BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
PETITION OF AMEREN ENERGY MEDINA	)	AS 21-008
VALLEY COGEN, LLC (OLD MEREDOSIA)	)	(Adjusted Standard - Land)
FOR ADJUSTED STANDARDS	)	
FROM 35 ILL. ADMIN. CODE PART 845	)	

NOTICE OF FILING

To: **Don Brown, Clerk**
Illinois Pollution Control Board
100 West Randolph St.
Suite 11-500
Chicago, Illinois 60601

Stefanie N. Diers
Sara Terranova
Greg Stucka
Illinois Environmental Protection Agency
1021 North Grand Avenue East
P.O. Box 19267
Springfield, IL 62795-9276

Please take notice that on April 28, 2023, the Petitioner filed electronically with the Office of the Clerk of the Illinois Pollution Control Board, Ameren's Index of Exhibits to the Amended Petition for Adjusted Standards from 35 Ill. Admin. Code, and Certificate of Service, copies of which are served upon you.

Dated: April 28, 2023

Respectfully submitted,
Ameren Energy Medina Valley Cogen, LLC, Petitioner.

By: /s/ Claire A. Manning
One of Its Attorneys

BROWN, HAY & STEPHENS, LLP
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CERTIFICATE OF SERVICE

I, the undersigned attorney, certify that I have filed the foregoing document electronically with the Illinois Pollution Control Board and served the following persons with the same document by electronic transmission on April 28, 2023:

Don Brown, Clerk
Illinois Pollution Control Board
100 West Randolph St.
Suite 11-500
Chicago, Illinois 60601

Stefanie N. Diers
Sara Terranova
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Electronic Filing: Received, Clerk's Office 05/01/2023

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PETITION OF AMEREN ENERGY MEDINA	)	AS 21-008
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INDEX OF EXHIBITS

Exhibit 1 *Geotechnology, Inc.*, Closure Plan: Fly Ash Pond and Bottom Ash Pond, Meredosia Power Station, Project No. J024917.01 (Aug. 15, 2016) ..... Pg. 1

Exhibit 2 *Neal Kochis & Steven F. Putrich*, Technical Memorandum – Engineering Review/Expert Witness Support: Petition for Adjusted Standard for Old Meredosia, Illinois Pollution Control Board Docket AS 2021-08, HALEY & ALDRICH. April 19, 2023 ..... Pg. 620

Exhibit 3 *Lisa JN Bradley*, Report on Old Meredosia Risk Evaluation, Meredosia, Illinois, HALEY & ALDRICH, April, 2023 ..... Pg. 1033

Exhibit 4 July 9, 1971 CIPS Permit ..... Pg. 1116

Exhibit 5 Elevation Rendering of Old Meredosia ..... Pg. 1163

Exhibit 6 Pre-Filed Answers of Gary King, R20-19, p. 24 (Sep. 24, 2020) ..... Pg. 1164

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IEPA-DIVISION OF RECORDS MANAGEMENT
RELEASABLE
AUG 18 2017
REVIEWER: JKS

GEOTECHNOLOGY INC
FROM THE GROUND UP

CLOSURE PLAN
FLY ASH POND AND BOTTOM ASH POND
MEREDOSIA POWER STATION
800 SOUTH WASHINGTON STREET
MEREDOSIA, ILLINOIS

Prepared for:

AMERENENERGY MEDINA VALLEY COGEN, LLC
St. Louis, Missouri

Prepared by:

GEOTECHNOLOGY, INC.
St. Louis, Missouri

Project No. J024917.01

August 15, 2016

J024917.01

FLY ASH POND AND BOTTOM ASH POND
MEREDOSIA POWER STATION
800 SOUTH WASHINGTON STREET
MEREDOSIA, ILLINOIS

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Closure Plan

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Groundwater Monitoring Plan	B
Groundwater Management Zone Application	C
Post-Closure Care Plan	D
Construction Quality Assurance Plan	E
Construction Specification	F
Construction Plans	G

IEPA-DIVISION OF RECORDS MANAGEMENT
RELEASABLE
AUG 18 2017
REVIEWER: JKS

RECEIVED
AUG 22 2016
Div. of Public Water Supplies
Illinois EPA

CLOSURE PLAN
FLY ASH POND AND BOTTOM ASH POND
MEREDOSIA POWER STATION
800 SOUTH WASHINGTON STREET
MEREDOSIA, ILLINOIS

Prepared for:

AMERENENERGY MEDINA VALLEY COGEN, LLC
St. Louis, Missouri

Prepared by:

GEOTECHNOLOGY, INC.
St. Louis, Missouri

Project No. J024917.01

August 15, 2016

deliverables/J024917.01 Meredosia Closure Plan RF.doc

J024917.01

CLOSURE PLAN
FLY ASH POND AND BOTTOM ASH POND
MEREDOSIA POWER STATION
800 SOUTH WASHINGTON STREET
MEREDOSIA, ILLINOIS

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J024917.01

CLOSURE PLAN
FLY ASH POND AND BOTTOM ASH POND
MEREDOSIA POWER STATION
800 SOUTH WASHINGTON STREET
MEREDOSIA, ILLINOIS

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J024917.01

CLOSURE PLAN
FLY ASH POND AND BOTTOM ASH POND
MEREDOSIA POWER STATION
800 SOUTH WASHINGTON STREET
MEREDOSIA, ILLINOIS

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J024917.01

CLOSURE PLAN
FLY ASH POND AND BOTTOM ASH POND
MEREDOSIA POWER STATION
800 SOUTH WASHINGTON STREET
MEREDOSIA, ILLINOIS

1.0 INTRODUCTION

This Closure Plan for the AmerenEnergy Medina Valley Cogen, LLC Meredosia Power Station (Meredosia Power Station) Fly Ash Pond and Bottom Ash Pond Coal Combustion Waste Surface Impoundments has been prepared in general accordance with the requirements of the site-specific rule in 35 Illinois Administrative Code (IAC) Part 840.101 through 840.152 and the United States Environmental Protection Agency (USEPA) regulation at 40 Code of Federal Regulations (CFR) Parts 257 and 261. Supporting documents to this Closure Plan are listed in the Reference Section of this report.

2.0 SITE LAYOUT

The Meredosia power Station is located at 800 South Washington Street, Meredosia, Illinois. The Fly Ash and Bottom Ash Ponds are located southwest of the coal pile and plant facilities. The site location and topography are shown on Plate 1. The existing structures, ash ponds, and boring/monitoring wells are shown on Plate 2.

3.0 SITE HISTORY

The Meredosia Power Station is located south of Meredosia in Morgan County, Illinois, which is located in west-central Illinois. The Meredosia Power Station ash ponds are located in the south half of Section 21 and the north half of Section 28, T.16N, R.13W. The plant generated electricity from 1948 until February 2012. The plant is located on the floodplain east of the Illinois River. A third ash pond referred to as the "Old Ash Pond" was reportedly closed, and will not be further discussed in this report. Reportedly, the Bottom Ash and Fly Ash Ponds were constructed of native materials.

The Bottom Ash Pond was constructed in 1972 with a design surface area of 11 acres, a height of 24 feet and a volume of approximately 90 acre-feet. The Bottom Ash Pond had received low-volume wastewater, bottom ash and storm water runoff. The site operates under NPDES Permit IL0000116, Outfall 003, which is for the Bottom Ash Pond. Reportedly, the Bottom Ash Pond did not have standing water within two months of the plant closure.

The Fly Ash Pond was constructed in 1968. The Fly Ash Pond has a surface area of 34 acres, a height of 24 feet and a volume of approximately 500 acre-feet. The Fly Ash Pond reportedly received fly ash, low-volume wastewater and storm water runoff. The site operates under NPDES Permit IL0000116, Outfall 004, which is for the Fly Ash Pond. The Fly Ash Pond was reportedly dry by October 2012.

A feasibility analysis was performed regarding the closure options for the Fly Ash and Bottom Ash Ponds on the site. The options included no action, complete clean closure, soil/geosynthetic composite cap, and partial clean closure with a ClosureTurf® cap alternatives. The no closure option was not selected due to the known groundwater impacts at the site and facility decommissioning activities. Clean closure of both ponds was cost and time prohibitive due to ash disposal and subsequent backfilling and grading of the site. The soil/geosynthetic composite cap option was not selected due to the long term maintenance issues, lack of personnel on site to perform maintenance activities, cost, and the longer time frame needed to close the ponds. Partial clean closure of the bottom ash pond, moving the bottom ash to the fly ash pond, and capping the fly ash pond and bottom ash pond berm with ClosureTurf® was selected as an effective and efficient option.

4.0 SLOPE STABILITY ANALYSIS

Slope stability analysis consists of comparing the driving forces within a cross-section of slope to the resisting forces and calculating the factor of safety. Per the Illinois Department Natural Resources (IDNR)[1], embankments should have a minimum factor of safety of 1.5 for long-term static stability, and 1.0 for the pseudo-static condition (seismic condition). Major flood conditions and rapid drawdown conditions were also analyzed due to the proximity of the site to the Illinois River. Slope stability analysis discussion, section profiles, and calculated critical failure arcs at selected locations are presented in Appendix A. Global stability analysis results, at current groundwater elevations in relation to mean sea level (MSL) and design grades for the Fly Ash and Bottom Ash Ponds, are summarized in the following table.

[1] *Rules for Construction and Maintenance of Dams*, Illinois Department of Natural Resources, Office of Water Resources, Springfield, Illinois.

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SUMMARY OF STABILITY ANALYSES			
Section Location	**Case**	**Calculated Factor of Safety**	**Target Factor of Safety**
Fly Ash Pond West Embankment	Static Condition Normal River Stage	2.1	1.5
	Static Condition Major Flood Stage (447'MSL)	2.5	1.5
	Rapid Drawdown Major Flood Stage (447'MSL)	1.7	1.2
	Seismic Condition	1.3	1.0
Bottom Ash Pond West Embankment	Static Condition Normal River Stage	1.8	1.5
	Static Condition Major Flood Stage (447'MSL)	1.6	1.5
	Rapid Drawdown Major Flood Stage (447'MSL)	1.7	1.2
	Seismic Condition	1.3	1.0

The stability models for each section at the Fly Ash Pond and Bottom Ash Pond closures have calculated factors of safety greater than or equal to the recommended IDNR target factor of safety for the static and seismic conditions.

5.0 CLOSURE ACTIVITIES

Proposed closure activities include grading, installation of high performance high density polyethylene (HDPE) geomembrane, and establishment of surface water control features for the Fly Ash and Bottom Ash Ponds. Closure activities will be performed in accordance with the Closure Plans and Specifications. Quality control will be performed in accordance with the Construction Quality Assurance (CQA) Plan prepared for this project and will be documented by a professional engineer licensed in Illinois.

Refer to the Plans and Specifications completed for this project (CDG, 2016) for details on the closure system.

5.1 Grading. Ash and other material (i.e. embankment soils, bottom ash, and approved demolition debris) will be moved within and between the Fly Ash and Bottom Ash Ponds to achieve design grades. Embankment materials and bottom ash may be used to bring the subgrade to within one foot of design elevations. At least one foot of fly ash will be placed on top of the

bottom ash to provide a good surface for ClosureTurf® installation. Ash will be placed at a maximum slope of 1V:10H (10 percent slope). Slopes are designed to promote surface runoff and reduce ponding. The final subgrade surface will be compacted and drum-rolled to provide a smooth surface prior to placement of the high performance HDPE system.

5.2 ClosureTurf®/HydroTurf® Installation. The ClosureTurf®/HydroTurf® system is a low permeability synthetic liner used to control storm water infiltration and limit exposure of the capped material to humans and vectors (i.e. animals). The design grades facilitate storm water runoff to the surface water management features outside the Fly Ash and Bottom Ash Ponds.

The ClosureTurf®/HydroTurf® is generally installed in the following manner (Refer to the CQA Plan for specific installation guidelines):

- The geomembrane component is installed per the manufacturer's requirements including the use of heat welding for seaming.
- The turf component is installed per the manufacturer's requirements including the use of a sewing machine for seaming.
- Sand or hydrobinder infill is placed and hydrated per the manufacturer's requirements.
- The perimeter of the geomembrane and turf components is secured by an anchor trench.

5.3 Surface Water Management. Surface water management features have been incorporated into the final cover design. Surface water features, such as ditches, will be formed in the subgrade to facilitate runoff. The ClosureTurf®/HydroTurf® will be placed over the berms and into ditches. Additional details are provided in the Plans and Specifications (CDG, 2016).

Surface water features are designed to handle runoff from a 20-year precipitation event without damage to the final cover and water ponding.

5.4 Construction Quality Assurance (CQA) Program. Refer to the CQA Plan (Geotechnology, 2016) for details on the project specific CQA program.

6.0 HYDROGEOLOGIC SITE INVESTIGATION

The Hydrogeologic Site Investigation includes a summary of geologic data, hydrogeologic data, and known impacts to the groundwater for the site. Boron and arsenic are typically the best indicator chemicals for coal combustion waste related impacts at the site. Please refer to the separate Hydrogeologic Site Investigation Report (Geotechnology, 2016) for detailed information.

7.0 GROUNDWATER

7.1 Groundwater Monitoring Program. Requirements for the groundwater monitoring program and associated quality assurance are found in the Groundwater Monitoring Plan (Geotechnology, 2016). Quarterly groundwater sampling of the groundwater monitoring system will occur for the first five years after the CQA acceptance report is submitted, and sampling frequencies may be reduced after that time frame. Monitoring data and trend analysis data will be maintained at the offices of Medina Valley Cogen, LLC until a post-closure completion report is accepted by the IEPA.

7.2 Groundwater Monitoring System. Nine monitoring wells (Groundwater Monitoring Program, Plate 2) have been installed in the vicinity of the Fly Ash and Bottom Ash Ponds. These monitoring wells are used for the groundwater monitoring system. Additional monitoring wells are not planned at this time. The monitoring well network will be evaluated two years after completion of the ash pond closures for effectiveness. One monitoring well (APW-1) will be sampled for background values, and eight monitoring wells will be sampled for groundwater assessment. Please refer to the separate Groundwater Monitoring Plan (Geotechnology, 2016) for additional information.

7.3 Groundwater Trend Analysis. Intrawell analysis will be used to assess groundwater trends over time. Please refer to the separate Groundwater Monitoring Plan (Geotechnology, 2016) for additional information.

7.4 Mitigation of Statistically Significant Trends. If statistically significant increasing trends are noted in the groundwater analysis, additional investigation into the cause of the increasing trends will be needed. Refer to the Groundwater Monitoring Plan (Geotechnology, 2016) for additional information.

8.0 TIME AND COST ESTIMATES

8.1 Time to Complete Closure. Completion of closure activities is dependent on weather and final approval of the closure plan by the IEPA. However, closure activities are anticipated to begin in 2016 and be completed in 2017.

8.2 Time to Reach Class I Groundwater Standards. Boron concentrations for the current ash pond configurations were modeled for 25 years to represent a scenario where the ash ponds were not closed. After 25 years, Monitoring Well APW-3 (the well with historically highest boron concentrations) stabilized at 16.9 mg/L of boron, which exceeds the Class I Groundwater standards. Monitoring Wells APW-2, APW-6, APW-7, and APW-8 also exceeded the Class I Groundwater standards at 25 years with no action.

After the dewatering and closure activities of the Fly Ash and Bottom Ash Ponds are complete, it will take approximately three years for boron concentrations to decrease below the Class I Groundwater standards for each well on site according to the model results.

Refer to the Hydrogeologic Site Investigation Report (Geotechnology, 2016) for more information regarding the groundwater modeling.

8.3 Remediation Time Frame. Once the ClosureTurf® caps for the Fly Ash and Bottom Ash Ponds are in place, precipitation will be diverted away from the ash ponds. Infiltration of precipitation into the ash ponds will be reduced or eliminated and further reductions of the concentrations of COCs are anticipated. Boron exhibited the highest concentration over the largest area and was used as the indicator contaminant for contaminant transport modeling. Based on the modeling results, the length of time required for the concentration of boron to decrease below the Class I Groundwater Standards is approximately three years. Additional contamination transport modeling information is in the Hydrogeologic Site Investigation Report (Geotechnology, 2016).

8.4 Cost of Closure. The cost for closure activities related to the closure of the Fly Ash and Bottom Ash Ponds as specified in the drawings and specifications is estimated to be $10,000,000.

8.5 Cost of Post-Closure Care. The cost for post-closure care activities related to the closure of the Fly Ash and Bottom Ash Ponds as specified in the Post-Closure Plan is estimated to be $20,000 annually while quarterly groundwater sampling is in progress.

9.0 REFERENCES

CDG, 2016. "Specifications and Construction Plans, Fly Ash and Bottom Ash Ponds Closure, Meredosia Power Station." CDG Engineers Architects Planners, Inc., St. Louis, Missouri, 2016

Geotechnology, Inc., Construction Quality Assurance Plan, Meredosia Power Station, Ameren, 2016.

Geotechnology, Inc., Groundwater Monitoring Plan, Meredosia Power Station, Ameren, 2016.

Geotechnology, Inc., Groundwater Management Zone Plan, Meredosia Power Station, Ameren, 2016.

Geotechnology, Inc., Post-Closure Plan, Meredosia Power Station, Ameren, 2016.

10.0 LICENSED PROFESSIONAL SIGNATURE/SEAL

I hereby affirm that the information and design documents contained in this closure plan are true and accurate to the best of my knowledge and professional opinion.

Rosanna M. Saindon, P.E., Ph.D.
Illinois Licensed Professional Engineer
Project Manager
Geotechnology, Inc.

NOTES

1. Plan adapted from a 7.5 minute U.S.G.S. map for Meredosia, Illinois quadrangle, last revised in 2015.

0 2,000 4,000

SCALE IN FEET

Drawn By: WAH	Ck'd By: [illegible]	App'vd By: AMS
Date: 7-20-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

SITE LOCATION AND TOPOGRAPHY

Project Number J024917.01	PLATE 1

NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.

LEGEND

- Monitoring Well Location
- Soil Boring Location
- Slope Stability Analysis Cross Section

N

0 300 600

SCALE IN FEET

Drawn By: WAH	Ck'd By: VDE	App'vd By: AMS
Date: 7-20-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

AERIAL PHOTOGRAPH OF SITE

Project Number J024917.01	PLATE 2

APPENDIX A

STABILITY ANALYSIS

APPENDIX A

STABILITY ANALYSIS

1.0 PREVIOUS SLOPE STABILITY STUDY

Geotechnology performed a subsurface exploration and global stability evaluation[2] for the west embankments of the Bottom Ash and Fly Ash Ponds at the subject site in January 2011. Ten borings designated as Borings B-1 through B-10 were drilled during the subsurface exploration. Boring locations are shown on Plate 2. Laboratory testing included moisture contents for cohesive samples and Atterberg limits on selected samples. Also, consolidated-undrained triaxial, unconfined compression and direct shear tests were performed on representative samples. Relevant data from this exploration are incorporated into this report. Copies of the boring logs are presented in Attachment A. Laboratory test results are included in Attachment B.

2.0 SLOPE STABILITY ANALYSIS

Slope stability analysis consists of comparing the driving forces within a cross-section of slope to the resisting forces and determining the factor of safety. Gravity forces tend to move the slope downwards (driving force), while resisting forces, derived from the soil shear strength, tend to keep the slope in place. When the driving force acting on the slope is greater than the resisting force, sliding can occur. The factor of safety of the slope is the ratio of the restraining force divided by the driving force. Generally, when the factor of safety is 1 or less, the slope is considered to be unstable. The accepted standard in local practice and consistent with the Illinois Department of Natural Resources (IDNR) dam safety requirement is a factor of safety of 1.5 for long term static stability of a slope, and 1.0 for pseudo-static conditions (seismic loading).

Slope stability analyses were performed for representative sections of the west embankments of the Bottom Ash and Fly Ash Ponds. We understand that the embankment slopes will remain as-is or will be graded to a slope of 1V:3H (Vertical:Horizontal) or flatter. The locations of the typical cross-sections of the embankments are represented by Sections B-B' and A-A', respectively, and are shown on Plate 2. Soil profile and properties used in the stability analysis were selected based on boring and laboratory test results reported in the 2011 Global Stability Evaluation report and Geotechnology's experience with similar materials. The soil properties used in the models are summarized in the following table:

[2] *Global Stability Evaluation, Meredosia Power Station, Bottom and Fly Ash Ponds, Meredosia, Illinois,* prepared for Ameren Energy Resources by Geotechnology Inc., Report No. J017150.01, and dated January 4, 2011.

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2.1 Effective Stress Parameters

Material	Cohesion (psf)	Friction Angle (deg)	Density (pcf)
Embankment Fill	0	28	115
Silty Clay	50	29	115
Sand	0	39	120
Fly Ash	0	25	112
Bottom Ash	0	28	112

2.2 Total Stress Parameters

Material	Cohesion (psf)	Friction Angle (deg)
Embankment Fill	0	0
Silty Clay	500	14
Sand	0	0
Fly Ash	0	0
Bottom Ash	0	0

Geotechnology performed stability analysis for deep seated, global failure of the embankments. Representative cross-sections of the embankments are shown on the plates included in Appendix C. Since the embankments have been in place for 40 years or more, long-term stability of the embankments was analyzed (i.e. effective stress conditions). Both effective and total stress soil properties were used for the rapid drawdown analysis. Groundwater in the Bottom Ash Pond was varied between El 435[3] to 440 for our analyses. Groundwater in the Fly Ash Pond was assumed to be at El 450. For the rapid drawdown case it was assumed that the Illinois River will drain rapidly from its major flood stage of El 447.

A pseudo-static seismic analysis was performed on the embankment sections using a Peak Ground Acceleration (PGA) of 0.1g, which corresponds to a seismic event with a mean return time of 2,500 years. The PGA is based on data provided in Appendix 1 of the dam safety guidelines[4] published by the IDNR. The Morgenstern-Price procedure was used to compute factors of safety. The computer program SLOPE/W was used to perform the computations. The calculated factors of safety are given in the following table.

[3] All elevations herein refer to the mean sea level (msl) datum in feet.
[4] "Procedural Guidelines for Preparation of Technical Data to be included in Application for Permits for Construction and Maintenance of Dams" issued by Illinois Department of Natural Resources.

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SLOPE STABILITY ANALYSIS RESULTS				
Analysis Condition	Calculated Factor of Safety		Target Factor of Safety[a]	Reference Plate No.
	Fly Ash Pond Section AA'	Bottom Ash Pond Section BB'		
Steady State Seepage Groundwater Elevation in Ash Pond as noted	2.1 (El 450)	1.8 (El 435)	1.5	1 and 5
Steady State Seepage at Major Flood Stage El 447 Groundwater Elevation in Ash Pond as noted	2.5 (El 450)	1.6 (El 440)	1.5	2 and 6
Rapid Drawdown from Major Flood Stage at El 447 Groundwater Elevation in Ash Pond as noted	1.7 (El 450)	1.7 (El 440)	1.2	3 and 7
Slope with Seismic Forces Mean Return Time 2,500 Years Groundwater Elevation in Ash Pond as noted	1.3 (El 450)	1.3 (El 435)	1.0	4 and 8

[a] "Procedural Guidelines for Preparation of Technical Data to be included in Application for Permits for Construction and Maintenance of Dams" issued by Illinois Department of Natural Resources.

IDNR recommends a minimum factor of safety of 1.5 for long-term stability. During an extreme event, such as an earthquake, a factor of safety of 1.0 or more is recommended. Based on the results of our analyses, the Bottom Ash and Fly Ash Pond embankment slopes have adequate factors of safety for global stability.

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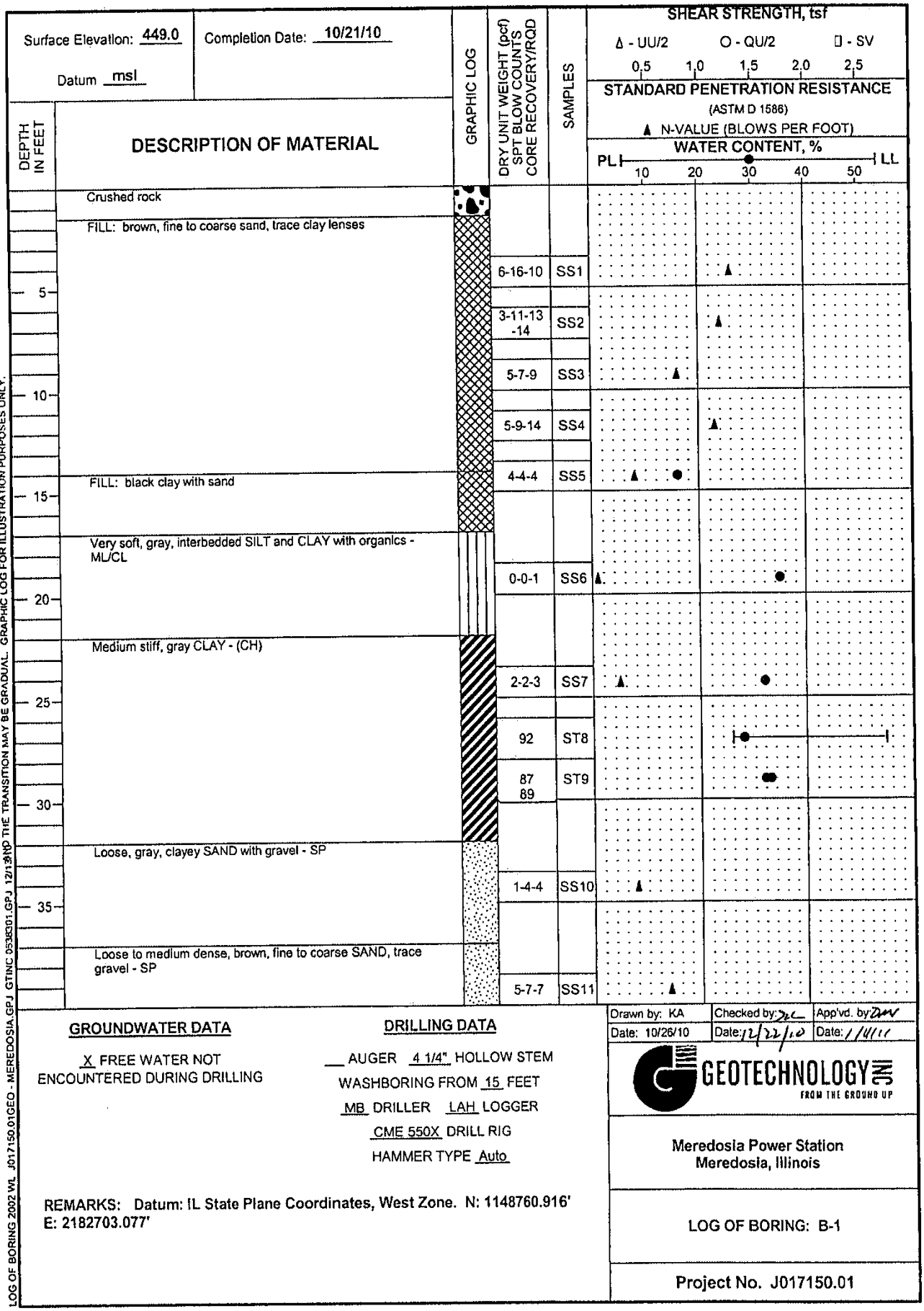
ATTACHMENT A

BORING LOGS AND
BORING LOG TERMS AND SYMBOLS



Surface Elevation: 449.0 Completion Date: 10/21/10

Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Crushed rock			
	FILL: brown, fine to coarse sand, trace clay lenses		6-16-10	SS1
5			3-11-13 -14	SS2
			5-7-9	SS3
10			5-9-14	SS4
			4-4-4	SS5
15	FILL: black clay with sand			
	Very soft, gray, interbedded SILT and CLAY with organics - ML/CL		0-0-1	SS6
20				
	Medium stiff, gray CLAY - (CH)		2-2-3	SS7
25			92	ST8
			87 89	ST9
30				
	Loose, gray, clayey SAND with gravel - SP		1-4-4	SS10
35				
	Loose to medium dense, brown, fine to coarse SAND, trace gravel - SP		5-7-7	SS11

SHEAR STRENGTH, tsf

Δ - UU/2 O - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC 053B01.GPJ 12/13/10

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM

WASHBORING FROM 15 FEET

MB DRILLER LAH LOGGER

CME 550X DRILL RIG

HAMMER TYPE Auto

REMARKS: Datum: IL State Plane Coordinates, West Zone. N: 1148760.916' E: 2182703.077'

Drawn by: KA	Checked by:	App'vd. by:
Date: 10/26/10	Date: 12/22/10	Date: 1/11/11

GEOTECHNOLOGY INC. FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

LOG OF BORING: B-1

Project No. J017150.01

Surface Elevation: 449.0 | Completion Date: 10/21/10

Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Loose to medium dense, brown, fine to coarse SAND, trace gravel - SP *(continued)*			
			4-5-4	SS12
45				
			5-7-9	SS13
50				
			9-8-9	SS14
55				
			7-12-15	SS15
60	Boring terminated at 60 feet			
65				
70				
75				

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC 0638301.GPJ 12/13/10

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM 15 FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: Datum: IL State Plane Coordinates, West Zone. N: 1148760.916' E: 2182703.077'

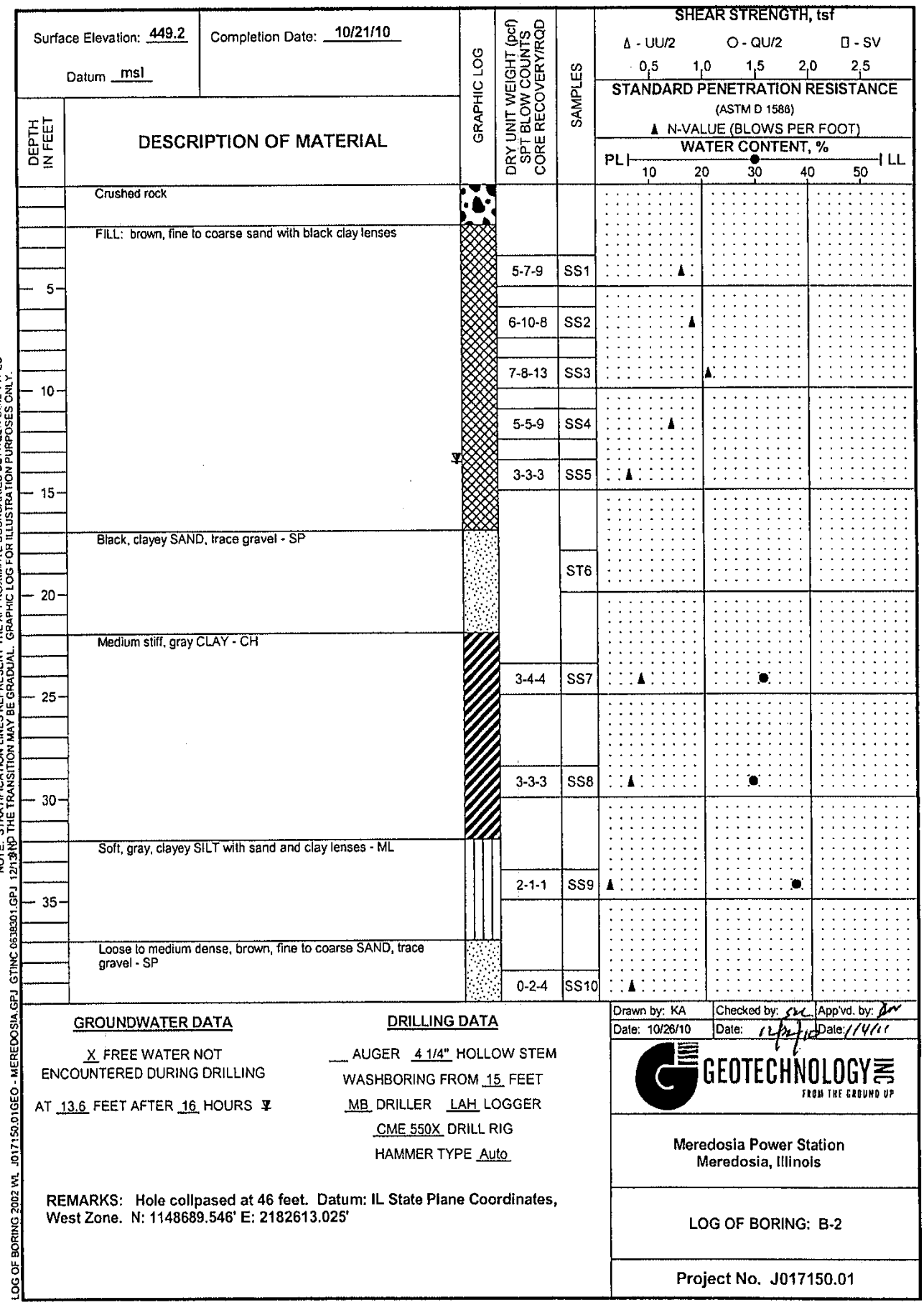
Drawn by: KA	Checked by: SK	App'vd. by: DM
Date: 10/26/10	Date: 12/22/10	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

CONTINUATION OF
LOG OF BORING: B-1

Project No. J017150.01



Surface Elevation: 449.2 Completion Date: 10/21/10

Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Crushed rock			
	FILL: brown, fine to coarse sand with black clay lenses		5-7-9	SS1
5			6-10-8	SS2
			7-8-13	SS3
10			5-5-9	SS4
			3-3-3	SS5
15				ST6
	Black, clayey SAND, trace gravel - SP			
20				
	Medium stiff, gray CLAY - CH		3-4-4	SS7
25				
			3-3-3	SS8
30				
	Soft, gray, clayey SILT with sand and clay lenses - ML		2-1-1	SS9
35				
	Loose to medium dense, brown, fine to coarse SAND, trace gravel - SP		0-2-4	SS10

SHEAR STRENGTH, tsf

Δ - UU/2 O - QU/2 □ - SV

0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE

(ASTM D 1586)

▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %

PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC 063501.GPJ 12/13/10

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

AT 13.6 FEET AFTER 16 HOURS ▼

DRILLING DATA

___ AUGER 4 1/4" HOLLOW STEM

WASHBORING FROM 15 FEET

MB DRILLER LAH LOGGER

CME 550X DRILL RIG

HAMMER TYPE Auto

REMARKS: Hole collpased at 46 feet. Datum: IL State Plane Coordinates, West Zone. N: 1148689.546' E: 2182613.025'

Drawn by: KA	Checked by:	App'vd. by:
Date: 10/26/10	Date: 12/2/10	Date: 12/4/10

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

LOG OF BORING: B-2

Project No. J017150.01

Surface Elevation: 449.2 Completion Date: 10/21/10

Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Loose to medium dense, brown, fine to coarse SAND, trace gravel - SP *(continued)*			
			3-6-6	SS11
45	Boring terminated at 46 feet.			

