

Intended for  
**Illinois Power Generating Company**

Date  
**December 28, 2022**

Project No.  
**1940103307**

# **40 C.F.R. § 257 GROUNDWATER MONITORING PLAN**

## **GMF RECYCLE POND COFFEEN POWER PLANT COFFEEN, ILLINOIS**

## 40 C.F.R. § 257 GROUNDWATER MONITORING PLAN COFFEEN POWER PLANT GMF RECYCLE POND

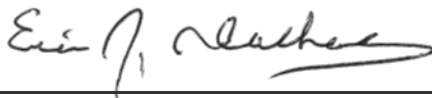
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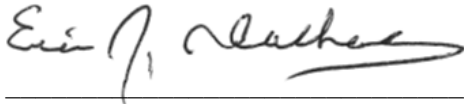
## LICENSED PROFESSIONAL CERTIFICATIONS

### 40 C.F.R. § 257.91(f) Groundwater Monitoring System Certification

In accordance with Title 40 of the Code of Federal Regulations (40 C.F.R.), Part 257, Subpart D, Section (§) 257.91(f) the owner or operator of a coal combustion residuals (CCR) unit must obtain certification from a qualified professional engineer stating that the groundwater monitoring system at the CCR unit has been designed and constructed to meet the requirements of 40 C.F.R. § 257.91. If the groundwater monitoring system includes the minimum number of monitoring wells specified in 40 C.F.R. § 257.91(c)(1), the certification must document the basis supporting use of the minimum number of monitoring wells. Further, in accordance with 40 C.F.R. § 257.91(e)(1), when completing the groundwater monitoring system certification, the qualified professional engineer must be given access to documentation regarding the design, installation, development, and decommissioning of any monitoring wells, piezometers, and other measurement, sampling, and analytical devices.

The groundwater monitoring system designed and constructed for the Coffeen Power Plant (CPP) Gypsum Management Facility (GMF) Recycle Pond (GMF RP) includes more than the minimum number of wells specified in 40 C.F.R. § 257.91(c)(1). The undersigned has been given access to documentation regarding the design, installation, development, and decommissioning of monitoring wells, piezometers and other measurement, sampling, and analytical devices concerning the CPP GMF RP.

*I, Eric J. Tlachac, a qualified professional engineer in good standing in the State of Illinois, certify that the groundwater monitoring system at the CPP GMF RP has been designed and constructed to meet the requirements of 40 C.F.R. § 257.91.*



Eric J. Tlachac  
Qualified Professional Engineer  
062-063091  
Illinois  
Date: December 28, 2022



*I, Brian G. Hennings, a qualified professional geologist in good standing in the State of Illinois, certify that the groundwater monitoring system at the CPP GMF RP has been designed and constructed to meet the requirements of 40 C.F.R. § 257.91.*



Brian G. Hennings  
Professional Geologist  
196-001482  
Illinois  
Date: December 28, 2022



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### **TABLES (ATTACHED)**

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## ACRONYMS AND ABBREVIATIONS

35 I.A.C.	Title 35 of the Illinois Administrative Code
40 C.F.R.	Title 40 of the Code of Federal Regulations
§	section
AP1	Ash Pond No. 1
AP2	Ash Pond No. 2
ASD	Alternate Source Demonstration
bgs	below ground surface
CCA	compliance commitment agreement
CCR	coal combustion residuals
CMA	Corrective Measures Assessment
CPP	Coffeen Power Plant
CSM	conceptual site model
DA	Deep Aquifer
GMF	Gypsum Management Facility
GMF GSP	GMF Gypsum Stack Pond
GMF RP	GMF Recycle Pond, also referred to as Site
GMP	Groundwater Monitoring Plan
GWPS	groundwater protection standard
HL	health-based level
HCR	Hydrogeologic Site Characterization Report
ID	identification
IEPA	Illinois Environmental Protection Agency
IPGC	Illinois Power Generating Company
LCL	lower confidence limit
LCU	Lower Confining Unit
LPL	lower prediction limit
MCL	maximum contaminant level
NA	not applicable
NID	National Inventory of Dams
No.	number
NRT/OBG	Natural Resource Technology, an OBG Company
QAPP	Multi-Site Quality Assurance Project Plan
QA/QC	quality assurance/quality control
Ramboll	Ramboll Americas Engineering Solutions, Inc.
RL	reporting limit
SAP	Multi-Site Sampling and Analysis Plan
SI	surface impoundment
SSI	statistically significant increase
SSL	statistically significant level
TDS	total dissolved solids
UA	Uppermost Aquifer
UCU	Upper Confining Unit
UPL	upper prediction limit
UTL	upper tolerance limit
USEPA	United States Environmental Protection Agency
WLO	water level only
WPCP	Water Pollution Control Permit

# 1. INTRODUCTION

## 1.1 Overview

Ramboll Americas Engineering Solutions, Inc. (Ramboll) has prepared this Groundwater Monitoring Plan (GMP) on behalf of CPP, operated by Illinois Power Generating Company (IPGC) to align the 40 C.F.R. § 257 compliance groundwater monitoring program with the Title 35 of the Illinois Administrative Code (35 I.A.C.) § 845 compliance groundwater monitoring program.

This GMP applies specifically to the CCR unit referred to as the GMF RP (CCR unit identification [ID] number (No.) 104, Illinois Environmental Protection Agency [IEPA] ID No. W1350150004-04, and National Inventory of Dams [NID] No. IL50578). The GMF RP is a 17-acre, lined surface impoundment (SI) used to manage CCR waste streams at CPP. This GMP includes content requirements specific to 40 C.F.R. § 257.91 (Groundwater Monitoring Systems), 40 C.F.R. § 257.93 (Groundwater Sampling and Analysis Requirements), 40 C.F.R. § 257.94 (Detection Monitoring Program), and 40 C.F.R. § 257.95 (Assessment Monitoring Program) for the GMF RP at CPP.

