Standard is the higher of the Background Concentration and the Class I Groundwater Standard (or the lower if compared to the pH lower limit)
[4] Standards listed are proposed changes to 35 Ill. Adm. Code Part 620 by Illinois EPA
[5] Groundwater concentrations based on historical results for wells in the proposed sampling program
[6] Groundwater samples collected for metals analysis as required by IL620.410 will be field filtered

Natural Resource Technology
AN OBG COMPANY

Table 4. Sampling and Analysis Summary
Groundwater Monitoring Plan
Coffeen Power Station - Ash Pond 2

Parameter	Analytical Method[5]	Number of Samples	Field Duplicates[1]	Field Blanks[2]	Equipment Blanks[2]	MS/MSD[3]	Total	Container Type	Minimum Volume[4]	Preservation (Cool to 4 °C for all samples)	Sample Hold Time from Collection Date
Metals - Appendix III (1)											
Boron (total and dissolved)	6020	14	2	0	0	1	17	plastic	600 mL	HNO_3 to pH<2	6 months
Calcium	6020	7	1	0	0	1	9	plastic	600 mL	HNO_3 to pH<3	6 months
Metals - Appendix IV (2) and Additional Metals											
Other Metals (3) (total and dissolved)	6020	14	2	0	0	1	17	plastic	600 mL	HNO3 to pH<2	6 months
Manganese (d)	6020	14	2	0	0	1	17	plastic	600 mL	HNO3 to pH<2	6 months
Lithium	6020	7	1	0	0	1	9	plastic	600 mL	HNO3 to pH<2	6 months
Mercury	7470A or 6020	14	2	0	0	1	17	plastic	400 mL	HNO_3 to pH<2	28 days
Inorganic Parameters - Appendix III (1) and Other Inorganic Parameters											
Cyanide	SM 4500-CN or C – EPA 335.4	14	2	0	0	1	17	amber	50 mL	NaOH, Cool to 4 °C	14 days
Fluoride	9214	14	2	0	0	1	17	plastic	300 mL	Cool to 4 °C	28 days
Chloride	9251	14	2	0	0	1	17	plastic	100 mL	Cool to 4 °C	28 days
Nitrate-N	EPA 300.0	14	2	0	0	1	17	plastic	10 mL	Cool to 4 °C	48 hours
Sulfate	9036	14	2	0	0	1	17	plastic	50 mL	Cool to 4 °C	28 days
Total Dissolved Solids	SM 2540 C	14	2	0	0	1	17	plastic	200 mL	Cool to 4 °C	7 days
Radium - Appendix IV (2)											
Radium 226	9315 or EPA 903	14	0	0	0	1	15	plastic	1000 mL	HNO3 to pH<2	6 months
Radium 228	9320 or EPA 904	14	0	0	0	1	15	plastic	1000 mL	HNO_3 to pH<2	6 months
Field Parameters											
pH (1)	SM 4500-H+ B	14	NA	NA	NA	NA	14	flow-through cell	NA	none	immediately
Dissolved Oxygen	SM 4500-O/405.1	14	NA	NA	NA	NA	14	flow-through cell	NA	none	immediately
Temperature	SM 2550	14	NA	NA	NA	NA	14	flow-through cell	NA	none	immediately
Oxidation/Reduction Potential	SM 258O B	14	NA	NA	NA	NA	14	flow-through cell	NA	none	immediately
Specific Conductivity	SM 2510 B	14	NA	NA	NA	NA	14	flow-through cell	NA	none	immediately
Turbidity (4)	SM 2130 B	14	NA	NA	NA	NA	14	flow-through cell or hand-held turbidity meter	NA	none	immediately

Notes:
(1) USEPA Appendix III Parameters (boron, calcium, chloride, fluoride, pH, sulfate, total dissolved solids (TDS))
(2) USEPA Appendix IV Parameters
(antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, fluoride, lead, lithium, mercury, molybdenum, selenium, thallium, radium 226 and 228 combined)
(3) Other Metals = aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, molybdenum, nickel, silver, selenium, thallium, vanadium, zinc
(4) If turbidity exceeds 10 NTUs, a duplicate sample filtered through a .45 micron filter may be collected for metals analysis in addition to the unfiltered sample. Both samples would be submitted for analysis.
NA = not applicable
HNO_3 = nitric acid
°C = degrees Celsius
mL = milliliter

1. Field duplicates will be collected at a frequency of one per group of 10 or fewer investigative water sample. Field duplicates will not be collected for radium analysis.
2. 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.
3. 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.
4. Sample volume is estimated and will be determined by the laboratory.
5. Analytical method numbers are from SW-846 unless otherwise indicated. Analytical methods may be updated with more recent versions as apropriate.

Table 5. Summary of Detection Limits for Proposed Monitoring Program Class I Groundwater Standards
Groundwater Monitoring Plan
Coffeen Power Station - Ash Pond 2

Constituent	Unit	Analytical Methods [1]	USEPA MCL [2] (ug/L)	IL Class I Std [7] (ug/L)	RL [4] (ug/L)	MDL [4] (ug/L)
Metals[8]						
Aluminum (d)	µg/L	6020	200 [3]	3500	10	0.85
Antimony	µg/L	6020	6	6	1	0.25
Arsenic	µg/L	6020	10	10	1	0.25
Barium	µg/L	6020	2000	2000	1	0.4
Beryllium	µg/L	6020	4	4	1	0.5
Boron	µg/L	6020	NS	2000	25	10
Boron(d)	µg/L	6020	NS	2000	2.3	10
Cadmium	µg/L	6020	5	5	1	0.25
Calcium	µg/L	6020	NS	NS	125	100
Chromium	µg/L	6020	100	100	1	0.3
Cobalt	µg/L	6020	NS	1000, 2	1	0.25
Copper (d)	µg/L	6020	NS	650, 200	3	0.025
Cyanide	µg/L	4500	200	200	5	0.85
Iron (d)	µg/L	6010	300 [3]	5,000	10	0.88
Lead	µg/L	6020	NS	7.5	1	0.25
Lithium	µg/L	6020	NS	NS	1	0.5
Manganese (d)	µg/L	6020	50 [3]	150	1	0.055
Mercury	µg/L	6020 or 7470A	2	2	0.2	0.051
Molybdenum	µg/L	6020	NS	NS	1	0.25
Nickel (d)	µg/L	6020	NS	100	5	0.075
Nitrate- N	µg/L	300	10000	10000	30	8
Selenium	µg/L	6020	50	50	1	0.9
Silver (d)	µg/L	6020	100 [3]	50	55	0.028
Thallium	µg/L	6020	2	2	1	0.25
Vanadium (d)	µg/L	6020	NS	49, 0.49	5	0.27
Zinc (d)	µg/L	6020	5000 [3]	5	6	0.495
Inorganics						
Fluoride	mg/L	9214	4	4	0.1	0.05
Chloride	mg/L	9251	250 [3]	200	5	1
Sulfate	mg/L	9036	250 [3]	400	10	5
Total Dissolved Solids	mg/L	SM 2540 C	500 [3]	1200	20	10
Other						
Combined Radium 226/228	pCi/L	9315/9320 or EPA 903/904	5	20/20, 5	-- [5]	-- [6]
Field						
pH	SU	SM 4500-H+ B	NS	6.5-9.0	NA	NA
Oxidation/Reduction Potential	mV	SM 2580 B	NS	NS	NA	NA
Dissolved Oxygen	mg/L	SM 4500-O/405.1	NS	NS	NA	NA
Temperature	°C	SM 2550	NS	NS	NA	NA
Specific Conductivity	µS/cm	SM 2510 B	NS	NS	NA	NA
Turbidity	NTU	SM 2130 B	NS	NS	NA	NA

Notes:

NS = No standard
ug/L = micrograms per liter
mg/L = milligrams per liter
pCi/L = picoCuries per liter
µS/cm = microSiemens per centimeter
NTU = nephelometric turbidity unit
(d) = dissolved analysis

RL = Reporting limit as established by the laboratory
MDL = Method detection limit as established by the laboratory
SM = Standard Methods for the Examination of Water and Wastewater

1. Analytical method numbers are from SW-846 unless otherwise indicated.
2. USEPA MCL = United States Environmental Protection Agency Maximum Contaminant Level.
3. USEPA SMCL = United States Environmental Protection Agency Secondary Maximum Contaminant Level.
4. Reporting limits and method detection limits will vary depending on the laboratory performing the work.
5. All radium results will be reported (values may be positive or negative) and will include uncertainty and the calculated MDC.
6. Laboratories calculate a minimum detectable concentration (MDC) based on the sample.
7. 35 IAC 620.410 standards are listed including proposed changes submitted to the IL Pollution Control Board

Natural Resource Technology
AN OBG COMPANY

SMARTER SOLUTIONS

EXCEPTIONAL SERVICE

VALUE

GROUNDWATER MONITORING PLAN

Ash Pond 2
Coffeen Power Station
Coffeen, Illinois

January 24, 2017

NATURAL
RESOURCE
TECHNOLOGY

ENVIRONMENTAL CONSULTANTS

Natural Resource Technology
Environmental Consultants

234 W. Florida Street, Fifth Floor
Milwaukee, Wisconsin 53204
(P) 414.837.3607
(F) 414.837.3608

GROUNDWATER MONITORING PLAN

ASH POND 2
COFFEEN POWER STATION
COFFEEN, ILLINOIS

Project No. 2380

Prepared For:

Illinois Power Generating Company
Coffeen Power Station
134 Cips Lane
Coffeen, IL 62107

Prepared By:

Natural Resource Technology, Inc.
234 W. Florida Street, Fifth Floor
Milwaukee, Wisconsin 53204

January 24, 2017

Stuart J. Cravens, PG
Principal Hydrogeologist

LICENSED PROFESSIONAL GEOLOGIST
Stuart J. Cravens
196-000108
ILLINOIS

Nathaniel R. Keller, PG
Hydrogeologist

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

1 INTRODUCTION

1.1 Overview

This Groundwater Monitoring Plan was prepared by Natural Resource Technology, Inc. (NRT) in support of a Closure Plan for Ash Pond 2 located at the Coffeen Power Station (CPS) which is owned by Illinois Power Generating Company (IPGC).. This plan and the Closure Plan will apply specifically Ash Pond 2, one of the five Coal Combustion Residuals (CCR) units associated with the CPS.

This plan describes the groundwater monitoring and reporting to be completed in support of the Closure Plan for the Ash Pond 2. In addition to this groundwater monitoring plan, a Groundwater Management Zone Application is being submitted under separate cover.

1.2 Site Location and Background

Ash Pond 2 is located approximately 2 miles south of the City of Coffeen in Montgomery County, Illinois (Figure 1). The power plant and the CCR Units are situated on a peninsula between two lobes of Coffeen Lake which was created in 1963 by damming a portion of the East Fork of Shoal Creek (IDNR, 2014). The lake covers approximately 1,100 acres and provides cooling water for the CPS.

Ash Pond 2 is located within Section 11 Township 7 North and Range 7 East. The city of Coffeen is approximately 2 miles north of the CPS and the city of Hillsboro, IL is about 8 miles to the northwest. The CPS is located in an agricultural area. Historically, however, several coal mines were operated at depth in the vicinity of the site as well as a US Minerals processing facility located to the north. The CPS property is bordered by Coffeen Lake on the west, east, and south, and by agricultural land to the north.

Ash Pond 2 was first investigated in 2010, as requested by the Illinois Environmental Protection Agency (IEPA). Results of the investigation (NRT, 2013) indicated impacts to groundwater in the vicinity of Ash Pond 1 and 2, including exceedances of Class I Groundwater Standards for boron, sulfate, manganese, sulfate and total dissolved solids. Additional wells were installed in 2015 to comply with the Federal CCR Rule (40 CFR Part 257), and define the extent of exceedances associated with Ash Pond 2. Based on the groundwater results of wells installed in 2015, Hanson submitted a Corrective Action Plan (CAP, Hanson, 2016) to define the proposed remedy. Ash Pond 2 will be closed by leaving CCR in place using an alternative geomembrane cover system, following partial dewatering of the pond. This design will control the potential for slope failure and water infiltration into the closed CCR unit and will allow for drainage of surface water off of the cover system (AECOM, 2016).

IEPA responded to Dynegy regarding the CAP with a draft letter including comments. Dynegy and IEPA met on July 20, 2016 to discuss the CAP and proposed remedy. Following the discussion, IEPA in a letter dated August 9, 2016 provided the following comments (summarized):

1. Investigation may be required to define the source and extent of exceedances from Ash Pond 2.
2. A vertical component is required for the GMZ.
3. The GMZ contains portions of CCR units not proposed to close; GMZ must be revised to include only areas where CAP for Ash Pond 2 will mitigate impacts.
4. Hydraulic conductivity of foundation layer needs to be evaluated, to determine if CAP is appropriate.
5. A groundwater monitoring plan, specific to Ash Pond 2 must be submitted with CAP.
6. Modeling is required to demonstrate corrective action will be successful, and at what point in the future.
7. Evaluate the impacts of the corrective action on Coffeen Lake, with respect to applicable surface water standards.

This GW monitoring plan is provided as requested in Comment #5. The Closure Plan, to which this Groundwater Monitoring Plan, as well as the Hydrogeologic Characterization Report, Groundwater Model Report, and Hydrostatic Model Report are attached, provides the additional information necessary to address these comments and justify the selected corrective action.

1.3 Conceptual Site Model

The geology and hydrogeology described above is summarized and grouped into the following hydrostratigraphic units for the remaining discussion in this report:

- Ash Unit – Saturated CCR within the various CCR Units
- Upper Confining Unit – Low permeability clays and silts, including the Loess Unit and the upper clayey till portion of the Hagarstown Member
- Uppermost Aquifer (Groundwater Monitoring Zone) – Thin (generally less than 3 feet), moderate permeability sand, silty sand, and sandy silt/clay units which include the Hagarstown Member and the upper Vandalia Member (where weathered)
- Lower Confining Unit – Thick (generally greater that 15 feet), very low permeability sandy silt till or clay till that includes the unweathered lower Vandalia Member, Mulberry Grove Member (discontinous), and Smithboro Member
- Bedrock – Pennsylvanian-age Bond Formation characterized by limestone and calcareous clays and shales. Bedrock was not encountered in any borings advanced onsite

Mounding of water within saturated ash in the impoundment creates a component of radial flow. The extent of this groundwater movement appears to be limited, as the elevated heads overlying the Upper

Confining Unit dissipate across the Ash Pond 2 berms. Potentially impacted water from the seeps observed along the berms may partially infiltrate through the Upper Confining Unit and/or run off toward the Lake or Unnamed Creek.

The Uppermost Aquifer underlying Ash Pond 2 consists of the Hagarstown Member and the weathered (upper) portions of the Vandalia Member, which is being monitored to define the extent of CCR constituents derived from Ash Pond 2. The Uppermost Aquifer is confined except where the Hagarstown Member is exposed along the eastern side of the impoundment within the former ravine (Figure 4). Based on hydraulic conductivity values (10^{-3} to 10^{-4} cm/sec) measured in the monitoring wells screened in the Hagarstown Member, groundwater at CPS has previously been classified as Class I in accordance with 35 IAC 620 (Hanson, 2009).

CCR within Ash Pond 2 is underlain by the Upper Confining Unit beneath the majority of the impoundment footprint. However, in former drainage features present prior to construction the saturated ash is in contact with the Hagarstown Beds and underlain by the Vandalia Member. Given the relatively high permeability of the Hagarstown Beds, leachate from Ash Pond 2 infiltrates into this unit, migrates through/under the eastern berm (where the Hagarstown Member is continuous below the berm) and discharges along the slope, as evidenced by the observation of seeps (Figure 4).

Groundwater within the Hagarstown Beds beyond the boundary of Ash Pond 2 flows predominantly to the east and south. Both the southern discharge flume and the Unnamed Creek intersect and cutoff the Hagarstown unit, eliminating further migration of potentially impacted groundwater. Impacted groundwater may also migrate to the north and northwest in the Hagarstown, potentially under the influence of the passive (gravity drain) underdrain system associated with the Recycle Pond and active underdrain system associated with the Landfill.

2 GROUNDWATER MONITORING

A groundwater investigation around Ash Pond 2 was initially completed in 2010-2012, A monitoring program was initiated in November 2015 to comply with the requirements of 40 CFR Part 257 (CCR Rule). Upon approval of the Closure Plan in which this document is included, the monitoring network will consist of the current CCR monitoring program and additional wells associated with other CPS units to comply with both IEPA and CCR Rule requirements. The proposed groundwater monitoring well network consists of a sufficient number of wells, installed at appropriate locations and depths, to monitor post-closure compliance with groundwater quality standards for Class I: Potable Resource Groundwater.

The proposed groundwater monitoring program included in this document is consistent with the requirements of 35 IAC Part 620 with Illinois EPA-approved modifications as well as 40 CFR Part 257. The wells will monitor the Hagarstown unit in the vicinity of Ash Pond 2 which has been designated the uppermost aquifer and has been monitored for the IEPA approved programs associated with the Landfill, Gypsum Stack Pond and Gypsum Recycle Pond.

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

The monitoring well network described below fulfills the following goals:

- Enable the collection of groundwater samples that represent the quality of background water that has not been affected by the Ash Pond 2
- Enable the collection of groundwater samples that represent the quality of downgradient groundwater
- Include wells that are located within the stratigraphic unit that may serve as potential contaminant migration pathways

2.1 Existing Well Network and Monitoring Programs

The existing monitoring wells present around the five units is summarized in Table 1 and shown on Figure 2. This subsection discusses the monitoring wells associated with Ash Pond 2, and Subsections 2.1.1 and 2.1.2 describe the monitoring performed around Ash Pond 2. Monitoring wells specifically associated with Ash Pond 2 include five leachate head wells (OW1 – OW-5), 7 monitoring wells

(G401 - G407), 8 piezometers (B-1(d), B-2(s), G45D, G46D, P009, P010, P012, and P014), and 2 temporary piezometers (T408 and T409). Monitoring wells around Ash Pond 2 were installed beginning in 2010 (G402), and the remaining wells and piezometers were installed in 2015 and 2016. The recent addition of wells and the piezometers, one of which is located within the ash impoundment, was completed in 2015 and 2016 to comply with the CCR Rule and define the vertical extent of CCR impacts. Monitoring wells around other CCR units were installed between 2008 and 2011 to monitor groundwater around the Landfill, Gypsum Stack Pond, and Recycle Pond as required by the IEPA.

2.1.1 IEPA Monitoring

Currently, no IEPA required groundwater monitoring is performed around Ash Pond 2. Following closure of Ash Pond 2 groundwater monitoring will be initiated to meet requirements of 35 IAC Part 620.410.

2.1.2 40 CFR Part 257 Monitoring

CCR Rule monitoring commenced in November 2015 and currently consists of quarterly groundwater elevation measurements and water quality samples collected at background monitoring wells G270 and G281, and downgradient wells G401, G402, G403, G404, and G405. The groundwater will be analyzed for Appendix III and Appendix IV parameters (see below) for eight quarterly sampling events. Piezometers (P009, P010, P012, and P014) are measured monthly for groundwater elevation only.

Appendix III Parameters (total, except TDS)			
Boron	Chloride	pH	Total Dissolved Solids (TDS)
Calcium	Fluoride	Sulfate	
Appendix IV Parameters (total)			
Antimony	Cadmium	Lead	Selenium
Arsenic	Chromium	Lithium	Thallium
Barium	Cobalt	Mercury	Radium 226/228
Beryllium	Fluoride	Molybdenum	
Field Parameters			
Dissolved Oxygen	Specific Conductivity	Temperature	Turbidity
Oxidation/Reduction Potential			

Following the completion of eight quarterly sampling events, the monitoring program will be modified so that the analytical parameters and sampling frequency are appropriate to the objectives and requirements of the CCR Rule.

2.2 Proposed Monitoring Network

This Closure Plan proposes a groundwater monitoring program to meet the requirements of 35 IAC Part 620.410. Wells to be sampled are summarized in Table 2 and below, and the proposed monitoring network is shown on Figure 5.

Boring logs and monitoring well construction reports for the groundwater monitoring system are provided in Appendix A. The well depths well screen intervals, depth to groundwater, and position relative to Ash Pond 2 are summarized below:

Well Number	Well Screen Interval (ft bgs)	Depth To Groundwater[1] (ft bgs)	Well Position in Hagarstown Unit	Additional Units Monitored
G154	14.3-18.8	11.67	Upgradient / Background	SW Pond
G270	13.1-17.9	7.61	Upgradient / Background	Gypsum Recycle Pond
G279	22.4-26.8	25.11		
G280	12.8-17.6	7.39		
G281	15.5-20.2	6.35		
G401	14.4-18.8	17.73	Downgradient / Side gradient	None
G402	10-20	9.13	Downgradient	
G403	13.1-17.8	4.67	Downgradient	
G404	6.4-11.2	5.09	Downgradient / Side gradient	
G405	9.0-13.8	5.15		
G406	13.6-18.4	9.35	Downgradient	
G407	13.8-18.6	8.05	Background / Downgradient	
G410[2]	TBD	TBD		
G411[2]	TBD	TBD		

[1] Groundwater depth elevations shown are from November 2016
[2] Proposed wells, to be installed upon approval of Closure Plan

Additional sampling is completed, as required by IEPA, at monitoring wells surrounding the Landfill, Gypsum Stack Pond, and Gypsum Recycling Pond. These sampling programs are not included or discussed in this Plan. However, groundwater elevations from these monitoring wells will be used for data analysis when they are collected in conjunction with the Ash Pond 2 monitoring.

Wells G410 and G411 are proposed to be installed, upon approval of the Closure Plan, to define the extent of sulfate exceedances above Class I standards in the Hagarstown Unit to the west of G407. The sulfate exceedances at well G407 have not been attiributed to Ash Pond 2 and will be further evaluated following completion of proposed wells G410 and G411 to the west.

2.3 Abandoned Wells

Monitoring wells and piezometers not included in the proposed network will be abandoned upon approval of this Groundwater Monitoring Plan. Piezometers G45D, north of Ash Pond 2, and G46D located on the southwest corner are no longer required because no CCR constituents were detected at concentrations of concern at these locations. Temporary wells T408 (nested with G45D), and T409 (nested with G46D), will also be abandoned because they were installed only to obtain horizontal hydraulic conductivities in the Vandalia Till Unit.

The leachate wells OW-1 through OW-5 and piezometers (B-1(d), B-2(s), P009, P010, P012, and P014) will be abandoned prior to capping of Ash Pond 2. The locations of the leachate well, monitoring wells, and piezometers that will be abandoned are shown on Figure 5.

3 APPLICABLE GROUNDWATER QUALITY STANDARDS

3.1 Groundwater Classification

Based on the detailed geologic information provided for the Hagarstown Unit at the Site, groundwater can be classified as Class I - Potable Resource Groundwater. Although the thickness of the sand and gravel is generally less than 5 feet, the field hydraulic conductivity tests performed on the Hagarstown had geometric mean hydraulic conductivities of approximately 2.9×10^{-4} cm/s, and in some locations it was measured as high as 10^{-3} cm/sec. Sands and gravels with a hydraulic conductivity of greater than 1×10^{-4} cm/s meet the provisions of Section 620.210 for Class I Potable Resource Groundwater.

3.2 Applicable Groundwater Quality Standards

The groundwater quality standards for the proposed monitoring well network screened in the Hagarstown Unit are Class I Potable Resource Groundwater [35 IAC 620.410] standards or background concentrations, based on statistical analyses (Section 3.3). For determination of background concentrations, only parameters included in the proposed analyte list (Table 2) and from wells within the proposed network were used in the evaluation. Background concentrations were calculated for arsenic, boron, manganese, pH, sulfate and TDS from background wells G270, G280, and G281.

Based on the statistical evaluation of the background groundwater data (Table 3), background concentrations exceed groundwater quality standards for Class I Potable Resource Groundwater for manganese. Therefore, the background groundwater concentration for manganese will apply to the proposed monitoring well network. Since background concentrations are lower than the Class I Potable Resource Groundwater standard for arsenic, boron, pH, sulfate and TDS, the Class I Potable Resource Groundwater will be applied.

Background groundwater quality for additional parameters subject to the USEPA CCR Rule (i.e., Appendix III and IV) will be established through statistical evaluation following completion of 8 quarters of groundwater sampling of background wells that commenced in November 2015. The groundwater quality standard for these parameters at the proposed monitoring well network for Ash Pond 2 will be the greater of either the background concentration or the groundwater quality standard for Class I Potable Resource Groundwater. Parameters with no Class I standard will not be evaluated for the IEPA monitoring program but will be evaluated separately for the USEPA CCR Rule with the methods outlined in 40 CFR Part 257. The current list of applicable groundwater quality standards for the monitoring well network is shown on Table 3.

3.3 Statistical Evaluation of Background Groundwater Data

A statistical evaluation was performed to determine the maximum background concentrations likely to occur upgradient of Ash Pond 2 at the CPS. The groundwater quality data collected from upgradient monitoring wells G270, G280, and G281 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 B. 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 B, Figure B-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 Hagarstown Unit are located in Appendix B. Appendix B includes a statistical summary of the background water quality data from Wells G270, G280, and G281 and the statistical analysis procedure inputs and results.

Calculated background values (upper and lower limits) for the tested inorganic constituents and pH are listed in Appendix B, Table B-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 3 and are compared to the groundwater quality standards for Class I: Potable Resource Groundwater. The higher of the two values is shown as the Applicable Groundwater Standard on Table 3 (see additional discussion provided in Section 3.2).

3.5 Proposed Exceptions to the Groundwater Monitoring Parameters

Based on the results of groundwater monitoring performed at CPS to date, the following exceptions to the above applicable Class I: Potable Resource Groundwater standards are proposed:

- Analytical results (Appendix C) indicate iron has historically exceeded the groundwater quality standards of Class I Potable Resource Groundwater inorganic constituents listed in 35 IAC 620.410(a)(1). However, elevated iron concentrations are attributed to reducing conditions and aquifer composition and are not prevalent in groundwater associated with Ash Pond 2.

- Nitrate is included in the inorganic parameters for Class I Potable Resource Groundwater. Historical monitoring has not exhibited nitrate exceedances and nitrate is not prevalent in groundwater associated with Ash Pond 2.

- Class I Potable Resource Groundwater requires monitoring the inorganic constituents copper, cyanide, nickel, silver, vanadium, and zinc listed in 35 IAC 620.410(a)(1). These constituents will not be monitored because they may be sensitive to the aquifer reducing conditions and are not associated with the chemical characteristics of CCR at Ash Pond 2.

- 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 620.410(a)(1) but has not been previously analyzed. Perchlorate will not be monitored because it is not associated with the chemical characteristics of CCR at Ash Pond 2.

The proposed groundwater monitoring parameters for the proposed monitoring well network are discussed further in Section 4.1.

4 GROUNDWATER MONITORING PLAN

The groundwater monitoring plan will monitor and evaluate groundwater quality to demonstrate compliance with the groundwater quality standards for Class I: Potable Resource Groundwater as well as USEPA MCLs or background exceedances, as appropriate. As discussed in Section 3, the proposed post-closure groundwater sampling network consists of three background monitoring wells and 11 compliance monitoring wells as shown on Figure 5.

4.1 Groundwater Monitoring

The proposed IEPA (35 IAC Part 620.410) well network for Ash Pond 2 consists of 11 monitoring wells (Table 2) installed in the Hagarstown Beds adjacent to Ash Pond 2, the Gypsum Recycle Pond and the SW Pond and 3 background monitoring wells (G270, G280, and G281). The wells included in the IEPA Closure Monitoring will be analyzed for the following laboratory and field parameters:

Laboratory Parameters		
Metals ***(dissolved)***		
Arsenic	Lead	Manganese
Boron		
Inorganics (totals)		
Sulfate	Total Dissolved Solids	
Field Parameters		
pH	Temperature	
Oxidation/Reduction Potential	Specific Conductivity	
Dissolved Oxygen	Turbidity	

In addition to the IEPA Closure Monitoring, wells G270, G279, G280, G281, and G401 – G405 will be sampled and analyzed for additional parameters to comply with the CCR Rule. These wells will be monitored for the following laboratory and field parameters shown below:

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

As discussed in Section 3.5, other constituents listed under 35 IAC 620 will not be monitored at the proposed monitoring well network because the groundwater monitoring results to date indicate that the inorganic constituents copper, cyanide, nitrate, nickel, silver, and zinc either meet the Class I: Potable Resource Groundwater standards or are not associated with the chemical characteristics of CCR at Ash Pond 2. Iron will not be sampled because it is indicative of reducing conditions in the aquifer and is not prevalent in groundwater associated with Ash Pond 2. Following the initial eight rounds of sampling at the CCR Rule monitoring wells, the parameters to be monitored will be in accordance with the requirements of 40 CFR Part 257.94 and 257.95 and this plan.

4.2 Sampling Schedule

Groundwater sampling for the proposed monitoring well network will initially be performed quarterly according to the following schedule:

Frequency	Duration
Quarterly	Begins: upon approval of this plan, for wells and parameters within the IEPA Closure Monitoring Program only. Wells within the CCR monitoring program will be monitored in accordance with 40 CFR 257.
	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 Ash Pond 2
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 Ash Pond 2.
Annual	Begins: after IEPA approves that semiannual monitoring requirements have been satisfied.
	Ends: upon IEPA approval of a certified post-closure care report, but no less than 30 years from the date of closure as specified in 40 CFR 257

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 wells of the site show no statistically significant increasing trends that can be attributed to Ash Pond 2 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 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

4.3 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 D. In addition to groundwater well samples, quality assurance samples will be collected as described in Section 4.5 (Table 4).

4.4 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 (Table 4). 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. A list of these parameters and the required PQLs are summarized in Table 5.

4.5 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 (Table 4). 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

4.6 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.

4.7 Annual Statistical Analysis

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 Ash Pond 2, 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.

In addition 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 Ash Pond 2 caused the increase or demonstrating another plausible reason for the increase (error in sampling, etc.).

4.8 Data Reporting

Sampling and analysis data from quarterly, semi-annual and/or annual groundwater monitoring for the 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.

4.9 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 Ash Pond 2 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 I 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, will be achieved when there are no statistically significant increasing trends that are attributed to Ash Pond 2 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.

4.10 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 well network, and a subsequent hydrogeologic site investigation demonstrates that such exceedances are due to a release from Ash Pond 2 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.

5 REFERENCES

AECOM, 2016. Revised 30% Closure Design Package for Coffeen Power Station Ash Pond No. 2. April 16, 2016.

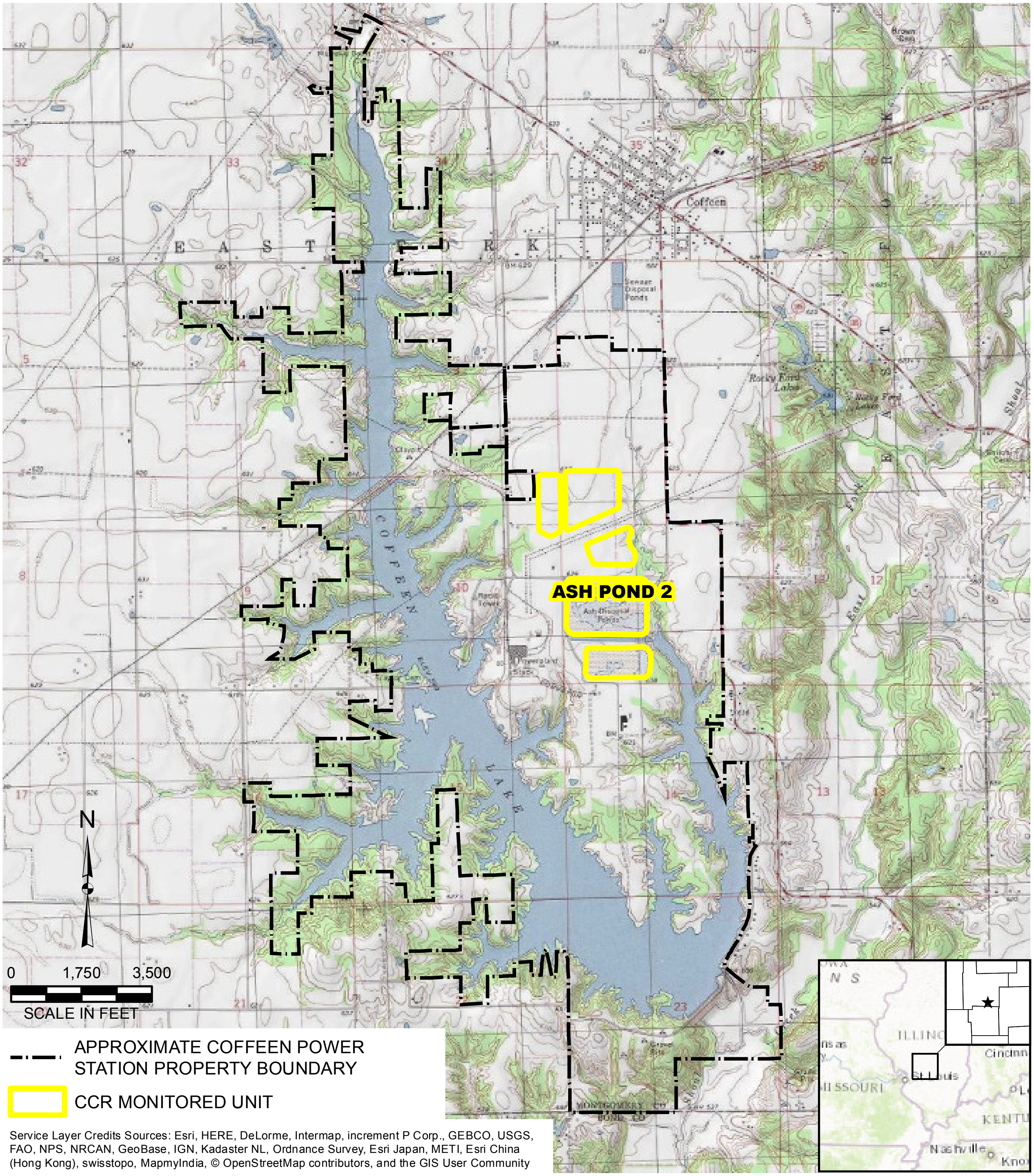
Natural Resource Technology, Inc. 2016. Hydrogeologic Site Characterization Report

USEPA, 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. EPA 530/R-09/007, U.S. Environmental Protection Agency, Office of Resource Conservation and Recovery, Washington, D.C., 554 p. + 4 app.

USEPA, January 2014. Technical Fact Sheet – Perchlorate

USEPA, April 17, 2015. 40 CFR Parts 257 and 261. Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule

FIGURES



DRAWN BY/DATE:
SDS 12/21/16
REVIEWED BY/DATE:
NRK 12/21/16
APPROVED BY/DATE:
SJC 12/21/16

SITE LOCATION MAP

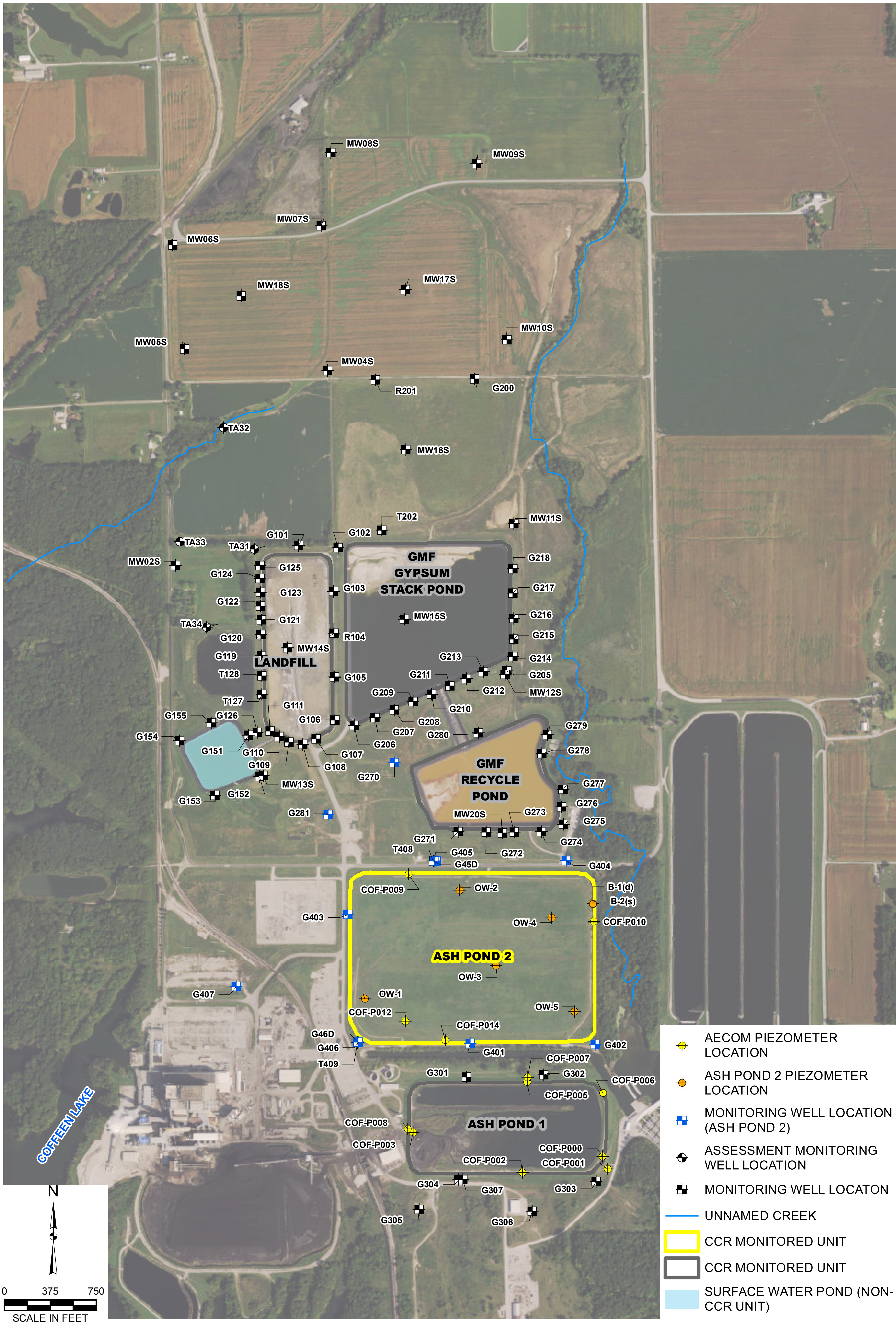
GROUNDWATER MONITORING PLAN
ASH POND 2
COFFEEN POWER STATION
COFFEEN, IL

PROJECT NO: 2380

FIGURE NO: 1

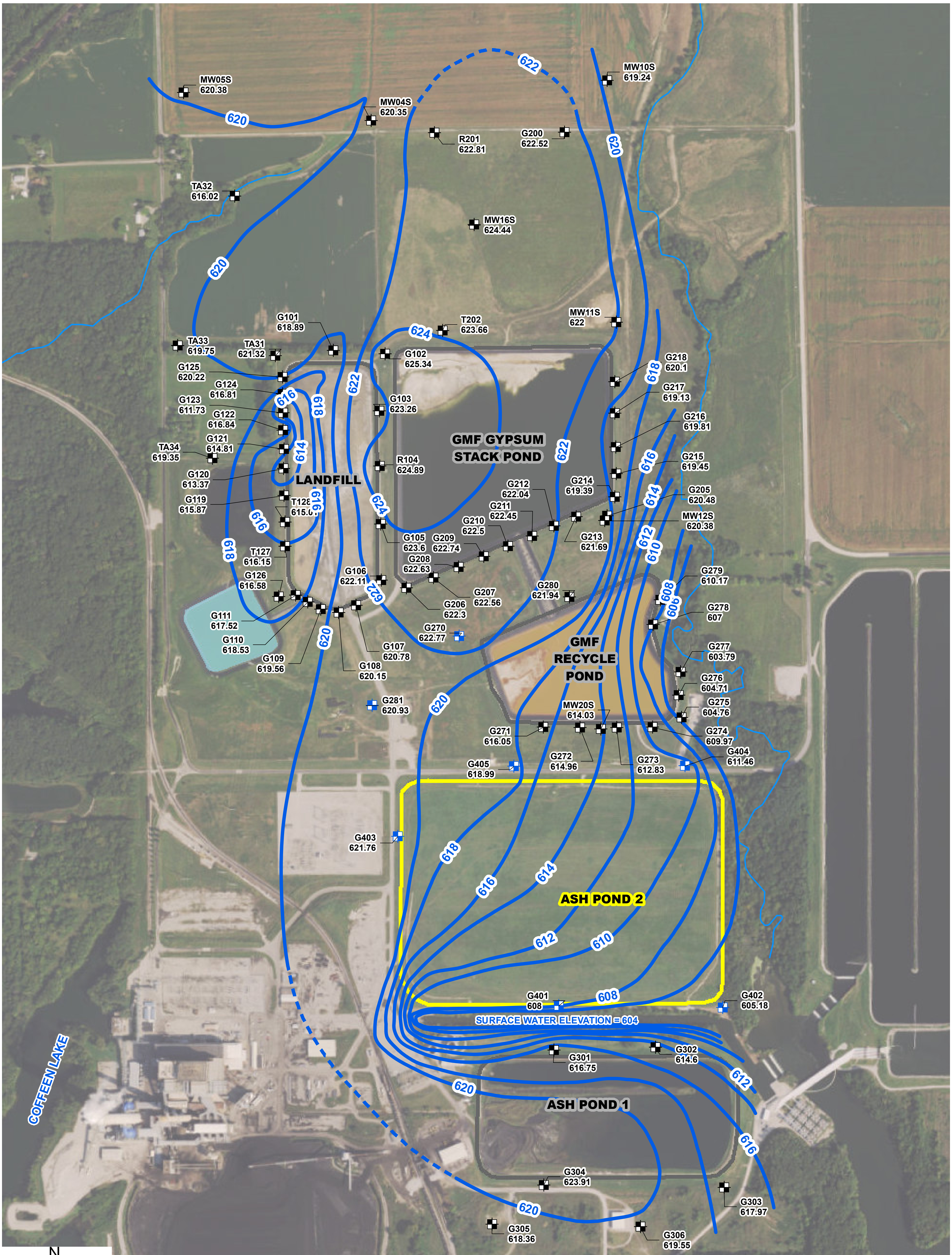
Natural Resource Technology

Y:\Mapping\Projects\23\2380\MXD\GWMP\Figure 1_Site Location Map.mxd Author: tcushman; Date/Time: 12/22/2016, 3:07:31 PM



Y:\Mapping\Projects\23\2380\MXD\GWMP\Figure 2_MW Location Map.mxd Author: tcushman; Date/Time: 12/22/2016, 3:13:36 PM

DRAWN BY/DATE: SDS 12/8/16 REVIEWED BY/DATE: NRK 12/8/16 APPROVED BY/DATE: SJC 12/21/16	MONITORING WELL LOCATION MAP GROUNDWATER MONITORING PLAN ASH POND 2 COFFEEN ENERGY CENTER COFFEEN, IL	PROJECT NO: 2380 FIGURE NO: 2 Natural Resource Technology



MONITORING WELL LOCATION (ASH POND 2)
MONITORING WELL LOCATON
POTENTIOMETRIC SURFACE CONTOUR
INFERRED POTENTIOMETRIC SURFACE CONTOUR
UNNAMED CREEK
CCR MONITORED UNIT
CCR MONITORED UNIT
SURFACE WATER POND (NON-CCR UNIT)