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0,5 1,0 1,5 2,0 2,5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC 0638301.GPJ 12/13/10

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

AT 13.6 FEET AFTER 16 HOURS ▼

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM 15 FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: Hole collpased at 46 feet. Datum: IL State Plane Coordinates, West Zone. N: 1148689.546' E: 2182613.025'

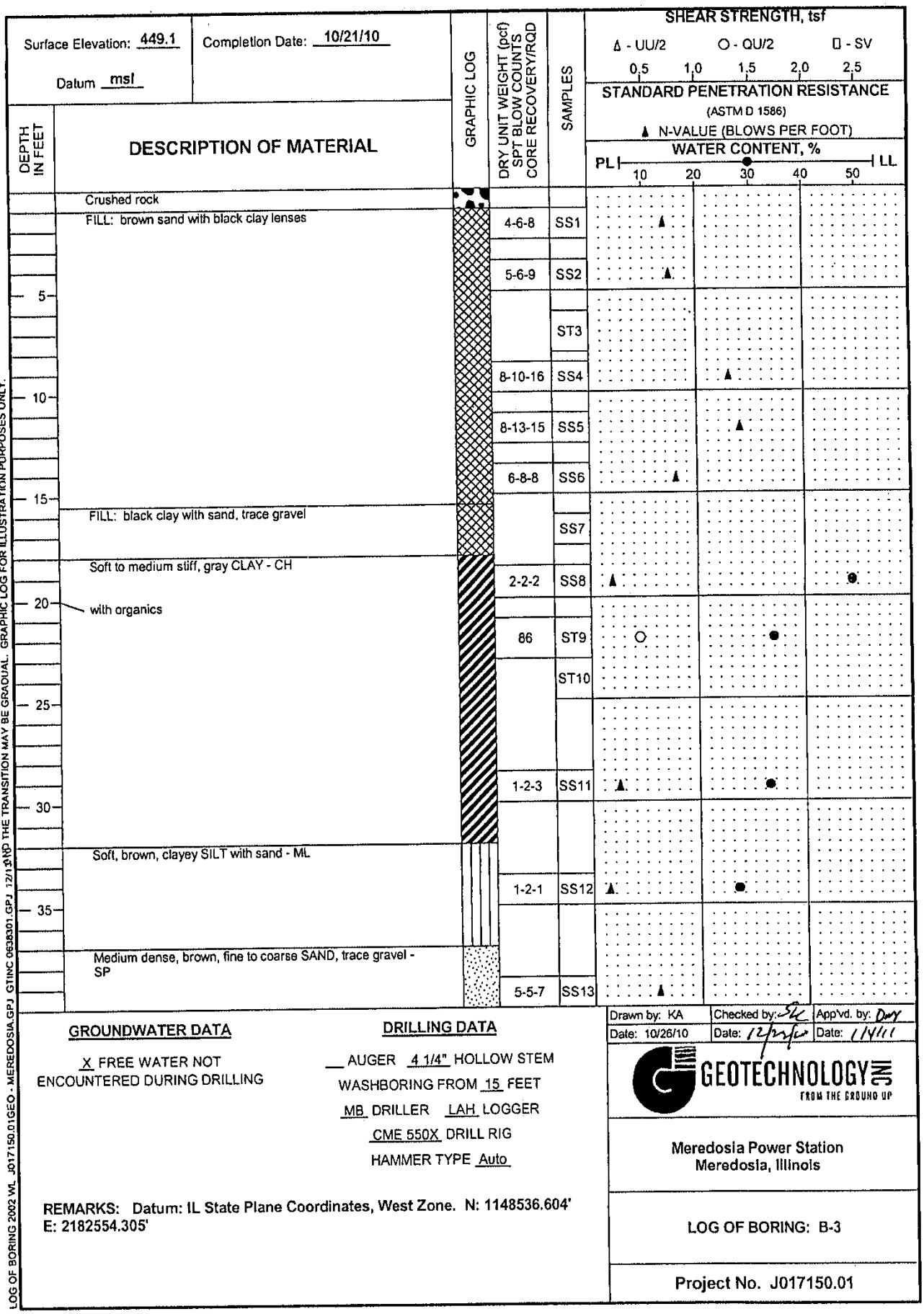
Drawn by: KA	Checked by: SK	App'vd. by: DW
Date: 10/26/10	Date: 12/22/10	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

CONTINUATION OF
LOG OF BORING: B-2

Project No. J017150.01



GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM 15 FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: Datum: IL State Plane Coordinates, West Zone. N: 1148536.604' E: 2182554.305'

Drawn by: KA	Checked by: SL	App'vd. by: DMY
Date: 10/26/10	Date: 12/29/10	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

LOG OF BORING: B-3

Project No. J017150.01

Surface Elevation: 449.1 | Completion Date: 10/21/10

Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf (Δ - UU/2, O - QU/2, □ - SV; 0.5, 1.0, 1.5, 2.0, 2.5) / STANDARD PENETRATION RESISTANCE (ASTM D 1586) ▲ N-VALUE (BLOWS PER FOOT) / WATER CONTENT, % (PL — LL; 10, 20, 30, 40, 50)
	Medium dense, brown, fine to coarse SAND, trace gravel - SP *(continued)*				
			6-7-7	SS14	▲
45					
			6-7-9	SS15	▲
50					
			5-8-9	SS16	▲
55					
			8-8-13	SS17	▲
60	Boring terminated at 60 feet.				
65					
70					
75					

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.VIL J017150.01GEO - MEREDOSIA.GPJ GTINC.0638301.GPJ 12/13/13

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM 15 FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: Datum: IL State Plane Coordinates, West Zone. N: 1148536.604' E: 2182554.305'

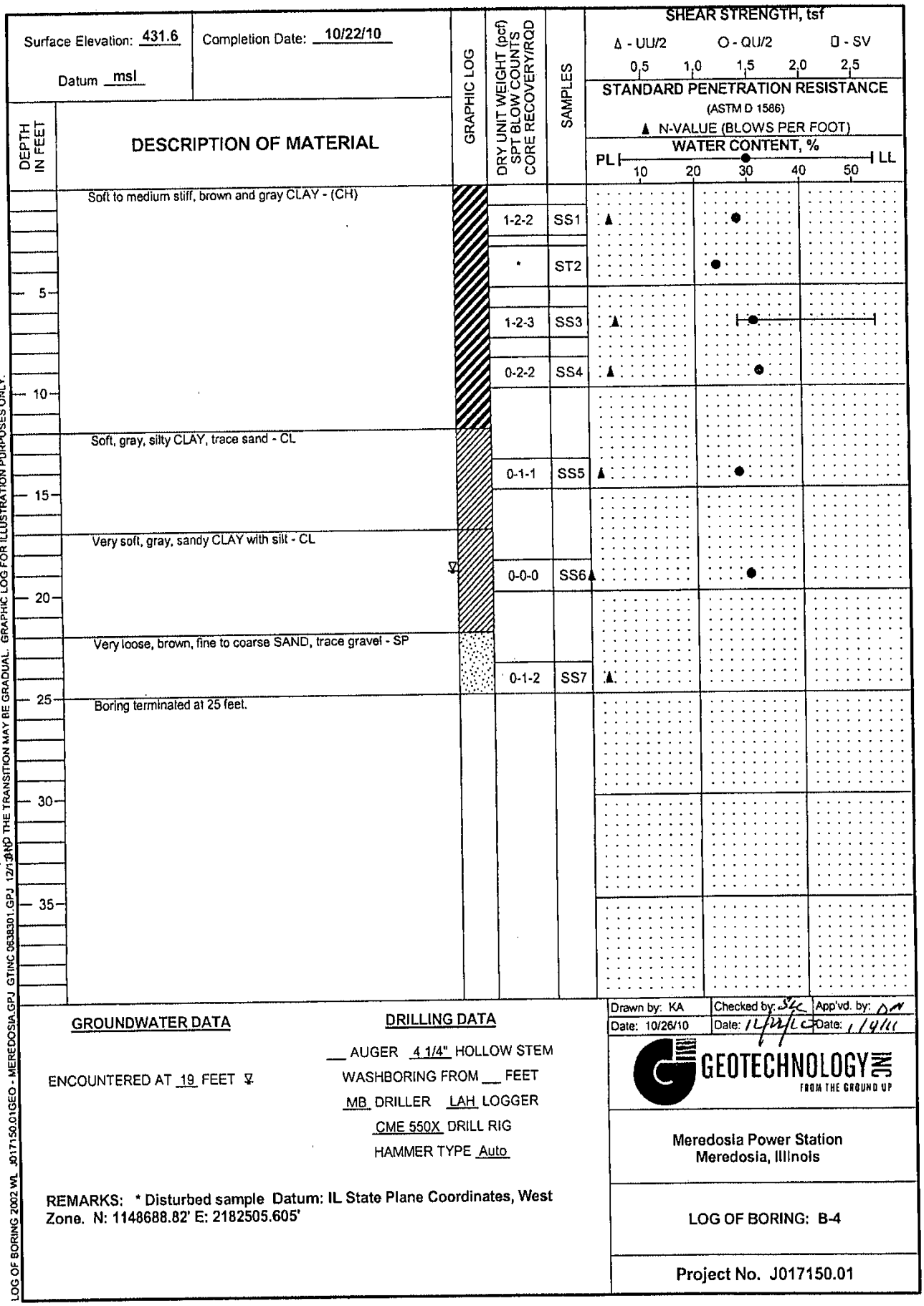
Drawn by: KA	Checked by: SC	App'vd. by: DW
Date: 10/26/10	Date: 12/17/13	Date: 1/1/14

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

CONTINUATION OF LOG OF BORING: B-3

Project No. J017150.01



Surface Elevation: 431.6 Completion Date: 10/22/10

Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Soft to medium stiff, brown and gray CLAY - (CH)		1-2-2	SS1
			•	ST2
5			1-2-3	SS3
			0-2-2	SS4
10				
	Soft, gray, silty CLAY, trace sand - CL		0-1-1	SS5
15				
	Very soft, gray, sandy CLAY with silt - CL		0-0-0	SS6
20				
	Very loose, brown, fine to coarse SAND, trace gravel - SP		0-1-2	SS7
25	Boring terminated at 25 feet.			
30				
35				

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC 063831.GPJ 12/13/10

GROUNDWATER DATA

ENCOUNTERED AT 19 FEET ▽

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: * Disturbed sample Datum: IL State Plane Coordinates, West Zone. N: 1148688.82' E: 2182505.605'

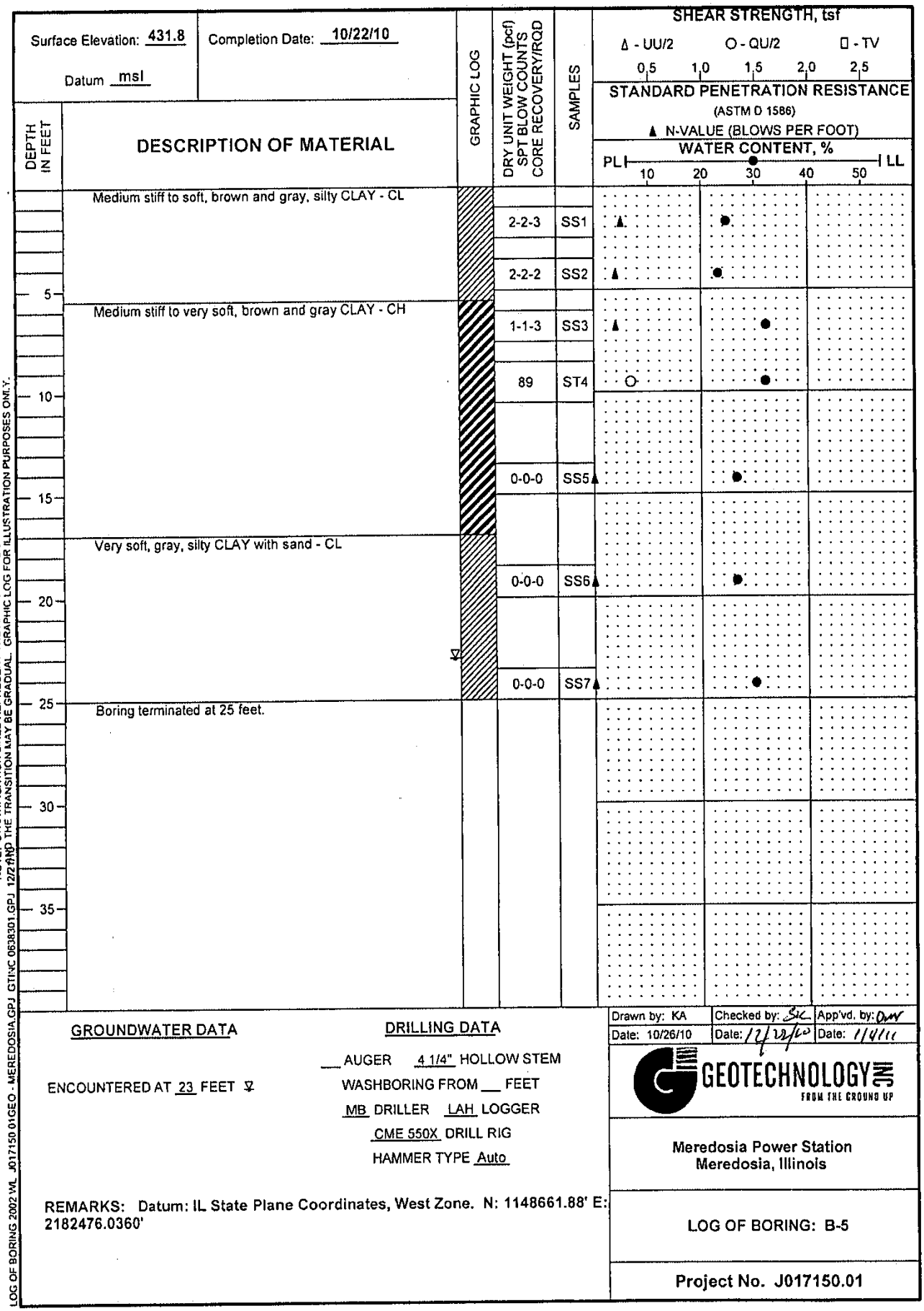
Drawn by: KA	Checked by: SJC	App'vd. by: DM
Date: 10/26/10	Date: 11/22/10	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

LOG OF BORING: B-4

Project No. J017150.01



Surface Elevation: 431.8 Completion Date: 10/22/10
Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
0	Medium stiff to soft, brown and gray, silty CLAY - CL		2-2-3	SS1
			2-2-2	SS2
5	Medium stiff to very soft, brown and gray CLAY - CH		1-1-3	SS3
			89	ST4
10				
			0-0-0	SS5
15	Very soft, gray, silty CLAY with sand - CL			
			0-0-0	SS6
20				
			0-0-0	SS7
25	Boring terminated at 25 feet.			
30				
35				

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - TV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC.0638301.GPJ 12/2/10

GROUNDWATER DATA

ENCOUNTERED AT 23 FEET ▽

DRILLING DATA

___ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM ___ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: Datum: IL State Plane Coordinates, West Zone. N: 1148661.88' E: 2182476.0360'

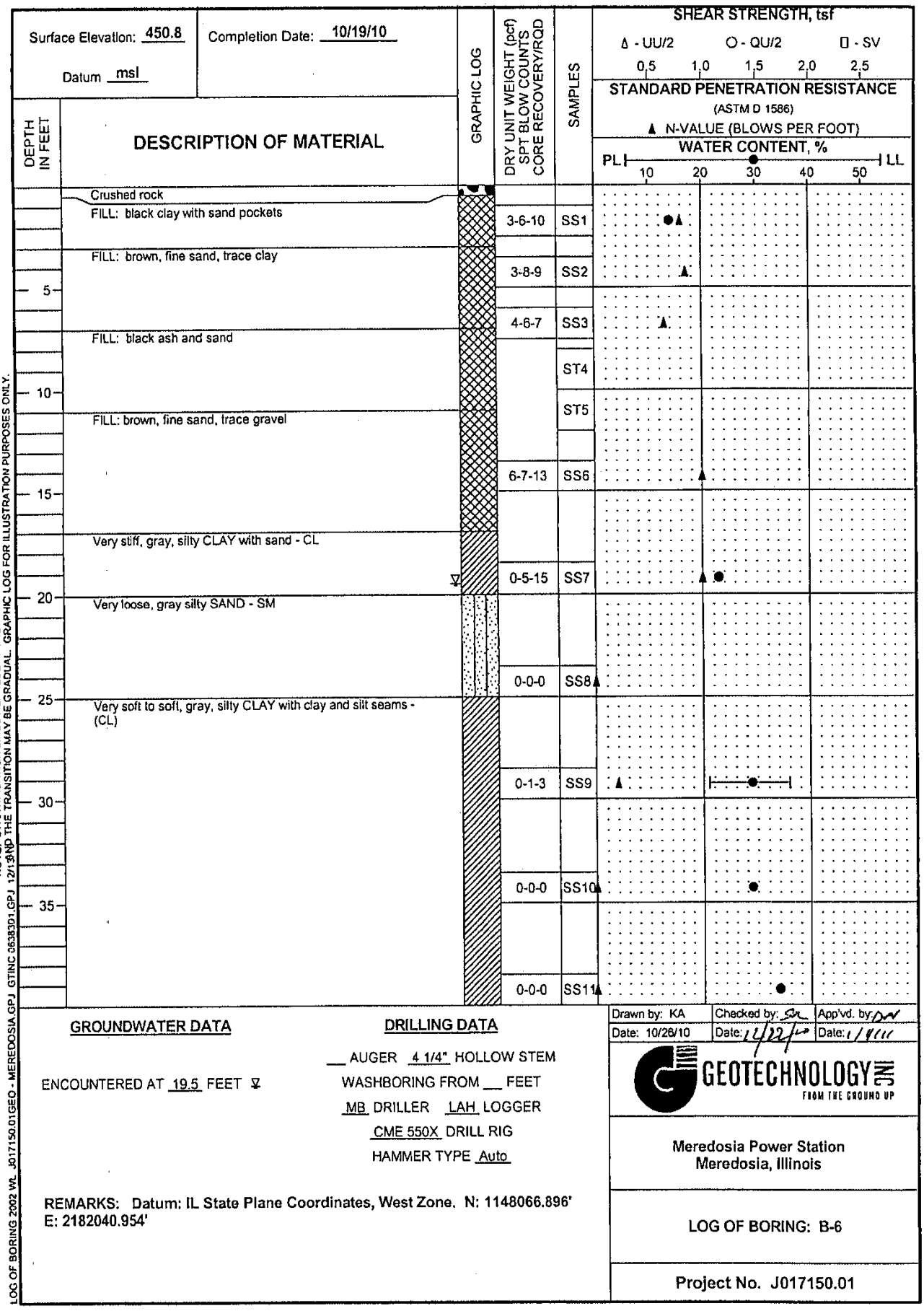
Drawn by: KA	Checked by: SLC	App'vd. by: DMV
Date: 10/26/10	Date: 12/23/10	Date: 1/4/11

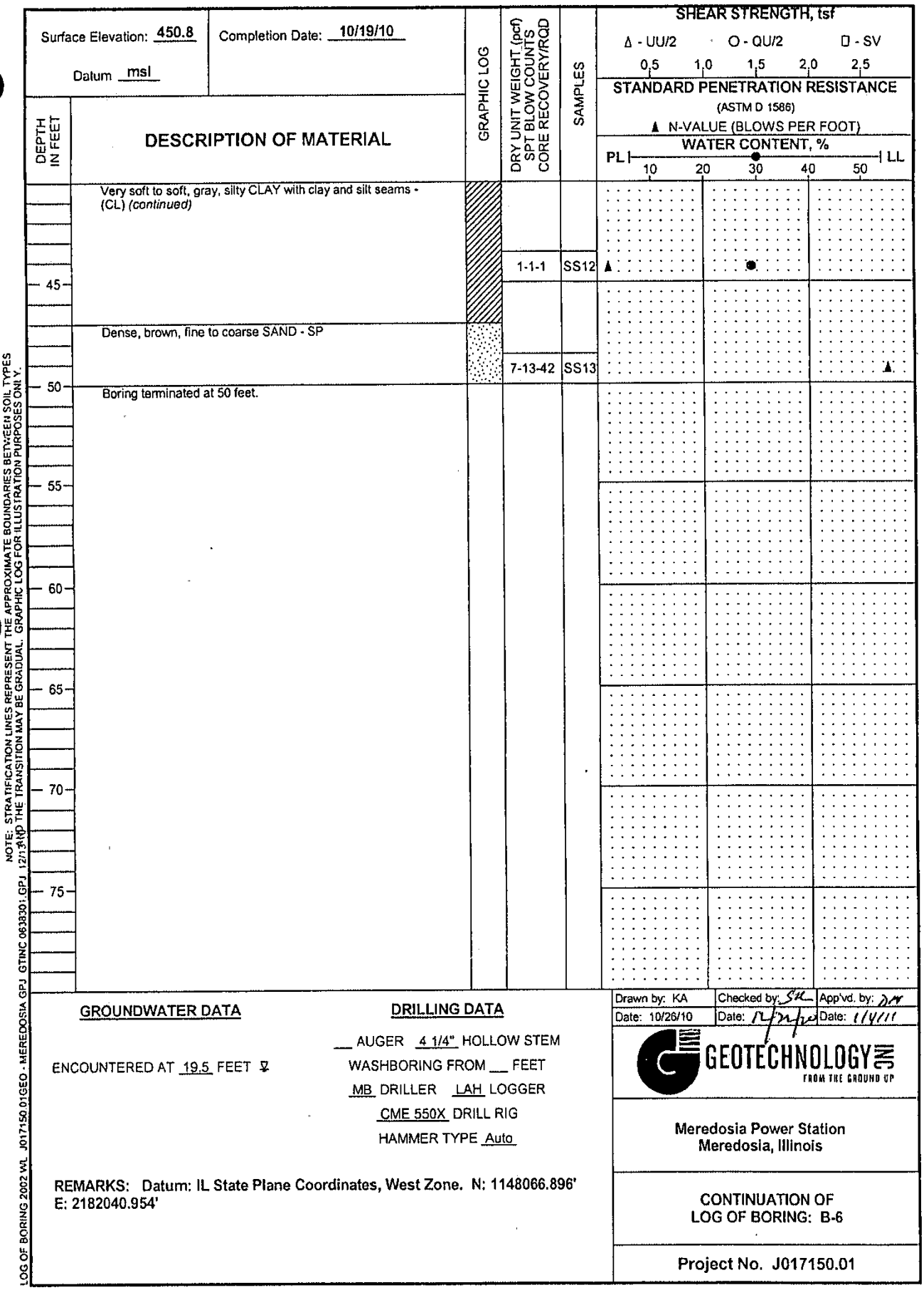
GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

LOG OF BORING: B-5

Project No. J017150.01


Surface Elevation: 450.8
Completion Date: 10/19/10
Datum msl
DEPTH IN FEET
DESCRIPTION OF MATERIAL
GRAPHIC LOG
DRY UNIT WEIGHT (pcf)
SPT BLOW COUNTS
CORE RECOVERY/RQD
SAMPLES
SHEAR STRENGTH, tsf
Δ - UU/2
O - QU/2
□ - SV
0.5 1.0 1.5 2.0 2.5
STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)
WATER CONTENT, %
PL
LL
10 20 30 40 50
Crushed rock
FILL: black clay with sand pockets
3-6-10 SS1
FILL: brown, fine sand, trace clay
3-8-9 SS2
4-6-7 SS3
FILL: black ash and sand
ST4
ST5
FILL: brown, fine sand, trace gravel
6-7-13 SS6
Very stiff, gray, silty CLAY with sand - CL
0-5-15 SS7
Very loose, gray silty SAND - SM
0-0-0 SS8
Very soft to soft, gray, silty CLAY with clay and silt seams - (CL)
0-1-3 SS9
0-0-0 SS10
0-0-0 SS11
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 J017150.01GEO - MEREDOSIA.GPJ GTINC 0638301.GPJ 12/13/10
GROUNDWATER DATA
ENCOUNTERED AT 19.5 FEET
DRILLING DATA
__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto
REMARKS: Datum: IL State Plane Coordinates, West Zone. N: 1148066.896' E: 2182040.954'
Drawn by: KA
Checked by:
App'vd. by:
Date: 10/26/10
Date: 11/22/10
Date: 1/9/11
GEOTECHNOLOGY INC
FROM THE GROUND UP
Meredosia Power Station
Meredosia, Illinois
LOG OF BORING: B-6
Project No. J017150.01



Surface Elevation: 450.8 Completion Date: 10/19/10

Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Very soft to soft, gray, silty CLAY with clay and silt seams - (CL) *(continued)*			
			1-1-1	SS12
45				
	Dense, brown, fine to coarse SAND - SP		7-13-42	SS13
50	Boring terminated at 50 feet.			
55				
60				
65				
70				
75				

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC.0638301.GPJ 12/13/10

GROUNDWATER DATA

ENCOUNTERED AT 19.5 FEET ▽

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: Datum: IL State Plane Coordinates, West Zone. N: 1148066.896' E: 2182040.954'

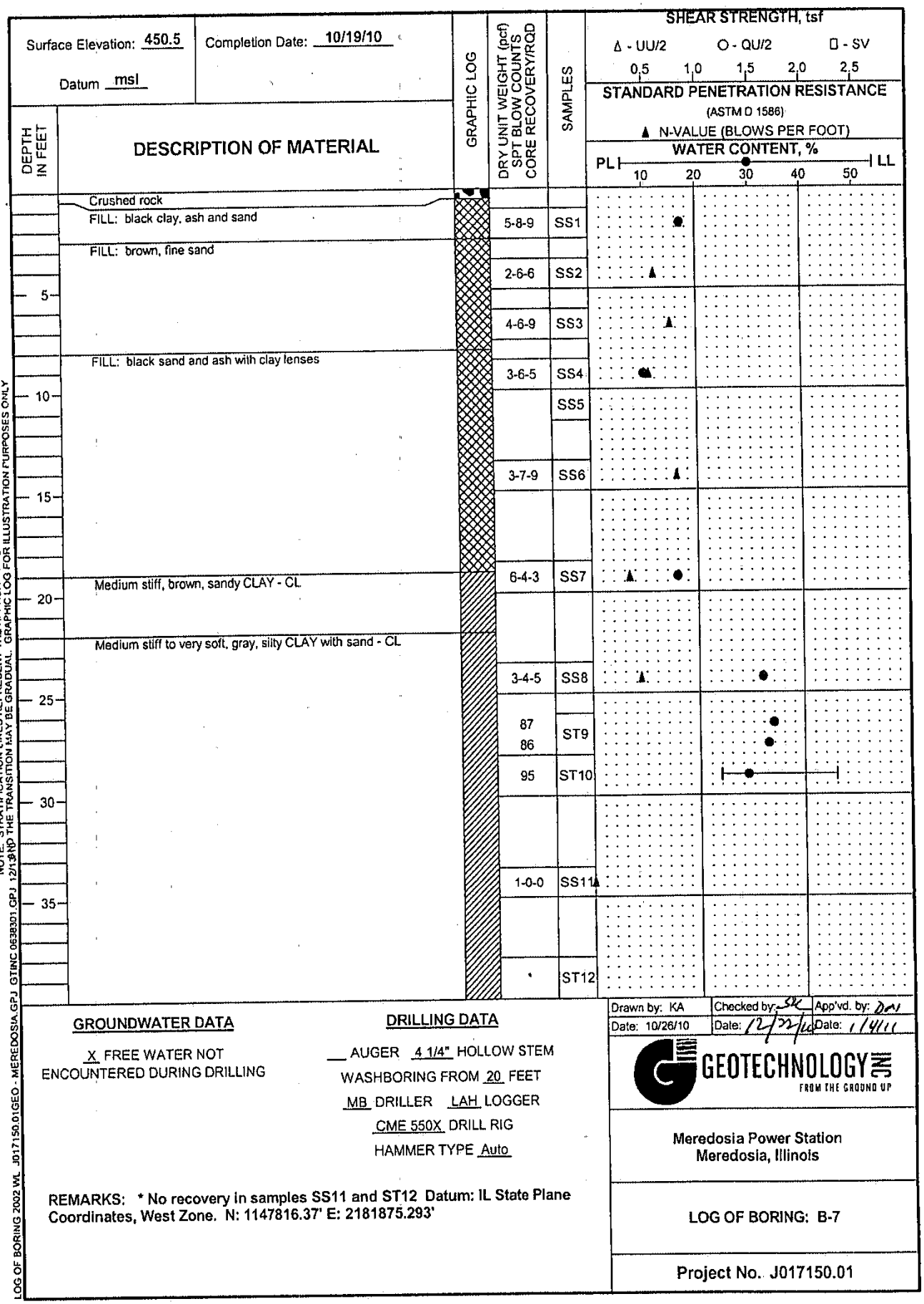
Drawn by: KA	Checked by: SHL	App'vd. by: DM
Date: 10/26/10	Date: 12/7/10	Date: 1/4/11

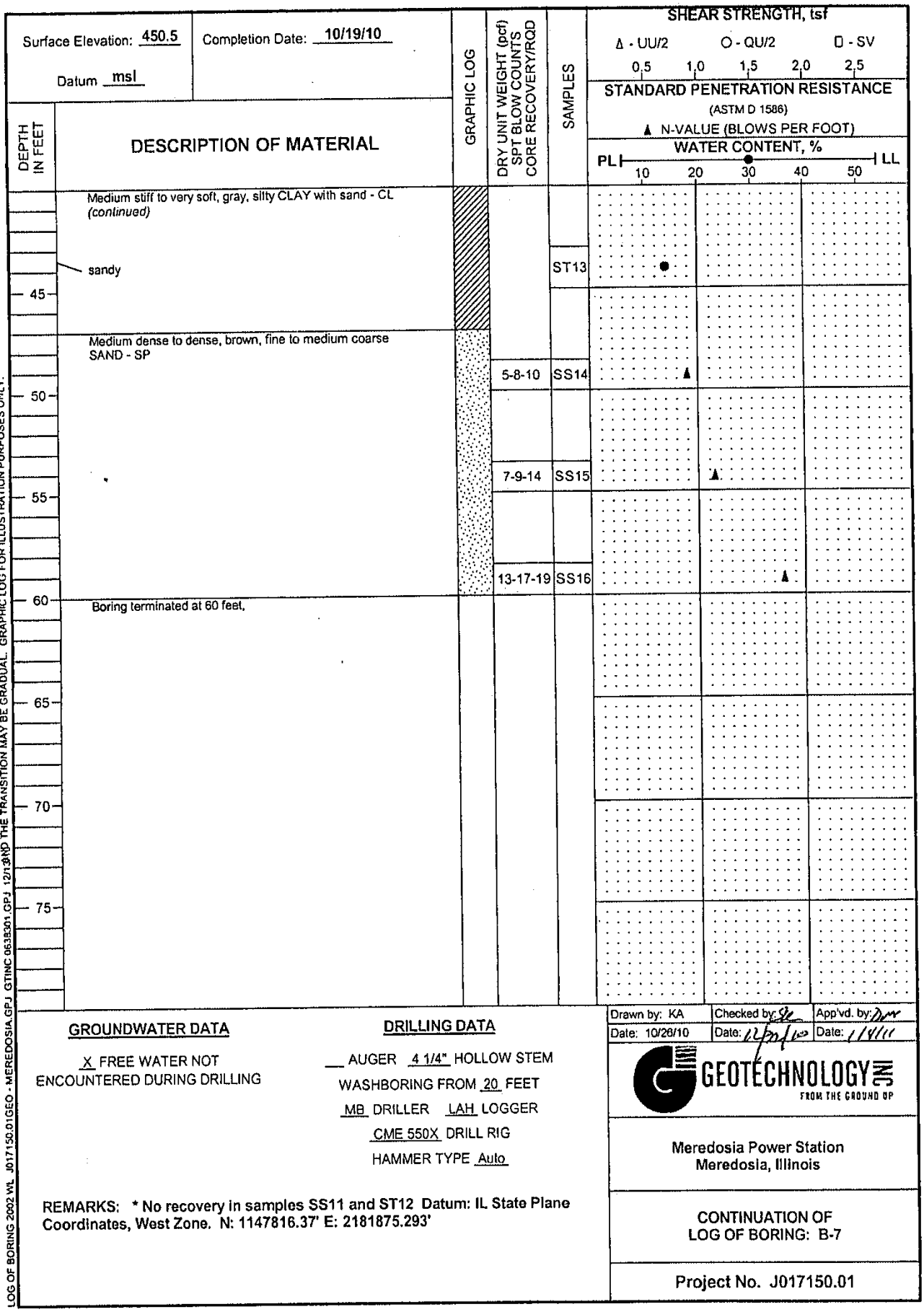
GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

CONTINUATION OF
LOG OF BORING: B-6

Project No. J017150.01


Surface Elevation: 450.5
Completion Date: 10/19/10
Datum msl
DEPTH IN FEET
DESCRIPTION OF MATERIAL
GRAPHIC LOG
DRY UNIT WEIGHT (pcf)
SPT BLOW COUNTS
CORE RECOVERY/RQD
SAMPLES
SHEAR STRENGTH, tsf
Δ - UU/2
O - QU/2
□ - SV
0.5 1.0 1.5 2.0 2.5
STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)
WATER CONTENT, %
PL
LL
10 20 30 40 50
Crushed rock
FILL: black clay, ash and sand
FILL: brown, fine sand
FILL: black sand and ash with clay lenses
Medium stiff, brown, sandy CLAY - CL
Medium stiff to very soft, gray, silty CLAY with sand - CL
5-8-9 SS1
2-6-6 SS2
4-6-9 SS3
3-6-5 SS4
SS5
3-7-9 SS6
6-4-3 SS7
3-4-5 SS8
87
86 ST9
95 ST10
1-0-0 SS11
ST12
5
10
15
20
25
30
35
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 J017150.01GEO - MEREDOSIA.GPJ GTINC 0638301.GPJ 12/1/10
GROUNDWATER DATA
X FREE WATER NOT ENCOUNTERED DURING DRILLING
DRILLING DATA
__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM 20 FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto
REMARKS: * No recovery in samples SS11 and ST12 Datum: IL State Plane Coordinates, West Zone. N: 1147816.37' E: 2181875.293'
Drawn by: KA
Date: 10/26/10
Checked by: SK
Date: 12/22/10
App'vd. by: DAI
Date: 1/4/11
GEOTECHNOLOGY INC
FROM THE GROUND UP
Meredosia Power Station
Meredosia, Illinois
LOG OF BORING: B-7
Project No. J017150.01



Surface Elevation: 450.5 Completion Date: 10/19/10

Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Medium stiff to very soft, gray, silty CLAY with sand - CL *(continued)*			
	sandy			ST13
45				
	Medium dense to dense, brown, fine to medium coarse SAND - SP		5-8-10	SS14
50			7-9-14	SS15
55			13-17-19	SS16
60	Boring terminated at 60 feet.			
65				
70				
75				

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC 063B301.GPJ 12/13/10

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM 20 FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: * No recovery in samples SS11 and ST12 Datum: IL State Plane Coordinates, West Zone. N: 1147816.37' E: 2181875.293'

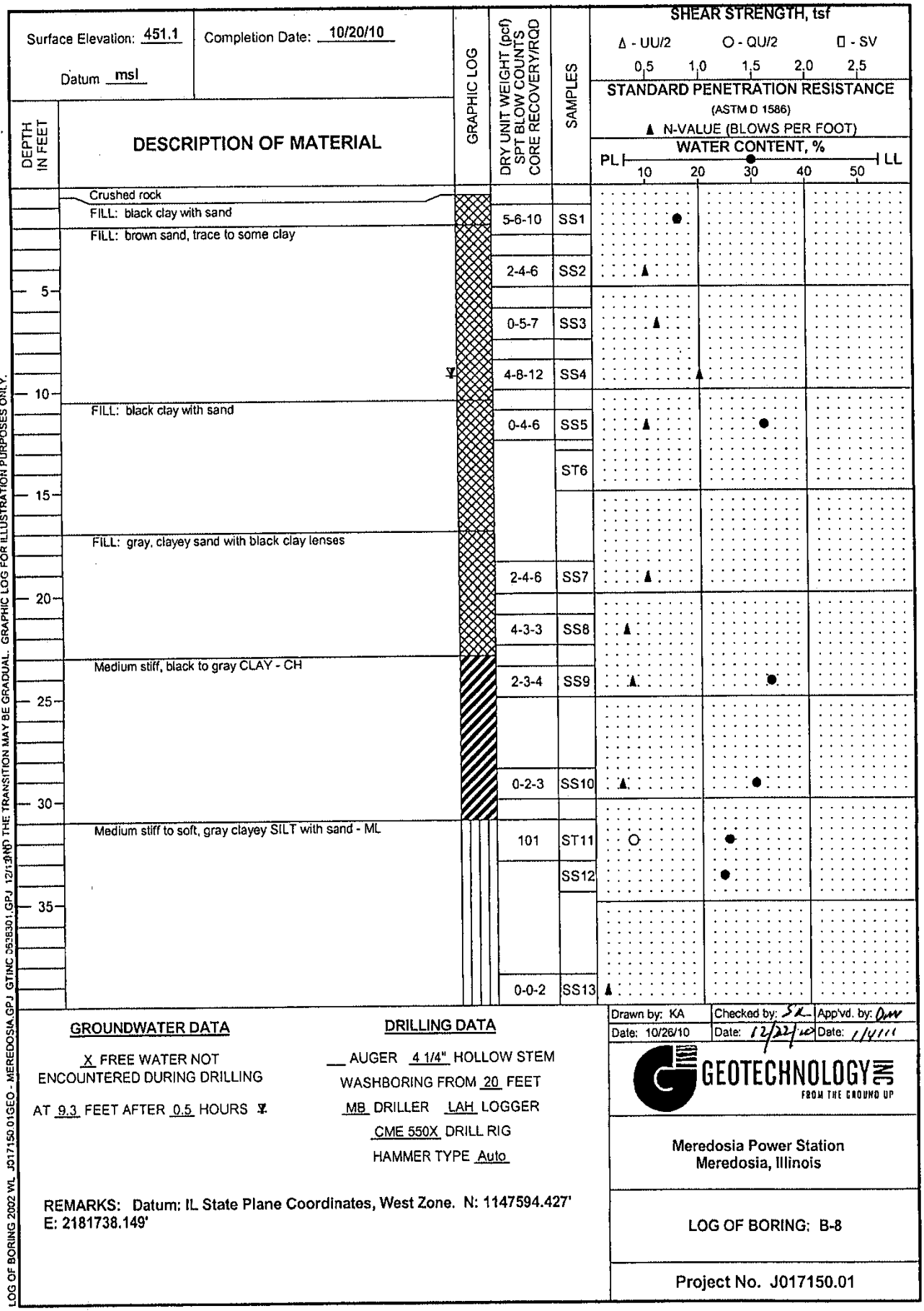
Drawn by: KA	Checked by:	App'vd. by:
Date: 10/26/10	Date: 12/9/10	Date: 1/14/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

CONTINUATION OF LOG OF BORING: B-7

Project No. J017150.01



Surface Elevation: 451.1 | Completion Date: 10/20/10 | Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Crushed rock			
	FILL: black clay with sand		5-6-10	SS1
	FILL: brown sand, trace to some clay		2-4-6	SS2
5			0-5-7	SS3
			4-8-12	SS4
10	FILL: black clay with sand		0-4-6	SS5
				ST6
15				
	FILL: gray, clayey sand with black clay lenses		2-4-6	SS7
20			4-3-3	SS8
	Medium stiff, black to gray CLAY - CH		2-3-4	SS9
25				
			0-2-3	SS10
30	Medium stiff to soft, gray clayey SILT with sand - ML		101	ST11
				SS12
35				
			0-0-2	SS13

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC 053031.GPJ 12/13/10

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

AT 9.3 FEET AFTER 0.5 HOURS ▼

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM 20 FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: Datum: IL State Plane Coordinates, West Zone. N: 1147594.427' E: 2181738.149'

Drawn by: KA	Checked by: SK	App'vd. by: QW
Date: 10/26/10	Date: 12/22/10	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

LOG OF BORING: B-8

Project No. J017150.01

Surface Elevation: 451.1 Datum msl | Completion Date: 10/20/10

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Medium stiff to soft, gray clayey SILT with sand - ML *(continued)*			
	Dense to medium dense, brown, fine to coarse SAND with gravel - SP			
			13-16-16	SS14
45				
			7-9-11	SS15
50				
			5-7-9	SS16
55				
			10-13-14	SS17
60	Boring terminated at 60 feet.			
65				
70				
75				

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC.0638301.GPJ 12/1/10

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

AT 9.3 FEET AFTER 0.5 HOURS ▼

DRILLING DATA

___ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM 20 FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: Datum: IL State Plane Coordinates, West Zone. N: 1147594.427' E: 2181738.149'

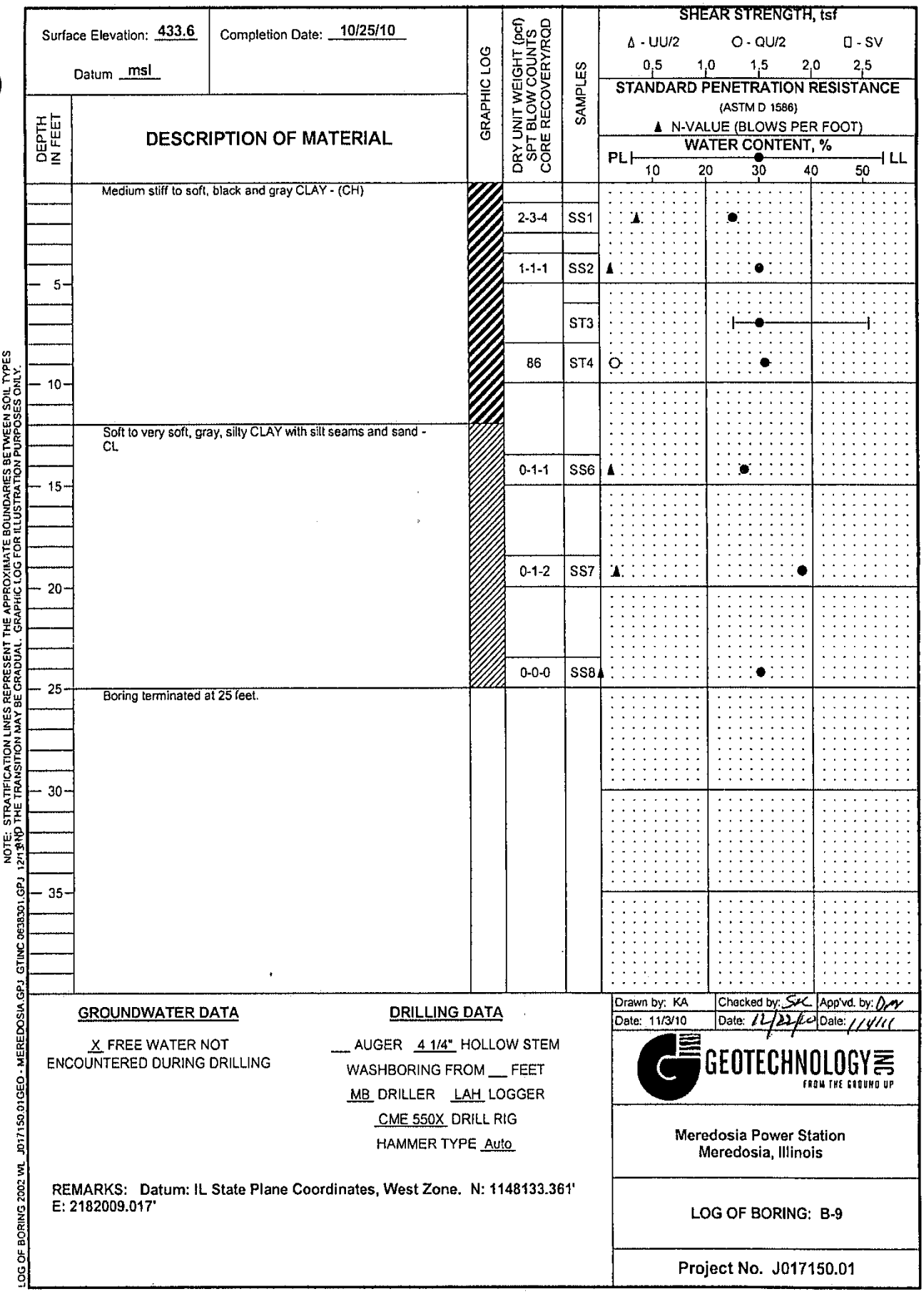
Drawn by: KA	Checked by: SK	App'vd. by: DAW
Date: 10/26/10	Date: 12/22/10	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

CONTINUATION OF
LOG OF BORING: B-8

Project No. J017150.01



Surface Elevation: 433.6 | Completion Date: 10/25/10 | Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Medium stiff to soft, black and gray CLAY - (CH)			
			2-3-4	SS1
			1-1-1	SS2
5				ST3
			86	ST4
10				
	Soft to very soft, gray, silty CLAY with silt seams and sand - CL			
15			0-1-1	SS6
20			0-1-2	SS7
25	Boring terminated at 25 feet.		0-0-0	SS8
30				
35				

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC 0638301.GPJ 12/13/10

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM ___ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: Datum: IL State Plane Coordinates, West Zone. N: 1148133.361' E: 2182009.017'

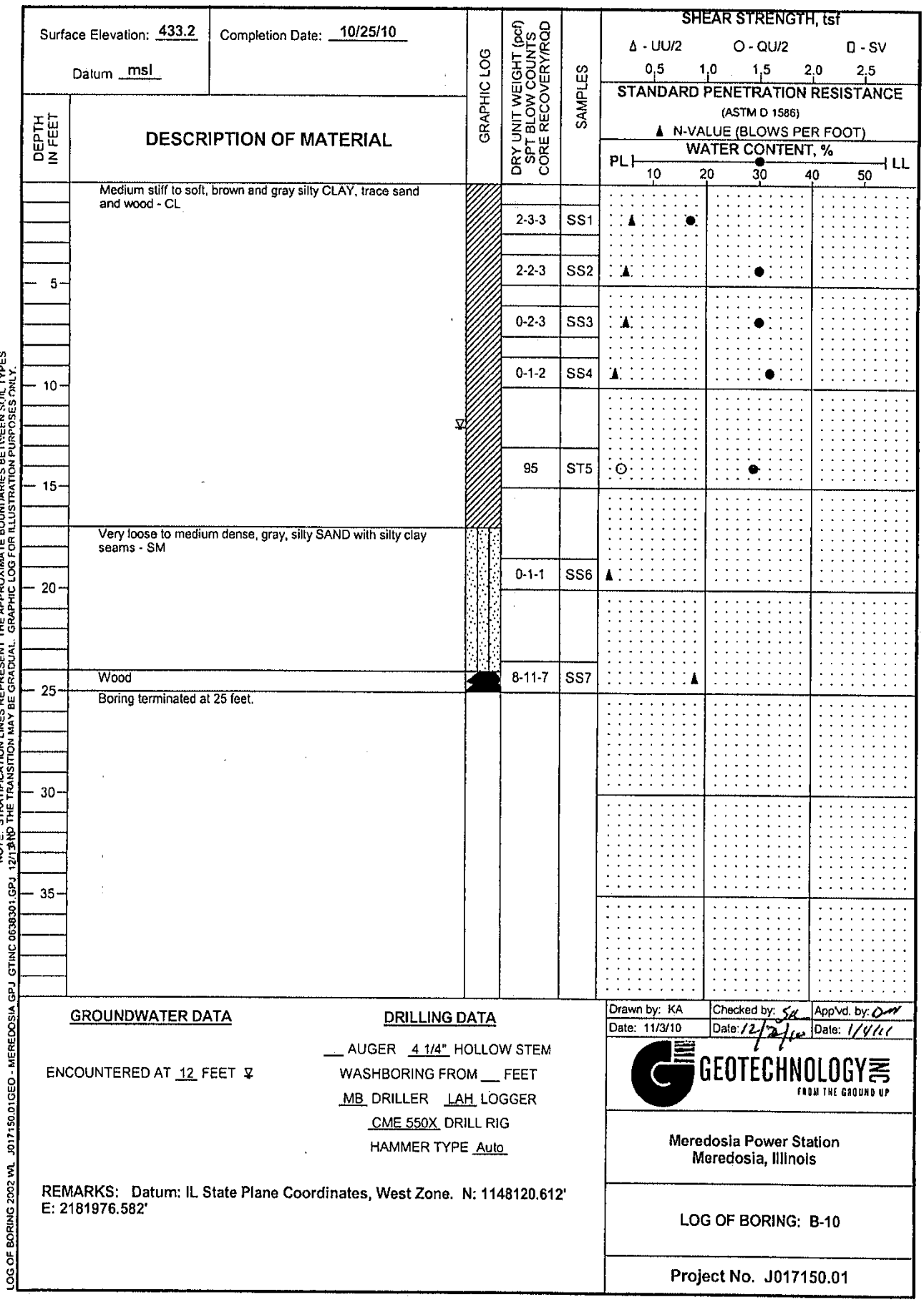
Drawn by: KA	Checked by: SVC	App'vd. by: DM
Date: 11/3/10	Date: 12/22/10	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

LOG OF BORING: B-9

Project No. J017150.01



Surface Elevation: 433.2 | Completion Date: 10/25/10

Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Medium stiff to soft, brown and gray silty CLAY, trace sand and wood - CL		
		2-3-3	SS1
		2-2-3	SS2
5		0-2-3	SS3
		0-1-2	SS4
10			
		95	ST5
15			
	Very loose to medium dense, gray, silty SAND with silty clay seams - SM		
		0-1-1	SS6
20			
	Wood	8-11-7	SS7
25	Boring terminated at 25 feet.		
30			
35			

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC 0638301.GPJ 12/1/10

GROUNDWATER DATA

ENCOUNTERED AT 12 FEET ▽

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: Datum: IL State Plane Coordinates, West Zone. N: 1148120.612' E: 2181976.582'

Drawn by: KA	Checked by: SK	App'vd. by: DM
Date: 11/3/10	Date: 12/2/10	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

LOG OF BORING: B-10

Project No. J017150.01

BORING LOG: TERMS AND SYMBOLS

GENERAL NOTES

1. *Information on each boring log is a compilation of subsurface conditions based on soil or rock classifications obtained from the field as well as from laboratory testing of samples. The strata lines on the logs may be approximate or the transition between the strata may be gradual rather than distinct. Water level measurements refer only to those ob - served at the times and places indicated, and may vary with time, geologic condition or construction activity.*
2. *Relative composition and Unified Soil Classification designations are based on visual estimates and are approximate only. If laboratory tests were performed to classify the soil, the unified designation is show in parenthesis.*
3. *Value given in Unit Dry Weight/SPT Column is either a unit dry weight in pounds per cubic foot, if adjacent to a ST sample designation, or blows per 6-inch increment if adjacent to a SS sample designation.*

ABBREVIATIONS

UU/2	*Shear Strength from Unconsolidated – Undrained Triaxial Test (ASTM D2850)*
QU/2	*Shear Strength from Unconfined Compression Test (ASTM D2166)*
SV	*Shear Strength from Field Vane (ASTM D2573)*
PL	*Plastic Limit (ASTM D4318)*
LL	*Liquid Limit (ASTM D4318)*

LEGEND

CS	Continuous Sampler
GB	Grab Sample Taken From Auger Cuttings Or Wash Water Return
NX 100/42	NX Rock Core with Percent Recovery/R.Q.D. Given In Adjacent Column
PST	Three Inch Diameter Piston Tube Sample
SS	Split Spoon Sample (Standard Penetration Test)
ST	Three Inch Diameter Shelby Tube Sample
*	Sample Not Recovered
SV	Field Vane Test

SPLIT – BARREL SAMPLER DRIVING RECORD

Blow Per Foot (N-Value)	*Description*
25	*25 blows drove sampler 12 inches after initial 6 inches of seating.*
75/10"	*75 blows drove sampler 10 inches after initial 6 inches of seating.*
50/3"	*50 blows drove sampler 3 inches during initial 6 inch seating interval.*

NOTES: 1. To avoid damage to sampling tools, driving is limited to 50 blows during any six inch interval.
2. N-Value (Blow Count) is the standard penetration resistance based on the total number of blows, using a 140-lb hammer with 30-inch free fall, required to drive a split spoon the last two of three, 6-inch drive increments. (Example: 4/7/9, N = 7 + 9 = 16). Values are shown as a summation on grid plot and may be shown as 4/7/9 in Unit Dry Weight – SPT column.