## 1.2 Site Location and Background

The CPP is approximately two miles south of the city of Coffeen, Illinois and approximately eight miles southeast of the city of Hillsboro, Illinois (**Figure 1-1**). The GMF RP is located in Montgomery County, in central Illinois, within Section 11 Township 7 North and Range 7 East. The CPP is located between the two lobes of Coffeen Lake to the west, east, and south, and is bordered by agricultural land to the north. The CPP operated as a coal-fired power plant from 1964 to November 2019 and has five CCR units. The approximately 1,100-acre Coffeen Lake was built by damming the McDavid Branch of the East Fork of Shoal Creek in 1963 for use as an artificial cooling lake for the CPP.

The two GMF ponds, consisting of the 77-acre GMF Gypsum Stack Pond (GSP) and the 17-acre GMF RP, receive blowdown from the air emission scrubbers and have been in operation since 2010. Construction of the GMFs were in accordance with the IEPA Water Pollution Control Permit (WPCP) 2008 EA 4661 and feature a composite high-density polyethylene liner with three feet of compacted soil with a hydraulic conductivity of  $1 \times 10^{-7}$  centimeters per second. Both GMF ponds have a groundwater underdrain system. The GMF GSP system was actively pumped during construction but is currently not used. The GMF RP underdrain is a passive, gravity drained system. IPGC ceased receipt of waste to the GMF RP prior to April 11, 2021.

**Figure 1-2** depicts the location of the CCR units and non-CCR units at CPP. The five CCR units consist of the following:

- Ash Pond No. 1 (AP1; CCR unit ID No. 101, IEPA ID No. W1350150004-01, and NID No. IL50722)
- Closed (with IEPA approval) Ash Pond No. 2 (AP2; CCR unit ID No. 102, IEPA ID No. W1350150004-02, and NID No. IL50723)
- GMF GSP (CCR unit ID No. 103, IEPA ID No. W1350150004-03, and NID No. IL50579)
- GMF RP
- Landfill (CCR unit ID No. 105)

Information regarding the AP1, AP2, GMF GSP, and Landfill CCR units is solely for background information, as this report applies specifically to the GMF RP CCR unit, which will hereinafter be referred to as the Site.

### 1.3 Conceptual Site Model

Multiple site investigations have been completed at the CPP to characterize the geology, hydrogeology, and groundwater quality as required by 40 C.F.R. § 257.91 (Groundwater Monitoring Systems). The GMF RP has been well characterized and detailed in the Hydrogeologic Site Characterization Report (HCR) (Ramboll, 2021) [<https://www.luminant.com/ccr/illinois-ccr/?dir=il-ccr%2FCoffeen%2F2021>], that was included with the Operating Permit application submitted to the IEPA in October 2021. The HCR was prepared to comply with the requirements specified in 35 I.A.C. § 845.620 and expands upon the Hydrogeologic Monitoring Plan (Natural Resource Technology, an OBG Company [NRT/OBG], 2017). A conceptual site model (CSM) has been developed and is discussed below.

In addition to the CCR and fill present at the GMF RP, there are five principal layers of unlithified material present above the bedrock, which are categorized into hydrostratigraphic units below (from surface downward) based on stratigraphic relationships and common hydrogeologic characteristics:

- **Upper Confining Unit (UCU):** Composed of the Roxana and Peoria Silts (Loess Unit) and the upper clayey portion of the Hagarstown member which are classified as silts to clayey silts and gravelly clay below the surficial soil. Construction of the GMF RP required the excavation and removal of this layer within the unit footprint and the UCU has been eroded east of the GMF RP, near the Unnamed Tributary.
- **Uppermost Aquifer (UA):** The UA is the Hagarstown Member which is classified as primarily sandy to gravelly silts and clays with thin beds of sands. Similar to the Loess Unit, the Hagarstown Member was excavated to facilitate construction of the GMF RP and the Hagarstown is also absent in some locations near the Unnamed Tributary.
- **Lower Confining Unit (LCU):** Comprised of the Vandalia Member, Mulberry Grove Member, and Smithboro Member. These units include a sandy to silty till with thin, discontinuous sand lenses, a discontinuous and limited extent sandy silt which has infilled prior erosional features, and silty to clayey diamicton, respectively.
- **Deep Aquifer (DA):** Sand and sandy silt/clay units of the Yarmouth Soil, which include accretionary deposits of fine sediment and organic materials, typically less than five feet thick and discontinuous across the CPP.



- **Deep Confining Unit:** Comprised of the Banner Formation, generally consists of clays, silts, and sands. The Lierle Clay Member is the upper layer of the Banner Formation which was encountered at the CPP.

Potential migration pathways (PMPs) were interpreted using the lithologic composition and hydrogeologic properties (hydraulic conductivity and hydraulic position with respect to the unit) of the screened materials. In addition to the physical properties, the analytical results from the baseline groundwater monitoring performed in wells screened in the confining units and DA were used to identify PMPs. The uppermost aquifer is the first occurrence of groundwater and therefore the PMPs identified are in geologic units located below the uppermost aquifer. These locations monitor the DA and the LCU in locations where the Hagarstown Member is absent.

In the vicinity of the GMF RP groundwater generally flow southeast (**Figure 1-3**) through the UA toward the Unnamed Tributary. Although elevations vary seasonally, the groundwater flow direction in the UA is consistent and likely controlled by the proximity and hydraulic connection to Coffeen Lake.

## 2. GROUNDWATER MONITORING SYSTEMS

### 2.1 Existing Monitoring Well Network and Analysis

Three monitoring programs specific to the GMF RP exist, the IEPA monitoring program, the 40 C.F.R. § 257 monitoring program, and the 35 I.A.C. § 845 monitoring program. This GMP is being provided to expand the 40 C.F.R. § 257 groundwater monitoring network and monitoring program specific to the GMF RP to align with the monitoring network established for 35 I.A.C. § 845. Monitoring networks and programs that apply to other units are not discussed in this GMP. IPGC entered into a compliance commitment agreement (CCA) with the IEPA on December 28, 2022. Groundwater monitoring in accordance with the CCA and the proposed 35 I.A.C. § 845 groundwater monitoring plan and sampling methodologies provided in the operating permit application for the GMF RP is scheduled to commence no later than the second quarter of 2023. After the GMF RP has been issued an approved operating permit, groundwater monitoring shall be conducted in accordance with that operating permit. As specified in the CCA, groundwater sampling requirements that apply to the CCR SI under other existing permit programs will become void upon issuance of an approved operating permit pursuant to 35 I.A.C § 845.