DRAWN BY/DATE: SDS 11/30/16
REVIEWED BY/DATE: NRK 11/30/16
APPROVED BY/DATE: SJC 12/21/16

POTENTIOMETRIC SURFACE MAP
MAY 2016

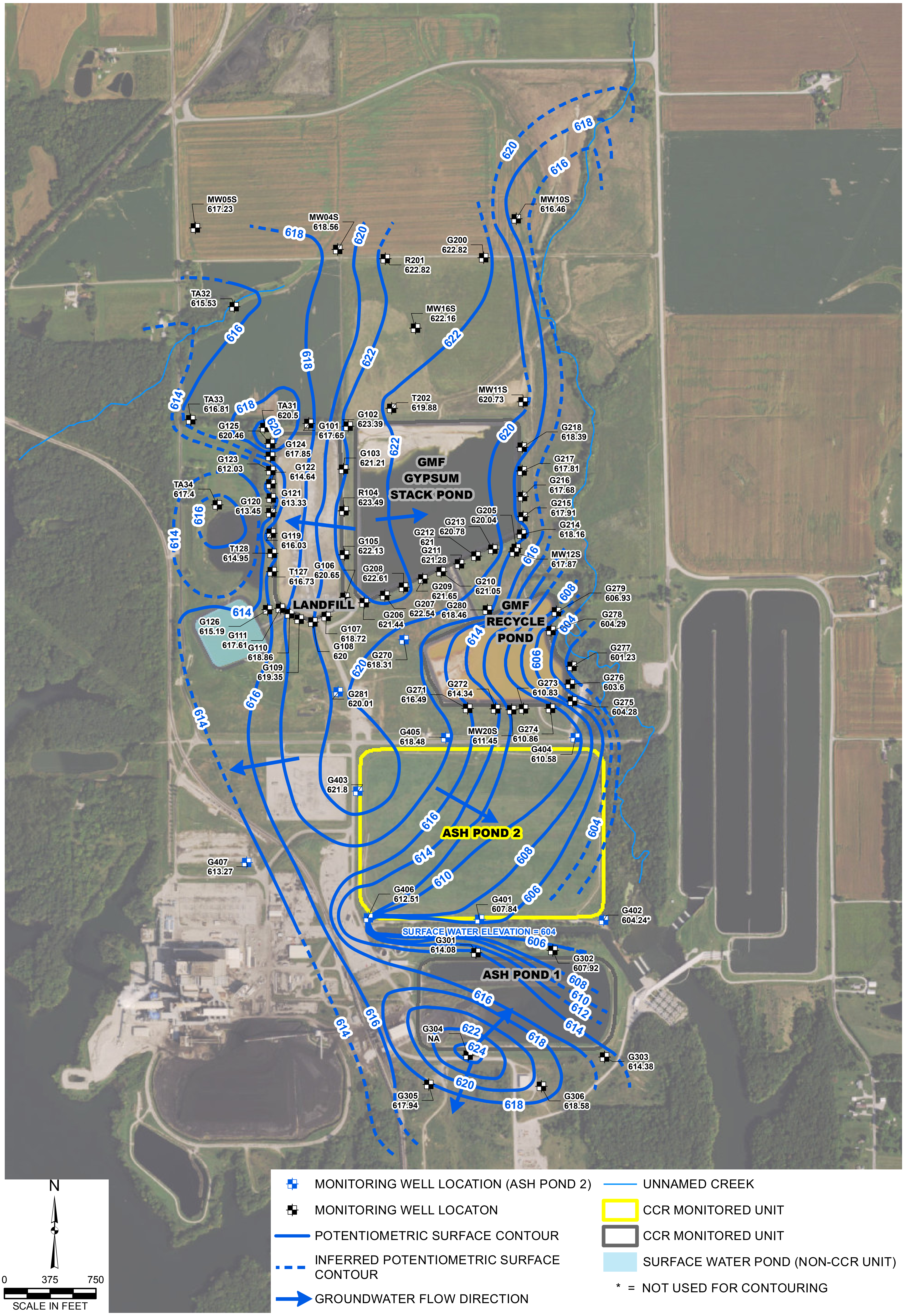
GROUNDWATER MONITORING PLAN
ASH POND 2
COFFEEN POWER STATION
COFFEEN, IL

PROJECT NO: 2380

FIGURE NO: 3

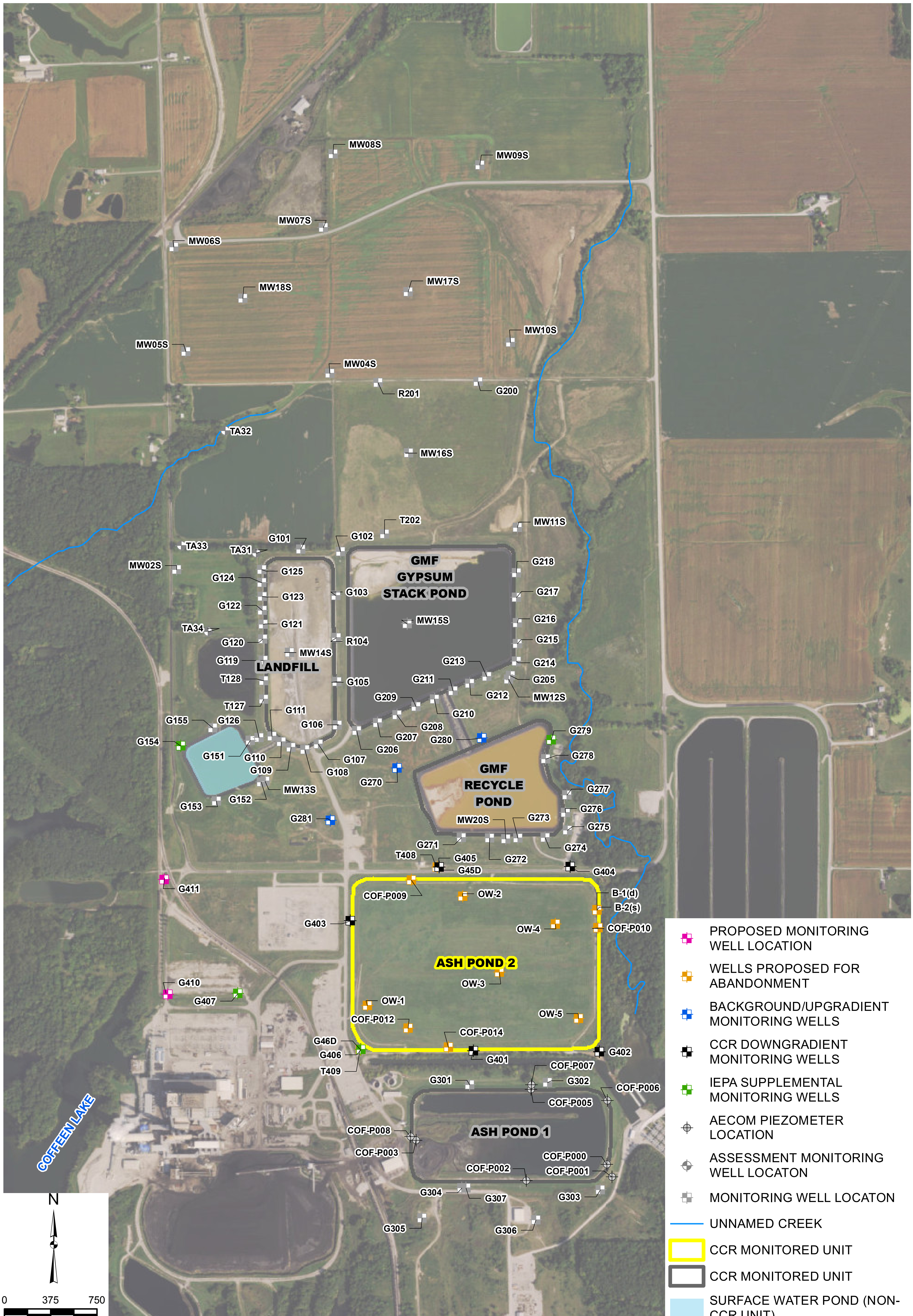
Natural Resource Technology

Y:\Mapping\Projects\23\2380\MXD\GWMP\Figure 3_May 2016 Potentiometric.mxd Author: tcushman; Date/Time: 12/22/2016, 3:14:57 PM



Y:\Mapping\Projects\23\2380\MXD\GWMP\Figure 4_Nov 2016 Potentiometric.mxd Author: tcushman; Date/Time: 12/22/2016, 3:16:38 PM

DRAWN BY/DATE: SDS 11/30/16 REVIEWED BY/DATE: NRK 11/30/16 APPROVED BY/DATE: SJC 12/21/16	POTENTIOMETRIC SURFACE MAP NOVEMBER 2016 GROUNDWATER MONITORING PLAN ASH POND 2 COFFEEN POWER STATION COFFEEN, IL	PROJECT NO: 2380 FIGURE NO: 4 Natural Resource Technology



DRAWN BY/DATE:
SDS 12/8/16
REVIEWED BY/DATE:
NRK 12/8/16
APPROVED BY/DATE:
SJC 12/21/16

PROPOSED MONITORING WELL NETWORKS AND ABANDONMENTS

GROUNDWATER MONITORING PLAN
ASH POND 2
COFFEEN ENERGY CENTER
COFFEEN, IL

PROJECT NO: 2380

FIGURE NO: 5

Natural Resource Technology

Y:\Mapping\Projects\23\2380\MXD\GWMP\Figure 5_MW Location Map.mxd Author: fcushman; Date/Time: 12/22/2016, 3:20:09 PM

TABLES

Table 1
Summary of Existing Monitoring Well Networks
Groundwater Monitoring Plan - Ash Pond 2
Coffeen Energy Center - Ash Pond 2

Well ID	Easting	Northing	Surface Elevation (ft MSL)	TOC Elevation (ft MSL)	Top of Screen Elevation	Bottom of Screen Elevation	Interpreted Screened Unit
G301	2,515,582.97	872,234.82	620.27	622.65	609.0	604.3	Upper Vandalia Till
G302	2,516,214.19	872,252.95	617.95	620.04	604.7	600.1	Upper Vandalia Till
G303	2,516,639.65	871,382.14	619.10	622.02	609.1	599.1	Hagarstown/Vandalia Till Contact
G304	2,515,519.74	871,397.69	623.46	626.72	613.5	603.5	Hagarstown Beds
G305	2,515,199.36	871,156.33	622.54	625.55	609.1	604.3	Hagarstown Beds
G306	2,516,120.41	871,140.98	622.84	625.72	609.8	605.2	Hagarstown Beds
G307	2,515,553.26	871,398.55	622.08	624.47	609.1	604.3	Hagarstown Beds
G281	2,514,455.48	874,375.37	623.82	626.36	608.31	603.66	Hagarstown Beds
G401	2,515,614.84	872,510.57	623.03	625.57	608.67	604.24	Hagarstown Beds
G402	2,516,632.46	872,500.49	610.56	613.37	600.6	590.6	Upper Vandalia Till
G403	2,514,616.63	873,561.34	623.81	626.47	610.7	606.03	Hagarstown Beds
G404	2,516,397.82	873,999.91	613.10	615.67	606.68	601.93	Hagarstown Beds
G405	2,515,335.67	873,996.63	620.90	623.63	611.89	607.14	Hagarstown Beds
G406	2,514,702.38	872,521.34	621.86	621.86	608.3	603.49	Hagarstown Beds
G407	2,513,705.87	872,973.39	618.35	621.32	604.57	599.74	Hagarstown Beds
T408	2,515,314.91	873,999.36	621.09	624.08	600.43	595.6	Vandalia Till
T409	2,514,693.89	872,517.79	621.85	625.01	600.06	595.26	Vandalia Till (Sand Seam)
G45D	2,515,322.23	873,998.03	620.94	623.81	589.06	579.42	Smithboro Till
G46D	2,514,697.78	872,519.70	621.91	625.24	580.3	570.65	Smithboro Till
OW-1	2,514,754.56	872,875.48	639.80	641.14	634.74	619.74	Ash
OW-2	2,515,525.87	873,761.43	639.70	641.34	629.84	614.84	Ash
OW-3	2,515,824.43	873,147.40	640.40	641.78	631.28	616.28	Ash
OW-4	2,516,277.90	873,535.97	644.70	damaged	629.7	604.7	Ash
OW-5	2,516,466.21	872,770.83	637.70	638.8	627.7	602.7	Ash
B-2(s)	2,516,615.41	873,650.85		639.44			Fill
B-1(d)	2,516,615.78	873,647.93		638.7			Fill
G101	2,514,215.00	876,575.00	625.27	627.6	609.59	604.95	Hagarstown Beds
G102	2,514,537.00	876,554.00	625.70	630.96	613.68	608.92	Hagarstown Beds
G103	2,514,500.93	876,200.00	630.99	633.8	615.11	610.32	Hagarstown Beds
R104	2,514,503.40	875,857.80	629.03	632.84	614.44	609.71	Hagarstown Beds
G105	2,514,509.03	875,500.00	629.26	632.08	613.15	608.36	Hagarstown Beds
G106	2,514,513.08	875,150.00	628.39	631.15	614.02	609.43	Hagarstown Beds
G107	2,514,358.30	874,994.07	627.79	630.23	613.92	609.29	Hagarstown Beds
G108	2,514,248.46	874,948.69	627.50	630.22	610.68	606	Hagarstown Beds (Silt)
G109	2,514,137.80	874,970.13	627.20	629.76	611.81	607.27	Hagarstown Beds
G110	2,514,057.93	875,015.38	627.02	629.65	611.97	607.43	Hagarstown Beds
G111	2,513,981.89	875,058.47	627.24	629.9	612.63	608.09	Hagarstown Beds
G119	2,513,910.00	875,675.00	628.85	631.55	611.56	607.02	Hagarstown Beds
G120	2,513,905.81	875,845.00	629.30	631.87	614.2	609.68	Hagarstown Beds
G121	2,513,910.00	875,965.00	629.57	632.83	612.78	608.1	Hagarstown Beds
G122	2,513,905.00	876,080.00	629.86	632.69	613.35	608.81	Hagarstown Beds
G123	2,513,905.00	876,190.00	630.13	632.96	609.19	604.67	Hagarstown Beds
G124	2,513,900.48	876,305.00	630.42	633.39	614.44	609.91	Hagarstown (Silt)/Vandalia Till Contact
G125	2,513,900.00	876,410.00	630.68	633.51	613.65	609.12	Hagarstown Beds
G126	2,513,878.29	875,049.31	622.96	625.39	610.07	605.53	Hagarstown Beds (Sandy clay)
T127	2,513,915.00	875,360.00	628.07	630.96	610.54	606	Hagarstown Beds
T128	2,513,915.00	875,510.00	628.44	630.93	611.91	607.4	Hagarstown Beds
TA31	2,513,856.77	876,542.25	623.89	626.55	608.8	604.32	Hagarstown Beds
TA32	2,513,605.19	877,532.57	618.93	621.42	607.62	603.25	Hagarstown Beds
TA33	2,513,248.73	876,605.45	622.51	625.27	610.28	605.62	Hagarstown Beds
TA34	2,513,466.73	875,906.10	624.10	626.52	613.18	608.69	Hagarstown Beds

G151	2,513,805.90	875,023.70	622.82	625.93	607.48	602.98	Hagarstown Beds
G152	2,513,894.50	874,687.50	623.06	626.52	609.47	604.97	Hagarstown Beds
G153	2,513,532.70	874,532.70	623.30	626.35	607.4	602.96	Hagarstown Beds
G154	2,513,243.10	874,978.40	623.52	626.35	609.26	604.76	Hagarstown Beds
G155	2,513,501.80	875,127.70	622.89	625.86	607.8	603.31	Hagarstown Beds
G200	2,515,650.00	877,930.60	624.20	625.94	612.01	607.22	Hagarstown Beds
R201	2,514,842.00	877,925.30	624.02	626.34	611.75	607.36	Hagarstown Beds
T202	2,514,895.00	876,699.40	626.22	628.63	613.95	609.57	Hagarstown Beds
G205	2,515,914.90	875,550.20	622.15	624.45	612.11	607.62	Hagarstown Beds
G206	2,514,669.20	875,103.90	630.54	632.82	613.03	608.62	Hagarstown Beds
G207	2,514,837.90	875,166.40	630.61	633.21	612.37	607.84	Hagarstown Beds
G208	2,514,993.60	875,231.50	630.57	633.16	613.04	608.51	Hagarstown Beds
G209	2,515,149.60	875,298.20	630.57	632.91	612.83	608.29	Hagarstown Beds
G210	2,515,299.00	875,359.70	630.48	632.99	611.09	606.55	Hagarstown Beds
G211	2,515,449.10	875,424.50	630.31	632.64	612.97	608.43	Hagarstown (Sandy Clay)/Vandalia Till Contact
G212	2,515,583.00	875,486.50	630.59	632.89	613.85	609.3	Hagarstown Beds
G213	2,515,723.50	875,544.40	630.34	632.81	613.59	609.05	Hagarstown Beds
G214	2,515,960.80	875,668.00	630.39	632.85	612.64	608.25	Hagarstown Beds
G215	2,515,971.60	875,810.20	630.48	633.06	611.07	606.68	Hagarstown Beds
G216	2,515,968.50	875,976.10	630.28	632.76	610.24	605.86	Hagarstown Beds
G217	2,515,963.00	876,185.60	630.67	633.1	610.18	605.79	Hagarstown Beds
G218	2,515,962.20	876,380.90	630.64	633.11	610.31	605.87	Hagarstown Beds
MW02S	2,513,210.04	876,408.86	624.10	sealed	613.76	608.98	
MW04S	2,514,450.58	877,999.73	622.40	625.79	612.57	608.14	Hagarstown Beds
MW05S	2,513,285.49	878,175.59	622.60	625.8	609.94	605.19	Hagarstown Beds
MW06S	2,513,189.40	879,021.15	623.10	626.14	612.06	607.48	Hagarstown Beds
MW07S	2,514,397.54	879,181.12	624.50	627.54	614.59	610.71	Hagarstown Beds
MW08S	2,514,478.83	879,776.62	624.70	627.9	613.19	608.7	Hagarstown Beds
MW09S	2,515,666.24	879,684.90	624.60	627.46	613.39	608.98	Hagarstown Beds
MW10S	2,515,914.37	878,250.50	621.20	624.22	609.92	605.44	Hagarstown Beds
MW11S	2,515,971.16	876,749.44	622.00	625.08	613.11	608.37	Hagarstown Beds
MW12S	2,515,900.54	875,520.08	622.20	625.21	611.59	607.02	Hagarstown Beds
MW13S	2,513,925.29	874,695.66	622.70	625.89	611.27	606.47	Hagarstown Beds
MW14S	2,514,125.95	875,737.78	624.60	sealed	612.34	607.58	Hagarstown Beds
MW15S	2,515,076.27	875,971.13	623.80	sealed	609.39	604.64	Hagarstown Beds
MW16S	2,515,087.98	877,355.14	626.10	629.37	611.51	606.69	Hagarstown Beds
MW17S	2,515,084.76	878,658.54	627.10	630.47	613.08	603.54	Hagarstown Beds
MW18S	2,513,745.20	878,604.67	625.60	628.66	614.29	609.81	Hagarstown Beds
MW20S	2,515,876.50	874,228.00		622.84			
G270	2,514,996.84	874,801.92	622.92	625.92	609.79	605	Hagarstown Beds
G271	2,515,517.12	874,239.38	622.89	625.57	612.93	608.58	Hagarstown Beds
G272	2,515,744.99	874,234.83	620.72	623.81	611.61	606.74	Hagarstown Beds (Silt)
G273	2,515,975.49	874,235.24	620.17	623.02	611.09	605.61	Hagarstown Beds
G274	2,516,195.60	874,239.25	621.67	624.04	608.77	604	Hagarstown Beds
G275	2,516,375.86	874,298.94	616.14	618.26	607.92	603.52	Hagarstown Beds
G276	2,516,358.83	874,438.60	629.14	632.	606.73	601.92	Hagarstown Beds
G277	2,516,370.51	874,581.80	620.79	623.08	606.5	602.02	Hagarstown Beds
G278	2,516,200.66	874,875.37	628.85	631.19	609.92	605.15	Hagarstown Beds
G279	2,516,245.60	875,028.06	629.19	632.04	606.79	602.4	Hagarstown Beds
G280	2,515,679.48	875,045.11	622.95	625.85	610.16	605.32	Hagarstown Beds

Notes:

Ground surface elevations based on information included on boring logs when the well was installed, and top of PVC elevations based on survey completed in Fall 2015.

NATURAL RESOURCE TECHNOLOGY

Table 2
Proposed Monitoring Well Network and Analyses
Groundwater Monitoring Plan - Ash Pond 2
Coffeen Energy Center - Ash Pond 2

Boring/Well ID	Ground Surface at Time of Install	Measuring Point Elevation (2015)	Top of Screen Elevation	Bottom of Screen Elevation	Screen length	Screen Top	Screen Bottom	Proposed Analyses for IEPA Monitoring	Additional Monitoring Programs Performed at Well	Other Analyses (USEPA CCR Rule or IEPA)
G270	622.92	625.92	609.79	605	5	16.1	20.9	Arsenic (d),boron (d), lead (d), manganese (d), sulfate, and total dissolved solids, field parameters (2)	Ash Pond 2 & GRP - CCR	40 CFR 257 - Appendix III and Appendix IV Parameters, Groundwater Elevation
G281	623.82	626.36	608.31	603.66	5	18.1	22.7		Ash Pond 2 CCR	
G401	623.03	625.57	608.67	604.24	4	16.9	21.3			
G402	610.56	613.37	600.60	590.6	10	12.8	22.8			
G403	623.81	626.47	610.70	606.03	5	15.8	20.4			
G404	613.10	615.67	606.68	601.93	5	9.0	13.7			
G405	620.90	623.63	611.89	607.14	5	11.7	16.5			
G406	621.86	621.86	608.30	603.49	5	13.6	18.4		None	None
G407	618.35	621.32	604.57	599.74	5	16.8	21.6			
G410[1]	TBD	TBD	TBD	TBD	TBD	TBD	TBD			
G411[1]	TBD	TBD	TBD	TBD	TBD	TBD	TBD			
G154	623.52	626.35	609.26	604.76	5	17.1	21.6		SW Pond - IEPA	IEPA Approved Parameters
G279	629.19	632.04	606.79	602.40	4	25.3	29.6		GRP - IEPA and CCR	40 CFR 257 - Appendix III and Appendix IV Parameters, Groundwater Elevation
G280	622.95	625.85	610.16	605.32	5	15.7	20.5			

Notes:

[1] Proposed wells to be installed upon approval of Closure Plan and GMZ application

[2] Field parameters include: pH, oxidation -reduction potential, specific conductance, temperature, and dissolved oxygen

Groundwater quality analyses including methods and sampling details are included in Table 4.

Natural Resource Technology

Table 3
Background Groundwater Quality and Applicable Groundwater Quality Standards
Groundwater Monitoring Plan - Ash Pond 2
Coffeen Energy Center

Parameters (totals)	Sampling Program	IL Class I Std[1] (mg/L)	Background Concentration[2] for IEPA (mg/L)	Applicable Groundwater Standard[3] for IEPA (mg/L)	Maximum[4] (mg/L)	Minimum[4] (mg/L)
Antimony	CCR	0.006	**tbd**	**tbd**	<0.003	<0.003
Arsenic	CCR	0.01	**tbd**	**tbd**	**0.014**	<0.001
Arsenic (d)	IEPA	0.01	0.001	0.01	**0.25**	<0.002
Barium	CCR	2.0	**tbd**	**tbd**	0.24	0.014
Beryllium	CCR	0.004	**tbd**	**tbd**	0.0018	<0.001
Boron	CCR	2.0	**tbd**	**tbd**	**17**	<0.02
Boron (d)	IEPA	2.0	0.12	2.0	**8.1**	<0.01
Calcium	CCR	NS	**tbd**	**tbd**	450	<0.1
Cadmium	CCR	0.005	**tbd**	**tbd**	0.008	<0.001
Chloride	CCR	200	**tbd**	**tbd**	160	1.5
Chromium	CCR	0.1	**tbd**	**tbd**	0.034	<0.004
Cobalt	CCR	1.0	**tbd**	**tbd**	0.28	<0.001
Fluoride	CCR	4	**tbd**	**tbd**	1.06	0.031
Lead	CCR	0.0075	**tbd**	**tbd**	**0.018**	<0.001
Lead (d)	IEPA	0.0075	0.001	0.0075	**0.220**	<0.001
Lithium	CCR	NS	**tbd**	**tbd**	0.057	<0.01
Manganese(d)	IEPA	0.150	0.47	0.47	**1.02**	<0.018
Mercury	CCR	0.002	**tbd**	**tbd**	0.00093	<0.0002
Molybdenum	CCR	NS	**tbd**	**tbd**	0.043	<0.001
Selenium	CCR	0.05	**tbd**	**tbd**	0.027	<0.001
Sulfate	CCR, IEPA	400	370	400	**2,500**	2.3
Thallium	CCR	0.002	**tbd**	**tbd**	0.0013	<0.001
TDS (d)	CCR, IEPA	1,200	780	1,200	**3,900**	320
Field pH	CCR, IEPA	6.5 - 9.0	6.64-7.88	6.5-9.0	8.03	**5.80**
Radium 226/228*	CCR	20/20	**tbd**	**tbd**	4.46	0.185

Notes:
All parameters are totals unless noted. Standards apply to dissolved or total concentrations
(d) Dissolved
tbd = To Be Determined for Illinois EPA monitoring program; CCR Appendix III and IV parameters based on future monitoring , started in November 2015
Bold = Background Concentration exceeds Class I Groundwater Standard
Red = Exceeds Applicable Groundwater Standard
NS = No Class II Groundwater Standard
na = not applicable; parameter [dissolved and total] not proposed for monitoring program
USEPA (t) = background concentration for parameter [total] required under USEPA program (40 CFR Part 257)
[1] IPCB 620 Class I: Potable Resource Groundwater Standard
[2] Background Concentration obtained from Appendix B - Statistical Procedure for Calculation of Background
(Table B-1 Tolerance Limits for Background Monitoring Wells G270, G280, and G281 using the Upper and Lower Limits)
[3] Applicable Groundwater Standard is the higher of the Background Concentration and the Class I Groundwater Standard (or the lower if compared to the pH lower limit)
[4] Groundwater concentrations based on historical results for wells in the proposed sampling program
* Radium 226 and 228 reported separately for IPCB Class I Groundwater Standard, reported combined for USEPA 40 CFR Part 257

NATURAL RESOURCE TECHNOLOGY

Table 4.
Sampling and Analysis Summary
Groundwater Monitoring Plan - Ash Pond 2
Coffeen Energy Center

Parameter	Analytical Method[5]	Number of Samples	Field Duplicates[1]	Field Blanks[2]	Equipment Blanks[2]	MS/MSD[3]	Total	Container Type	Minimum Volume[4]	Preservation (Cool to 4 °C for all samples)	Sample Hold Time from Collection Date
Metals - Appendix III (1)											
Boron (total and dissolved)	6020	14	2	0	0	1	17	plastic	600 mL	HNO_3 to pH<2	6 months
Calcium	6020	7	1	0	0	1	9	plastic	601 mL	HNO_3 to pH<3	6 months
Metals - Appendix IV (2) and Additional Metals											
Other Metals (3)	6020	7	1	0	0	1	9	plastic	600 mL	HNO3 to pH<2	6 months
Arsenic (dissolved)	6020	14	2	0	0	1	17	plastic	600 mL	HNO3 to pH<2	6 months
Lead (dissolved)	6020	14	2	0	0	1	17	plastic	600 mL	HNO3 to pH<2	6 months
Manganese (dissolved)	6020	14	2	0	0	1	17	plastic	600 mL	HNO3 to pH<2	6 months
Mercury	7470A or 6020	7	1	0	0	1	9	plastic	400 mL	HNO_3 to pH<2	28 days
Inorganic Parameters - Appendix III (1)											
Fluoride	9214	7	1	0	0	1	9	plastic	300 mL	Cool to 4 °C	28 days
Chloride	9251	7	1	0	0	1	9	plastic	100 mL	Cool to 4 °C	28 days
Sulfate	9036	14	2	0	0	1	17	plastic	50 mL	Cool to 4 °C	28 days
Total Dissolved Solids	SM 2540 C	14	2	0	0	1	17	plastic	200 mL	Cool to 4 °C	7 days
Radium - Appendix IV (2)											
Radium 226	9315 or EPA 903	7	0	0	0	1	8	plastic	1000 mL	HNO3 to pH<2	6 months
Radium 228	9320 or EPA 904	7	0	0	0	1	8	plastic	1000 mL	HNO_3 to pH<2	6 months
Field Parameters											
pH (1)	SM 4500-H+ B	14	NA	NA	NA	NA	14	flow-through cell	NA	none	immediately
Dissolved Oxygen	SM 4500-O/405.1	14	NA	NA	NA	NA	14	flow-through cell	NA	none	immediately
Temperature	SM 2550	14	NA	NA	NA	NA	14	flow-through cell	NA	none	immediately
Oxidation/Reduction Potential	SM 258O B	14	NA	NA	NA	NA	14	flow-through cell	NA	none	immediately
Specific Conductivity	SM 2510 B	14	NA	NA	NA	NA	14	flow-through cell	NA	none	immediately
Turbidity (4)	SM 2130 B	14	NA	NA	NA	NA	14	flow-through cell or hand-held turbidity meter	NA	none	immediately

Notes:

(1) USEPA Appendix III Parameters (boron, calcium, chloride, fluoride, pH, sulfate, total dissolved solids (TDS))

(2) USEPA Appendix IV Parameters
(antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, fluoride, lead, lithium, mercury, molybdenum, selenium, thallium, radium 226 and 228 combined)

(3) Other Metals = antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, lead, lithium, molybdenum, selenium, thallium

(4) If turbidity exceeds 10 NTUs, a duplicate sample filtered through a .45 micron filter may be collected for metals analysis in addition to the unfiltered sample. Both samples would be submitted for analysis.

NA = not applicable
HNO_3 = nitric acid
°C = degrees Celsius
mL = milliliter

1. Field duplicates will be collected at a frequency of one per group of 10 or fewer investigative water sample. Field duplicates will not be collected for radium analysis.
2. 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.
3. 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.
4. Sample volume is estimated and will be determined by the laboratory.
5. Analytical method numbers are from SW-846 unless otherwise indicated. Analytical methods may be updated with more recent versions as apropriate.

Table 5

Summary of Detection Limits for Proposed Monitoring Program Class I Groundwater Standards

Groundwater Monitoring Plan - Ash Pond 2

Coffeen Energy Center

Constituent	Unit	Analytical Methods [1]	USEPA MCL [2]	IL Class I Std[1] (ug/L)	RL [4]	MDL [4]
Metals						
Antimony	µg/L	6020	6	6	1	0.25
Arsenic	µg/L	6020	10	10	1	0.25
Arsenic(d)	µg/L	6020	10	10	1	0.13
Barium	µg/L	6020	2000	2000	1	0.4
Beryllium	µg/L	6020	4	4	1	0.5
Boron	µg/L	6020	NS	2000	25	10
Boron(d)	µg/L	6020	NS	2000	2.3	10
Cadmium	µg/L	6020	5	5	1	0.25
Calcium	µg/L	6020	NS	NS	125	100
Chromium	µg/L	6020	100	100	1	0.3
Cobalt	µg/L	6020	NS	1,000	1	0.25
Lead	µg/L	6020	15	7.5	1	0.25
Lead(d)	µg/L	6020	15	7.5	1	0.025
Lithium	µg/L	6020	NS	NS	1	0.5
Manganese (d)	µg/L	6020	50 [3]	150	1	0.055
Mercury	µg/L	6020 or 7470A	2	2	0.2	0.051
Molybdenum	µg/L	6020	NS	NS	1	0.25
Selenium	µg/L	6020	50	50	1	0.9
Thallium	µg/L	6020	2	2	1	0.25
Inorganics						
Fluoride	mg/L	9214	4	4	0.1	0.05
Chloride	mg/L	9251	250 [3]	200	5	1
Sulfate	mg/L	9036	250 [3]	400	10	5
Total Dissolved Solids	mg/L	SM 2540 C	500 [3]	1200	20	10
Other						
Combined Radium 226/228	pCi/L	9315/9320 or EPA 903/904	5	20/20	-- [5]	-- [6]
Field						
pH	SU	SM 4500-H+ B	NS	6.5-9.0	NA	NA
Oxidation/Reduction Potential	mV	SM 2580 B	NS	NS	NA	NA
Dissolved Oxygen	mg/L	SM 4500-O/405.1	NS	NS	NA	NA
Temperature	^oC	SM 2550	NS	NS	NA	NA
Specific Conductivity	µS/cm	SM 2510 B	NS	NS	NA	NA
Turbidity	NTU	SM 2130 B	NS	NS	NA	NA

Notes:

NS = No standard

RL = Reporting limit as established by the laboratory

MDL = Method detection limit as established by the laboratory

SM = Standard Methods for the Examination of Water and Wastewater

ug/L = micrograms per liter

mg/L = milligrams per liter

pCi/L = picoCuries per liter

µS/cm = microSiemens per centimeter

NTU = nephelometric turbidity unit

(d) = dissolved analysis

1. Analytical method numbers are from SW-846 unless otherwise indicated.
2. USEPA MCL = United States Environmental Protection Agency Maximum Contaminant Level.
3. USEPA SMCL = United States Environmental Protection Agency Secondary Maximum Contaminant Level.
4. Reporting limits and method detection limits will vary depending on the laboratory performing the work.
5. All radium results will be reported (values may be positive or negative) and will include uncertainty and the calculated MDC. 611
6. Laboratories calculate a minimum detectable concentration (MDC) based on the sample.

APPENDIX A

MONITORING WELL NETWORK BORING LOGS AND MONITORING WELL CONSTRUCTION REPORTS

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 12/16/2011
Finish: 12/16/2011
WEATHER: Ptly. cloudy (mid-30's)

CONTRACTOR: Testing Service Corp.
Rig mfg/model: CME-550 ATV Drill
Drilling Method: 4¼" HSA w/SS samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. McCuan
Eng/Geo: R. Fiorito

BOREHOLE ID: G154
Well ID: G154
Surface Elev: 623.52 ft. MSL
Completion: 20.00 ft. BGS
Station: 874,978.38N
2,513,243.10E

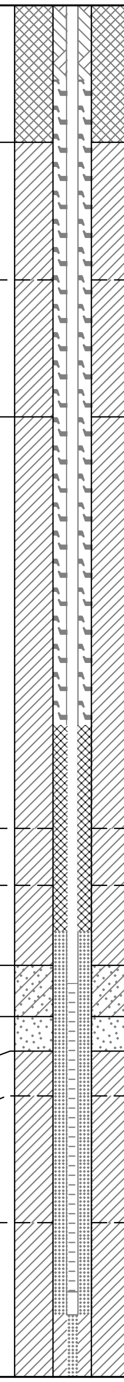
TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 13.45 - While drilling
▼ =
▽ = 11.10 - 12/21/2011

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) Failure Type
1A	14/24 *58%*	SS	*3-4 4-5* N=8			
2A	10/24 *42%*	SS	*woh-1 4-5* N=5			
3A	14/24 *58%*	SS	*2-4 6-7* N=10			
4A	21/24 *88%*	SS	*6-8 10-10* N=18			
5A	16/24 *67%*	SS	*1-4 6-8* N=10			
6A	13/24 *54%*	SS	*1-4 6-8* N=10			
7A, 7B	20/24 *83%*	SS	*4-6 8-12* N=14			
8A, 8B, 8C	23/24 *96%*	SS	*4-18 30-37* N=48			
9A	21/24 *88%*	SS	*40-75 86-84* N=161			
10A	20/24 *83%*	SS	*28-28 30-34* N=58			

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
0–2	FILL - Light yellowish brown (10YR6/4), silty CLAY with trace sand and slight trace gravel.	622	
2–4	Brownish yellow (10YR6/6) with 25% gray (10YR6/1) mottles, silty CLAY with trace sand.	620	
4–6	Gray (10YR5/1) with 25% yellowish brown (10YR5/4) mottles, silty CLAY with trace sand.	618	
6–12	Gray (10YR6/1) with 25% brownish yellow (10YR6/6) mottles, silty CLAY with trace sand and slight trace gravel.	616, 614, 612	
12–12.8	Gray (10YR6/1) with 10% brownish yellow (10YR6/8) mottles, silty CLAY with trace sand and slight trace gravel.		
12.8–14	Gray (10YR6/1), silty CLAY with trace sand and slight trace gravel.	610	
14–14.7	Gray (10YR6/1), clayey SAND with trace silt.		
14.7–15.2	Gray (10YR6/1) with 50% yellowish brown (10YR5/6) mottles, silty SAND with slight trace gravel.		
15.2–16	Dark yellowish brown (10YR4/4), silty CLAY with sand and trace gravel.	608	
16–17.8	Brown (10YR4/3), silty CLAY with sand and trace gravel.	606	
17.8–20	Dark gray (10YR4/1), silty CLAY with sand and trace gravel.	604	

Borehole Detail



End of Boring = 20.0 ft. BGS

NOTE(S): G154 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 2/26/2008
Finish: 2/26/2008
WEATHER: Overcast, cold

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: S. Simpson

BOREHOLE ID: G270
Well ID: G270
Surface Elev: 622.9 ft. MSL
Completion: 18.3 ft. BGS
Station: 874,801.92N
2,514,996.84E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 16.00 - While drilling
▼ = 5.62 - 3/12/08
▽ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Failure Type*	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
	20/24 *83%*	SS	*2-2 2-4* N=4					Dark grayish brown (10YR4/2), moist, firm, clayey SILT		622	
1A				24			2	Dark grayish brown (10YR4/2), moist, firm, silty CLAY			
2A	19/24 *79%*	SS	*3-4 5-9* N=9	22		2.33 *B*		Dark grayish brown (10YR4/2) with 5% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, slight trace sand		620	
2B				20		5.04 *Sh*	4	Gray (10YR5/1) with 70% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, slight trace sand and gravel			
3A	20/24 *83%*	SS	*14-5 7-8* N=12	17		2.52 *Sh*	▼ 6	Dark gray (10YR4/1) with 5% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, trace sand, slight trace gravel		618	
4A	24/24 *100%*	SS	*8-6 7-5* N=13	21		1.24 *BSh*				616	
4B				21		1.20 *B*	8	Gray (10YR5/1) with 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, trace sand, slight trace gravel			
5A	22/24 *92%*	SS	*2-3 4-4* N=7	21		1.36 *B*				614	
6A	24/24 *100%*	SS	*1-2 2-3* N=4	21		0.74 *BSh*	10	Gray (10YR5/1) with 60% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, trace sand, slight trace gravel		612	
6B				24		0.78 *B*		Gray (10YR5/1), moist, soft, sandy CLAY			
7A	17/24 *71%*	SS	*2-2 2-3* N=4	21			12	Gray (10YR5/1), moist, soft, sandy CLAY, trace gravel		610	
8A				20			14	Gray (10YR5/1), moist, soft, fine- to coarse-grained SAND, trace gravel			
8B	19/24 *79%*	SS	*1-3 5-6* N=8	17		4.46 *Sh*		Dark yellowish brown (10YR4/4), moist, soft, sandy CLAY		608	
								Gray (10YR5/1) with 10% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, slight trace sand and gravel			
9A	24/24 *100%*	SS	*6-8 30-35* N=38	20			▼ 16	Yellowish brown (10YR5/4), wet, soft, fine to coarse SAND		606	
9B				8			18	Gray (10YR5/1), moist, hard, silty CLAY, trace sand and gravel			

End of Boring = 18.27 ft. BGS

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/10/2009
Finish: 9/10/2009
WEATHER: Sunny, warm (80's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

BOREHOLE ID: G279
Well ID: G279
Surface Elev: 629.19 ft. MSL
Completion: 28.00 ft. BGS
Station: 875,028.06N
2,516,245.60E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 23.60 - While drilling
▼ = 24.68 - 9/21/09
▽ =

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) Failure Type
1A	24/24 *100%*	SS	*3-3 5-6* N=8	18		
2A	24/24 *100%*	SS	*5-9 10-11* N=19	14		
3A	24/24 *100%*	SS	*5-9 9-10* N=18	17		
4A	24/24 *100%*	SS	*4-5 7-6* N=12	21		
5A	24/24 *100%*	SS	*3-3 5-7* N=8	19		
6A	24/24 *100%*	SS	*3-4 6-9* N=10	17		
7A	23/24 *96%*	SS	*2-5 5-6* N=10	23		
8A	24/24 *100%*	SS	*2-3 7-6* N=10	23		
9A	18/24 *75%*	SS	*4-7 8-9* N=15	25		
10A	24/24 *100%*	SS	*3-6 7-10* N=13	17		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
0–3.5	FILL - Brown (10YR4/3) with 30% yellowish brown (10YR5/6) mottles, moist, firm, silty CLAY with sand and trace gravel.	628, 626
3.5–14	FILL - dark gray (10YR4/1) with 10% brownish yellow (10YR6/6) mottles, moist, hard, silty CLAY with sand and trace gravel.	624, 622, 620, 618, 616
14–15.3	Brownish yellow (10YR6/8) with 30% gray (10YR5/1) mottles, moist, firm, silty CLAY with slight trace sand and gravel.	614
15.3–18.4	Yellowish brown (10YR5/8) with 20% gray (10YR6/1) mottles, moist, firm, silty CLAY with slight trace sand and gravel.	612
18.4–20	Gray (10YR6/1) with 25% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and trace gravel.	610

Depth scale: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

Borehole Detail | Remarks

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 9/10/2009
Finish: 9/10/2009
WEATHER: Sunny, warm (80's)

CONTRACTOR: Layne-Western Co
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4¼" HSA w/SS & CME samplers
FIELD STAFF: Driller: G. Mills
Helper: J. Twellman
Eng/Geo: R. Hasenyager

BOREHOLE ID: G279
Well ID: G279
Surface Elev: 629.19 ft. MSL
Completion: 28.00 ft. BGS
Station: 875,028.06N
2,516,245.60E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 23.60 - While drilling
▼ = 24.68 - 9/21/09
▽ =

SAMPLE: Number	Recov / Total (in) / *% Recovery*	Type	TESTING: *Blows / 6 in* / N - Value / **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
11A	23/24 *96%*	SS	*2-4* *5-7* N=9	18				Gray (10YR6/1) with 25% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and trace gravel. *[Continued from previous page]*		608	
12A	19/24 *79%*	SS	*4-9* *8-9* N=17	13			22	Yellowish brown (10YR5/8), moist, firm, clayey SILT and very fine-grained SAND with slight trace gravel.		606	
12B				12			24				
13A	17/24 *71%*	SS	*1-5* *5-7* N=10	18				Light brownish gray (10YR6/2), wet, loose, very fine- to coarse-grained SAND.		604	
14A				16			26	Brownish yellow (10YR6/6), moist, hard, very silty CLAY with sand and trace gravel.			
14B	24/24 *100%*	SS	*10-10* *18-18* N=28	14				Gray (10YR6/1), moist, hard, very silty CLAY with sand and trace gravel.		602	
							28	**End of Boring = 28.0 ft. BGS**			

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: AEG Coffeen Power Station
Site: CCB Management Facility
Location: Coffeen, Illinois
Project: 05S3004A
DATES: Start: 2/26/2008
Finish: 2/26/2008
WEATHER: Overcast, cold

CONTRACTOR: Testing Service Corporation
Rig mfg/model: CME-650 Track Rig
Drilling Method: 3¼" HSA w/SS & CME samplers

FIELD STAFF: Driller: B. Williamson
Helper: R. Keedy
Eng/Geo: S. Simpson

BOREHOLE ID: G280
Well ID: G280
Surface Elev: 623.0 ft. MSL
Completion: 18.0 ft. BGS
Station: 875,045.11N
2,515,679.48E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 15.60 - While drilling
▼ = 4.34 - 3/12/08
▽ =

SAMPLE / TESTING

Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Failure Type*
1A	24/24 *100%*	SS	*5-3 4-4* N=7	23		
1B				26		2.33 *B*
2A	24/24 *100%*	SS	*3-4 4-6* N=8	30		1.28 *BSh*
2B				25		
	19/24 *79%*	SS	*3-4 6-6* N=10			
3A				14		3.10 *Sh*
	22/24 *92%*	SS	*9-11 10-8* N=21			
4A				18		1.67 *BSh*
5A	19/24 *79%*	SS	*2-2 4-4* N=6	20		1.47 *B*
5B				21		1.28 *B*
	22/24 *92%*	SS	*2-3 3-3* N=6			
6A				20		
	23/24 *96%*	SS	*3-14 23-21* N=37			
7A				13		
	23/24 *96%*	SS	*12-17 24-26* N=41			
8A				9		
8B				15		
9A	24/24 *100%*	SS	*11-27 54-43* N=81	26		
9B				7		

Lithologic Description (Depth ft. BGS: 0–18; Elevation ft. MSL: 622–606)

- Dark grayish brown (10YR4/2), moist, firm, clayey SILT
- Brown (10YR4/3) with 20% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY
- Dark yellowish brown (10YR4/4), moist, firm, silty CLAY
- Dark gray (10YR4/1) with 40% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY
- Dark gray (10YR4/1) with 40% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, slight trace sand
- Dark gray (10YR4/1) with 40% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, trace sand, slight trace gravel
- Dark gray (10YR4/1) with 40% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY, sand, trace gravel
- Yellowish brown (10YR5/8) with 20% light gray (10YR6/1) mottles, moist, soft, sandy CLAY
- Yellowish brown (10YR5/8), moist, soft, fine to coarse SAND, trace gravel
- Yellowish brown (10YR5/8), moist, firm, sandy CLAY, trace gravel
- Yellowish brown (10YR5/4), moist, firm, clayey SILT, trace sand and gravel
- Yellowish brown (10YR5/4), wet, soft, fine- to coarse-grained SAND, trace gravel
- Gray (10YR5/1), moist, hard, silty CLAY, trace sand and gravel

End of Boring = 17.98 ft. BGS

Remarks:

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: Natural Resource Technology, Inc.
Site: Coffeen Energy Center
Location: Coffeen, Illinois
Project: 15E0030
DATES: Start: 9/8/2015
Finish: 9/8/2015
WEATHER: Sunny, hi 70's

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: D-50 Turbo Tracked MST 800ATV
Drilling Method: Hollow Stem Auger (3¼"overdrill / 4¼")
FIELD STAFF: Driller: D. Crump
Helper: D. Groves
Eng/Geo: K. Theesfeld

BOREHOLE ID: G281
Well ID: G281
Surface Elev: 623.82 ft. MSL
Completion: 20.29 ft. BGS
Station: 2,514,455.48N
874,375.37E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 10, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 14.00 - During Drilling
▼ =
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
1A	17/24 *71%*	SS	*15-10 7-6* N=17	14		
2A	19/24 *79%*	SS	*2-4 5-5* N=9	25		*1.50*
3A	22/24 *92%*	SS	*2-2 3-4* N=5	23		*0.40*
4A	24/24 *100%*	SS	*5-5 6-6* N=11	19		*1.20*
5A	20/24 *83%*	SS	*2-2 3-4* N=5	21		*1.40*
6A	22/24 *92%*	SS	*2-2 3-3* N=5	18		*0.50*
7A	17/24 *71%*	SS	*3-4 5-5* N=9	19		*0.30*
	19/24 *79%*	SS	*3-11 21-28* N=32			
	24/24 *100%*	SS	*21-36 39-50* N=75			
8A	11/24 *46%*	SS	*16-9 30-50* N=39	7		*4.50*
	0/3 *0%*	BD				

Depth ft. BGS	Lithologic Description
	Light gray (10YR7/2), dry, very stiff, SILT with little clay and trace gravel.
	Yellowish brown (10YR5/4) with 5% dark brown (10YR3/3) mottles, dry, very stiff, SILT with few clay and trace gravel.
2	Yellowish brown (10YR5/4) with 15% dark yellowish brown (10YR4/6) and 5% dark brown (10YR3/3) mottles, moist, stiff, SILT with few clay.
4	Yellowish brown (10YR5/4) with 15% dark yellowish brown (10YR4/6) mottles, moist, medium, CLAY with some silt and trace fine-grained sand and small gravel.
6	Yellowish brown (10YR5/4) with 15% dark yellowish brown (10YR4/6) and 5% dark brown (10YR3/3) mottles, moist, stiff, CLAY with some silt and trace fine-grained sand and small gravel.
8	Yellowish brown (10YR5/4) with 30% dark yellowish brown (10YR4/6) and 5% dark brown (10YR3/3) mottles, moist, stiff, SILT with some clay and trace very fine- to fine-grained sand and small gravel.
10	Dark yellowish brown (01YR4/6) with 30% yellowish brown (10YR5/4) mottles, moist, soft, SILT with few clay and little fine- to coarse-grained sand and small gravel, trace wood fragments.
12	Dark yellowish brown (01YR4/6) with 15% yellowish brown (10YR5/4) mottles, moist, soft, SILT with few clay and very fine- to fine-grained sand and trace small gravel.
▼ 14	Dark yellowish brown (10YR4/4), wet, dense, very fine- to fine-grained SAND with some silt, few clay and trace small gravel.
16	Dark yellowish brown (10YR4/4), wet, dense, very fine- to fine-grained SAND with few silt, little clay and trace small gravel.
18	Yellowish brown (10YR5/6) with 5% strong brown (7.5YR5/6) mottles, moist, hard, SILT with few clay and little fine-grained sand and small gravel.
	Dark grayish brown (10YR4/2) with 5% strong brown (7.5YR5/6) mottles, moist, hard, SILT with few clay and little fine-grained sand and small gravel.
20	

Borehole Detail | Elevation ft. MSL: 622, 620, 618, 616, 614, 612, 610, 608, 606, 604 | Remarks

End of boring = 20.29 feet

NOTE(S): G281 installed in borehole.