RELATIVE COMPOSITION

Trace.....0-10 %
With/Some.....11-35 %
Soil modifier such..... > 35 %
As silty, clayey, sandy, etc.

DENSITY OF GRANULAR SOILS

Descriptive Term:	*N—Value*
Very Loose	*0 - 4*
Loose	*5 - 10*
Medium Dense	*11 - 30*
Dense	*31 - 50*
Very Dense	*> 50*

STRENGTH OF COHESIVE SOILS

Consistency	Undrained Shear Strength Tons Per Sq. Ft.	Field Test	Approximate N-Value Range
Very Soft	*less than 0.12*	*Thumb will penetrate soil more than 1"*	*0 - 1*
Soft	*13 to 0.25*	*Thumb will penetrate soil about 1"*	*2 - 4*
Medium Stiff	*0.26 to 0.50*	*Thumb will penetrate soil about ¼"*	*5 – 8*
Stiff	*0.51 to 1.00*	*Thumb hardly indents soil*	*9 – 15*
Very Stiff	*1.01 to 2.00*	*Thumb will not indent soil, but readily indented with thumbnail*	*16 – 30*
Hard	*greater than 2.00*	*Thumbnail will not indent soil*	*> 30*

SOIL GRAIN SIZE

U.S. STANDARD SIEVE

12"	3"	¾"	4	10	40	200		
BOULDERS	COBBLES	GRAVEL		SAND			SILT	CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE		
300	76.2	19.1	4.76	2.00	0.42	0.074	0.002	

SOIL GRAIN SIZE IN MILLIMETERS

SOIL STRUCTURE

Calcareous *– Having appreciable quantities of carbonate.*
Fissured *– Containing shrinkage or relief cracks, often filled with sand or silt; usually more or less vertical.*
Slickensided *– Having planes of weakness that appear slick and glossy. The degree of slickensidedness depends upon the spacing of slickensides and the ease of breaking along those planes.*
Layer *– Inclusion greater than 3 inches thick.*
Seam *– Inclusion 1/8 inch to 3 inches thick extending through the sample*
Parting *– Inclusion less than 1/8 inch thick.*
Pocket *– Inclusion of material of different texture that is smaller than the diameter of the sample.*
Interlayered *– Soil samples composed of alternating layers of different soil types.*
Intermixed *– Soil samples composed of pockets of different soil types and a layered or laminated structure is not evident.*
Laminated *– Soil sample composed of alternating partings or seams of different soil type.*

GEOTECHNOLOGY INC
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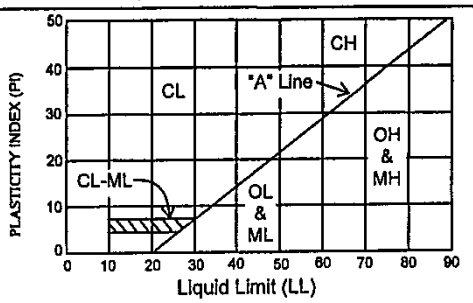
UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			SYMBOL	DESCRIPTION
Coarse-Grained Soils (More than 50% Larger than No 200 Sieve Size)	Gravel and Gravelly Soils	Clean Gravels Little or no Fines	GW	Well-Graded Gravel, Gravel-Sand Mixture
			GP	Poorly –Graded Gravel, Gravel-Sand Mixture
		Gravels with Appreciable Fines	GM	Silty Gravel, Gravel-Sand-Silt Mixture
			GC	Clayey-Gravel, Gravel-Sand-Clay Mixture
	Sand and Sandy Soils	Clean Sands Little or no Fines	SW	Well-Graded Sand, Gravelly Sand
			SP	Poorly Graded Sand, Gravelly Sand
		Sands with Appreciable Fines	SM	Silty Sand, Sand-Silt Mixture
			SC	Clayey Sand, Sand-Clay Mixture
Fine-Grained Soils (More than 50% Smaller than No 200 Sieve Size)	Silts and Clays	Liquid Limit Less Than 50	ML	Silt, Clayey Silt, Silty or Clayey Very Fine Sand, Slight Plasticity
			CL	Clay, Sandy Clay, Silty Clay, Low to Medium Plasticity
			OL	Organic Silts, or Silty Clays of Low Plasticity
	Silts and Clays	Liquid Limit More Than 50	MH	Silt, Fine Sandy or Silt Soil with High Plasticity
			CH	Clay, High Plasticity
			OH	Organic Clay of Medium to High Plasticity
	Highly Organic Soils		PT	Peat, Humus, Swamp Soil

PLASTICITY CHART



RELATIVE PLASTICITY

Nonplastic	Cannot Roll Into Ball
Trace Plasticity	Barely Roll Into Ball
Medium Plastic	Can be Rolled Into Ball
Highly Plastic	No Rupture by Kneading

VISUAL DESCRIPTION CRITERIA*

TABLE 1: CRITERIA FOR DESCRIBING ANGULARITY OF COARSE-GRAINED PARTICLES

Description	Criteria
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular	Particles are similar to angular description but have rounded edges
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges
Rounded	Particles have smoothly curved sides and no edges

TABLE 2: CRITERIA FOR DESCRIBING PARTICLE SHAPE

Description	Criteria
Flat	Particles with width/thickness X3
Elongated	Particles with length/width X3
Flat and Elongated	Particles meet criteria for both flat and elongated

TABLE 3: CRITERIA FOR DESCRIBING MOISTURE CONDITION

Description	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp, but no visible water
Wet	Visible free water, usually soil is below the water table

TABLE 4: CRITERIA FOR DESCRIBING REACTION WITH HCL

Description	Criteria
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming rapidly

TABLE 6: CRITERIA FOR DESCRIBING CEMENTATION

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure
Moderate	Crumbles or breaks with considerable finger pressure
Strong	Will not crumble or break with finger pressure

TABLE 8: CRITERIA FOR DESCRIBING DRY STRENGTH

Description	Criteria
None	The dry specimen crumbles into powder with mere pressure of handling
Low	The dry specimen crumbles into powder with some finger pressure
Medium	The dry specimen breaks into pieces or crumbles with considerable finger pressure
High	The dry specimen cannot be broken with finger pressure. Specimen will break into pieces between thumb and a hard surface.
Very High	The dry specimen cannot be broken between the thumb and a hard surface

TABLE 9: CRITERIA FOR DESCRIBING DILATANCY

Description	Criteria
None	No visible change in the specimen
Slow	Water appears slowly on the surface of the specimen during shaking and does not disappear or disappears slowly upon squeezing.
Rapid	Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing.

TABLE 10: CRITERIA FOR DESCRIBING TOUGHNESS

Description	Criteria
Low	Only slight pressure is required to roll the thread near the plastic limit. The thread and the lump are weak and soft.
Medium	Medium pressure is required to roll the thread to near the plastic limit. The thread and the lump have medium stiffness
High	Considerable pressure is required to roll the thread to near the plastic limit. The thread and the lump have very high stiffness

TABLE 12: IDENTIFICATION OF INORGANIC FINE-GRAINED SOILS FROM MANUAL TESTS

Soil Symbol	Dry Strength	Dilatancy	Toughness
ML	None to low	Slow to rapid	Low or thread cannot be formed
CL	Medium to high	None to slow	Medium
MH	Low to medium	None to slow	Low to medium
CH	High to very high	none	High

*NOTES: 1. Tables adapted from ASTM D2488 "Description and identification of Soils" (Visual-Manual Procedure)
2. Tables 5, 7 and 11 incorporated into other information on this plate.

ATTACHMENT B

LABORATORY TEST RESULTS

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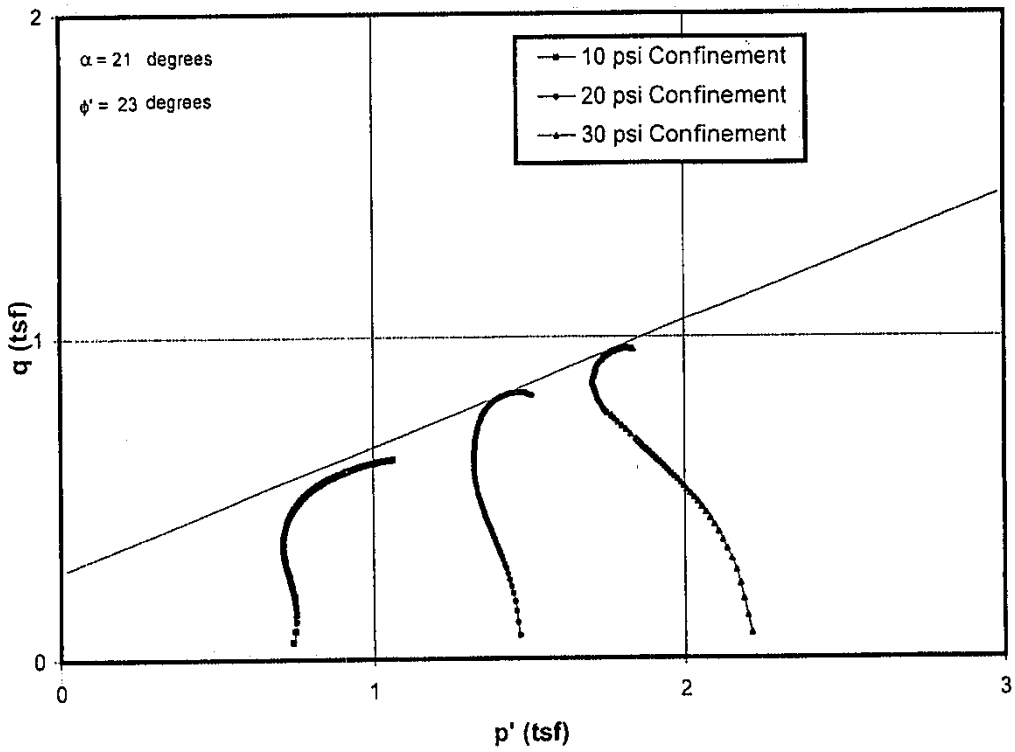
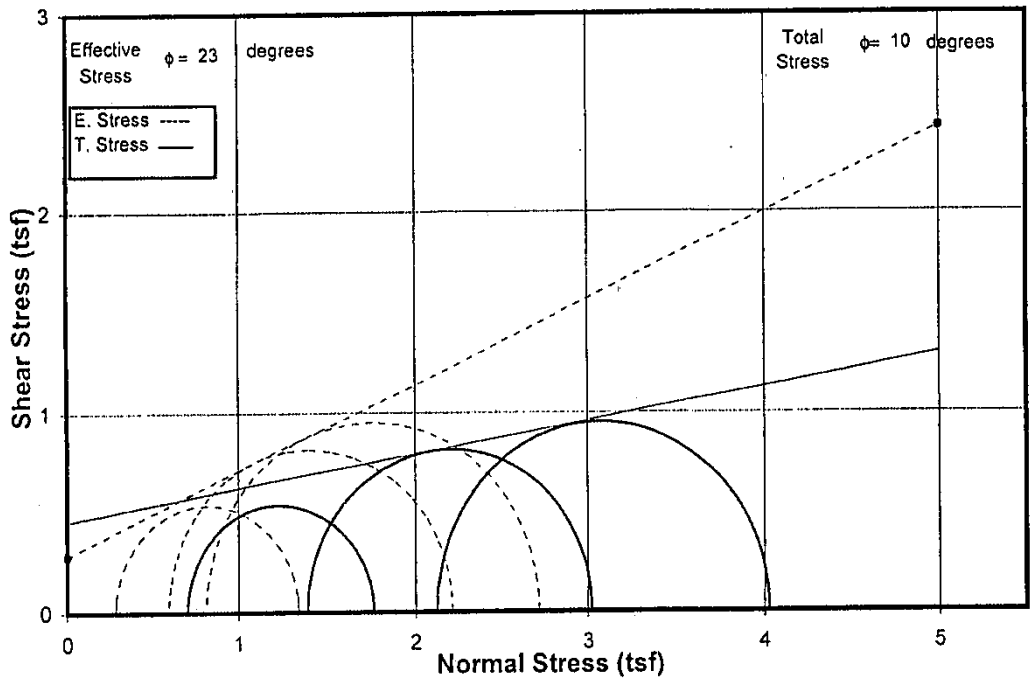
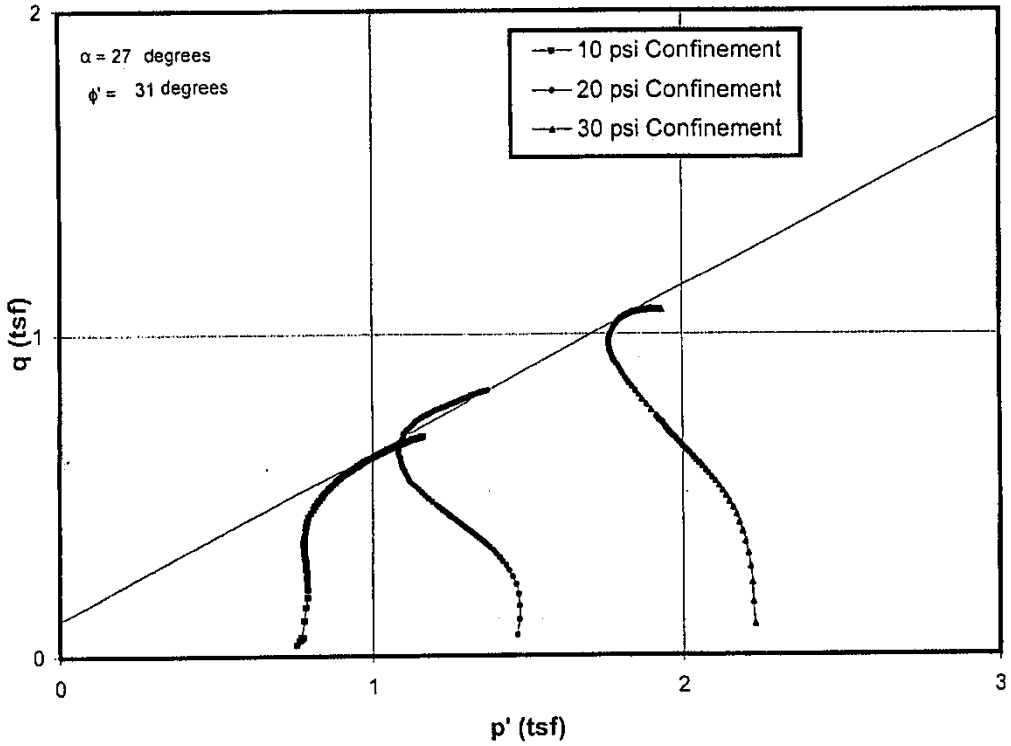
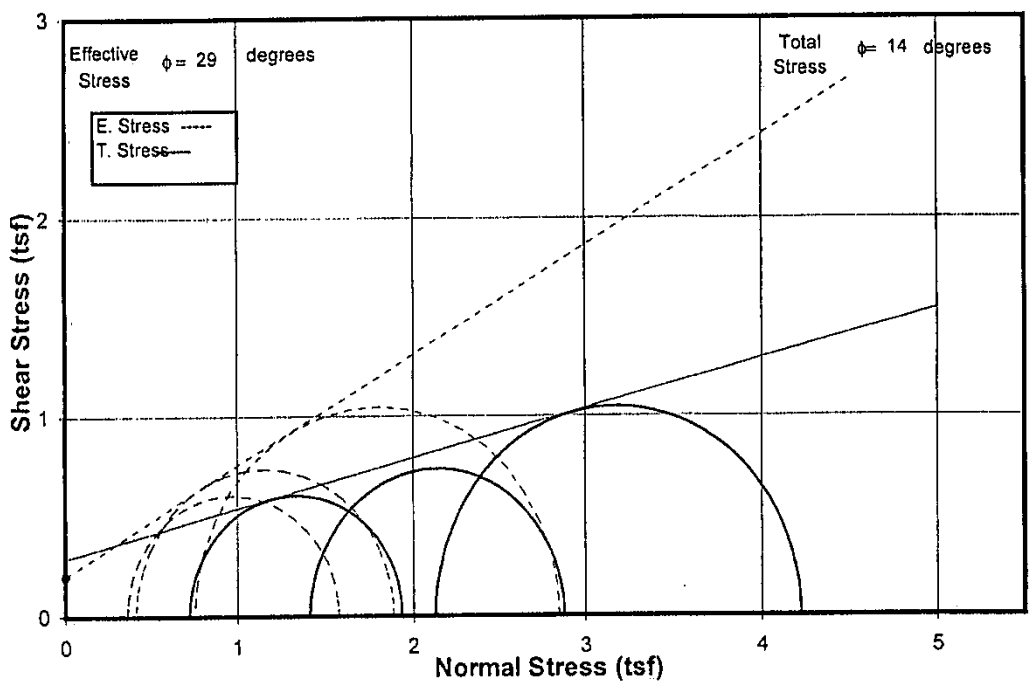




CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D 4767
Project No.: J017150.01
Boring: B-1
Sample: ST-8, ST-9, ST-9 - Depth: 26, 28, 28

GEOTECHNOLOGY INC
FROM THE GROUND UP



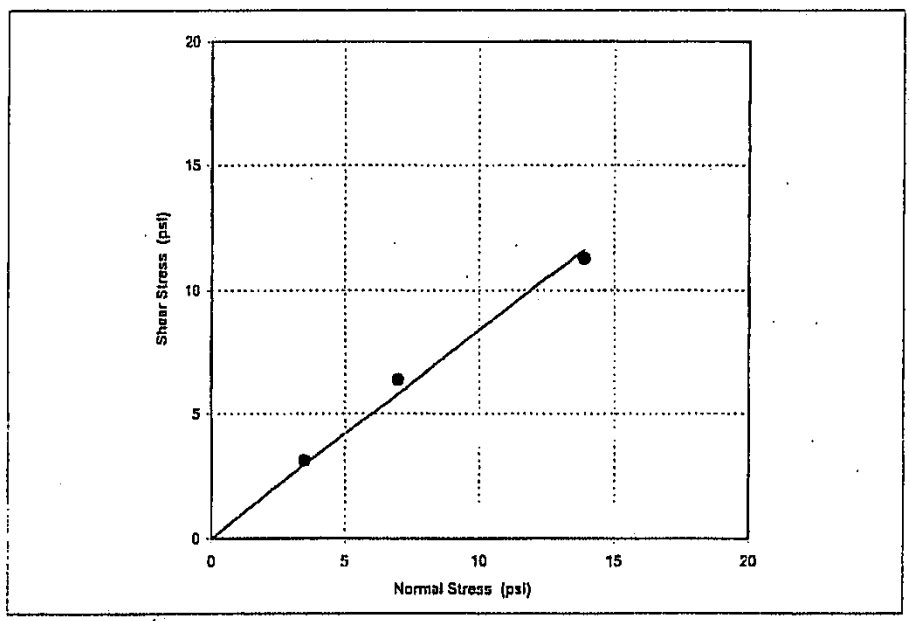


CONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D 4767
Project No.: J017150.01
Boring: B-7
Sample: ST-10, ST-9, ST-9 - Depth: 28, 26, 26

DIRECT SHEAR TEST DATA

ASTM D 3080

Project Number:	J017150.01	Boring Number.:	B-1
Project Name:	Ameren-Meredosia	Sample Number:	SS-11, SS-12
Project Location:	--	Sample Depth (ft):	38.5' - 45.0'



Trial Number	Normal Stress (psi)	Shear Stress (psi)	Normal Stress (psf)	Shear Stress (psf)	ϕ (degrees)
1	3.5	3.1	500	445	39.9
2	6.9	6.4	1000	923	
3	13.9	11.3	2000	1626	

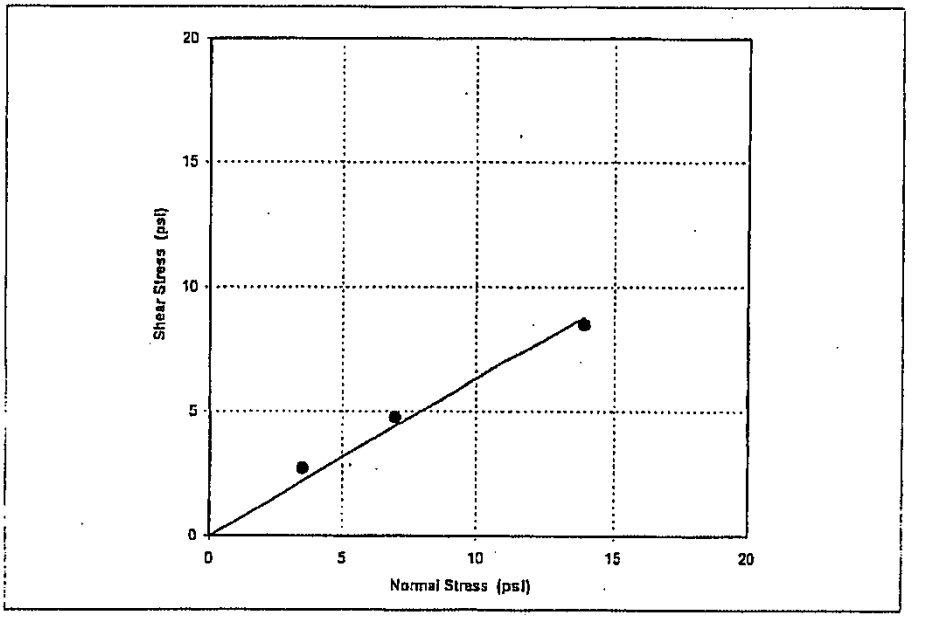
Atterberg Limits:		Standard Proctor Results:	
Liquid Limit:	--	Max. Dry Density:	N/A
Plastic Limit:	--	Opt. Moisture Content:	N/A
Plasticity Index:	NP		

Soil Classification: SAND, medium grained, brown, medium dense - (SP)

DIRECT SHEAR TEST DATA

ASTM D 3080

Project Number:	J017150.01	Boring Number.:	B-1
Project Name:	Ameren-Meredosia	Sample Number:	SS-2
Project Location:	–	Sample Depth (ft):	6.0' - 7.5'



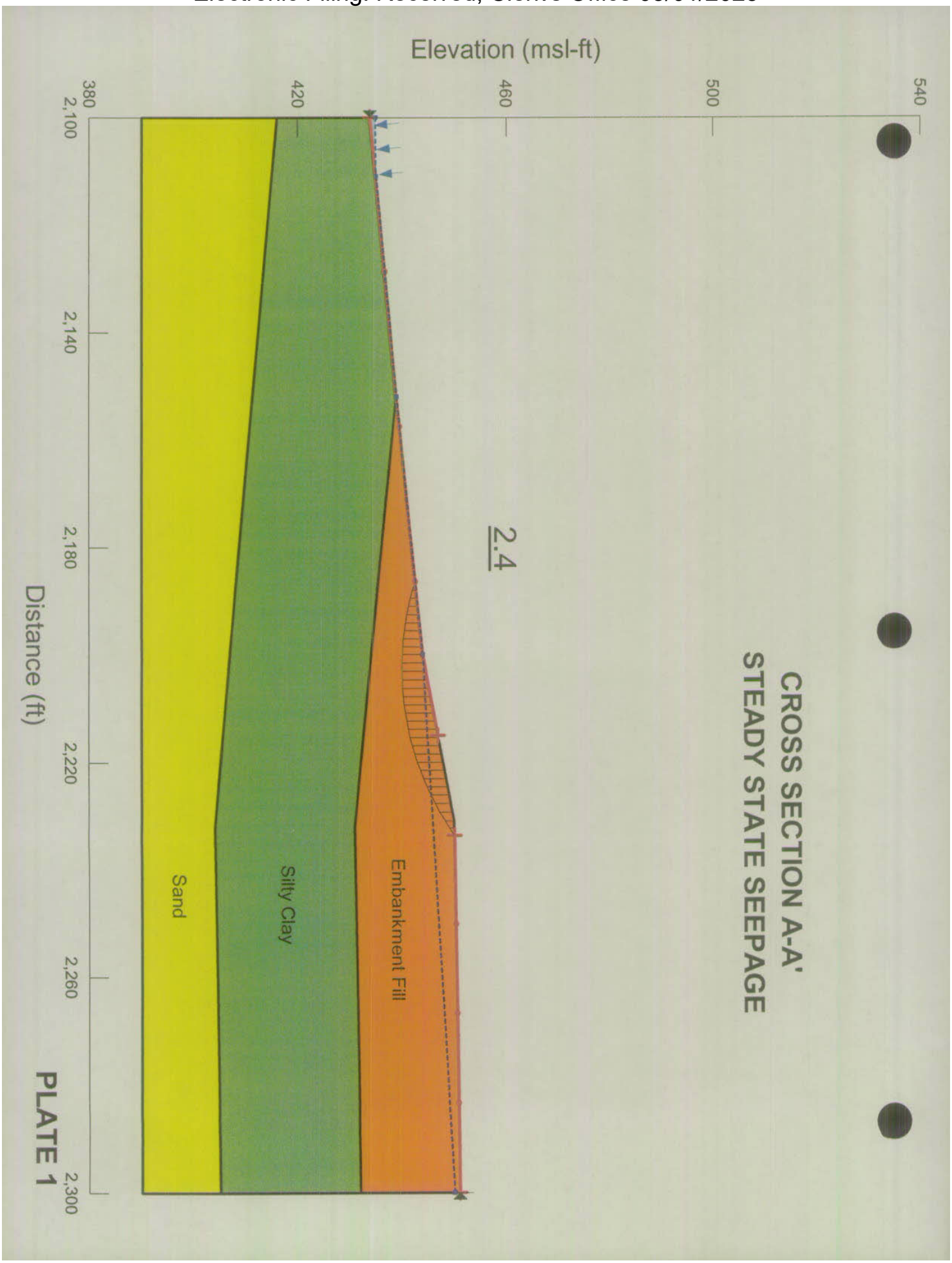
Trial Number	Normal Stress (psi)	Shear Stress (psi)	Normal Stress (psf)	Shear Stress (psf)	ϕ (degrees)
1	3.5	2.7	500	389	32.3
2	6.9	4.7	1000	684	
3	13.9	8.5	2000	1218	

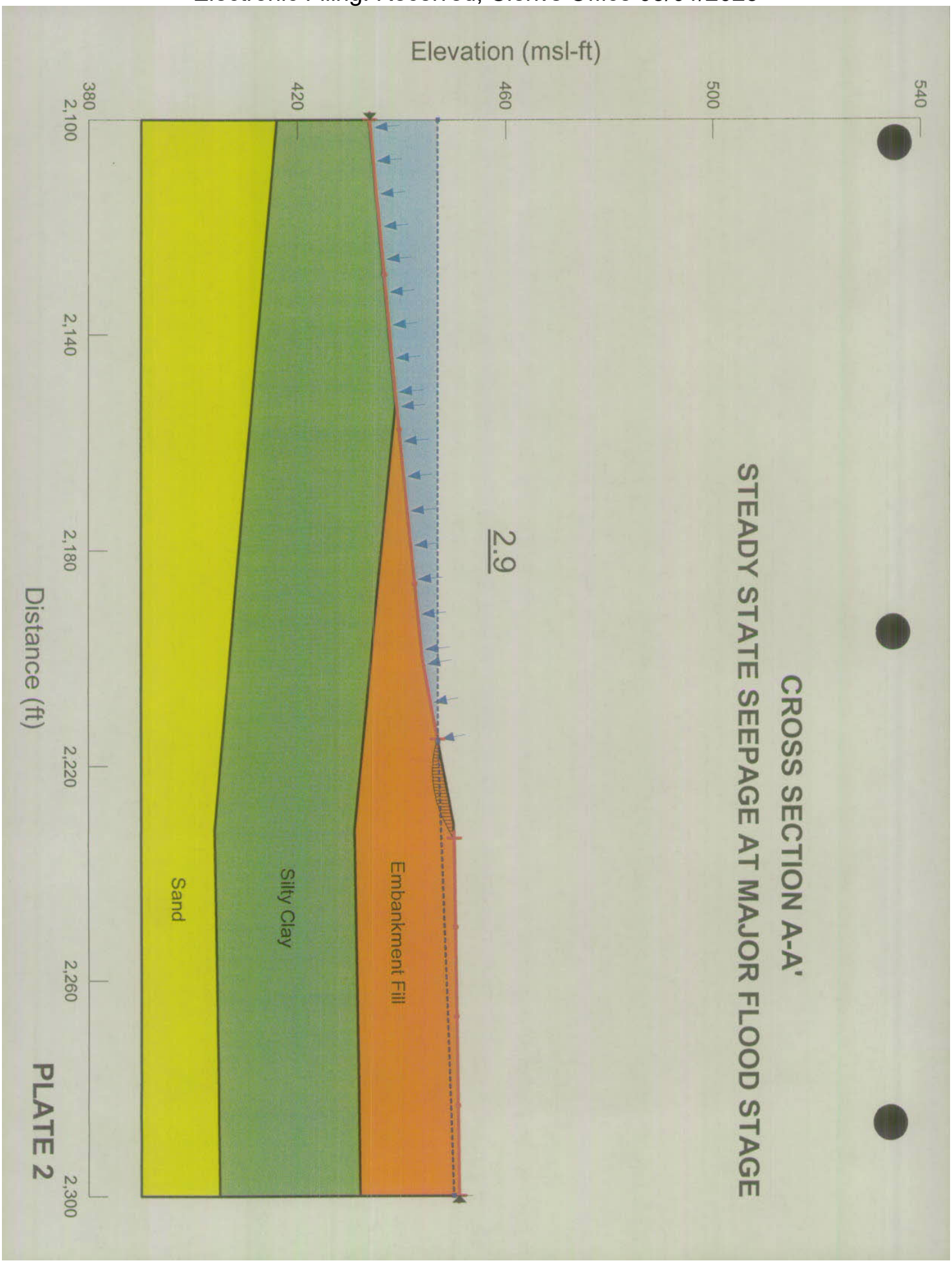
Atterberg Limits:		Standard Proctor Results:	
Liquid Limit:	–	Max. Dry Density:	N/A
Plastic Limit:	–	Opt. Moisture Content:	N/A
Plasticity Index:	NP		

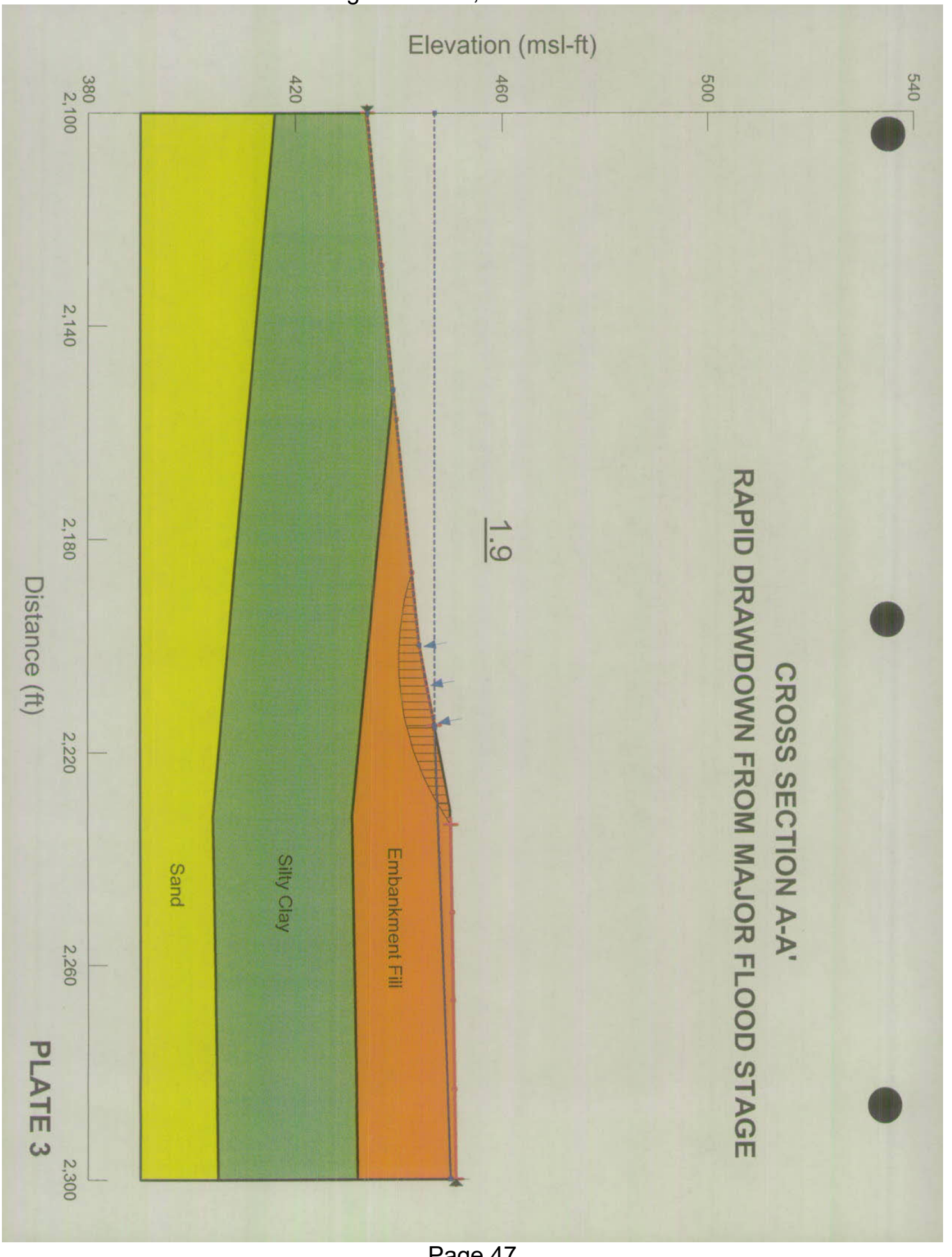
Soil Classification: SAND, fine grained, brown, loose - (SP)