#### 2.1.1 IEPA Monitoring Program

Routine quarterly groundwater monitoring is completed for a monitoring well network that combines the GMF GSP and GMF RP. The monitoring well network consists of thirty-one monitoring wells screened in the UA (G102, G103, R104, G105, G106, G200, G205, G206, G207, G208, G209, G210, G211, G212, G213, G214, G215, G216, G217, G218, G270, G271, G272, G273, G274, G275, G276, G277, G279, G280, and R201) in accordance with IEPA WPCP No. 2020-EO-65043, issued on March 11, 2020. The boring logs and well construction forms for the GMF well network are included in Appendix C of the HCR (Ramboll, 2021). Quarterly and annual samples are analyzed for the following field and laboratory parameters listed in **Table A** on the following page.

**Table A. IEPA Groundwater Monitoring Program Parameters**

Field Parameters <sup>1</sup>							
pH		Elevation of Measuring Point		Specific Conductance			
Depth to Water (below measuring point, below ground surface [bgs])		Elevation of Groundwater Surface		Temperature			
Metals (Dissolved)							
Antimony		Cadmium		Manganese		Thallium	
Arsenic		Chromium		Mercury		Vanadium	
Aluminum		Cobalt		Molybdenum		Zinc	
Barium		Copper		Nickel			
Beryllium		Iron		Selenium			
Boron		Lead		Silver			
Inorganics (Dissolved)							
Chloride		Fluoride		Total Dissolved Solids (TDS)			
Cyanide		Sulfate					
Other (Total)							
Phenols							

Note: Parameters are monitored as dissolved quarterly, and as dissolved and total annually.

<sup>1</sup>Dissolved oxygen, oxidation/reduction potential, and turbidity were recorded during sample collection.

### 2.1.2 Existing 40 C.F.R. § 257 Monitoring Program

The 40 C.F.R. § 257 well network for the GMF RP consists of six monitoring wells installed nearby or adjacent to the GMF RP within the UA. The GMF RP 40 C.F.R. § 257 well network consists of two background monitoring wells (G270 and G280) and four compliance monitoring wells (G271, G273, G276, and G279). The boring logs, well construction forms, and other related monitoring well forms are available in the GMF RP Operating Records as required by 40 C.F.R. § 257.91 for each monitored CCR Unit or CCR Multi-Unit, and are included in Appendix C of the HCR (Ramboll, 2021).

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 Multi-Site Sampling and Analysis Plan (SAP) (Ramboll, 2022a).

Groundwater samples are collected semiannually 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** on the following page.

**Table B. 40 C.F.R. § 257 Groundwater Monitoring Program Parameters**

Field Parameters <sup>1</sup>			
Groundwater Elevation		pH	
Appendix III Parameters (Total, except TDS)			
Boron	Chloride	Sulfate	
Calcium	Fluoride	TDS	
Appendix IV Parameters (Total)			
Antimony	Cadmium	Lithium	Thallium
Arsenic	Chromium	Mercury	Radium 226 and 228 combined
Barium	Cobalt	Molybdenum	
Beryllium	Lead	Selenium	

<sup>1</sup>Dissolved oxygen, temperature, specific conductance, oxidation/reduction potential, and turbidity are recorded during sample collection.

Results and analysis of groundwater sampling are reported annually by January 31 of the following year and made available on the CCR public website as required by 40 C.F.R. § 257.

### **2.1.3 35 I.A.C. § 845 Well Installation and Monitoring**

In 2021, seven additional monitoring wells (G275D, G283, G284, G285, G286, G287, and G288), one CCR source sample collection point (X201), and one surface water staff gage (SG04) were installed at the GMF RP to assess the vertical and horizontal lithology, stratigraphy, chemical properties, and physical properties of geologic layers to a minimum of 100 feet bgs as specified in 35 I.A.C. § 845.620(b).

Prospective 35 I.A.C. § 845 monitoring wells were sampled for eight rounds from March to August 2021 and the results were assessed for selection of the 35 I.A.C. § 845 monitoring well network for the GMF RP. Groundwater samples were collected and analyzed for 35 I.A.C. § 845.600 parameters as summarized in **Table C** on the following page.

The current 35 I.A.C. § 845 monitoring well network (**Table 2-1**) consists of two background monitoring wells (G270 and G280) in the UA, seven compliance wells in the UA (G273, G275, G276, G277, G279, and G284), two compliance wells in the LCU (G283 and G285), one compliance well in the DA (G275D), one water level only source sample collection point (X201), and one temporary water level only surface water staff gage (SG-04).

**Table C. 35 I.A.C. § 845 Groundwater Monitoring Program Parameters**

Field Parameters <sup>1</sup>			
Groundwater Elevation	pH	Turbidity	
Metals (Total)			
Antimony	Boron	Cobalt	Molybdenum
Arsenic	Cadmium	Lead	Selenium
Barium	Calcium	Lithium	Thallium
Beryllium	Chromium	Mercury	
Inorganics (Total)			
Fluoride	Sulfate	Chloride	TDS
Other (Total)			
Radium 226 and 228 combined			

<sup>1</sup> Dissolved oxygen, temperature, specific conductance, and oxidation/reduction potential were recorded during sample collection.

Data and results from the 35 I.A.C. § 845 background monitoring were included in the water quality discussion included in the HCR (Ramboll, 2021). The data collected from background locations during the 35 I.A.C. § 845 monitoring were used to evaluate and calculate background concentrations for the GMF RP.