FIELD BORING LOG

CLIENT: Natural Resource Technology, Inc.
Site: Coffeen Energy Center
Location: Coffeen, Illinois
Project: 15E0030
DATES: Start: 9/14/2015
Finish: 9/14/2015
WEATHER: Sunny, hi 60's

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: D-50 Turbo Tracked MST 800ATV
Drilling Method: Hollow Stem Auger (3¼"overdrill / 4¼")

FIELD STAFF: Driller: D. Crump
Helper: D. Groves
Eng/Geo: R. Hasenyager

HANSON

BOREHOLE ID: G401
Well ID: G401
Surface Elev: 623.03 ft. MSL
Completion: 19.30 ft. BGS
Station: 2,515,614.84N
872,510.57E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE Number	Recov / Total (in) % Recovery	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description
1A	16/24 *67%*	SS	*2-2 3-7* N=5	17			0–1.0	Dark grayish brown (10YR4/2), moist, soft, CLAY with little silt and trace very fine- to fine-grained sand - FILL.
							1.0–2.5	Yellowish brown (10YR5/6) moist, medium, CLAY with some silt and trace very fine- to coarse-grained sand - FILL.
2A	21/24 *88%*	SS	*8-11 8-9* N=19	17		*1.80*	2.5–3.2	Dark gray (10YR4/1), moist, stiff, SILT with little clay and trace very fine-grained sand.
2B				25			3.2–4.0	Yellowish brown (10YR5/6), moist, stiff, CLAY with some silt and trace very fine- to fine-grained sand.
3A	23/24 *96%*	SS	*3-4 7-8* N=11	23		*2.50*	4.0–7.4	Gray (10YR5/1) with 20% yellowish brown (10YR5/6) mottles, moist, medium, CLAY with some silt and trace very fine- to fine-grained sand.
4A	24/24 *100%*	SS	*8-9 12-14* N=21	21		*3.30*		
4B				19		*2.80*	7.4–8.0	Gray (10YR5/1) with 30% yellowish brown (10YR5/8) mottles, moist, stiff, SILT and very fine-grained SAND with trace clay.
5A	24/24 *100%*	SS	*2-3 4-5* N=7	21		*1.30*	8.0–14.8	Gray (10YR5/1) with 30% yellowish brown (10YR5/6) mottles, moist, medium, CLAY with some silt and trace very fine- to fine-grained sand.
6A	24/24 *100%*	SS	*2-4 5-6* N=9	17		*2.50*		
7A	24/24 *100%*	SS	*9-7 8-9* N=15	21		*1.40*		
8A	24/24 *100%*	SS	*2-3 2-4* N=5	17		*1.30*	14.8–15.9	Gray (10YR6/1), moist soft, CLAY with very fine- to fine-grained sand and little silt.
8B				19			15.9–16.7	Yellowish brown (10YR5/6), wet, loose, very fine- to fine-grained SAND with trace silt.
9A	20/24 *83%*	SS	*5-4 5-10* N=9	21			16.7–17.2	Yellowish brown (10YR5/6), wet medium, SILT with some very fine-grained sand and little clay.
9B				16			17.2–17.9	Yellowish brown (10YR5/6), wet, loose, very fine- to medium-grained SAND with trace silt.
10A	12/16 *75%*	SS	*23-41 50/4"*	6		*4.50*	17.9–19.3	Gray (10YR5/1), moist, very hard, SILT with few clay and little very fine- to very coarse sand.

Elevation ft. MSL: 622, 620, 618, 616, 614, 612, 610, 608, 606, 604

Borehole Detail | Remarks

End of boring = 19.3 feet

NOTE(S): G401 installed in borehole.

Surface Elevation: 610.56

Datum msl

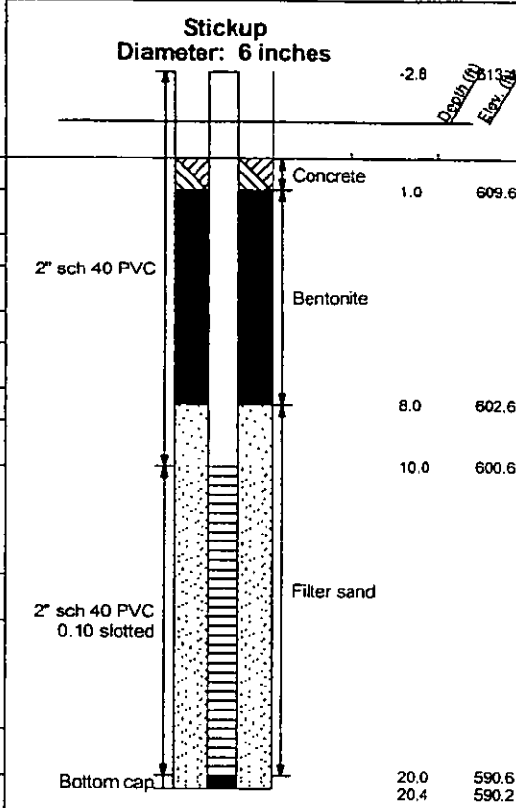
Completion Date: 8/27/10

Northing: 872502.26

Easting: 2516632.59

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Medium stiff, brown, silty CLAY - CL			
			6-3-3	SS1
			1-2-4	SS2
5	Medium stiff, gray, silty CLAY, trace sand - CL			
	∇		1-2-5	SS3
	Hard to stiff, brown to gray, silty CLAY, trace sand seams - CL (TILL)			
			9-22-28	SS4
10				
			1-6-12	SS5
15				
			3-4-9	SS6
20	Boring terminated at 20 feet.			
25				
30				
35				

WELL DIAGRAM



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J017150.01- COFFEEN.GPJ GTINC 0638301.GPJ 12/13/10

GROUNDWATER DATA

ENCOUNTERED AT 7 FEET ∇

DRILLING DATA

___ AUGER 4 1/4" HOLLOW STEM

WASHBORING FROM ___ FEET

MVU DRILLER SWG LOGGER

CME 55TRK DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by: DTK	App'vd. by: KRB
Date: 9/10/10	Date: 1-4-11	Date: 1/4/11

GEOTECHNOLOGY INC FROM THE GROUND UP

Ameren-Coffeen Ash Pond Evaluation

LOG OF BORING: APW-2

G402

Project No. J017150.01

FIELD BORING LOG

HANSON

CLIENT: Natural Resource Technology, Inc.
Site: Coffeen Energy Center
Location: Coffeen, Illinois
Project: 15E0030
DATES: Start: 9/11/2015
Finish: 9/11/2015
WEATHER: Raining, hi 60's

CONTRACTOR: Ramsey Geotechnical Engineering, LLC
Rig mfg/model: D-50 Turbo Tracked MST 800ATV
Drilling Method: Hollow Stem Auger (3¼"overdrill / 4¼")

FIELD STAFF: Driller: D. Crump
Helper: D. Groves
Eng/Geo: K. Theesfeld

BOREHOLE ID: G403
Well ID: G403
Surface Elev: 623.81 ft. MSL
Completion: 18.15 ft. BGS
Station: 2,514,616.63N
873,561.34E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 15.00 - During Drilling
▼ =
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp (tsf)* Failure Type	Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
1A	19/24 *79%*	SS	*2-2* *2-2* N=4	25		*0.80*	0–2	Very dark brown (10YR2/2) grading to dark grayish brown (10YR4/2), moist, medium, SILT with some clay, trace roots and grass.	622	
2A	22/24 *92%*	SS	*2-2* *3-4* N=5	29			2–2.9	Very dark brown (10YR2/2) grading to dark grayish brown (10YR4/2), moist , stiff, SILT with some clay, trace wood.		
2B				26		*1.50*	2.9–4	Yellowish brown (10YR5/4) with 10% very dark brown (10YR2/2) mottles, moist, stiff, CLAY with little silt, trace very fine-grained sand seams (<1/16" thick).	620	
3A	8/24 *33%*	SS	*2-3* *4-4* N=7	25		*1.50*	4–6	Yellowish brown (10YR5/4), moist, stiff, CLAY with little silt and trace very fine-grained sand.	618	
4A	21/24 *88%*	SS	*8-7* *8-7* N=15	20		*1.30*	6–8	Grayish brown (10YR5/2) with 15% yellowish brown (10YR5/6) and 5% very dark grayish brown (10YR3/2) mottles, moist, stiff, CLAY with little silt and trace very fine-grained sand.	616	
5A	20/24 *83%*	SS	*2-2* *3-3* N=5	22		*0.70*	8–10	Grayish brown (10YR5/2) with 5% yellowish brown (10YR5/6) mottles, moist, medium, CLAY with little silt and trace very fine-grained sand.	614	
6A	24/24 *100%*	SS	*2-2* *3-4* N=5	23		*1.40*	10–11.6	Grayish brown (10YR5/2) with 30% yellowish brown (10YR5/6) mottles, moist, very stiff, CLAY with little silt, few very fine- to medium-grained sand, and trace gravel.	612	
7A	21/24 *88%*	SS	*5-5* *6-5* N=11	20		*0.90*	11.6–14	Grayish brown (10YR5/3) with 45% yellowish brown (10YR5/6) and 5% dark brown (10YR3/3) mottles, moist, stiff, SILT with some clay, few very fine- to coarse-grained sand, and trace gravel.	610	
8A	24/24 *100%*	SS	*3-2* *3-6* N=5	17			14–15	Grayish brown (10YR5/3) with 40% yellowish brown (10YR5/6) mottles, moist, medium, SILT with little clay, few very fine- to coarse-grained sand, and trace gravel.		
							15 ▼ –15.5	Yellowish brown (10YR5/6) with 30% grayish brown (10YR5/2) mottles, moist, medium, SILT with little clay, few very fine- to coarse-grained sand, and trace gravel.	608	
							15.5–16.2	Yellowish brown (10YR5/6), wet, loose, SAND with some clay and few silt.		
9A	19/24 *79%*	SS	*8-12* *21-25* N=33	8		*4.50*	16.2–17.3	Yellowish brown (10YR5/6) with 30% grayish brown (10YR5/2) mottles, moist, stiff, SILT with few clay, very fine- to coarse-grained sand, and gravel.		
							17.3–18	Yellowish brown (10YR5/6), moist, very stiff, SILT with some clay and few sand and gravel.	606	
	0/2 *0%*	BD					18–18.15	Very dark grayish brown (10YR3/2), dry, hard, SILT with little clay and few very fine- to coarse-grained sand and gravel.		

End of boring = 18.15 feet

NOTE(S): G403 installed in borehole.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Energy Center
Location: Coffeen, Illinois
Project: 15E0030
DATES: Start: 5/1/2007
Finish: 5/1/2007
WEATHER: Partly sunny, warm

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-550 ATV Drill
Drilling Method: 4¼" Hollow stem auger with split spoon sampler
FIELD STAFF: Driller: A. Rachford
Helper: M. Brown
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB22
Well ID: G404
Surface Elev: 613.10 ft. MSL
Completion: 12.00 ft. BGS
Station: 873,999.77N
2,516,397.85E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

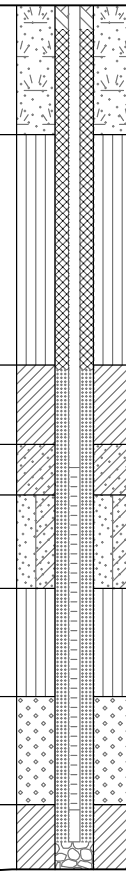
WATER LEVEL INFORMATION:

▼ =	2.07 - 05/10/2007
▼ =	
▽ =	

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp (tsf)* Failure Type
1A	19/24 *79%*	SS		26		0.85 B
1B				26		
2A	19/24 *79%*	SS		16		2.47 B
3A	18/24 *75%*	SS		19		2.18 B
3B				18		2.33 B
4A	24/24 *100%*	SS		23		0.58 B
4B				18		
5A	23/24 *96%*	SS		10		
5B				19		
6A	19/24 *79%*	SS		19		
6B				11		

Depth ft. BGS	Lithologic Description	Elevation ft. MSL	Remarks
	Black (10YR2/1), moist, firm, clayey SILT (TOPSOIL)	612	
2	Gray (10YR5/1) with 35% dark yellowish brown (10YR4/6) mottles, moist, firm, clayey SILT with sand and trace gravel	610	
4	Gray (10YR6/1) with 20% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and trace gravel	608	
6	Yellowish brown (10YR5/8), moist, soft, sandy CLAY with slight trace gravel		
	Yellowish brown (10YR5/8), very moist to wet, very soft, clayey, very fine- to medium-grained SAND with trace gravel	606	
8	Yellowish brown (10YR5/4) with 30% yellowish brown (10YR5/8) mottles, moist, hard, clayey SILT with sand and trace gravel	604	
10	Yellowish brown (10YR5/6), wet, loose, very fine- to medium-grained SAND with coarse-grained sand and slight trace gravel	602	
12	Dark yellowish brown (10YR4/6) with 40% yellowish brown (10YR5/8) mottles, moist, very hard, very silty CLAY with sand and gravel		

Borehole Detail



End of Boring = 12.0 ft. BGS

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Energy Center
Location: Coffeen, Illinois
Project: 15E0030
DATES: Start: 5/1/2007
Finish: 5/1/2007
WEATHER: Partly sunny, warm

CONTRACTOR: Reynolds Drilling Corp.
Rig mfg/model: CME-550 ATV Drill
Drilling Method: 4¼" Hollow stem auger with split spoon sampler
FIELD STAFF: Driller: A. Rachford
Helper: M. Brown
Eng/Geo: R. Hasenyager

BOREHOLE ID: SB21
Well ID: G405
Surface Elev: 620.90 ft. MSL
Completion: 14.21 ft. BGS
Station: 873,996.79N
2,515,335.70E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen, IL
Township: East Fork
Section 11, **Tier** 7N; **Range** 3W

WATER LEVEL INFORMATION:
▼ = 1.28 - 05/10/2007
▼ =
▽ =

SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type
1A	19/24 *79%*	SS		43		0.78 B
1B				26		1.94 B
2A	12/12 *100%*	SS		27		2.52 BSh
3A	24/24 *100%*	SS		24		3.92 BSh
3B				24		2.33 BSh
4A	24/24 *100%*	SS		20		2.33 BSh
5A	24/24 *100%*	SS		24		1.55 BSh
	24/24 *100%*	SS				
6A				19		
6B				18		
7A	24/24 *100%*	SS		9		7.42 BSh

Depth ft. BGS	Lithologic Description	Elevation ft. MSL
	Black (10YR2/1), moist, soft, clayey SILT (TOPSOIL)	620
2	Gray (10YR6/1) with 30% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY	618
4	Gray (10YR6/1), moist, firm, silty CLAY slight trace sand	616
6	Gray (10YR5/1), very moist, soft, clayey, very fine- to fine-grained SAND	
	Gray (10YR6/1) with 25% yellowish brown (10YR5/8) mottles, moist, firm, silty CLAY with sand and trace gravel	614
8	Yellowish brown (10YR5/8) with 40% gray (10YR6/1) mottles, moist, firm, silty CLAY with sand and trace gravel	612
10	Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND	610
	Dark brown (10YR3/3), very moist, soft, clayey, fine- to very coarse-grained SAND with slight trace gravel	
12	Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND	
	Dark yellowish brown (10YR4/4), moist, soft, sandy SILT with trace gravel	608
	Yellowish brown (10YR5/4), wet, loose, very fine- to fine-grained SAND	
14	Gray (10YR5/1), moist, very hard, very silty CLAY with sand and gravel	

End of Boring = 14.2 ft. BGS

Borehole Detail

Remarks

NOTE(S):

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/19/2016
Finish: 8/19/2016
WEATHER: Sunny, (mid-70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger

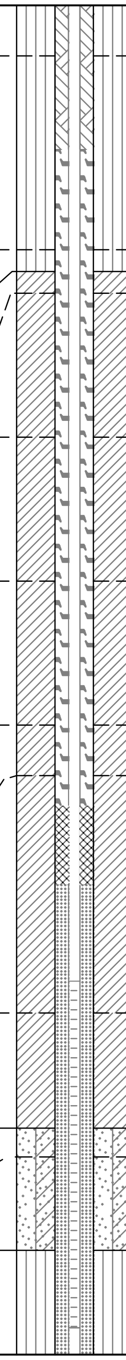
FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: G406
Well ID: G406
Surface Elev: 621.86 ft. MSL
Completion: 18.75 ft. BGS
Station: 872,521.34N
2,514,702.38E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE			TESTING								
Number	Recov / Total (in) *% Recovery*	Type	*Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) *Qp* (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
								Dark brown (10YR3/3), moist, stiff, SILT with few clay and trace organics.			
							2	Brown (10YR5/3) with 10% dark brown (10YR3/3) mottles, SILT with some clay and trace small gravel.		620	
								Brown (10YR5/3) with 10% dark brown (10YR3/3) mottles, SILT with some clay.		618	
							4	Grayish brown (10YR5/2) with 5% dark yellowish brown (10YR4/6) mottles, moist, stiff, CLAY with few silt and little fine-grained sand.			
								Very pale brown (10YR7/4) with 25% yellowish brown (10YR5/6) mottles, moist, medium, CLAY with trace silt.		616	
							6	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with little silt and trace fine- to medium-grained sand.		614	
							8	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with little silt, little fine- to medium-grained sand and trace small gravel.		612	
							10	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with few fine- to medium-grained sand, little silt, and trace small gravel.			
							12	Gray (10YR6/1) with 25% brownish yellow (10YR6/8) and 5% strong brown (7.5YR4/6) mottles, moist, stiff, CLAY with few fine- to medium-grained sand, little silt, and trace small gravel.		610	
							14	Gray (10YR6/1) with 10% brownish yellow (10YR6/8) and 5% strong brown (7.5YR4/6) mottles, moist, stiff, CLAY with some fine- to medium-grained sand, little silt, and trace small gravel.		608	
								Gray (10YR6/1) with 5% brownish yellow (10YR6/6) mottles, wet, loose, fine-grained SAND with some clay.		606	
							16	Gray (10YR6/1) with 5% brownish yellow (10YR6/6) mottles, moist, loose, fine-grained SAND with some clay.			
							18	Gray (10YR5/1), dry, hard, SILT with few clay, few fine- to coarse-grained sand and trace small gravel.		604	



End of Boring = 18.75 ft. BGS

NOTE(S): G406 installed in boring.
Boring was blind drilled adjacent to G406D.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/16/2016
Finish: 8/16/2016
WEATHER: Rain, (mid-70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger

FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: G407
Well ID: G407
Surface Elev: 618.35 ft. MSL
Completion: 20.00 ft. BGS
Station: 872,973.39N
2,513,705.87E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 10, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = 16.00 - During Drilling
▼ =
▽ =

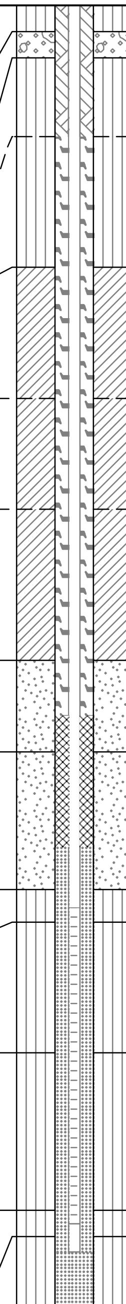
SAMPLE Number	Recov / Total (in) *% Recovery*	Type	TESTING *Blows / 6 in* N - Value **RQD**	Moisture (%)	Dry Den. (lb/ft³)	Qu (tsf) *Qp* (tsf) Failure Type
1A	12/24 *50%*	SS	*4-3 3-3* N=6	14		*3.50*
2A	20/24 *83%*	SS	*2-2 4-4* N=6	18		*1.50*
3A	23/24 *96%*	SS	*1-2 3-4* N=5	19		*1.75*
4A	24/24 *100%*	SS	*1-3 3-5* N=6	19		*1.50*
5A	21/24 *88%*	SS	*1-2 4-4* N=6	19		*0.50*
6A	22/24 *92%*	SS	*1-2 2-1* N=4	17		
7A	24/24 *100%*	SS	*7-29 33-17* N=62	8		
8A	24/24 *100%*	SS	*3-7 12-17* N=19	12		*4.50*
9A	24/24 *100%*	SS	*4-9 14-20* N=23	13		*4.00*
10A	24/24 *100%*	SS	*2-8 14-19* N=22	14		*4.50*

Depth ft. BGS | Lithologic Description | Borehole Detail | Elevation ft. MSL | Remarks

Depth: 2, 4, 6, 8, 10, 12, 14, 16 ▼, 18, 20
Elevation: 618, 616, 614, 612, 610, 608, 606, 604, 602, 600

- Very dark gray (10YR3/1), wet, medium, SILT with some organics. [Fill]
- Gray (10YR6/1), wet, loose, SAND with some gravel and little clay. [Fill]
- Yellowish brown (10YR5/6) with 5% dark yellowish brown (10YR3/6) mottles, moist, very stiff, SILT with some clay and trace very fine- to fine-grained sand.
- Brown (10YR5/3) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, SILT with some clay, little fine- to coarse-grained sand, and trace small gravel.
- Brown (10YR5/3) with 25% yellowish brown (10YR5/6) mottles, moist, stiff, CLAY with some silt, trace fine-grained sand and trace small gravel.
- Brown (10YR5/3) with 10% yellowish brown (10YR5/6) mottles, moist, stiff, CLAY with some silt, little fine- to coarse-grained sand and trace small gravel.
- Yellowish brown (10YR5/6) with 25% brown (10YR5/3) mottles, moist, medium, CLAY with few silt, few fine-grained sand, and trace small gravel.
- Yellowish brown (10YR5/8) with 5% gray (10YR5/1) mottles, moist, very loose, fine-grained SAND with some clay and trace small gravel.
- Gray (10YR5/1) with 25% yellowish brown (10YR5/8) mottles, moist, very dense, fine-grained SAND
- Brown (10YR5/3), moist, hard, SILT with some clay and little fine- to coarse-grained sand.
- Yellowish brown (10YR5/4) with 5% yellowish brown (10YR5/6) and 5% black (10YR2/1) mottles, SILT with some clay and little fine- to coarse-grained sand.
- Yellowish brown (10YR5/4) with 5% yellowish brown (10YR5/6), 5% dark gray (10YR4/1) and 5% black (10YR2/1) mottles, moist, hard, SILT with little fine- to coarse-grained sand and trace small gravel.
- Yellowish brown (10YR5/4) with 5% yellowish brown (10YR5/6), 5% dark gray (10YR4/1) and 5% black (10YR2/1) mottles, wet, stiff, SILT with little fine- to coarse-grained sand and little small gravel.
- Dark grayish brown (10YR4/2) with 10% dark yellowish brown (10YR3/6) mottles, moist, hard, CLAY with some silt, little fine- to coarse-grained sand and trace small gravel.

End of Boring = 20.0 ft. BGS



NOTE(S): G407 installed in boring.

FIELD BORING LOG

HANSON

CLIENT: Natural Resources Technology, Inc.
Site: Coffeen Power Station - Ash Pond 2
Location: 134 CIPS Lane, Coffeen, IL 62017
Project: 16E0080
DATES: Start: 8/19/2016
Finish: 8/19/2016
WEATHER: Cloudy, (70s)

CONTRACTOR: Bulldog Drilling, Inc.
Rig mfg/model: CME-750 ATV Drill
Drilling Method: 4 1/4" Hollow Stem Auger

FIELD STAFF: Driller: J. Dittmaier
Helper: M. Hill
Eng/Geo: K. Theesfeld

BOREHOLE ID: T409
Well ID: T409
Surface Elev: 621.85 ft. MSL
Completion: 26.99 ft. BGS
Station: 872,517.79N
2,514,693.89E

TOPOGRAPHIC MAP INFORMATION:
Quadrangle: Coffeen
Township: East Fork
Section 11, **Tier** 7 N.; **Range** 3 W.

WATER LEVEL INFORMATION:
▼ = Dry - During Drilling
▼ =
▽ =

SAMPLE: Number	Recov / Total (in) % Recovery	Type	TESTING: Blows / 6 in N - Value RQD	Moisture (%)	Dry Den. (lb/ft^3)	Qu (tsf) Qp (tsf) Failure Type	Depth ft. BGS	Lithologic Description	Borehole Detail	Elevation ft. MSL	Remarks
	0/60 0%	BD					0–0.7	Dark brown (10YR3/3), moist, stiff, SILT with few clay and trace organics.			
							2	Brown (10YR5/3) with 10% dark brown (10YR3/3) mottles, SILT with some clay and trace small gravel.		620	
								Brown (10YR5/3) with 10% dark brown (10YR3/3) mottles, SILT with some clay.			
							4	Grayish brown (10YR5/2) with 5% dark yellowish brown (10YR4/6) mottles, moist, stiff, CLAY with few silt and little fine-grained sand.		618	
	0/60 0%	BD						Very pale brown (10YR7/4) with 25% yellowish brown (10YR5/6) mottles, moist, medium, CLAY with trace silt.			
							6	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with little silt and trace fine- to medium-grained sand.		616	
							8	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with little silt, little fine- to medium-grained sand and trace small gravel.		614	
	0/60 0%	BD					10	Gray (10YR5/1) with 10% yellowish brown (10YR5/6) and 5% very dark gray (10YR3/1) mottles, moist, stiff, CLAY with few fine- to medium-grained sand, little silt, and trace small gravel.		612	
							12	Gray (10YR6/1) with 25% brownish yellow (10YR6/8) and 5% strong brown (7.5YR4/6) mottles, moist, stiff, CLAY with few fine- to medium-grained sand, little silt, and trace small gravel.		610	
							14	Gray (10YR6/1) with 10% brownish yellow (10YR6/8) and 5% strong brown (7.5YR4/6) mottles, moist, stiff, CLAY with some fine- to medium-grained sand, little silt, and trace small gravel.		608	
	0/60 0%	BD						Gray (10YR6/1) with 5% brownish yellow (10YR6/6) mottles, wet, loose, fine-grained SAND with some clay.		606	
							16	Gray (10YR6/1) with 5% brownish yellow (10YR6/6) mottles, moist, loose, fine-grained SAND with some clay.			
							18	Gray (10YR5/1), dry, hard, SILT with few clay, few fine- to coarse-grained sand and trace small gravel.		604	
							20			602	

NOTE(S): T409 installed in boring.
Boring was blind drilled to 27.0 feet bgs. Blind drill lithologies from boring G406D.

Illinois Environmental Protection Agency

Well Completion Report

Site #: ______ County: Montgomery Well #: G154

Site Name: CCB Management Facility Borehole #: G154

State Plane Coordinate: X 2,513,243.1 Y 874,978.4 (or) Latitude: ______ Longitude: ______

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Testing Service Corp. Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): n/a

Logged By: Ryne M. Fiorito Date Started: 12/16/2011 Date Finished: 12/16/2011

Report Form Completed By: Rhonald W. Hasenyager Date: 12/27/2011

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 24 min

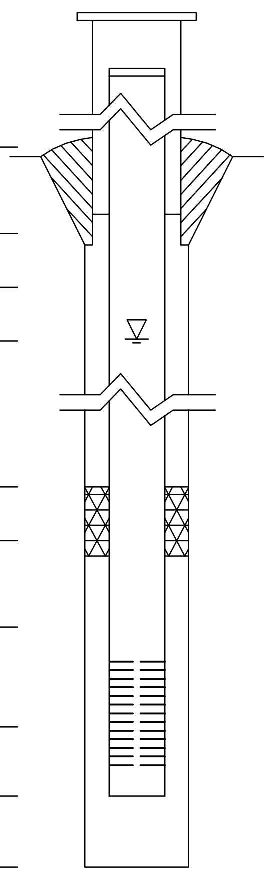
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.55	-3.03	Top of Protective Casing
626.35	-2.83	Top of Riser Pipe
623.52	0.00	Ground Surface
622.44	1.08	Top of Annular Sealant
612.42	11.10	Static Water Level (After Completion) 12/21/2011
613.02	10.50	Top of Seal
610.02	13.50	Top of Sand Pack
609.26	14.26	Top of Screen
604.76	18.76	Bottom of Screen
604.42	19.10	Bottom of Well
603.52	20.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.09
Bottom of Screen to End Cap	(feet)	0.34
Screen Length (1st slot to last slot)	(feet)	4.50
Total Length of Casing	(feet)	21.93
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G270

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G270

~~State-~~ Plant ~~Plane~~ Coordinate: X 874,801.9 Y 2,514,996.8 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

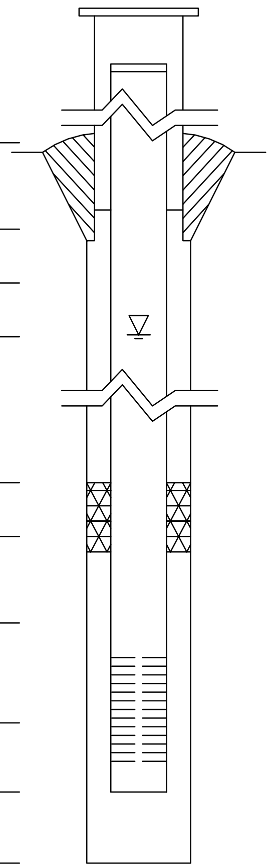
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ______

Logged By: Suzanna L Simpson Date Started: 2/26/2008 Date Finished: 2/26/2008

Report Form Completed By: Suzanna L Simpson Date: 2/29/2008

ANNULAR SPACE DETAILS



Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: >24 hr.

Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a

Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.41	-3.49	Top of Protective Casing
625.97	-3.05	Top of Riser Pipe
622.92	0.00	Ground Surface
619.92	3.00	Top of Annular Sealant
617.30	5.62	Static Water Level (After Completion) 3/12/2008
619.92	3.00	Top of Seal
610.92	12.00	Top of Sand Pack
609.79	13.13	Top of Screen
605.00	17.92	Bottom of Screen
604.65	18.27	Bottom of Well
604.65	18.27	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	16.18
Bottom of Screen to End Cap	(feet)	0.35
Screen Length (1st slot to last slot)	(feet)	4.79
Total Length of Casing	(feet)	21.32
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G279

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G279

~~State Plane~~ Plant Coordinate: X 2,516,245.6 Y 875,028.1 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Layne-Western Co Driller: G. Mills

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type):

Logged By: Rhonald W. Hasenyager Date Started: 9/10/2009 Date Finished: 9/10/2009

Report Form Completed By: Suzanna L. Simpson Date: 10/7/2009

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 18 min

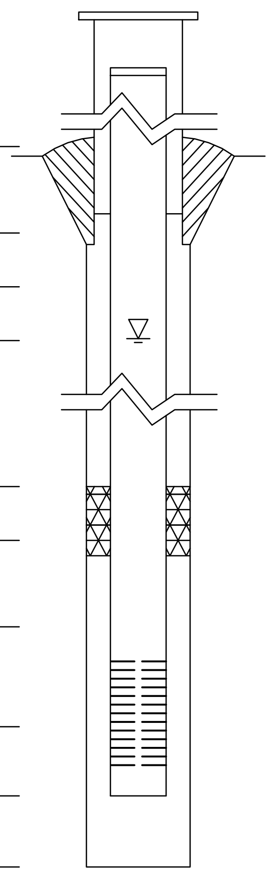
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz Sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
632.33	-3.14	Top of Protective Casing
632.04	-2.85	Top of Riser Pipe
629.19	0.00	Ground Surface
626.19	3.00	Top of Annular Sealant
601.66	27.53	Static Water Level (After Completion) 9/21/2009
610.45	18.74	Top of Seal
608.77	20.42	Top of Sand Pack
606.79	22.40	Top of Screen
602.40	26.79	Bottom of Screen
604.51	24.68	Bottom of Well
601.19	28.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	25.25
Bottom of Screen to End Cap	(feet)	0.53
Screen Length (1st slot to last slot)	(feet)	4.39
Total Length of Casing	(feet)	30.17
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____ County: Montgomery Well #: G280

Site Name: AEG Coffeen Power Station CCB Management Facility Borehole #: G280

~~State-~~ Plant ~~Plane~~ Coordinate: X 875,045.1 Y 2,515,679.5 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed By: Jeffrey D. Emrick IL Registration #: 035-003507

Drilling Contractor: Testing Service Corporation Driller: B. Williamson

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): ____

Logged By: Suzanna L Simpson Date Started: 2/26/2008 Date Finished: 2/26/2008

Report Form Completed By: Suzanna L Simpson Date: 2/29/2008

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: Gravity

Setting Time: >24 hr.

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: >24 hr.

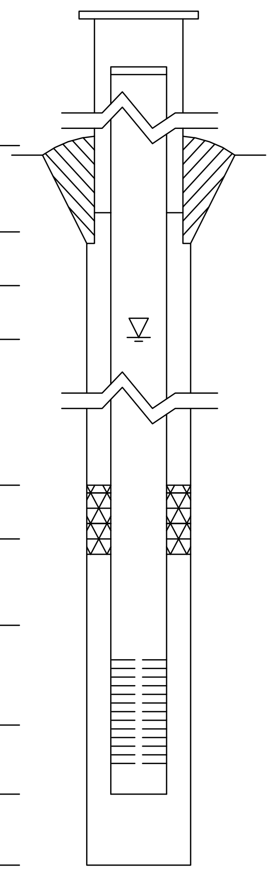
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: n/a



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.79	-2.84	Top of Protective Casing
625.30	-2.35	Top of Riser Pipe
622.95	0.00	Ground Surface
620.85	2.10	Top of Annular Sealant
618.61	4.34	Static Water Level (After Completion) 3/12/2008
620.85	2.10	Top of Seal
611.75	11.20	Top of Sand Pack
610.16	12.79	Top of Screen
605.32	17.63	Bottom of Screen
604.97	17.98	Bottom of Well
604.97	17.98	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	15.14
Bottom of Screen to End Cap	(feet)	0.35
Screen Length (1st slot to last slot)	(feet)	4.84
Total Length of Casing	(feet)	20.33
Screen Slot Size **	(inches)	0.010

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

**Hand-Slotted Well Screens Are Unacceptable

Illinois Environmental Protection Agency — Well Completion Report

Site #: ____ County: Montgomery Well #: G281

Site Name: Coffeen Power Station Borehole #: G281

State Plane Coordinate: X 874,375.4 Y 2,514,455.5 (or) Latitude: ____ ____ ____ Longitude: ____ ____ ____

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Ramsey Driller: D. Crump

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld Date Started: 9/8/2015 Date Finished: 9/8/2015

Report Form Completed By: Suzanna L. Keim Date: 10/6/2015

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 25 minutes

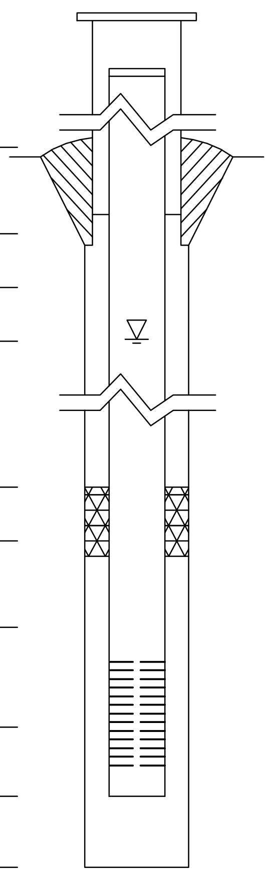
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ____



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.64	-2.82	Top of Protective Casing
626.36	-2.54	Top of Riser Pipe
623.82	0.00	Ground Surface
622.82	1.00	Top of Annular Sealant
		Static Water Level (After Completion)
612.59	11.23	Top of Seal
610.37	13.45	Top of Sand Pack
608.31	15.51	Top of Screen
603.66	20.16	Bottom of Screen
603.53	20.29	Bottom of Well
603.53	20.29	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.80
Bottom of Screen to End Cap	(feet)	0.38
Screen Length (1st slot to last slot)	(feet)	4.65
Total Length of Casing	(feet)	22.83
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G401

Site Name: Coffeen Power Station Borehole #: G401

State Plane Coordinate: X 872,510.6 Y 2,515,614.8 (or) Latitude: ______ ______ ______ Longitude: ______ ______ ______

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Ramsey Driller: D. Crump

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Rhonald W. Hasenyager Date Started: 9/14/2015 Date Finished: 9/14/2015

Report Form Completed By: Suzanna L. Keim Date: 10/7/2015

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite Chips

Installation Method: Gravity

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 25 minutes

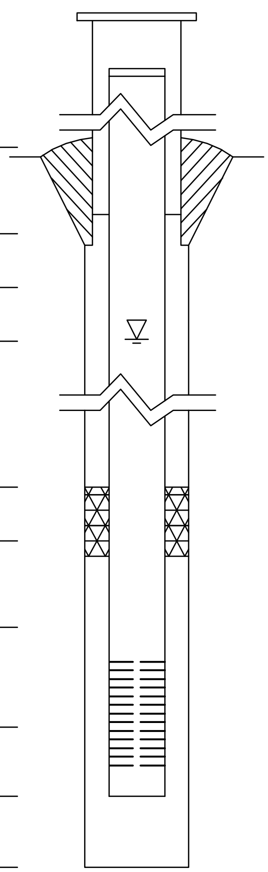
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.84	-2.81	Top of Protective Casing
625.57	-2.54	Top of Riser Pipe
623.03	0.00	Ground Surface
621.33	1.70	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
610.12	12.91	Top of Sand Pack
608.67	14.36	Top of Screen
604.24	18.79	Bottom of Screen
603.74	19.29	Bottom of Well
603.73	19.30	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	16.70
Bottom of Screen to End Cap	(feet)	0.50
Screen Length (1st slot to last slot)	(feet)	4.63
Total Length of Casing	(feet)	21.83
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G403

Site Name: Coffeen Power Station Borehole #: G403

State Plane Coordinate: X 873,561.3 Y 2,514,616.6 (or) Latitude: ______ Longitude: ______

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Ramsey Driller: D. Crump

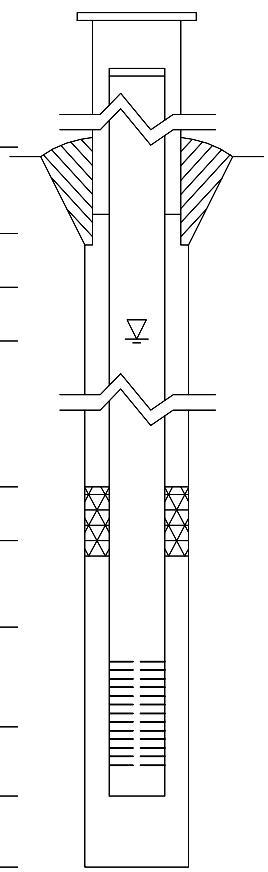
Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld Date Started: 9/11/2015 Date Finished: 9/11/2015

Report Form Completed By: Suzanna L. Keim Date: 10/7/2015

ANNULAR SPACE DETAILS



Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite Chips

Installation Method: Gravity

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: n/a

Setting Time: n/a

Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ______

Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
626.72	-2.91	Top of Protective Casing
626.47	-2.66	Top of Riser Pipe
623.81	0.00	Ground Surface
621.81	2.00	Top of Annular Sealant
		Static Water Level (After Completion)
n/a	n/a	Top of Seal
612.64	11.17	Top of Sand Pack
610.70	13.11	Top of Screen
606.03	17.78	Bottom of Screen
605.66	18.15	Bottom of Well
605.66	18.15	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	15.77
Bottom of Screen to End Cap	(feet)	0.37
Screen Length (1st slot to last slot)	(feet)	4.67
Total Length of Casing	(feet)	20.81
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Well Completion Form (revised 02/06/02)