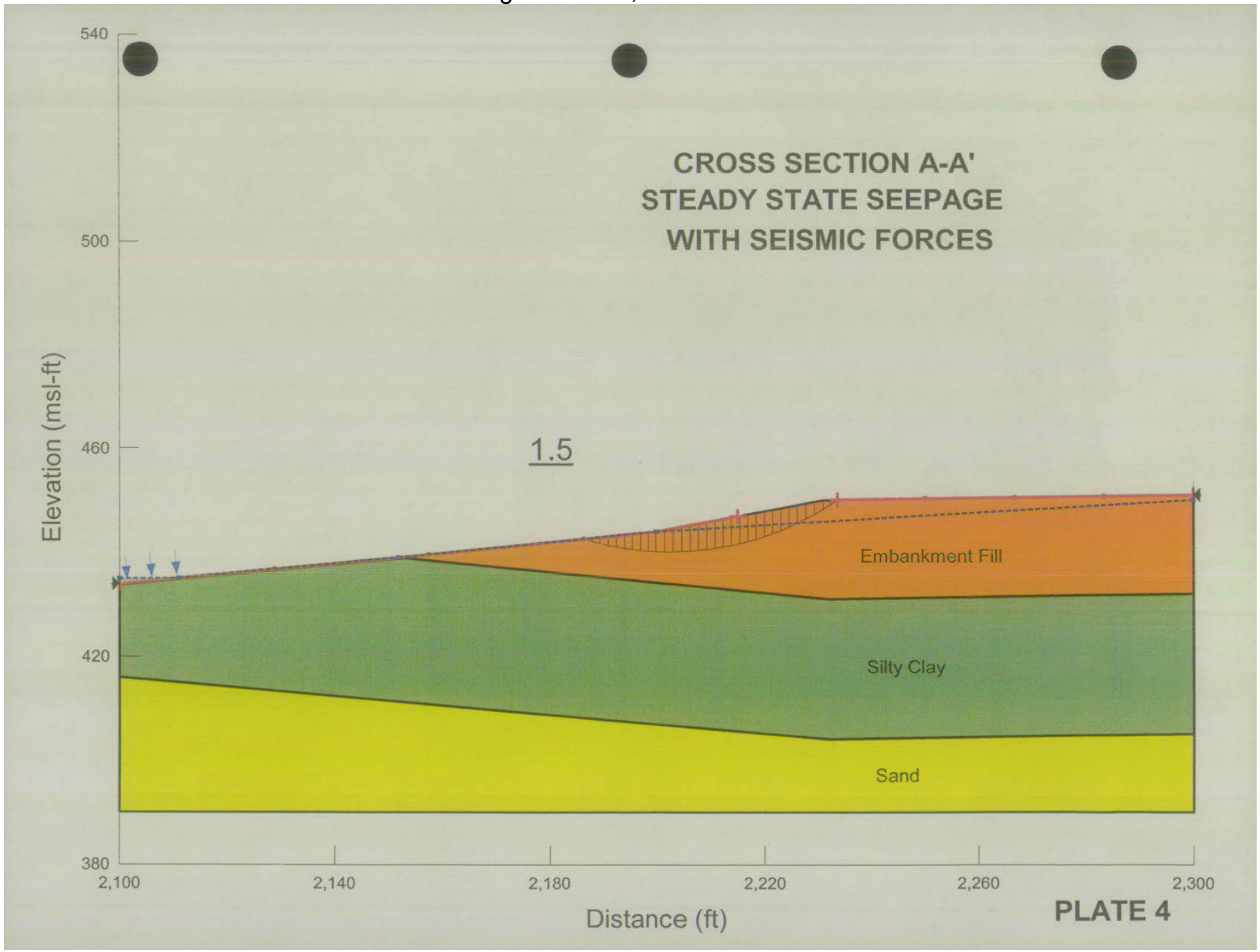
ATTACHMENT C

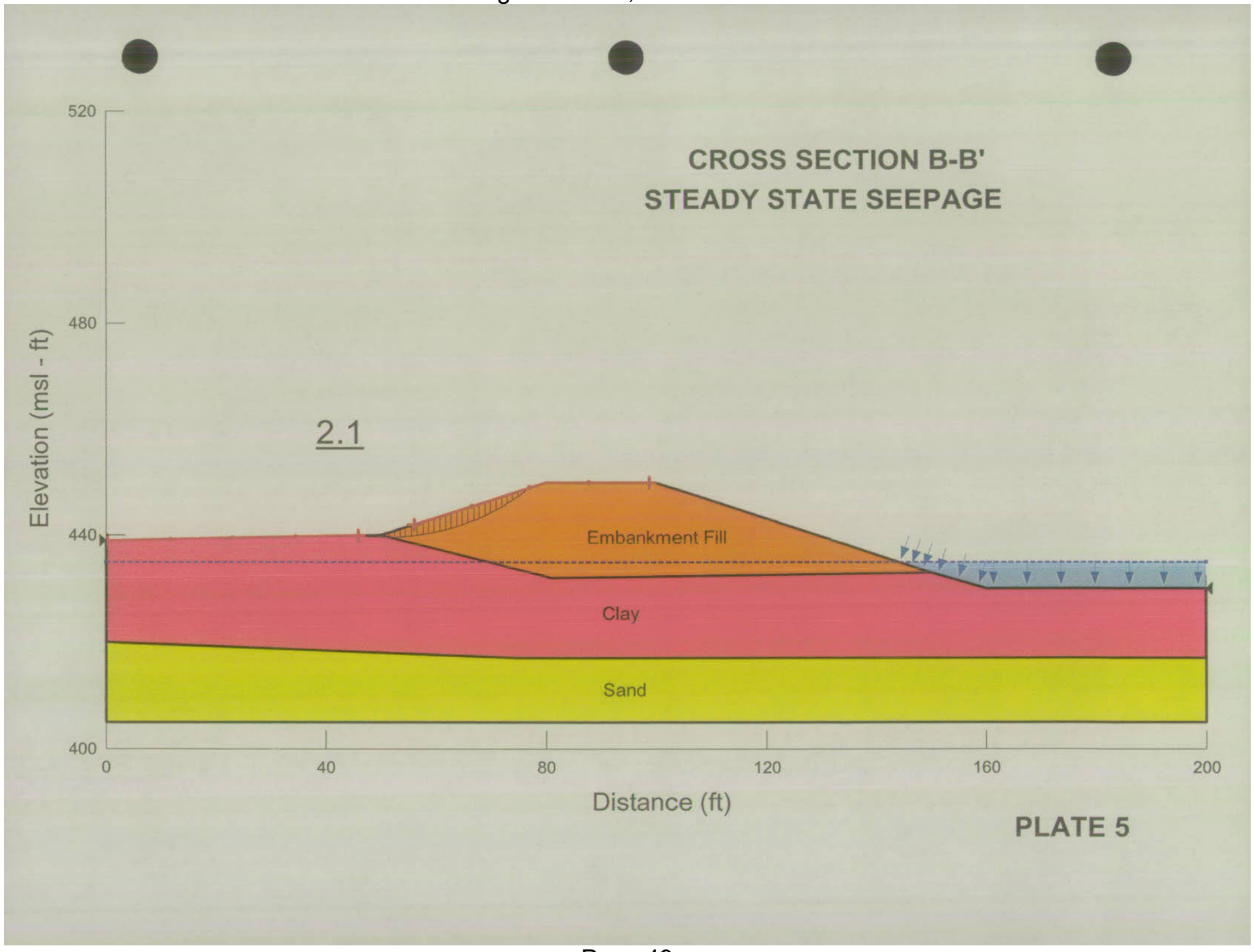
SLOPE STABILITY ANALYSIS RESULTS

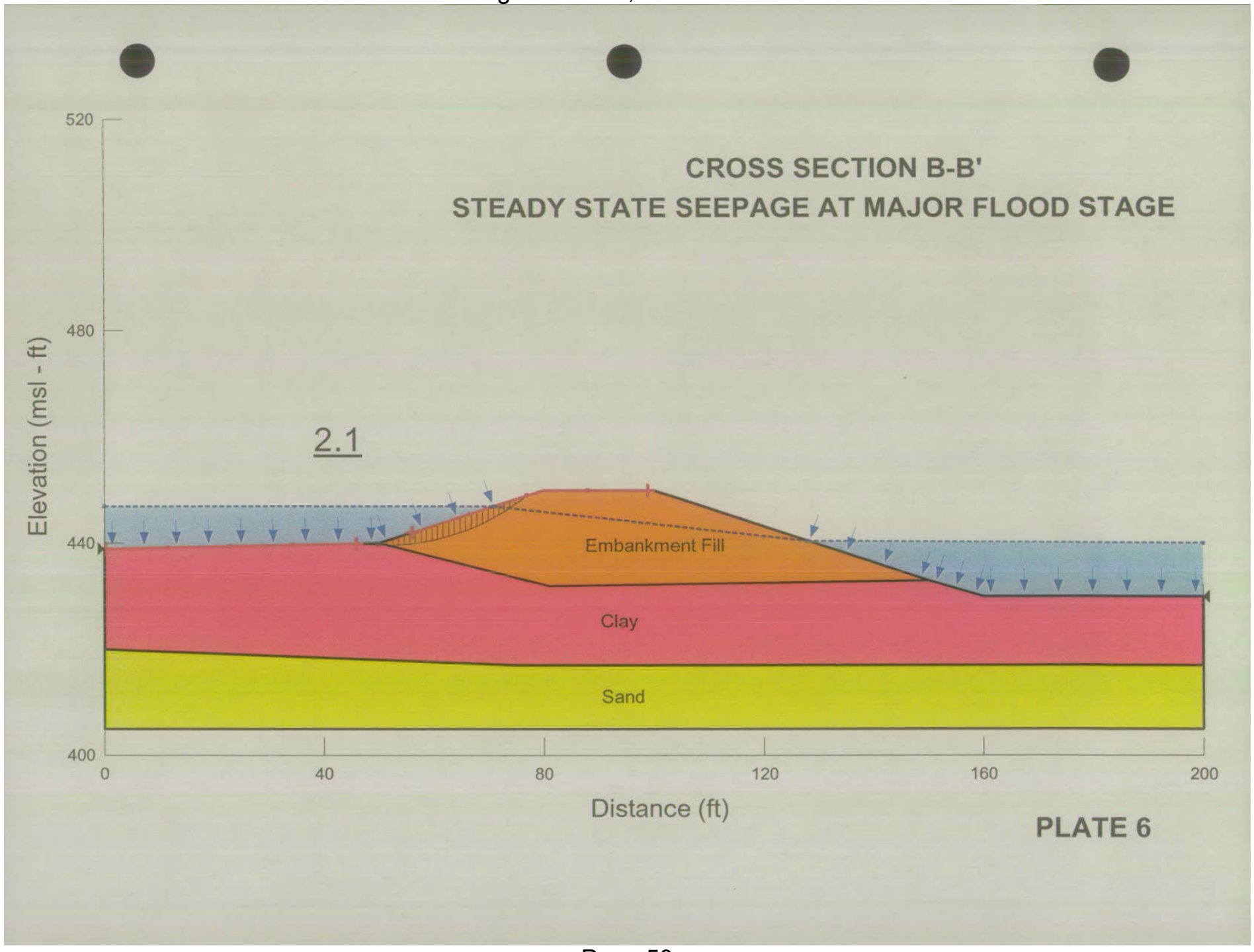

CROSS SECTION A-A'
STEADY STATE SEEPAGE
Elevation (msl-ft)
540
500
460
420
380
2,100
2,140
2,180
2,220
2,260
2,300
Distance (ft)
Embankment Fill
Silty Clay
Sand
2.4
PLATE 1

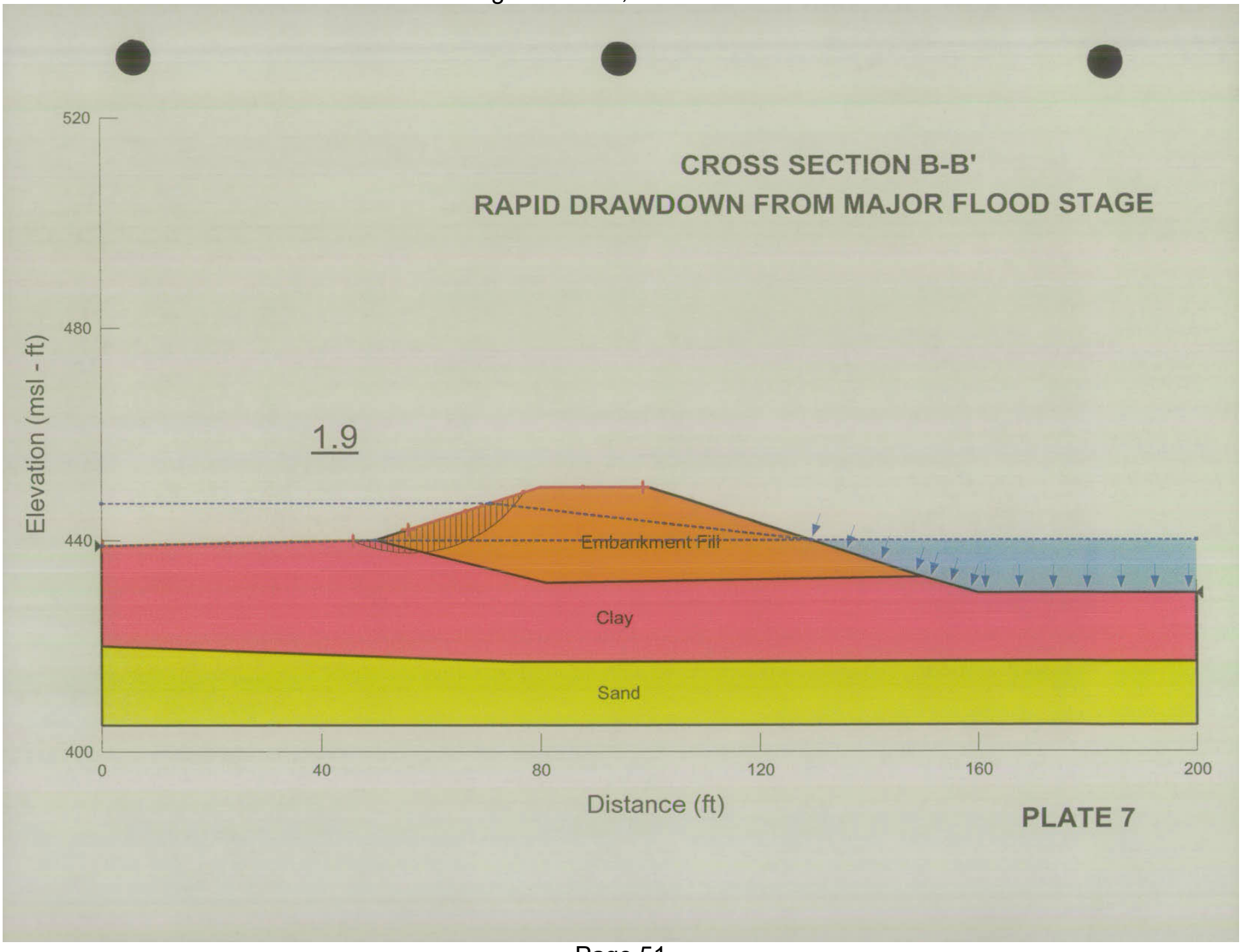

CROSS SECTION A-A'
STEADY STATE SEEPAGE AT MAJOR FLOOD STAGE
Elevation (msl-ft)
540
500
460
420
380
2,100
2,140
2,180
2,220
2,260
2,300
Distance (ft)
2.9
Embankment Fill
Silty Clay
Sand
PLATE 2

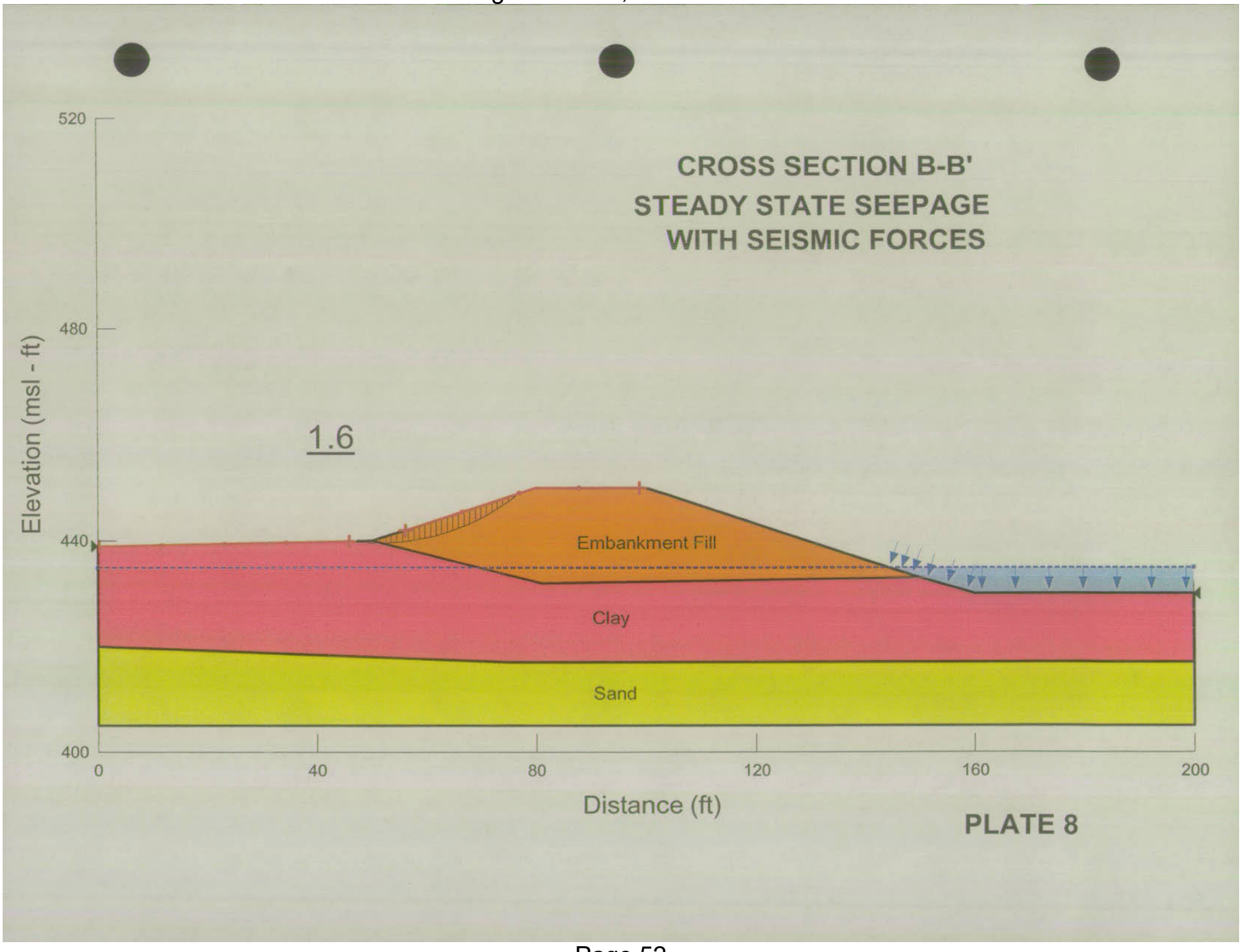

CROSS SECTION A-A'
RAPID DRAWDOWN FROM MAJOR FLOOD STAGE
Elevation (msl-ft)
540
500
460
420
380
1.9
Embankment Fill
Silty Clay
Sand
2,100
2,140
2,180
2,220
2,260
2,300
Distance (ft)
PLATE 3


CROSS SECTION A-A'
STEADY STATE SEEPAGE
WITH SEISMIC FORCES
1.5
Embankment Fill
Silty Clay
Sand
Elevation (msl-ft)
540
500
460
420
380
2,100
2,140
2,180
2,220
2,260
2,300
Distance (ft)
PLATE 4


CROSS SECTION B-B'
STEADY STATE SEEPAGE
2.1
Elevation (msl - ft)
520
480
440
400
Embankment Fill
Clay
Sand
0
40
80
120
160
200
Distance (ft)
PLATE 5


CROSS SECTION B-B'
STEADY STATE SEEPAGE AT MAJOR FLOOD STAGE
2.1
Elevation (msl - ft)
520
480
440
400
Embankment Fill
Clay
Sand
0
40
80
120
160
200
Distance (ft)
PLATE 6


CROSS SECTION B-B'
RAPID DRAWDOWN FROM MAJOR FLOOD STAGE
1.9
Embankment Fill
Clay
Sand
Elevation (msl - ft)
520
480
440
400
0
40
80
120
160
200
Distance (ft)
PLATE 7


CROSS SECTION B-B'
STEADY STATE SEEPAGE
WITH SEISMIC FORCES
1.6
Embankment Fill
Clay
Sand
Elevation (msl - ft)
520
480
440
400
0
40
80
120
160
200
Distance (ft)
PLATE 8

ATTACHMENT A

HYDROGEOLOGIC ASSESSMENT REPORT
FLY ASH POND AND BOTTOM ASH POND
MEREDOSIA POWER STATION
800 SOUTH WASHINGTON STREET
MEREDOSIA, ILLINOIS

Prepared for:

AMERENENERGY MEDINA VALLEY COGEN, LLC
St. Louis, Missouri

Prepared by:

GEOTECHNOLOGY, INC.
St. Louis, Missouri

Project No. J024917.01

August 4, 2016

Dcl/J024917.01 Meredosia Hydro-Geo RF.doc

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HYDROGEOLOGIC ASSESSMENT REPORT
FLY ASH POND AND BOTTOM ASH POND
MEREDOSIA POWER STATION
800 SOUTH WASHINGTON STREET
MEREDOSIA, ILLINOIS

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1.0 INTRODUCTION

AmerenEnergy Median Valley Cogen, LLC (Ameren) has retained Geotechnology, Inc. (Geotechnology) to provide design services for the closures of a fly ash pond and a bottom ash pond at their Meredosia, Illinois power station. We understand that the closure rules for the Meredosia ash ponds are similar to those defined for ash pond closures at Ameren's Hutsonville Power Station - Hutsonville, Illinois in January 2011 under Illinois Administrative Code (IAC) Title 35, Part 840, Subpart A: *Closure of Ash Pond D, Hutsonville Power Station*. These rules address the hydrogeologic site investigation, groundwater monitoring, groundwater collection and discharge, final slopes and stabilization, final cover system, closure plan, and post-closure maintenance and care.

The Meredosia Power Station in Morgan County, Illinois is owned by AmerenEnergy Medina Valley Cogen, LLC and operated by the Ameren Energy Generating Company from 1948 to 2011, when the power station was closed. The Meredosia Power Station has three coal combustion product impoundments including: the Bottom Ash Pond, the Fly Ash Pond and the Old Ash Pond. The Old Ash Pond was previously closed.

This document comprises the Hydrogeologic Assessment and includes a review and update of previous hydrogeologic assessment documents prepared by others for the Meredosia Power Station. Additionally, subsurface data collected from the October 2015 subsurface investigation and monitoring well installation activities are incorporated into this assessment. Hydrogeologic assessment data was compiled from previously presented information including the March 2013 Phase I Hydrogeological Assessment Report prepared by Natural Resource Technology Environmental Consultants (NRT)[1] and the November 2009 Site Characterization and Groundwater Monitoring Plan for CCP Impoundments prepared by Rapps Engineering and Applied Science (Rapps)[2].

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[1] *Phase I Hydrogeological Assessment Report, Coal Combustion Product Impoundments, Meredosia Power Station, Morgan County, Illinois;* prepared by Natural Resource Technology, Inc. for Ameren Energy Generating Company; Project No. 2124, dated March 19, 2013.

[2] *Site Characterization and Groundwater Monitoring Plan For CCP Impoundments, Ameren Energy Generating Company, Meredosia Power Station, Morgan County, Illinois;* prepared by Rapps Engineering and Applied Science for Ameren Services; dated November 2009.

2.0 PHYSICAL SETTING

The Meredosia Power Station is located at 800 South Washington Street, Meredosia, Illinois. The Fly Ash and Bottom Ash Ponds are located southwest of the former coal pile and plant facilities. The site location and topography are shown on Plate 1. An aerial photograph site plan showing existing structures, ash ponds, and monitoring well/boring locations is included as Plate 2. The Meredosia Power Station is located in the floodplain of the Illinois River which borders the site to the west.

The Meredosia Power Station ash ponds are located in the south half of Section 21 and the north half of Section 28, T.16N, R.13W. The Bottom Ash Pond was constructed in 1972 with a design surface area of 11 acres, a height of 24 feet, and a volume of approximately 90 acre-feet. The Fly Ash Pond was constructed in 1968 and has a design surface area of 44.8 acres, a height of 24 feet, and a volume of approximately 500 acre-feet.

3.0 REGIONAL GEOLOGY

The Meredosia Power Station is located near the western edge of the Springfield Plain Subsection of the Till Plains Section, Central Lowland Province, Interior Plains Physiographic Region. The Interior Plains Physiographic Region extends across the Laurentian craton of central North America. It is comprised of the Great Plains and Central Lowland Provinces. The Central Lowlands Province to the east formed from eroded sediments from the topographically-higher Great Plains Province to the west (Fenneman, 1922).

The Till Plains Section of the Central Lowland Province is subdivided into seven areas in Illinois. Four of the subdivisions are in Illinoian-aged drift (Willman et al., 1975). The Springfield Plain comprises the western half of the Illinoian-aged till plain. It is level to undulatory and exhibits relatively shallow drainages. The southern boundary is observed where the drift thins and the underlying bedrock control becomes prominent. It is characterized by smoothed features and glacial landforms. The Illinois River forms the northwestern border of the Springfield Plain.

3.1 Bedrock Stratigraphy. The Meredosia Power Station and surrounding areas within the Illinois River valley are underlain by Mississippian System bedrock of the Lower Valmeyeran Series which consists of the Meppen Limestone, Fern Glen formation, and the Burlington-Keokuk Limestone (Kolata, 2005). A bedrock geology map of the site and surrounding areas is included as Plate 3.

Willman et al. (1975) describe the Meppen Limestone as a tan or buff, very fine-grained dolomitic limestone or calcareous dolomite. The formation is slightly crinoidal and contains calcite geodes up to 2-inches in diameter. The maximum thickness of this formation is

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approximately 22 feet. The Fern Glen formation consists of calcareous shale, limestone, and dolomite. Dolomitic portions of the formation are partially argillaceous. The limestone portions of the formation contain nodules of greenish-gray chert. The thickness of the formation can range from approximately 50 to 100 feet. The Burlington formation of the Burlington-Keokuk Limestone is described as a "very pure, coarsely crystalline, crinoidal, light gray limestone in medium to thick beds." The Burlington formation also contains beds of fine-grained, brownish-gray, dolomitic limestone. The formation is approximately 100 to 150 feet thick in Illinois. The Keokuk formation of the Burlington-Keokuk Limestone is composed of beds of fossiliferous, crinoidal limestone interbedded with fine-grained limestone, argillaceous dolomite, and calcareous gray shale. The Keokuk formation is approximately 60 to 80 feet thick in Illinois.

3.2 Surficial Geology. The Meredosia Power Station is situated within the Illinois River valley. The overburden soils consist of channel and floodplain deposits of the Cahokia formation underlain by glacial outwash deposits belonging to the Henry formation. Fine-grained lacustrine deposits of the Equality formation are present in the subsurface, but are discontinuous. These formations occur throughout Illinois in valley bottoms and floodplains as channel deposits in present-day rivers and streams.

The Cahokia Alluvium consists mainly of poorly-sorted silt, clay, and silty sand, but locally contains lenses of sand and gravel. The upper part consists of overbank silt and clays. The lower portion consists of coarse-textured sand and lateral accretion deposits. The Cahokia formation may be up to 20 feet thick in the area of the Meredosia Power Station (Berg and Kempton, 1987).

The Henry formation consists of glacial sand and gravel outwash. The Henry formation is subdivided into three members that differ in lithology: the Batavia Member (outwash plains), the Mackinaw Member (valley trains), and the Wasco Member (ice-contact deposits) (Willman and Frye, 1970; Willman et al., 1975). Based on information from well logs, the thickness of the Henry formation ranges from 60 to 84 feet in the area of the Meredosia Power Station.

The Equality formation consists of bedded silt and clay deposits in glacial and post-glacial lakes. Gravel, sand, and organic deposits occur in lenses that intertongue with the Henry formation. In the area of the Meredosia Power Station, the Equality formation overlies the Henry formation and generally occurs as lenses or patches not exceeding 20 feet thick.

Geotechnology has conducted subsurface explorations of the overburden soils at the Meredosia Power Station. The subsurface exploration and laboratory testing efforts are discussed further in Section 4.0.

3.3 Surface Water. The major surface water body in the vicinity of the Meredosia Power Station is the Illinois River, which flows from the north-northeast to the south-southwest, and borders the west side of the site. The normal pool elevation of the Illinois River is approximately

421.0 feet[3]. Information from the U.S. Army Corps of Engineers indicates the Illinois River flood stage is 435.0 feet above mean sea level (MSL). The record high stage was 446.69 feet above MSL on May 26, 1943, and the record low stage was 418.40 feet above MSL on January 11, 1940.

Meredosia Lake is a backwater lake located north of the Village of Meredosia within the Illinois River valley and within the Meredosia National Wildlife Refuge. Meredosia Lake is approximately 1.5 miles north of the Meredosia Power Station. Smith Lake is located approximately 1-mile south of the Meredosia Power Station and is connected to Seaman's Pond. Westerly-flowing streams drain the uplands to the east of the Meredosia Power Station. Easterly-flowing streams and drainage channels drain the floodplain across the Illinois River to the west of the Meredosia Power Station.

3.4 Groundwater. Groundwater within and near the Illinois River valley is obtained from the sand and gravel deposits of the Henry formation and to a lesser extent from wells drilled into the Mississippian-age Burlington-Keokuk Limestone and Salem Limestone. A summary of the water supply wells identified within 1-mile of the Meredosia Power Station is presented in Table 1 below. The water supply well information is included as Appendix A. The approximate locations of the water supply wells are depicted on Plate 4.

TABLE 1 – WATER SUPPLY WELL SUMMARY

Owner	Wells	On/Off Site	Type	Status
CIPS*	42	On Site	Water Supply	Abandoned (except 4)
National Starch	15	Off Site	Water Supply	Unknown
Village of Meredosia	6	Off Site	Public Supply	In Use
IDOT	4	Off Site	Test Borings	Not Wells
W.R. Grace	2	Off Site	Water Supply	Unknown
T.A. Terminal	2	Off Site	Water Supply	Unknown
Illinois Road Contractors	1	Off Site	Water Supply	Unknown

*Central Illinois Public Service Company

The water supply wells were located using the Illinois State Geological Survey (ISGS) *Illinois Water Well* (ILWATER) *Internet Map Service*, the Illinois State Water Survey's *Domestic Wells Database*, the Illinois Environmental Protection Agency (IEPA) web-based Geographic Information System (GIS) files, Illinois Department of Health (IDPH) records, and Morgan County Health Department records.

[3] Elevations herein refer to the mean sea level datum in feet (msl-ft).

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3.4.1 Private Water Supply Wells. Approximately 62 private water supply wells and 4 non-well test borings were identified within 1-mile of the Meredosia Power Station. Twenty of the private water supply wells are off-site. The status of the wells are unknown at this time, but are assumed to be in-use. The twenty off-site private water supply wells are up-gradient or cross-gradient from the site and are not anticipated to be impacted from the site. Groundwater sampling and testing results further support that the twenty off-site water supply wells are not expected to be impacted.

The other 42 private water supply wells are located at the Meredosia Power Station. According to site records, personnel interviews, and field reconnaissance, 38 of the on-site water supply wells have been abandoned. Two wells are no longer used, but have not been abandoned. One well is shut down and one currently supplies water to the restrooms/showers on the site. Once the former power plant is demolished and the ash pond closure activities are complete, these four supply wells will be abandoned. Additional water needs at the Meredosia Power Station are provided by the Village of Meredosia public water supply.

3.4.2 Public Water Supply Wells. According to the mapping sources referenced in Section 3.4.1, public water supply wells are not located within 1-mile of the Meredosia Power Station. The closest public water supply wells to the Meredosia Power Station belong to the Village of Meredosia. The six public water supply wells are situated approximately 1.2 miles to the north-northeast. Although the wells are beyond 1-mile from the facility, the locations are depicted on Plate 4 and the water supply well information is included in Appendix A for reference.

Per the IEPA database, two of the Village of Meredosia public water supply wells have a minimum setback of 400 feet and a second setback of 1,000 feet due to the Phase I Wellhead Protection Area (WHPA). A third Village of Meredosia public water supply well has a Phase II WHPA, which has an extended area of protection that includes the recharge area or geographic area surrounding the well that supplies potable water to a community.

3.4.3 Oil and Gas Wells. Oil and gas wells within a 1-mile radius of the Meredosia Power Station were identified using the Illinois State Geological Survey *Illinois Oil and Gas Resources* (ILOIL) *Internet Map Service*. ILOIL contained records for three wells within the search radius, but the status of the three wells was listed as dry, abandoned and plugged.

4.0 SUBSURFACE INVESTIGATION

4.1 Subsurface Investigations. From October 19 through October 26, 2010, Geotechnology advanced 15 borings at the Meredosia Power Station. Ten of the borings (B-1 through B-10) were drilled in support of a global stability evaluation, while the remaining five borings were completed as Monitoring Wells APW-1 through APW-5 in support of groundwater monitoring activities. The borings were drilled using a truck-mounted CME 550 rotary drill rig equipped with 4-1/4-inch hollow stem augers. The borings were drilled to depths ranging from 25 to 60 feet below land surface (bls). Standard Penetration Tests (SPT) were performed using an automatic hammer and split spoon sampler. The locations of the borings and monitoring wells are included on Plate 2.

From September 28 through October 1, 2015, Geotechnology advanced four additional borings at the site using a truck-mounted CME 550 rotary drill rig equipped with 4-1/4-inch hollow stem augers. The borings were drilled to depths ranging from 17 to 40 feet bls. SPTs were performed using an automatic hammer and split spoon sampler. Monitoring Wells APW-6 through APW-9 were installed in the borings in support of ongoing groundwater monitoring activities. Copies of the boring logs are included as Appendix B. The locations of the monitoring wells are included on Plate 2.

Monitoring Wells APW-6 through APW-9 were constructed using 10 feet of 2-inch-diameter 0.010-inch slotted PVC screen and riser to the surface. The monitoring wells were completed at the surface with above-ground steel covers set in a concrete pad. The monitoring wells were developed in accordance with industry practice and registered with the IDPH and the IEPA.

An engineer from Geotechnology provided technical direction during field exploration, observed drilling and sampling, assisted in obtaining samples and prepared descriptive logs of the material encountered. The boring logs represent conditions observed at the time of exploration.

Unless noted on the boring logs, the lines designating the changes between various strata represent approximate boundaries. The transition between materials may be gradual or may occur between recovered samples. The stratification given on the boring logs, or described herein, is for use by Geotechnology in its analyses and should not be used as the basis of design or construction cost estimates without realizing that there can be variation from that shown or described.

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4.2 Subsurface Conditions. Native soils consisting of brown and gray, very soft to medium stiff, silt and clay were encountered below the fill in Boring B-1 and Monitoring Well APW-9, and at the ground surface in Boring B-5. Native soils consisting of black, clayey sand with trace gravel were encountered below the fill in Boring B-2.

A stratum of very soft to medium stiff, brown, black, and gray clay with traces of sand and wood was encountered below the fill in Borings B-3 and B-8, below the native soils in Borings B-1, B-2, and B-5, and at the ground surface in Borings B-4, B-9, APW-2, APW-3, APW-4, and APW-7. This soil stratum ranged in thickness from approximately 8 to 17 feet bls.

The clay layer described above was underlain by a stratum of granular and cohesive alluvial soils (except for Boring APW-4). The granular alluvium generally consisted of loose, gray, clayey sand with gravel. The cohesive alluvium generally consisted of very soft to medium stiff, gray and brown, clayey silt, silty clay, and sandy clay. This soil stratum ranges in thickness from approximately 5 to 11 feet bls in borings where it is encountered.

Alluvium was encountered below the fill soils in Borings B-6 and B-7, and at the ground surface in Boring B-10 and Monitoring Wells APW-6 and APW-8. This stratum is interpreted as alluvium placed in a buried valley that had been cut down through the soil stratum described above. The granular portions of this alluvium infill generally consisted of very loose, gray, silty sand. The cohesive portions generally consisted of very soft to very stiff, gray, silty clay with sand and silt seams. This soil stratum was at least 28 feet thick where encountered.

The native soils described above are interpreted as belonging to the Cahokia Alluvium, and were underlain by sand deposits interpreted as belonging to the Henry formation. Generalized east-west and north-south subsurface profiles based on the soil boring data at the Meredosia Power Station are included on Plates 6 and 7, respectively. The plan-view of the subsurface profile orientations is included on Plate 5.

During the subsurface exploration activities, groundwater was observed in Borings B-3, B-4, B-5 and B-6 at depths ranging from approximately 18 to 39 feet bls. Groundwater was observed in Monitoring Wells APW-1 through APW-9 at depths ranging from 6 to 32 feet bls at the time of construction. Groundwater levels might not have stabilized before backfilling or well construction activities. Consequently, the indicated groundwater levels might not represent present or future levels. Groundwater levels could vary over time due to the effects of the Illinois River, seasonal variation in precipitation, or other factors not evident at the time of exploration.

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5.0 SITE HYDROGEOLOGY

5.1 Groundwater Classification. The Illinois Class I groundwater standards are applicable to the Meredosia Power Station. The Illinois Class I groundwater is defined as groundwater that is capable of being potable. As stated in 35 IAC 620.410(a) and (d) the following parameters are required to be monitored with the exception of Radium 226 and 228:

- antimony,
- arsenic,
- barium,
- beryllium,
- boron,
- cadmium,
- chloride,
- chromium,
- cobalt,
- copper,
- cyanide,
- fluoride,
- iron,
- lead,
- manganese,
- mercury,
- nickel,
- nitrate as nitrogen,
- selenium,
- silver,
- sulfate,
- thallium,
- total dissolved solids,
- vanadium, and
- zinc.

5.2 Groundwater Monitoring. The groundwater monitoring network at the Meredosia Power Station consists of one up-gradient monitoring well (APW-1) and eight down-gradient monitoring wells (APW-2 through APW-9). The approximate locations of the monitoring wells are included on Plate 2. The monitoring wells are screened in the uppermost aquifer which generally consists of saturated, fine to coarse sand. The monitoring well depths range from 17 to 40 feet bls. Monitoring well construction diagrams from Monitoring Wells APW-1 through APW-9 are included in Appendix B. A total of 11 groundwater monitoring events have been conducted at the Meredosia Power Station since December 2010. The groundwater monitoring events have been conducted quarterly since the third quarter of 2015. Future groundwater monitoring events are anticipated to be conducted quarterly until trend analysis indicates less frequent monitoring is acceptable. A summary of the monitoring well gauging data is included as Table 2. A summary of the groundwater laboratory analytical results collected to date is included as Table 3.

5.3 Groundwater Flow. Based on the monitoring well gauging data in Table 2, the groundwater flow direction at the Meredosia Power Station is to the west-northwest toward the Illinois River. Groundwater flow direction may be influenced by the stage of the Illinois River. Groundwater elevation contour maps for the 10 groundwater monitoring events are included as

Plates 8 through 16. These events include a range of climate conditions including flood and dry timeframes. *Note: Only gauging events with data from at least five monitoring wells are included.*

5.4 Groundwater Geochemistry. A total of 11 groundwater sampling events have been conducted at the Meredosia Power Station since December 2010. The parameters analyzed include those listed in Section 5.1 in addition to field parameters pH, specific conductivity, and temperature. The analytical testing data are summarized in Table 3. The historical groundwater data collected prior to 2015 consists of dissolved parameter concentrations only. During the time these data were collected, laboratory analysis for dissolved concentrations was the applicable standard of care. The use of dissolved parameter concentration results in the statistical analysis for this Hydrogeologic Assessment report was the only historical data available for the site and was based on the precedent set by the Hutsonville Ash Pond D Closure which was approved by the IEPA. The recent three quarterly sampling events (3Q15, 4Q15, and 1Q16) were analyzed for both total and dissolved parameter concentrations. The purpose of the dual analysis was to allow historical data to be compared to current data and to prepare for future statistical analysis using total parameter concentrations. *Note: The historical data provided by others did not contain practical quantitation limits (PQLs) or method detection limits (MDLs). The PQLs and MDLs from the February 2016 groundwater sampling event were substituted for the missing data during statistical analysis.*

The analytical results were compared to the Illinois Class I groundwater standards. Historical concentrations of arsenic exceeded the Class I groundwater standard in Monitoring Wells APW-3 and APW-4. Currently, (as of February 2016) the arsenic concentration exceeded the Class I groundwater standard in APW-3 only. Concentrations of boron exceeded the Class I groundwater standard in Monitoring Wells APW-2, APW-3, APW-4, APW-6, APW-8, and APW-9. Currently, (as of February 2016) the boron concentration exceeded the Class I groundwater standard (2 ppm) in Monitoring Wells APW-2, APW-3, APW-8, and APW-9. Aerial photographs showing the boron concentration contours for September 2015, December 2015, and February 2016 are included as Plates 18 through 20, respectively. Concentrations of manganese exceeded the Class I groundwater standard in Monitoring Wells APW-2, APW-3, and APW-4. Historical concentrations of iron exceeded the Class I groundwater standards in Monitoring Wells APW-3 and APW-4, but the February 2016 results are below the Class I groundwater standard. A single event anomaly associated with flooding in February 2016 resulted in the concentration of sulfate in Monitoring Well APW-9 being above the Class I groundwater standard. The arsenic and manganese exceedances at each monitoring well for the February 2016 sampling event are included on Plate 21. Changes of oxidation/reduction (redox) potential in the subsurface due to fluctuations in pH make evaluation of manganese and iron concentrations unreliable at this facility. Comparison of manganese and iron to the respective Class I groundwater standard may be inappropriate for this site.

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Box and whiskers plots of the exceedances, with the exception of sulfate, iron, and manganese are included as Appendix C. Statistical trend analysis plots for arsenic and boron are also included in Appendix C. Statistical trends are decreasing or not significant at a 98% confidence level. The analysis indicates that increasing trends may have been present while the Meredosia Power Station was in operation through 2011, but appear to be decreasing based on the three most recent quarterly monitoring data.