## 2.2 Expansion of Existing 40 C.F.R. § 257 Monitoring Well Network

The existing 40 C.F.R. § 257 network is being expanded to include nine monitoring wells screened in the UA (G270, G271, G273, G275, G276, G277, G279, G280, and G284), two monitoring wells in the LCU (G283<sup>1</sup> and G285<sup>1</sup>), one monitoring well in the DA (G275D<sup>1</sup>), one temporary water level only location (X201), and one temporary water level only surface water staff gage (SG-04). The proposed network is summarized in **Table D** on the following page and displayed on **Figure 2-1**. Twelve wells (two background and ten compliance) will be used to monitor groundwater concentrations within the hydrostratigraphic units.

The groundwater samples collected from the 12 wells will be used to monitor and evaluate groundwater quality and demonstrate compliance with the groundwater quality standards included in 40 C.F.R. § 257.94(e) and 40 C.F.R. § 257.95(h). The proposed monitoring wells will yield groundwater samples that accurately represent the quality of background groundwater that has not been affected by leakage from the GMF RP, as well as downgradient groundwater at the waste boundary of the GMF RP (as required in 40 C.F.R. § 257.91(a)(1) and (2)). Monitoring well depths and construction details are listed in **Table 2-1** and summarized in **Table D** on the following page.

Any future changes to the groundwater monitoring well network as approved by the IEPA under 35 I.A.C. § 845 will also be incorporated into the 40 C.F.R. § 257 network.

<sup>1</sup> Wells 275D, G283, and G285 are screened in the LCU or DA and have been identified to monitor the PMP.

**Table D. Expanded 40 C.F.R. § 257 Monitoring Well Network**

Well ID	Monitored Unit	Well Screen Interval (feet bgs)	Well Type <sup>1</sup>
<b>G270</b>	UA	13.1 – 17.9	Background
<b>G271</b>	UA	10.0 – 14.3	Compliance
<b>G273</b>	UA	9.1 – 14.6	Compliance
<b>G275</b>	UA	8.2 – 12.6	Compliance
<b>G275D*</b>	DA	49.8 – 59.6	Compliance
<b>G276</b>	UA	22.4 – 27.2	Compliance
<b>G277</b>	UA	14.3 – 18.8	Compliance
<b>G279</b>	UA	22.4 – 26.8	Compliance
<b>G280</b>	UA	12.8 – 17.6	Background
<b>G283*</b>	LCU	8.4 – 18.2	Compliance
<b>G284</b>	UA	8.1 – 12.9	Compliance
<b>G285*</b>	LCU	13.7 – 23.5	Compliance
<b>X201<sup>2, 3</sup></b>	CCR	NA	WLO
<b>SG-04<sup>3, 4</sup></b>	Surface Water	NA	WLO

<sup>1</sup> Well type refers to the role of the well in the monitoring network.

<sup>2</sup> Well is to be for water level data collection only.

<sup>3</sup> Location is temporary pending implementation of impoundment closure per an approved Construction Permit Application.

<sup>4</sup> Surface water level measuring point.

\* Well in the LCU or DA that has been identified to monitor a PMP.

NA = not applicable

WLO = water level only

Any future changes to the groundwater monitoring well network as approved by the IEPA under 35 I.A.C. § 845 will also be incorporated into the 40 C.F.R. § 257 network.

## 2.3 Well Abandonment

No wells are currently proposed for abandonment.

## 2.4 Groundwater Monitoring System Maintenance Plan

Maintenance procedures have been developed in the SAP will be performed as needed to assure that the monitoring wells provide representative groundwater samples (Ramboll, 2022a).

### 3. GROUNDWATER MONITORING PLAN

The GMP will monitor and evaluate groundwater quality to demonstrate compliance with the groundwater quality standards included in 40 C.F.R. § 257.94(e) and 40 C.F.R. § 257.95(h). The groundwater monitoring program will include sampling and analysis procedures that are consistent and that provide an accurate representation of groundwater quality at the background and downgradient wells as required by 40 C.F.R. § 257.91. As discussed in **Section 2**, three monitoring programs specific to the GMF RP exist, the IEPA monitoring program, the 40 C.F.R. § 257 monitoring program, and the 35 I.A.C. § 845 monitoring program. As specified in the CCA, groundwater sampling requirements that apply to the CCR SI under other existing permit programs will become void upon issuance of an approved operating permit pursuant to 35 I.A.C § 845.

#### 3.1 Sampling Schedule

Groundwater sampling for the 40 C.F.R. § 257 monitoring well network was initially performed quarterly between 2015 and 2017 to establish baseline groundwater quality. Detection monitoring began in the first quarter of 2017 with semiannual sampling. Assessment monitoring began in the second quarter of 2018. The GMF RP is currently in assessment monitoring and sampling will continue in 2023 according to the schedule summarized in **Table E** on the following page.

**Table E. 40 C.F.R. § 257 Sampling Schedule**

Frequency	Duration
Quarterly (groundwater quality)	<b>Baseline</b> Began: monitoring began in 2015. Ended: monitoring was completed in 2017 to establish baseline groundwater quality for existing landfills and SIs.
At least Semi-annually (groundwater quality)	<b>Detection Monitoring</b> Begins: monitoring began no later than October 17, 2017, for existing landfills and SIs, following collection of a minimum of eight independent samples for constituents from Appendix III and Appendix IV from each background and downgradient well. At least semiannual sampling continues for Appendix III constituents throughout the active life of the CCR unit and the post-closure period. For new landfills and SIs, and lateral expansion of existing CCR units, a minimum of eight independent samples from each background well must be collected and analyzed for the constituents in Appendix III and Appendix IV during the first six months of sampling. Ends: Following 30-year post-closure care period or statistically significant increase (SSI) determination and unsuccessful Alternate Source Demonstration (ASD) evaluation within 90 days of SSI determination. <b>Assessment Monitoring</b> Begins: within 90 days of unsuccessful ASD evaluation for SSIs determined during Detection Monitoring; samples must be collected and analyzed for all constituents listed in Appendix IV. Within 90 days of obtaining the of the initial sample results, and on at least a semiannual basis thereafter, wells must be resampled for Appendix III and for those constituents in Appendix IV that have been detected during sampling. Ends: Following demonstration that concentrations of all constituents in Appendices III and IV are below background values for two consecutive sampling events.