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G404

Site Name: Coffeen Energy Center Borehole #: SB22

State Plane Coordinate: X 2,516,397.9 Y 873,999.8 (or) Latitude: ______ Longitude: ______

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: A. Rachford

Consulting Firm: Hanson Professional Services Inc. Geologist: , LPG #

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Rhonald W. Hasenyager Date Started: 5/1/2007 Date Finished: 5/1/2007

Report Form Completed By: Rhonald W. Hasenyager Date: 5/2/2007

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: gravity

Setting Time: >12 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method:

Setting Time:

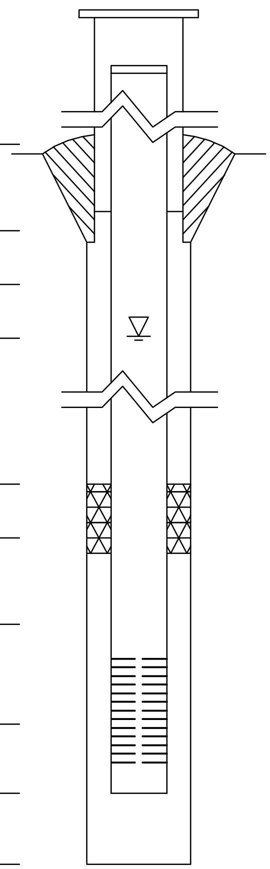
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: gravity

Type of Backfill Material: Formation sand (if applicable)

Installation Method: slough



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
616.02	-2.92	Top of Protective Casing
615.77	-2.67	Top of Riser Pipe
613.10	0.00	Ground Surface
613.10	0.00	Top of Annular Sealant
611.03	2.07	Static Water Level (After Completion) 5/10/2007
n/a	n/a	Top of Seal
608.05	5.05	Top of Sand Pack
606.68	6.42	Top of Screen
601.93	11.17	Bottom of Screen
601.48	11.62	Bottom of Well
601.10	12.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	9.09
Bottom of Screen to End Cap	(feet)	0.45
Screen Length (1st slot to last slot)	(feet)	4.75
Total Length of Casing	(feet)	14.29
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G405

Site Name: Coffeen Energy Center Borehole #: SB21

State Plane Coordinate: X 2,515,335.7 Y 873,996.8 (or) Latitude: ___ ___ ___ Longitude: ___ ___ ___

Surveyed By: Darren E. Forgy IL Registration #: 035-003637

Drilling Contractor: Reynolds Drilling Corp. Driller: A. Rachford

Consulting Firm: Hanson Professional Services Inc. Geologist: , LPG #

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Rhonald W. Hasenyager Date Started: 5/1/2007 Date Finished: 5/1/2007

Report Form Completed By: Rhonald W. Hasenyager Date: 5/2/2007

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite chips

Installation Method: gravity

Setting Time: >12 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: ______

Setting Time: ______

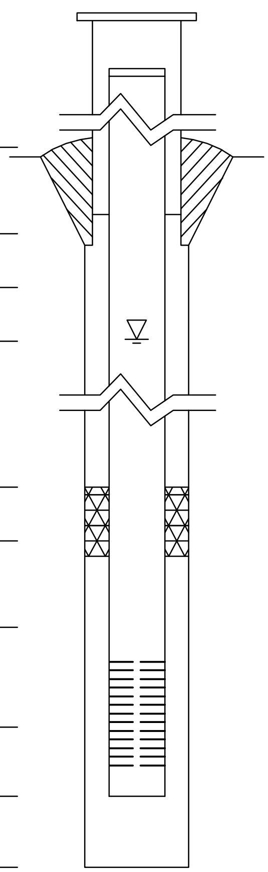
Type of Sand Pack: Quartz sand

Grain Size: 10/20 (sieve size)

Installation Method: gravity

Type of Backfill Material: ______ (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
624.04	-3.14	Top of Protective Casing
623.78	-2.88	Top of Riser Pipe
620.90	0.00	Ground Surface
620.90	0.00	Top of Annular Sealant
619.67	1.23	Static Water Level (After Completion) 5/10/2007
n/a	n/a	Top of Seal
613.19	7.71	Top of Sand Pack
611.89	9.01	Top of Screen
607.14	13.76	Bottom of Screen
606.69	14.21	Bottom of Well
606.69	14.21	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	11.89
Bottom of Screen to End Cap	(feet)	0.45
Screen Length (1st slot to last slot)	(feet)	4.75
Total Length of Casing	(feet)	17.09
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G406

Site Name: Coffeen Power Station - Ash Pond 2 Borehole #: G406

State Plane Coordinate: X 2,514,702.4 Y 872,521.3 (or) Latitude: 39° 3' 37.114" Longitude: -89° 23' 54.628"

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Bulldog Drilling, Inc. Driller: J. Dittmaier

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld Date Started: 8/19/2016 Date Finished: 8/19/2016

Report Form Completed By: Suzanna L. Keim Date: 8/24/2016

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hours

Type of Bentonite Seal -- Granular Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 30 minutes

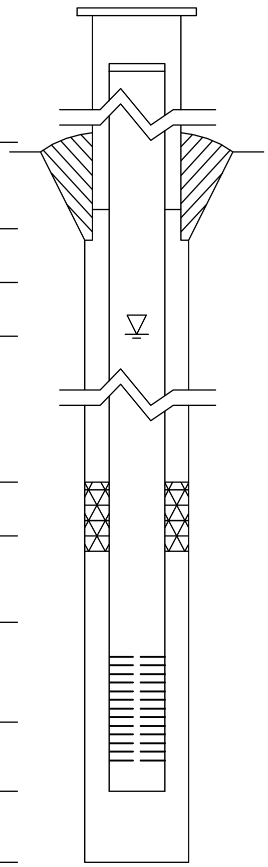
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: n/a (if applicable)

Installation Method: ______



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
625.70	-3.84	Top of Protective Casing
625.36	-3.50	Top of Riser Pipe
621.86	0.00	Ground Surface
619.86	2.00	Top of Annular Sealant
		Static Water Level (After Completion)
610.74	11.12	Top of Seal
609.65	12.21	Top of Sand Pack
608.30	13.56	Top of Screen
603.49	18.37	Bottom of Screen
603.11	18.75	Bottom of Well
603.11	18.75	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	17.06
Bottom of Screen to End Cap	(feet)	0.38
Screen Length (1st slot to last slot)	(feet)	4.81
Total Length of Casing	(feet)	22.25
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS

(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC	OTHER:
Screen	SS304	SS316	PTFE	PVC	OTHER:

Illinois Environmental Protection Agency — Well Completion Report

Site #: ______ County: Montgomery Well #: G407

Site Name: Coffeen Power Station - Ash Pond 2 Borehole #: G407

State Plane Coordinate: X 2,513,705.9 Y 872,973.4 (or) Latitude: 39° 3' 41.665" Longitude: -89° 24' 7.213"

Surveyed By: Gary C. Rogers IL Registration #: 035-002957

Drilling Contractor: Bulldog Drilling, Inc. Driller: J. Dittmaier

Consulting Firm: Hanson Professional Services Inc. Geologist: Rhonald W. Hasenyager, LPG #196-000246

Drilling Method: Hollow stem auger Drilling Fluid (Type): none

Logged By: Kristen L. Theesfeld Date Started: 8/16/2016 Date Finished: 8/16/2016

Report Form Completed By: Suzanna L. Keim Date: 8/24/2016

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: High-solids bentonite

Installation Method: Tremie

Setting Time: >24 hours

Type of Bentonite Seal -- Granular (circled) Pellet Slurry (choose one)

Installation Method: Gravity

Setting Time: 15 minutes

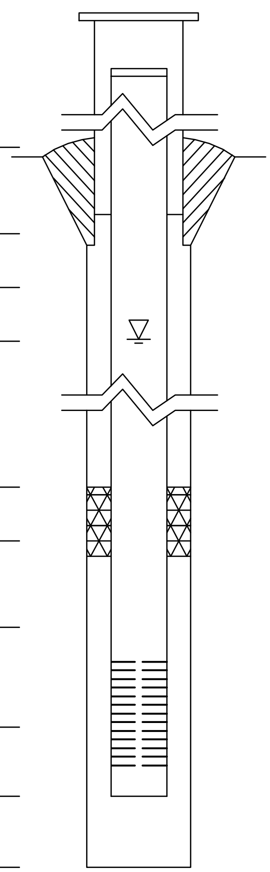
Type of Sand Pack: Quartz Sand

Grain Size: 10-20 (sieve size)

Installation Method: Gravity

Type of Backfill Material: Quartz Sand (if applicable)

Installation Method: Gravity



Elevations (MSL)*	Depths (BGS)	(0.01 ft.)
621.70	-3.35	Top of Protective Casing
621.32	-2.97	Top of Riser Pipe
618.35	0.00	Ground Surface
616.35	2.00	Top of Annular Sealant
		Static Water Level (After Completion)
607.50	10.85	Top of Seal
605.50	12.85	Top of Sand Pack
604.57	13.78	Top of Screen
599.74	18.61	Bottom of Screen
599.31	19.04	Bottom of Well
598.35	20.00	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASUREMENTS

Diameter of Borehole	(inches)	8.0
ID of Riser Pipe	(inches)	2.0
Protective Casing Length	(feet)	5.0
Riser Pipe Length	(feet)	16.75
Bottom of Screen to End Cap	(feet)	0.43
Screen Length (1st slot to last slot)	(feet)	4.83
Total Length of Casing	(feet)	22.01
Screen Slot Size **	(inches)	0.010

**Hand-Slotted Well Screens Are Unacceptable

WELL CONSTRUCTION MATERIALS
(Choose one type of material for each area)

Protective Casing	SS304	SS316	PTFE	PVC	OTHER: Steel (circled)
Riser Pipe Above W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Riser Pipe Below W.T.	SS304	SS316	PTFE	PVC (circled)	OTHER:
Screen	SS304	SS316	PTFE	PVC (circled)	OTHER:

APPENDIX B

STATISTICAL PROCEDURE FOR BACKGROUND

APPENDIX B
STATISTICAL PROCEDURE FOR CALCULATION OF BACKGROUND
Ash Pond 2
Groundwater Monitoring Plan
Coffeen Energy Center, Montgomery County, IL

Introduction

The purpose of the statistical calculations documented in this appendix is to determine the maximum background concentrations likely to occur upgradient of Ash Pond 2 within the Hagarstown Unit. High predicted background concentrations relative to the Illinois Class I groundwater quality standards may suggest that downgradient concentrations for those parameters in the Hagarstown 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 B-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 (attached to this summary) for background calculations were evaluated for the monitoring data from monitoring wells G270, G280, and G281 collected from all historical results, for a subset of the inorganic parameters listed in 35 IAC 620.410(a), specifically arsenic (total and dissolved), boron (total and dissolved), lead (total and dissolved), manganese (dissolved), sulfate, total dissolved solids, and pH (both upper and lower limits). Background concentrations for additional parameters will be calculated following collection of 8 rounds of data. All water quality data were stored, prepared, and statistically analyzed using MANAGES^{TM} Version 3.4.49 software (EPRI, March 2014).

A statistical summary of the background water quality data from G270, G280 and G281 including 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 also provided in this Appendix.

Calculated background values for the tested inorganic constituents and pH are listed in the following Table B-1 along with the percent non-detects, normal or lognormal distribution, test method, and confidence level.

Figure B-1. Statistical Analysis Flowchart

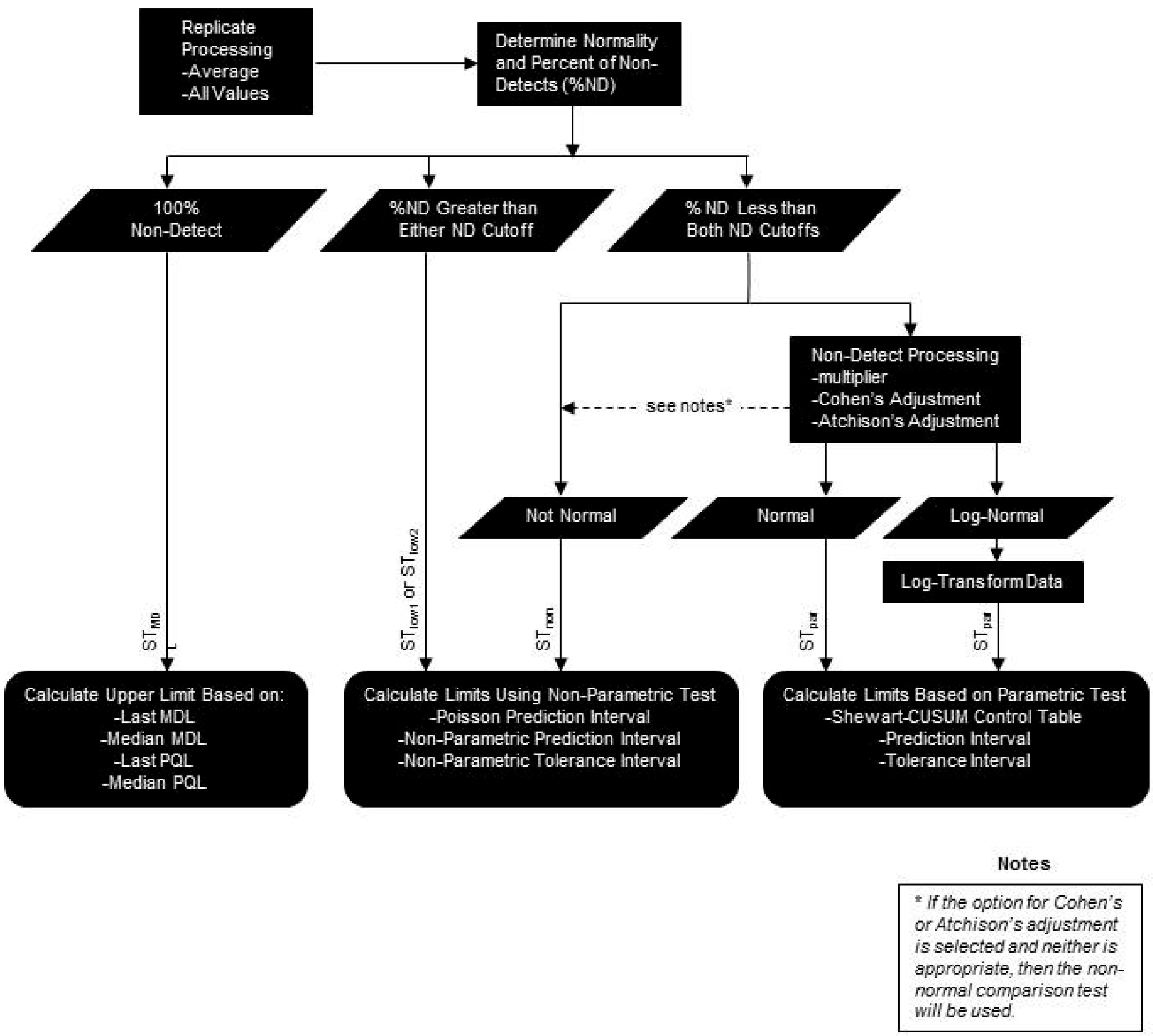


Table B-1. Tolerance Limits for Background Monitoring Wells G270, G280, and G281

Parameter	Count of Background Results	Percent of Non Detects	Normal/ Lognormal	Test	Confidence Level	Upper Limit	Lower Limit
As (dissolved)	69	97.10	No/No	STlow2	97.10	0.001	
Boron (dissolved)	69	60.87	No/No	STlow1	97.10	0.12	
Lead (dissolved)	69	100.0	No/No	STmdl	N/A	0.001	
Manganese (diss)	69	23.19	No/No	STnon	97.10	0.48	
pH	80	0.00	Yes/Yes	STpar	99.00	7.88	6.64
Sulfate (total)	78	0.00	No/No	STnon	98.17	370	
TDS	77	0.00	No/No	STnon	98.70	820	

* 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

Coffeen
Ash Pond 2 - Background Summary

User Supplied Information

Date Range: 03/11/2008 to 11/22/2016 **Option for LT Pts: x 0.5**
Pooled Locations: G270,G280,G281

Parameter	Units	Count	Mean	Median	Maximum	Minimum	Std Dev	Sen Slope Units/yr	Normal / Log Normal	% of Non-Detects
As, diss	mg/L	69	0.001	0.001	0.005	0.001	0.001	0.000	No / No	97.10
B, diss	mg/L	69	0.025	0.010	0.250	0.005	0.038	-0.004	No / No	60.87
Mn, diss	mg/L	69	0.069	0.023	0.480	0.001	0.104	-0.027	No / No	23.19
Pb, diss	mg/L	69	0.001	0.001	0.003	0.000	0.000	0.000	No / No	100.00
pH (field)	STD	83	7.229	7.220	7.870	6.500	0.268	0.029	Yes / Yes	0.00
SO4, tot	mg/L	81	79.116	74.000	370.000	2.300	70.663	12.951	No / No	0.00
TDS	mg/L	80	468.750	445.000	820.000	340.000	101.612	5.988	No / No	0.00

Shapiro-Wilk Normality test performed at 0.05 significance level.

December 21, 2016
1:42:24 PM

Coffeen

Ash Pond 2- Statistical Analysis

Background Date Range: 01/01/2008 to 11/22/2016
Background Locations: G270,G280,G281

Compliance Date Range: 01/01/2014 to 11/22/2016
Compliance Locations: G151,G152,G153,G154,G271,G272,G273,G274,G275,G279,G401,G402,G403,G404,G405,G406,G407

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 Tolerance 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 > 90%)
Statistical Test for Non-Parametric Background Data Distributions:	STnon = Non-Parametric Tolerance Interval on background
Background Comparison:	Interwell
Number of Verification Samples:	1
Default Type 1 Individual Comparison Error Level (False Positive Rate) for tests other than Prediction Interval	0.01
Trend Analysis for Exceedances:	Mann-Kendall Trend Analysis
Trend Analysis Date Range:	Compliance Date Range
Non-Detect Processing (Parametric Tests):	<=50% using MDL * 0.5 >50% using Aitchison's/Cohen's Decision
Non-Detect Processing (All Other):	<=50% using MDL * 0.5 >50% using MDL * 0.5
Tolerance Interval Coverage:	95%

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

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
G151	As, diss, mg/L	02/19/2014	69	97.10	No/No	STlow2	97.10	0.001		<0.001	No	
		05/12/2014	69	97.10	No/No		97.10	0.001		<0.001	No	
		08/11/2014	69	97.10	No/No		97.10	0.001		<0.001	No	
		10/14/2014	69	97.10	No/No		97.10	0.001		<0.001	No	
		01/21/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		04/08/2015	69	97.10	No/No		97.10	0.001		<0.002	No	
		07/23/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		10/06/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		02/09/2016	69	97.10	No/No		97.10	0.001		<0.001	No	
		05/11/2016	69	97.10	No/No		97.10	0.001		<0.002	No	
G151	B, diss, mg/L	02/19/2014	69	60.87	No/No	STlow1	97.10	0.120		0.014	No	
		05/12/2014	69	60.87	No/No		97.10	0.120		0.024	No	
		08/11/2014	69	60.87	No/No		97.10	0.120		<0.010	No	
		10/14/2014	69	60.87	No/No		97.10	0.120		<0.010	No	
		01/21/2015	69	60.87	No/No		97.10	0.120		<0.010	No	
		04/08/2015	69	60.87	No/No		97.10	0.120		<0.020	No	
		07/23/2015	69	60.87	No/No		97.10	0.120		0.018	No	
		10/06/2015	69	60.87	No/No		97.10	0.120		0.036	No	
		02/09/2016	69	60.87	No/No		97.10	0.120		<0.010	No	
		05/11/2016	69	60.87	No/No		97.10	0.120		<0.020	No	
G151	Mn, diss, mg/L	02/19/2014	69	23.19	No/No	STnon	97.10	0.480		0.072	No	
		05/12/2014	69	23.19	No/No		97.10	0.480		0.069	No	
		08/11/2014	69	23.19	No/No		97.10	0.480		0.140	No	
		10/14/2014	69	23.19	No/No		97.10	0.480		0.031	No	
		01/21/2015	69	23.19	No/No		97.10	0.480		0.066	No	
		04/08/2015	69	23.19	No/No		97.10	0.480		0.190	No	
		07/23/2015	69	23.19	No/No		97.10	0.480		0.093	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
G151	Mn, diss, mg/L	10/06/2015	69	23.19	No/No	STnon	97.10	0.480		0.560	Yes	None
		02/09/2016	69	23.19	No/No		97.10	0.480		0.180	No	
		05/11/2016	69	23.19	No/No		97.10	0.480		0.011	No	
G151	Pb, diss, mg/L	02/19/2014	69	100.00	No/No	STmdl	N/A	0.001		<0.001	No	
		05/12/2014	69	100.00	No/No		N/A	0.001		<0.001	No	
		08/11/2014	69	100.00	No/No		N/A	0.001		<0.001	No	
		10/14/2014	69	100.00	No/No		N/A	0.001		<0.001	No	
		01/21/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		04/08/2015	69	100.00	No/No		N/A	0.001		<0.002	No	
		07/23/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		10/06/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		02/09/2016	69	100.00	No/No		N/A	0.001		<0.001	No	
		05/11/2016	69	100.00	No/No		N/A	0.001		<0.002	No	
G151	pH (field), STD	02/19/2014	80	0.00	Yes/Yes	STpar	99.00	7.86	6.64	7.38	No	
		05/12/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.80	No	
		08/11/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.30	No	
		10/14/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.54	No	
		01/21/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.44	No	
		04/08/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.12	No	
		07/23/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	6.84	No	
		10/06/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	6.90	No	
		02/09/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.73	No	
		05/11/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	6.99	No	
G151	TDS, mg/L	08/11/2014	77	0.00	No/No	STnon	98.07	820		560	No	
		10/14/2014	77	0.00	No/No		98.07	820		570	No	
		01/21/2015	77	0.00	No/No		98.07	820		500	No	
		04/08/2015	77	0.00	No/No		98.07	820		600	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
G151	TDS, mg/L	07/23/2015	77	0.00	No/No	STnon	98.07	820		550	No	
		10/06/2015	77	0.00	No/No		98.07	820		600	No	
		02/09/2016	77	0.00	No/No		98.07	820		560	No	
		05/11/2016	77	0.00	No/No		98.07	820		500	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
G152	As, diss, mg/L	02/19/2014	69	97.10	No/No	STlow2	97.10	0.001		<0.001	No	
		05/12/2014	69	97.10	No/No		97.10	0.001		<0.001	No	
		08/11/2014	69	97.10	No/No		97.10	0.001		<0.001	No	
		10/14/2014	69	97.10	No/No		97.10	0.001		<0.001	No	
		01/21/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		04/08/2015	69	97.10	No/No		97.10	0.001		<0.002	No	
		07/23/2015	69	97.10	No/No		97.10	0.001		0.008	Yes	None
		10/06/2015	69	97.10	No/No		97.10	0.001		0.005	Yes	None
		02/09/2016	69	97.10	No/No		97.10	0.001		0.003	Yes	None
		05/11/2016	69	97.10	No/No		97.10	0.001		<0.002	No	
G152	B, diss, mg/L	02/19/2014	69	60.87	No/No	STlow1	97.10	0.120		0.038	No	
		05/12/2014	69	60.87	No/No		97.10	0.120		0.044	No	
		08/11/2014	69	60.87	No/No		97.10	0.120		0.044	No	
		10/14/2014	69	60.87	No/No		97.10	0.120		0.034	No	
		01/21/2015	69	60.87	No/No		97.10	0.120		0.030	No	
		04/08/2015	69	60.87	No/No		97.10	0.120		0.025	No	
		07/23/2015	69	60.87	No/No		97.10	0.120		0.079	No	
		10/06/2015	69	60.87	No/No		97.10	0.120		0.110	No	
		02/09/2016	69	60.87	No/No		97.10	0.120		0.082	No	
		05/11/2016	69	60.87	No/No		97.10	0.120		0.066	No	
G152	Mn, diss, mg/L	02/19/2014	69	23.19	No/No	STnon	97.10	0.480		0.120	No	
		05/12/2014	69	23.19	No/No		97.10	0.480		0.050	No	
		08/11/2014	69	23.19	No/No		97.10	0.480		0.310	No	
		10/14/2014	69	23.19	No/No		97.10	0.480		0.150	No	
		01/21/2015	69	23.19	No/No		97.10	0.480		0.150	No	
		04/08/2015	69	23.19	No/No		97.10	0.480		0.070	No	
		07/23/2015	69	23.19	No/No		97.10	0.480		0.890	Yes	None

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
G152	Mn, diss, mg/L	10/06/2015	69	23.19	No/No	STnon	97.10	0.480		0.530	Yes	None
		02/09/2016	69	23.19	No/No		97.10	0.480		0.470	No	
		05/11/2016	69	23.19	No/No		97.10	0.480		0.310	No	
G152	Pb, diss, mg/L	02/19/2014	69	100.00	No/No	STmdl	N/A	0.001		<0.001	No	
		05/12/2014	69	100.00	No/No		N/A	0.001		<0.001	No	
		08/11/2014	69	100.00	No/No		N/A	0.001		<0.001	No	
		10/14/2014	69	100.00	No/No		N/A	0.001		<0.001	No	
		01/21/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		04/08/2015	69	100.00	No/No		N/A	0.001		<0.002	No	
		07/23/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		10/06/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		02/09/2016	69	100.00	No/No		N/A	0.001		<0.001	No	
		05/11/2016	69	100.00	No/No		N/A	0.001		<0.002	No	
G152	pH (field), STD	02/19/2014	80	0.00	Yes/Yes	STpar	99.00	7.86	6.64	7.12	No	
		05/12/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.54	No	
		08/11/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.25	No	
		10/14/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.33	No	
		01/21/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.42	No	
		04/08/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	6.94	No	
		07/23/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.05	No	
		10/06/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.07	No	
		02/09/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.46	No	
		05/11/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	6.89	No	
		11/19/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	6.94	No	
G152	SO4, tot, mg/L	11/19/2016	78	0.00	No/No	STnon	98.17	370.0		130.0	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
G152	TDS, mg/L	08/11/2014	77	0.00	No/No	STnon	98.07	820		820	No	
		10/14/2014	77	0.00	No/No		98.07	820		620	No	
		01/21/2015	77	0.00	No/No		98.07	820		620	No	
		04/08/2015	77	0.00	No/No		98.07	820		680	No	
		07/23/2015	77	0.00	No/No		98.07	820		730	No	
		10/06/2015	77	0.00	No/No		98.07	820		1,100	Yes	None
		02/09/2016	77	0.00	No/No		98.07	820		920	Yes	None
		05/11/2016	77	0.00	No/No		98.07	820		800	No	
		11/19/2016	77	0.00	No/No		98.07	820		680	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
G153	As, diss, mg/L	02/19/2014	69	97.10	No/No	STlow2	97.10	0.001		<0.001	No	
		05/12/2014	69	97.10	No/No		97.10	0.001		<0.001	No	
		08/11/2014	69	97.10	No/No		97.10	0.001		<0.001	No	
		10/14/2014	69	97.10	No/No		97.10	0.001		0.002	Yes	None
		01/21/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		04/08/2015	69	97.10	No/No		97.10	0.001		0.003	Yes	None
		07/23/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		10/06/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		02/09/2016	69	97.10	No/No		97.10	0.001		<0.001	No	
		05/11/2016	69	97.10	No/No		97.10	0.001		0.004	Yes	None
G153	B, diss, mg/L	02/19/2014	69	60.87	No/No	STlow1	97.10	0.120		0.042	No	
		05/12/2014	69	60.87	No/No		97.10	0.120		0.021	No	
		08/11/2014	69	60.87	No/No		97.10	0.120		0.026	No	
		10/14/2014	69	60.87	No/No		97.10	0.120		0.028	No	
		01/21/2015	69	60.87	No/No		97.10	0.120		0.020	No	
		04/08/2015	69	60.87	No/No		97.10	0.120		0.020	No	
		07/23/2015	69	60.87	No/No		97.10	0.120		0.015	No	
		10/06/2015	69	60.87	No/No		97.10	0.120		0.030	No	
		02/09/2016	69	60.87	No/No		97.10	0.120		0.016	No	
		05/11/2016	69	60.87	No/No		97.10	0.120		0.026	No	
G153	Mn, diss, mg/L	02/19/2014	69	23.19	No/No	STnon	97.10	0.480		0.160	No	
		05/12/2014	69	23.19	No/No		97.10	0.480		0.050	No	
		08/11/2014	69	23.19	No/No		97.10	0.480		0.240	No	
		10/14/2014	69	23.19	No/No		97.10	0.480		0.510	Yes	None
		01/21/2015	69	23.19	No/No		97.10	0.480		0.200	No	
		04/08/2015	69	23.19	No/No		97.10	0.480		0.024	No	
		07/23/2015	69	23.19	No/No		97.10	0.480		0.160	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
G153	Mn, diss, mg/L	10/06/2015	69	23.19	No/No	STnon	97.10	0.480		0.190	No	
		02/09/2016	69	23.19	No/No		97.10	0.480		0.046	No	
		05/11/2016	69	23.19	No/No		97.10	0.480		0.037	No	
G153	Pb, diss, mg/L	02/19/2014	69	100.00	No/No	STmdl	N/A	0.001		<0.001	No	
		05/12/2014	69	100.00	No/No		N/A	0.001		<0.001	No	
		08/11/2014	69	100.00	No/No		N/A	0.001		<0.001	No	
		10/14/2014	69	100.00	No/No		N/A	0.001		<0.001	No	
		01/21/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		04/08/2015	69	100.00	No/No		N/A	0.001		<0.002	No	
		07/23/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		10/06/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		02/09/2016	69	100.00	No/No		N/A	0.001		<0.001	No	
		05/11/2016	69	100.00	No/No		N/A	0.001		<0.002	No	
G153	pH (field), STD	02/19/2014	80	0.00	Yes/Yes	STpar	99.00	7.86	6.64	6.91	No	
		05/12/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	6.98	No	
		08/11/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	6.95	No	
		10/14/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	6.97	No	
		01/21/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	6.85	No	
		04/08/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	6.52	Yes	None
		07/23/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.16	No	
		10/06/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.25	No	
		02/09/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.07	No	
		05/11/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	6.97	No	
		11/19/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.20	No	
G153	SO4, tot, mg/L	11/19/2016	78	0.00	No/No	STnon	98.17	370.0		2,500.0	Yes	Insufficient Data: Cannot Trend.

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
G153	TDS, mg/L	08/11/2014	77	0.00	No/No	STnon	98.07	820		3,500	Yes	Upward
		10/14/2014	77	0.00	No/No		98.07	820		3,400	Yes	Upward
		01/21/2015	77	0.00	No/No		98.07	820		3,600	Yes	Upward
		04/08/2015	77	0.00	No/No		98.07	820		3,700	Yes	Upward
		07/23/2015	77	0.00	No/No		98.07	820		3,900	Yes	Upward
		10/06/2015	77	0.00	No/No		98.07	820		3,700	Yes	Upward
		02/09/2016	77	0.00	No/No		98.07	820		3,800	Yes	Upward
		05/11/2016	77	0.00	No/No		98.07	820		3,800	Yes	Upward
		11/19/2016	77	0.00	No/No		98.07	820		4,000	Yes	Upward

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
G154	As, diss, mg/L	02/19/2014	69	97.10	No/No	STlow2	97.10	0.001		<0.001	No	
		05/12/2014	69	97.10	No/No		97.10	0.001		<0.001	No	
		08/11/2014	69	97.10	No/No		97.10	0.001		<0.001	No	
		10/14/2014	69	97.10	No/No		97.10	0.001		<0.001	No	
		01/21/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		04/08/2015	69	97.10	No/No		97.10	0.001		<0.002	No	
		07/23/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		10/06/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		02/09/2016	69	97.10	No/No		97.10	0.001		<0.001	No	
		05/11/2016	69	97.10	No/No		97.10	0.001		<0.002	No	
G154	B, diss, mg/L	02/19/2014	69	60.87	No/No	STlow1	97.10	0.120		0.043	No	
		05/12/2014	69	60.87	No/No		97.10	0.120		0.044	No	
		08/11/2014	69	60.87	No/No		97.10	0.120		0.035	No	
		10/14/2014	69	60.87	No/No		97.10	0.120		0.035	No	
		01/21/2015	69	60.87	No/No		97.10	0.120		0.037	No	
		04/08/2015	69	60.87	No/No		97.10	0.120		0.023	No	
		07/23/2015	69	60.87	No/No		97.10	0.120		0.024	No	
		10/06/2015	69	60.87	No/No		97.10	0.120		0.044	No	
		02/09/2016	69	60.87	No/No		97.10	0.120		0.041	No	
		05/11/2016	69	60.87	No/No		97.10	0.120		0.037	No	
G154	Mn, diss, mg/L	02/19/2014	69	23.19	No/No	STnon	97.10	0.480		0.018	No	
		05/12/2014	69	23.19	No/No		97.10	0.480		0.014	No	
		08/11/2014	69	23.19	No/No		97.10	0.480		0.081	No	
		10/14/2014	69	23.19	No/No		97.10	0.480		0.008	No	
		01/21/2015	69	23.19	No/No		97.10	0.480		0.009	No	
		04/08/2015	69	23.19	No/No		97.10	0.480		0.003	No	
		07/23/2015	69	23.19	No/No		97.10	0.480		0.140	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
G154	Mn, diss, mg/L	10/06/2015	69	23.19	No/No	STnon	97.10	0.480		0.010	No	
		02/09/2016	69	23.19	No/No		97.10	0.480		0.041	No	
		05/11/2016	69	23.19	No/No		97.10	0.480		0.009	No	
G154	Pb, diss, mg/L	02/19/2014	69	100.00	No/No	STmdl	N/A	0.001		<0.001	No	
		05/12/2014	69	100.00	No/No		N/A	0.001		<0.001	No	
		08/11/2014	69	100.00	No/No		N/A	0.001		<0.001	No	
		10/14/2014	69	100.00	No/No		N/A	0.001		<0.001	No	
		01/21/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		04/08/2015	69	100.00	No/No		N/A	0.001		<0.002	No	
		07/23/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		10/06/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		02/09/2016	69	100.00	No/No		N/A	0.001		<0.001	No	
		05/11/2016	69	100.00	No/No		N/A	0.001		<0.002	No	
G154	pH (field), STD	02/19/2014	80	0.00	Yes/Yes	STpar	99.00	7.86	6.64	7.45	No	
		05/12/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.91	Yes	None
		08/11/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.65	No	
		10/14/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.64	No	
		01/21/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.55	No	
		04/08/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.25	No	
		07/23/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	6.62	Yes	None
		10/06/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	6.93	No	
		02/09/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	8.03	Yes	None
		05/11/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.00	No	
G154	TDS, mg/L	08/11/2014	77	0.00	No/No	STnon	98.07	820		480	No	
		10/14/2014	77	0.00	No/No		98.07	820		440	No	
		01/21/2015	77	0.00	No/No		98.07	820		450	No	
		04/08/2015	77	0.00	No/No		98.07	820		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
G154	TDS, mg/L	07/23/2015	77	0.00	No/No	STnon	98.07	820		430	No	
		10/06/2015	77	0.00	No/No		98.07	820		500	No	
		02/09/2016	77	0.00	No/No		98.07	820		560	No	
		05/11/2016	77	0.00	No/No		98.07	820		460	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
G271	As, diss, mg/L	02/19/2014	69	97.10	No/No	STlow2	97.10	0.001		<0.001	No	
		05/13/2014	69	97.10	No/No		97.10	0.001		0.160	Yes	None
		08/11/2014	69	97.10	No/No		97.10	0.001		<0.001	No	
		10/14/2014	69	97.10	No/No		97.10	0.001		<0.001	No	
		01/21/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		04/10/2015	69	97.10	No/No		97.10	0.001		<0.002	No	
		07/22/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		10/08/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		02/16/2016	69	97.10	No/No		97.10	0.001		<0.001	No	
		05/12/2016	69	97.10	No/No		97.10	0.001		<0.002	No	
G271	B, diss, mg/L	02/19/2014	69	60.87	No/No	STlow1	97.10	0.120		0.260	Yes	None
		05/13/2014	69	60.87	No/No		97.10	0.120		0.450	Yes	None
		08/11/2014	69	60.87	No/No		97.10	0.120		0.390	Yes	None
		10/14/2014	69	60.87	No/No		97.10	0.120		0.440	Yes	None
		01/21/2015	69	60.87	No/No		97.10	0.120		0.420	Yes	None
		04/10/2015	69	60.87	No/No		97.10	0.120		0.370	Yes	None
		07/22/2015	69	60.87	No/No		97.10	0.120		0.320	Yes	None
		10/08/2015	69	60.87	No/No		97.10	0.120		0.440	Yes	None
		02/16/2016	69	60.87	No/No		97.10	0.120		0.510	Yes	None
		05/12/2016	69	60.87	No/No		97.10	0.120		0.610	Yes	None
G271	Mn, diss, mg/L	02/19/2014	69	23.19	No/No	STnon	97.10	0.480		<0.001	No	
		05/13/2014	69	23.19	No/No		97.10	0.480		0.220	No	
		08/11/2014	69	23.19	No/No		97.10	0.480		<0.001	No	
		10/14/2014	69	23.19	No/No		97.10	0.480		0.002	No	
		01/21/2015	69	23.19	No/No		97.10	0.480		<0.001	No	
		04/10/2015	69	23.19	No/No		97.10	0.480		<0.002	No	
		07/22/2015	69	23.19	No/No		97.10	0.480		0.001	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
G271	Mn, diss, mg/L	10/08/2015	69	23.19	No/No	STnon	97.10	0.480		<0.001	No	
		02/16/2016	69	23.19	No/No		97.10	0.480		<0.001	No	
		05/12/2016	69	23.19	No/No		97.10	0.480		<0.002	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
G271	Pb, diss, mg/L	02/19/2014	69	100.00	No/No	STmdl	N/A	0.001		<0.001	No	
		05/13/2014	69	100.00	No/No		N/A	0.001		0.150	Yes	None
		08/11/2014	69	100.00	No/No		N/A	0.001		<0.001	No	
		10/14/2014	69	100.00	No/No		N/A	0.001		<0.001	No	
		01/21/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		04/10/2015	69	100.00	No/No		N/A	0.001		<0.002	No	
		07/22/2015	69	100.00	No/No		N/A	0.001		0.002	Yes	None
		10/08/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		02/16/2016	69	100.00	No/No		N/A	0.001		<0.001	No	
		05/12/2016	69	100.00	No/No		N/A	0.001		<0.002	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
G271	pH (field), STD	02/19/2014	80	0.00	Yes/Yes	STpar	99.00	7.86	6.64	7.35	No	
		05/13/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	6.80	No	
		08/11/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.46	No	
		10/14/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.42	No	
		01/21/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.49	No	
		04/10/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.28	No	
		07/22/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.20	No	
		10/08/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	6.96	No	
		11/23/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.27	No	
		02/16/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.47	No	
		02/16/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.47	No	
		05/12/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.19	No	
		05/12/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.19	No	
		08/05/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.20	No	
		11/21/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.24	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
G271	SO4, tot, mg/L	02/19/2014	78	0.00	No/No	STnon	98.17	370.0		420.0	Yes	None
		05/13/2014	78	0.00	No/No		98.17	370.0		440.0	Yes	None
		08/11/2014	78	0.00	No/No		98.17	370.0		500.0	Yes	None
		10/14/2014	78	0.00	No/No		98.17	370.0		480.0	Yes	None
		01/21/2015	78	0.00	No/No		98.17	370.0		490.0	Yes	None
		04/10/2015	78	0.00	No/No		98.17	370.0		440.0	Yes	None
		07/22/2015	78	0.00	No/No		98.17	370.0		350.0	No	
		10/08/2015	78	0.00	No/No		98.17	370.0		400.0	Yes	None
		11/23/2015	78	0.00	No/No		98.17	370.0		420.0	Yes	None
		02/16/2016	78	0.00	No/No		98.17	370.0		440.0	Yes	None
		02/16/2016	78	0.00	No/No		98.17	370.0		360.0	No	
		05/12/2016	78	0.00	No/No		98.17	370.0		540.0	Yes	None
		05/12/2016	78	0.00	No/No		98.17	370.0		420.0	Yes	None
		08/05/2016	78	0.00	No/No		98.17	370.0		440.0	Yes	None
		11/21/2016	78	0.00	No/No		98.17	370.0		400.0	Yes	None
G271	TDS, mg/L	08/11/2014	77	0.00	No/No	STnon	98.07	820		1,000	Yes	None
		10/14/2014	77	0.00	No/No		98.07	820		940	Yes	None
		01/21/2015	77	0.00	No/No		98.07	820		870	Yes	None
		04/10/2015	77	0.00	No/No		98.07	820		1,000	Yes	None
		07/22/2015	77	0.00	No/No		98.07	820		1,000	Yes	None
		10/08/2015	77	0.00	No/No		98.07	820		1,000	Yes	None
		11/23/2015	77	0.00	No/No		98.07	820		860	Yes	None
		02/16/2016	77	0.00	No/No		98.07	820		1,000	Yes	None
		02/16/2016	77	0.00	No/No		98.07	820		980	Yes	None
		05/12/2016	77	0.00	No/No		98.07	820		940	Yes	None
		05/12/2016	77	0.00	No/No		98.07	820		1,000	Yes	None
		08/05/2016	77	0.00	No/No		98.07	820		840	Yes	None
		11/21/2016	77	0.00	No/No		98.07	820		910	Yes	None