5.5 Contaminants of Concern. Boron is the contaminant of concern for the Meredosia Power Station and is also indicator parameters. Boron is widespread across the site and is generally considered a good indicator chemical for ash pond facilities in Illinois. Due to the elevated levels of boron above background levels in the groundwater near the ash ponds on site, boron will be a primary indicator parameter for the site during remedial actions and ash pond closure activities. Boron is relatively stable in the subsurface and is not prone to attenuation.

Other chemicals and water quality parameters such as iron, manganese, pH, and TDS can be affected by redox conditions in the subsurface and are therefore not reliable as indicator parameters at this site. The concentrations of other chemicals may naturally fluctuate through attenuation.

5.6 Groundwater Modeling.

Both a two-dimensional and three-dimensional transient groundwater flow and transport model was used to describe the site. The models were calibrated to match the groundwater elevation and concentration trends observed between 2009 and 2015. Prediction simulations were then performed for no action and for proposed ash pond closure activities. The existing conditions model was used to calibrate the hydrogeologic flow and transport conditions and to evaluate the need for the ponds to be closed. The proposed closure conditions model was created to evaluate the length of time for the boron concentrations to decrease to below the IEPA Class I Groundwater standards. Boron transport was chosen because it is an indicator contaminant for coal ash leachate, is mobile in groundwater, and impacts are the most widespread across the site.

5.6.1 HELP Model

In order to assess the drainage capabilities of the proposed fly ash and bottom ash pond closures, Geotechnology utilized the USEPA Hydrologic Evaluation of Landfill Performance (HELP) model to simulate conditions at the site. The version of software used was HELP 3.07 (November 1997). A description of inputs and output data is attached in Appendix D of this report. For the purposes of this evaluation, the proposed ash pond cap, ash, and soil cross-section has been divided into six layers.

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Model parameters for the layers were the default values for each selected layer type as provided by the HELP software module, or were input by the user (for synthetic materials) with known or manufacturer provided parameters. The model was run without groundwater influx parameters.

The model indicates that steady state conditions (<0.05 inches of head on the sand layer) will be achieved within approximately six months of closure activities at the two ash ponds on site. The data obtained from the HELP model was used as input parameters for MODFLOW and MT3DMS.

5.6.2 MODFLOW and MT3DMS

MODFLOW was developed by the United States Geological Survey (USGS) to solve three-dimensional transient head distributions using finite difference approximations. The model inputs include soil properties, multiple layers, heterogeneities, variable thicknesses, variable gradients, flow boundaries, wells, and can define confined or unconfined flow systems. Assumptions of the program include that groundwater is governed by Darcy's law; the formation behaves as a continuous porous medium; flow is not affected by chemical, temperature, or density gradients; and hydraulic properties are constant within a grid cell.

MT3DMS was developed by the USGS and calculates concentration distributions for a single chemical as a function of time and location using a finite difference solution. Concentration is distributed over a three-dimensional, non-uniform, transient flow field. MT3DMS accounts for advection, diffusion, dispersion, sorption, and first order decay. Assumptions of the module include changes in the concentration field do not affect the flow field; concentrations of solutes do not interact with each other; chemical and hydraulic properties are constant within a cell; sorption is instantaneous and fully reversible; and decay is not reversible.

Flow and transport boundaries, soil properties, and river stage fluctuations were the same for the calibration and prediction scenarios. One prediction scenario was no action and the other included the proposed ash pond closures.

Boron concentrations for the current configuration were modeled for 25 years to represent a scenario where the ash ponds were not closed. After 25 years, monitoring well APW-3 (the well with historically highest boron concentrations) stabilized at 16.9 mg/L of boron, which exceeds the Class I Groundwater standards. APW-2, APW-6, APW-7, and APW-8 also exceeded the Class I Groundwater standards at 25 years with no action.

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According to the model results, boron concentrations will be below the Class I Groundwater standards for each well on site within three years after dewatering and closure of the fly ash and bottom ash ponds.

Additional information on the MODFLOW and MT3DMS modeling and modeling results are provided in Appendix E.

5.6.3 Boron and Arsenic Loading to the Illinois River

Groundwater in the vicinity of the fly ash and bottom ash ponds discharges to the Illinois River. A mixing calculation was performed to conservatively estimate the boron and arsenic loading rates to the Illinois River. Calculations are provided in Appendix F.

The loading rate was calculated by multiplying the volume of groundwater flowing into the river by the concentration of boron and arsenic in groundwater.

Loading Rate (L) = Concentration (C) * Groundwater Discharge Volume (Q)

Where Q = Hydraulic Conductivity (K) * Hydraulic Gradient (I) * Area (A)

To be conservative, the highest single concentration in groundwater monitoring wells at the site was initially used in this calculation (Cmax). A second calculation was performed using the average of the four monitoring wells near the river (APW-2, APW-3, APW-4, and APW-9).

The monitoring wells were not tested for hydraulic conductivity; however, Gibbet al. (1979) published hydraulic conductivity values for wells along the Illinois waterway, which included a site-specific value of 1,200 gallons per day/square foot (gpd/ft2). Both a maximum and an average hydraulic gradient were used. The average hydraulic gradient was based on the ten groundwater gauging events. Two groundwater gauging events were not used because of flooding and inaccessibility of the wells. Removing flooding events provides a more conservative value. The cross sectional area was assumed to be over the entire thickness of the aquifer, and along the entire length of the Fly Ash Pond parallel to the river, plus 50 feet north and south of the pond.

The calculated loading rate was divided by: 1) the 7-day 10-year low flow (Q7,10); and 2) the mean of the average annual flow data at the Meredosia gaging station. This calculation estimates the incremental concentration increase (dB) in the river due to discharge from the Fly Ash Pond. Due to the size of the Illinois River, it is unlikely that boron and arsenic concentrations would initially be distributed across the entire width of the river. Therefore, an additional calculation was performed to determine

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the incremental concentration increase assuming that mixing occurred within 50 feet of the shoreline. This calculation was performed by multiplying dB by 750 feet/50 feet (750 feet being total river width and 50 feet being the assumed mixing width).

The result of the boron calculation is an incremental increase of 0.048 mg/L calculated using average concentration, average hydraulic gradient, and mean annual river discharge. This is near the reporting limit for boron as listed by the USEPA in method SW-846, 6010c and below the Class I Groundwater Standard. The result of the boron calculation; based on maximum concentration, maximum hydraulic gradient, and the Q7,10; is a conservative estimate of the increase in boron loading to the Illinois River. This result (1.92 mg/L) suggests that a measurable boron increase could occur near shore for worst case conditions at low flow. This value is below the IEPA Class I Groundwater standard.

Under typical conditions, arsenic will not have a measurable impact (incremental concentration increase of 0.0022 mg/L) on concentrations within the Illinois River. The calculations for arsenic suggest that it may be measurable in river water under worst case conditions (incremental increase of 0.0129 mg/L), assuming that it does not precipitate or sorb from solution prior to reaching the groundwater/surface water interface.

6.0 CONCLUSIONS

Although up to 11 groundwater monitoring events have been conducted at the Meredosia Power Station since December 2010, only three events have been conducted since the facility ceased operations in 2011. Therefore, statistical analysis of post-closure trends could not be performed. The groundwater analytical and statistical data indicates that the unlined ash ponds are a primary contributor to groundwater impacts based on the location of groundwater exceedances, the types of chemicals common to coals ash exceeding the applicable Class I groundwater standards, gradual reduction of groundwater impacts after plant closure, and contaminant transport modeling. The preliminary data suggests that a reduction in the concentrations of boron and arsenic has occurred since the facility ceased operations. The results of the groundwater modeling further supports this preliminary assessment in that once the ash ponds are capped and a Groundwater Management Zone is put into effect, the primary pathway (storm water infiltration) for contaminants to impact the groundwater at the site will not be complete. Groundwater modeling indicates that within four years of dewatering and closure, boron levels will be below the Class I Groundwater standards.

Additional groundwater monitoring events are planned to further assess the extent of the impacts of ash pond capping activities. Future monitoring events will be sampled for the parameters in accordance with the Meredosia Power Station Groundwater Monitoring Plan (GMP, 2016).

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8.0 LICENSED PROFESSIONAL SIGNATURE/SEAL

I hereby affirm that the information and design documents contained in this hydrogeologic assessment report are true and accurate to the best of my knowledge and professional opinion.

Rosanna M. Saindon, P.E., Ph.D.
Illinois Licensed Professional Engineer
Project Manager
Geotechnology, Inc.

TABLE 2

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MONITORING WELL DATA SUMMARY
MEREDOSIA POWER STATION
MORGAN COUNTY, ILLINOIS

Well ID	Ground Surface Elevation	Bottom of Well Elevation	Screen Length (ft)	Top of Casing Elevation[1]	Groundwater Measurements		
					Date	Depth to Water (ft)	Groundwater Surface Elevation
APW-1	446.06	420.90	10.00	449.26	11/17/10	18.35	430.91
					12/13/10	19.15	430.11
					03/14/11	18.30	430.96
					06/24/11	10.80	438.46
					09/15/11	17.30	431.96
					10/28/11	19.60	429.66
					03/26/12	21.55	427.71
					06/18/12	21.34	427.92
					09/17/12	23.45	425.81
					08/25/15	12.10	437.16
					12/21/15	18.22	431.04
					02/18/16	13.54	435.72
APW-2	433.97	410.60	10.00	436.87	11/17/10	13.00	423.87
					12/13/10	13.14	423.73
					03/14/11	8.30	428.57
					09/15/11	12.65	424.22
					10/28/11	13.60	423.27
					03/26/12	13.27	423.60
					06/18/12	14.46	422.41
					09/17/12	15.59	421.28
					08/25/15	9.67	427.20
					12/21/15	9.05	427.82
					02/18/16	8.21	428.66
APW-3	433.35	410.30	10.00	436.28	11/17/10	13.52	422.76
					12/13/10	13.35	422.93
					03/14/11	5.70	430.58
					09/15/11	13.90	422.38
					10/28/11	14.60	421.68
					03/26/12	12.80	423.48
					06/18/12	13.95	422.33
					09/17/12	15.92	420.36
					08/25/15	11.10	425.18
					12/21/15	4.79	431.49
					02/18/16	8.74	427.54
APW-4	431.90	405.80	6.50	434.86	11/17/10	9.15	425.71
					12/13/10	9.25	425.61
					09/15/11	9.20	425.66
					10/28/11	10.00	424.86
					03/26/12	9.90	424.96
					06/18/12	10.95	423.91
					09/17/12	12.36	422.50
					08/25/15	6.13	428.73
					12/21/15	5.47	429.39
					02/18/16	4.92	429.94
APW-5	450.48	420.20	10.00	453.20	11/17/10	25.60	427.60
					12/13/10	25.40	427.80
					03/14/11	22.60	430.60
					06/24/11	14.70	438.50
					09/15/11	23.40	429.80
					10/28/11	24.50	428.70
					03/26/12	27.20	426.00
					06/18/12	27.30	425.90
					09/17/12	29.18	424.02
					08/25/15	18.55	434.65
					12/21/15	23.68	429.52
					02/18/16	19.42	433.78
APW-6	448.60	420.60	9.68	451.90	12/21/15	21.90	430.00
					02/18/16	18.35	433.55
APW-7	435.00	418.50	9.70	438.70	12/21/15	9.15	429.55
					02/18/16	6.95	431.75
APW-8	460.50	421.40	9.68	463.90	12/21/15	34.56	429.34
					02/18/16	31.60	432.30
APW-9	445.00	415.70	9.68	448.10	12/21/15	18.23	429.87
					02/18/16	17.76	430.34

[1]Elevations reported in feet above mean sea level.

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TABLE 3

GROUNDWATER ANALYTICAL DATA SUMMARY
MEREDOSIA POWER STATION
MEREDOSIA, ILLINOIS

WELL ID	SAMPLE DATE	PARAMETER[1]													
		Antimony (d)	Antimony (t)	Arsenic (d)	Arsenic (t)	Barium (d)	Barium (t)	Beryllium (d)	Beryllium (t)	Boron (d)	Boron (t)	Cadmium (d)	Cadmium (t)	Chloride (d)	Chromium (d)
APW-1	12/13/2010	<0.006	NA	<0.004	NA	<0.05	NA	<0.004	NA	0.117	NA	<0.004	NA	1	<0.01
	3/24/2011	<0.003	NA	<0.001	NA	0.01	NA	<0.001	NA	0.13	NA	<0.001	NA	11	<0.004
	6/24/2011	<0.003	NA	<0.001	NA	0.01	NA	<0.001	NA	0.14	NA	<0.001	NA	5.6	<0.004
	9/15/2011	<0.003	NA	<0.001	NA	0.017	NA	<0.001	NA	0.1	NA	<0.001	NA	13	<0.004
	10/28/2011	<0.003	NA	<0.001	NA	0.019	NA	<0.001	NA	0.098	NA	<0.001	NA	6.8	<0.004
	3/26/2012	<0.003	NA	<0.001	NA	0.011	NA	<0.001	NA	0.11	NA	<0.001	NA	20	<0.004
	6/18/2012	<0.003	NA	<0.001	NA	0.02	NA	<0.001	NA	0.097	NA	<0.001	NA	45	<0.004
	9/17/2012	<0.003	NA	<0.001	NA	0.013	NA	<0.001	NA	0.055	NA	<0.001	NA	39	<0.004
	8/25/2015	<0.001	<0.001	<0.001	0.004	0.014	0.032	<0.0005	<0.0005	0.066	0.071	<0.002	<0.002	54	<0.005
	12/21/2015	<0.001	<0.001	<0.001	0.003	0.014	0.03	<0.0005	<0.0005	0.074	0.079	<0.002	<0.002	62	<0.005
	2/18/2016	<0.0010	0.0004	<0.0010	0.0012	0.0207	0.0276	<0.0005	<0.0005	0.0712	0.0705	<0.0020	<0.0020	80	<0.0050
APW-2	12/13/2010	<0.006	NA	0.004	NA	<0.05	NA	<0.004	NA	2.11	NA	<0.004	NA	33	<0.01
	3/24/2011	<0.003	NA	0.004	NA	0.055	NA	<0.001	NA	3.1	NA	<0.001	NA	50	<0.004
	9/15/2011	<0.003	NA	0.003	NA	0.042	NA	<0.001	NA	2.8	NA	<0.001	NA	41	<0.004
	10/28/2011	<0.003	NA	0.004	NA	0.045	NA	<0.001	NA	3.3	NA	<0.001	NA	42	<0.004
	3/26/2012	<0.003	NA	0.004	NA	0.046	NA	<0.001	NA	3.6	NA	<0.001	NA	47	<0.004
	6/18/2012	<0.003	NA	0.004	NA	0.051	NA	<0.001	NA	3.5	NA	<0.001	NA	50	<0.004
	9/17/2012	<0.003	NA	0.004	NA	0.048	NA	<0.001	NA	3.9	NA	<0.001	NA	44	<0.004
	8/25/2015	<0.001	<0.001	0.001	0.003	0.06	0.073	<0.0005	<0.0005	2.65	2.8	<0.002	<0.002	40	<0.005
	12/21/2015	<0.001	<0.001	0.002	0.003	0.074	0.092	<0.0005	<0.0005	2.61	2.61	<0.002	<0.002	26	<0.005
	2/18/2016	<0.0010	0.0007	0.0011	0.0014	0.0597	0.0654	<0.0005	<0.0005	2.66	2.88	<0.0020	<0.0020	30	<0.0050
APW-3	12/13/2010	<0.006	NA	0.148	NA	<0.05	NA	<0.004	NA	30.2	NA	<0.004	NA	54.5	<0.01
	3/24/2011	<0.003	NA	0.17	NA	0.05	NA	<0.001	NA	28	NA	0.001	NA	54	<0.004
	9/15/2011	<0.003	NA	0.21	NA	0.042	NA	<0.001	NA	32	NA	<0.001	NA	44	<0.004
	10/28/2011	<0.003	NA	0.22	NA	0.045	NA	0.001	NA	35	NA	<0.001	NA	47	<0.004
	3/26/2012	<0.003	NA	0.19	NA	0.048	NA	<0.001	NA	31	NA	0.001	NA	54	<0.004
	6/18/2012	<0.003	NA	0.31	NA	0.081	NA	<0.001	NA	46	NA	0.002	NA	49	<0.004
	9/17/2012	<0.003	NA	0.17	NA	0.11	NA	<0.001	NA	26	NA	0.001	NA	58	<0.004
	8/25/2015	<0.001	<0.001	0.216	0.225	0.072	0.082	<0.0005	<0.0005	25.3	27	<0.002	<0.002	27	<0.005
	12/21/2015	<0.001	<0.001	0.19	0.207	0.066	0.074	<0.0005	<0.0005	24.2	24.9	<0.002	<0.002	26	<0.005
	2/18/2016	<0.0010	0.0004	0.143	0.158	0.0605	0.0690	<0.0005	<0.0005	23.1	23.7	<0.0020	<0.0020	25	<0.0050
APW-4	12/13/2010	<0.006	NA	0.053	NA	0.067	NA	<0.004	NA	2.55	NA	<0.004	NA	41	<0.01
	9/15/2011	<0.003	NA	0.15	NA	0.085	NA	0.002	NA	4.5	NA	<0.001	NA	50	0.007
	10/28/2011	<0.003	NA	0.18	NA	0.095	NA	0.002	NA	6.3	NA	<0.001	NA	63	<0.004
	3/26/2012	<0.003	NA	0.029	NA	0.048	NA	<0.001	NA	3.9	NA	<0.001	NA	58	<0.004
	6/18/2012	<0.003	NA	0.033	NA	0.063	NA	<0.001	NA	4.8	NA	<0.001	NA	53	<0.004
	9/17/2012	<0.003	NA	0.036	NA	0.064	NA	<0.001	NA	4.9	NA	<0.001	NA	49	<0.004
	8/25/2015	<0.001	<0.001	0.03	0.032	0.053	0.063	<0.0005	<0.0005	1.81	1.89	<0.002	<0.002	33	<0.005
	12/21/2015	<0.001	<0.001	0.018	0.02	0.057	0.077	<0.0005	<0.0005	1.96	2.22	<0.002	<0.002	24	<0.005
	2/18/2016	<0.0010	0.0008	0.0086	0.0151	0.0706	0.176	<0.0005	0.0007	1.33	1.62	<0.0020	<0.0020	26	<0.0050
APW-5	12/13/2010	<0.006	NA	<0.004	NA	<0.05	NA	<0.004	NA	0.118	NA	<0.004	NA	3	<0.01
	3/24/2011	<0.003	NA	<0.001	NA	0.009	NA	<0.001	NA	0.17	NA	<0.001	NA	2.8	<0.004
	6/24/2011	<0.003	NA	<0.001	NA	0.01	NA	<0.001	NA	0.2	NA	<0.001	NA	2.6	<0.004
	9/15/2011	<0.003	NA	<0.001	NA	0.006	NA	<0.001	NA	0.35	NA	<0.001	NA	<1	<0.004
	10/28/2011	<0.003	NA	<0.001	NA	0.006	NA	<0.001	NA	0.31	NA	<0.001	NA	1	<0.004
	3/26/2012	<0.003	NA	0.001	NA	0.009	NA	<0.001	NA	0.3	NA	<0.001	NA	2.5	<0.004
	6/18/2012	<0.003	NA	0.001	NA	0.01	NA	<0.001	NA	0.41	NA	<0.001	NA	4.6	<0.004
	9/17/2012	<0.003	NA	<0.001	NA	0.009	NA	<0.001	NA	0.32	NA	<0.001	NA	2.9	<0.004
	8/25/2015	<0.001	0.001	<0.001	0.008	0.011	0.042	<0.0005	<0.0005	0.109	0.119	<0.002	<0.002	9	<0.005
	12/21/2015	<0.001	<0.001	<0.001	0.001	0.012	0.018	<0.0005	<0.0005	0.092	0.116	<0.002	<0.002	6	<0.005
	2/18/2016	0.0003	0.0006	0.0003	0.0010	0.0113	0.0151	<0.0005	<0.0005	0.118	0.165	<0.0020	<0.0020	9	<0.0050
APW-6	12/21/2015	<0.001	<0.001	<0.001	<0.001	0.015	0.018	<0.0005	<0.0005	0.246	0.271	<0.002	<0.002	6	<0.005
	2/18/2016	<0.0010	0.0005	0.0006	0.0008	0.0150	0.0167	<0.0005	<0.0005	0.412	0.444	<0.0020	<0.0020	6	<0.0050
APW-7	12/21/2015	<0.001	<0.001	<0.001	0.002	0.028	0.042	<0.0005	<0.0005	0.245	0.26	<0.002	<0.002	28	<0.005
	2/18/2016	<0.0010	0.0005	0.0003	0.0010	0.0202	0.0284	<0.0005	<0.0005	0.109	0.0986	<0.0020	<0.0020	30	<0.0050
APW-8	12/21/2015	<0.001	<0.001	0.001	0.002	0.083	0.09	<0.0005	<0.0005	10.8	11	<0.002	<0.002	13	0.01
	2/18/2016	0.0003	0.0006	0.0012	0.0013	0.0729	0.0788	<0.0005	<0.0005	10.3	11.1	<0.0020	<0.0020	12	0.0070
APW-9	12/21/2015	<0.001	0.001	<0.001	0.002	0.017	0.028	<0.0005	<0.0005	0.5	0.531	<0.002	<0.002	16	<0.005
	2/18/2016	0.0008	0.0013	0.0007	0.0012	0.0363	0.0425	<0.0005	<0.0005	4.42	5.12	<0.0020	<0.0020	19	<0.0050
Class 1 GW Standards		**0.006**	**NE**	**0.010**	**NE**	**2**	**NE**	**0.004**	**NE**	**2**	**NE**	**0.005**	**NE**	**200**	**0.1**

Results are reported as mg/L or parts per million (ppm)
Contents of table obtained from data provided by Ameren.
Concentration above Illinois Class I Groundwater Standards
NA = Not Analyzed
NE = Not Established
TDS = Total Dissolved Solids
(d) = dissolved concentration
(t) = total concentration

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TABLE 3

GROUNDWATER ANALYTICAL DATA SUMMARY
MEREDOSIA POWER STATION
MEREDOSIA, ILLINOIS

WELL ID	PARAMETER[1]														
	Chromium (t)	Cobalt (d)	Cobalt (t)	Copper (d)	Copper (t)	Cyanide	Fluoride (d)	Iron (t)	Iron (d)	Lead (d)	Lead (t)	Manganese (t)	Manganese (d)	Mercury (d)	Mercury (t)
APW-1	NA	<0.05	NA	<0.025	NA	<0.01	<0.1	NA	0.162	<0.005	NA	NA	<0.015	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	<0.25	NA	0.03	<0.001	NA	NA	0.008	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	<0.25	NA	<0.01	<0.001	NA	NA	<0.001	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	0.26	NA	<0.01	<0.001	NA	NA	0.003	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	0.32	NA	<0.01	<0.001	NA	NA	0.005	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	<0.25	NA	<0.01	<0.001	NA	NA	<0.001	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	<0.25	NA	<0.01	<0.001	NA	NA	0.009	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	<0.25	NA	<0.01	<0.001	NA	NA	<0.001	<0.0002	NA
	<0.005	<0.005	0.012	<0.005	0.008	<0.007	<0.1	5.67	0.1	<0.001	0.007	0.593	<0.003	<0.0002	<0.0002
	<0.005	<0.005	0.009	<0.005	0.006	<0.007	0.11	4.18	<0.02	<0.001	0.005	0.418	<0.003	<0.0002	<0.0002
	0.0022	<0.0050	0.0028	<0.0050	0.0016	<0.007	0.10	1.53	<0.0200	<0.0010	0.0020	0.170	<0.0030	<0.00020	<0.00020
APW-2	NA	<0.05	NA	<0.025	NA	<0.01	0.3	NA	<0.1	<0.005	NA	NA	0.931	<0.0002	NA
	NA	0.004	NA	<0.003	NA	<0.005	<0.25	NA	1.1	<0.001	NA	NA	0.48	<0.0002	NA
	NA	0.003	NA	<0.003	NA	<0.005	0.44	NA	0.37	<0.001	NA	NA	0.82	<0.0002	NA
	NA	0.002	NA	<0.003	NA	<0.005	0.46	NA	0.46	<0.001	NA	NA	0.79	<0.0002	NA
	NA	0.003	NA	<0.003	NA	<0.005	0.32	NA	0.15	<0.001	NA	NA	0.91	<0.0002	NA
	NA	0.003	NA	<0.003	NA	<0.005	0.27	NA	0.34	0.001	NA	NA	0.83	<0.0002	NA
	NA	0.003	NA	<0.003	NA	<0.005	0.3	NA	0.3	<0.001	NA	NA	0.96	<0.0002	NA
	<0.005	<0.005	<0.005	<0.005	<0.005	<0.007	0.28	2.16	0.104	<0.001	0.001	1.09	0.989	<0.0002	<0.0002
	<0.005	<0.005	<0.005	<0.005	<0.005	<0.007	0.29	1.9	0.024	<0.001	0.001	0.686	0.63	<0.0002	<0.0002
	<0.0050	<0.0050	<0.0050	<0.0050	0.0015	<0.007	0.31	0.297	0.018	<0.0010	0.0004	0.925	0.906	<0.00020	<0.00020
APW-3	NA	<0.05	NA	<0.025	NA	<0.01	0.25	NA	<0.1	<0.005	NA	NA	0.169	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	0.36	NA	0.65	<0.001	NA	NA	0.45	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	0.49	NA	0.41	<0.001	NA	NA	0.28	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	0.54	NA	0.33	<0.001	NA	NA	0.25	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	0.32	NA	0.48	<0.001	NA	NA	0.3	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	0.29	NA	0.39	0.001	NA	NA	0.46	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	0.29	NA	5.4	<0.001	NA	NA	1.2	<0.0002	NA
	<0.005	<0.005	<0.005	<0.005	<0.005	<0.007	0.2	2.38	0.475	<0.001	0.001	0.492	0.432	<0.0002	<0.0002
	<0.005	<0.005	<0.005	<0.005	<0.005	<0.007	0.23	1.93	1.38	<0.001	<0.001	0.635	0.586	<0.0002	<0.0002
	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.007	0.22	2.26	1.36	<0.0010	0.0006	0.669	0.632	<0.00020	<0.00020
APW-4	NA	<0.05	NA	<0.025	NA	<0.01	0.39	NA	<0.1	<0.005	NA	NA	3.1	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	0.73	NA	5.9	<0.001	NA	NA	3.4	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	0.79	NA	6.6	<0.001	NA	NA	5.4	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	0.47	NA	14	<0.001	NA	NA	2.8	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	0.45	NA	16	<0.001	NA	NA	3.3	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	0.45	NA	16	<0.001	NA	NA	2.9	<0.0002	NA
	<0.005	<0.005	<0.005	<0.005	<0.005	<0.007	0.37	13.8	11.8	<0.001	<0.001	2.14	2.05	<0.0002	<0.0002
	<0.005	<0.005	<0.005	<0.005	<0.005	<0.007	0.41	18.4	14.1	<0.001	0.001	2.3	2.18	<0.0002	<0.0002
	0.0228	<0.0050	0.0079	<0.0050	0.0203	<0.007	0.30	27.5	2.16	<0.0010	0.0136	2.39	1.72	<0.00020	<0.00020
APW-5	NA	<0.05	NA	<0.025	NA	<0.01	0.13	NA	<0.1	<0.005	NA	NA	<0.015	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	<0.25	NA	<0.01	<0.001	NA	NA	0.012	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	<0.25	NA	0.012	<0.001	NA	NA	0.001	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	0.31	NA	<0.01	<0.001	NA	NA	<0.001	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	0.36	NA	<0.01	<0.001	NA	NA	<0.001	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	<0.25	NA	<0.01	<0.001	NA	NA	0.001	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	<0.25	NA	<0.01	<0.001	NA	NA	0.04	<0.0002	NA
	NA	<0.002	NA	<0.003	NA	<0.005	<0.25	NA	<0.01	<0.001	NA	NA	0.002	<0.0002	NA
	0.009	<0.005	0.05	<0.005	0.023	<0.007	<0.1	11.2	<0.02	<0.001	0.018	2.13	0.004	<0.0002	<0.0002
	<0.005	<0.005	0.007	<0.005	<0.005	<0.007	<0.1	1.4	<0.02	<0.001	0.002	0.292	<0.003	<0.0002	<0.0002
	<0.0050	<0.0050	0.0035	<0.0050	0.0015	<0.007	0.08	0.886	<0.0200	<0.0010	0.0016	0.181	0.0009	<0.00020	<0.00020
APW-6	<0.005	<0.005	<0.005	<0.005	<0.005	<0.007	0.11	0.402	<0.02	<0.001	<0.001	0.04	0.01	<0.0002	<0.0002
	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.007	0.15	0.198	<0.0200	<0.0010	0.0003	0.0129	<0.0030	<0.00020	<0.00020
APW-7	<0.005	<0.005	<0.005	<0.005	<0.005	<0.007	0.22	2.57	<0.02	<0.001	0.002	0.177	0.018	<0.0002	<0.0002
	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.007	0.21	1.32	<0.0200	<0.0010	0.0010	0.0549	0.0008	<0.00020	<0.00020
APW-8	0.013	<0.005	<0.005	<0.005	<0.005	<0.007	<0.1	0.809	<0.02	<0.001	0.001	0.116	<0.003	<0.0002	<0.0002
	0.0078	<0.0050	<0.0050	<0.0050	<0.0050	<0.007	0.23	0.0531	<0.0200	<0.0010	<0.0010	0.0052	<0.0030	<0.00020	<0.00020
APW-9	<0.005	<0.005	<0.005	<0.005	<0.005	<0.007	0.59	1.26	<0.02	<0.001	0.002	0.175	0.008	<0.0002	<0.0002
	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.007	0.10	0.505	<0.0200	<0.0010	0.0007	0.0579	<0.0030	<0.00020	<0.00020
Class I GW Standards	**NE**	**1**	**NE**	**0.65**	**NE**	**0.2**	**4**	**NE**	**5**	**0.0075**	**NE**	**NE**	**0.15**	**0.002**	**NE**

Results are reported as mg/L or parts per million (ppm)
Contents of table obtained from data provided by Ameren.
Concentration above Illinois Class I Groundwater Standards
NA = Not Analyzed
NE = Not Established
TDS = Total Dissolved Solids
(d) = dissolved concentration
(t) = total concentration

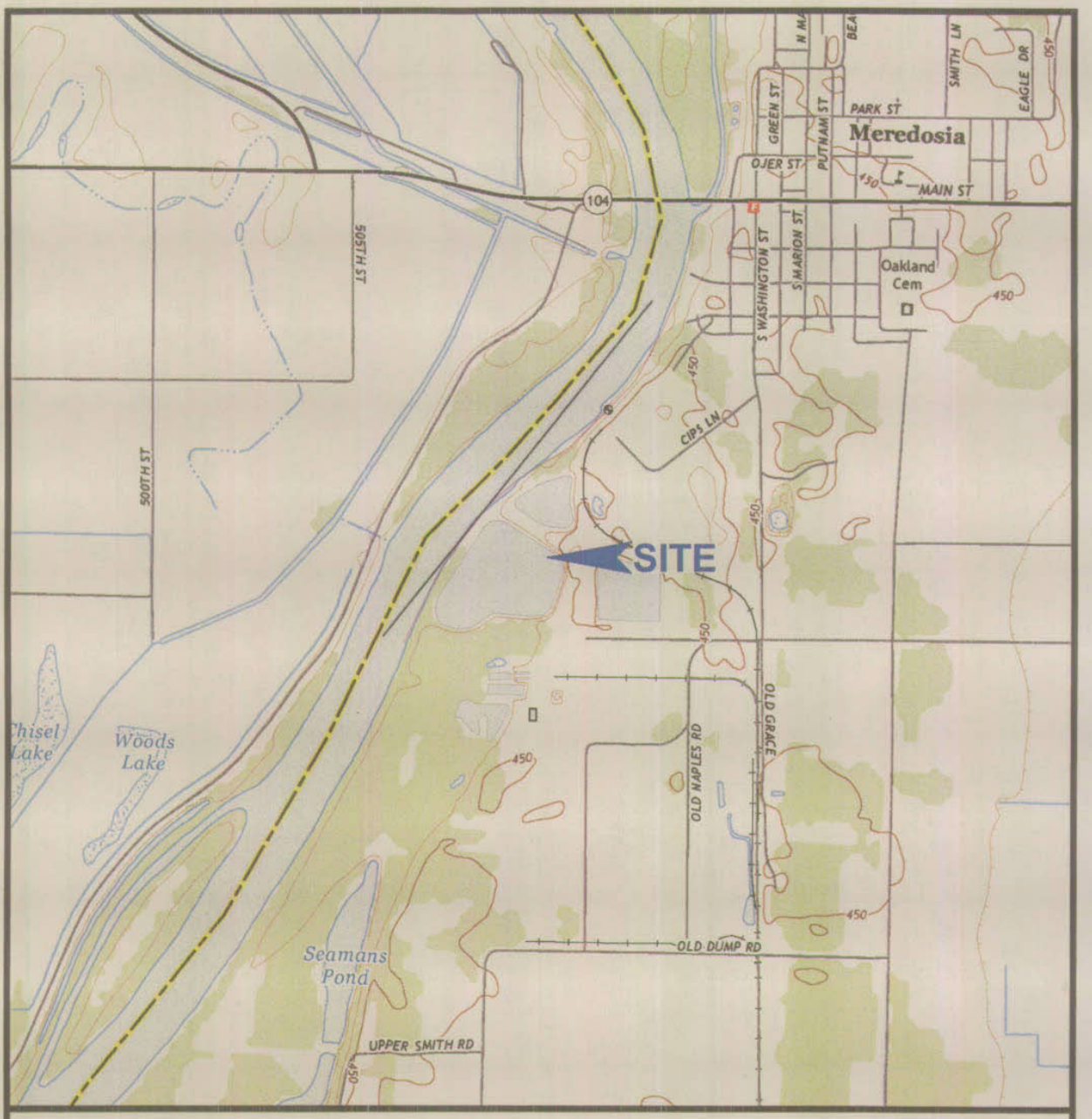
Electronic Filing: Received, Clerk's Office 05/01/2023

TABLE 3

GROUNDWATER ANALYTICAL DATA SUMMARY
MEREDOSIA POWER STATION
MEREDOSIA, ILLINOIS

WELL ID	PARAMETER														
	Nickel (d)	Nickel (t)	Nitrate	Selenium (d)	Selenium (t)	Silver (d)	Silver (t)	Sulfate	TDS	Thallium (d)	Thallium (t)	Vanadium (d)	Vanadium (t)	Zinc (d)	Zinc (t)
APW-1	<0.04	NA	3.8	<0.01	NA	<0.005	NA	26.4	132	<0.002	NA	NA	NA	<0.02	NA
	<0.005	NA	3.9	0.002	NA	<0.005	NA	23	190	<0.001	NA	NA	NA	<0.006	NA
	0.014	NA	4.7	0.002	NA	<0.005	NA	33	140	<0.001	NA	NA	NA	<0.006	NA
	<0.005	NA	1.7	0.002	NA	<0.005	NA	20	190	<0.001	NA	NA	NA	<0.006	NA
	0.005	NA	2.8	0.002	NA	<0.005	NA	24	150	<0.001	NA	NA	NA	<0.006	NA
	<0.005	NA	5.7	0.001	NA	<0.005	NA	15	180	<0.001	NA	NA	NA	<0.006	NA
	<0.005	NA	2.1	<0.001	NA	<0.005	NA	13	270	<0.001	NA	NA	NA	<0.006	NA
	<0.005	NA	1.6	0.002	NA	<0.005	NA	12	280	<0.001	NA	NA	NA	<0.006	NA
	<0.005	0.021	3.94	<0.04	<0.04	<0.005	<0.005	12	226	<0.001	<0.001	<0.01	<0.01	<0.01	0.02
	<0.005	0.015	3.43	<0.04	<0.04	<0.005	<0.005	11	280	<0.001	<0.001	<0.01	<0.01	<0.01	0.015
	0.0030	0.0090	3.59	<0.0400	<0.0400	<0.0050	<0.0050	20	298	<0.0010	<0.0010	<0.0100	0.0025	<0.0100	0.0068
APW-2	<0.04	NA	0.4	<0.01	NA	<0.005	NA	28.2	368	<0.002	NA	NA	NA	<0.02	NA
	0.012	NA	<0.02	<0.001	NA	<0.005	NA	41	630	<0.001	NA	NA	NA	<0.006	NA
	0.007	NA	<0.02	<0.001	NA	<0.005	NA	<25	430	<0.001	NA	NA	NA	<0.006	NA
	0.006	NA	0.04	0.003	NA	<0.005	NA	14	440	<0.001	NA	NA	NA	<0.006	NA
	0.009	NA	0.07	0.001	NA	<0.005	NA	13	460	<0.001	NA	NA	NA	<0.006	NA
	0.011	NA	<0.02	0.004	NA	<0.005	NA	18	510	<0.001	NA	NA	NA	0.006	NA
	0.011	NA	<0.02	0.002	NA	<0.005	NA	15	520	<0.001	NA	NA	NA	<0.006	NA
	<0.005	0.007	<0.05	<0.04	<0.04	<0.005	<0.005	<10	488	<0.001	<0.001	<0.01	<0.01	<0.01	<0.01
	<0.005	0.005	<0.05	<0.04	<0.04	<0.005	<0.005	22	572	<0.001	<0.001	<0.01	<0.01	<0.01	<0.01
	0.0058	0.0062	<0.050	<0.0400	<0.0400	<0.0050	<0.0050	19	494	<0.0010	<0.0010	0.0015	0.0017	<0.0100	0.0036
APW-3	<0.04	NA	0.49	<0.01	NA	<0.005	NA	284	660	<0.002	NA	NA	NA	<0.02	NA
	0.01	NA	<0.02	0.001	NA	<0.005	NA	310	750	<0.001	NA	NA	NA	<0.006	NA
	<0.005	NA	<0.02	<0.001	NA	<0.005	NA	260	680	<0.001	NA	NA	NA	<0.006	NA
	0.006	NA	<0.02	0.002	NA	<0.005	NA	290	650	<0.001	NA	NA	NA	<0.006	NA
	0.006	NA	<0.02	<0.001	NA	<0.005	NA	270	710	<0.001	NA	NA	NA	<0.006	NA
	0.011	NA	<0.02	0.002	NA	<0.005	NA	300	770	0.001	NA	NA	NA	0.012	NA
	0.012	NA	<0.02	0.003	NA	<0.005	NA	300	970	<0.001	NA	NA	NA	<0.006	NA
	<0.005	<0.005	<0.05	<0.04	<0.04	<0.005	<0.005	177	670	<0.001	<0.001	<0.01	<0.01	<0.01	<0.01
	<0.005	<0.005	<0.05	<0.04	<0.04	<0.005	<0.005	235	738	<0.001	<0.001	<0.01	<0.01	<0.01	<0.01
	<0.0050	<0.0050	<0.050	<0.0400	<0.0400	<0.0050	<0.0050	192	736	<0.0010	<0.0010	<0.0100	<0.0100	<0.0100	0.0028
APW-4	<0.04	NA	0.31	<0.01	NA	<0.005	NA	49.3	418	<0.002	NA	NA	NA	<0.02	NA
	0.019	NA	0.04	0.012	NA	<0.005	NA	53	470	<0.001	NA	NA	NA	<0.006	NA
	0.01	NA	0.29	0.013	NA	<0.005	NA	17	520	<0.001	NA	NA	NA	<0.006	NA
	0.006	NA	<0.02	0.015	NA	<0.005	NA	23	300	<0.001	NA	NA	NA	<0.006	NA
	0.009	NA	<0.02	0.021	NA	<0.005	NA	14	690	<0.001	NA	NA	NA	0.007	NA
	0.01	NA	<0.02	0.03	NA	<0.005	NA	24	360	<0.001	NA	NA	NA	<0.006	NA
	<0.005	<0.005	<0.05	<0.04	<0.04	<0.005	<0.005	<10	504	<0.001	<0.001	<0.01	<0.01	<0.01	<0.01
	<0.005	<0.005	<0.05	<0.04	<0.04	<0.005	<0.005	28	578	<0.001	<0.001	<0.01	<0.01	<0.01	<0.01
	0.0033	0.0232	<0.050	<0.0400	<0.0400	<0.0050	<0.0050	66	462	<0.0010	<0.0010	<0.0100	0.0331	0.0024	0.0677
APW-5	<0.04	NA	1.7	<0.01	NA	<0.005	NA	6.1	138	<0.002	NA	NA	NA	<0.02	NA
	0.007	NA	1.9	<0.001	NA	<0.005	NA	17	230	<0.001	NA	NA	NA	<0.006	NA
	0.01	NA	1.4	0.002	NA	<0.005	NA	15	290	<0.001	NA	NA	NA	<0.006	NA
	<0.005	NA	2	0.001	NA	<0.005	NA	9.5	180	<0.001	NA	NA	NA	<0.006	NA
	<0.005	NA	1.9	0.004	NA	<0.005	NA	6.7	160	<0.001	NA	NA	NA	<0.006	NA
	<0.005	NA	2	0.002	NA	<0.005	NA	14	250	<0.001	NA	NA	NA	<0.006	NA
	<0.005	NA	4.1	0.003	NA	<0.005	NA	15	280	<0.001	NA	NA	NA	<0.006	NA
	0.006	NA	2.6	0.002	NA	<0.005	NA	33	290	<0.001	NA	NA	NA	<0.006	NA
	<0.005	0.07	2.03	<0.04	<0.04	<0.005	<0.005	19	338	<0.001	<0.001	<0.01	0.017	<0.01	0.037
	<0.005	0.009	2.1	<0.04	<0.04	<0.005	<0.005	66	400	<0.001	<0.001	<0.01	<0.01	<0.01	<0.01
	<0.0050	0.0077	1.85	<0.0400	<0.0400	<0.0050	<0.0050	36	340	<0.0010	<0.0010	<0.0100	0.0025	<0.0100	0.0048
APW-6	<0.005	<0.005	0.172	<0.04	<0.04	<0.005	<0.005	<10	354	<0.001	<0.001	<0.01	<0.01	<0.01	<0.01
	<0.0050	0.002	0.730	<0.0400	<0.0400	<0.0050	<0.0050	12	296	<0.0010	<0.0010	<0.0100	<0.0100	<0.0100	0.0025
APW-7	<0.005	<0.005	1.09	<0.04	<0.04	<0.005	<0.005	17	384	<0.001	<0.001	<0.01	<0.01	<0.01	<0.01
	<0.0050	0.0033	4.82	<0.0400	<0.0400	<0.0050	<0.0050	35	248	<0.0010	<0.0010	<0.0100	0.0033	<0.0100	0.0054
APW-8	<0.005	<0.005	5.73	0.126	0.135	<0.005	<0.005	473	994	<0.001	<0.001	<0.01	<0.01	<0.01	<0.01
	<0.0050	<0.0050	5.29	0.102	0.118	<0.0050	<0.0050	338	786	<0.0010	<0.0010	<0.0100	<0.0100	<0.0100	<0.0100
APW-9	<0.005	0.005	3.25	<0.04	<0.04	<0.005	<0.005	265	716	<0.001	<0.001	<0.01	<0.01	<0.01	<0.01
	<0.0050	0.0035	3.88	<0.0400	<0.0400	<0.0050	<0.0050	466	1,070	<0.0010	<0.0010	0.0028	0.0033	<0.0100	0.0030
Class I GW Standards	0.1	NE	10	0.05	NE	0.05	NE	400	1200	NE	NE	0.049	NE	5	NE

Results are reported as mg/L or parts per million (ppm)
Contents of table obtained from data provided by Ameren.
Concentration above Illinois Class I Groundwater Standards
NA = Not Analyzed
NE = Not Established
TDS = Total Dissolved Solids
(d) = dissolved concentration
(t) = total concentration



NOTES

1. Plan adapted from a 7.5 minute U.S.G.S. map for Meredosia, Illinois quadrangle, last revised in 2015.

0 2,000 4,000

SCALE IN FEET

Drawn By: WAH	Ck'd By:	App'vd By: AMS
Date: 5-9-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

SITE LOCATION AND TOPOGRAPHY

Project Number J024917.01	PLATE 1

NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.