Groundwater monitoring for the 40 C.F.R. § 257 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 United States Environmental Protection Agency (USEPA) approval of 35 I.A.C. § 845 as a State CCR Permit Program, the 40 C.F.R. § 257 monitoring will be discontinued and replaced by the 35 I.A.C. § 845 monitoring.

### 3.2 Groundwater Sample Collection

Groundwater sampling procedures have been developed in the SAP (Ramboll, 2022a) and the collection of groundwater samples is being implemented to meet the requirements of 40 C.F.R. § 257.93. In addition to groundwater well samples, quality assurance samples will be collected as described in the Multi-Site Quality Assurance Project Plan (QAPP) (Ramboll, 2022b).

### 3.3 Laboratory Analysis

Laboratory analysis will be performed consistent with the specifications of the QAPP. 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. Data reporting requirements and workflow are provided in the Multi-Site Data Management Plan (Ramboll, 2022c).



### **3.4 Quality Assurance Program**

The QAPP includes procedures and techniques for laboratory quality assurance/quality control (QA/QC). Additionally, the SAP includes requirements for field data collection QA/QC.

### **3.5 Statistical Analysis**

A Multi-Site Statistical Analysis Plan (Ramboll, 2022d) has been developed to describe procedures that will be used to establish background conditions and determine SSIs over background concentrations and statistically significant levels (SSLs) over groundwater protection standards (GWPSs) as required by 40 C.F.R. § 257.94 and 257.95. The Multi-Site Statistical Analysis Plan was prepared in accordance with the requirements of 40 C.F.R. § 257.93(f), with reference to the acceptable statistical procedures provided in *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (USEPA, 2009). The determination of SSIs over background concentrations and SSLs over GWPSs will be completed at least Semiannually in accordance with the sampling schedule provided in **Section 3.1**.

### **3.6 Data Reporting**

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

### **3.7 Compliance with Groundwater Quality Standards**

Compliance with the groundwater quality standards for the detection monitoring program referenced in 40 C.F.R. § 257.94(e) and the assessment monitoring program referenced in 40 C.F.R. § 257.95(h) will be determined as described in the following sections.

#### **3.7.1 SSI Determination in Detection Monitoring**

One-sided upper prediction limits (UPL) will be calculated for each Appendix III constituent using the background samples, with the exception of pH, for which both upper and lower prediction limits will be calculated. A tabular summary of UPLs will be provided in the Annual Groundwater Monitoring and Corrective Action Reports. Individual sampling event concentrations for each constituent detected in the downgradient monitoring wells will then be compared to the background UPL. An exceedance of the UPL for any constituent measured at any downgradient well constitutes an SSI. For pH, a measurement above the UPL or below the lower prediction limit (LPL) constitutes an SSI. As required by 40 C.F.R. § 257.93(h)(2), SSI determination will be completed within 90 days of sampling and analysis.

#### **3.7.2 GWPS and SSL Determination in Assessment Monitoring**

A GWPS will be established for Appendix IV constituents. The GWPS will be either the USEPA maximum contaminant levels (MCLs) or the health-based levels (HBLs) established in 40 C.F.R. § 257.95(h)(2) for cobalt, lead, lithium, and molybdenum. The exception to this is when the background concentration is greater than the established MCL or HBL. For this exception, background concentrations will be used to define the GWPS. The background will be calculated using a parametric or non-parametric upper tolerance limit (UTL), depending on the data distribution. A tabular summary of GWPSs will be provided in the Annual Groundwater Monitoring and Corrective Action Reports.

Compliance will be determined by comparing the lower confidence limit (LCL) of the downgradient concentrations to the GWPS. An SSL will be identified when the LCL exceeds the GWPS. The method of calculating the LCL is described in the Multi-Site Statistical Analysis Plan. If there are too few data points to calculate an LCL (a minimum of four data points is required), the most recent data point is compared to the GWPS. If all the downgradient samples for a well constituent pair are non-detect, the most recent RL is compared to the GWPS. Additionally, an SSL will be identified if all previous samples at a downgradient well were not-detect, and the two most recent samples have both detections and GWPS exceedances. SSL determination will be completed within 90 days of sampling and analysis.

### **3.8 Alternate Source Demonstrations**

An ASD may be completed for a unit under the detection monitoring program in 40 C.F.R. § 257.94(e)(2) or assessment monitoring program in 40 C.F.R. § 257.95(g)(3)(ii) to provide lines of evidence that a source other than the monitored unit caused the SSI/SSL or that the SSI/SSL resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The ASD will include information and analysis that supports the conclusions and a certification of accuracy by a qualified professional engineer. ASDs will be completed within 90 days of SSI/SSL determination and be provided in the Annual Groundwater Monitoring and Corrective Action Reports as required by 40 C.F.R. § 257.94(e)(2) and 40 C.F.R. § 257.95(g)(3)(ii).

#### **3.8.1 Detection Monitoring Program**

As allowed in 40 C.F.R. § 257.94(e)(2), following the determination of an SSI over background for groundwater constituents listed in Appendix III of 40 C.F.R. § 257, an ASD will be evaluated, and if completed within 90 days of the SSI determination, detection monitoring will continue.

If an ASD has not been successfully completed within 90 days of the SSI determination, Assessment Monitoring in accordance with 40 C.F.R. § 257.95 will be initiated within 90 days and the associated notification will be made to the CCR unit operating record and state director (and/or appropriate tribal authority, if applicable).

#### **3.8.2 Assessment Monitoring Program**

As allowed in 40 C.F.R. § 257.95(g)(3)(ii), following the determination of an SSL over the GWPS of constituents listed in Appendix IV of 40 C.F.R. § 257, an ASD will be evaluated and, if completed within 90 days of the SSL determination, assessment monitoring will continue.