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

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
G272	As, diss, mg/L	02/19/2014	69	97.10	No/No	STlow2	97.10	0.001		<0.001	No	
		05/13/2014	69	97.10	No/No		97.10	0.001		0.170	Yes	None
		08/11/2014	69	97.10	No/No		97.10	0.001		<0.001	No	
		10/14/2014	69	97.10	No/No		97.10	0.001		<0.001	No	
		01/21/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		04/10/2015	69	97.10	No/No		97.10	0.001		<0.002	No	
		07/23/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		10/08/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		02/09/2016	69	97.10	No/No		97.10	0.001		<0.001	No	
		05/12/2016	69	97.10	No/No		97.10	0.001		<0.001	No	
G272	B, diss, mg/L	02/19/2014	69	60.87	No/No	STlow1	97.10	0.120		<0.010	No	
		05/13/2014	69	60.87	No/No		97.10	0.120		0.270	Yes	None
		08/11/2014	69	60.87	No/No		97.10	0.120		<0.010	No	
		10/14/2014	69	60.87	No/No		97.10	0.120		0.036	No	
		01/21/2015	69	60.87	No/No		97.10	0.120		<0.010	No	
		04/10/2015	69	60.87	No/No		97.10	0.120		<0.020	No	
		07/23/2015	69	60.87	No/No		97.10	0.120		<0.010	No	
		10/08/2015	69	60.87	No/No		97.10	0.120		<0.010	No	
		02/09/2016	69	60.87	No/No		97.10	0.120		<0.010	No	
		05/12/2016	69	60.87	No/No		97.10	0.120		<0.010	No	
G272	Mn, diss, mg/L	02/19/2014	69	23.19	No/No	STnon	97.10	0.480		<0.001	No	
		05/13/2014	69	23.19	No/No		97.10	0.480		0.230	No	
		08/11/2014	69	23.19	No/No		97.10	0.480		<0.001	No	
		10/14/2014	69	23.19	No/No		97.10	0.480		<0.001	No	
		01/21/2015	69	23.19	No/No		97.10	0.480		<0.001	No	
		04/10/2015	69	23.19	No/No		97.10	0.480		<0.002	No	
		07/23/2015	69	23.19	No/No		97.10	0.480		<0.001	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
G272	Mn, diss, mg/L	10/08/2015	69	23.19	No/No	STnon	97.10	0.480		<0.001	No	
		02/09/2016	69	23.19	No/No		97.10	0.480		0.001	No	
		05/12/2016	69	23.19	No/No		97.10	0.480		<0.001	No	
G272	Pb, diss, mg/L	02/19/2014	69	100.00	No/No	STmdl	N/A	0.001		<0.001	No	
		05/13/2014	69	100.00	No/No		N/A	0.001		0.150	Yes	None
		08/11/2014	69	100.00	No/No		N/A	0.001		<0.001	No	
		10/14/2014	69	100.00	No/No		N/A	0.001		<0.001	No	
		01/21/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		04/10/2015	69	100.00	No/No		N/A	0.001		<0.002	No	
		07/23/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		10/08/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		02/09/2016	69	100.00	No/No		N/A	0.001		<0.001	No	
		05/12/2016	69	100.00	No/No		N/A	0.001		<0.001	No	
G272	pH (field), STD	02/19/2014	80	0.00	Yes/Yes	STpar	99.00	7.86	6.64	7.75	No	
		05/13/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.84	No	
		08/11/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.61	No	
		10/14/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.43	No	
		01/21/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.64	No	
		04/10/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.18	No	
		07/23/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.22	No	
		10/08/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.21	No	
		02/09/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.54	No	
		05/12/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.25	No	
G272	SO4, tot, mg/L	02/19/2014	78	0.00	No/No	STnon	98.17	370.0		340.0	No	
		05/13/2014	78	0.00	No/No		98.17	370.0		310.0	No	
		08/11/2014	78	0.00	No/No		98.17	370.0		330.0	No	
		10/14/2014	78	0.00	No/No		98.17	370.0		310.0	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
G272	SO4, tot, mg/L	01/21/2015	78	0.00	No/No	STnon	98.17	370.0		380.0	Yes	None
		04/10/2015	78	0.00	No/No		98.17	370.0		340.0	No	
		07/23/2015	78	0.00	No/No		98.17	370.0		270.0	No	
		10/08/2015	78	0.00	No/No		98.17	370.0		340.0	No	
		02/09/2016	78	0.00	No/No		98.17	370.0		290.0	No	
		05/12/2016	78	0.00	No/No		98.17	370.0		310.0	No	
G272	TDS, mg/L	08/11/2014	77	0.00	No/No	STnon	98.07	820		740	No	
		10/14/2014	77	0.00	No/No		98.07	820		840	Yes	None
		01/21/2015	77	0.00	No/No		98.07	820		790	No	
		04/10/2015	77	0.00	No/No		98.07	820		800	No	
		07/23/2015	77	0.00	No/No		98.07	820		840	Yes	None
		10/08/2015	77	0.00	No/No		98.07	820		660	No	
		02/09/2016	77	0.00	No/No		98.07	820		660	No	
		05/12/2016	77	0.00	No/No		98.07	820		680	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
G273	As, diss, mg/L	02/19/2014	69	97.10	No/No	STlow2	97.10	0.001		<0.001	No	
		05/13/2014	69	97.10	No/No		97.10	0.001		0.240	Yes	None
		08/11/2014	69	97.10	No/No		97.10	0.001		<0.001	No	
		10/14/2014	69	97.10	No/No		97.10	0.001		<0.001	No	
		01/21/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		04/13/2015	69	97.10	No/No		97.10	0.001		<0.002	No	
		07/23/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		10/08/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		02/16/2016	69	97.10	No/No		97.10	0.001		<0.001	No	
		05/12/2016	69	97.10	No/No		97.10	0.001		<0.001	No	
G273	B, diss, mg/L	02/19/2014	69	60.87	No/No	STlow1	97.10	0.120		0.520	Yes	None
		05/13/2014	69	60.87	No/No		97.10	0.120		0.620	Yes	None
		08/11/2014	69	60.87	No/No		97.10	0.120		0.250	Yes	None
		10/14/2014	69	60.87	No/No		97.10	0.120		0.320	Yes	None
		01/21/2015	69	60.87	No/No		97.10	0.120		0.580	Yes	None
		04/13/2015	69	60.87	No/No		97.10	0.120		0.290	Yes	None
		07/23/2015	69	60.87	No/No		97.10	0.120		0.400	Yes	None
		10/08/2015	69	60.87	No/No		97.10	0.120		0.100	No	
		02/16/2016	69	60.87	No/No		97.10	0.120		0.430	Yes	None
		05/12/2016	69	60.87	No/No		97.10	0.120		0.310	Yes	None
G273	Mn, diss, mg/L	02/19/2014	69	23.19	No/No	STnon	97.10	0.480		0.015	No	
		05/13/2014	69	23.19	No/No		97.10	0.480		0.330	No	
		08/11/2014	69	23.19	No/No		97.10	0.480		0.010	No	
		10/14/2014	69	23.19	No/No		97.10	0.480		0.013	No	
		01/21/2015	69	23.19	No/No		97.10	0.480		0.018	No	
		04/13/2015	69	23.19	No/No		97.10	0.480		0.019	No	
		07/23/2015	69	23.19	No/No		97.10	0.480		0.001	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
G273	Mn, diss, mg/L	10/08/2015	69	23.19	No/No	STnon	97.10	0.480		0.014	No	
		02/16/2016	69	23.19	No/No		97.10	0.480		0.010	No	
		05/12/2016	69	23.19	No/No		97.10	0.480		0.012	No	
G273	Pb, diss, mg/L	02/19/2014	69	100.00	No/No	STmdl	N/A	0.001		<0.001	No	
		05/13/2014	69	100.00	No/No		N/A	0.001		0.220	Yes	None
		08/11/2014	69	100.00	No/No		N/A	0.001		<0.001	No	
		10/14/2014	69	100.00	No/No		N/A	0.001		<0.001	No	
		01/21/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		04/13/2015	69	100.00	No/No		N/A	0.001		<0.002	No	
		07/23/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		10/08/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		02/16/2016	69	100.00	No/No		N/A	0.001		<0.001	No	
		05/12/2016	69	100.00	No/No		N/A	0.001		<0.001	No	
G273	pH (field), STD	02/19/2014	80	0.00	Yes/Yes	STpar	99.00	7.86	6.64	7.40	No	
		05/13/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.76	No	
		08/11/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.34	No	
		10/14/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.27	No	
		01/21/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.28	No	
		04/13/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	6.96	No	
		07/23/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.19	No	
		10/08/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.36	No	
		11/24/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	1.08	Yes	None
		02/16/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.23	No	
		02/16/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.23	No	
		05/12/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.04	No	
		05/12/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.04	No	
		08/05/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.14	No	
		11/21/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.26	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
G273	SO4, tot, mg/L	02/19/2014	78	0.00	No/No	STnon	98.17	370.0		570.0	Yes	None
		05/13/2014	78	0.00	No/No		98.17	370.0		620.0	Yes	None
		08/11/2014	78	0.00	No/No		98.17	370.0		530.0	Yes	None
		10/14/2014	78	0.00	No/No		98.17	370.0		500.0	Yes	None
		01/21/2015	78	0.00	No/No		98.17	370.0		650.0	Yes	None
		04/13/2015	78	0.00	No/No		98.17	370.0		690.0	Yes	None
		07/23/2015	78	0.00	No/No		98.17	370.0		390.0	Yes	None
		10/08/2015	78	0.00	No/No		98.17	370.0		450.0	Yes	None
		11/24/2015	78	0.00	No/No		98.17	370.0		420.0	Yes	None
		02/16/2016	78	0.00	No/No		98.17	370.0		550.0	Yes	None
		02/16/2016	78	0.00	No/No		98.17	370.0		530.0	Yes	None
		05/12/2016	78	0.00	No/No		98.17	370.0		520.0	Yes	None
		05/12/2016	78	0.00	No/No		98.17	370.0		500.0	Yes	None
		08/05/2016	78	0.00	No/No		98.17	370.0		400.0	Yes	None
		11/21/2016	78	0.00	No/No		98.17	370.0		440.0	Yes	None
G273	TDS, mg/L	08/11/2014	77	0.00	No/No	STnon	98.07	820		1,000	Yes	None
		10/14/2014	77	0.00	No/No		98.07	820		1,100	Yes	None
		01/21/2015	77	0.00	No/No		98.07	820		1,200	Yes	None
		04/13/2015	77	0.00	No/No		98.07	820		1,300	Yes	None
		07/23/2015	77	0.00	No/No		98.07	820		1,200	Yes	None
		10/08/2015	77	0.00	No/No		98.07	820		930	Yes	None
		11/24/2015	77	0.00	No/No		98.07	820		890	Yes	None
		02/16/2016	77	0.00	No/No		98.07	820		1,100	Yes	None
		02/16/2016	77	0.00	No/No		98.07	820		1,200	Yes	None
		05/12/2016	77	0.00	No/No		98.07	820		980	Yes	None
		05/12/2016	77	0.00	No/No		98.07	820		1,100	Yes	None
		08/05/2016	77	0.00	No/No		98.07	820		840	Yes	None
		11/21/2016	77	0.00	No/No		98.07	820		900	Yes	None

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

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
G274	As, diss, mg/L	02/19/2014	69	97.10	No/No	STlow2	97.10	0.001		<0.001	No	
		05/13/2014	69	97.10	No/No		97.10	0.001		0.006	Yes	None
		08/11/2014	69	97.10	No/No		97.10	0.001		<0.001	No	
		10/14/2014	69	97.10	No/No		97.10	0.001		<0.001	No	
		01/21/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		04/13/2015	69	97.10	No/No		97.10	0.001		<0.002	No	
		07/23/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		10/08/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		02/09/2016	69	97.10	No/No		97.10	0.001		<0.001	No	
		05/12/2016	69	97.10	No/No		97.10	0.001		<0.001	No	
G274	B, diss, mg/L	02/19/2014	69	60.87	No/No	STlow1	97.10	0.120		0.790	Yes	None
		05/13/2014	69	60.87	No/No		97.10	0.120		0.520	Yes	None
		08/11/2014	69	60.87	No/No		97.10	0.120		0.570	Yes	None
		10/14/2014	69	60.87	No/No		97.10	0.120		0.620	Yes	None
		01/21/2015	69	60.87	No/No		97.10	0.120		0.680	Yes	None
		04/13/2015	69	60.87	No/No		97.10	0.120		0.570	Yes	None
		07/23/2015	69	60.87	No/No		97.10	0.120		0.480	Yes	None
		10/08/2015	69	60.87	No/No		97.10	0.120		0.430	Yes	None
		02/09/2016	69	60.87	No/No		97.10	0.120		0.870	Yes	None
		05/12/2016	69	60.87	No/No		97.10	0.120		0.970	Yes	None
G274	Mn, diss, mg/L	02/19/2014	69	23.19	No/No	STnon	97.10	0.480		<0.001	No	
		05/13/2014	69	23.19	No/No		97.10	0.480		0.006	No	
		08/11/2014	69	23.19	No/No		97.10	0.480		<0.001	No	
		10/14/2014	69	23.19	No/No		97.10	0.480		<0.001	No	
		01/21/2015	69	23.19	No/No		97.10	0.480		0.004	No	
		04/13/2015	69	23.19	No/No		97.10	0.480		<0.002	No	
		07/23/2015	69	23.19	No/No		97.10	0.480		0.002	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
G274	Mn, diss, mg/L	10/08/2015	69	23.19	No/No	STnon	97.10	0.480		<0.001	No	
		02/09/2016	69	23.19	No/No		97.10	0.480		<0.001	No	
		05/12/2016	69	23.19	No/No		97.10	0.480		0.046	No	
G274	Pb, diss, mg/L	02/19/2014	69	100.00	No/No	STmdl	N/A	0.001		<0.001	No	
		05/13/2014	69	100.00	No/No		N/A	0.001		0.003	Yes	None
		08/11/2014	69	100.00	No/No		N/A	0.001		<0.001	No	
		10/14/2014	69	100.00	No/No		N/A	0.001		<0.001	No	
		01/21/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		04/13/2015	69	100.00	No/No		N/A	0.001		<0.002	No	
		07/23/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		10/08/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		02/09/2016	69	100.00	No/No		N/A	0.001		<0.001	No	
		05/12/2016	69	100.00	No/No		N/A	0.001		<0.001	No	
G274	pH (field), STD	02/19/2014	80	0.00	Yes/Yes	STpar	99.00	7.86	6.64	7.53	No	
		05/13/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.61	No	
		08/11/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.40	No	
		10/14/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.23	No	
		01/21/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.33	No	
		04/13/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	6.84	No	
		07/23/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.30	No	
		10/08/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.17	No	
		02/09/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.43	No	
		05/12/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.35	No	
G274	SO4, tot, mg/L	02/19/2014	78	0.00	No/No	STnon	98.17	370.0		300.0	No	
		05/13/2014	78	0.00	No/No		98.17	370.0		370.0	No	
		08/11/2014	78	0.00	No/No		98.17	370.0		400.0	Yes	None
		10/14/2014	78	0.00	No/No		98.17	370.0		320.0	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
G274	SO4, tot, mg/L	01/21/2015	78	0.00	No/No	STnon	98.17	370.0		260.0	No	
		04/13/2015	78	0.00	No/No		98.17	370.0		390.0	Yes	None
		07/23/2015	78	0.00	No/No		98.17	370.0		320.0	No	
		10/08/2015	78	0.00	No/No		98.17	370.0		320.0	No	
		02/09/2016	78	0.00	No/No		98.17	370.0		290.0	No	
		05/12/2016	78	0.00	No/No		98.17	370.0		350.0	No	
G274	TDS, mg/L	08/11/2014	77	0.00	No/No	STnon	98.07	820		880	Yes	None
		10/14/2014	77	0.00	No/No		98.07	820		770	No	
		01/21/2015	77	0.00	No/No		98.07	820		770	No	
		04/13/2015	77	0.00	No/No		98.07	820		770	No	
		07/23/2015	77	0.00	No/No		98.07	820		890	Yes	None
		10/08/2015	77	0.00	No/No		98.07	820		770	No	
		02/09/2016	77	0.00	No/No		98.07	820		820	No	
		05/12/2016	77	0.00	No/No		98.07	820		770	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
G275	As, diss, mg/L	05/13/2014	69	97.10	No/No	STlow2	97.10	0.001		0.250	Yes	None
		08/11/2014	69	97.10	No/No		97.10	0.001		<0.001	No	
		10/14/2014	69	97.10	No/No		97.10	0.001		<0.001	No	
		01/21/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		04/13/2015	69	97.10	No/No		97.10	0.001		<0.002	No	
		07/23/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		02/09/2016	69	97.10	No/No		97.10	0.001		<0.001	No	
		05/12/2016	69	97.10	No/No		97.10	0.001		<0.001	No	
G275	B, diss, mg/L	05/13/2014	69	60.87	No/No	STlow1	97.10	0.120		2.800	Yes	None
		08/11/2014	69	60.87	No/No		97.10	0.120		4.200	Yes	None
		10/14/2014	69	60.87	No/No		97.10	0.120		1.900	Yes	None
		01/21/2015	69	60.87	No/No		97.10	0.120		4.600	Yes	None
		04/13/2015	69	60.87	No/No		97.10	0.120		0.910	Yes	None
		07/23/2015	69	60.87	No/No		97.10	0.120		3.000	Yes	None
		02/09/2016	69	60.87	No/No		97.10	0.120		4.000	Yes	None
		05/12/2016	69	60.87	No/No		97.10	0.120		2.500	Yes	None
G275	Mn, diss, mg/L	05/13/2014	69	23.19	No/No	STnon	97.10	0.480		0.340	No	
		08/11/2014	69	23.19	No/No		97.10	0.480		<0.001	No	
		10/14/2014	69	23.19	No/No		97.10	0.480		0.003	No	
		01/21/2015	69	23.19	No/No		97.10	0.480		0.025	No	
		04/13/2015	69	23.19	No/No		97.10	0.480		0.002	No	
		07/23/2015	69	23.19	No/No		97.10	0.480		0.012	No	
		02/09/2016	69	23.19	No/No		97.10	0.480		0.006	No	
		05/12/2016	69	23.19	No/No		97.10	0.480		0.004	No	
G275	Pb, diss, mg/L	05/13/2014	69	100.00	No/No	STmdl	N/A	0.001		0.200	Yes	None
		08/11/2014	69	100.00	No/No		N/A	0.001		<0.001	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
G275	Pb, diss, mg/L	10/14/2014	69	100.00	No/No	STmdl	N/A	0.001		<0.001	No	
		01/21/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		04/13/2015	69	100.00	No/No		N/A	0.001		<0.002	No	
		07/23/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		02/09/2016	69	100.00	No/No		N/A	0.001		0.004	Yes	None
		05/12/2016	69	100.00	No/No		N/A	0.001		<0.001	No	
G275	pH (field), STD	05/13/2014	80	0.00	Yes/Yes	STpar	99.00	7.86	6.64	7.72	No	
		08/11/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.11	No	
		10/14/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	6.81	No	
		01/21/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.02	No	
		04/13/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	6.68	No	
		07/23/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.07	No	
		02/09/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.24	No	
		05/12/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.09	No	
G275	SO4, tot, mg/L	05/13/2014	78	0.00	No/No	STnon	98.17	370.0		750.0	Yes	None
		08/11/2014	78	0.00	No/No		98.17	370.0		880.0	Yes	None
		10/14/2014	78	0.00	No/No		98.17	370.0		500.0	Yes	None
		01/21/2015	78	0.00	No/No		98.17	370.0		940.0	Yes	None
		04/13/2015	78	0.00	No/No		98.17	370.0		650.0	Yes	None
		07/23/2015	78	0.00	No/No		98.17	370.0		750.0	Yes	None
		02/09/2016	78	0.00	No/No		98.17	370.0		470.0	Yes	None
		05/12/2016	78	0.00	No/No		98.17	370.0		310.0	No	
G275	TDS, mg/L	08/11/2014	77	0.00	No/No	STnon	98.07	820		1,500	Yes	None
		10/14/2014	77	0.00	No/No		98.07	820		840	Yes	None
		01/21/2015	77	0.00	No/No		98.07	820		1,500	Yes	None
		04/13/2015	77	0.00	No/No		98.07	820		1,500	Yes	None
		07/23/2015	77	0.00	No/No		98.07	820		1,500	Yes	None

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
G275	TDS, mg/L	02/09/2016	77	0.00	No/No	STnon	98.07	820		1,500	Yes	None
		05/12/2016	77	0.00	No/No		98.07	820		1,300	Yes	None

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
G279	As, diss, mg/L	02/19/2014	69	97.10	No/No	STlow2	97.10	0.001		<0.001	No	
		05/13/2014	69	97.10	No/No		97.10	0.001		0.017	Yes	None
		08/12/2014	69	97.10	No/No		97.10	0.001		<0.001	No	
		10/14/2014	69	97.10	No/No		97.10	0.001		<0.001	No	
		01/21/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		04/13/2015	69	97.10	No/No		97.10	0.001		<0.002	No	
		07/23/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		10/08/2015	69	97.10	No/No		97.10	0.001		<0.001	No	
		02/16/2016	69	97.10	No/No		97.10	0.001		<0.001	No	
		05/13/2016	69	97.10	No/No		97.10	0.001		<0.001	No	
G279	B, diss, mg/L	02/19/2014	69	60.87	No/No	STlow1	97.10	0.120		0.022	No	
		05/13/2014	69	60.87	No/No		97.10	0.120		0.038	No	
		08/12/2014	69	60.87	No/No		97.10	0.120		0.015	No	
		10/14/2014	69	60.87	No/No		97.10	0.120		0.025	No	
		01/21/2015	69	60.87	No/No		97.10	0.120		0.032	No	
		04/13/2015	69	60.87	No/No		97.10	0.120		0.047	No	
		07/23/2015	69	60.87	No/No		97.10	0.120		0.031	No	
		10/08/2015	69	60.87	No/No		97.10	0.120		1.300	Yes	None
		02/16/2016	69	60.87	No/No		97.10	0.120		0.290	Yes	None
		05/13/2016	69	60.87	No/No		97.10	0.120		0.110	No	
G279	Mn, diss, mg/L	02/19/2014	69	23.19	No/No	STnon	97.10	0.480		0.029	No	
		05/13/2014	69	23.19	No/No		97.10	0.480		0.034	No	
		08/12/2014	69	23.19	No/No		97.10	0.480		0.024	No	
		10/14/2014	69	23.19	No/No		97.10	0.480		0.026	No	
		01/21/2015	69	23.19	No/No		97.10	0.480		0.017	No	
		04/13/2015	69	23.19	No/No		97.10	0.480		0.003	No	
		07/23/2015	69	23.19	No/No		97.10	0.480		0.013	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
G279	Mn, diss, mg/L	10/08/2015	69	23.19	No/No	STnon	97.10	0.480		0.032	No	
		02/16/2016	69	23.19	No/No		97.10	0.480		0.011	No	
		05/13/2016	69	23.19	No/No		97.10	0.480		0.006	No	
G279	Pb, diss, mg/L	02/19/2014	69	100.00	No/No	STmdl	N/A	0.001		<0.001	No	
		05/13/2014	69	100.00	No/No		N/A	0.001		0.022	Yes	None
		08/12/2014	69	100.00	No/No		N/A	0.001		<0.001	No	
		10/14/2014	69	100.00	No/No		N/A	0.001		<0.001	No	
		01/21/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		04/13/2015	69	100.00	No/No		N/A	0.001		<0.002	No	
		07/23/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		10/08/2015	69	100.00	No/No		N/A	0.001		<0.001	No	
		02/16/2016	69	100.00	No/No		N/A	0.001		<0.001	No	
		05/13/2016	69	100.00	No/No		N/A	0.001		<0.001	No	
G279	pH (field), STD	02/19/2014	80	0.00	Yes/Yes	STpar	99.00	7.86	6.64	7.37	No	
		05/13/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.00	No	
		08/12/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.22	No	
		10/14/2014	80	0.00	Yes/Yes		99.00	7.86	6.64	7.09	No	
		01/21/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.14	No	
		04/13/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	6.59	Yes	None
		07/23/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.11	No	
		10/08/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.04	No	
		11/24/2015	80	0.00	Yes/Yes		99.00	7.86	6.64	7.21	No	
		02/16/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.19	No	
		02/16/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.19	No	
		05/13/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	6.91	No	
		05/13/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	6.91	No	
		08/03/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.11	No	
		11/22/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.16	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
G279	SO4, tot, mg/L	02/19/2014	78	0.00	No/No	STnon	98.17	370.0		110.0	No	
		05/13/2014	78	0.00	No/No		98.17	370.0		110.0	No	
		08/12/2014	78	0.00	No/No		98.17	370.0		120.0	No	
		10/14/2014	78	0.00	No/No		98.17	370.0		140.0	No	
		01/21/2015	78	0.00	No/No		98.17	370.0		230.0	No	
		04/13/2015	78	0.00	No/No		98.17	370.0		470.0	Yes	Upward
		07/23/2015	78	0.00	No/No		98.17	370.0		470.0	Yes	Upward
		10/08/2015	78	0.00	No/No		98.17	370.0		810.0	Yes	Upward
		11/24/2015	78	0.00	No/No		98.17	370.0		520.0	Yes	Upward
		02/16/2016	78	0.00	No/No		98.17	370.0		610.0	Yes	Upward
		02/16/2016	78	0.00	No/No		98.17	370.0		590.0	Yes	Upward
		05/13/2016	78	0.00	No/No		98.17	370.0		230.0	No	
		05/13/2016	78	0.00	No/No		98.17	370.0		270.0	No	
		08/03/2016	78	0.00	No/No		98.17	370.0		570.0	Yes	Upward
		11/22/2016	78	0.00	No/No		98.17	370.0		720.0	Yes	Upward
G279	TDS, mg/L	08/12/2014	77	0.00	No/No	STnon	98.07	820		600	No	
		10/14/2014	77	0.00	No/No		98.07	820		650	No	
		01/21/2015	77	0.00	No/No		98.07	820		810	No	
		04/13/2015	77	0.00	No/No		98.07	820		800	No	
		07/23/2015	77	0.00	No/No		98.07	820		1,200	Yes	None
		10/08/2015	77	0.00	No/No		98.07	820		1,700	Yes	None
		11/24/2015	77	0.00	No/No		98.07	820		1,100	Yes	None
		02/16/2016	77	0.00	No/No		98.07	820		1,400	Yes	None
		02/16/2016	77	0.00	No/No		98.07	820		1,500	Yes	None
		05/13/2016	77	0.00	No/No		98.07	820		600	No	
		05/13/2016	77	0.00	No/No		98.07	820		700	No	
		08/03/2016	77	0.00	No/No		98.07	820		1,300	Yes	None
		11/22/2016	77	0.00	No/No		98.07	820		1,300	Yes	None

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

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
G401	pH (field), STD	11/21/2015	80	0.00	Yes/Yes	STpar	99.00	7.86	6.64	5.98	Yes	None
		02/22/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	5.80	Yes	None
		05/19/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	5.96	Yes	None
		08/01/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	6.15	Yes	None
		11/17/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	6.24	Yes	None
G401	SO4, tot, mg/L	11/21/2015	78	0.00	No/No	STnon	98.17	370.0		2,300.0	Yes	None
		02/22/2016	78	0.00	No/No		98.17	370.0		2,500.0	Yes	None
		05/19/2016	78	0.00	No/No		98.17	370.0		2,200.0	Yes	None
		08/01/2016	78	0.00	No/No		98.17	370.0		2,100.0	Yes	None
		11/17/2016	78	0.00	No/No		98.17	370.0		3,400.0	Yes	None
G401	TDS, mg/L	11/21/2015	77	0.00	No/No	STnon	98.07	820		3,000	Yes	None
		02/22/2016	77	0.00	No/No		98.07	820		3,000	Yes	None
		05/19/2016	77	0.00	No/No		98.07	820		2,800	Yes	None
		08/01/2016	77	0.00	No/No		98.07	820		2,900	Yes	None
		11/17/2016	77	0.00	No/No		98.07	820		3,200	Yes	None

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
G402	pH (field), STD	11/21/2015	80	0.00	Yes/Yes	STpar	99.00	7.86	6.64	6.81	No	
		02/22/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	6.74	No	
		05/19/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	6.77	No	
		08/02/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	6.60	Yes	None
		11/17/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	6.62	Yes	None
G402	SO4, tot, mg/L	11/21/2015	78	0.00	No/No	STnon	98.17	370.0		1,200.0	Yes	None
		02/22/2016	78	0.00	No/No		98.17	370.0		1,000.0	Yes	None
		05/19/2016	78	0.00	No/No		98.17	370.0		960.0	Yes	None
		08/02/2016	78	0.00	No/No		98.17	370.0		890.0	Yes	None
		11/17/2016	78	0.00	No/No		98.17	370.0		1,100.0	Yes	None
G402	TDS, mg/L	11/21/2015	77	0.00	No/No	STnon	98.07	820		1,700	Yes	None
		02/22/2016	77	0.00	No/No		98.07	820		1,700	Yes	None
		05/19/2016	77	0.00	No/No		98.07	820		1,500	Yes	None
		08/02/2016	77	0.00	No/No		98.07	820		1,500	Yes	None
		11/17/2016	77	0.00	No/No		98.07	820		1,700	Yes	None

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
G403	pH (field), STD	11/23/2015	80	0.00	Yes/Yes	STpar	99.00	7.86	6.64	7.15	No	
		02/22/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	6.96	No	
		05/18/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	6.89	No	
		08/01/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	6.91	No	
		11/17/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	6.74	No	
G403	SO4, tot, mg/L	11/23/2015	78	0.00	No/No	STnon	98.17	370.0		35.0	No	
		02/22/2016	78	0.00	No/No		98.17	370.0		17.0	No	
		05/18/2016	78	0.00	No/No		98.17	370.0		11.0	No	
		08/01/2016	78	0.00	No/No		98.17	370.0		9.9	No	
		11/17/2016	78	0.00	No/No		98.17	370.0		8.9	No	
G403	TDS, mg/L	11/23/2015	77	0.00	No/No	STnon	98.07	820		320	No	
		02/22/2016	77	0.00	No/No		98.07	820		340	No	
		05/18/2016	77	0.00	No/No		98.07	820		320	No	
		08/01/2016	77	0.00	No/No		98.07	820		320	No	
		11/17/2016	77	0.00	No/No		98.07	820		350	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
G404	pH (field), STD	11/21/2015	80	0.00	Yes/Yes	STpar	99.00	7.86	6.64	6.72	No	
		02/15/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.24	No	
		05/19/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	6.82	No	
		08/02/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.08	No	
		11/22/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.09	No	
G404	SO4, tot, mg/L	11/21/2015	78	0.00	No/No	STnon	98.17	370.0		180.0	No	
		02/15/2016	78	0.00	No/No		98.17	370.0		150.0	No	
		05/19/2016	78	0.00	No/No		98.17	370.0		140.0	No	
		08/02/2016	78	0.00	No/No		98.17	370.0		190.0	No	
		11/22/2016	78	0.00	No/No		98.17	370.0		380.0	Yes	None
G404	TDS, mg/L	11/21/2015	77	0.00	No/No	STnon	98.07	820		580	No	
		02/15/2016	77	0.00	No/No		98.07	820		560	No	
		05/19/2016	77	0.00	No/No		98.07	820		460	No	
		08/02/2016	77	0.00	No/No		98.07	820		620	No	
		11/22/2016	77	0.00	No/No		98.07	820		880	Yes	None

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
G405	pH (field), STD	11/21/2015	80	0.00	Yes/Yes	STpar	99.00	7.86	6.64	6.82	No	
		02/15/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	7.07	No	
		05/18/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	6.85	No	
		08/02/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	6.81	No	
		11/22/2016	80	0.00	Yes/Yes		99.00	7.86	6.64	6.90	No	
G405	SO4, tot, mg/L	11/21/2015	78	0.00	No/No	STnon	98.17	370.0		1,700.0	Yes	None
		02/15/2016	78	0.00	No/No		98.17	370.0		1,700.0	Yes	None
		05/18/2016	78	0.00	No/No		98.17	370.0		1,800.0	Yes	None
		08/02/2016	78	0.00	No/No		98.17	370.0		1,600.0	Yes	None
		11/22/2016	78	0.00	No/No		98.17	370.0		1,400.0	Yes	None
G405	TDS, mg/L	11/21/2015	77	0.00	No/No	STnon	98.07	820		2,400	Yes	None
		02/15/2016	77	0.00	No/No		98.07	820		2,500	Yes	None
		05/18/2016	77	0.00	No/No		98.07	820		2,200	Yes	None
		08/02/2016	77	0.00	No/No		98.07	820		2,200	Yes	None
		11/22/2016	77	0.00	No/No		98.07	820		2,100	Yes	None

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
G406	As, diss, mg/L	08/30/2016	69	97.10	No/No	STlow2	97.10	0.001		<0.001	No	
G406	B, diss, mg/L	08/30/2016	69	60.87	No/No	STlow1	97.10	0.120		1.600	Yes	Insufficient Data: Cannot Trend.
G406	Mn, diss, mg/L	08/30/2016	69	23.19	No/No	STnon	97.10	0.480		5.500	Yes	Insufficient Data: Cannot Trend.
G406	Pb, diss, mg/L	08/30/2016	69	100.00	No/No	STmdl	N/A	0.001		<0.001	No	
G406	pH (field), STD	11/18/2016	80	0.00	Yes/Yes	STpar	99.00	7.86	6.64	7.32	No	
G406	SO4, tot, mg/L	11/18/2016	78	0.00	No/No	STnon	98.17	370.0		910.0	Yes	Insufficient Data: Cannot Trend.
G406	TDS, mg/L	08/30/2016	77	0.00	No/No	STnon	98.07	820		1,300	Yes	Insufficient Data: Cannot Trend.
		11/18/2016	77	0.00	No/No		98.07	820		1,400	Yes	Insufficient Data: Cannot Trend.

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
G407	As, diss, mg/L	08/30/2016	69	97.10	No/No	STlow2	97.10	0.001		<0.001	No	
G407	B, diss, mg/L	08/30/2016	69	60.87	No/No	STlow1	97.10	0.120		0.052	No	
G407	Mn, diss, mg/L	08/30/2016	69	23.19	No/No	STnon	97.10	0.480		0.210	No	
G407	Pb, diss, mg/L	08/30/2016	69	100.00	No/No	STmdl	N/A	0.001		<0.001	No	
G407	pH (field), STD	11/18/2016	80	0.00	Yes/Yes	STpar	99.00	7.86	6.64	7.75	No	
G407	SO4, tot, mg/L	11/18/2016	78	0.00	No/No	STnon	98.17	370.0		830.0	Yes	Insufficient Data: Cannot Trend.
G407	TDS, mg/L	08/30/2016	77	0.00	No/No	STnon	98.07	820		1,400	Yes	Insufficient Data: Cannot Trend.
		11/18/2016	77	0.00	No/No		98.07	820		1,400	Yes	Insufficient Data: Cannot Trend.

APPENDIX C

GROUNDWATER MONITORING DATA

APPENDIX C
Summary of Groundwater Data
Units: mg/L

Well ID	Date	Arsenic, dissolved	Arsenic, total	Barium, total	Beryllium, total	Boron, dissolved	Boron, total	Cadmium, total	Calcium, total L	Chloride, total	Chromium, total	Cobalt, total	Fluoride, total	Lead, dissolved	Lead, total	Lithium, total	Manganese, dissolved	Mercury, total	Molybdenum, total	Selenium, total	Sulfate, total	Thallium, total	Total Dissolved Solids
G151	12/21/2011	< 0.003				0.0218								< 0.002			0.257						510
G151	01/25/2012		0.0012	0.057	< 0.001		0.026	< 0.001		50	< 0.004	< 0.002	0.691		< 0.001			< 0.0002		0.0021	95	< 0.001	510
G151	03/13/2012		< 0.001	0.069	< 0.001		0.019	< 0.001		67	< 0.004	< 0.002	0.486		< 0.001			< 0.0002		0.0029	120	< 0.001	580
G151	05/22/2012	0.0014				0.052								< 0.001			0.11						520
G151	07/23/2012		< 0.001	0.067	< 0.001		0.01	< 0.001		58	< 0.004	< 0.002	0.649		< 0.001			< 0.0002		0.0024	98	< 0.001	570
G151	11/14/2012	< 0.001				0.013								< 0.001			0.091						660
G151	01/30/2013	< 0.001				< 0.02								< 0.001			0.071						560
G151	05/20/2013	< 0.001				< 0.005								< 0.001			0.031						520
G151	07/22/2013	< 0.001				0.02								< 0.001			0.12						500
G151	02/19/2014	< 0.001				0.014								< 0.001			0.072						
G151	05/12/2014	< 0.001				0.024								< 0.001			0.069						
G151	08/11/2014	< 0.001				< 0.01								< 0.001			0.14						560
G151	10/14/2014	< 0.001				< 0.01								< 0.001			0.031						570
G151	01/21/2015	< 0.001				< 0.01								< 0.001			0.066						500
G151	04/08/2015	< 0.002				< 0.02								< 0.002			0.19						600
G151	07/23/2015	< 0.001				0.018								< 0.001			0.093						550
G151	10/06/2015	< 0.001				0.036								< 0.001			0.56						600
G151	02/09/2016	< 0.001				< 0.01								< 0.001			0.18						560
G151	05/11/2016	< 0.002				< 0.02								< 0.002			0.011						500
G152	12/21/2011	< 0.003				0.0513								< 0.002			0.927						494
G152	01/25/2012		0.0023	0.13	< 0.001		0.047	< 0.001		40	0.008	0.0023	0.642		0.0026			< 0.0002		0.003	110	< 0.001	520
G152	03/13/2012		0.0014	0.13	< 0.001		0.036	< 0.001		42	< 0.004	< 0.002	0.422		< 0.001			< 0.0002		0.0043	130	< 0.001	580
G152	05/22/2012	0.0011				0.044								< 0.001			0.21						580
G152	07/23/2012		0.0011	0.1	< 0.001		0.032	< 0.001		45	< 0.004	< 0.002	0.587		< 0.001			< 0.0002		0.0035	120	< 0.001	670
G152	11/14/2012	< 0.001				0.031								< 0.001			0.14						620
G152	01/30/2013	< 0.001				0.033								< 0.001			0.14						600
G152	05/20/2013	< 0.001				0.015								< 0.001			0.034						570
G152	07/22/2013	< 0.001				0.024								0.0014			0.21						580
G152	02/19/2014	< 0.001				0.038								< 0.001			0.12						
G152	05/12/2014	< 0.001				0.044								< 0.001			0.05						
G152	08/11/2014	< 0.001				0.044								< 0.001			0.31						820
G152	10/14/2014	< 0.001				0.034								< 0.001			0.15						620
G152	01/21/2015	< 0.001				0.03								< 0.001			0.15						620
G152	04/08/2015	< 0.002				0.025								< 0.002			0.07						680
G152	07/23/2015	0.0078				0.079								< 0.001			0.89						730
G152	10/06/2015	0.0054				0.11								< 0.001			0.53						1100
G152	02/09/2016	0.0034				0.082								< 0.001			0.47						920
G152	05/11/2016	< 0.002				0.066								< 0.002			0.31						800
G152	11/19/2016			0.073			0.017			51			0.509								130		680
G153	12/21/2011	< 0.003				0.0575								< 0.002			1.02						3150
G153	01/25/2012		0.0056	0.036	< 0.001		0.064	< 0.001		130	0.0053	0.0068	0.369		< 0.001			< 0.0002		0.021	1500	< 0.001	3000
G153	03/13/2012		0.0059	0.022	< 0.001		0.036	< 0.001		160	0.0041	0.0034	0.293		< 0.001			< 0.0002		0.027	1900	< 0.001	3200
G153	05/22/2012	0.004				0.032								< 0.001			0.42						3100
G153	07/23/2012		0.0052	0.016	< 0.001		0.031	< 0.001		130	0.0041	< 0.002	0.341		< 0.001			< 0.0002		0.021	1500	< 0.001	3200
G153	11/14/2012	0.0023				0.04								< 0.001			0.19						3300
G153	01/30/2013	0.0022				0.039								< 0.001			0.28						3000
G153	05/20/2013	< 0.001				0.012								< 0.001			0.13						2800
G153	07/22/2013	0.0027				0.028								< 0.001			0.1						3000
G153	02/19/2014	< 0.001				0.042							0.4	< 0.001			0.16						
G153	05/12/2014	< 0.001				0.021							0.41	< 0.001			0.05						

Well ID	Date	Arsenic, dissolved	Arsenic, total	Barium, total	Beryllium, total	Boron, dissolved	Boron, total	Cadmium, total	Calcium, total L	Chloride, total	Chromium, total	Cobalt, total	Fluoride, total	Lead, dissolved	Lead, total	Lithium, total	Manganese, dissolved	Mercury, total	Molybdenum, total	Selenium, total	Sulfate, total	Thallium, total	Total Dissolved Solids
G153	08/11/2014	< 0.001				0.026								< 0.001			0.24						3500
G153	10/14/2014	0.0016				0.028								< 0.001			0.51						3400
G153	01/21/2015	< 0.001				0.02								< 0.001			0.2						3600
G153	04/08/2015	0.003				0.02								< 0.002			0.024						3700
G153	07/23/2015	< 0.001				0.015								< 0.001			0.16						3900
G153	10/06/2015	< 0.001				0.03								< 0.001			0.19						3700
G153	02/09/2016	< 0.001				0.016								< 0.001			0.046						3800
G153	05/11/2016	0.0035				0.026								< 0.002			0.037						3800
G153	11/19/2016			0.017			0.013			230			0.491								2500		4000
G154	12/21/2011	< 0.003				0.0452								< 0.002			0.462						624
G154	01/25/2012		0.0014	0.037	< 0.001		0.031	< 0.001		10	< 0.004	< 0.002	1.01		< 0.001			< 0.0002		0.0042	93	< 0.001	410
G154	03/13/2012		< 0.001	0.032	< 0.001		0.021	< 0.001		4.6	< 0.004	< 0.002	0.971		< 0.001			< 0.0002		0.0062	93	< 0.001	440
G154	05/22/2012	0.0017				0.025								< 0.001			0.038						470
G154	07/23/2012		< 0.001	0.033	< 0.001		0.038	< 0.001		4.9	< 0.004	< 0.002	1.06		< 0.001			< 0.0002		0.0058	110	< 0.001	490
G154	11/14/2012	< 0.001				0.04								< 0.001			0.043						500
G154	01/30/2013	< 0.001				0.043								< 0.001			0.032						440
G154	05/20/2013	< 0.001				0.021								< 0.001			0.046						460
G154	07/22/2013	< 0.001				0.035								< 0.001			0.045						500
G154	02/19/2014	< 0.001				0.043								< 0.001			0.018						
G154	05/12/2014	< 0.001				0.044								< 0.001			0.014						
G154	08/11/2014	< 0.001				0.035								< 0.001			0.081						480
G154	10/14/2014	< 0.001				0.035								< 0.001			0.0077						440
G154	01/21/2015	< 0.001				0.037								< 0.001			0.0092						450
G154	04/08/2015	< 0.002				0.023								< 0.002			0.003						440
G154	07/23/2015	< 0.001				0.024								< 0.001			0.14						430
G154	10/06/2015	< 0.001				0.044								< 0.001			0.01						500
G154	02/09/2016	< 0.001				0.041								< 0.001			0.041						560
G154	05/11/2016	< 0.002				0.037								< 0.002			0.0085						460
G270	03/11/2008	< 0.005	< 0.005	0.076	< 0.005	< 0.25	< 0.25	< 0.0025	77	9.5	< 0.025	< 0.005	0.36	< 0.0025	< 0.0025		0.19	< 0.0002		< 0.012	2.3	< 0.002	440
G270	04/21/2008	< 0.001	0.0016	0.076	< 0.001	0.078	0.071	< 0.0005	72	11	< 0.005	0.0017	0.36	< 0.0005	0.0021		0.21	< 0.0002		< 0.0025	2.4	< 0.002	420
G270	06/11/2008	< 0.001	0.0012	0.072	< 0.001	< 0.05	< 0.05	< 0.0005	70	< 10	< 0.005	0.001	0.33	< 0.0005	0.0021		0.21	< 0.0002		< 0.0025	2.8	< 0.002	430
G270	08/13/2008	< 0.001	< 0.001	0.069	< 0.001	0.052	< 0.05	< 0.0005	67	8.9	< 0.005	< 0.001	0.38	< 0.0005	< 0.0005		0.26	< 0.0002		< 0.0025	4.2	< 0.002	440
G270	10/14/2008	< 0.001	< 0.001	0.068	< 0.001	0.073	< 0.05	< 0.0005	71	9.4	< 0.005	< 0.001	0.35	< 0.0005	< 0.0005		0.22	< 0.0002		< 0.0025	4.7	< 0.002	440
G270	12/02/2008	< 0.001	< 0.001	0.068	< 0.001	0.052	0.051	< 0.0005	69	9.6	< 0.005	< 0.001	0.31	< 0.0005	0.00054		0.22	< 0.0002		< 0.0025	4.4	< 0.002	400
G270	09/21/2009	< 0.001	0.001			0.054	0.058	< 0.0005	77	9.4				< 0.0005	0.0011		0.26				3.2		430
G270	11/10/2009	< 0.001	0.001			0.054	0.057	< 0.0005	75	11				< 0.0005	0.0011		0.23				5.1		450
G270	01/28/2010	< 0.001	< 0.001			0.053	0.052	< 0.0005	74	19				< 0.0005	0.0031		0.14				8.2		430
G270	02/11/2010			0.056	< 0.001						< 0.005	< 0.001	0.3					< 0.0002		< 0.0025		< 0.002	460
G270	06/09/2010	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	61	39				< 0.001	< 0.001		0.058				6.8		470
G270	07/27/2010	< 0.001	< 0.001			0.011	< 0.01	< 0.001	58	40				< 0.001	< 0.001		0.062				9.1		480
G270	11/15/2010	< 0.001	0.0011			0.013	0.016	< 0.001	60	40				< 0.001	0.0021		0.069				7.6		490
G270	01/28/2011	< 0.001	< 0.001	0.064	< 0.001	< 0.01	0.012	< 0.001	80	45	< 0.004	0.002	0.36	< 0.001	0.0041		0.032	< 0.0002		0.002	9.6	< 0.001	470
G270	05/03/2011	< 0.001	< 0.001			0.01	< 0.01	< 0.001	57	57				< 0.001	< 0.001		0.023				13		430
G270	07/27/2011	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	59	57				< 0.001	< 0.001		0.046				18		480
G270	11/11/2011	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	61	64				< 0.001	< 0.001		0.05				23		440
G270	01/26/2012	< 0.001	< 0.001	0.049	< 0.001	< 0.01	< 0.01	< 0.001	64	73	< 0.004	< 0.002	0.363	< 0.001	< 0.001		0.0094	< 0.0002		0.0046	40	< 0.001	420
G270	05/22/2012	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	67	83				< 0.001	< 0.001		0.04				57		460
G270	07/24/2012	< 0.001	< 0.001			0.092	0.018	< 0.001	73	66				< 0.001	< 0.001		0.045				43		480
G270	11/14/2012	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	65	76				< 0.001	< 0.001		0.017				77		500
G270	01/30/2013	< 0.001	0.001	0.062	< 0.001	< 0.01	< 0.01	< 0.001	65	91	< 0.004	< 0.002	0.372	< 0.001	< 0.001		0.011	< 0.0002		0.0078	96	< 0.001	540
G270	05/20/2013	0.0011	< 0.001			< 0.01	< 0.01	< 0.001	72	85				< 0.001	< 0.001		0.025				120		480
G270	07/22/2013	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	70	79				< 0.001	< 0.001		0.045				120		500
G270	10/14/2013	< 0.001	< 0.001			0.014	< 0.01	< 0.001	81	72				< 0.001	< 0.001		0.041				85		520