LEGEND

- Monitoring Well Location
- Soil Boring Location

N

0 200 400 800

SCALE IN FEET

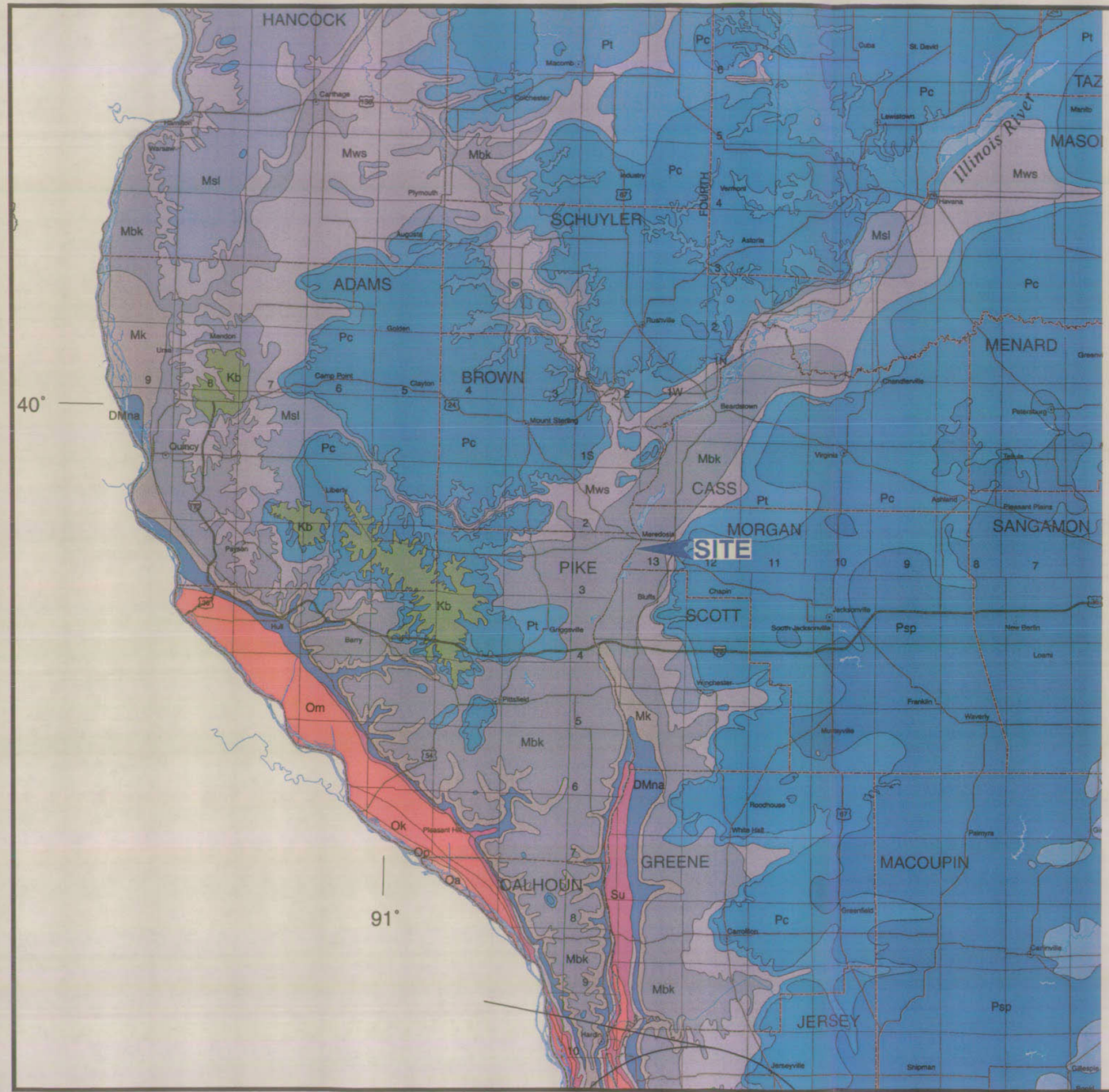
Drawn By: WAH	Ck'd By:	App'vd By: AMS
Date: 5-18-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

SITE PLAN AND MONITORING WELL LOCATIONS

Project Number J024917.01	PLATE 2



Kb	Baylis Formation (western Illinois)
Psp	Shelburn-Patoka Formations undivided
Pc	Carbondale Formation
Pt	Tradewater Formation
Msg	Ste. Genevieve Limestone
Msl	St. Louis Limestone
Mbk	Meppen Limestone, Fern Glen Formation, and Burlington-Keokuk Limestone
Mk	Glen Park Formation, Hannibal Shale, Chouteau Limestone, McCraney Limestone, Prospect Hill Siltstone, and Starrs Cave Limestone
DMna	New Albany Shale, Blocher Shale, Sylamore Sandstone, Selmier Shale, Sweetland Creek Shale, Grassy Creek Shale, Saverton Shale, and Louisiana Limestone
Su	Silurian System undivided, includes Sexton Creek Limestone, St. Clair Limestone, and Moccasin Springs Formation in southern Illinois; includes Wilhelmi Formation, Elwood Dolomite, Kankakee Dolomite, Joliet Dolomite, Sugar Run Dolomite, and Racine Dolomite in northeastern Illinois; includes Mosalem, Tete des Morts, Blanding, Sweeney, Marcus, and Racine Dolomites in northwestern Illinois
Om	Maquoketa Formation or Group, includes Cape Limestone, Cape La Croix Shale, Thebes Sandstone, Orchard Creek Shale, Girardeau Limestone, and Leemon Formation in southern Illinois; includes Scales Shale, Fort Atkinson Limestone, Brainard Shale, and Neda Formation in northern Illinois; includes Noix Oolite in western Illinois
Ok	Kimmswick (Trenton) Limestone and Decorah Formation in southern and western Illinois
Op	Platteville Group, includes Pecatonica, Mifflin, Grand Detour, Nachusa, and Quimbys Mill Formations; includes Plattin Limestone in southwestern Illinois
Oa	Ancell Group, includes St. Peter Sandstone, Dutchtown Limestone, Joachim Dolomite, and Glenwood Formation; includes Prairie du Chien Group in Jo Daviess County of northwestern Illinois

Drawn By: WAH	Ck'd By: bc	App'vd By: AMS
Date: 2-26-16	Date: 7/20/16	Date: 7/20/16

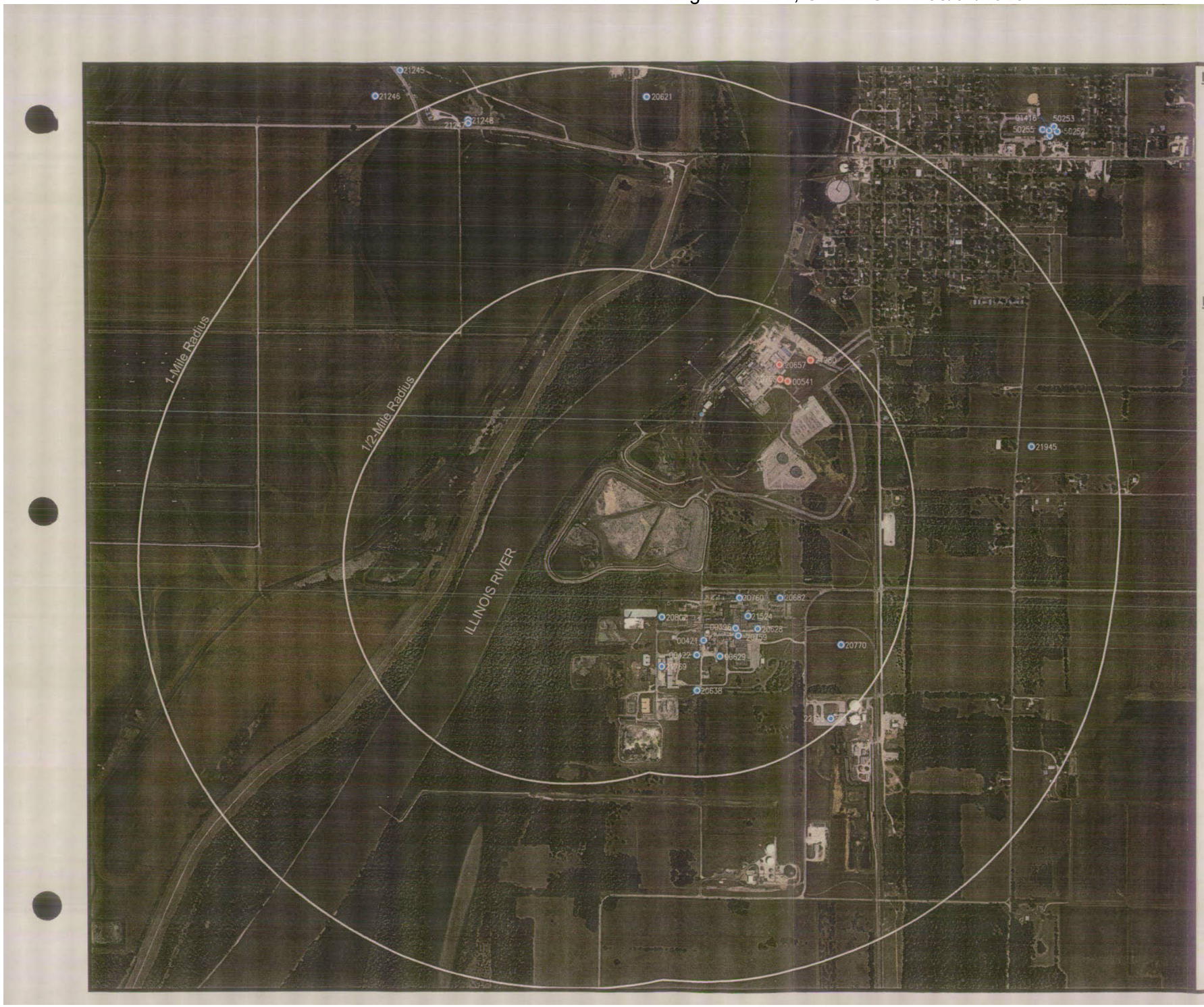
GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

BEDROCK GEOLOGY MAP

Project Number J024917.01

PLATE 3



NOTES

1. Plan adapted from a July 22, 2012 aerial photograph courtesy of Google Earth.
2. Water well locations from Illinois State Geological Survey Prairie Research Institute.
3. See Appendix A for water well records.
4. Abandoned on-site water supply wells are not shown.

LEGEND

- Water Supply Wells
- On-Site Water Supply Wells to be Abandoned

N

0 600 1200 2400

SCALE IN FEET

Drawn By: WAH	Ck'd By: [illegible]	App'vd By: [illegible]
Date: 4-21-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

POTABLE WATER WELL SEARCH RADIUS

Project Number J024917.01	PLATE 4

NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

- Monitoring Well Location
- Soil Boring Location
- Subsurface Profile (See Plate 6 and 7 for Cross-Section A-A' and B-B', Respectively)

N

0 300 600

SCALE IN FEET

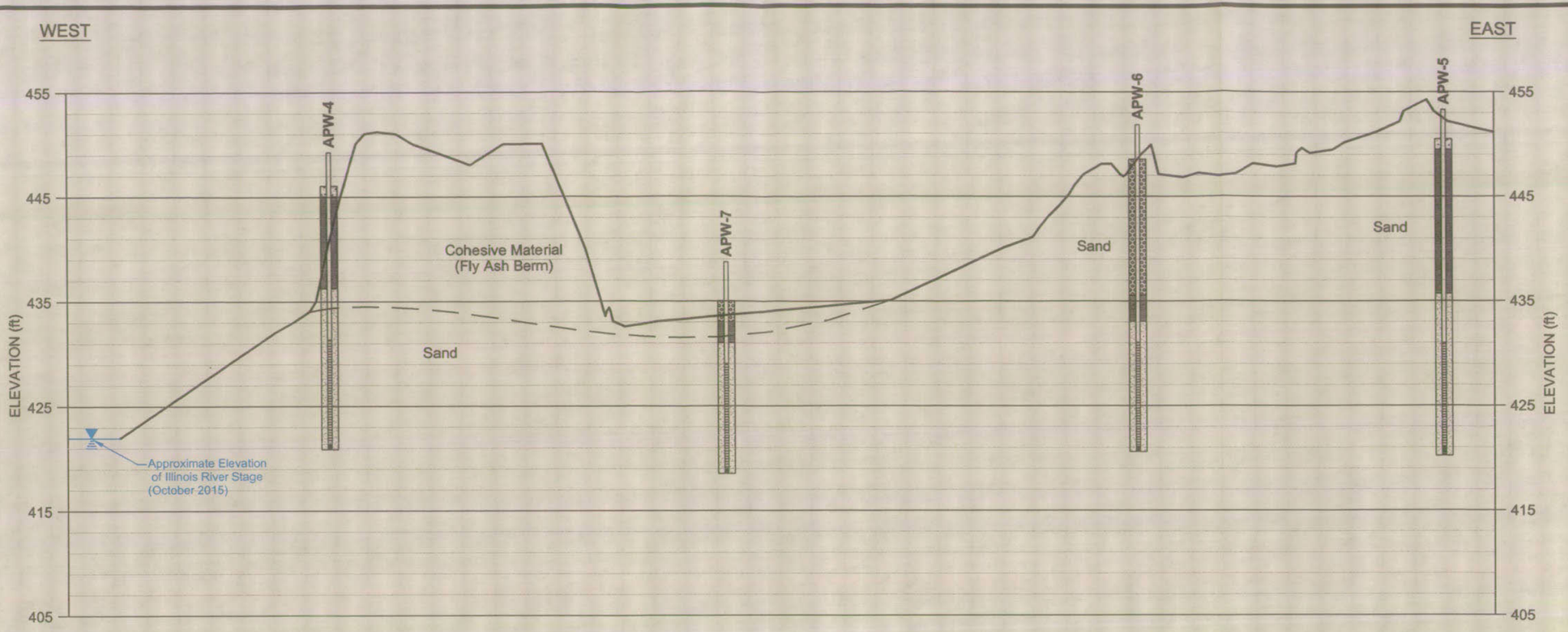
Drawn By: WAH	Ck'd By: VSE	App'vd By: AMS
Date: 3-9-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

SUBSURFACE PROFILE PLAN

Project Number	PLATE 5
J024917.01	



NOTES

1. See PLATE 5 for location of Subsurface Profile A-A'.
2. Data concerning subsurface conditions have been obtained at boring locations only. Actual conditions at locations between borings may differ from the generalized profile shown here.

SCALE IN FEET
Horizontal 1" = 200'
Vertical 1" = 10'

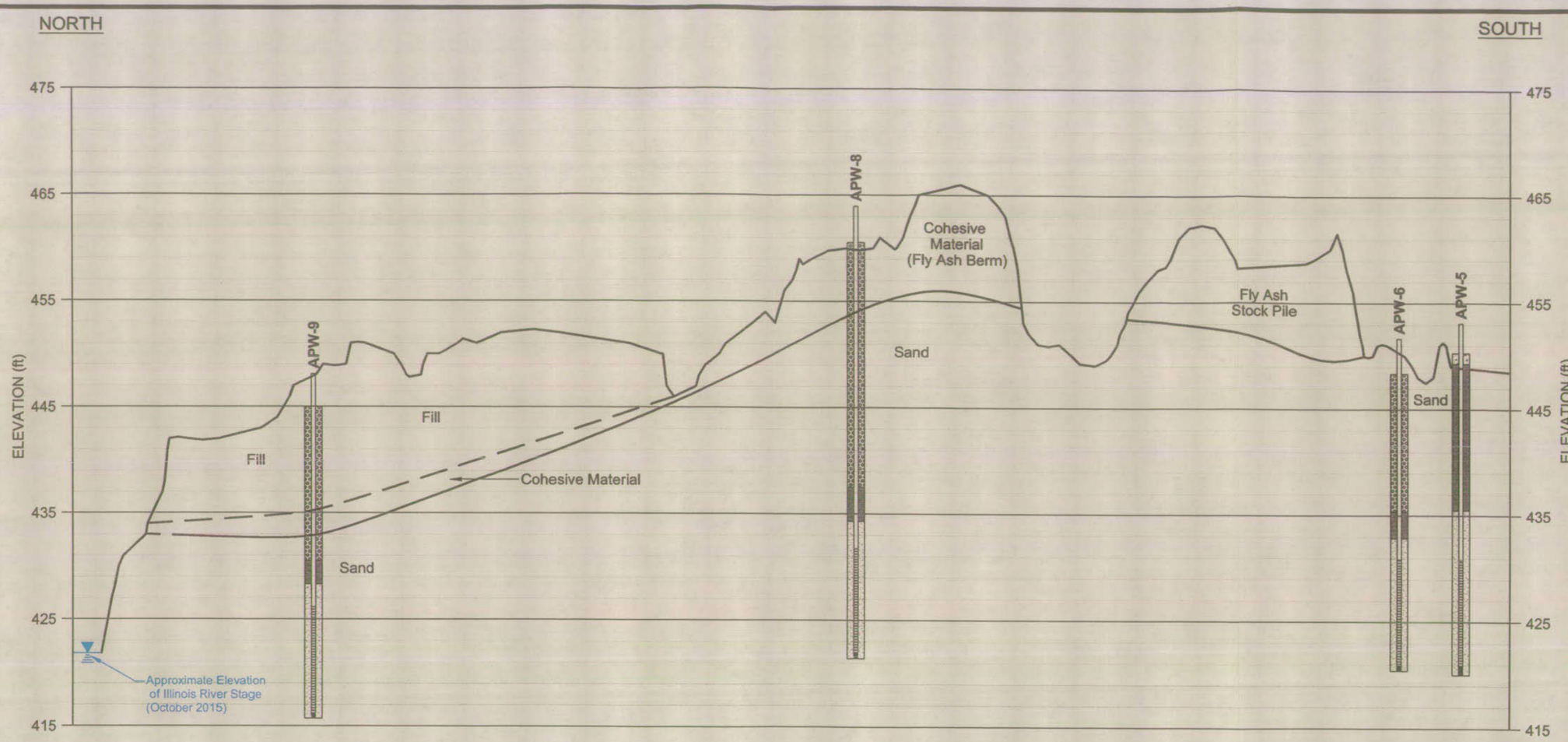
Drawn By: WAH	Ck'd By:	App'vd By: AMS
Date: 3-9-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

GENERALIZED SUBSURFACE PROFILE - SECTION A-A'

Project Number J024917.01	PLATE 6



NOTES

1. See PLATE 5 for location of Subsurface Profile B-B'.
2. Data concerning subsurface conditions have been obtained at boring locations only. Actual conditions at locations between borings may differ from the generalized profile shown here.

SCALE IN FEET
Horizontal 1" = 200'
Vertical 1" = 10'

Drawn By: WAH	Ck'd By: [illegible]	App'vd By: AMS
Date: 3-7-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

GENERALIZED SUBSURFACE PROFILE - SECTION B-B'

Project Number J024917.01	PLATE 7

NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

- Monitoring Well Location
- (427.20) Groundwater Elevation at Well Location (November 17, 2010)
- —425— Groundwater Elevation Contour

N

0 300 600

SCALE IN FEET

Drawn By: WAH	Ck'd By: [illegible]	App'vd By: AMS
Date: 5-18-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

GROUNDWATER ELEVATION CONTOURS - NOVEMBER 2010

Project Number J024917.01	PLATE 8

NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

- Monitoring Well Location
- (427.20) Groundwater Elevation at Well Location (December 13, 2010)
- —425— Groundwater Elevation Contour

N

0 300 600

SCALE IN FEET

Drawn By: WAH	Ck'd By:	App'vd By: AMS
Date: 5-18-16	Date: 7/20/16	Date: 7/16/20

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

GROUNDWATER ELEVATION CONTOURS - DECEMBER 2010

Project Number J024917.01	PLATE 9

NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

- Monitoring Well Location
- (427.20) Groundwater Elevation at Well Location (September 15, 2011)
- —425— Groundwater Elevation Contour

N

0 300 600

SCALE IN FEET

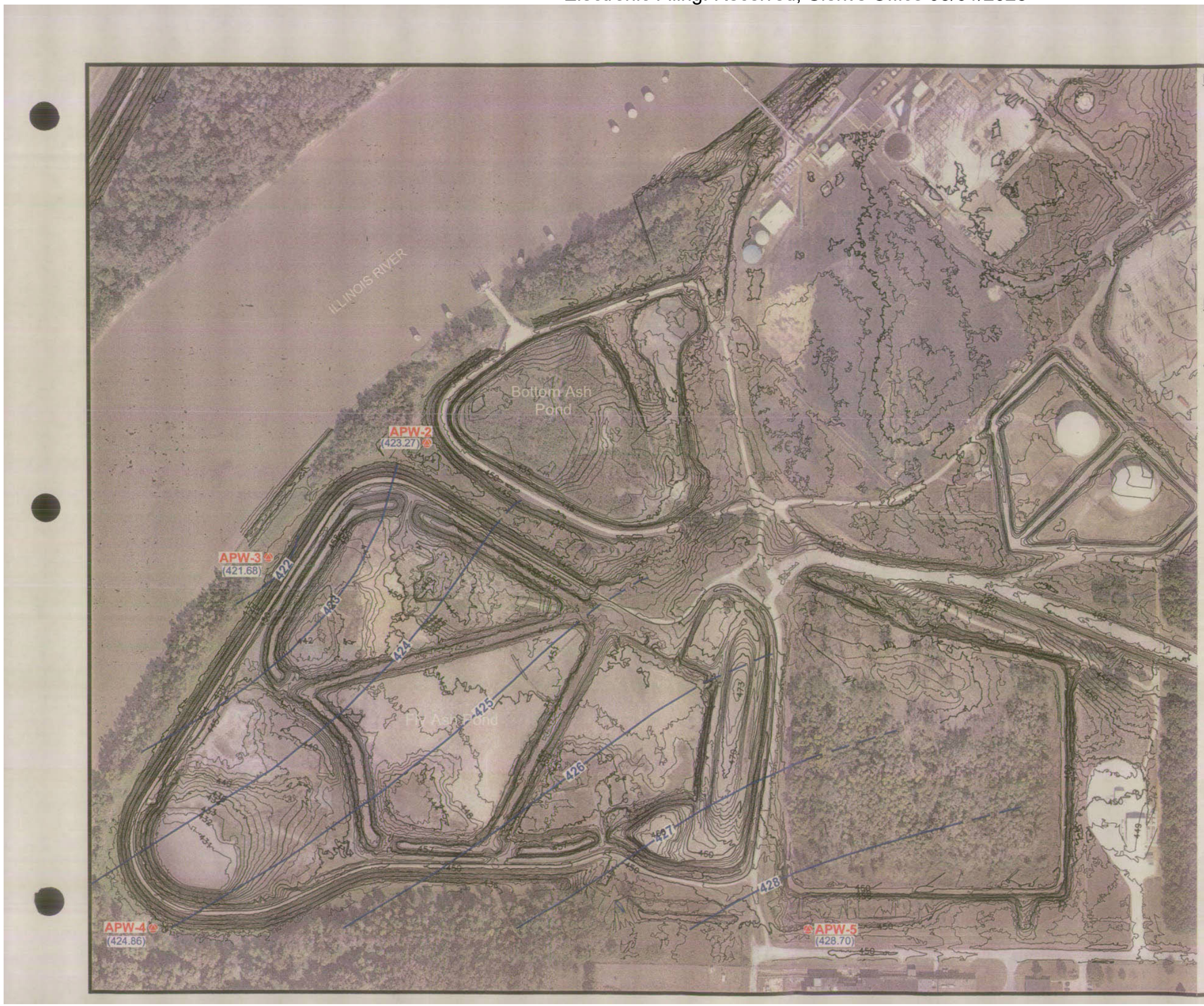
Drawn By: WAH	Ck'd By:	App'vd By: AMS
Date: 5-18-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

GROUNDWATER ELEVATION CONTOURS - SEPTEMBER 2011

Project Number	
J024917.01	PLATE 10



NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

- Monitoring Well Location
- (427.20) Groundwater Elevation at Well Location (October 28, 2011)
- —425— Groundwater Elevation Contour

N

0 300 600

SCALE IN FEET

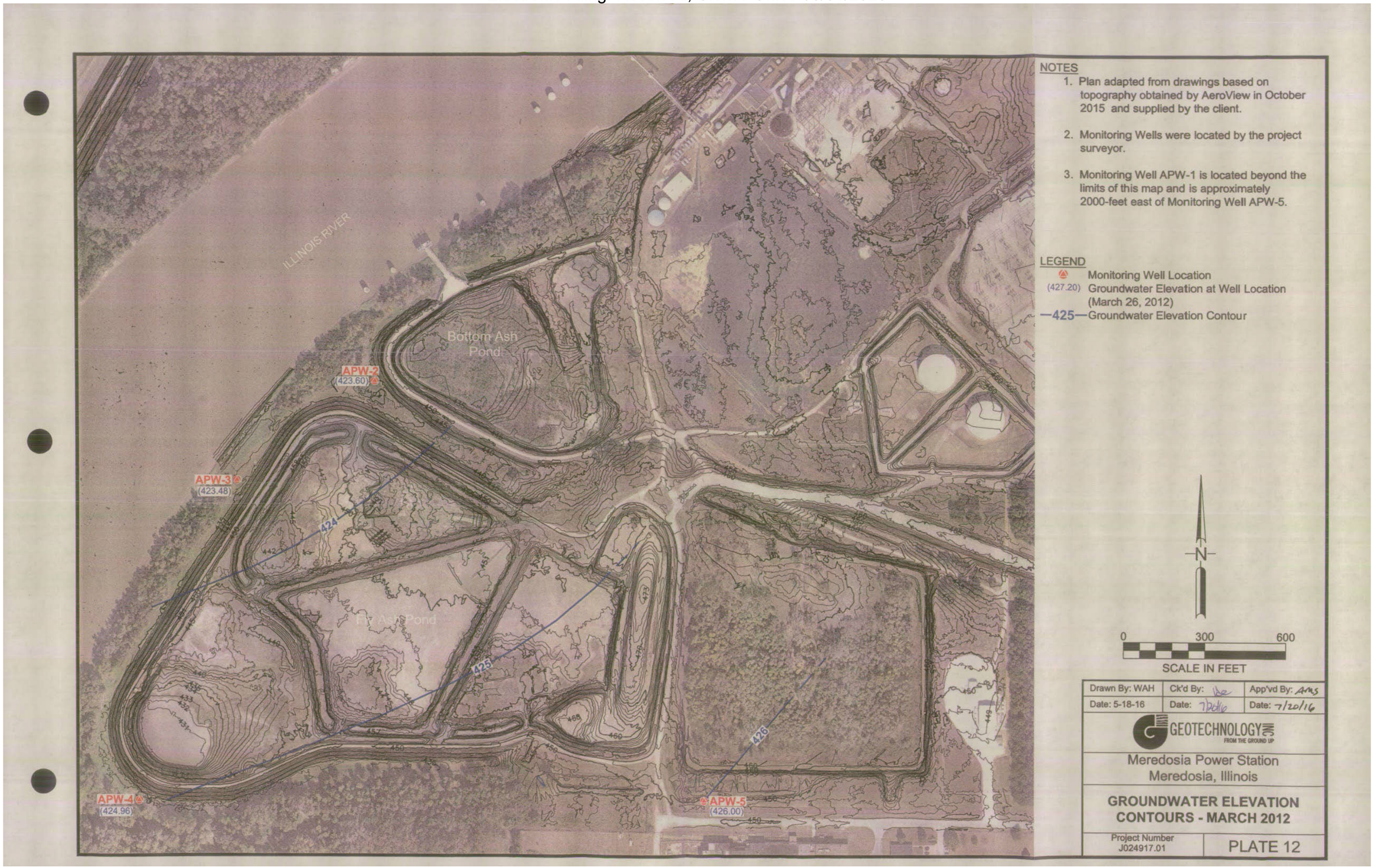
Drawn By: WAH	Ck'd By:	App'vd By: AMS
Date: 5-18-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

GROUNDWATER ELEVATION CONTOURS - OCTOBER 2011

Project Number J024917.01	PLATE 11



NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

- Monitoring Well Location
- (427.20) Groundwater Elevation at Well Location (March 26, 2012)
- —425— Groundwater Elevation Contour

N

0 300 600

SCALE IN FEET

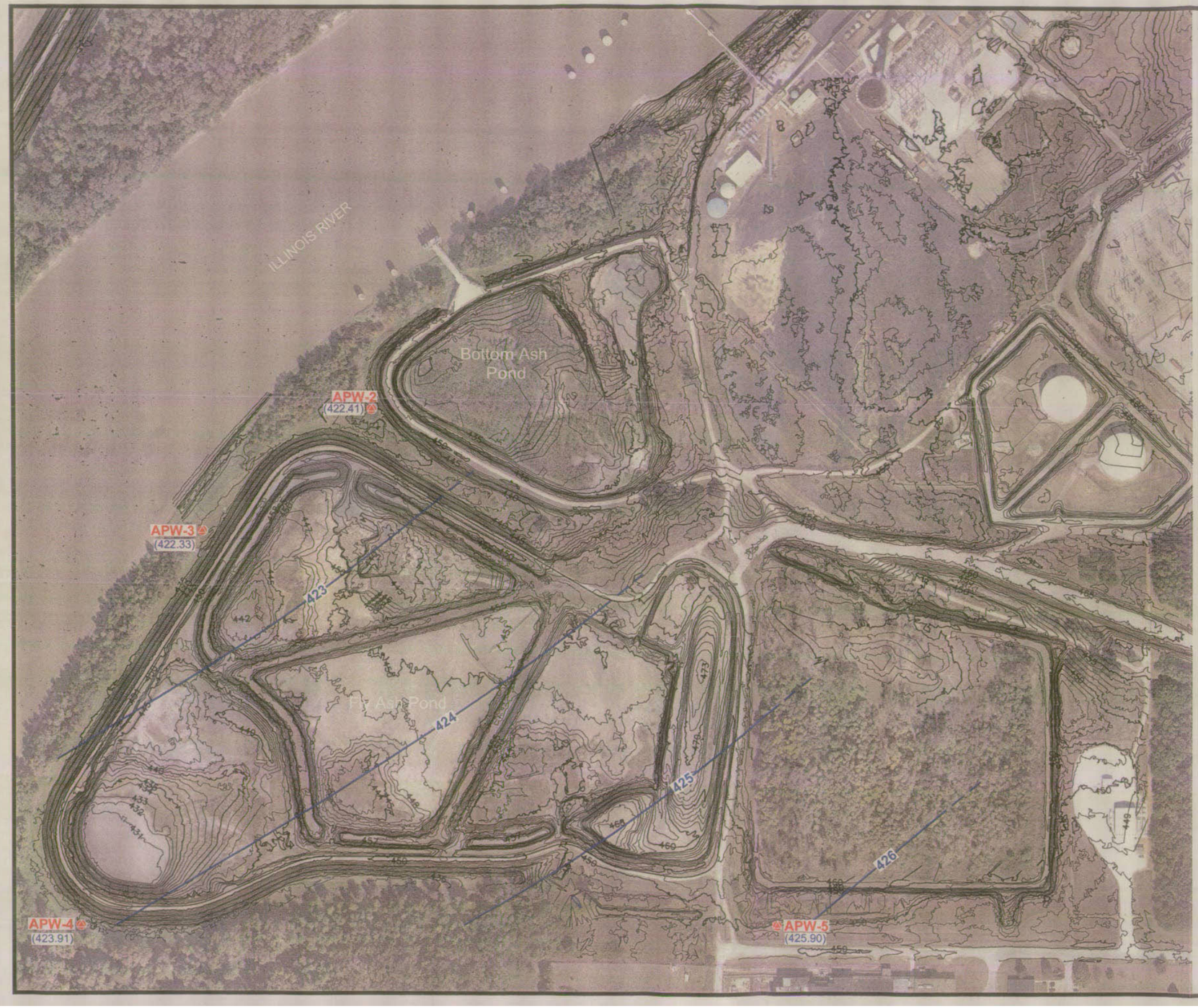
Drawn By: WAH	Ck'd By:	App'vd By: AMS
Date: 5-18-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

GROUNDWATER ELEVATION CONTOURS - MARCH 2012

Project Number J024917.01	PLATE 12



NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

- Monitoring Well Location
- (427.20) Groundwater Elevation at Well Location (June 18, 2012)
- —425— Groundwater Elevation Contour

N

0 300 600

SCALE IN FEET

Drawn By: WAH	Ck'd By: [illegible]	App'vd By: AMS
Date: 5-18-16	Date: 7/20/16	Date: 7/20/16

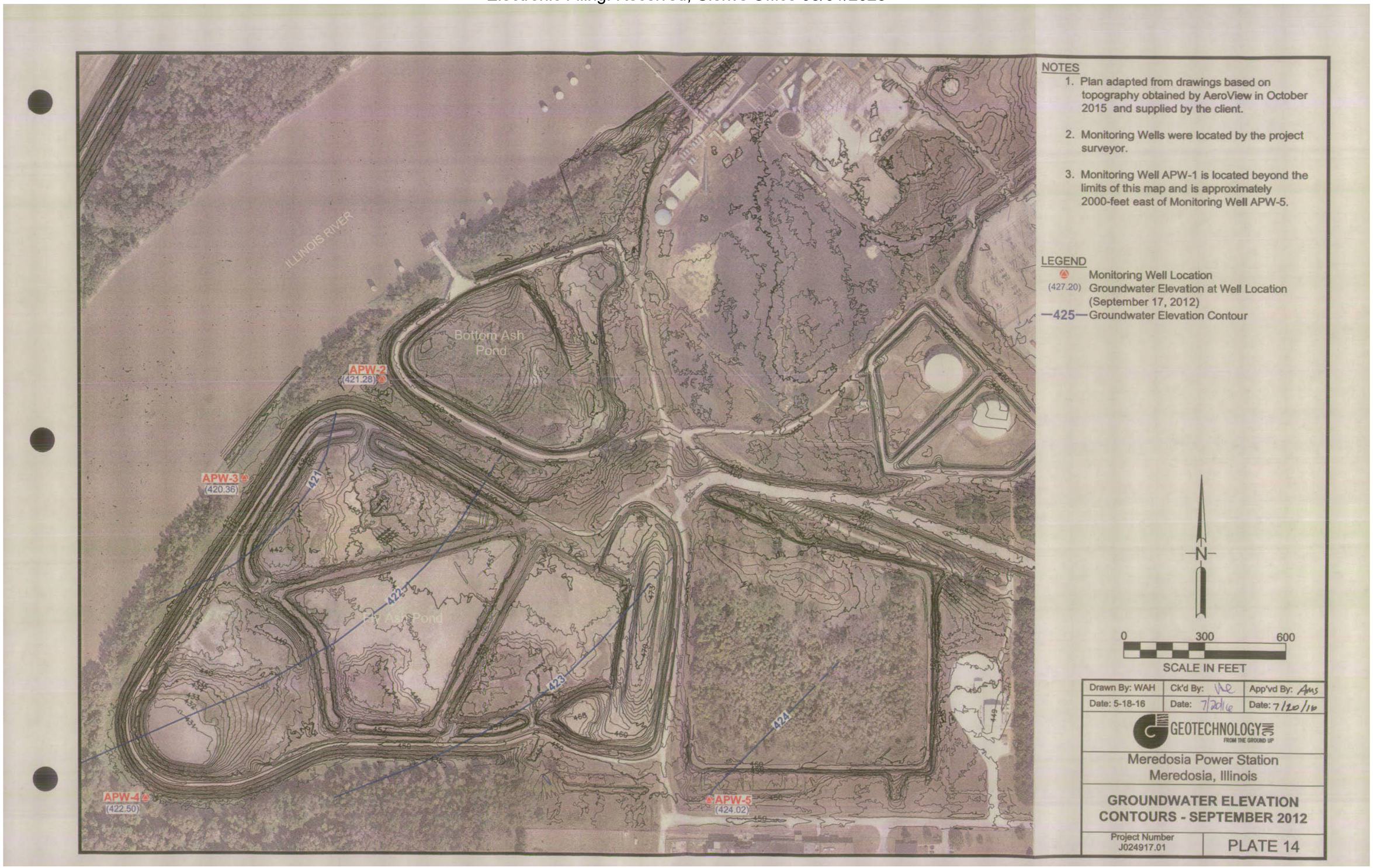
GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

GROUNDWATER ELEVATION CONTOURS - JUNE 2012

Project Number J024917.01

PLATE 13


ILLINOIS RIVER
Bottom Ash Pond
APW-2
(421.28)
APW-3
(420.36)
APW-4
(422.50)
APW-5
(424.02)
421
422
423
424
NOTES
1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.
LEGEND
Monitoring Well Location
(427.20) Groundwater Elevation at Well Location (September 17, 2012)
—425— Groundwater Elevation Contour
N
0
300
600
SCALE IN FEET
Drawn By: WAH
Ck'd By:
App'vd By: Ams
Date: 5-18-16
Date: 7/20/16
Date: 7/20/16
GEOTECHNOLOGY INC
FROM THE GROUND UP
Meredosia Power Station
Meredosia, Illinois
GROUNDWATER ELEVATION CONTOURS - SEPTEMBER 2012
Project Number
J024917.01
PLATE 14

NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

- Monitoring Well Location
- (427.20) Groundwater Elevation at Well Location (August 25, 2015)
- —425— Groundwater Elevation Contour

N

0 300 600

SCALE IN FEET

Drawn By: WAH	Ck'd By: MLe	App'vd By: AMS
Date: 5-18-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