If an ASD has not been successfully completed within the 90 days of the SSL determination, a Corrective Measures Assessment (CMA) in accordance with 40 C.F.R. § 257.96 will be initiated and the associated notification will be made to the CCR unit operating record and state director (and/or appropriate tribal authority, if applicable).

### **3.9 Corrective Action**

As described in 40 C.F.R. § 257.96, if the ASD summarized in **Section 3.8** has not been successfully completed, the CMA must be completed within 90 days, unless the owner or operator demonstrates the need for up to an additional 60 days to complete the CMA due to site-specific conditions of circumstances.

Remedy selection will follow the CMA and be documented in a remedy selection report in accordance 40 C.F.R. § 257.97. A corrective action monitoring plan will be developed to monitor the performance of the selected remedy.

### **3.10 Annual Report**

An Annual Groundwater Monitoring and Corrective Action Report will be completed and placed in the CCR unit operating record by January 31<sup>st</sup> of the following calendar year. At a minimum, the annual report must contain the following information, to the extent available:

1. A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit.
2. Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken.
3. In addition to all the monitoring data obtained under 40 C.F.R. §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs.
4. A narrative discussion of any transition between monitoring programs (*e.g.*, the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at an SSI relative to background levels).
5. Other information required to be included in the annual report as specified in 40 C.F.R. §§ 257.90 through 257.98.
6. A section at the beginning of the annual report that provides an overview of the current status of groundwater monitoring and corrective action programs for the CCR unit. At a minimum, the summary must specify all of the following:
  - i) At the start of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in § 257.94 or the assessment monitoring program in 40 C.F.R. § 257.95.
  - ii) At the end of the current annual reporting period, whether the CCR unit was operating under the detection monitoring program in 40 C.F.R. § 257.94 or the assessment monitoring program in 40 C.F.R. § 257.95.
  - iii) If it was determined that there was an SSI over background for one or more constituents listed in Appendix III of 40 C.F.R. § 257 pursuant to 40 C.F.R. § 257.94(e):
    - A. Identify those constituents listed in Appendix III of 40 C.F.R. § 257 and the names of the monitoring wells associated with such an increase.
    - B. Provide the date when the assessment monitoring program was initiated for the CCR unit.
  - iv) If it was determined that there was an SSL above the groundwater protection standard for one or more constituents listed in Appendix IV of 40 C.F.R. § 257 pursuant to 40 C.F.R. § 257.95(g) include all of the following:
    - A. Identify those constituents listed in Appendix IV of 40 C.F.R. § 257 and the names of the monitoring wells associated with such an increase.

- B. Provide the date when the CMA was initiated for the CCR unit.
- C. Provide the date when the public meeting was held for the CMA.
- D. Provide the date when the CMA was completed.
- v) Whether a remedy was selected pursuant to 40 C.F.R. § 257.97 during the current annual reporting period, and if so, the date of remedy selection.
- vi) Whether remedial activities were initiated or are ongoing pursuant to 40 C.F.R. § 257.98 during the current annual reporting period.

## 4. REFERENCES

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Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2021. *Hydrogeologic Site Characterization Report. Coffeen GMF Recycle Pond, Coffeen Power Plant. Coffeen, Illinois*. October 25, 2021.

Ramboll Americas Engineering Solutions, Inc. (Ramboll), 2022a. *Multi-Site Sampling and Analysis Plan*. December 28, 2022.

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United States Environmental Protection Agency (USEPA), 2015. *Title 40 of the Code of Federal Regulations, Part 257*.

## TABLES

**TABLE 2-1. MONITORING WELL LOCATIONS AND CONSTRUCTION DETAILS**  
GROUNDWATER MONITORING PLAN  
COFFEEN POWER PLANT  
GMF RECYCLE POND  
COFFEEN, ILLINOIS