Well ID	Date	Arsenic, dissolved	Arsenic, total	Barium, total	Beryllium, total	Boron, dissolved	Boron, total	Cadmium, total	Calcium, total L	Chloride, total	Chromium, total	Cobalt, total	Fluoride, total	Lead, dissolved	Lead, total	Lithium, total	Manganese, dissolved	Mercury, total	Molybdenum, total	Selenium, total	Sulfate, total	Thallium, total	Total Dissolved Solids
G270	02/19/2014	< 0.001	< 0.001	0.041	< 0.001	< 0.01	< 0.01	< 0.001	67	56	< 0.004	< 0.002	0.279	< 0.001	< 0.001		0.0029	< 0.0002		0.0022	140	< 0.001	
G270	05/13/2014	< 0.001	0.0013			0.026	0.025	< 0.001	68	30				< 0.001	< 0.001		0.016				140		
G270	08/11/2014	< 0.001	0.0034			< 0.01	< 0.01	< 0.001	62	34				< 0.001	< 0.001		0.04				130		500
G270	10/14/2014	< 0.001	0.011			0.12	0.057	0.008	67	21				< 0.001	0.0073		0.04				140		500
G270	01/20/2015	< 0.001	< 0.001			0.011	< 0.01	< 0.001	70	18				< 0.001	< 0.001		0.011				140		500
G270	04/13/2015	< 0.002	< 0.001	0.05	< 0.001	0.025	0.047	< 0.001	70	20	< 0.004	< 0.002	0.334	< 0.002	< 0.001		0.0055	< 0.0002		0.0016	120	< 0.001	540
G270	07/22/2015	< 0.001	< 0.001	0.049	< 0.001	< 0.01	< 0.01	< 0.001		15	< 0.004	< 0.002	0.427	< 0.001	0.0018		0.47	< 0.0002	0.0011	< 0.001	110	< 0.001	550
G270	10/05/2015	< 0.001	< 0.001	0.037	< 0.001	0.013	< 0.01	< 0.001		11	< 0.004	< 0.002	0.411	< 0.001	< 0.001		0.056	< 0.0002	< 0.001	< 0.001	82	< 0.001	480
G270	11/20/2015		0.001	0.045	< 0.001		< 0.01	< 0.001	59	12	< 0.004	< 0.002	0.362		0.0015	< 0.01		< 0.0002	0.001	< 0.001	89	< 0.001	400
G270	02/10/2016	< 0.001	< 0.001	0.037	< 0.001	0.02	< 0.01	< 0.001	49	16	< 0.004	< 0.002	0.472	< 0.001	< 0.001	< 0.01	0.012	< 0.0002	< 0.001	0.0013	77	< 0.001	400
G270	05/12/2016	< 0.002	< 0.001	0.034	< 0.001	< 0.02	< 0.01	< 0.001	57	15	< 0.004	< 0.002	0.504	< 0.002	< 0.001	< 0.01	0.029	< 0.0002	< 0.001	< 0.001	77	< 0.001	370
G270	08/01/2016		< 0.001	0.037	< 0.001		< 0.01	< 0.001	50	15	< 0.004	< 0.002	0.397		< 0.001	< 0.01		< 0.0002	< 0.001	< 0.001	76	< 0.001	360
G271	09/22/2009		0.003	0.08	< 0.001		0.33	< 0.0005	110	37	0.0064	0.0023	0.46		0.0054			< 0.0002		0.0038	230	< 0.002	770
G271	11/09/2009		0.0049	0.11	< 0.001		0.33	< 0.0005	140	34	0.014	0.0047	0.41		0.011			< 0.0002		0.0034	290	< 0.002	770
G271	11/10/2009	< 0.001				0.34								< 0.0005			0.11						
G271	01/19/2010	< 0.001	0.001	0.055	< 0.001	0.18	0.24	< 0.0005	110	33	< 0.005	< 0.001	0.34	< 0.0005	0.0018		0.007	< 0.0002		0.0035	320	< 0.002	860
G271	03/08/2010	< 0.001	< 0.001	0.055	< 0.001	0.25	0.23	< 0.0005	120	36	< 0.005	< 0.001	0.39	0.00061	0.0023		< 0.0025	< 0.0002		0.0053	300	< 0.002	880
G271	05/27/2010	< 0.001	0.0016	0.053	< 0.001	0.26	0.16	< 0.001	130	40	0.0056	< 0.002	0.42	< 0.001	0.0029		0.028	< 0.0002		0.0051	330	< 0.001	870
G271	07/27/2010	< 0.001	< 0.001	0.041	< 0.001	0.24	0.15	< 0.001	120	40	< 0.004	< 0.002	0.34	< 0.001	< 0.001		0.016	< 0.0002		0.005	350	< 0.001	840
G271	09/20/2010	< 0.001				0.16								< 0.001			0.0015						
G271	11/16/2010	< 0.001	< 0.001			0.14	0.15	< 0.001	110	44				< 0.001	< 0.001		< 0.001				280		830
G271	01/28/2011	< 0.001	0.0015	0.05	< 0.001	0.17	0.14	< 0.001	110	44	< 0.004	< 0.002	0.48	< 0.001	0.0035		0.0013	< 0.0002		0.0079	270	< 0.001	730
G271	05/04/2011	< 0.001	< 0.001			0.16	0.11	< 0.001	100	53				< 0.001	< 0.001		< 0.001				240		750
G271	07/27/2011	< 0.001	< 0.001			0.13	0.17	< 0.001	96	49				< 0.001	< 0.001		< 0.001				240		800
G271	11/14/2011	< 0.001	0.0013			0.15	0.21	< 0.001	110	50				< 0.001	< 0.001		< 0.001				250		710
G271	01/26/2012	< 0.001	0.0013	0.034	< 0.001	0.19	0.18	< 0.001	110	44	< 0.004	< 0.002	0.393	< 0.001	< 0.001		< 0.001	< 0.0002		0.0099	240	< 0.001	750
G271	05/22/2012	< 0.001	< 0.001			0.16	0.14	< 0.001	110	5.1				< 0.001	< 0.001		< 0.001				240		710
G271	07/24/2012	< 0.001	< 0.001			0.18	0.13	< 0.001	110	45				< 0.001	< 0.001		< 0.001				280		770
G271	11/14/2012	< 0.001	0.0014			0.28	0.19	< 0.001	130	50				< 0.001	0.0012		0.0021				300		940
G271	01/31/2013	< 0.001	0.0031	0.063	< 0.001	0.32	0.32	< 0.001	150	58	0.0066	0.0026	0.458	< 0.001	0.005		0.024	< 0.0002		0.005	380	< 0.001	880
G271	05/20/2013	0.0013	< 0.001			0.17	0.19	< 0.001	120	47				< 0.001	< 0.001		< 0.001				350		790
G271	07/22/2013	< 0.001	< 0.001			0.16	0.15	< 0.001	99	49				< 0.001	< 0.001		< 0.001				360		800
G271	10/14/2013	< 0.001	< 0.001			0.3	0.18	< 0.001	120	47				< 0.001	< 0.001		< 0.001				390		840
G271	02/19/2014	< 0.001	0.0028	0.062	< 0.001	0.26	0.24	< 0.001	150	51	0.0087	0.0023	0.298	< 0.001	0.0056		< 0.001	< 0.0002		0.0045	420	< 0.001	
G271	05/13/2014	0.16	0.0017			0.45	0.33	< 0.001	140	47				0.15	0.0018		0.22				440		
G271	08/11/2014	< 0.001	0.0027			0.39	0.44	< 0.001	140	42				< 0.001	0.0061		< 0.001				500		1000
G271	10/14/2014	< 0.001	0.0019			0.44	0.5	< 0.001	150	45				< 0.001	0.0062		0.0021				480		940
G271	01/21/2015	< 0.001	< 0.001			0.42	0.51	< 0.001	120	39				< 0.001	0.0014		< 0.001				490		870
G271	04/10/2015	< 0.002	< 0.001	0.029	< 0.001	0.37	0.31	< 0.001	130	45	< 0.004	< 0.002	0.406	< 0.002	< 0.001		< 0.002	< 0.0002		0.0035	440	< 0.001	1000
G271	07/22/2015	< 0.001	< 0.001	0.028	< 0.001	0.32	0.24	< 0.001		35	< 0.004	< 0.002	0.406	0.0017	0.0036		0.001	< 0.0002	< 0.001	0.0026	350	< 0.001	1000
G271	10/08/2015	< 0.001	< 0.001	0.03	< 0.001	0.44	0.33	< 0.001		38	< 0.004	< 0.002	0.402	< 0.001	< 0.001		< 0.001	< 0.0002	0.0036	0.0035	400	< 0.001	1000
G271	11/23/2015		< 0.001	0.031	< 0.001		0.5	< 0.001	130	38	< 0.004	< 0.002	0.347		0.0012	< 0.01		< 0.0002	0.0012	0.0024	420	< 0.001	860
G271	02/16/2016	< 0.001	< 0.001	0.029	< 0.001	0.51	0.61	< 0.001	130	38	< 0.004	< 0.002	0.481	< 0.001	< 0.001	< 0.01	< 0.001	< 0.0002	< 0.001	0.0032	440	< 0.001	980
G271	05/12/2016	< 0.002	< 0.001	0.028	< 0.001	0.61	0.98	< 0.001	170	39	< 0.004	< 0.002	0.562	< 0.002	< 0.001	< 0.01	< 0.002	< 0.0002	< 0.001	0.0021	540	< 0.001	940
G271	08/05/2016		< 0.001	0.032	< 0.001		0.63	< 0.001	110	37	< 0.004	< 0.002	0.414		0.0027	< 0.01		< 0.0002	< 0.001	0.0022	440	< 0.001	840
G271	11/21/2016		< 0.001	0.031	< 0.001		0.4	< 0.001		29	< 0.004	< 0.002	0.484		< 0.001	< 0.01		< 0.0002	< 0.001	0.0029	400	< 0.001	910
G272	09/22/2009		0.0012	0.079	< 0.001		0.06	< 0.0005	84	53	< 0.005	0.0017	0.48		0.0039			< 0.0002		< 0.0025	120	< 0.002	570
G272	11/10/2009	< 0.001	< 0.001	0.073	< 0.001	0.057	< 0.05	< 0.0005	88	46	< 0.005	0.0012	0.5	< 0.0005	0.0025		0.056	< 0.0002		< 0.0025	130	< 0.002	610
G272	01/19/2010	< 0.001	< 0.001	0.068	< 0.001	< 0.05	0.051	< 0.0005	85	45	< 0.005	< 0.001	0.42	< 0.0005	0.002		0.006	< 0.0002		< 0.0025	160	< 0.002	610
G272	03/04/2010	< 0.001	< 0.001	0.061	< 0.001	< 0.05	0.05	< 0.0005	93	44	< 0.005	< 0.001	0.41	< 0.0005	0.00058		< 0.0025	< 0.0002		< 0.0025	160	< 0.002	630
G272	05/27/2010	< 0.001	< 0.001	0.062	< 0.001	< 0.01	< 0.01	< 0.001	92	46	0.0049	< 0.002	0.41	< 0.001	0.0011		0.0029	< 0.0002		0.0021	190	< 0.001	670
G272	07/27/2010	< 0.001	< 0.001	0.062	< 0.001	< 0.01	< 0.01	< 0.001	92	44	< 0.004	< 0.002	0.43	< 0.001	< 0.001		0.0019	< 0.0002		0.0039	210	< 0.001	690

Well ID	Date	Arsenic, dissolved	Arsenic, total	Barium, total	Beryllium, total	Boron, dissolved	Boron, total	Cadmium, total	Calcium, total L	Chloride, total	Chromium, total	Cobalt, total	Fluoride, total	Lead, dissolved	Lead, total	Lithium, total	Manganese, dissolved	Mercury, total	Molybdenum, total	Selenium, total	Sulfate, total	Thallium, total	Total Dissolved Solids
G272	09/20/2010	< 0.001				< 0.01								< 0.001			< 0.001						
G272	11/16/2010	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	84	42				< 0.001	< 0.001		< 0.001				200		670
G272	01/31/2011	< 0.001	< 0.001	0.07	< 0.001	< 0.01	0.013	< 0.001	98	43	< 0.004	< 0.002	0.48	< 0.001	< 0.001		< 0.001	< 0.0002		0.0042	230	< 0.001	660
G272	05/04/2011	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	92	42				< 0.001	< 0.001		< 0.001				210		690
G272	07/27/2011	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	99	< 100				< 0.001	< 0.001		< 0.001				250		740
G272	11/14/2011	< 0.001	< 0.001			< 0.01	0.01	< 0.001	98	41				< 0.001	< 0.001		< 0.001				230		670
G272	01/26/2012	< 0.001	0.001	0.068	< 0.001	< 0.01	< 0.01	< 0.001	98	43	< 0.004	< 0.002	0.459	< 0.001	< 0.001		< 0.001	< 0.0002		0.0021	240	< 0.001	660
G272	05/22/2012	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	82	42				< 0.001	< 0.001		< 0.001				190		750
G272	07/24/2012	< 0.001	< 0.001			0.032	< 0.01	< 0.001	100	43				< 0.001	< 0.001		< 0.001				220		710
G272	11/14/2012	< 0.001	0.0011			< 0.01	< 0.01	< 0.001	110	40				< 0.001	0.0011		0.0012				220		780
G272	01/31/2013	< 0.001	< 0.001	0.072	< 0.001	< 0.01	< 0.01	< 0.001	110	44	< 0.004	< 0.002	0.461	< 0.001	< 0.001		< 0.001	< 0.0002		0.0029	330	< 0.001	760
G272	05/20/2013	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	98	37				< 0.001	< 0.001		< 0.001				280		680
G272	07/22/2013	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	100	35				< 0.001	< 0.001		< 0.001				260		680
G272	10/14/2013	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	100	32				< 0.001	< 0.001		< 0.001				300		740
G272	02/19/2014	< 0.001	< 0.001	0.06	< 0.001	< 0.01	< 0.01	< 0.001	110	40	< 0.004	< 0.002	0.355	< 0.001	< 0.001		< 0.001	< 0.0002		< 0.001	340	< 0.001	
G272	05/13/2014	0.17	< 0.001			0.27	0.015	< 0.001	93	36				0.15	< 0.001		0.23				310		
G272	08/11/2014	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	110	34				< 0.001	0.0014		< 0.001				330		740
G272	10/14/2014	< 0.001	< 0.001			0.036	0.022	< 0.001	110	37				< 0.001	0.0026		< 0.001				310		840
G272	01/21/2015	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	99	31				< 0.001	0.0022		< 0.001				380		790
G272	04/10/2015	< 0.002	< 0.001	0.059	< 0.001	< 0.02	< 0.01	< 0.001	110	37	< 0.004	< 0.002	0.399	< 0.002	< 0.001		< 0.002	< 0.0002		0.0012	340	< 0.001	800
G272	07/23/2015	< 0.001	< 0.001	0.06	< 0.001	< 0.01	0.031	< 0.001		29	< 0.004	< 0.002	0.493	< 0.001	< 0.001		< 0.001	< 0.0002	< 0.001	< 0.001	270	< 0.001	840
G272	10/08/2015	< 0.001	< 0.001	0.058	< 0.001	< 0.01	0.046	< 0.001		33	< 0.004	< 0.002	0.361	< 0.001	< 0.001		< 0.001	< 0.0002	0.0024	0.0016	340	< 0.001	660
G272	02/09/2016	< 0.001	0.0013	0.099	< 0.001	< 0.01	< 0.01	< 0.001		29	0.011	0.0022	0.516	< 0.001	0.0049		0.0013	< 0.0002	0.0013	< 0.001	290	< 0.001	660
G272	05/12/2016	< 0.001	< 0.001	0.059	< 0.001	< 0.01	< 0.01	< 0.001		29	< 0.004	< 0.002	0.561	< 0.001	< 0.001		< 0.001	< 0.0002	< 0.001	< 0.001	310	< 0.001	680
G273	09/23/2009		< 0.001	0.094	< 0.001		< 0.05	< 0.0005	120	35	< 0.005	< 0.001	0.38		< 0.0005			< 0.0002		< 0.0025	340	< 0.002	890
G273	11/10/2009	< 0.001	< 0.001	0.09	< 0.001	< 0.05	0.051	< 0.0005	140	28	< 0.005	< 0.001	0.33	< 0.0005	0.00093		0.097	< 0.0002		< 0.0025	400	< 0.002	980
G273	01/21/2010	< 0.001	< 0.001	0.085	< 0.001	0.054	< 0.05	< 0.0005	150	30	< 0.005	< 0.001	0.29	< 0.0005	< 0.0005		0.063	< 0.0002		< 0.0025	560	< 0.002	1200
G273	03/04/2010	< 0.001	< 0.001	0.079	< 0.001	< 0.05	< 0.05	< 0.0005	190	25	< 0.005	< 0.001	0.26	< 0.0005	< 0.0005		0.055	< 0.0002		< 0.0025	570	< 0.002	1300
G273	05/27/2010	< 0.001	0.0011	0.055	< 0.001	0.019	0.016	< 0.001	180	31	0.034	< 0.002	0.33	< 0.001	< 0.001		0.041	< 0.0002		0.0016	620	< 0.001	1300
G273	07/27/2010	< 0.001	< 0.001	0.048	< 0.001	0.023	0.023	< 0.001	160	30	< 0.004	< 0.002	0.37	< 0.001	< 0.001		0.048	< 0.0002		< 0.001	490	< 0.001	1100
G273	09/20/2010	< 0.001				0.024								< 0.001			0.052						
G273	11/16/2010	< 0.001	< 0.001			0.035	0.039	< 0.001	130	27				< 0.001	< 0.001		0.058				420		960
G273	01/31/2011	< 0.001	0.001	0.05	< 0.001	0.16	0.21	< 0.001	170	33	< 0.004	< 0.002	0.38	< 0.001	< 0.001		0.047	< 0.0002		< 0.001	520	< 0.001	1100
G273	05/03/2011	< 0.001	< 0.001			0.16	0.14	< 0.001	160	59				< 0.001	< 0.001		0.042				640		1200
G273	07/27/2011	< 0.001	< 0.001			0.097	0.12	< 0.001	150	29				< 0.001	< 0.001		0.029				510		1100
G273	11/14/2011	< 0.001	0.0013			0.13	0.15	< 0.001	150	29				< 0.001	< 0.001		0.041				510		990
G273	01/26/2012	< 0.001	0.001	0.043	< 0.001	0.27	0.26	< 0.001	180	27	< 0.004	< 0.002	0.359	< 0.001	< 0.001		0.033	< 0.0002		0.0012	750	< 0.001	1300
G273	05/22/2012	< 0.001	< 0.001			0.21	0.2	< 0.001	160	27				< 0.001	< 0.001		0.028				470		1100
G273	07/24/2012	< 0.001	< 0.001			0.12	0.094	< 0.001	140	32				< 0.001	< 0.001		0.022				360		910
G273	11/14/2012	0.0016	0.0034			0.27	0.2	< 0.001	160	33				< 0.001	0.0037		0.026				630		1100
G273	01/31/2013	< 0.001	< 0.001	0.046	< 0.001	0.48	0.46	< 0.001	180	37	< 0.004	< 0.002	0.33	< 0.001	< 0.001		0.03	< 0.0002		< 0.002	740	< 0.001	1300
G273	05/20/2013	0.0014	< 0.001			0.18	0.29	< 0.001	180	4				< 0.001	< 0.001		0.013				670		1100
G273	07/22/2013	< 0.001	< 0.001			0.21	0.25	< 0.001	160	35				< 0.001	< 0.001		0.022				510		980
G273	10/14/2013	< 0.001	< 0.001			0.18	0.18	< 0.001	140	37				< 0.001	< 0.001		0.015				450		900
G273	02/19/2014	< 0.001	< 0.001	0.039	< 0.001	0.52	0.36	< 0.001	150	38	< 0.004	< 0.002	0.286	< 0.001	< 0.001		0.015	< 0.0002		< 0.001	570	< 0.001	
G273	05/13/2014	0.24	< 0.001			0.62	0.35	< 0.001	160	47				0.22	< 0.001		0.33				620		
G273	08/11/2014	< 0.001	< 0.001			0.25	0.26	< 0.001	140	37				< 0.001	< 0.001		0.01				530		1000
G273	10/14/2014	< 0.001	0.0011			0.32	0.29	< 0.001	150	37				< 0.001	0.0011		0.013				500		1100
G273	01/21/2015	< 0.001	< 0.001			0.58	0.45	< 0.001	150	46				< 0.001	< 0.001		0.018				650		1200
G273	04/13/2015	< 0.002	< 0.001	0.028	< 0.001	0.29	0.48	< 0.001	200	41	< 0.004	< 0.002	0.32	< 0.002	< 0.001		0.019	< 0.0002		< 0.001	690	< 0.001	1300
G273	07/23/2015	< 0.001	< 0.001	0.044	< 0.001	0.4	0.12	< 0.001		39	< 0.004	< 0.002	0.382	< 0.001	< 0.001		0.0011	< 0.0002	< 0.001	< 0.001	390	< 0.001	1200
G273	10/08/2015	< 0.001	< 0.001	0.039	< 0.001	0.1	0.15	< 0.001		46	< 0.004	< 0.002	< 0.25	< 0.001	< 0.001		0.014	< 0.0002	0.0019	< 0.001	450	< 0.001	930
G273	11/24/2015		< 0.001	0.049	< 0.001		0.2	< 0.001	140	41	< 0.004	< 0.002	< 0.25		0.0011	< 0.01		< 0.0002	< 0.001	< 0.001	420	< 0.001	890

Well ID	Date	Arsenic, dissolved	Arsenic, total	Barium, total	Beryllium, total	Boron, dissolved	Boron, total	Cadmium, total	Calcium, total L	Chloride, total	Chromium, total	Cobalt, total	Fluoride, total	Lead, dissolved	Lead, total	Lithium, total	Manganese, dissolved	Mercury, total	Molybdenum, total	Selenium, total	Sulfate, total	Thallium, total	Total Dissolved Solids
G273	02/16/2016	< 0.001	< 0.001	0.043	< 0.001	0.43	0.42	< 0.001	150	45	< 0.004	< 0.002	0.401	< 0.001	< 0.001	< 0.01	0.01	< 0.0002	< 0.001	< 0.001	550	< 0.001	1200
G273	05/12/2016	< 0.001	< 0.001	0.031	< 0.001	0.31	0.29	< 0.001	170	44	< 0.004	< 0.002	0.537	< 0.001	< 0.001	< 0.01	0.012	< 0.0002	< 0.001	< 0.001	520	< 0.001	980
G273	08/05/2016		< 0.001	0.032	< 0.001		0.17	< 0.001	120	46	< 0.004	< 0.002	0.294		< 0.001	< 0.01		< 0.0002	< 0.001	< 0.001	400	< 0.001	840
G273	11/21/2016		< 0.001	0.036	< 0.001		0.15	< 0.001		48	< 0.004	< 0.002	0.39		< 0.001	< 0.01		< 0.0002	< 0.001	< 0.001	440	< 0.001	900
G274	09/24/2009		0.0024	0.12	< 0.001		0.053	< 0.0005	100	55	0.0059	0.0028	0.34		0.0091			< 0.0002		< 0.0025	230	< 0.002	830
G274	11/11/2009	< 0.001	< 0.001	0.092	< 0.001	0.057	< 0.05	< 0.0005	100	54	< 0.005	< 0.001	0.35	< 0.0005	0.0012		0.007	< 0.0002		< 0.0025	250	< 0.002	820
G274	01/27/2010	< 0.001	< 0.001	0.09	< 0.001	< 0.05	< 0.05	< 0.0005	100	50	< 0.005	< 0.001	0.32	< 0.0005	< 0.0005		0.0039	< 0.0002		< 0.0025	260	< 0.002	850
G274	03/08/2010	< 0.001	< 0.001	0.091	< 0.001	< 0.05	< 0.05	< 0.0005	110	49	< 0.005	< 0.001	0.32	< 0.0005	< 0.0005		0.0056	< 0.0002		< 0.0025	270	< 0.002	870
G274	05/27/2010	< 0.001	< 0.001	0.09	< 0.001	< 0.01	< 0.01	< 0.001	110	45	< 0.004	< 0.002	0.32	< 0.001	0.0015		< 0.001	< 0.0002		0.0022	300	< 0.001	910
G274	07/27/2010	< 0.001	< 0.001	0.08	< 0.001	< 0.01	< 0.01	< 0.001	110	44	< 0.004	< 0.002	0.35	< 0.001	< 0.001		< 0.001	< 0.0002		< 0.001	320	< 0.001	900
G274	09/20/2010	< 0.001				< 0.01								< 0.001			< 0.001						
G274	11/16/2010	< 0.001	< 0.001			< 0.01	0.012	< 0.001	120	38				< 0.001	< 0.001		< 0.001				360		940
G274	01/31/2011	< 0.001	0.0023	0.077	0.0018	< 0.01	0.012	0.0014	110	39	< 0.004	< 0.002	0.36	< 0.001	0.0018		< 0.001	< 0.0002		< 0.001	370	0.0013	950
G274	05/03/2011	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	120	36				< 0.001	< 0.001		< 0.001				400		980
G274	07/27/2011	< 0.001	< 0.001			0.013	< 0.01	< 0.001	120	37				< 0.001	< 0.001		< 0.001				370		980
G274	11/14/2011	< 0.001	< 0.001			0.035	0.039	< 0.001	120	37				< 0.001	< 0.001		< 0.001				370		900
G274	01/26/2012	< 0.001	< 0.001	0.068	< 0.001	0.076	0.052	< 0.001	110	34	< 0.004	< 0.002	0.379	< 0.001	< 0.001		0.001	< 0.0002		0.0014	370	< 0.001	880
G274	05/22/2012	< 0.001	< 0.001			0.12	0.11	< 0.001	120	36				< 0.001	< 0.001		< 0.001				330		920
G274	07/24/2012	< 0.001	< 0.001			0.15	0.13	< 0.001	120	40				< 0.001	< 0.001		< 0.001				300		880
G274	11/14/2012	< 0.001	0.0022			0.18	0.16	< 0.001	120	37				< 0.001	0.0031		< 0.001				420		910
G274	01/31/2013	< 0.001	< 0.001	0.059	< 0.001	0.26	0.25	< 0.001	130	36	< 0.004	< 0.002	0.382	< 0.001	< 0.001		< 0.001	< 0.0002		0.0015	460	< 0.001	870
G274	05/20/2013	0.001	< 0.001			0.25	0.27	< 0.001	120	3.6				< 0.001	< 0.001		0.0073				350		800
G274	07/22/2013	< 0.001	< 0.001			0.31	0.31	< 0.001	110	32				< 0.001	0.0015		< 0.001				330		820
G274	10/14/2013	< 0.001	< 0.001			0.52	0.46	< 0.001	110	31				< 0.001	< 0.001		< 0.001				380		840
G274	02/19/2014	< 0.001	< 0.001	0.063	< 0.001	0.79	0.47	< 0.001	110	32	< 0.004	< 0.002	0.262	< 0.001	< 0.001		< 0.001	< 0.0002		< 0.001	300	< 0.001	
G274	05/13/2014	0.0055	< 0.001			0.52	0.52	< 0.001	98	27				0.0034	< 0.001		0.0059				370		
G274	08/11/2014	< 0.001	< 0.001			0.57	0.61	< 0.001	120	25				< 0.001	< 0.001		< 0.001				400		880
G274	10/14/2014	< 0.001	0.004			0.62	0.55	< 0.001	100	23				< 0.001	0.01		< 0.001				320		770
G274	01/21/2015	< 0.001	0.0011			0.68	0.5	< 0.001	110	19				< 0.001	0.0029		0.0036				260		770
G274	04/13/2015	< 0.002	< 0.001	0.052	< 0.001	0.57	0.53	< 0.001	110	24	< 0.004	< 0.002	0.341	< 0.002	< 0.001		< 0.002	< 0.0002		< 0.001	390	< 0.001	770
G274	07/23/2015	< 0.001	< 0.001	0.068	< 0.001	0.48	0.49	< 0.001		24	< 0.004	< 0.002	0.403	< 0.001	0.0018		0.0015	< 0.0002	< 0.001	0.0014	320	< 0.001	890
G274	10/08/2015	< 0.001	< 0.001	0.061	< 0.001	0.43	0.74	< 0.001		22	< 0.004	< 0.002	0.265	< 0.001	< 0.001		< 0.001	< 0.0002	0.0012	< 0.001	320	< 0.001	770
G274	02/09/2016	< 0.001	< 0.001	0.07	< 0.001	0.87	0.65	< 0.001		22	< 0.004	< 0.002	0.455	< 0.001	0.001		< 0.001	< 0.0002	< 0.001	< 0.001	290	< 0.001	820
G274	05/12/2016	< 0.001	< 0.001	0.057	< 0.001	0.97	0.63	< 0.001		22	< 0.004	< 0.002	0.417	< 0.001	< 0.001		0.046	< 0.0002	< 0.001	< 0.001	350	< 0.001	770
G275	09/22/2009		< 0.005	0.12	< 0.001		4.5	< 0.0005	300	14	< 0.025	< 0.005	0.22		0.01			< 0.0002		< 0.012	990	< 0.002	2000
G275	11/11/2009	< 0.001	< 0.001	0.032	< 0.001	2.4	2.5	< 0.0005	140	12	< 0.005	< 0.001	0.32	< 0.0005	< 0.0005		0.032	< 0.0002		< 0.0025	350	< 0.002	910
G275	01/21/2010	< 0.001	< 0.001	0.032	< 0.001	1.2	1.2	< 0.0005	120	13	< 0.005	< 0.001	0.32	< 0.0005	< 0.0005		0.023	< 0.0002		< 0.0025	390	< 0.002	870
G275	03/08/2010	< 0.001	< 0.001	0.035	< 0.001	1.3	1.3	< 0.0005	160	23	< 0.005	< 0.001	0.27	< 0.0005	0.00053		0.029	< 0.0002		< 0.0025	460	< 0.002	1100
G275	05/28/2010	< 0.001	0.0016	0.047	< 0.001	2.9	2.9	< 0.001	180	18	0.0087	< 0.002	0.33	< 0.001	0.0017		0.018	< 0.0002		0.0014	540	< 0.001	1200
G275	07/26/2010	< 0.001	< 0.001	0.038	< 0.001	2.9	2.8	< 0.001	180	9.9	< 0.004	< 0.002	0.4	< 0.001	< 0.001		0.019	< 0.0002		< 0.001	550	< 0.001	1200
G275	09/20/2010	< 0.001				2.6								< 0.001			0.026						
G275	11/16/2010	< 0.001	0.0028			3.7	4.1	< 0.001	260	9.7				< 0.001	0.0045		0.16				970		1700
G275	01/31/2011	< 0.001	0.0015	0.046	< 0.001	3.6	3.6	< 0.001	230	11	< 0.004	< 0.002	0.34	< 0.001	< 0.001		0.016	< 0.0002		< 0.001	840	< 0.001	1500
G275	05/03/2011	< 0.001	< 0.001			3.6	3.8	< 0.001	240	13				< 0.001	< 0.001		0.04				790		1600
G275	07/27/2011	< 0.001	< 0.001			4.3	4.2	< 0.001	200	9.2				< 0.001	< 0.001		0.03				720		1300
G275	11/14/2011	0.0015	0.0041			4.3	4.4	< 0.001	260	17				< 0.001	0.0059		0.09				820		1500
G275	01/31/2012	< 0.001	0.0011	0.039	< 0.001	3.8	3.6	< 0.001	310	15	0.0047	< 0.002	0.281	< 0.001	< 0.001		0.0081	< 0.0002		0.0015	370	< 0.001	1300
G275	05/22/2012	< 0.001	0.0017			3.7	3.4	< 0.001	240	11				< 0.001	0.0015		0.01				670		1500
G275	07/24/2012	< 0.001	0.0018			4.6	4.2	< 0.001	260	13				< 0.001	0.0024		0.09				900		1600
G275	11/14/2012	< 0.001	0.0025			3.7	3.9	< 0.001	270	19				< 0.001	0.0037		0.28				950		1600
G275	05/20/2013	0.0013	0.0025			3.4	3.8	< 0.001	250	24				< 0.001	0.0015		< 0.001				840		1400
G275	07/22/2013	< 0.001	< 0.001			3.5	3.1	< 0.001	210	19				< 0.001	0.0013		0.0017				700		1400
G275	05/13/2014	0.25	0.0019			2.8	3.4	< 0.001	210	20				0.2	0.0037		0.34				750		

Well ID	Date	Arsenic, dissolved	Arsenic, total	Barium, total	Beryllium, total	Boron, dissolved	Boron, total	Cadmium, total	Calcium, total L	Chloride, total	Chromium, total	Cobalt, total	Fluoride, total	Lead, dissolved	Lead, total	Lithium, total	Manganese, dissolved	Mercury, total	Molybdenum, total	Selenium, total	Sulfate, total	Thallium, total	Total Dissolved Solids
G275	08/11/2014	< 0.001	0.0043			4.2	4.1	< 0.001	240	20				< 0.001	0.0078		< 0.001				880		1500
G275	10/14/2014	< 0.001	0.0011			1.9	3.5	< 0.001	200	16				< 0.001	0.0012		0.003				500		840
G275	01/21/2015	< 0.001	0.0043			4.6	4.6	< 0.001	230	20				< 0.001	0.0079		0.025				940		1500
G275	04/13/2015	< 0.002	< 0.001	0.056	< 0.001	0.91	1.8	< 0.001	180	22	< 0.004	< 0.002	< 0.25	< 0.002	< 0.001		0.0024	< 0.0002		0.0012	650	< 0.001	1500
G275	07/23/2015	< 0.001	< 0.001	0.035	< 0.001	3	4	< 0.001		30	< 0.004	< 0.002	0.307	< 0.001	0.001		0.012	< 0.0002	0.0014	0.0014	750	< 0.001	1500
G275	02/09/2016	< 0.001	< 0.001	0.042	< 0.001	4	2.3	< 0.001		26	< 0.004	< 0.002	0.349	0.0044	0.0016		0.0064	< 0.0002	< 0.001	< 0.001	470	< 0.001	1500
G275	05/12/2016	< 0.001	< 0.001	0.039	< 0.001	2.5	2.4	< 0.001		14	< 0.004	< 0.002	0.452	< 0.001	< 0.001		0.0036	< 0.0002	< 0.001	< 0.001	310	< 0.001	1300
G276	09/23/2009		< 0.005	0.16	0.0026		0.087	< 0.0025	94	38	< 0.025	< 0.005	0.75		0.035			< 0.0002		< 0.012	170	< 0.002	620
G276	11/11/2009	< 0.001	< 0.001	0.079	< 0.001	0.057	0.062	< 0.0005	91	40	0.0059	< 0.001	0.57	< 0.0005	0.0037		0.03	< 0.0002		< 0.0025	170	< 0.002	670
G276	01/21/2010	< 0.001	< 0.001	0.075	< 0.001	0.057	0.052	< 0.0005	91	36	< 0.005	< 0.001	0.53	< 0.0005	0.00079		0.0093	< 0.0002		< 0.0025	190	< 0.002	660
G276	03/09/2010									38			0.51								180		650
G276	03/10/2010	< 0.001	< 0.001	0.083	< 0.001	0.057	0.058	< 0.0005	110		< 0.005	< 0.001		< 0.0005	0.0016		0.01	< 0.0002		< 0.0025		< 0.002	
G276	05/28/2010	< 0.001	< 0.001	0.067	< 0.001	0.035	0.033	< 0.001	100	40	0.0051	< 0.002	0.49	< 0.001	< 0.001		0.012	< 0.0002		0.0014	190	< 0.001	720
G276	07/26/2010	< 0.001	< 0.001	0.063	< 0.001	0.023	0.022	< 0.001	93	40	< 0.004	< 0.002	0.54	< 0.001	< 0.001		0.0054	< 0.0002		< 0.001	230	< 0.001	710
G276	09/20/2010	< 0.001				0.024								< 0.001			0.005						
G276	11/16/2010	< 0.001	< 0.001			0.013	0.044	< 0.001	96	35				< 0.001	< 0.001		0.0018				200		670
G276	01/31/2011	< 0.001	0.0026	0.078	< 0.001	0.036	0.052	< 0.001	96	36	< 0.004	< 0.002	0.53	< 0.001	0.001		0.0041	< 0.0002		< 0.001	200	< 0.001	710
G276	05/03/2011	< 0.001	< 0.001			0.043	0.039	< 0.001	95	36				< 0.001	< 0.001		0.0016				200		650
G276	07/27/2011	< 0.001	< 0.001			0.011	< 0.01	< 0.001	96	37				< 0.001	< 0.001		0.001				170		670
G276	11/14/2011	< 0.001	0.0013			0.081	0.08	< 0.001	94	35				< 0.001	< 0.001		< 0.001				180		620
G276	01/31/2012	< 0.001	< 0.001	0.075	< 0.001	< 0.01	0.06	< 0.001	130	32	0.0052	< 0.002	0.501	< 0.001	< 0.001		< 0.001	< 0.0002		0.0022	190	< 0.001	650
G276	05/22/2012	< 0.001	0.0011			0.066	0.073	< 0.001	97	38				< 0.001	< 0.001		0.0014				160		660
G276	07/24/2012	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	100	38				< 0.001	< 0.001		< 0.001				190		680
G276	11/14/2012	< 0.001	0.0015			0.012	0.083	< 0.001	100	36				< 0.001	< 0.001		< 0.001				190		680
G276	01/31/2013	< 0.001	< 0.001	0.081	< 0.001	0.014	0.023	< 0.001	110	35	< 0.004	< 0.002	0.51	< 0.001	0.0011		< 0.001	< 0.0002		0.0031	250	< 0.001	680
G276	05/20/2013	< 0.001	< 0.001			0.036	0.031	< 0.001	99	3.8				< 0.001	< 0.001		< 0.001				180		640
G276	07/22/2013	< 0.001	< 0.001			0.022	< 0.01	< 0.001	100	32				< 0.001	< 0.001		< 0.001				220		670
G276	05/13/2014	< 0.001	0.0013			< 0.01	0.021	< 0.001	130	31				< 0.001	< 0.001		< 0.001				230		
G276	08/12/2014	< 0.001	0.0013			0.018	0.027	< 0.001	120	29				< 0.001	0.006		< 0.001				220		640
G276	10/14/2014	< 0.001	< 0.001			0.028	0.019	< 0.001	100	28				< 0.001	0.0024		< 0.001				220		700
G276	01/21/2015	< 0.001	< 0.001			0.015	0.021	< 0.001	100	30				< 0.001	< 0.001		< 0.001				260		700
G276	04/13/2015	< 0.002	0.0057	0.34	0.0016	< 0.02	0.036	< 0.001	170	34	0.043	0.0047	0.486	< 0.002	0.022		< 0.002	< 0.0002		0.0034	310	< 0.001	780
G276	07/23/2015	< 0.001	< 0.001	0.096	< 0.001	0.037	0.015	< 0.001		26	< 0.004	< 0.002	0.377	< 0.001	0.0012		< 0.001	< 0.0002	0.0012	0.001	180	< 0.001	800
G276	11/24/2015		< 0.001	0.077	< 0.001		0.043	< 0.001	120	28	< 0.004	< 0.002	0.345		< 0.001	0.013		< 0.0002	0.0017	< 0.001	190	< 0.001	710
G276	02/16/2016		< 0.001	0.09	< 0.001		0.021	< 0.001	120	23	< 0.004	< 0.002	0.456		0.0014	0.015		< 0.0002	0.0013	0.0018	230	< 0.001	760
G276	02/17/2016	< 0.001	< 0.001	0.089	< 0.001	0.027	0.029	< 0.001		28	< 0.004	< 0.002	0.456	< 0.001	< 0.001		< 0.001	< 0.0002	< 0.001	< 0.001	230	< 0.001	700
G276	05/12/2016	< 0.001	< 0.001	0.079	< 0.001	0.013	< 0.01	< 0.001	130	22	< 0.004	< 0.002	0.549	< 0.001	< 0.001	0.012	< 0.001	< 0.0002	< 0.001	0.0017	240	< 0.001	720
G276	08/03/2016		< 0.001	0.085	< 0.001		0.019	< 0.001	110	23	< 0.004	< 0.002	0.443		< 0.001	< 0.01		< 0.0002	< 0.001	0.0017	1900	< 0.001	680
G276	11/21/2016		< 0.001	0.081	< 0.001		< 0.01	< 0.001		23	< 0.004	< 0.002	0.445		< 0.001	0.011		< 0.0002	< 0.001	0.002	210	< 0.001	720
G277	09/23/2009		0.027	0.61	0.0027		0.11	< 0.0025	190	41	0.052	0.04	0.79		0.072			0.00023		< 0.012	79	< 0.002	
G277	09/24/2009																						430
G277	11/11/2009	0.021	0.02	0.22	0.0011	< 0.05	0.074	< 0.0005	110	43	0.037	0.017	0.47	0.028	0.029		1.6	< 0.0002		< 0.0025	49	< 0.002	680
G277	01/19/2010	< 0.001	0.0019	0.093	< 0.001	< 0.05	0.062	< 0.0005	92	39	0.0094	0.0019	0.41	< 0.0005	0.0037		0.02	< 0.0002		< 0.0025	63	< 0.002	
G277	01/20/2010																						550
G277	03/08/2010		< 0.001	0.075	< 0.001		0.065	< 0.0005	93	43	< 0.005	< 0.001	0.4		0.00092			< 0.0002		< 0.0025	49	< 0.002	540
G277	03/09/2010	< 0.001				0.073								< 0.0005			0.0037						
G277	05/28/2010	< 0.001	0.0023	0.092	< 0.001	0.02	0.021	< 0.001	100	46	0.033	< 0.002	0.4	< 0.001	0.0031		0.0011	< 0.0002		0.0032	58	< 0.001	580
G277	07/26/2010	< 0.001	0.0018	0.085	< 0.001	0.015	0.019	< 0.001	85	46	0.0092	< 0.002	0.42	< 0.001	0.0029		0.003	< 0.0002		0.0021	58	< 0.001	790
G277	09/20/2010	< 0.001				0.012								< 0.001			0.0055						
G277	11/16/2010	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	86					< 0.001	< 0.001		0.0021						
G277	01/31/2011	< 0.001	0.0015	0.085	< 0.001	0.016	0.025	< 0.001	97	40	< 0.004	< 0.002	0.38	< 0.001	0.0024		0.0031	< 0.0002		0.003	52	< 0.001	610
G277	05/03/2011	< 0.001	< 0.001			0.02	0.02	< 0.001	100	42				< 0.001	< 0.001		< 0.001				56		600
G277	07/27/2011	< 0.001	< 0.001			0.012	< 0.01	< 0.001	110	49				< 0.001	< 0.001		< 0.001				61		650