GROUNDWATER ELEVATION CONTOURS - AUGUST 2015

Project Number	
J024917.01	PLATE 15

NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

- Monitoring Well Location
- (427.20) Groundwater Elevation at Well Location (December 21, 2015)
- —425— Groundwater Elevation Contour

N

0 300 600

SCALE IN FEET

Drawn By: WAH	Ck'd By:	App'vd By: AMS
Date: 3-9-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

GROUNDWATER ELEVATION CONTOURS - DECEMBER 2015

Project Number J024917.01	PLATE 16

NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

- Monitoring Well Location
- (427.20) Groundwater Elevation at Well Location (February 18, 2016)
- —425— Groundwater Elevation Contour

N

0 300 600

SCALE IN FEET

Drawn By: WAH	Ck'd By: VSR	App'vd By: AMS
Date: 5-18-16	Date: 7/20/16	Date: 7/20/16

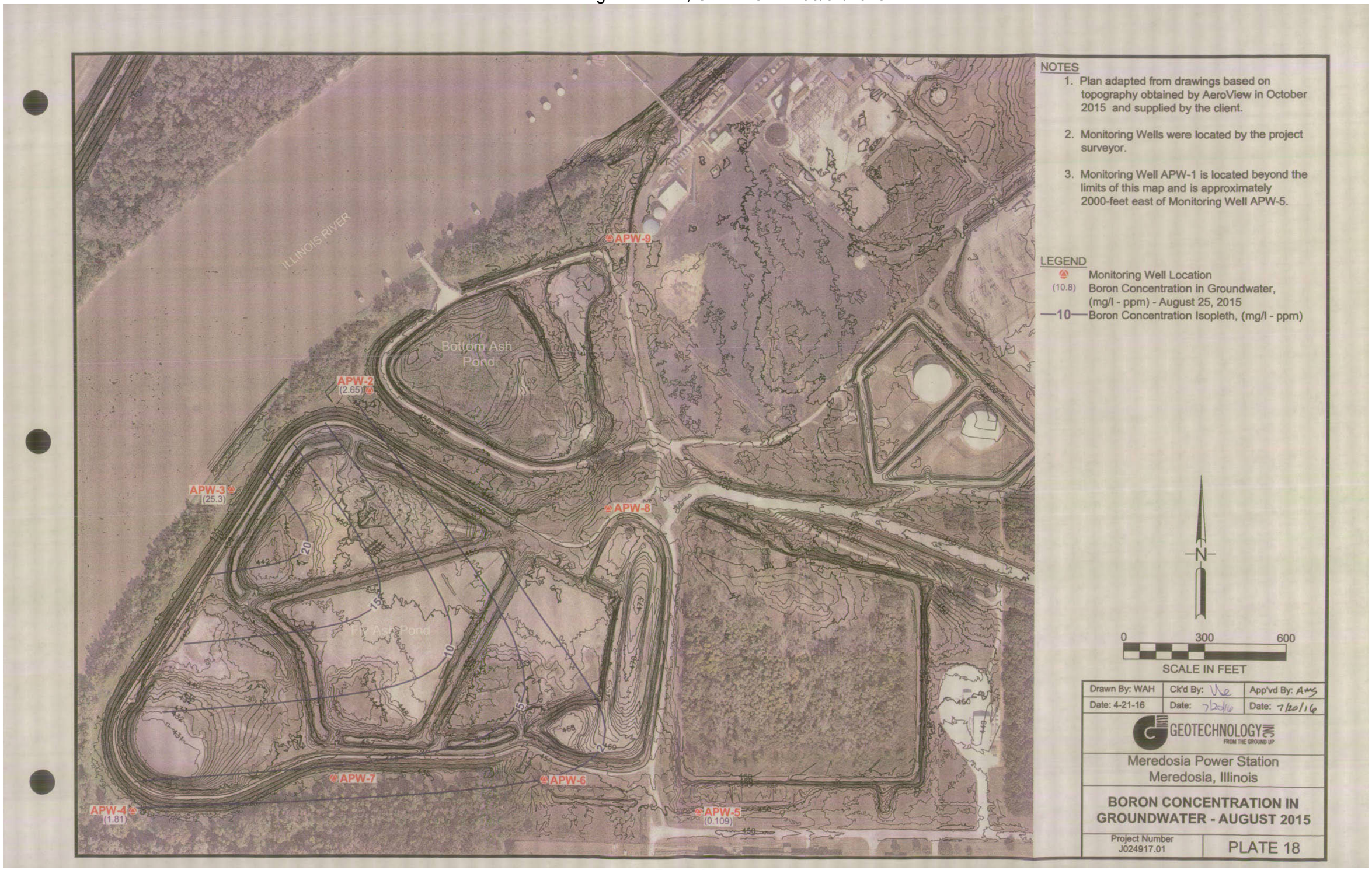
GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

GROUNDWATER ELEVATION CONTOURS - FEBRUARY 2016

Project Number J024917.01

PLATE 17


ILLINOIS RIVER
Bottom Ash Pond
Fly Ash Pond
APW-1
APW-2
(2.65)
APW-3
(25.3)
APW-4
(1.81)
APW-5
(0.109)
APW-6
APW-7
APW-8
APW-9
20
15
10
5
2
NOTES
1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.
LEGEND
Monitoring Well Location
(10.8) Boron Concentration in Groundwater, (mg/l - ppm) - August 25, 2015
—10— Boron Concentration Isopleth, (mg/l - ppm)
N
0
300
600
SCALE IN FEET
Drawn By: WAH
Ck'd By: Ue
App'vd By: AMS
Date: 4-21-16
Date: 7/20/16
Date: 7/20/16
GEOTECHNOLOGY INC
FROM THE GROUND UP
Meredosia Power Station
Meredosia, Illinois
BORON CONCENTRATION IN GROUNDWATER - AUGUST 2015
Project Number
J024917.01
PLATE 18

NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

- Monitoring Well Location
- (10.8) Boron Concentration in Groundwater, (mg/l - ppm) - December 21, 2015
- —10— Boron Concentration Isopleth, (mg/l - ppm)

N

0 300 600

SCALE IN FEET

Drawn By: WAH	Ck'd By:	App'vd By: AMS
Date: 4-19-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

BORON CONCENTRATION IN GROUNDWATER - DECEMBER 2015

Project Number J024917.01	PLATE 19

NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

- Monitoring Well Location
- (10.3) Boron Concentration in Groundwater, (mg/l - ppm) - February 18, 2016
- —10— Boron Concentration Isopleth, (mg/l - ppm)

N

0 300 600

SCALE IN FEET

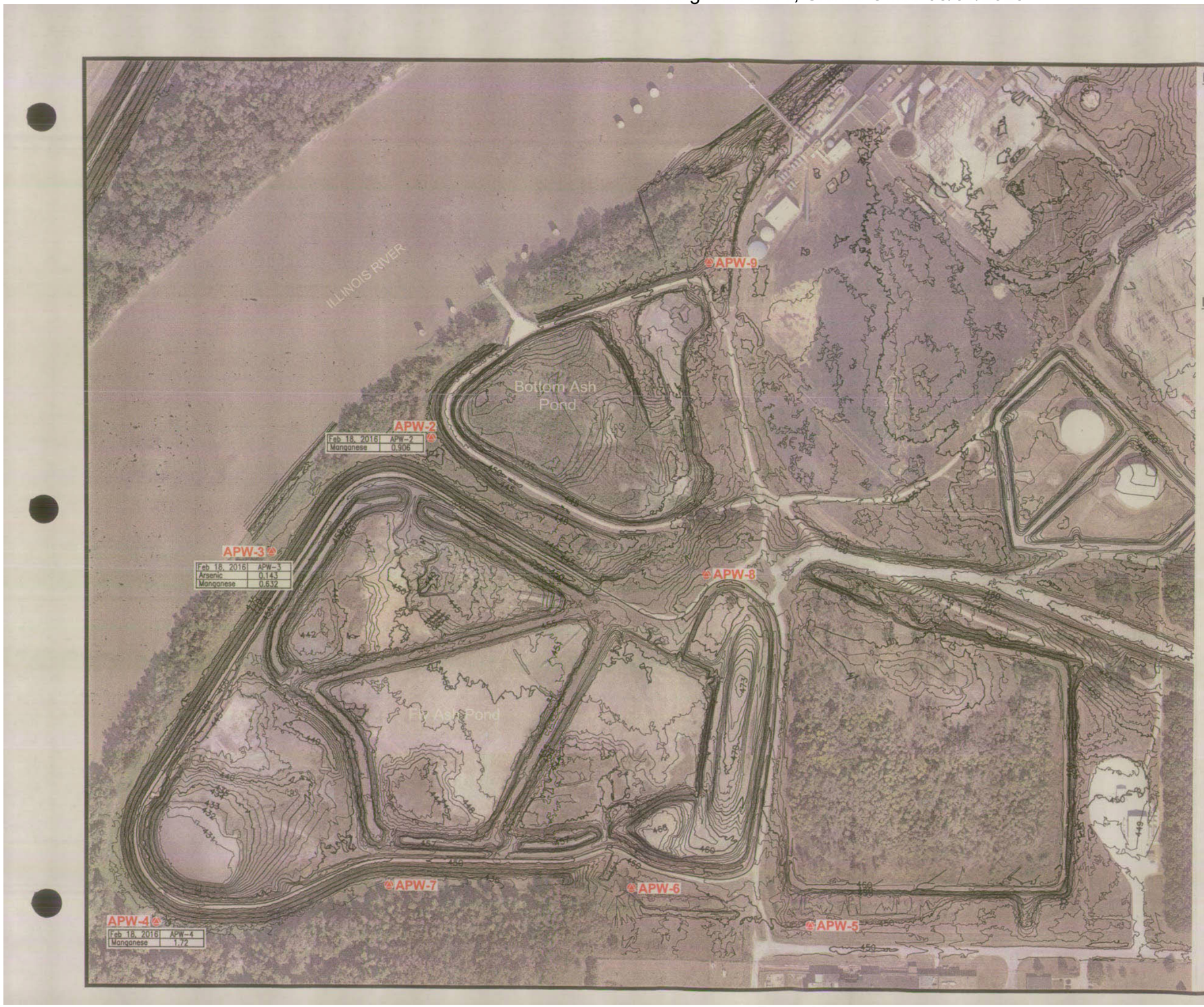
Drawn By: WAH	Ck'd By: VJZ	App'vd By: AMS
Date: 4-21-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

BORON CONCENTRATION IN GROUNDWATER - FEBRUARY 2016

Project Number J024917.01	PLATE 20



NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

Monitoring Well Location

N

0 300 600

SCALE IN FEET

Drawn By: WAH	Ck'd By:	App'vd By: AMS
Date: 5-18-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

ARSENIC AND MANGANESE EXCEEDANCES - FEBRUARY 2016

Project Number J024917.01	PLATE 21

APPENDIX A

POTABLE WATER WELL DATA

ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
sand, fine; silt & pebbles	0	5
sand, medium grain	5	11
sand, medium grain	11	22
sand, medium; small pebbles	22	32
sand, medium; small pebbles	32	42
sand, medium; small pebbles	42	52
sand, medium; small pebbles	52	62
sand, coarse;medium gravel & rock	62	67
limestone, chert bands; core	67	77
limestone, chert bands; core	77	88
limestone, chert bands; core	88	94
limestone, chert bands; core	94	100
Total Depth		100

Driller's Log filed

Owner Address:

Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner

FARM Cen. Ill. Pub. Service Co

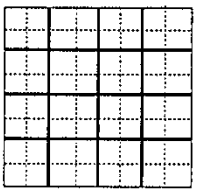
DATE DRILLED January 1, 1941 **NO.** 27

ELEVATION 418CO **COUNTY NO.** 00561

LOCATION 460'N line, 20'W line of NW SE

LATITUDE 39.82506 **LONGITUDE** -90.567886

COUNTY Morgan **API** 121370056100 21 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
fine sand	0	25
medium sand fine gravel	25	40
fine sand	40	48
fine coarse sand & gravel	48	52
fine medium sand	52	65
fine pink sand,	65	81
coarse sand, gravel & small boulders	81	105
Total Depth		105

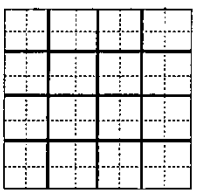
Static level 38' below casing top which is 0' above GL
Pumping level 40' when pumping at 503 gpm for 8 hours

Driller's Log filed

Owner Address: ,
Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner
FARM Central Ill.Public Service
DATE DRILLED December 1, 1960 **NO.** 4
ELEVATION 460GL **COUNTY NO.** 20656
LOCATION 2003'S line, 577'E line of section
LATITUDE 39.824389 **LONGITUDE** -90.565516
COUNTY Morgan **API** 121372065600 **21 - 16N - 13W**



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
[illegible]nd, brown, medium grain	0	3
[illegible]nd, brown, medium grain	3	6
sand, brown, fine grain	6	10
sand, brown, coarse grain	10	15
sand, coarse; fine gravel	15	20
sand, brown, medium grain	20	30
sand, medium, small pebbles	30	40
sand, brown, medium grain	40	50
sand, brown, fine grain	50	60
sand, coarse; medium gravel	60	70
sand, brown, fine grain	70	80
sand, coarse; coarse gravel	80	83
limestone, 2 1/8" core	83	86
limestone, 2 1/8" core	86	91
limestone, crystallized bands, very hard	91	96
limestone, 2 1/8" core	96	100
Total Depth		100

Driller's Log filed

Owner Address:

[illegible]cation source: Location from the driller

Permit Date: Permit #:

COMPANY owner

FARM Cen. Ill. Pub. Service Co

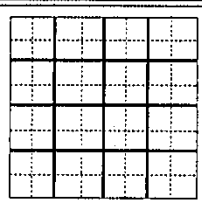
DATE DRILLED January 1, 1941 NO. 21

ELEVATION 433CO COUNTY NO. 00555

LOCATION 530'N 315'E SW/c NE SE

LATITUDE 39.824039 LONGITUDE -90.564817

COUNTY Morgan API 121370055500 21 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

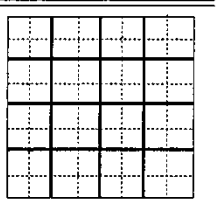
Water Well	Top	Bottom
sand, medium, light brown	0	3
sand, medium, clay content	3	6
sand, brown, medium grain	6	10
sand, medium, slight clay content	10	15
sand, brown, fine grain	15	20
sand, brown, fine grain	20	30
sand, coarse; fine gravel	30	40
sand, brown, fine grain	40	50
sand, coarse; fine gravel	50	60
sand, coarse; small gravel	60	70
sand, coarse; coarse gravel	70	80
sand, fine	80	90
sand, fine	90	98
boulders, small	98	99
sand, coarse; small gravel	99	100
Total Depth		**100**

Driller's Log filed

Owner Address: ,
Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner
FARM Cen. Ill. Pub. Service Co
DATE DRILLED January 1, 1941 **NO.** 20
ELEVATION 450CO **COUNTY NO.** 00554
LOCATION 485'N 350'E SW/c NE SE
LATITUDE 39.823913 **LONGITUDE** -90.564729
COUNTY Morgan **API** 121370055400 **21 - 16N - 13W**



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
nd, silty, brown	0	3
and, brown, medium grain	3	10
sand, brown, medium grain	10	20
sand, brown, medium grain	20	30
sand, brown, medium grain	30	40
sand, brown, coarse grain, medium gravel	40	50
sand, coarse, small gravel	50	60
gravel, medium	60	70
gravel, medium	70	80
gravel, medium;sand, medium brown	80	90
medium gravel & sand, traces of lignite	90	100
Total Depth		100

Driller's Log filed

Owner Address:

Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner

FARM Cen. Ill. Pub. Service

DATE DRILLED January 1, 1941 **NO.** 11

ELEVATION 456CO **COUNTY NO.** 00545

LOCATION 420'N 405'E SW/c NE SE

LATITUDE 39.823732 **LONGITUDE** -90.564583

COUNTY Morgan **API** 121370054500 21 - 16N - 13W

ILLINOIS STATE GEOLOGICAL SURVEY

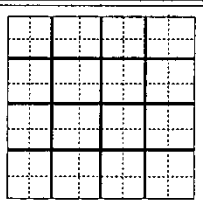
Water Well	Top	Bottom
sand, brown, medium grain	0	5
sand, brown, medium grain	5	7
sand, coarse; fine gravel	7	11
sand, coarse; fine gravel	11	16
sand, medium grain	16	26
sand, medium; medium gravel	26	36
sand, medium; medium gravel	36	46
sand, fine grain	46	56
sand, fine grain	56	66
sand, medium grain	66	76
sand, coarse; medium gravel	76	82
limestone	82	88
limestone	88	91
limestone, interbedded with flint	91	98
limestone	98	100
Total Depth		100

Driller's Log filed

Owner Address: ,
Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner
FARM Cen. Ill. Pub. Service Co
DATE DRILLED January 1, 1941 **NO.** 22
ELEVATION 434CO **COUNTY NO.** 00556
LOCATION 445'N 230'E SW/c NE SE
LATITUDE 39.823809 **LONGITUDE** -90.565185
COUNTY Morgan **API** 121370055600 **21 - 16N - 13W**



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
sand, fine grain	0	3
sand, fine grain	3	6
sand, fine grain	6	10
sand, fine grain	10	15
sand, fine grain	15	25
sand, medium, clay content	25	35
sand, coarse, small pebbles	35	45
sand, coarse, small pebbles	45	55
sand, fine grain	55	65
sand, fine grain	65	75
sand, medium grain	75	85
sand, coarse; fine gravel	85	92
sand, coarse; medium gravel (rock)	92	94
limestone (core)	94	100
Total Depth		100

Driller's Log filed

Owner Address:

Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner

FARM Cen. Ill. Pub. Service Co.

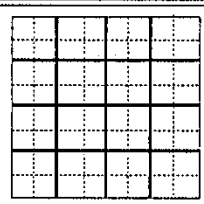
DATE DRILLED January 1, 1941 **NO.** 19

ELEVATION 444CO **COUNTY NO.** 00553

LOCATION 400'N 270'E SW/c NE SE

LATITUDE 39.823683 **LONGITUDE** -90.56508

COUNTY Morgan **API** 121370055300 21 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

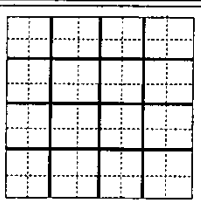
Water Well	Top	Bottom
sand, brown, medium grain	0	3
sand, brown, medium grain	3	10
sand, brown, medium grain	10	20
sand, brown, medium grain	20	30
sand, brown, medium grain	30	40
sand, coarse grain, small gravel	40	50
sand, coarse, grain, medium gravel	50	60
sand, coarse grain, small gravel	60	70
sand, coarse grain, small gravel	70	80
sand, coarse, grain, med gvl, tr lignite	80	90
sand, coarse grain, medium gravel	90	100
Total Depth		100

Driller's Log filed

Owner Address: ,
Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner
FARM Cen. Ill. Pub. Service
DATE DRILLED January 1, 1941 **NO.** 12
ELEVATION 457CO **COUNTY NO.** 00546
LOCATION 370'N 360'E SW/c NE SE
LATITUDE 39.823598 **LONGITUDE** -90.564781
COUNTY Morgan **API** 121370054600 21 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
lty sand	0	15
arse sand & gravel	15	30
medium sand & gravel	30	50
gravel, coarse sand	50	60
fine sand	60	67
sand & gravel	67	80
fine sand	80	85
gravel	85	106
rock at	106	106
Total Depth		106

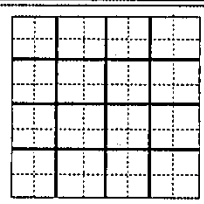
Casing: 12" from -2' to 81'
20" from 0' to 30'
Water from sand & gravel at 0' to 0'.
Static level 27' below casing top which is 2' above GL
Pumping level 33' when pumping at 503 gpm for 24 hours

Driller's Log filed

Owner Address:
Location source: Location from permit

Permit Date: **Permit #:**

COMPANY owner
FARM CIPS Meredosia Unit 4
DATE DRILLED May 1, 1974 **NO.** 5
ELEVATION 455TM **COUNTY NO.** 20658
LOCATION 1700'S line, 300'E line of SE
LATITUDE 39.823541 **LONGITUDE** -90.564662
COUNTY Morgan **API** 121372065800 **21 - 16N - 13W**



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
sand, fine grain	0	3
sand, fine grain	3	6
sand, medium grain	6	10
sand, medium grain	10	15
sand, medium; fine gravel	15	25
sand, coarse; medium gravel	25	35
sand, fine grain	35	45
sand, fine grain	45	55
sand, medium; small gravel	55	65
sand, coarse; small gravel	65	75
sand, coarse; medium gravel	75	82
limestone	82	85
limestone	85	95
limestone	95	100
Total Depth		100

Driller's Log filed

Owner Address:

Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner

FARM Cen. Ill. Pub. Service Co

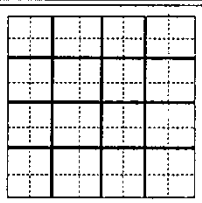
DATE DRILLED January 1, 1941 **NO.** 23

ELEVATION 432CO **COUNTY NO.** 00557

LOCATION 380'N 160'E SW/c NE SE

LATITUDE 39.823633 **LONGITUDE** -90.565487

COUNTY Morgan **API** 121370055700 **21 - 16N - 13W**



Page 1 **ILLINOIS STATE GEOLOGICAL SURVEY**

Water Well	Top	Bottom
nd, fine; little clay	0	3
nd, fine grain	3	6
sand, medium grain	6	10
sand, medium grain	10	15
sand, coarse; fine gravel	15	25
sand, coarse; fine gravel	25	35
sand, medium, small pebbles	35	45
sand, coarse; fine gravel	45	55
sand, fine grain	55	65
sand, fine grain	65	75
sand, medium, small pebbles	75	85
sand, coarse; coarse gravel	85	93
limestone core	93	97
limestone, chert bands, core	97	100
Total Depth		100

Driller's Log filed

Owner Address:

Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner

FARM Cen. Ill. Pub. Service Co.

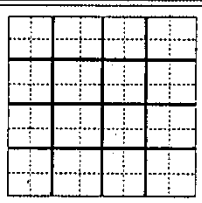
DATE DRILLED January 1, 1941 **NO.** 18

ELEVATION 443CO **COUNTY NO.** 00552

LOCATION 335'N 200'E SW/c NE SE

LATITUDE 39.823507 **LONGITUDE** -90.565381

COUNTY Morgan **API** 121370055200 21 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
fine to medium sand	0	24
medium sand & fine gravel	24	55
fine sand	55	68
sand & gravel	68	73
medium sand, gravel & boulders	73	78
total depth	78	109
Total Depth		109

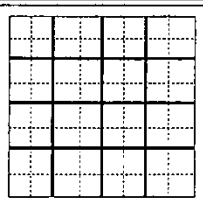
Casing: 30" from 0' to 30'
10" from 4' to 84'
Pumping level 3' when pumping at 165 gpm for 1 hour

Driller's Log filed

Owner Address: ,
Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner
FARM Central Ill.Public Ser.
DATE DRILLED November 21, 1957 **NO.** 3
ELEVATION 460GL **COUNTY NO.** 20657
LOCATION 1643'S line, 473'E line of section
LATITUDE 39.823391 **LONGITUDE** -90.565304
COUNTY Morgan **API** 121372065700 **21 - 16N - 13W**



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
nd, medium grain	0	3
nd, brown, medium grain	3	10
sand, brown, medium grain	10	15
sand, medium grain, clay content	15	17
sand, brown, medium grain	17	20
sand, brown, medium grain	20	30
sand, coarse; small gravel	30	40
sand, coarse; small gravel	40	50
sand, coarse; medium gravel	50	60
sand, coarse; medium gravel	60	70
sand, medium grain	70	80
sand, medium grain	80	90
sand, medium grain; medium gravel	90	100
Total Depth		100

Driller's Log filed

Owner Address:

Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner

FARM Cen. Ill. Pub. Service Co.

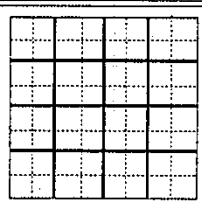
DATE DRILLED January 1, 1941 **NO.** 13

ELEVATION 456CO **COUNTY NO.** 00547

LOCATION 305'N 295'E SW/c NE SE

LATITUDE 39.823421 **LONGITUDE** -90.565065

COUNTY Morgan **API** 121370054700 21 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

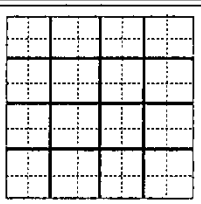
Water Well	Top	Bottom
sand, silty, brown	0	3
sand, brown, medium grain	3	10
sand, brown, medium grain	10	20
sand, brown, medium grain	20	25
Total Depth		**25**

Driller's Log filed

Owner Address: ,
Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner
FARM Cen. Ill. Pub. Service
DATE DRILLED January 1, 1941 **NO.** 10
ELEVATION 456CO **COUNTY NO.** 00544
LOCATION 255'N 350'E SW/c NE SE
LATITUDE 39.823282 **LONGITUDE** -90.564909
COUNTY Morgan **API** 121370054400 **21 - 16N - 13W**



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
nd, silty, medium grain	0	1
Sand, brown, medium grain	1	7
sand, brown, medium grain	7	10
sand, brown, slight clay content	10	13
sand, brown, slight clay content	13	19
sand, dark brown, medium grain	19	25
Total Depth		25

Driller's Log filed

Permit Date: **Permit #:**

COMPANY C.I.P.S.
FARM Cen. Ill. Pub. Service
DATE DRILLED January 1, 1941 **NO.** 1
ELEVATION 454CO **COUNTY NO.** 00535
LOCATION 190'N 410'E SW/c NE SE
LATITUDE 39.823098 **LONGITUDE** -90.564749
COUNTY Morgan **API** 121370053500 21 - 16N - 13W

ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
sand, medium grain	0	3
sand, medium grain	3	6
sand, medium grain	6	10
sand, medium grain	10	15
sand, fine grain	15	25
sand, medium; fine gravel	25	35
sand, fine grain	35	45
sand, fine grain	45	50
Total Depth		50

Driller's Log filed

Owner Address:

Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner

FARM Cen. Ill. Pub. Service Co

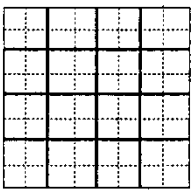
DATE DRILLED January 1, 1941 **NO.** 26

ELEVATION 423CO **COUNTY NO.** 00560

LOCATION 395'N 45'E SW/c NE SE

LATITUDE 39.823679 **LONGITUDE** -90.565885

COUNTY Morgan **API** 121370056000 **21 - 16N - 13W**



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
nd, brown, medium grain	0	3
and, brown, medium grain	3	10
sand, brown, medium grain	10	20
sand, brown, medium grain	20	30
sand, medium grain; small gravel	30	40
sand, medium grain; small gravel	40	50
sand, medium grain; small gravel	50	60
sand, medium grain; medium gravel	60	70
sand, medium grain; small gravel	70	80
sand, medium grain; small gravel	80	90
sand, medium grain; small gravel	90	100
Total Depth		100

Driller's Log filed

Owner Address:

Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner

FARM Cen. Ill. Pub. Service Co.

DATE DRILLED January 1, 1941 **NO.** 14

ELEVATION 456CO **COUNTY NO.** 00548

LOCATION 240'N 230'E SW/c NE SE

LATITUDE 39.823245 **LONGITUDE** -90.565349

COUNTY Morgan **API** 121370054800 21 - 16N - 13W

ILLINOIS STATE GEOLOGICAL SURVEY

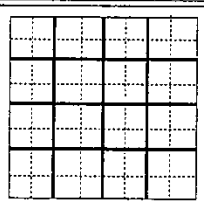
Water Well	Top	Bottom
sand, silty, brown	0	3
sand, brown, medium grain	3	10
sand, brown, medium grain	10	20
sand, brown, medium grain, small gravel	20	25
Total Depth		25

Driller's Log filed

Owner Address: ,
Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner
FARM Cen. Ill. Pub. Service
DATE DRILLED January 1, 1941 **NO.** 9
ELEVATION 456CO **COUNTY NO.** 00543
LOCATION 215'N 310'E SW/c NE SE
LATITUDE 39.823173 **LONGITUDE** -90.565083
COUNTY Morgan **API** 121370054300 21 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
nd, silty	0	2
and, brown, medium grain	2	5
sand, brown, medium grain	5	10
sand, brown, medium grain	10	14
sand,brown,medium grain,slight clay	14	15
sand, brown, medium grain	15	20
sand, brown, medium grain	20	25
Total Depth		25

Driller's Log filed

Owner Address:

Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner

FARM Cen. Ill. Pub. Service

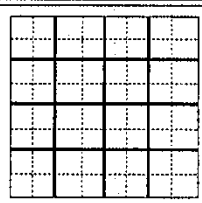
DATE DRILLED January 1, 1941 **NO.** 2

ELEVATION 454CO **COUNTY NO.** 00536

LOCATION 150'N 370'E SW/c NE SE

LATITUDE 39.822992 **LONGITUDE** -90.564922

COUNTY Morgan **API** 121370053600 21 - 16N - 13W



Page 1 **ILLINOIS STATE GEOLOGICAL SURVEY**

Water Well	Top	Bottom
sand, fine grain	0	3
sand, medium grain	3	6
sand, fine grain	6	10
sand, fine grain	10	15
sand, medium, small pebbles	15	25
sand, fine grain	25	35
sand, medium grain	35	45
sand, fine grain	45	55
sand, fine grain	55	65
sand, coarse; fine gravel	65	75
sand, coarse; medium gravel	75	81
limestone core	81	86
limestone with chert bands	86	89
limestone	89	91
limestone	91	100
Total Depth		100

Driller's Log filed

Owner Address: .

Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner

FARM Cen. Ill. Pub. Service Co

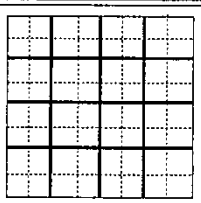
DATE DRILLED January 1, 1941 **NO.** 24

ELEVATION 431CO **COUNTY NO.** 00558

LOCATION 310'N 95'E SW/c NE SE

LATITUDE 39.823442 **LONGITUDE** -90.565774

COUNTY Morgan **API** 121370055800 **21 - 16N - 13W**



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
nd, medium grain	0	3
and, medium grain	3	10
sand, medium grain	10	20
sand, medium grain; small gravel	20	30
sand, medium grain	30	40
sand, coarse; large gravel	40	50
sand, coarse; large gravel	50	56
sand, fine	56	60
sand, fine; small gravel	60	70
sand, fine; small gravel	70	80
sand, coarse; coarse gravel	80	90
gravel, medium, clay content	90	95
limestone	95	96
limestone	96	100
Total Depth		100

Driller's Log filed

Owner Address:

Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner

FARM Cen. Ill. Pub. Service Co.

DATE DRILLED January 1, 1941 **NO.** 17

ELEVATION 446CO **COUNTY NO.** 00551

LOCATION 270'N 135'E SW/c NE SE

LATITUDE 39.82333 **LONGITUDE** -90.565661

COUNTY Morgan **API** 121370055100 **21 - 16N - 13W**

ILLINOIS STATE GEOLOGICAL SURVEY

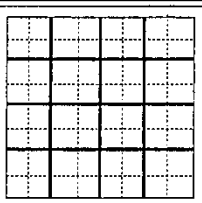
Water Well	Top	Bottom
sand, brown, medium grain	0	2
sand, brown, medium grain	2	10
sand, brown, medium grain	10	20
sand, brown, medium grain	20	25
Total Depth		25

Driller's Log filed

Owner Address: ,
Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner
FARM Cen. Ill. Pub. Service
DATE DRILLED January 1, 1941 **NO.** 8
ELEVATION 457CO **COUNTY NO.** 00542
LOCATION 175'N 270'E SW/c NE SE
LATITUDE 39.823063 **LONGITUDE** -90.565256
COUNTY Morgan **API** 121370054200 21 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
nd, brown, silty	0	3
and, brown, medium grain	3	5
sand, brown, medium grain	5	10
sand, brown, medium grain	10	20
sand, brown, traces of fine gravel	20	25
Total Depth		25

Driller's Log filed

Owner Address:
Location source: Location from the driller

Permit Date: Permit #:

COMPANY owner
FARM Cen. Ill. Pub. Service
DATE DRILLED January 1, 1941 NO. 3
ELEVATION 454CO COUNTY NO. 00537
LOCATION 105'N 330'E SW/c NE SE
LATITUDE 39.822869 LONGITUDE -90.5651
COUNTY Morgan API 121370053700 21 - 16N - 13W

ILLINOIS STATE GEOLOGICAL SURVEY

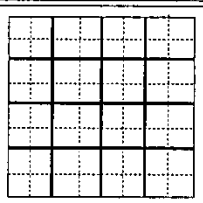
Water Well	Top	Bottom
sand, brown	0	3
sand, brown, medium grain	3	10
sand, brown, medium grain	10	20
sand, brown, medium grain	20	30
sand, medium grain; small gravel	30	40
sand, medium grain; small gravel	40	50
sand; small gravel	50	60
sand; coarse gravel	60	70
sand, fine grain; traces small gravel	70	80
sand, fine grain	80	90
sand, coarse	90	100
Total Depth		100

Driller's Log filed

Owner Address: ,
Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner
FARM Cen. Ill. Pub. Service Co.
DATE DRILLED January 1, 1941 **NO.** 15
ELEVATION 454CO **COUNTY NO.** 00549
LOCATION 175'N 160'E SW/c NE SE
LATITUDE 39.823068 **LONGITUDE** -90.565647
COUNTY Morgan **API** 121370054900 **21 - 16N - 13W**



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
sand, brown, medium grain	0	3
sand, brown, medium grain	3	10
sand, brown, medium grain	10	20
sand, brown, medium grain	20	30
sand, medium coarse grain, small gravel	30	40
sand, medium coarse grain, small gravel	40	50
Total Depth		50

Driller's Log filed

Owner Address:

Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner

FARM Cen. Ill. Pub. Service

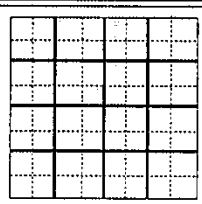
DATE DRILLED January 1, 1941 **NO.** 7

ELEVATION 456CO **COUNTY NO.** 00541

LOCATION 130'N 230'E SW/c NE SE

LATITUDE 39.822943 **LONGITUDE** -90.565434

COUNTY Morgan **API** 121370054100 21 - 16N - 13W



Page 1

ILLINOIS STATE GEOLOGICAL SURVEY

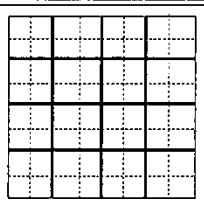
Water Well	Top	Bottom
sand, silty,brown	0	1
sand, brown, medium grain	1	5
sand, brown, medium grain	5	10
sand,brown,medium grain,slight clay	10	10
sand, brown, medium grain	10	28
sand, medium gravel	28	30
sand, medium gravel, water showing	30	40
sand, medium gravel, water showing	40	50
Total Depth		50

Driller's Log filed

Owner Address: ,
Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner
FARM Cen. Ill. Pub. Service
DATE DRILLED January 1, 1941 **NO.** 4
ELEVATION 454CO **COUNTY NO.** 00538
LOCATION 65'N 290'E SW/c NE SE
LATITUDE 39.82276 **LONGITUDE** -90.565273
COUNTY Morgan **API** 121370053800 **21 - 16N - 13W**



Page 1 **ILLINOIS STATE GEOLOGICAL SURVEY**

Water Well	Top	Bottom
nd, brown, medium grain	0	5
and, brown, medium grain	5	10
sand, brown, medium grain	10	20
sand, light brown, medium grain	20	30
no record	30	31
sand, coarse; medium gravel	31	35
sand, coarse; medium gravel	35	40
sand, fine grain	40	50
sand, fine grain	50	60
gravel, small, pea size	60	70
sand, coarse; small gravel	70	80
sand, coarse; small gravel	80	86
limestone	86	92
limestone	92	95
limestone	95	100
Total Depth		**100**

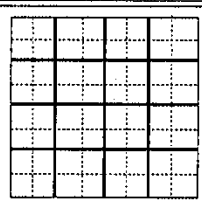
Driller's Log filed

Owner Address:

Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner
FARM Cen. Ill. Pub. Service Co
DATE DRILLED January 1, 1941 **NO.** 25
ELEVATION 436CO **COUNTY NO.** 00559
LOCATION 245'N 25'E SW/c NE SE
LATITUDE 39.823266 **LONGITUDE** -90.566072
COUNTY Morgan **API** 121370055900 21 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

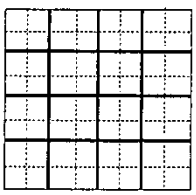
Water Well	Top	Bottom
sand, brown, medium grain	0	4
clay, sandy	4	5
sand, brown, medium grain	5	10
sand, brown, medium grain	10	20
sand, medium; medium gravel	20	30
sand, medium; medium gravel	30	40
sand, coarse; medium gravel	40	50
sand, fine; coarse gravel	50	60
sand, fine	60	70
sand; medium gravel	70	80
sand, coarse; small gravel	80	90
sand, coarse; small gravel	90	93
sand, coarse; small gravel	93	95
limestone	95	96
limestone	96	100
Total Depth		100

Driller's Log filed

Owner Address: ,
Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner
FARM Cen. Ill. Pub. Service Co.
DATE DRILLED January 1, 1941 **NO.** 16
ELEVATION 446CO **COUNTY NO.** 00550
LOCATION 190'N 80'E SW/c NE SE
LATITUDE 39.823113 **LONGITUDE** -90.565919
COUNTY Morgan **API** 121370055000 **21 - 16N - 13W**



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
nd, silty, brown	0	2
nd, brown, medium grain	2	10
sand, brown, medium grain	10	20
sand, brown, medium coarse grain	20	30
sand, brown, small gravel	30	40
sand, medium coarse, medium gravel	40	50
Total Depth		50

Driller's Log filed

Owner Address:

Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner

FARM Cen. Ill. Pub. Service

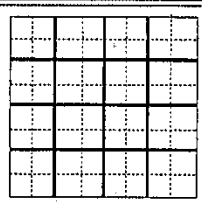
DATE DRILLED January 1, 1941 **NO.** 6

ELEVATION 454CO **COUNTY NO.** 00540

LOCATION 85'N 190'E SW/c NE SE

LATITUDE 39.82282 **LONGITUDE** -90.565614

COUNTY Morgan **API** 121370054000 21 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

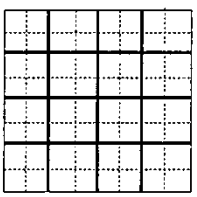
Water Well	Top	Bottom
sand, silty, brown	0	3
sand, brown, medium grain	3	5
sand, brown, medium grain	5	10
sand, brown, slight clay content	10	15
sand, brown, medium grain	15	20
sand, brown, medium grain	20	29
sand, medium gravel, water showing	29	30
sand, medium grain, medium gravel	30	40
sand, medium grain, medium gravel	40	50
Total Depth		50

Driller's Log filed

Owner Address: ,
Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner
FARM Cen. Ill. Pub. Service
DATE DRILLED January 1, 1941 **NO.** 5
ELEVATION 454CO **COUNTY NO.** 00539
LOCATION 25'N 250'E SW/c NE SE
LATITUDE 39.822653 **LONGITUDE** -90.565447
COUNTY Morgan **API** 121370053900 **21 - 16N - 13W**



Page 1 **ILLINOIS STATE GEOLOGICAL SURVEY**

Water Well	Top	Bottom
...d, medium; silt & pebbles	0	5
Sand, medium; fine gravel	5	14
sand, medium; fine gravel	14	24
sand, fine grain	24	34
sand, fine grain	34	44
sand, fine grain	44	54
sand, coarse; small pebbles	54	64
sand, coarse; medium gravel	64	67
limestone (broken), core	67	77
limestone (broken), core	77	87
limestone (broken), core	87	100
Total Depth		100

Driller's Log filed

Owner Address:

Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner

FARM Cen. Ill. Pub. Service Co

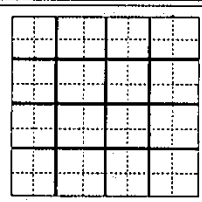
DATE DRILLED January 1, 1941 **NO.** 28

ELEVATION 417CO **COUNTY NO.** 00562

LOCATION 290'N 180'W SE/c NW SE

LATITUDE 39.823398 **LONGITUDE** -90.566769

COUNTY Morgan **API** 121370056200 21 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

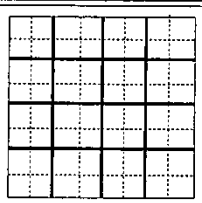
Water Well	Top	Bottom
silt, sandy, dark brown	0	3
silt, sandy, dark brown	3	6
sand, medium & silt	6	10
sand, fine, light brown	10	15
sand, medium; fine gravel	15	20
sand, coarse; coarse gravel	20	30
sand, fine; small stones	30	40
sand, fine	40	50
Total Depth		50