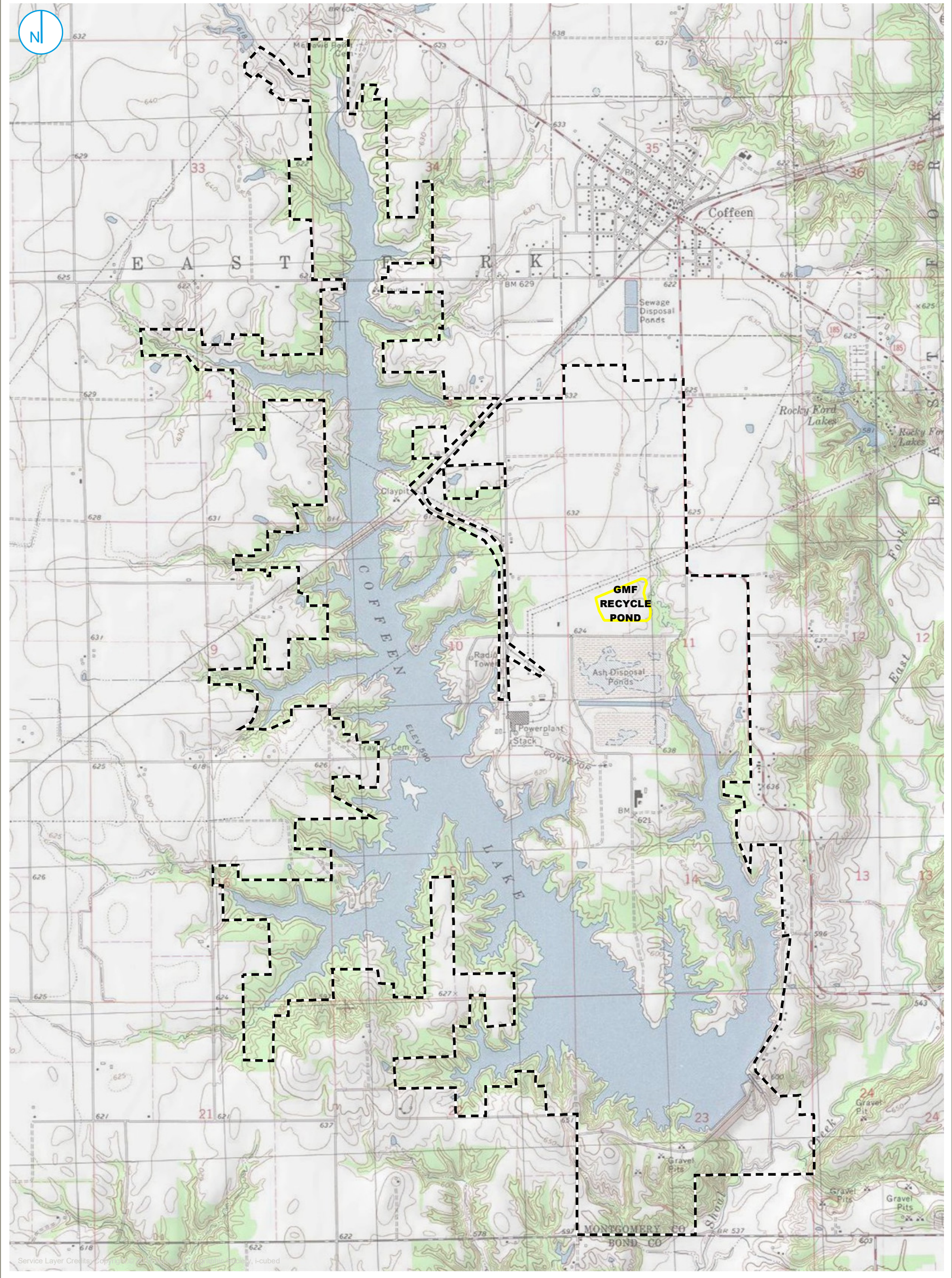
Well Number	Type	HSU	Date Constructed	Top of PVC Elevation (ft)	Measuring Point Elevation (ft)	Measuring Point Description	Ground Elevation (ft)	Screen Top Depth (ft BGS)	Screen Bottom Depth (ft BGS)	Screen Top Elevation (ft)	Screen Bottom Elevation (ft)	Well Depth (ft BGS)	Bottom of Boring Elevation (ft)	Screen Length (ft)	Screen Diameter (inches)	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
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
G271	C	UA	09/10/2009	--	625.57	Top of Disk	622.89	9.96	14.31	612.93	608.58	14.79	606.90	4.4	2	39.065007	-89.395587
G273	C	UA	09/10/2009	--	623.02	Top of Disk	620.17	9.08	14.56	611.09	605.61	15.10	604.20	5.5	2	39.064985	-89.393973
G275	C	UA	09/16/2009	--	618.26	Top of Disk	616.14	8.22	12.62	607.92	603.52	13.19	603.00	4.4	2	39.065151	-89.392561
G275D	C	DA	01/14/2021	620.31	620.31	Top of PVC	617.52	49.76	59.55	567.76	557.97	59.89	517.80	9.8	2	39.065121	-89.392595
G276	C	UA	09/16/2009	--	632.00	Top of Disk	629.14	22.41	27.22	606.73	601.92	27.65	601.10	4.8	2	39.065534	-89.392617
G277	C	UA	09/14/2009	--	623.08	Top of Disk	620.79	14.29	18.77	606.50	602.02	19.24	600.80	4.5	2	39.065927	-89.392572
G279	C	UA	09/10/2009	--	632.04	Top of Disk	629.19	22.40	26.79	606.79	602.40	27.30	601.20	4.4	2	39.067156	-89.392998
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
G283	C	LCU	01/14/2021	610.75	610.75	Top of PVC	608.30	8.39	18.17	599.91	590.13	18.36	589.90	9.8	2	39.064645	-89.392119
G284	C	UA	02/03/2021	618.42	618.42	Top of PVC	615.33	8.08	12.85	607.25	602.48	13.23	601.30	4.8	2	39.065487	-89.390631
G285	C	LCU	01/25/2021	613.52	613.52	Top of PVC	610.54	13.68	23.45	596.86	587.09	23.83	584.50	9.8	2	39.066513	-89.391474
X201	WLO	S	--	--	618.47	--	--	--	--	--	--	--	--	--	--	39.065278	-89.3925
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  
DA = deep aquifer  
ft = foot or feet  
HSU = Hydrostratigraphic Unit  
LCU = lower confining unit  
PVC = polyvinyl chloride  
S = source water  
SW = surface water  
UA = uppermost aquifer


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## FIGURES





 40 C.F.R. § 257 REGULATED UNIT (SUBJECT UNIT)

 PROPERTY BOUNDARY

SITE LOCATION MAP

FIGURE 1-1

0 1,000 2,000  
Feet

40 C.F.R. § 257 GROUNDWATER MONITORING PLAN  
GMF RECYCLE POND  
COFFEEN POWER PLANT  
COFFEEN, ILLINOIS

RAMBOLL AMERICAS  
ENGINEERING SOLUTIONS, INC.







- COAL MINE SHAFT
- 40 C.F.R. § 257 REGULATED UNIT (SUBJECT UNIT)
- SITE FEATURE
- LIMITS OF FINAL COVER
- PROPERTY BOUNDARY