Well ID	Date	Arsenic, dissolved	Arsenic, total	Barium, total	Beryllium, total	Boron, dissolved	Boron, total	Cadmium, total	Calcium, total L	Chloride, total	Chromium, total	Cobalt, total	Fluoride, total	Lead, dissolved	Lead, total	Lithium, total	Manganese, dissolved	Mercury, total	Molybdenum, total	Selenium, total	Sulfate, total	Thallium, total	Total Dissolved Solids
G277	11/14/2011	< 0.001	0.0039			0.031	0.044	< 0.001	110	36				< 0.001	0.0056		0.0054				51		580
G277	01/31/2012		0.003	0.12	< 0.001		0.027	< 0.001	160	37	0.012	0.0022	0.326		0.0035			< 0.0002		0.0014	45	< 0.001	
G277	05/22/2012	< 0.001	< 0.001			0.021	0.026	< 0.001	110	30				< 0.001	< 0.001		0.0052				49		580
G277	07/24/2012									34											52		580
G277	07/25/2012	< 0.001	0.0011			< 0.01	< 0.01	< 0.001	110					< 0.001	0.0011		0.013						
G277	11/14/2012		0.001				< 0.01	< 0.001	120	11					0.0012						42		
G277	05/20/2013	< 0.001	< 0.001			0.022	0.018	< 0.001	110	3.3				< 0.001	< 0.001		< 0.001				5.7		520
G277	07/22/2013	< 0.001	< 0.001			0.02	0.021	< 0.001	93	18				< 0.001	< 0.001		< 0.001				45		500
G277	05/13/2014	< 0.001	0.0021			0.012	0.053	< 0.001	130	30				< 0.001	0.0019		< 0.001				60		
G277	10/15/2014		0.0023				0.024	< 0.001	84	3.6					0.0033						18		
G277	10/16/2014	< 0.001				0.032								< 0.001			0.003						360
G277	05/12/2016	< 0.001	0.0011	0.09	< 0.001	0.047	0.025	< 0.001		1.2	< 0.004	< 0.002	0.495	< 0.001	0.0013		0.0017	< 0.0002	0.001	< 0.001	15	< 0.001	460
G278	05/26/2010		0.0011	0.078	< 0.001		0.026	< 0.001	93	82	0.016	< 0.002	0.41		< 0.001			< 0.0002		0.0058	87	< 0.001	640
G278	05/28/2010	< 0.001				0.012								< 0.001			0.052						
G278	03/23/2011	< 0.001	0.0026	0.069	< 0.001	0.014	0.014	< 0.001	90	55	0.0063	< 0.002	0.55	< 0.001	0.0025		0.1	< 0.0002		0.0019	91	< 0.001	630
G278	05/03/2011	< 0.001	0.0056	0.15	< 0.001	< 0.01	0.026	< 0.001	97	60	0.022	0.0055	0.43	< 0.001	0.013		0.027	< 0.0002		0.0032	110	< 0.001	670
G278	07/25/2011	< 0.001	0.016	0.34	0.0018	< 0.01	0.023	< 0.001	170	62	0.034	0.018	0.42	< 0.001	0.033		0.032	< 0.0002		0.0029	100	< 0.001	690
G278	09/19/2011	< 0.001	0.0018	0.086	< 0.001	0.093	0.023	< 0.001	100	85	0.048	< 0.002	0.51	< 0.001	0.0031		0.04	< 0.0002		0.012	120	< 0.001	640
G278	05/22/2012	< 0.001	0.0032	0.098	< 0.001	0.017	0.017	< 0.001	110	82	0.007	0.0028	0.359	< 0.001	0.0059		0.46	< 0.0002		0.0025	120	< 0.001	730
G278	02/09/2016	< 0.001	0.004	0.11	< 0.001	0.54	0.54	< 0.001		310	0.0092	0.0034	0.336	< 0.001	0.008		0.14	< 0.0002	0.0014	0.041	680	< 0.001	1800
G278	05/13/2016	< 0.001	0.0067	0.19	< 0.001	0.5	0.2	< 0.001		180	0.017	0.0066	0.441	< 0.001	0.015		0.39	< 0.0002	0.0026	0.014	450	< 0.001	1500
G279	09/23/2009		0.0064	0.095	< 0.001		0.062	< 0.0005	90	59	0.01	0.0059	0.5		0.0092			< 0.0002		< 0.0025	99	< 0.002	620
G279	11/09/2009	< 0.001	< 0.001	0.065	< 0.001	0.062	0.056	< 0.0005	81	50	< 0.005	< 0.001	0.5	< 0.0005	0.00068		0.26	< 0.0002		< 0.0025	92	< 0.002	620
G279	01/27/2010	< 0.001	< 0.001	0.067	< 0.001	< 0.05	0.057	< 0.0005	80	54	< 0.005	< 0.001	0.43	< 0.0005	0.0013		0.094	< 0.0002		< 0.0025	88	< 0.002	630
G279	03/04/2010	< 0.001	< 0.001	0.065	< 0.001	< 0.05	< 0.05	< 0.0005	85	57	< 0.005	< 0.001	0.42	< 0.0005	0.00068		0.059	< 0.0002		< 0.0025	83	< 0.002	610
G279	05/26/2010	< 0.001	< 0.001	0.068	< 0.001	< 0.01	0.01	< 0.001	89	69	0.011	< 0.002	0.42	< 0.001	< 0.001		0.022	< 0.0002		0.005	100	< 0.001	680
G279	07/26/2010	< 0.001	< 0.001	0.062	< 0.001	< 0.01	< 0.01	< 0.001	91	64	< 0.004	< 0.002	0.43	< 0.001	< 0.001		0.019	< 0.0002		0.0015	88	< 0.001	670
G279	09/20/2010	< 0.001				< 0.01								< 0.001			0.014						
G279	11/16/2010	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	89	52				< 0.001	< 0.001		0.0088				96		600
G279	01/28/2011	< 0.001	0.0026	0.098	< 0.001	< 0.01	0.016	< 0.001	100	50	< 0.004	0.0029	0.44	< 0.001	0.0052		0.014	< 0.0002		0.0038	93	< 0.001	600
G279	05/04/2011	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	130	49				< 0.001	< 0.001		0.0033				100		630
G279	07/27/2011	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	83	51				< 0.001	< 0.001		0.0071				95		600
G279	11/14/2011	< 0.001	< 0.001			0.017	0.019	< 0.001	84	53				< 0.001	< 0.001		0.0035				95		580
G279	01/30/2012	< 0.001	< 0.001	0.05	< 0.001	< 0.01	< 0.01	< 0.001	120	51	< 0.004	< 0.002	0.54	< 0.001	< 0.001		0.0049	< 0.0002		0.0041	160	< 0.001	630
G279	05/22/2012	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	69	54				< 0.001	< 0.001		0.042				96		590
G279	07/24/2012	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	98	71				< 0.001	< 0.001		0.002				130		660
G279	11/14/2012	0.0019	0.0018			< 0.01	< 0.01	< 0.001	97	62				< 0.001	0.001		0.019				140		750
G279	01/31/2013	0.0014	< 0.001	0.06	< 0.001	< 0.01	< 0.01	< 0.001	120	60	< 0.004	< 0.002	0.418	< 0.001	< 0.001		0.0019	< 0.0002		0.0034	390	< 0.001	1200
G279	05/20/2013	< 0.001	0.0012			0.01	0.011	< 0.001	87	56				< 0.001	< 0.001		0.0011				180		600
G279	07/22/2013	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	88	55				< 0.001	< 0.001		0.0078				140		560
G279	10/14/2013	< 0.001	< 0.001			0.015	0.011	< 0.001	97	55				< 0.001	< 0.001		0.078				120		640
G279	02/19/2014	< 0.001	< 0.001	0.058	< 0.001	0.022	0.015	< 0.001	86	54	< 0.004	< 0.002	0.331	< 0.001	< 0.001		0.029	< 0.0002		< 0.001	110	< 0.001	
G279	05/13/2014	0.017	< 0.001			0.038	0.016	< 0.001	94	50				0.022	< 0.001		0.034				110		
G279	08/12/2014	< 0.001	< 0.001			0.015	0.11	< 0.001	97	56				< 0.001	< 0.001		0.024				120		600
G279	10/14/2014	< 0.001	< 0.001			0.025	0.012	< 0.001	92	63				< 0.001	< 0.001		0.026				140		650
G279	01/21/2015	< 0.001	< 0.001			0.032	0.031	< 0.001	100	74				< 0.001	< 0.001		0.017				230		810
G279	04/13/2015	< 0.002	0.0013	0.029	< 0.001	0.047	0.016	< 0.001	170	46	< 0.004	< 0.002	0.518	< 0.002	< 0.001		0.0033	0.00024		0.0056	470	< 0.001	800
G279	07/23/2015	< 0.001	0.002	0.11	< 0.001	0.031	0.065	< 0.001		96	0.0042	0.0025	0.361	< 0.001	0.0041		0.013	< 0.0002	0.0015	0.02	470	< 0.001	1200
G279	10/08/2015	< 0.001	0.0015	0.096	< 0.001	1.3	1.4	< 0.001		120	0.0047	0.0033	< 0.25	< 0.001	0.0025		0.032	< 0.0002	0.0015	0.017	810	< 0.001	1700
G279	11/24/2015		< 0.001	0.053	< 0.001		0.63	< 0.001	140	61	< 0.004	< 0.002	0.334		0.0015	0.014		< 0.0002	< 0.001	0.0041	520	< 0.001	1100
G279	02/16/2016	< 0.001	< 0.001	0.082	< 0.001	0.29	0.26	< 0.001	180	130	< 0.004	< 0.002	0.392	< 0.001	< 0.001	0.012	0.011	< 0.0002	0.043	0.017	610	< 0.001	1500
G279	05/13/2016	< 0.001	< 0.001	0.055	< 0.001	0.11	0.073	< 0.001	120	31	< 0.004	< 0.002	0.608	< 0.001	< 0.001	< 0.01	0.0061	< 0.0002	0.024	0.0043	270	< 0.001	700
G279	08/03/2016		< 0.001	0.069	< 0.001		0.24	< 0.001	210	110	< 0.004	< 0.002	0.394		< 0.001	< 0.01		< 0.0002	< 0.001	0.02	570	< 0.001	1300

Well ID	Date	Arsenic, dissolved	Arsenic, total	Barium, total	Beryllium, total	Boron, dissolved	Boron, total	Cadmium, total	Calcium, total L	Chloride, total	Chromium, total	Cobalt, total	Fluoride, total	Lead, dissolved	Lead, total	Lithium, total	Manganese, dissolved	Mercury, total	Molybdenum, total	Selenium, total	Sulfate, total	Thallium, total	Total Dissolved Solids
G279	11/22/2016		< 0.001	0.057	< 0.001		0.49	< 0.001		130	< 0.004	< 0.002	0.272		< 0.001	0.011		< 0.0002	< 0.001	0.017	720	< 0.001	1300
G280	03/11/2008	< 0.01	< 0.01	0.049	< 0.01	< 0.5	< 0.5	< 0.005	63	47	< 0.05	< 0.01	0.37	< 0.005	< 0.005		0.11	< 0.0002		< 0.025	60	< 0.002	420
G280	04/21/2008	< 0.001	< 0.001	0.058	< 0.001	0.06	0.062	< 0.0005	59	51	< 0.005	< 0.001	0.37	< 0.0005	0.00055		0.18	< 0.0002		0.0028	58	< 0.002	400
G280	06/11/2008	< 0.001	< 0.001	0.052	< 0.001	< 0.05	< 0.05	< 0.0005	66	43	< 0.005	< 0.001	0.33	< 0.0005	< 0.0005		0.13	< 0.0002		0.0027	62	< 0.002	430
G280	08/13/2008	< 0.001	< 0.001	0.053	< 0.001	0.05	< 0.05	< 0.0005	63	44	< 0.005	< 0.001	0.39	< 0.0005	< 0.0005		0.13	< 0.0002		0.0026	59	< 0.002	410
G280	10/13/2008	< 0.001	< 0.001	0.05	< 0.001	< 0.05	< 0.05	< 0.0005	69	45	< 0.005	< 0.001	0.35	< 0.0005	< 0.0005		0.078	< 0.0002		< 0.0025	60	< 0.002	450
G280	12/03/2008	< 0.001	< 0.001	0.11	< 0.001	< 0.05	< 0.05	< 0.0005	120	110	< 0.005	< 0.001	0.26	< 0.0005	0.0007		0.24	< 0.0002		< 0.0025	230	< 0.002	760
G280	09/21/2009	< 0.001	< 0.001			< 0.05	< 0.05	< 0.0005	59	40				< 0.0005	< 0.0005		0.012				43		380
G280	11/12/2009	< 0.001	< 0.001			< 0.05	< 0.05	< 0.0005	61	40				< 0.0005	< 0.0005		0.019				42		370
G280	01/28/2010	< 0.001	< 0.001			< 0.05	< 0.05	< 0.0005	60	41				< 0.0005	0.0006		0.0069				47		400
G280	02/11/2010			0.039	< 0.001						< 0.005	< 0.001	0.32					< 0.0002		0.0042		< 0.002	440
G280	06/09/2010	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	66	65				< 0.001	< 0.001		0.0031				82		510
G280	07/27/2010	< 0.001	< 0.001			0.01	< 0.01	< 0.001	60	60				< 0.001	< 0.001		< 0.001				80		520
G280	11/16/2010	< 0.001	0.001			< 0.01	< 0.01	< 0.001	58	35				< 0.001	< 0.001		0.018				43		370
G280	01/28/2011	< 0.001	0.0012	0.082	< 0.001	< 0.01	0.012	< 0.001	100	57	< 0.004	0.0024	0.36	< 0.001	0.0055		< 0.001	< 0.0002		0.0051	76	< 0.001	500
G280	05/04/2011	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	< 0.1	87				< 0.001	< 0.001		< 0.001				98		560
G280	07/27/2011	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	63	45				< 0.001	< 0.001		0.015				54		420
G280	11/11/2011	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	60	51				< 0.001	< 0.001		0.0033				59		390
G280	01/30/2012	< 0.001	< 0.001	0.047	< 0.001	< 0.01	< 0.01	< 0.001	81	54	< 0.004	< 0.002	0.44	< 0.001	< 0.001		< 0.001	< 0.0002		0.0055	68	< 0.001	440
G280	05/22/2012	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	65	67				< 0.001	< 0.001		< 0.001				93		470
G280	07/24/2012	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	72	48				< 0.001	0.0026		0.0073				51		360
G280	11/14/2012	0.0013	0.0021			< 0.01	< 0.01	< 0.001	63	46				< 0.001	0.0014		0.0081				48		440
G280	01/31/2013	< 0.001	< 0.001	0.036	< 0.001	< 0.01	< 0.01	< 0.001	63	46	< 0.004	< 0.002	0.423	< 0.001	< 0.001		< 0.001	< 0.0002		0.0042	54	< 0.001	380
G280	05/20/2013	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	67	59				< 0.001	< 0.001		< 0.001				71		410
G280	07/22/2013	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	73	52				< 0.001	< 0.001		< 0.001				67		400
G280	10/14/2013	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	72	51				< 0.001	< 0.001		< 0.001				65		480
G280	02/19/2014	< 0.001	< 0.001	0.041	< 0.001	< 0.01	< 0.01	< 0.001	69	56	< 0.004	< 0.002	0.338	< 0.001	< 0.001		< 0.001	< 0.0002		0.0031	74	< 0.001	
G280	05/13/2014	< 0.001	0.0014			0.017	0.029	< 0.001	73	55				< 0.001	0.001		< 0.001				78		
G280	08/12/2014	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	75	55				< 0.001	< 0.001		< 0.001				76		490
G280	10/14/2014	< 0.001	0.0012			0.013	< 0.01	< 0.001	76	60				< 0.001	0.002		< 0.001				83		480
G280	01/21/2015	< 0.001	< 0.001			< 0.01	< 0.01	< 0.001	74	62				< 0.001	< 0.001		< 0.001				87		540
G280	04/13/2015	< 0.002	< 0.001	0.045	< 0.001	0.025	< 0.01	< 0.001	71	67	< 0.004	< 0.002	0.358	< 0.002	< 0.001		0.026	< 0.0002		0.0037	86	< 0.001	480
G280	07/23/2015	< 0.001	< 0.001	0.049	< 0.001	0.01	< 0.01	< 0.001		53	< 0.004	< 0.002	0.415	< 0.001	< 0.001		0.074	< 0.0002	0.0019	0.0033	74	< 0.001	480
G280	10/08/2015	< 0.001	< 0.001	0.056	< 0.001	0.025	0.024	< 0.001		54	< 0.004	< 0.002	0.318	< 0.001	< 0.001		0.0035	< 0.0002	0.0074	0.0017	92	< 0.001	450
G280	11/24/2015		0.0066	0.11	< 0.001		0.029	< 0.001	120	54	0.019	0.0059	0.343		0.012	0.019		< 0.0002	0.0045	0.0032	94	< 0.001	460
G280	02/10/2016	< 0.001	< 0.001	0.048	< 0.001	0.012	< 0.01	< 0.001	60	55	< 0.004	< 0.002	0.466	< 0.001	0.0019	< 0.01	< 0.001	< 0.0002	0.0016	0.0033	84	< 0.001	410
G280	05/10/2016		< 0.001	0.045	< 0.001		< 0.01	< 0.001	63	50	< 0.004	< 0.002	0.429		< 0.001	< 0.01		< 0.0002	0.0014	0.0044	80	< 0.001	350
G280	05/13/2016	< 0.001	< 0.001	0.044	< 0.001	< 0.01	< 0.01	< 0.001		45	< 0.004	< 0.002	0.497	< 0.001	0.0014		< 0.001	< 0.0002	0.0014	0.0035	75	< 0.001	410
G280	08/03/2016		< 0.001	0.045	< 0.001		< 0.01	< 0.001	65	46	< 0.004	< 0.002	0.397		0.0014	< 0.01		< 0.0002	0.0016	0.0048	55	< 0.001	350
G280	11/20/2016		< 0.001	0.044	< 0.001		< 0.01	< 0.001		49	< 0.004	< 0.002	0.473		< 0.001	< 0.01		< 0.0002	0.0014	0.0034	67	< 0.001	430
G281	11/20/2015		0.0043	0.14	< 0.001		< 0.01	< 0.001	150	74	0.011	0.0056	0.349		0.0063	0.013		< 0.0002	0.0015	< 0.001	300	< 0.001	820
G281	02/11/2016		< 0.001	0.067	< 0.001		0.01	< 0.001	120	55	< 0.004	< 0.002	0.411		< 0.001	< 0.01		< 0.0002	< 0.001	< 0.001	340	< 0.001	740
G281	05/10/2016		< 0.001	0.072	< 0.001		< 0.01	< 0.001	130	72	< 0.004	< 0.002	0.405		< 0.001	< 0.01		< 0.0002	< 0.001	< 0.001	370	< 0.001	740
G281	08/01/2016		< 0.001	0.078	< 0.001		0.012	< 0.001	140	70	< 0.004	< 0.002	0.368		0.0011	< 0.01		< 0.0002	< 0.001	< 0.001	310	< 0.001	780
G281	08/31/2016	< 0.001				< 0.01								< 0.001			0.48						800
G401	11/21/2015		0.0046	0.037	< 0.001		3.3	< 0.001	440	3.6	0.0053	0.25	< 0.25		0.0031	0.055		< 0.0002	< 0.001	0.002	2300	< 0.001	3000
G401	02/22/2016		< 0.002	0.015	< 0.001		3.4	< 0.001	330	6	< 0.004	0.24	< 0.25		< 0.001	0.05		< 0.0002	< 0.001	< 0.002	2500	< 0.001	3000
G401	05/19/2016		0.0015	0.014	< 0.001		3.5	< 0.001	380	3	< 0.004	0.27	0.758		< 0.001	0.046		< 0.0002	< 0.001	< 0.001	2200	< 0.001	2800
G401	08/01/2016		0.004	0.053	< 0.001		4.1	0.0012	450	5.3	0.0096	0.28	< 0.25		0.0048	0.051		0.00093	< 0.001	0.0055	2100	< 0.001	2900
G401	11/17/2016		0.0027	0.021	< 0.001		4	0.0013		< 5	< 0.004	0.27	< 0.25		0.0029	0.054		< 0.0002	< 0.001	0.001	3400	< 0.001	3200
G402	11/21/2015		0.024	0.082	< 0.001		6.6	0.001	270	2.8	0.019	0.014	< 0.25		0.015	0.054		< 0.0002	0.006	0.002	1200	< 0.001	1700
G402	02/22/2016		0.027	0.11	< 0.001		5.7	< 0.001	220	2.8	0.031	0.015	0.355		0.018	0.057		< 0.0002	0.0049	0.0033	1000	< 0.001	1700
G402	05/19/2016		0.023	0.085	< 0.001		6.3	< 0.001	270	1.5	0.022	0.019	0.367		0.015	0.036		< 0.0002	0.0044	0.0016	960	< 0.001	1500

Well ID	Date	Arsenic, dissolved	Arsenic, total	Barium, total	Beryllium, total	Boron, dissolved	Boron, total	Cadmium, total	Calcium, total L	Chloride, total	Chromium, total	Cobalt, total	Fluoride, total	Lead, dissolved	Lead, total	Lithium, total	Manganese, dissolved	Mercury, total	Molybdenum, total	Selenium, total	Sulfate, total	Thallium, total	Total Dissolved Solids
G402	08/02/2016		0.01	0.047	< 0.001		7.4	< 0.001	240	2.2	0.0085	0.0074	0.33		0.0072	0.033		< 0.0002	0.0033	< 0.001	890	< 0.001	1500
G402	11/17/2016		0.012	0.054	< 0.001		6.9	< 0.001		2.6	0.011	0.007	0.463		0.0079	0.047		< 0.0002	0.0034	0.0012	1100	< 0.001	1700
G403	11/23/2015		0.0017	0.14	< 0.001		0.039	< 0.001	78	6.8	0.0062	< 0.002	0.442		0.0021	< 0.01		< 0.0002	0.004	< 0.001	35	< 0.001	320
G403	02/22/2016		< 0.001	0.13	< 0.001		0.064	< 0.001	69	4.1	< 0.004	< 0.002	0.518		< 0.001	< 0.01		< 0.0002	< 0.001	< 0.001	17	< 0.001	340
G403	05/18/2016		< 0.001	0.16	< 0.001		0.014	< 0.001	71	2.7	< 0.004	< 0.002	0.478		< 0.001	< 0.01		< 0.0002	0.0012	< 0.001	11	< 0.001	320
G403	08/01/2016		0.0033	0.24	< 0.001		0.027	< 0.001	140	4.5	0.0073	0.0029	0.485		0.0021	< 0.01		< 0.0002	0.0055	0.0068	9.9	< 0.001	320
G403	11/17/2016		0.0026	0.2	< 0.001		0.042	< 0.001		4	< 0.004	0.0024	0.539		< 0.001	< 0.01		< 0.0002	0.001	< 0.001	8.9	< 0.001	350
G404	11/21/2015		< 0.001	0.05	< 0.001		2.1	< 0.001	110	53	< 0.004	< 0.002	< 0.25		< 0.001	< 0.01		< 0.0002	< 0.001	< 0.001	180	< 0.001	580
G404	02/15/2016		< 0.001	0.043	< 0.001		1.6	< 0.001	110	49	< 0.004	< 0.002	< 0.25		< 0.001	< 0.01		< 0.0002	< 0.001	< 0.001	150	< 0.001	560
G404	05/19/2016		< 0.001	0.041	< 0.001		1.4	< 0.001	89	46	< 0.004	< 0.002	0.287		< 0.001	< 0.01		< 0.0002	< 0.001	< 0.001	140	< 0.001	460
G404	08/02/2016		< 0.001	0.055	< 0.001		3.2	< 0.001	120	62	< 0.004	< 0.002	< 0.25		< 0.001	< 0.01		< 0.0002	< 0.001	< 0.001	190	< 0.001	620
G404	11/22/2016		< 0.001	0.052	< 0.001		3.4	< 0.001		61	< 0.004	< 0.002	< 0.25		< 0.001	< 0.01		< 0.0002	< 0.001	< 0.001	380	< 0.001	880
G405	11/21/2015		0.014	0.051	< 0.001		17	0.0012	330	14	0.0051	0.0034	0.454		0.0085	< 0.01		< 0.0002	0.001	< 0.001	1700	< 0.001	2400
G405	02/15/2016		0.0028	0.018	< 0.001		16	< 0.001	320	11	< 0.004	< 0.002	0.459		0.0023	< 0.01		< 0.0002	< 0.001	< 0.001	1700	< 0.001	2500
G405	05/18/2016		0.0025	0.02	< 0.001		15	< 0.001	320	9.3	< 0.004	< 0.002	0.544		0.0011	< 0.01		< 0.0002	< 0.001	< 0.001	1800	< 0.001	2200
G405	08/02/2016		0.0063	0.028	< 0.001		17	< 0.001	280	3.4	< 0.004	0.0038	< 0.25		0.0018	< 0.01		< 0.0002	0.0016	< 0.001	1600	< 0.001	2200
G405	11/22/2016		0.0024	0.022	< 0.001		13	< 0.001		19	< 0.004	0.0021	0.525		0.0023	< 0.01		< 0.0002	0.0011	< 0.001	1400	< 0.001	2100
G406	08/30/2016	< 0.001				1.6								< 0.001			5.5						1300
G406	11/18/2016			0.024			1.9			4.4			0.345								910		1400
G407	08/30/2016	< 0.001				0.052								< 0.001			0.21						1400
G407	11/18/2016			0.024			0.078			14			0.289								830		1400
G45D	09/02/2016	0.0014				0.35								< 0.001			0.035						370
G46D	09/02/2016	0.0028				0.14								< 0.001			0.094						460

APPENDIX D

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.

Well Volume Calculations (2-inch well):

Schedule 40 PVC has an inside diameter of 2.067 inches.

$\therefore$ ((2.067 inches/12 inches/ft)/2)^2 • π • 1 ft of water = 0.0233 ft^3/ft of water.

0.0233 ft^3/ft • 7.48 gallons/ft^3 = 0.174 gallon/ft

Schedule 5 Stainless Steel (304 or 316) has an inside diameter of 2.245 inches.

$\therefore$ ((2.245 inches/12 inches/ft)/2)^2 • π • 1 ft of water = 0.0275 ft^3/ft of water.

0.0275 ft^3/ft • 7.48 gallons/ft^3 = 0.206 gallon/ft

Volume of well (in gallons) = well type gallon/ft • (DTB - DTW); where,
DTB $\equiv$ depth to bottom of well (from measuring point), and
DTW $\equiv$ depth to water (from measuring point)

Bailer Volumes:

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, 3$^{rd.}$ 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

ATTACHMENT J

Memorandum

Date: 25 October 2021

Subject: 35 I.A.C. Section 845.430 – Slope Maintenance Documentation for Ash Pond No. 2 at Coffeen Power Plant

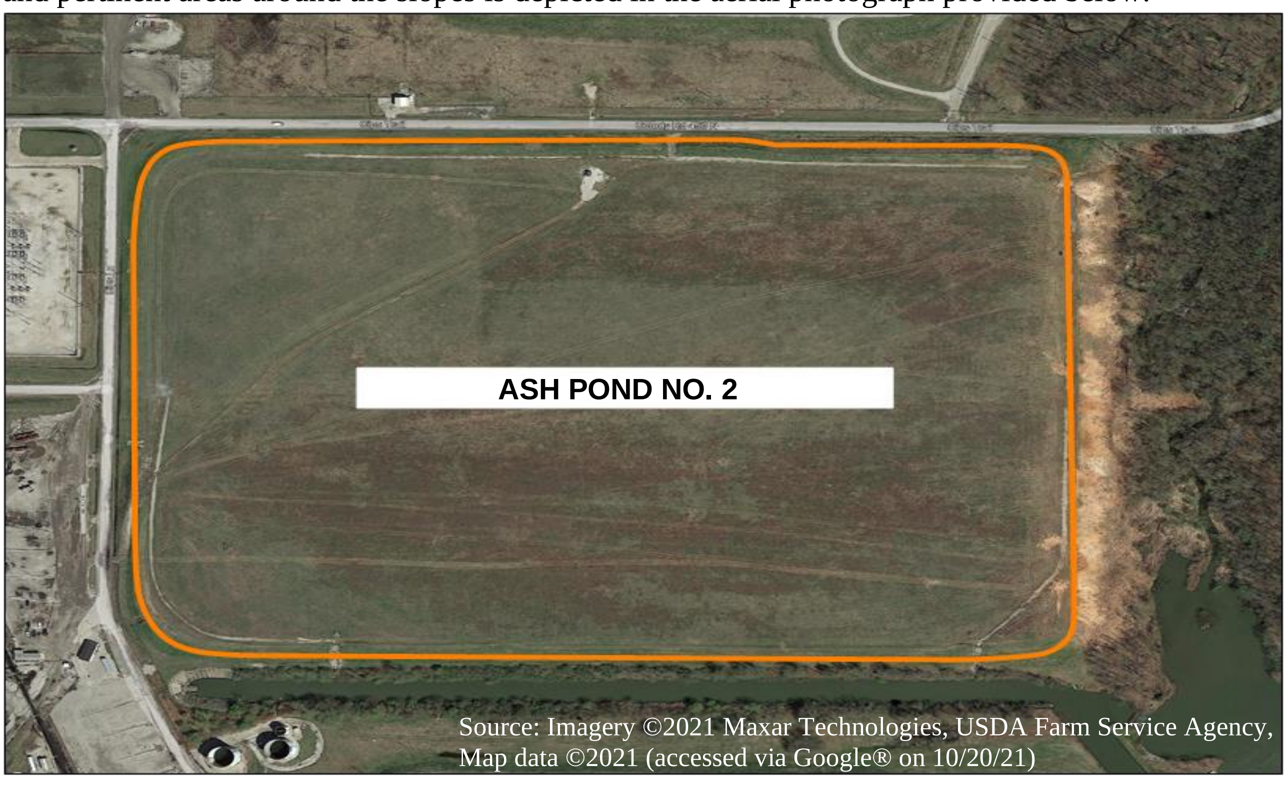
Illinois Power Generating Company operates the coal fired Coffeen Power Plant (Plant) located in Montgomery County, Illinois. The Ash Pond No. 2 is a closed inactive surface impoundment storing coal combustion residuals (CCR). The requirements for the Ash Pond No. 2 are found in 35 Ill. Admin. Code 845, Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments (Part 845).

Pursuant to Part 845, Section 845.230(d)(3)(C), the initial operating permit application for inactive closed CCR surface impoundments that have completed an Agency approved closure before prior to July 30, 2021, must contain documentation that the CCR surface impoundment, if not incised, will be operated, and maintained with one of the forms of slope protection specified in Section 845.430. This statement addresses the requirements of Part 845, Section 845.430 Slope Maintenance, which states:

> Section 845.430: *The slopes and pertinent surrounding areas of the CCR surface impoundment must be designed, constructed, operated, and maintained with one of the forms of slope protection specified in subsection (a) that meets all the performance standards of subsection (b).*
>
> Section 845.430(a): *Slope protection must consist of one of the following: 1) A vegetative cover consisting of grassy vegetation; 2) An engineered cover consisting of a single form or combination of forms of engineered slope protection measures; or 3) A combination of the forms of cover specified in subsections (a)(1) or (a)(2).*
>
> Section 845.430(b): *Any form of cover for slope protection must meet the following performance standards: 1) The cover must be installed and maintained on the slopes and pertinent surrounding areas of the CCR surface impoundment; 2) The cover must provide protection against surface erosion, wave action, and adverse effects of rapid drawdown; 3) The cover must be maintained to allow for the observation of, and access to, the slopes and pertinent surrounding areas during routine and emergency events; 4) Woody vegetation must be removed from the slopes or pertinent surrounding areas. Any removal of woody vegetation with a diameter greater than 1/2 inch must be directed by a person familiar with the design and operation of the CCR surface impoundment and in consideration of the complexities of removal of a tree or a shrubbery, who must ensure the removal does not create a risk of destabilizing the CCR surface impoundment or otherwise adversely affect the stability and safety of the CCR surface impoundment or*

> *personnel undertaking the removal; and 5) The height of vegetation must not exceed 12 inches.*

Slope protection, consisting of vegetative cover, was installed on the slopes and pertinent surrounding areas of the Coffeen Ash Pond 2, and is inspected, maintained, and repaired as needed. Based on observations from weekly inspections conducted in accordance with Section 845.540(a), and the 2020 annual inspections conducted by Hanson Professional Services Inc., the vegetative cover is described to be in good working condition with a maximum vegetation height of 12 inches. The owner's Operations and Maintenance Plan (O&M Plan) provides details for maintaining grass and removing woody vegetation and addressing erosion features on the slopes. Based on a review of the documentation described above, the owner is implementing the O&M Plan, including the completion of repairs and maintenance as needed and when issues are identified during weekly and/or annual inspections. The slope maintenance portion of the O&M Plan and the Annual Inspection performed by Hanson in 2020 are included in Attachment J. The surface impoundment slope protection (vegetative cover) installed and maintained on the slopes and pertinent areas around the slopes is depicted in the aerial photograph provided below.



Source: Imagery ©2021 Maxar Technologies, USDA Farm Service Agency, Map data ©2021 (accessed via Google® on 10/20/21)

Excerpt from the Coffeen AP2 Operations and Maintenance Manual

1.0 Dam Safety Requirements

1.1 Dam Safety Inspections - The plant's impoundment and flood prevention structures shall be inspected and maintained in a manner to ensure safe and environmentally responsible operations. A regular maintenance program shall be performed and shall consist of the following inspection items:

1. Earth embankments: Walk the crest, side slopes, and downstream toe of the dam concentrating on surface erosion, seepage, cracks, settlement, slumps, slides, and animal burrows. Frequency of inspection: Weekly.
2. Vegetation: Grass should be a thick vigorous growth to stabilize the earth embankment soils and prevent erosion form occurring. There should be NO trees on the earth embankment and none within a minimum of 20 feet of the embankment toe or other structures. Mowing frequency: Semiannually.
3. Well Readings: Record level of wells on the crest and toe of the berm. Frequency: Quarterly.
4. Special Inspections – Special inspections of the levees and ash pond berms shall be performed after earthquakes, floods, water level exceedance in the ponds, or heavy rainfall events. Inspection and report shall be equal to an annual inspection level of detail. Water level in the pond should be noted after a heavy rainfall. Dam Safety staff shall accompany plant personnel on special inspections. Frequency: As required.

Dam Inspection Report

Name of Dam: Coffeen Ash Pond #2 Dam — Dam ID No.: None

Permit Number: None — Class of Dam: NA

Location: SW 1/4 Section 11 Township 7N Range 3W

Owner

Dynegy Midwest Generation, LLC	217-534-7668
Name	Telephone Number (Day)
134 CIPS Lane	217-534-7668
Street	Telephone Number (Night)

Coffeen, IL	52017	County: Montgomery
City	Zip Code	

Type of Dam: Earth Embankment

Type of Spillway: Surface Riprapped Channels Around Perimeter of Embankment

Date(s) Inspected: 16-Nov-20

Weather When Inspected: Clear

Temperature When Inspected: 50° F

Pool Elevation When Inspected: NA - pond is closed and capped

Tailwater Elevation When Inspected: NA

LICENSED PROFESSIONAL ENGINEER
JAMES P. KNUTELSKI
062-054206
OF ILLINOIS

J Knut 12/30/2020
EXP 11/30/21

Professional Engineer's Seal

Inspection Personnel:

Name	Title
James Knutelski, PE	Geotechnical Engineer
Jason Campbell, PE	Dynegy Dam Safety Manager
Gina Kramer	IDNR-OWR
John Romang	Coffeen Plant

CONDITION CODES

NE -	No evidence of a problem
GC -	Good condition
MM -	Item needing minor maintenance and/or repairs within the year, the safety or integrity of the item is not yet imperiled
IM -	Item needing immediate maintenance to restore or ensure its safety or integrity
EC -	Emergency condition which if not immediately repaired or other appropriate measures taken could lead to failure of the dam
OB -	Condition requires regular observation to ensure that the condition does not become worse
NA -	Not applicable to this dam
NI -	Not inspected - list the reason for non-inspection under deficiencies

EARTH EMBANKMENT

ITEM	CONDITION CODE	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Surface Cracks	NE		
Vertical and Horizontal Alignment of Crest	GC		Pond has been closed and re-graded.
Unusual Movement or Cracking At or Beyond Toe	NE		
Sloughing or Erosion of Embankment and Abutment Slopes	NE		
Upstream Face Slope Protection	NA		
Seepage	NA		
Filter and Filter Drains	NA		

EARTH EMBANKMENT
(Continued)

ITEM	CONDITION CODE	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Animal Damage	NE		Ash pond is under construction for capping and closure. Contractor is responsible for all items during construction.
Embankment Drainage Ditches	GC		
Vegetative Cover	NE		
Let-down Channels	GC		
Other			
Other			
Other			

PRINCIPAL SPILLWAY
APPROACH CHANNEL

ITEM	CONDITION CODE	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Debris	NE		Ash pond is under construction for capping and closure. Contractor is responsible for all items during construction.
Side Slope Stability	NE		
Slope Protection	GC		
Other (Name)	NA		
Other	NA		
Other	NA		
Other	NA		

EMERGENCY SPILLWAY

☐ Earth　　　　Other: Name None

ITEM	CONDITION CODE	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Erosion	NA		
Weeds, Logs, Other Obstructions	NA		
Side Slope Sloughing	NA		
Vegetation	NA		
Sedimentation	NA		
Riprap	NA		
Settlement of Crest	NA		
Downstream Channel	NA		
Other (Name)	NA		

SUMMARY OF MAINTENANCE DONE AND/OR

REPAIRS MADE SINCE THE LAST INSPECTION

DATE OF PRESENT INSPECTION	16-Nov-20
DATE OF LAST INSPECTION	22-Oct-19

1. EARTH EMBANKMENT DAMS
   Ash pond is under construction for capping and closure. Contractor is responsible for all items during construction.

2. CONCRETE MASONRY DAMS

   NA

3. PRINCIPAL SPILLWAY

   None Noted

4. OUTLET WORKS

   NA

5. EMERGENCY SPILLWAY

   NA

Owner's Maintenance Statement

I, ______________________________, owner of Coffeen Ash Pond #2 Dam,

Dam Identification Number None, in Montgomery County,

am maintaining the dam in accordance with the accepted maintenance plan which is part of

Permit Number None.

____
Signature

____
Date

Owner's Operation and Maintenance Plan Statement

I, ______________________________, owner of Coffeen Ash Pond #2 Dam,

Dam Identification Number None, in Montgomery County,

have reviewed the operation and maintenance plan including the Emergency Action Plan (EAP),

which is part of, Permit Number None.

I _____ have enclosed the appropriate revisions or

_____ have determined that no revisions to the plan are necessary.

____
Signature

____
Date

The Department of Nautural Resources is requesting information that is necessary to accomplish the statutory purpose as outlined under the River, Lakes and Streams Act, 615 ILCS 5. Submittal of this information is REQUIRED. Failure to provide the required information could result in the initiation of non-compliance procedures as outlined in Section 3702.160 of the "Rules for Construction and Maintenance of Dams".


East slope and interior


East slope

East toe area

South slope

South slope and interior

West slope

North slope

Southwest corner – lined ditch

Let-down structure - typical

ATTACHMENT K

POST-CLOSURE PLAN FOR EXISTING CCR SURFACE IMPOUNDMENT
40 C.F.R. § 257.104 and 35 I.A.C. 845.780
REV 0 –10/30/2021

SITE INFORMATION			
Site Name / Address	Coffeen Power Plant / 134 Cips Lane, Coffeen, IL 61207		
Owner Name / Address	Illinois Power Generating Company / 6555 Sierra Drive Irving, Texas 75039		
CCR Unit	Ash Pond No. 2	Closure Method and Final Cover Type	Closed In-Place Geomembrane with Soil and Vegetation Cover

POST-CLOSURE PLAN DESCRIPTION	
40 C.F.R. § 257.104(c)(1) and 35 I.A.C. 845.780(c)(1) – Length of post-closure care period.	Post-closure care will be conducted for a period of 30 years as required by 40 C.F.R. § 257.104(c)(1) and 35 I.A.C. 845.780(c)(1), except as provided by 40 C.F.R. § 257.104(c)(2) and 35 I.A.C. 845.780(c)(2).
40 C.F.R. § 257.104(c)(2) and 35 I.A.C. 845.780(c)(2) – Circumstances extending the post closure care period.	If at the end of the post-closure care period the CCR unit is operating under assessment monitoring in accordance with §257.95, the post-closure care as described in this plan will continue until returning to detection monitoring in accordance with §257.95. Under 35 I.A.C. 845.780(c)(2), the post-closure care period will be extended until groundwater monitoring data demonstrate that concentrations are below the groundwater protection standards in Section 845.600 and are not increasing for those constituents over background, using the statistical procedures and performance standards in Section 845.640(f) and (g), provided that concentrations have been reduced to the maximum extent feasible and concentrations are protective of human health and the environment.
40 C.F.R. § 257.104(d)(1)(i) and 35 I.A.C. 845.780(d)(1)(A) – A description of the monitoring and maintenance activities required in40 C.F.R. § 257.104(b) and 35 I.A.C. 845.780(b), and the frequency at which these activities will be performed, to maintain the integrity and effectiveness of the final cover system, maintain the groundwater monitoring system and monitor the groundwater.	Pursuant to § 257.104(b)(1) and 35 I.A.C. 845.780(b)(1), throughout the post-closure care period, periodic visual observations of the final cover system and stormwater management system will be performed at least annually for evidence of settlement, subsidence, erosion, or other damage that may adversely affect the integrity and effectiveness of the final cover system. When practical, visual observations of the final cover will be made concurrent with groundwater monitoring activities. Noted evidence of damage, such as damage to the geosynthetic components, rills, surface cracks and settlement, will be repaired to maintain the integrity and effectiveness of the final cover system. Vegetation will be established and maintained on the final cover system, including storm drainage areas, where appropriate, to provide long-term erosion control. Established vegetation and the slope design of the final cover system will prevent potential erosion and damage that may be caused by run-on and run-off. Repair activities may include, but are not limited to, repairing or replacing damaged geosynthetic components, replacing and

	compacting soil cover, repairing drainage channels that have been eroded, filling in depressions with soil, regrading, and reseeding areas of failed vegetation, as necessary. Pursuant to § 257.104(b)(3) and 35 I.A.C. 845.780(b)(3), the groundwater monitoring system will be maintained, and groundwater will be monitored as required by 40 C.F.R. § 257.90 through 40 C.F.R. § 257.98 and 35 I.A.C. 845.600 through 35 I.A.C. 845.680. Monitoring wells will be inspected during each groundwater sampling event. Monitoring wells and associated instrumentation will be maintained so that they perform to the design specifications throughout the life of the monitoring program. Groundwater monitoring frequency will be at least quarterly, except as provided in 40 C.F.R. § 257.94(d), 257.94(c), and 35 I.A.C. 845.650(b)(4).
40 C.F.R. § 257.104(d)(1)(ii) and 35 I.A.C. 845.780(d)(1)(B) – The name, address, telephone number and email address of the person or office to contact about the facility during the post-closure care period.	Illinois Power Generating Company 6555 Sierra Drive Irving, Texas 75039 800.633.4704 ccr@dynegy.com
40 C.F.R. § 257.104(d)(1)(iii) and 35 I.A.C. 845.780(d)(1)(C) – A description of the planned uses of the property during the post-closure period.	The CCR unit is located at a retired electric generation facility. Planned uses of the property during the post-closure period are currently unknown, except for post-closure care of the CCR unit. Post-closure use of the property will not disturb the integrity of the final cover system or other components of the containment system, or the function of the monitoring systems unless necessary to comply with the requirements of 40 C.F.R. Part § 257, Subpart D and 35 I.A.C. Part 845. Any other disturbance will be conducted following a demonstration that it will not increase the potential threat to human health or the environment, as required by 40 C.F.R. § 257.104(d)(1)(iii) and 35 I.A.C. 845.780 (d)(1)(C). The demonstration will be certified by a qualified professional engineer and submitted to the Illinois Environmental Protection Agency (IEPA). Per 40 C.F.R. § 257.104(d)(1)(iii) notification shall be provided to the State Director that the demonstration has been placed in the operating record and on the owners or operator's publicly accessible internet site. This CCR unit is closed. A notation on the deed to the property, or some other instrument that is normally examined during title search, will be recorded in accordance with 40 C.F.R. § 257.102(i) and 35 I.A.C. 845.760(h). The notation will notify potential purchasers of the property that the land has been used as a CCR unit and its use is restricted under the post-closure care requirements in 40 C.F.R. § 257.104(d)(1)(iii) and 35 I.A.C. 845.780(d)(1)(C) or groundwater monitoring requirements per 35 I.A.C. 845.740(b). Within 30 days of recording the deed notation, a notification stating that the notation has been recorded will be submitted to the IEPA and placed in the facility's operating record per 35 I.A.C. 845.760(h)(3). The notification will be placed on the owner or operator's publicly accessible CCR Web site in accordance with 40 C.F.R. § 257.107(i)(9) and 35 I.A.C. 845.810(e) and placed in the facility's operating record as required by 35 I.A.C. 845.800(d)(26) and §257.105(i)(9).