0 275 550 Feet

SITE MAP

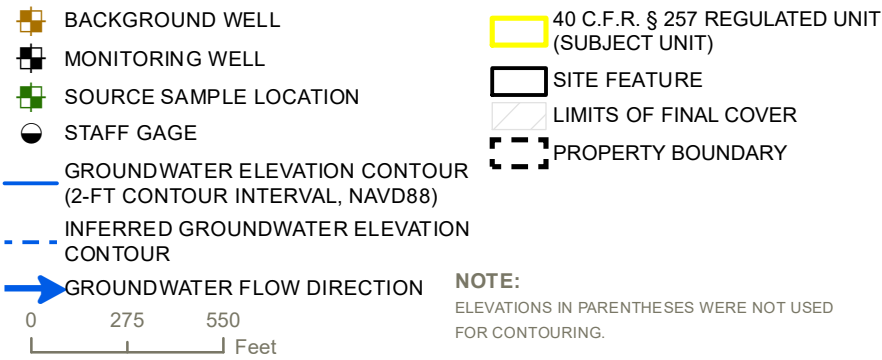
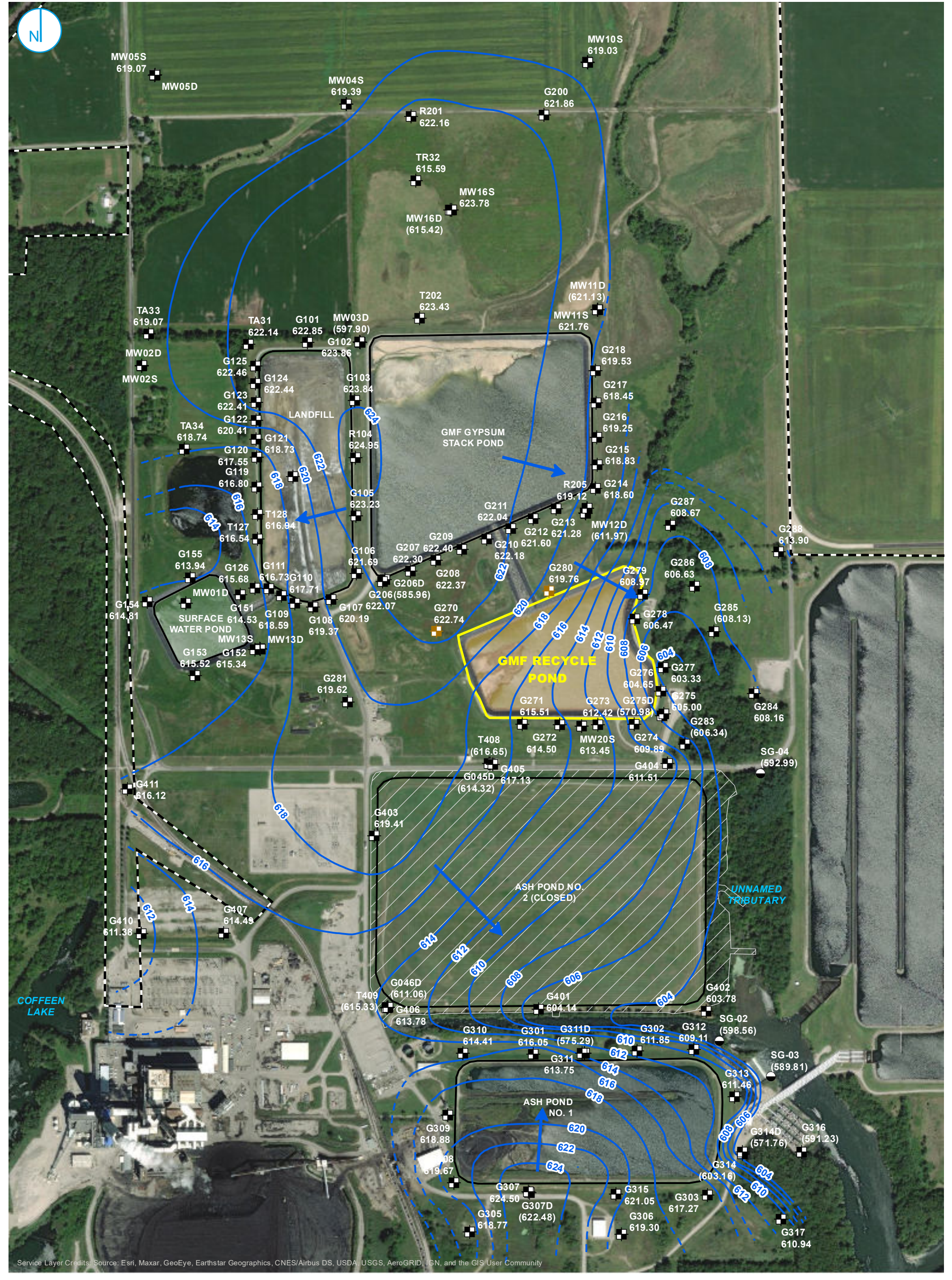
FIGURE 1-2

40 C.F.R. § 257 GROUNDWATER MONITORING PLAN  
GMF RECYCLE POND  
COFFEEN POWER PLANT  
COFFEEN, ILLINOIS

RAMBOLL AMERICAS  
ENGINEERING SOLUTIONS, INC.







UPPERMOST AQUIFER  
POTENTIOMETRIC SURFACE MAP  
APRIL 20, 2021

40 C.F.R. § 257 GROUNDWATER MONITORING PLAN  
GMF RECYCLE POND  
COFFEEN POWER PLANT  
COFFEEN, ILLINOIS

FIGURE 1-3

RAMBOLL AMERICAS  
ENGINEERING SOLUTIONS, INC.





PROJECT: 169000XXXX | DATED: 1/11/2023 | DESIGNER: galammc  
Y:\Mapping\Projects\22\2285\MXD\GMP\Coffee\GMP\_RP\_10a\Figure 2-1\_Expanded Part 257 GW Monitoring Well Network.mxd



- |  |                            |  |   |
|--|----------------------------|--|---|
|  | COMPLIANCE MONITORING WELL |  | 40 C.F.R. § 257 REGULATED UNIT (SUBJECT UNIT) |
|  | BACKGROUND MONITORING WELL |  | SITE FEATURE                                  |
|  | LEACHATE WELL              |  | LIMITS OF FINAL COVER                         |
|  | STAFF GAGE, RIVER          |  | PROPERTY BOUNDARY                             |

0 150 300  
Feet

## EXPANDED 40 C.F.R. § 257 GROUNDWATER MONITORING WELL NETWORK

40 C.F.R. § 257 GROUNDWATER MONITORING PLAN  
GMF RECYCLE POND  
COFFEEN POWER PLANT  
COFFEEN, ILLINOIS

FIGURE 2-1

RAMBOLL AMERICAS  
ENGINEERING SOLUTIONS, INC.