40 C.F.R. § 257.104(d)(3)(and 35 I.A.C. 845.780(d)(3) – Amendments to the initial or subsequent written post-closure plan.	Pursuant to 40 C.F.R. § 257.104(d), the initial post closure care plan for the Coffeen Ash Pond No. 2 was prepared on October 17, 2016. That plan is being amended pursuant to 40 C.F.R. § 257.104(d)(3)(i). This plan also serves as the initial post-closure care plan, prepared in accordance with 35 I.A.C. 845.780(d). Pursuant to § 257.104(d)(3) and 35 I.A.C. 845.780(d)(3), an operating permit modification application to amend the initial or any subsequent written post-closure care plan developed under 35 I.A.C. 845.780 (d)(1) and § 257.104(d)(1) will be submitted to IEPA. The written post-closure care plan will be amended whenever there is a change in the operation of the CCR surface impoundment that would substantially affect the written post-closure care plan in effect; or unanticipated events necessitate a revision of the written post-closure care plan, after post-closure activities have started. The written post-closure care plan will be amended at least 60 days before a planned change in the operation of the facility or CCR surface impoundment, or within 60 days after an unanticipated event requires the need to revise the existing plan. If the plan is revised after post-closure activities have started, a request to modify the operating permit, including an amended written post-closure care plan, will be submitted to the IEPA within 30 days following the triggering event.
40 C.F.R. § 257.104(d)(4) and 35 I.A.C. 845.780(d)(4) – Qualified professional engineering certification.	Certification by a qualified professional engineer will be appended to this plan and any amendment of this plan.
35 I.A.C. 845.780(e) – Termination of post-closure care.	Upon completion of the post-closure period, a request to terminate post-closure care will be submitted to the IEPA. The request will include a certification by a qualified professional engineer verifying that post-closure care has been completed in accordance with the post-closure care plan specified in 35 I.A.C. 845.780(d) and the requirements of 35 I.A.C. 845.780.
40 C.F.R. § 257.104(e) and 35 I.A.C. 845.780(f) – Notification of completion of the post-closure care period.	A notification of completion of post-closure care will be prepared and placed in the facility's operating record within 30 days after IEPA approval of the request to terminate post-closure care. The notification will be placed in the facility's operating record in accordance with 35 I.A.C. 845.800(d)(31) and § 257.105(i)(13). The notification will be placed on the owner or operator's publicly accessible CCR Internet site in accordance with the requirements of § 257.107(i)(13) and 35 I.A.C. 845.810(e). The IEPA will be notified when the notification has been placed in the operating record and on the owner or operator's publicly accessible Internet site in accordance with the requirements of § 257.106(i)(13).

Certification Statement 40 C.F.R. § 257.104 (d)(4) and 35 I.A.C. 845.780(d)(4) – Amended/Initial Written Post Closure Plan for a CCR Surface Impoundment

CCR Unit: Illinois Power Generating Company; Coffeen Power Plant; Ash Pond No. 2

I, John R. Hesemann, 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 certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above referenced CCR Unit, that the information contained in the amended/initial written post closure plan, dated October 30, 2021, meets the requirements of 40 C.F.R. § 257.104 and 35 I.A.C. 845.780.

John R. Hesemann

Printed Name

9/27/2021

Date

JOHN ROBERT HESEMANN
062-058523
LICENSED PROFESSIONAL ENGINEER OF
ILLINOIS

John R. Hesemann

Exp.: 11/30/2021

ATTACHMENT M

HISTORY OF POTENTIAL EXCEEDANCES

This presentation 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 Coffeen Power Plant Ash Pond No. 2, Illinois Environmental Protection Agency (IEPA) ID No. W1350150004-02.

Note

Groundwater concentrations observed from 2015 to 2021 in monitoring wells included in an existing groundwater monitoring program or installed in 2021 have been evaluated and summarized in the following tables. These concentrations are considered potential exceedances because the methodology used to determine them is proposed in the Statistical Analysis Plan (Appendix A to Groundwater Monitoring Plan [GMP]), which has not been reviewed or approved by IEPA at the time of submittal of the 35 I.A.C. § 845 Operating Permit application.

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.

Results for G154, G279, G410, and G411 are provided in Tables 1 and 2 because they were included in the previously approved GMP. As discussed in the GMP Addendum, wells G154, G279, G410, and G411 have been removed from the monitoring program because these locations are not downgradient of Ash Pond No. 2.

Background Concentrations

Background monitoring wells identified in the GMP include G281, G270, and G280.

Background concentrations calculated from sampling events in 2015-2017 were compared to the standards identified in 35 I.A.C. § 845.600(a)(1). For constituents with calculated background concentrations in 2015-2017 greater than the standards in 35 I.A.C. § 845.600(a)(1), those calculated background concentrations were used as Groundwater Protection Standards (GWPSs) for comparing to statistical calculation results for each compliance well to determine potential exceedances. Compliance well statistical calculations consider concentrations from all sampling events in 2015-2021.

Corrective Action

A Corrective Measures Assessment (CMA) was completed to address statistically significant levels of total cobalt and total lithium, as required by 40 C.F.R. § 257.96. The CMA indicated the source control measure consists of closure in place with a geomembrane cover system in accordance with the Closure and Post Closure Care Plan submitted to the IEPA in January 2017 and approved on January 30, 2018. Closure construction began in July of 2019 and was completed on November 17, 2020.

Activities completed associated with the selection of a groundwater remedy include review of existing groundwater and source water data, and collection of additional samples of groundwater, source water, surface water, and aquifer solids to support analysis of natural attenuation *mechanisms, rates, and aquifer capacity. Preliminary results indicate that site-specific conditions are favorable for implementation of monitored natural attenuation (MNA) in combination with the recently completed closure referenced above.*

TABLE 1. DETERMINATION OF POTENTIAL EXCEEDANCES
HISTORY OF POTENTIAL EXCEEDANCES
COFFEEN POWER PLANT
ASH POND NO. 2
COFFEEN, ILLINOIS

Sample Location	HSU	Constituent	Result Unit	Sample Date Range	Statistical Calculation	Statistical Result	GWPS	Background	Part 845 Standard	GWPS Source
G154	UA	Antimony, total	mg/L	10/13/2020 - 08/18/2021	All ND - Last	0.003	0.006	0.003	0.006	Standard
G154	UA	Arsenic, total	mg/L	10/13/2020 - 08/18/2021	CI around median	0	0.010	0.0043	0.01	Standard
G154	UA	Barium, total	mg/L	10/13/2020 - 08/18/2021	CI around mean	0.036	2.0	0.18	2	Standard
G154	UA	Beryllium, total	mg/L	10/13/2020 - 08/18/2021	All ND - Last	0.001	0.004	0.001	0.004	Standard
G154	UA	Boron, total	mg/L	10/13/2020 - 08/18/2021	CI around mean	0.010	2.0	0.022	2	Standard
G154	UA	Cadmium,total	mg/L	10/13/2020 - 08/18/2021	All ND - Last	0.001	0.005	0.001	0.005	Standard
G154	UA	Chloride, total	mg/L	10/13/2020 - 08/18/2021	CI around mean	8.3	200	75	200	Standard
G154	UA	Chromium, total	mg/L	10/13/2020 - 08/18/2021	All ND - Last	0.004	0.10	0.011	0.1	Standard
G154	UA	Cobalt, total	mg/L	10/13/2020 - 08/18/2021	All ND - Last	0.002	0.006	0.0056	0.006	Standard
G154	UA	Fluoride, total	mg/L	10/13/2020 - 08/18/2021	CI around mean	0.61	4.0	0.49	4	Standard
G154	UA	Lead, total	mg/L	10/13/2020 - 08/18/2021	CI around median	0	0.0075	0.0063	0.0075	Standard
G154	UA	Lithium, total	mg/L	10/13/2020 - 08/18/2021	All ND - Last	0.020	0.040	0.013	0.04	Standard
G154	UA	Mercury, total	mg/L	10/13/2020 - 08/18/2021	CI around median	0	0.002	0.0002	0.002	Standard
G154	UA	Molybdenum, total	mg/L	10/13/2020 - 08/18/2021	CI around mean	0.000919	0.10	0.0015	0.1	Standard
G154	UA	pH (field)	SU	01/21/2015 - 08/18/2021	CI around mean	6.9	6.5/9.0	6.7/7.3	6.5/9	Standard/Standard
G154	UA	Radium-226 + Radium 228, tot	pCi/L	10/13/2020 - 08/18/2021	CI around mean	-0.901	5.0	2.0	5	Standard
G154	UA	Selenium, total	mg/L	10/13/2020 - 08/18/2021	CI around mean	0.00111	0.050	0.0012	0.05	Standard
G154	UA	Sulfate, total	mg/L	10/13/2020 - 08/18/2021	CI around mean	66	400	370	400	Standard
G154	UA	Thallium, total	mg/L	10/13/2020 - 08/18/2021	All ND - Last	0.001	0.002	0.001	0.002	Standard
G154	UA	Total Dissolved Solids	mg/L	01/21/2015 - 08/18/2021	CI around mean	422	1200	840	1200	Standard
G279	UA	Antimony, total	mg/L	04/13/2015 - 08/18/2021	All ND - Last	0.003	0.006	0.003	0.006	Standard
G279	UA	Arsenic, total	mg/L	01/21/2015 - 08/18/2021	CI around median	0.001	0.010	0.0043	0.01	Standard
G279	UA	Barium, total	mg/L	04/13/2015 - 08/18/2021	CB around linear reg	0.020	2.0	0.18	2	Standard
G279	UA	Beryllium, total	mg/L	04/13/2015 - 08/18/2021	All ND - Last	0.001	0.004	0.001	0.004	Standard
G279	UA	Boron, total	mg/L	01/21/2015 - 08/18/2021	CI around geomean	0.085	2.0	0.022	2	Standard
G279	UA	Cadmium,total	mg/L	01/21/2015 - 08/18/2021	All ND - Last	0.001	0.005	0.001	0.005	Standard

RAMBOLL

TABLE 1. DETERMINATION OF POTENTIAL EXCEEDANCES
HISTORY OF POTENTIAL EXCEEDANCES
COFFEEN POWER PLANT
ASH POND NO. 2
COFFEEN, ILLINOIS

Sample Location	HSU	Constituent	Result Unit	Sample Date Range	Statistical Calculation	Statistical Result	GWPS	Background	Part 845 Standard	GWPS Source
G279	UA	Chloride, total	mg/L	01/21/2015 - 08/18/2021	CI around median	57	200	75	200	Standard
G279	UA	Chromium, total	mg/L	04/13/2015 - 08/18/2021	CI around median	0.004	0.10	0.011	0.1	Standard
G279	UA	Cobalt, total	mg/L	04/13/2015 - 08/18/2021	CI around median	0.002	0.006	0.0056	0.006	Standard
G279	UA	Fluoride, total	mg/L	04/13/2015 - 08/18/2021	CI around mean	0.33	4.0	0.49	4	Standard
G279	UA	Lead, total	mg/L	01/21/2015 - 08/18/2021	CI around median	0.001	0.0075	0.0063	0.0075	Standard
G279	UA	Lithium, total	mg/L	11/24/2015 - 08/18/2021	CI around median	0.010	0.040	0.013	0.04	Standard
G279	UA	Mercury, total	mg/L	04/13/2015 - 08/18/2021	CI around median	0.0002	0.002	0.0002	0.002	Standard
G279	UA	Molybdenum, total	mg/L	07/23/2015 - 08/18/2021	CB around T-S line	0.000541	0.10	0.0015	0.1	Standard
G279	UA	pH (field)	SU	01/21/2015 - 08/18/2021	CI around mean	6.9	6.5/9.0	6.7/7.3	6.5/9	Standard/Standard
G279	UA	Radium-226 + Radium 228, tot	pCi/L	11/24/2015 - 08/18/2021	CI around mean	0.65	5.0	2.0	5	Standard
G279	UA	Selenium, total	mg/L	04/13/2015 - 08/18/2021	CB around linear reg	-0.0027	0.050	0.0012	0.05	Standard
G279	UA	Sulfate, total	mg/L	01/21/2015 - 08/18/2021	CI around geomean	323	400	370	400	Standard
G279	UA	Thallium, total	mg/L	04/13/2015 - 08/18/2021	All ND - Last	0.001	0.002	0.001	0.002	Standard
G279	UA	Total Dissolved Solids	mg/L	01/21/2015 - 08/18/2021	CI around geomean	938	1200	840	1200	Standard
G401	UA	Antimony, total	mg/L	11/21/2015 - 08/17/2021	All ND - Last	0.003	0.006	0.003	0.006	Standard
G401	UA	Arsenic, total	mg/L	11/21/2015 - 08/17/2021	CI around geomean	0.00191	0.010	0.0043	0.01	Standard
G401	UA	Barium, total	mg/L	11/21/2015 - 08/17/2021	CI around geomean	0.019	2.0	0.18	2	Standard
G401	UA	Beryllium, total	mg/L	11/21/2015 - 08/17/2021	CI around median	0.001	0.004	0.001	0.004	Standard
G401	UA	Boron, total	mg/L	11/21/2015 - 08/17/2021	CI around median	3.5	2.0	0.022	2	Standard
G401	UA	Cadmium,total	mg/L	11/21/2015 - 08/17/2021	CI around median	0.001	0.005	0.001	0.005	Standard
G401	UA	Chloride, total	mg/L	11/21/2015 - 08/17/2021	CI around geomean	2.7	200	75	200	Standard
G401	UA	Chromium, total	mg/L	11/21/2015 - 08/17/2021	CI around median	0.004	0.10	0.011	0.1	Standard
G401	UA	Cobalt, total	mg/L	11/21/2015 - 08/17/2021	CI around mean	0.22	0.006	0.0056	0.006	Standard
G401	UA	Fluoride, total	mg/L	11/21/2015 - 08/17/2021	CI around median	0.25	4.0	0.49	4	Standard
G401	UA	Lead, total	mg/L	11/21/2015 - 08/17/2021	CI around median	0.001	0.0075	0.0063	0.0075	Standard
G401	UA	Lithium, total	mg/L	11/21/2015 - 08/17/2021	CI around geomean	0.039	0.040	0.013	0.04	Standard

TABLE 1. DETERMINATION OF POTENTIAL EXCEEDANCES
HISTORY OF POTENTIAL EXCEEDANCES
COFFEEN POWER PLANT
ASH POND NO. 2
COFFEEN, ILLINOIS

Sample Location	HSU	Constituent	Result Unit	Sample Date Range	Statistical Calculation	Statistical Result	GWPS	Background	Part 845 Standard	GWPS Source
G401	UA	Mercury, total	mg/L	11/21/2015 - 08/17/2021	CI around median	0.0002	0.002	0.0002	0.002	Standard
G401	UA	Molybdenum, total	mg/L	11/21/2015 - 08/17/2021	CI around median	0.001	0.10	0.0015	0.1	Standard
G401	UA	pH (field)	SU	11/21/2015 - 08/17/2021	CI around mean	6.0	6.5/9.0	6.7/7.3	6.5/9	Standard/Standard
G401	UA	Radium-226 + Radium 228, tot	pCi/L	11/21/2015 - 08/17/2021	CI around geomean	0.74	5.0	2.0	5	Standard
G401	UA	Selenium, total	mg/L	11/21/2015 - 08/17/2021	CI around median	0.001	0.050	0.0012	0.05	Standard
G401	UA	Sulfate, total	mg/L	11/21/2015 - 08/17/2021	CI around median	2000	400	370	400	Standard
G401	UA	Thallium, total	mg/L	11/21/2015 - 08/17/2021	All ND - Last	0.001	0.002	0.001	0.002	Standard
G401	UA	Total Dissolved Solids	mg/L	11/21/2015 - 08/17/2021	CI around median	2800	1200	840	1200	Standard
G402	UA	Antimony, total	mg/L	11/21/2015 - 08/17/2021	All ND - Last	0.003	0.006	0.003	0.006	Standard
G402	UA	Arsenic, total	mg/L	11/21/2015 - 08/17/2021	CB around linear reg	-0.00803	0.010	0.0043	0.01	Standard
G402	UA	Barium, total	mg/L	11/21/2015 - 08/17/2021	CB around linear reg	-0.00763	2.0	0.18	2	Standard
G402	UA	Beryllium, total	mg/L	11/21/2015 - 08/17/2021	All ND - Last	0.001	0.004	0.001	0.004	Standard
G402	UA	Boron, total	mg/L	11/21/2015 - 08/17/2021	CI around mean	5.5	2.0	0.022	2	Standard
G402	UA	Cadmium,total	mg/L	11/21/2015 - 08/17/2021	Most recent sample	0.001	0.005	0.001	0.005	Standard
G402	UA	Chloride, total	mg/L	11/21/2015 - 08/17/2021	CI around mean	1.8	200	75	200	Standard
G402	UA	Chromium, total	mg/L	11/21/2015 - 08/17/2021	CB around linear reg	-0.00638	0.10	0.011	0.1	Standard
G402	UA	Cobalt, total	mg/L	11/21/2015 - 08/17/2021	CB around linear reg	-0.00375	0.006	0.0056	0.006	Standard
G402	UA	Fluoride, total	mg/L	11/21/2015 - 08/17/2021	CI around median	0.30	4.0	0.49	4	Standard
G402	UA	Lead, total	mg/L	11/21/2015 - 08/17/2021	CB around linear reg	-0.00606	0.0075	0.0063	0.0075	Standard
G402	UA	Lithium, total	mg/L	11/21/2015 - 08/17/2021	CB around linear reg	0.011	0.040	0.013	0.04	Standard
G402	UA	Mercury, total	mg/L	11/21/2015 - 08/17/2021	All ND - Last	0.0002	0.002	0.0002	0.002	Standard
G402	UA	Molybdenum, total	mg/L	11/21/2015 - 08/17/2021	CB around linear reg	0.000642	0.10	0.0015	0.1	Standard
G402	UA	pH (field)	SU	11/21/2015 - 08/17/2021	CB around linear reg	6.7	6.5/9.0	6.7/7.3	6.5/9	Standard/Standard
G402	UA	Radium-226 + Radium 228, tot	pCi/L	11/21/2015 - 08/17/2021	CB around linear reg	-1.04	5.0	2.0	5	Standard
G402	UA	Selenium, total	mg/L	11/21/2015 - 08/17/2021	CB around T-S line	-0.00028	0.050	0.0012	0.05	Standard
G402	UA	Sulfate, total	mg/L	11/21/2015 - 08/17/2021	CB around T-S line	421	400	370	400	Standard

TABLE 1. DETERMINATION OF POTENTIAL EXCEEDANCES
HISTORY OF POTENTIAL EXCEEDANCES
COFFEEN POWER PLANT
ASH POND NO. 2
COFFEEN, ILLINOIS

Sample Location	HSU	Constituent	Result Unit	Sample Date Range	Statistical Calculation	Statistical Result	GWPS	Background	Part 845 Standard	GWPS Source
G402	UA	Thallium, total	mg/L	11/21/2015 - 08/17/2021	All ND - Last	0.001	0.002	0.001	0.002	Standard
G402	UA	Total Dissolved Solids	mg/L	11/21/2015 - 08/17/2021	CI around mean	1600	1200	840	1200	Standard
G403	UA	Antimony, total	mg/L	11/23/2015 - 08/17/2021	All ND - Last	0.003	0.006	0.003	0.006	Standard
G403	UA	Arsenic, total	mg/L	11/23/2015 - 08/17/2021	CI around median	0.001	0.010	0.0043	0.01	Standard
G403	UA	Barium, total	mg/L	11/23/2015 - 08/17/2021	CB around linear reg	0.079	2.0	0.18	2	Standard
G403	UA	Beryllium, total	mg/L	11/23/2015 - 08/17/2021	All ND - Last	0.001	0.004	0.001	0.004	Standard
G403	UA	Boron, total	mg/L	11/23/2015 - 08/17/2021	CI around mean	0.020	2.0	0.022	2	Standard
G403	UA	Cadmium,total	mg/L	11/23/2015 - 08/17/2021	All ND - Last	0.001	0.005	0.001	0.005	Standard
G403	UA	Chloride, total	mg/L	11/23/2015 - 08/17/2021	CI around mean	3.7	200	75	200	Standard
G403	UA	Chromium, total	mg/L	11/23/2015 - 08/17/2021	CI around median	0.004	0.10	0.011	0.1	Standard
G403	UA	Cobalt, total	mg/L	11/23/2015 - 08/17/2021	CI around median	0.002	0.006	0.0056	0.006	Standard
G403	UA	Fluoride, total	mg/L	11/23/2015 - 08/17/2021	CI around mean	0.36	4.0	0.49	4	Standard
G403	UA	Lead, total	mg/L	11/23/2015 - 08/17/2021	CI around median	0.001	0.0075	0.0063	0.0075	Standard
G403	UA	Lithium, total	mg/L	11/23/2015 - 08/17/2021	All ND - Last	0.020	0.040	0.013	0.04	Standard
G403	UA	Mercury, total	mg/L	11/23/2015 - 08/17/2021	All ND - Last	0.0002	0.002	0.0002	0.002	Standard
G403	UA	Molybdenum, total	mg/L	11/23/2015 - 08/17/2021	CI around median	0.001	0.10	0.0015	0.1	Standard
G403	UA	pH (field)	SU	11/23/2015 - 08/17/2021	CI around mean	6.9	6.5/9.0	6.7/7.3	6.5/9	Standard/Standard
G403	UA	Radium-226 + Radium 228, tot	pCi/L	11/23/2015 - 08/17/2021	CI around mean	0.49	5.0	2.0	5	Standard
G403	UA	Selenium, total	mg/L	11/23/2015 - 08/17/2021	CI around median	0.001	0.050	0.0012	0.05	Standard
G403	UA	Sulfate, total	mg/L	11/23/2015 - 08/17/2021	CB around linear reg	28	400	370	400	Standard
G403	UA	Thallium, total	mg/L	11/23/2015 - 08/17/2021	All ND - Last	0.001	0.002	0.001	0.002	Standard
G403	UA	Total Dissolved Solids	mg/L	11/23/2015 - 08/17/2021	CI around geomean	317	1200	840	1200	Standard
G404	UA	Antimony, total	mg/L	10/07/2015 - 08/17/2021	All ND - Last	0.003	0.006	0.003	0.006	Standard
G404	UA	Arsenic, total	mg/L	10/07/2015 - 08/17/2021	CI around median	0.001	0.010	0.0043	0.01	Standard
G404	UA	Barium, total	mg/L	10/07/2015 - 08/17/2021	CI around mean	0.040	2.0	0.18	2	Standard
G404	UA	Beryllium, total	mg/L	10/07/2015 - 08/17/2021	All ND - Last	0.001	0.004	0.001	0.004	Standard

RAMBOLL

TABLE 1. DETERMINATION OF POTENTIAL EXCEEDANCES
HISTORY OF POTENTIAL EXCEEDANCES
COFFEEN POWER PLANT
ASH POND NO. 2
COFFEEN, ILLINOIS

Sample Location	HSU	Constituent	Result Unit	Sample Date Range	Statistical Calculation	Statistical Result	GWPS	Background	Part 845 Standard	GWPS Source
G404	UA	Boron, total	mg/L	10/07/2015 - 08/17/2021	CI around mean	2.6	2.0	0.022	2	Standard
G404	UA	Cadmium,total	mg/L	10/07/2015 - 08/17/2021	All ND - Last	0.001	0.005	0.001	0.005	Standard
G404	UA	Chloride, total	mg/L	10/07/2015 - 08/17/2021	CB around linear reg	164	200	75	200	Standard
G404	UA	Chromium, total	mg/L	10/07/2015 - 08/17/2021	All ND - Last	0.004	0.10	0.011	0.1	Standard
G404	UA	Cobalt, total	mg/L	10/07/2015 - 08/17/2021	CI around median	0.002	0.006	0.0056	0.006	Standard
G404	UA	Fluoride, total	mg/L	10/07/2015 - 08/17/2021	CI around median	0.25	4.0	0.49	4	Standard
G404	UA	Lead, total	mg/L	10/07/2015 - 08/17/2021	CI around median	0.001	0.0075	0.0063	0.0075	Standard
G404	UA	Lithium, total	mg/L	11/21/2015 - 08/17/2021	CB around linear reg	0.017	0.040	0.013	0.04	Standard
G404	UA	Mercury, total	mg/L	10/07/2015 - 08/17/2021	All ND - Last	0.0002	0.002	0.0002	0.002	Standard
G404	UA	Molybdenum, total	mg/L	10/07/2015 - 08/17/2021	All ND - Last	0.001	0.10	0.0015	0.1	Standard
G404	UA	pH (field)	SU	10/07/2015 - 08/17/2021	CI around mean	6.9	6.5/9.0	6.7/7.3	6.5/9	Standard/Standard
G404	UA	Radium-226 + Radium 228, tot	pCi/L	11/21/2015 - 08/17/2021	CI around mean	0.57	5.0	2.0	5	Standard
G404	UA	Selenium, total	mg/L	10/07/2015 - 08/17/2021	All ND - Last	0.001	0.050	0.0012	0.05	Standard
G404	UA	Sulfate, total	mg/L	10/07/2015 - 08/17/2021	CI around mean	203	400	370	400	Standard
G404	UA	Thallium, total	mg/L	10/07/2015 - 08/17/2021	All ND - Last	0.001	0.002	0.001	0.002	Standard
G404	UA	Total Dissolved Solids	mg/L	10/07/2015 - 08/17/2021	CB around linear reg	837	1200	840	1200	Standard
G405	UA	Antimony, total	mg/L	10/07/2015 - 08/17/2021	All ND - Last	0.003	0.006	0.003	0.006	Standard
G405	UA	Arsenic, total	mg/L	10/07/2015 - 08/17/2021	CB around T-S line	-0.0105	0.010	0.0043	0.01	Standard
G405	UA	Barium, total	mg/L	10/07/2015 - 08/17/2021	CI around geomean	0.020	2.0	0.18	2	Standard
G405	UA	Beryllium, total	mg/L	10/07/2015 - 08/17/2021	All ND - Last	0.001	0.004	0.001	0.004	Standard
G405	UA	Boron, total	mg/L	10/07/2015 - 08/17/2021	CB around linear reg	3.2	2.0	0.022	2	Standard
G405	UA	Cadmium,total	mg/L	10/07/2015 - 08/17/2021	CI around median	0.001	0.005	0.001	0.005	Standard
G405	UA	Chloride, total	mg/L	10/07/2015 - 08/17/2021	CI around geomean	9.2	200	75	200	Standard
G405	UA	Chromium, total	mg/L	10/07/2015 - 08/17/2021	CI around median	0.004	0.10	0.011	0.1	Standard
G405	UA	Cobalt, total	mg/L	10/07/2015 - 08/17/2021	CI around median	0.002	0.006	0.0056	0.006	Standard
G405	UA	Fluoride, total	mg/L	10/07/2015 - 08/17/2021	CI around mean	0.42	4.0	0.49	4	Standard

TABLE 1. DETERMINATION OF POTENTIAL EXCEEDANCES
HISTORY OF POTENTIAL EXCEEDANCES
COFFEEN POWER PLANT
ASH POND NO. 2
COFFEEN, ILLINOIS

Sample Location	HSU	Constituent	Result Unit	Sample Date Range	Statistical Calculation	Statistical Result	GWPS	Background	Part 845 Standard	GWPS Source
G405	UA	Lead, total	mg/L	10/07/2015 - 08/17/2021	CB around T-S line	-0.00599	0.0075	0.0063	0.0075	Standard
G405	UA	Lithium, total	mg/L	11/21/2015 - 08/17/2021	CB around T-S line	0.010	0.040	0.013	0.04	Standard
G405	UA	Mercury, total	mg/L	10/07/2015 - 08/17/2021	All ND - Last	0.0002	0.002	0.0002	0.002	Standard
G405	UA	Molybdenum, total	mg/L	10/07/2015 - 08/17/2021	CI around median	0.001	0.10	0.0015	0.1	Standard
G405	UA	pH (field)	SU	10/07/2015 - 08/17/2021	CI around mean	6.8	6.5/9.0	6.7/7.3	6.5/9	Standard/Standard
G405	UA	Radium-226 + Radium 228, tot	pCi/L	11/21/2015 - 08/17/2021	CI around geomean	0.57	5.0	2.0	5	Standard
G405	UA	Selenium, total	mg/L	10/07/2015 - 08/17/2021	CI around median	0.001	0.050	0.0012	0.05	Standard
G405	UA	Sulfate, total	mg/L	10/07/2015 - 08/17/2021	CB around linear reg	195	400	370	400	Standard
G405	UA	Thallium, total	mg/L	10/07/2015 - 08/17/2021	All ND - Last	0.001	0.002	0.001	0.002	Standard
G405	UA	Total Dissolved Solids	mg/L	10/07/2015 - 08/17/2021	CB around linear reg	720	1200	840	1200	Standard
G406	UA	Antimony, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.003	0.006	0.003	0.006	Standard
G406	UA	Arsenic, total	mg/L	10/14/2020 - 08/17/2021	CI around median	0	0.010	0.0043	0.01	Standard
G406	UA	Barium, total	mg/L	10/14/2020 - 08/17/2021	CI around median	0	2.0	0.18	2	Standard
G406	UA	Beryllium, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.001	0.004	0.001	0.004	Standard
G406	UA	Boron, total	mg/L	10/14/2020 - 08/17/2021	CI around median	0	2.0	0.022	2	Standard
G406	UA	Cadmium,total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.001	0.005	0.001	0.005	Standard
G406	UA	Chloride, total	mg/L	10/14/2020 - 08/17/2021	CI around mean	0.99	200	75	200	Standard
G406	UA	Chromium, total	mg/L	10/14/2020 - 08/17/2021	CI around median	0	0.10	0.011	0.1	Standard
G406	UA	Cobalt, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.002	0.006	0.0056	0.006	Standard
G406	UA	Fluoride, total	mg/L	10/14/2020 - 08/17/2021	CI around mean	0.066	4.0	0.49	4	Standard
G406	UA	Lead, total	mg/L	10/14/2020 - 08/17/2021	CI around median	0	0.0075	0.0063	0.0075	Standard
G406	UA	Lithium, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.020	0.040	0.013	0.04	Standard
G406	UA	Mercury, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.0002	0.002	0.0002	0.002	Standard
G406	UA	Molybdenum, total	mg/L	10/14/2020 - 08/17/2021	CI around median	0	0.10	0.0015	0.1	Standard
G406	UA	pH (field)	SU	10/14/2020 - 08/17/2021	CI around mean	6.2	6.5/9.0	6.7/7.3	6.5/9	Standard/Standard
G406	UA	Radium-226 + Radium 228, tot	pCi/L	10/14/2020 - 08/17/2021	CI around mean	-0.441	5.0	2.0	5	Standard

RAMBOLL

TABLE 1. DETERMINATION OF POTENTIAL EXCEEDANCES
HISTORY OF POTENTIAL EXCEEDANCES
COFFEEN POWER PLANT
ASH POND NO. 2
COFFEEN, ILLINOIS

Sample Location	HSU	Constituent	Result Unit	Sample Date Range	Statistical Calculation	Statistical Result	GWPS	Background	Part 845 Standard	GWPS Source
G406	UA	Selenium, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.001	0.050	0.0012	0.05	Standard
G406	UA	Sulfate, total	mg/L	10/14/2020 - 08/17/2021	CI around mean	-191	400	370	400	Standard
G406	UA	Thallium, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.001	0.002	0.001	0.002	Standard
G406	UA	Total Dissolved Solids	mg/L	10/14/2020 - 08/17/2021	CI around median	0	1200	840	1200	Standard
G407	UA	Antimony, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.003	0.006	0.003	0.006	Standard
G407	UA	Arsenic, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.001	0.010	0.0043	0.01	Standard
G407	UA	Barium, total	mg/L	10/14/2020 - 08/17/2021	CI around mean	0.011	2.0	0.18	2	Standard
G407	UA	Beryllium, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.001	0.004	0.001	0.004	Standard
G407	UA	Boron, total	mg/L	10/14/2020 - 08/17/2021	CI around mean	0.038	2.0	0.022	2	Standard
G407	UA	Cadmium,total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.001	0.005	0.001	0.005	Standard
G407	UA	Chloride, total	mg/L	10/14/2020 - 08/17/2021	CI around mean	8.1	200	75	200	Standard
G407	UA	Chromium, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.004	0.10	0.011	0.1	Standard
G407	UA	Cobalt, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.002	0.006	0.0056	0.006	Standard
G407	UA	Fluoride, total	mg/L	10/14/2020 - 08/17/2021	CI around mean	0.25	4.0	0.49	4	Standard
G407	UA	Lead, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.001	0.0075	0.0063	0.0075	Standard
G407	UA	Lithium, total	mg/L	10/14/2020 - 08/17/2021	CI around mean	0.033	0.040	0.013	0.04	Standard
G407	UA	Mercury, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.0002	0.002	0.0002	0.002	Standard
G407	UA	Molybdenum, total	mg/L	10/14/2020 - 08/17/2021	CI around mean	0.00122	0.10	0.0015	0.1	Standard
G407	UA	pH (field)	SU	10/14/2020 - 08/17/2021	CI around mean	6.4	6.5/9.0	6.7/7.3	6.5/9	Standard/Standard
G407	UA	Radium-226 + Radium 228, tot	pCi/L	10/14/2020 - 08/17/2021	CI around mean	-0.476	5.0	2.0	5	Standard
G407	UA	Selenium, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.001	0.050	0.0012	0.05	Standard
G407	UA	Sulfate, total	mg/L	10/14/2020 - 08/17/2021	CI around mean	177	400	370	400	Standard
G407	UA	Thallium, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.001	0.002	0.001	0.002	Standard
G407	UA	Total Dissolved Solids	mg/L	10/14/2020 - 08/17/2021	CI around mean	1520	1200	840	1200	Standard
G410	UA	Antimony, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.003	0.006	0.003	0.006	Standard
G410	UA	Arsenic, total	mg/L	10/14/2020 - 08/17/2021	CI around mean	-0.000536	0.010	0.0043	0.01	Standard

TABLE 1. DETERMINATION OF POTENTIAL EXCEEDANCES
HISTORY OF POTENTIAL EXCEEDANCES
COFFEEN POWER PLANT
ASH POND NO. 2
COFFEEN, ILLINOIS

Sample Location	HSU	Constituent	Result Unit	Sample Date Range	Statistical Calculation	Statistical Result	GWPS	Background	Part 845 Standard	GWPS Source
G410	UA	Barium, total	mg/L	10/14/2020 - 08/17/2021	CI around mean	0.12	2.0	0.18	2	Standard
G410	UA	Beryllium, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.001	0.004	0.001	0.004	Standard
G410	UA	Boron, total	mg/L	10/14/2020 - 08/17/2021	CI around mean	0.077	2.0	0.022	2	Standard
G410	UA	Cadmium,total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.001	0.005	0.001	0.005	Standard
G410	UA	Chloride, total	mg/L	10/14/2020 - 08/17/2021	CI around mean	304	200	75	200	Standard
G410	UA	Chromium, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.004	0.10	0.011	0.1	Standard
G410	UA	Cobalt, total	mg/L	10/14/2020 - 08/17/2021	CI around mean	0.00188	0.006	0.0056	0.006	Standard
G410	UA	Fluoride, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.25	4.0	0.49	4	Standard
G410	UA	Lead, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.001	0.0075	0.0063	0.0075	Standard
G410	UA	Lithium, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.020	0.040	0.013	0.04	Standard
G410	UA	Mercury, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.0002	0.002	0.0002	0.002	Standard
G410	UA	Molybdenum, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.001	0.10	0.0015	0.1	Standard
G410	UA	pH (field)	SU	10/14/2020 - 08/17/2021	CI around mean	6.2	6.5/9.0	6.7/7.3	6.5/9	Standard/Standard
G410	UA	Radium-226 + Radium 228, tot	pCi/L	10/14/2020 - 08/17/2021	CI around mean	-0.742	5.0	2.0	5	Standard
G410	UA	Selenium, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.001	0.050	0.0012	0.05	Standard
G410	UA	Sulfate, total	mg/L	10/14/2020 - 08/17/2021	CI around mean	30	400	370	400	Standard
G410	UA	Thallium, total	mg/L	10/14/2020 - 08/17/2021	All ND - Last	0.001	0.002	0.001	0.002	Standard
G410	UA	Total Dissolved Solids	mg/L	10/14/2020 - 08/17/2021	CI around mean	502	1200	840	1200	Standard
G411	UA	Antimony, total	mg/L	10/13/2020 - 08/17/2021	All ND - Last	0.003	0.006	0.003	0.006	Standard
G411	UA	Arsenic, total	mg/L	10/13/2020 - 08/17/2021	All ND - Last	0.001	0.010	0.0043	0.01	Standard
G411	UA	Barium, total	mg/L	10/13/2020 - 08/17/2021	CI around mean	0.022	2.0	0.18	2	Standard
G411	UA	Beryllium, total	mg/L	10/13/2020 - 08/17/2021	All ND - Last	0.001	0.004	0.001	0.004	Standard
G411	UA	Boron, total	mg/L	10/13/2020 - 08/17/2021	CI around mean	0.00782	2.0	0.022	2	Standard
G411	UA	Cadmium,total	mg/L	10/13/2020 - 08/17/2021	All ND - Last	0.001	0.005	0.001	0.005	Standard
G411	UA	Chloride, total	mg/L	10/13/2020 - 08/17/2021	CI around mean	2.4	200	75	200	Standard
G411	UA	Chromium, total	mg/L	10/13/2020 - 08/17/2021	All ND - Last	0.004	0.10	0.011	0.1	Standard

TABLE 1. DETERMINATION OF POTENTIAL EXCEEDANCES
HISTORY OF POTENTIAL EXCEEDANCES
COFFEEN POWER PLANT
ASH POND NO. 2
COFFEEN, ILLINOIS

Sample Location	HSU	Constituent	Result Unit	Sample Date Range	Statistical Calculation	Statistical Result	GWPS	Background	Part 845 Standard	GWPS Source
G411	UA	Cobalt, total	mg/L	10/13/2020 - 08/17/2021	All ND - Last	0.002	0.006	0.0056	0.006	Standard
G411	UA	Fluoride, total	mg/L	10/13/2020 - 08/17/2021	CI around mean	0.56	4.0	0.49	4	Standard
G411	UA	Lead, total	mg/L	10/13/2020 - 08/17/2021	All ND - Last	0.001	0.0075	0.0063	0.0075	Standard
G411	UA	Lithium, total	mg/L	10/13/2020 - 08/17/2021	All ND - Last	0.020	0.040	0.013	0.04	Standard
G411	UA	Mercury, total	mg/L	10/13/2020 - 08/17/2021	All ND - Last	0.0002	0.002	0.0002	0.002	Standard
G411	UA	Molybdenum, total	mg/L	10/13/2020 - 08/17/2021	All ND - Last	0.001	0.10	0.0015	0.1	Standard
G411	UA	pH (field)	SU	10/13/2020 - 08/17/2021	CI around mean	6.8	6.5/9.0	6.7/7.3	6.5/9	Standard/Standard
G411	UA	Radium-226 + Radium 228, tot	pCi/L	10/13/2020 - 08/17/2021	CI around mean	-0.774	5.0	2.0	5	Standard
G411	UA	Selenium, total	mg/L	10/13/2020 - 08/17/2021	CI around median	0	0.050	0.0012	0.05	Standard
G411	UA	Sulfate, total	mg/L	10/13/2020 - 08/17/2021	CI around mean	141	400	370	400	Standard
G411	UA	Thallium, total	mg/L	10/13/2020 - 08/17/2021	All ND - Last	0.001	0.002	0.001	0.002	Standard
G411	UA	Total Dissolved Solids	mg/L	10/13/2020 - 08/17/2021	CI around mean	567	1200	840	1200	Standard

TABLE 1. DETERMINATION OF POTENTIAL EXCEEDANCES
HISTORY OF POTENTIAL EXCEEDANCES
COFFEEN POWER PLANT
ASH POND NO. 2
COFFEEN, ILLINOIS

Notes:
Potential exceedance of GWPS
HSU = hydrostratigraphic unit:
  UA = uppermost aquifer
mg/L = milligrams per liter
pCi/L = picocuries per liter
SU = standard units
Statistical Calculation = method used to calculate the statistical result:
  All ND - Last = All results were below the reporting limit, and the last determined reporting limit is shown
  CB around linear reg = Confidence band around linear regression
  CB around T-S line = Confidence band around Thiel-Sen line
  CI around geomean = Confidence interval around the geometric mean
  CI around mean = Confidence interval around the mean
  CI around median = Confidence interval around the median
  Most recent sample = Result for the most recently collected sample used due to insufficient data
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
COFFEEN POWER PLANT
ASH POND NO. 2
COFFEEN, ILLINOIS

Sample Location	HSU	Constituent	Result Unit	Sample Date Range	Statistical Calculation	Statistical Result	GWPS	Background	Part 845 Standard	GWPS Source
G401	UA	Boron, total	mg/L	11/21/2015 - 08/17/2021	CI around median	3.5	2.0	0.022	2	Standard
G401	UA	Cobalt, total	mg/L	11/21/2015 - 08/17/2021	CI around mean	0.22	0.006	0.0056	0.006	Standard
G401	UA	pH (field)	SU	11/21/2015 - 08/17/2021	CI around mean	6.0	6.5/9.0	6.7/7.3	6.5/9	Standard/Standard
G401	UA	Sulfate, total	mg/L	11/21/2015 - 08/17/2021	CI around median	2000	400	370	400	Standard
G401	UA	Total Dissolved Solids	mg/L	11/21/2015 - 08/17/2021	CI around median	2800	1200	840	1200	Standard
G402	UA	Boron, total	mg/L	11/21/2015 - 08/17/2021	CI around mean	5.5	2.0	0.022	2	Standard
G402	UA	Sulfate, total	mg/L	11/21/2015 - 08/17/2021	CB around T-S line	421	400	370	400	Standard
G402	UA	Total Dissolved Solids	mg/L	11/21/2015 - 08/17/2021	CI around mean	1600	1200	840	1200	Standard
G404	UA	Boron, total	mg/L	10/07/2015 - 08/17/2021	CI around mean	2.6	2.0	0.022	2	Standard
G405	UA	Boron, total	mg/L	10/07/2015 - 08/17/2021	CB around linear reg	3.2	2.0	0.022	2	Standard
G406	UA	pH (field)	SU	10/14/2020 - 08/17/2021	CI around mean	6.2	6.5/9.0	6.7/7.3	6.5/9	Standard/Standard
G407	UA	pH (field)	SU	10/14/2020 - 08/17/2021	CI around mean	6.4	6.5/9.0	6.7/7.3	6.5/9	Standard/Standard
G407	UA	Total Dissolved Solids	mg/L	10/14/2020 - 08/17/2021	CI around mean	1520	1200	840	1200	Standard
G410	UA	Chloride, total	mg/L	10/14/2020 - 08/17/2021	CI around mean	304	200	75	200	Standard
G410	UA	pH (field)	SU	10/14/2020 - 08/17/2021	CI around mean	6.2	6.5/9.0	6.7/7.3	6.5/9	Standard/Standard

Notes:
HSU = hydrostratigraphic unit:
  UA = uppermost aquifer
mg/L = milligrams per liter
pCi/L = picocuries per liter
SU = standard units
Statistical Calculation = method used to calculate the statistical result:
  CB around linear reg = Confidence band around linear regression
  CB around T-S line = Confidence band around Thiel-Sen line
  CI around mean = Confidence interval around the mean
  CI around median = Confidence interval around the median
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)

ATTACHMENT N

Certification of Financial Assurance Requirements

On June 17, 2021, Illinois Power Generating Company provided financial assurance in the form of performance bonds to the Illinois Environmental Protection Agency in the amount of $27,884,983 for Ash Pond 1, Ash Pond 2, and the GMF Pond System at the Coffeen Power Plant.[1]

I, Matthew A. Goering, Senior Vice President of Illinois Power Generating Company, do hereby certify to the best of my knowledge for the above referenced CCR Units that the financial assurance instruments satisfy the requirements of 35 I.A.C. Part 845, Subpart I.

Matthew A. Goering
Senior Vice President
Illinois Power Generating Company

[1]In the operating permit applications, the GMF Pond System is referred to as the GMF Gypsum Stack Pond and GMF Recycle Pond.

October