Driller's Log filed

Owner Address: ,
Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner
FARM Cen. Ill. Pub. Service Co
DATE DRILLED January 1, 1941 **NO.** 29
ELEVATION 429CO **COUNTY NO.** 00563
LOCATION 200'N 95'W SE/c NW SE
LATITUDE 39.823148 **LONGITUDE** -90.566536
COUNTY Morgan **API** 121370056300 21 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
nd, brown, slight clay content	0	3
nd, brown, medium grain	3	10
sand, brown, medium grain	10	19
sand, course; medium gravel	19	20
sand, course; medium gravel	20	30
sand, coarse; small gravel	30	40
sand, coarse; medium gravel	40	50
sand, fine	50	60
sand, coarse	60	70
sand, coarse	70	80
sand, coarse	80	89
sand, coarse;small gvl w/tr of lignite	89	90
limestone	90	96
limestone	96	100
Total Depth		100

Driller's Log filed

Owner Address:

Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner

FARM Cen. Ill. Pub. Service Co

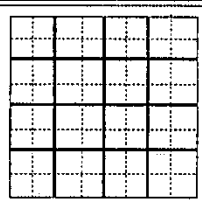
DATE DRILLED January 1, 1941 **NO.** 30

ELEVATION 442CO **COUNTY NO.** 00564

LOCATION 115'N 5'W SE/c NW SE

LATITUDE 39.822911 **LONGITUDE** -90.566281

COUNTY Morgan **API** 121370056400 21 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
sand fill	0	20
clay	20	30
coarse sand & gravel	30	104
rock at	104	104
Total Depth		**104**

Casing: 30" STEEL .312 from 0' to 30'
12" STEEL .375 from 0' to 79'
Screen: 25' of 12" diameter 6 slot
Size hole below casing: 38"

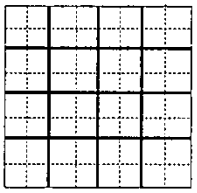
Water from alluvial at 30' to 102'.
Static level 25' below casing top which is 2' above GL

Driller's Log filed

Owner Address: Meredosia, IL
Location source: Platbook verified

Permit Date: September 8, 1977 **Permit #:** 66466

COMPANY Ruester, John T.
FARM Central Ill. Public Ser.Co.
DATE DRILLED April 25, 1978 **NO.** 6
ELEVATION 448GL **COUNTY NO.** 20758
LOCATION 100'S line, 50'W line of SW NE SE
LATITUDE 39.822865 **LONGITUDE** -90.566098
COUNTY Morgan **API** 121372075800 **21 - 16N - 13W**



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
sand, brown, medium grain	0	8
nd, medium, clay content	8	10
sand, brown, medium grain	10	15
sand, brown, medium grain	15	20
sand, brown, medium grain	20	30
sand & medium gravel	30	35
sand, coarse; medium gravel	35	40
sand, coarse; medium gravel	40	45
sand, coarse; fine gravel	45	50
Total Depth		50

Driller's Log filed

Owner Address:

Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner

FARM Cen. Ill. Pub. Service Co

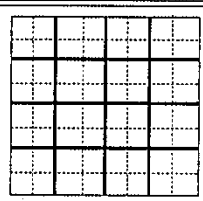
DATE DRILLED January 1, 1941 **NO.** 31

ELEVATION 454CO **COUNTY NO.** 00565

LOCATION 40'N 70'E SW/c NE SE

LATITUDE 39.8227 **LONGITUDE** -90.566074

COUNTY Morgan **API** 121370056500 21 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
fine brown sand	0	30
coarse sand	30	50
medium sand	50	70
fine to medium sand	70	90
sand & gravel	90	105
rock at	105	105
Total Depth		105

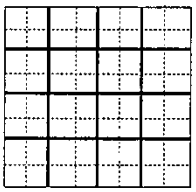
Casing: 12" from -1' to 79'
30" from 0' to 31'
Water from sand & gravel at 0' to 0'.
Static level 32' below casing top which is 0' above GL
Pumping level 39' when pumping at 517 gpm for 22 hours

Driller's Log filed
Sample set # 58921 (0' - 103') Received: December 8, 1973

Owner Address: ,
Location source: Location from permit

Permit Date: **Permit #:**

COMPANY owner
FARM CIPS Meredosia Power Sta unit 4,#
DATE DRILLED August 30, 1973 **NO.** 5
ELEVATION 445TM **COUNTY NO.** 00639
LOCATION 1300'S line, 500'E line of SE
LATITUDE 39.822448 **LONGITUDE** -90.565551
COUNTY Morgan **API** 121370063900 **21 - 16N - 13W**



Page 1 **ILLINOIS STATE GEOLOGICAL SURVEY**

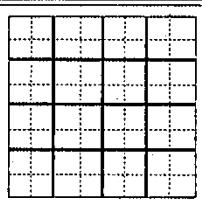
Test Hole	Top	Bottom
crushed stone	0	1
silty sand	1	5
fine sand	5	20
fine to medium sand	20	25
fine to coarse sand	25	35
coarse sand	35	40
med. to coarse sand w/gravel	40	45
fine to medium sand	45	50
fine to coarse sand	50	70
fine to coarse sand w/gravel	70	75
silty, fine to medium sand	75	85
fine to coarse sand	85	95
medium to coarse sand	95	101
fine to coarse sand w/boulders	101	104
Total Depth		104

Sample set # 67974 (5' - 103') Received: July 1, 1994

Owner Address: Meredosia, IL
Location source: Location from the driller

Permit Date: **Permit #:** none

COMPANY Brotcke, Paul
FARM CIPS Power Station
DATE DRILLED June 21, 1994 **NO.** 7
ELEVATION 0 **COUNTY NO.** 21579
LOCATION SE NE SE
LATITUDE 39.823501 **LONGITUDE** -90.564221
COUNTY Morgan **API** 121372157900 21 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Noncommunity - Public Water Well	Top	Bottom
fine-medium sand	0	24
medium sand & fine gravel	24	55
fine sand	55	68
sand & gravel	68	73
medium sand, gravel & boulders	73	78
Total Depth		78

Pumping level 0' when pumping at 165 gpm for 1 hour

Permit Date: **Permit #:**

COMPANY

FARM CIPS

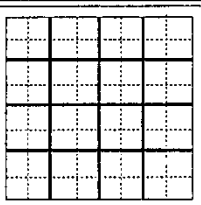
DATE DRILLED November 21, 1957 NO. 3

ELEVATION 460 COUNTY NO. 21982

LOCATION NW NE SE

LATITUDE 39.825368 **LONGITUDE** -90.564994

COUNTY Morgan **API** 121372198200 21 - 16N - 13W



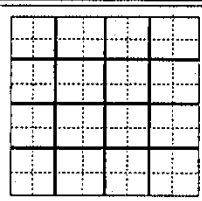
Page 1 ILLINOIS STATE GEOLOGICAL SURVEY

Noncommunity - Public Water Well	Top	Bottom
ne sand	0	25
dium sand-fine gravel	25	40
fine sand	40	48
fine-coarse sand & gravel	48	52
fine-medium sand	52	65
fine pink sand	65	81
coarse sand, gravel & small boulders	81	105
Total Depth		105

Static level 38' below casing top which is 0' above GL
Pumping level 40' when pumping at 503 gpm for 8 hours

Permit Date: **Permit #:**

COMPANY
FARM CIPS
DATE DRILLED December 1, 1960 NO. 4
ELEVATION 460 COUNTY NO. 21981
LOCATION NE NE SE
LATITUDE 39.825356 **LONGITUDE** -90.563863
COUNTY Morgan API 121372198100 21 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Noncommunity - Public Water Well	Top	Bottom
fill sand	0	20
fine sand	20	40
medium sand	40	85
medium sand with gravel	85	104
rock at	104	104
Total Depth		104

Casing: 36" STEEL 166.35#/FT from -2' to 30'
16" STEEL 62.58#/FT from -2' to 79'

Screen: 25' of 16" diameter .05 slot

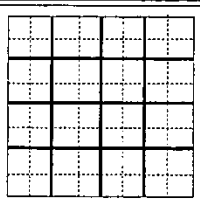
Grout: NEAT from 0 to 30.

Water from sand & gravel at 32' to 104'.
Static level 32' below casing top which is 2' above GL
Permanent pump installed at 75'
on July 11, 1994, with a capacity of 600 gpm

Owner Address: 800 S. Washington St. Meredosia, IL
Location source: Location from permit

Permit Date: June 9, 1994 **Permit #:**

COMPANY Brotcke Engineering
FARM Central IL Public Service C
DATE DRILLED June 21, 1994 **NO.** 7
ELEVATION 0 **COUNTY NO.** 21613
LOCATION SE NE SE
LATITUDE 39.823501 **LONGITUDE** -90.564221
COUNTY Morgan **API** 121372161300 21 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Noncommunity - Public Water Well	Top	Bottom
fill sand	0	20
fine sand	20	40
medium sand	40	85
medium sand w/ gravel	85	104
rock @	104	104
Total Depth		104

Casing: 36" STEEL from -2' to 30'
16" STEEL from -2' to 79'

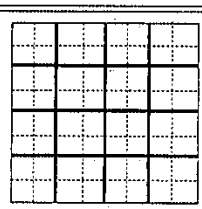
Grout: NEAT from 0 to 30.

Water from sand & gravel at 32' to 104'.
Static level 32' below casing top which is 2' above GL
Permanent pump installed at 75'
on July 11, 1994, with a capacity of 600 gpm
Remarks: IEPA well #13700182

Owner Address:
Address of well: 800 Washington
Meredosia, IL
Location source: Location from the driller

Permit Date: June 9, 1994 **Permit #:**

COMPANY Brotcke Engineering
FARM CIPS
DATE DRILLED June 21, 1994 **NO.** 7
ELEVATION 0 **COUNTY NO.** 21980
LOCATION SE NE SE
LATITUDE 39.823501 **LONGITUDE** -90.564221
COUNTY Morgan **API** 121372198000 21 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

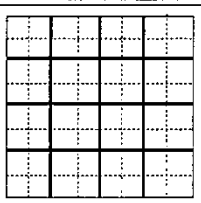
Water Well	Top	Bottom
sand	0	40
medium to fine sand	40	70
sand & gravel	70	94
gravel & boulders	94	98
Total Depth		98

Casing: 12" STEEL CASING from 0' to 78'

Static level 25' below casing top which is 0' above GL
Pumping level 34' when pumping at 600 gpm for 15 hours

Owner Address:
Location source: Location from the driller

Permit Date: **Permit #:**



COMPANY owner
FARM National Starch & Chem. Co
DATE DRILLED July 7, 1964 **NO.** 4
ELEVATION 435GL **COUNTY NO.** 20802
LOCATION 1669'N line, 1850'E line of NE
LATITUDE 39.814322 **LONGITUDE** -90.570968
COUNTY Morgan **API** 121372080200 28 - 16N - 13W

ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
gs #31677	0	0
nd	0	20
sand & gravel	20	60
coarse sand & gravel	60	92
Total Depth		92

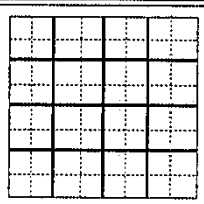
Casing: 12" ID from -2' to 72'
Water from at 70' to 90'.
Static level 25' below casing top which is 0' above GL
Pumping level 0' when pumping at 500 gpm for 0 hours

Remarks: see file for detail sample study
Driller's Log filed
Sample set # 31677 (0' - 92') Received: October 21, 1958

Owner Address:
Location source: Location from permit

Permit Date: September 9, 1958 **Permit #:**

COMPANY owner
FARM National Starch Prod.
DATE DRILLED October 1, 1958 **NO.** 2
ELEVATION 442GL **COUNTY NO.** 00147
LOCATION 310'N line, 1200'E line of NE
LATITUDE 39.818045 **LONGITUDE** -90.568641
COUNTY Morgan **API** 121370014700 28 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

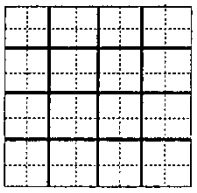
Water Well	Top	Bottom
sand	0	45
sand & gravel	45	90
Total Depth		90

Casing: 16" STEEL 3/8 WALL from -2' to 65'
Screen: 25' of 16" diameter .8 slot
Water from drift at 65' to 90'.

Owner Address: P.O. Box 197 Meredosia, IL
Location source: Location from permit

Permit Date: October 13, 1978 **Permit #:** 80737

COMPANY owner
FARM National Starch
DATE DRILLED October 24, 1978 **NO.** 11
ELEVATION 0 **COUNTY NO.** 20760
LOCATION 1408'N line, 855'E line of NE
LATITUDE 39.815 **LONGITUDE** -90.567407
COUNTY Morgan **API** 121372076000 **28 - 16N - 13W**



Page 1 **ILLINOIS STATE GEOLOGICAL SURVEY**

Water Well	Top	Bottom
sand	0	40
dium to fine sand	40	70
sand & gravel	70	94
gravel & boulders	94	98
Total Depth		98

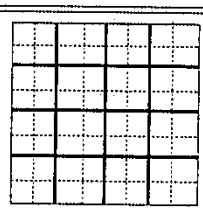
Casing: 12" STEEL CASING from 0' to 78'

Static level 25' below casing top which is 0' above GL
Pumping level 34' when pumping at 600 gpm for 15 hours

Owner Address: ,
Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner
FARM National Starch & Chem. Co
DATE DRILLED July 7, 1964 NO. 4
ELEVATION 435GL **COUNTY NO.** 20802
LOCATION 1669'N line, 1850'E line of NE
LATITUDE 39.814322 **LONGITUDE** -90.570968
COUNTY Morgan **API** 121372080200 28 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Semi-Private Water Well	Top	Bottom
top soil	0	2
fine sand	2	17
medium-coarse sand	17	40
medium-coarse gravel	40	62
coarse sand at	62	62
Total Depth		62

Casing: 5" SS SCREEN from 0' to 4'
5" PLAIN CASING from 4' to 62'

Screen: 4' of 5" diameter .012 slot

Grout: BENTONITE from 4 to 25.

Permanent pump installed at 45'
on , with a capacity of 10 gpm

Owner Address: P.O. Box #500 Meredosia, IL

Address of well: Co. Rd. #1975N

Location source: Location from permit

Permit Date: July 16, 1993 **Permit #:**

COMPANY Dirks, Michael J.

FARM National Starch & Chemical Co.

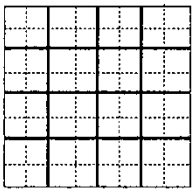
DATE DRILLED July 26, 1993 **NO.**

ELEVATION 0 **COUNTY NO.** 21524

LOCATION NW SE NE

LATITUDE 39.814361 **LONGITUDE** -90.567035

COUNTY Morgan **API** 121372152400 28 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

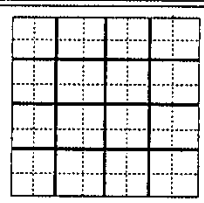
Water Well	Top	Bottom
Sand & gravel	0	89
Total Depth		89

Casing: 16" OD STEEL 3/8"WALL from 0' to 63'
Screen: 25' of 16" diameter .08 slot
Water from sand & gravel at 63' to 88'.
Static level 26' below casing top which is 2' above GL
Pumping level 33' when pumping at 600 gpm for 8 hours

Owner Address: Merdosia, IL
Location source: Location from permit

Permit Date: October 16, 1977 **Permit #:** 61809

COMPANY Miller, J.P. Artesian Well Co.
FARM Natl. Starch & Chem.
DATE DRILLED June 21, 1977 **NO.** 6A
ELEVATION 0 **COUNTY NO.** 20759
LOCATION 1889'N line, 871'E line of NE
LATITUDE 39.813672 **LONGITUDE** -90.567465
COUNTY Morgan **API** 121372075900 **28 - 16N - 13W**



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
sand	0	40
medium to fine sand	40	70
sand & gravel	70	94
gravel & boulders	94	98
Total Depth		98

Casing: 12" STEEL CASING from 0' to 78'

Static level 25' below casing top which is 0' above GL

Pumping level 34' when pumping at 600 gpm for 15 hours

Owner Address: ,

Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner

FARM National Starch & Chem. Co

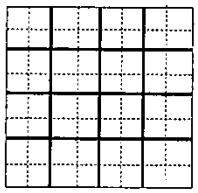
DATE DRILLED July 7, 1964 **NO.** 4

ELEVATION 435GL **COUNTY NO.** 20802

LOCATION 1669'N line, 1850'E line of NE

LATITUDE 39.814322 **LONGITUDE** -90.570968

COUNTY Morgan **API** 121372080200 28 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
e sand, not clean	0	18
ine sand, clean	18	60
Total Depth		60

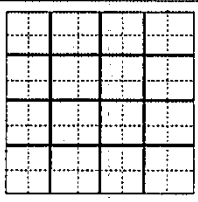
Casing: 16" STEEL 3/8" WALL from 0' to 49'
8" STEEL 25# from 0' to 52'
Screen: 10' of 8" diameter 40 slot
Water from aluvium at 0' to 62'.
Static level 20' below casing top which is 2' above GL
Pumping level 25' when pumping at 120 gpm for 2 hours

Driller's Log filed

Owner Address: Meredosia, IL
Location source: Location from permit

Permit Date: January 1, 1971 **Permit #:** 10077

COMPANY Diehl Pump and Supply Co.
FARM National Starch
DATE DRILLED January 1, 1971 **NO.** 2A
ELEVATION 0 **COUNTY NO.** 00629
LOCATION 2154'N line, 1108'E line of NE
LATITUDE 39.812952 **LONGITUDE** -90.568313
COUNTY Morgan **API** 121370062900 28 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Test Hole	Top	Bottom
drift- sand & gravel	0	96
Total Depth		96

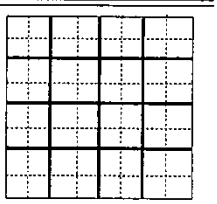
Casing: 16" STEEL 62.58 LB. from 0' to 70'
Screen: 25' of 16" diameter .08 slot
Water from drift at 50' to 96'.
Static level 17' below casing top which is 0' above GL
Pumping level 24' when pumping at 800 gpm for 8 hours

Remarks: see file for detail sample study
Driller's Log filed
Sample set # 58824 (0' - 95') Received: September 19, 1973

Owner Address: Meredosia, IL
Location source: Location from permit

Permit Date: May 1, 1973 **Permit #:** 18880

COMPANY Miller, J.P. Artesian Well Co.
FARM National Starch & Chemical
DATE DRILLED May 1, 1973 **NO.** 9
ELEVATION 0 **COUNTY NO.** 00638
LOCATION 2600'N line, 1400'E line of NE
LATITUDE 39.811734 **LONGITUDE** -90.569358
COUNTY Morgan **API** 121370063800 28 - 16N - 13W



Page 1 **ILLINOIS STATE GEOLOGICAL SURVEY**

Test Hole	Top	Bottom
#55587	0	0
sandy brown clay	0	20
sandy gravel	20	92
Total Depth		92

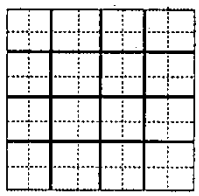
Casing: 24" STEEL 3/8" WALL from 0' to 50'
12" STEEL 3/8" WALL from 0' to 62'
Screen: 30' of 12" diameter 50 slot
Water from drift at 0' to 92'.
Static level 26' below casing top which is 0' above GL

Remarks: see file for detail sample study
Driller's Log filed
Sample set # 55587 (0' - 93') Received: October 1, 1968

Owner Address: Meredosia, IL
Location source: Location from permit

Permit Date: January 1, 1968 **Permit #:** NF 4615

COMPANY Diehl Pump and Supply Co.
FARM National Starch
DATE DRILLED August 31, 1968 **NO.** 8
ELEVATION 0 **COUNTY NO.** 00422
LOCATION 2150'N line, 1400'E line of NE
LATITUDE 39.812976 **LONGITUDE** -90.569359
COUNTY Morgan **API** 121370042200 28 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Non Potable Water Well	Top	Bottom
brown silty sand	0	5
fine sand	5	18
medium to large sand w/1" gravel	18	83
sand w/medium to large gravel	83	85
gravel	85	86
Total Depth		86

Casing: 24" STEEL 94.62#/FT from -2' to 51'
Screen: 15' of 24" diameter 100 slot
Grout: CEMENT from 0 to 20.

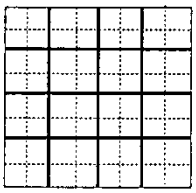
Size hole below casing: 42"

Water from sand & gravel at 0' to 0'.
Static level 18' below casing top which is 2' above GL
Pumping level 33' when pumping at 1500 gpm for 8 hours
Permanent pump installed at 65'
on September 17, 1996, with a capacity of 1500 gpm

Owner Address: PO Box 500 Meredosia, IL
Address of well: S. Washington St.
Meredosia, IL
Add'l loc. info: FALSE
Process water only
Location source: Location from permit

Permit Date: August 28, 1996 **Permit #:** 137-046

COMPANY Stollhans, Jeff
FARM National Starch & Chem. Co
DATE DRILLED September 13, 1996 **NO.** 16
ELEVATION 0 **COUNTY NO.** 21769
LOCATION SW SW NE
LATITUDE 39.812578 **LONGITUDE** -90.570974
COUNTY Morgan **API** 121372176900 28 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Test Hole	Top	Bottom
#55586	0	0
Sandy brown clay	0	24
fine sand & gravel	24	69
medium sand & small gravel	69	96
Total Depth		96

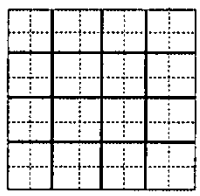
Casing: 8" STEEL 3/8" WALL from 0' to 96'
Screen: 16' of 8" diameter 25 slot
Water from drift at 0' to 96'.
Static level 26' below casing top which is 0' above GL

Driller's Log filed
Sample set # 55586 (0' - 97') Received: October 1, 1968

Owner Address: Meredosia, IL
Location source: Location from permit

Permit Date: January 1, 1968 **Permit #:** NF 4614

COMPANY Diehl Pump and Supply Co.
FARM National Starch
DATE DRILLED August 31, 1968 **NO.** 7
ELEVATION 0 **COUNTY NO.** 00421
LOCATION 0'N 0'E SW/c NW SE NE
LATITUDE 39.813492 **LONGITUDE** -90.569044
COUNTY Morgan **API** 121370042100 28 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Test Hole	Top	Bottom
ss #57364	0	0
sandy top soil	0	18
fine sand	18	45
fine sand, small gravel	45	55
fine sand	55	65
fine sand, small gravel	65	93
very large boulders	93	95
rock at	95	95
Total Depth		95

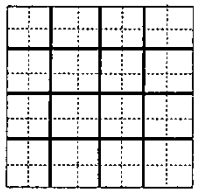
Casing: 26" 3/8 WALL from 0' to 63'
12" 48 POUND from 0' to 68'
Screen: 25' of 12" diameter 40 slot
Water from glacial drift at 0' to 95'.
Static level 25' below casing top which is 2' above GL
Pumping level 34' when pumping at 1000 gpm for 6 hours

Remarks: see file for detail sample study
Driller's Log filed
Sample set # 57364 (2' - 93') Received: February 4, 1971

Owner Address: Meredosia, IL
Location source: Location from permit

Permit Date: June 24, 1970 **Permit #:** 10077

COMPANY Diehl Pump and Supply Co.
FARM National Starch
DATE DRILLED December 18, 1970 **NO.** 8
ELEVATION 0 **COUNTY NO.** 00628
LOCATION 1800'N line, 625'E line of NE
LATITUDE 39.813907 **LONGITUDE** -90.566585
COUNTY Morgan **API** 121370062800 28 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Test Hole	Top	Bottom
#54997	0	0
Sandy clay	0	21
fine sand, very little gravel	21	60
sand & gravel	60	90
Total Depth		90

Casing: 18" CASING STEEL 3/8" from 0' to 60'
12" STEEL WALL from 0' to 67'

Screen: 25' of 10" diameter 35 slot

Size hole below casing: 18"

Water from glacial drift at 0' to 0'.
Static level 27' below casing top which is 0' above GL
Pumping level 47' when pumping at 780 gpm for 3 hours

Driller's Log filed

Sample set # 54997 (50' - 91.5') Received: December 14, 1967

Owner Address: Meredosia, IL

Location source: Location from permit

Permit Date: January 1, 1967 **Permit #:** 3350

COMPANY Diehl Pump and Supply Co.

FARM National Starch

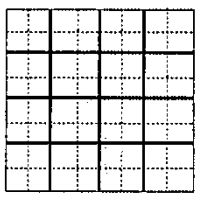
DATE DRILLED February 1, 1968 **NO.** 6

ELEVATION 0 **COUNTY NO.** 00396

LOCATION 1800'N line, 900'E line of NE

LATITUDE 39.81392 **LONGITUDE** -90.567569

COUNTY Morgan **API** 121370039600 28 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Test Hole	Top	Bottom
ss #60435	0	0
sand	0	40
sand & fine gravel	40	90
rock at	90	90
Total Depth		90

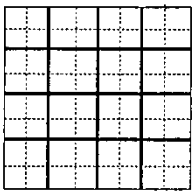
Casing: 16" from -2' to 65'
Screen: 25' of 16" diameter slot
Static level 25' below casing top which is 0' above GL
Pumping level 38' when pumping at 1075 gpm for 2 hours

Sample set # 60435 (0' - 90') Received: August 30, 1976

Owner Address: ,
Location source: Location from permit

Permit Date: January 20, 1976 **Permit #:** 44276

COMPANY owner
FARM National Starch & Chem.Co
DATE DRILLED February 17, 1976 **NO.** 10
ELEVATION 0 **COUNTY NO.** 20682
LOCATION 1403'N line, 332'E line of NE
LATITUDE 39.81499 **LONGITUDE** -90.565535
COUNTY Morgan **API** 121372068200 28 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Industrial Water Well	Top	Bottom
e brown sand	0	40
fine light brown sand	40	55
medium to coarse brown sand & gravel	55	90
Total Depth		91

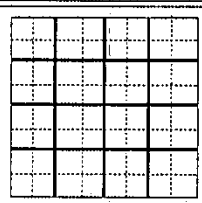
Casing: 16" BLACK 375 from -2' to 64'
Screen: 25' of 16" diameter .08 slot
Grout: CEMENT from 0 to 20.

Water from sand & gravel at 64' to 91'.
Static level 28' below casing top which is 2' above GL
Pumping level 36' when pumping at 800 gpm for 6 hours
Permanent pump installed at 50'
on November 10, 1988, with a capacity of 800 gpm

Owner Address: South Washington St. Meredosia, IL
Location source: Location from permit

Permit Date: September 23, 1988 **Permit #:** 006133

COMPANY Peterson, Steven R.
FARM National Starch-Chemical Co.
DATE DRILLED October 11, 1988 **NO.**
ELEVATION 0 **COUNTY NO.** 21398
LOCATION NE NE NE
LATITUDE 39.817955 **LONGITUDE** -90.565139
COUNTY Morgan **API** 121372139800 28 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Industrial Water Well	Top	Bottom
SS #67434 (0'-80.5')	0	0
fine reddish brown sand	0	15
fine-med lt brown to reddish brown sand	15	25
fine-medium light brown sand	25	30
med lt brn sand, some cobbles in samples	30	45
medium light brown sand	45	50
med lt brown sand, lignite in sample	50	55
medium to fine light brown sand	55	60
medium light brown sand	60	80
medium to fine light brown sand	80	81
Total Depth		81

Casing: 8" CARBON STEEL 24.7# from -2' to 58'
Screen: 20' of 8" diameter 60 slot
Grout: CONCRETE from 0 to 20.

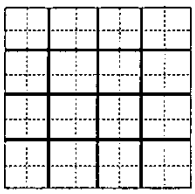
Size hole below casing: 34"

Water from at 24' to 81'.
Static level 24' below casing top which is 2' above GL
Pumping level 26' when pumping at 0 gpm for 1 hour
Permanent pump installed at 50'
on March 8, 1991, with a capacity of 80 gpm
Sample set # 67434 (0' - 80.5') Received: April 17, 1981

Owner Address: S. Washington Meredosia, IL
Location source: Location from the driller

Permit Date: January 15, 1991 **Permit #:** 13736

COMPANY Skouby, Marion
FARM National Starch
DATE DRILLED February 13, 1991 **NO.**
ELEVATION 0 **COUNTY NO.** 21647
LOCATION SW NE NE
LATITUDE 39.816167 **LONGITUDE** -90.56688
COUNTY Morgan **API** 121372164700 28 - 16N - 13W



Page 1 **ILLINOIS STATE GEOLOGICAL SURVEY**

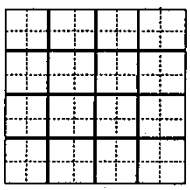
Water Well	Top	Bottom
ss #20134	0	0
sand	0	30
sand, coarse	30	40
Total Depth		40

Casing: 8" from 0' to 0'
Screen: 10' of " diameter 16 slot

Driller's Log filed
Sample set # 20134 (0' - 40') Received: January 1, 1950

Owner Address:
Location source: Location from the driller

Permit Date: **Permit #:**



COMPANY owner
FARM Meredosia, Village of
DATE DRILLED April 1, 1950 **NO.** 1
ELEVATION 455GL **COUNTY NO.** 00514
LOCATION 900'N line, 3000'E line of section
LATITUDE 39.831189 **LONGITUDE** -90.5543
COUNTY Morgan **API** 121370051400 **22 - 16N - 13W**

Page 1 **ILLINOIS STATE GEOLOGICAL SURVEY**

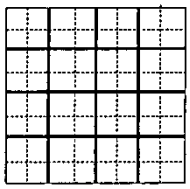
Municipal Water Supply	Top	Bottom
no record	0	84
Total Depth		84

Casing: 8" CASING from 0' to 70'
8" SCREEN from 70' to 84'
Screen: 14' of 8" diameter 25 slot
Water from coarse sand at 69' to 84'.

Owner Address: ,
Address of well: 120' NNE of WTP

Permit Date: **Permit #:**

COMPANY Elmer W. Franke/Calhoun Drlg.
FARM Meredosia, Village
DATE DRILLED September 1, 1973 **NO.** 3
ELEVATION 0 **COUNTY NO.** 21944
LOCATION SE NE NW
LATITUDE 39.830881 **LONGITUDE** -90.554188
COUNTY Montgomery **API** 121352194400 **22 - 16N - 13W**



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
Total Depth		88

Permit Date: Permit #: 37760

COMPANY

FARM Meredosia Village

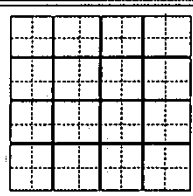
DATE DRILLED NO. 4

ELEVATION 0 COUNTY NO. 20971

LOCATION 805'N line, 2950'E line of NE

LATITUDE 39.83145 LONGITUDE -90.554082

COUNTY Morgan API 121372097100 22 - 16N - 13W



Page 1 **ILLINOIS STATE GEOLOGICAL SURVEY**

Water Well	Top	Bottom
ss #20135	0	0
s,lgt brn,f,rndd,well srtd,drty,noncalc	0	5
s,lgt brn,f,rndd,well srtd,few calc grns	5	10
s,f,rndd,well srtd,few calc grns,clean	10	25
sand,light brown,fine/med,clean,noncalc	25	30
s,lgt brn,f/med,clean,few calc grns	30	35
sand,lgt brn,f/vy crd,clean,mly calc	35	40
Pleistocene	5	40
Total Depth		40

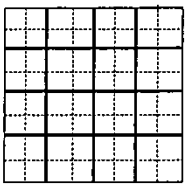
Casing: 8" from 0' to 0'
Screen: 10' of " diameter 16 slot

Remarks: see logbook for detail sample study
Driller's Log filed
Survey Sample Study filed
Sample set # 20135 (0' - 40') Received: January 1, 1950

Owner Address:
Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner
FARM Meredosia, Village of
DATE DRILLED April 1, 1950 **NO.** 2
ELEVATION 0 **COUNTY NO.** 00515
LOCATION 725'S 10'W NE/c NW
LATITUDE 39.831665 **LONGITUDE** -90.552929
COUNTY Morgan **API** 121370051500 22 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

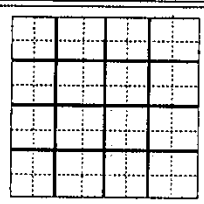
Municipal Water Supply	Top	Bottom
no record	0	25
sand & gravel	25	92
Total Depth		92

Casing: 10" CASING from -1' to 72'
10" SCREEN from 72' to 92'
Screen: 20' of 10" diameter slot
Water from sand & gravel at 25' to 92'.
Static level 27' below casing top which is 1' above GL
Pumping level 32' when pumping at 300 gpm for 3 hours

Owner Address:
Address of well: 200' NNW of WTP

Permit Date: Permit #:

COMPANY Albrecht Well Drilling Inc
FARM Meredosia, Village
DATE DRILLED September 2, 1980 NO. 5
ELEVATION 0 COUNTY NO. 21945
LOCATION 612'S line, 2425'E line of section
LATITUDE 39.820473 LONGITUDE -90.553748
COUNTY Montgomery API 121352194500 22 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Engineering Test	Top	Bottom
railroad embankment ballast stone, cinders, & silty clay loam fill drilled 5' to seat augers	0	5
brown silty clay loam moist (v. stiff)	5	8
brown silty clay loam moist (hard)	8	10
dark brown & grey silty clay loam moist (v. stiff)	10	13
dark brown & grey silty clay moist (v. stiff)	13	18
grey clay v. moist (stiff)	18	20
grey & brown clay v. moist (medium)	20	23
grey & brown clay v. moist (stiff)	23	25
grey & brown clay v. moist (medium)	25	28
grey & brown silty clay loam v. moist (stiff)	28	30
grey silty clay v. moist (stiff)	30	33
grey silty clay v. moist (medium)	33	35
grey clay loam wet (soft)	35	38
grey silty clay loam v. moist (soft)	38	40
grey sand (coarse) w/medium pebble gravel wet (v. loose)	40	43
grey sand (coarse) w/some small gravel wet medium	43	45
brown sand (medium) w/some small gravel wet (medium)	45	50
brown sand (medium) wet (medium)	50	53
brown sand (medium-coarse) w/some small gravel wet (medium)	53	55
brown sand (medium-coarse) w/some small gravel wet (dense)	55	58

Permit Date: **Permit #:**

COMPANY IL Dept. of Transportation

FARM FAS 2585 P-96-056-85

DATE DRILLED June 9, 1986 **NO.** 1(NW.Abut)

ELEVATION 438GL **COUNTY NO.** 21245

LOCATION 0'S 0'W NE/c SW SE NW

LATITUDE 39.833731 **LONGITUDE** -90.582965

COUNTY Pike **API** 121492124500 1 - 3S - 2W

 ILLINOIS STATE GEOLOGICAL SURVEY

wn sand (coarse) w/some small gravel (medium)	58	60
brown sand (coarse) w/some medium pebble gravel wet (dense)	60	65
brown sand (medium-coarse) w/some fine pebble gravel wet (dense	65	70
brown sand (medium-coarse) w/some gravel wet (dense)	70	71.5
Total Depth		71

IL Dept. of Transportation FAS 2585 P-96-056-8 1(NW.Abut)

COUNTY Pike API 121492124500 1 - 3S - 2W

ILLINOIS STATE GEOLOGICAL SURVEY

Engineering Test	Top	Bottom
brown-brown & grey silty clay loam moist (stiff)	0	7
grey & brown silty clay loam v. moist (medium)	7	9
grey silty clay wet (medium)	9	12
grey silty clay wet (soft)	12	14
grey silty clay wet (medium)	14	17
grey silty clay wet (soft)	17	22
grey clay loam wet (soft)	22	27
grey sand (fine-medium) w/some clay bonding wet (v. loose)	27	29
grey sand (medium-coarse) w/some medium pebble gravel wet (medium)	29	39
grey sand (fine-medium) wet (medium)	39	44
grey sand (medium-coarse) w/some fine pebble gravel wet (medium)	44	49
grey sand (medium-coarse) w/some medium pebble gravel wet (medium)	49	57
grey sand (medium-coarse) w/some medium pebble gravel wet (dense)	57	60.5
Total Depth		60

Permit Date: **Permit #:**

COMPANY IL Dept. of Transportation

FARM FAS 2585 Illinois Route 99

DATE DRILLED June 19, 1986 **NO.** 2(SE.Abut)

ELEVATION 427GL **COUNTY NO.** 21246

LOCATION SW SE NW

LATITUDE 39.832804 **LONGITUDE** -90.584075

COUNTY Pike **API** 121492124600 1 - 3S - 2W

ILLINOIS STATE GEOLOGICAL SURVEY

Engineering Test	Top	Bottom
concrete pavement & subbase material	0	3
dark grey silty clay loam moist (soft)	3	7
dark grey silty clay loam moist (stiff)	7	12
grey & brown silty clay moist (stiff)	12	14
grey sand (fine) wet (v. loose)	14	19
grey sand (fine) wet (loose)	19	22
grey sand (fine) wet (medium)	22	27
grey sand (medium) wet (medium)	27	37
grey sand (medium-coarse) w/some gravel wet (dense)	37	42
grey sand (medium) wet (medium)	42	54
grey sand (medium-coarse) w/some fine pebble gravel wet (dense)	54	59
grey sand (medium-coarse) w/some fine pebble gravel wet (medium)	59	64
grey sand (medium-coarse) w/some fine pebble gravel wet (dense)	64	67
standard 50 tsf bearing achieved. augered and additional 10' to check for possible limestone bedrock	67	70
grey sand w/some gravel throughout wet (medium-dense) from elev.365.7 to 354.7	70	78
Total Depth		78

Permit Date: **Permit #:**

COMPANY IL Dept. of Transportation

FARM FAP 745 Il. Rte. 104

DATE DRILLED June 3, 1986 **NO.** 2(W.Abut)

ELEVATION 433GL **COUNTY NO.** 21248

LOCATION 2640'N line, 2640'W line of section

LATITUDE 39.831966 **LONGITUDE** -90.579769

COUNTY Pike **API** 121492124800 1 - 3S - 2W

ILLINOIS STATE GEOLOGICAL SURVEY

Engineering Test	Top	Bottom
concrete pavement & subbase material	0	2
brown sand (medium) moist (loose) w/some shells @ 9.5 - 10.5'	2	10.5
grey clay moist (medium)	10.5	14
grey clay moist (stiff)	14	17
grey silty clay v. moist (medium)	17	19
grey sand (fine) wet (loose)	19	22
grey sand (fine) wet (v. loose)	22	24
grey sand (fine) wet (loose)	24	27
grey sand (fine) wet (medium)	27	29
grey sand (fine) wet (loose)	29	31
grey sand (medium) wet (medium)	31	37
grey sand (fine-medium) wet (medium)	37	44
grey fine pebble gravel wet (medium)	44	49
grey gravel (fine-medium pebble) wet (medium)	49	54
brown sand (coarse) w/some gravel wet (dense)	54	59
grey sand (fine) wet (dense)	59	63.5
grey sand (fine) wet (medium)	63.5	65.5
Total Depth		65

Permit Date: **Permit #:**

COMPANY IL Dept. of Transportation

FARM FAP 745 Ill. RTE. 104

DATE DRILLED June 2, 1986 **NO.** 1 (E.Abut)

ELEVATION 436GL **COUNTY NO.** 21247

LOCATION

LATITUDE 39.831875 **LONGITUDE** -90.579775

COUNTY Pike **API** 121492124700 1 - 3S - 2W

ILLINOIS STATE GEOLOGICAL SURVEY

Test Hole	Top	Bottom
#56380	0	0
ne sand	0	20
fine sand, small gravel	20	45
fine sand, coarse gravel	45	55
fine sand, small gravel	55	71
medium sand, small gravel	71	85
medium sand, large gravel	85	90
Total Depth		90

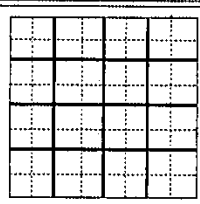
Casing: 24" 3/8 WALL from 0' to 60'
12" 52 LB. from 0' to 64'
Screen: 26' of 12" diameter 60 slot
Water from sand & gravel at 0' to 90'.
Static level 14' below casing top which is 2' above GL
Pumping level 32' when pumping at 1000 gpm for 8 hours

Remarks: see file for detail sample study
Driller's Log filed
Sample set # 56380 (0' - 90') Received: August 26, 1969

Owner Address: Meredosia, IL
Location source: Location from permit

Permit Date: June 29, 1969 **Permit #:** 06700

COMPANY Lorenz D A
FARM W.R. Grace Co.
DATE DRILLED September 11, 1969 **NO.** DL-3
ELEVATION 0 **COUNTY NO.** 00607
LOCATION NE NE NE
LATITUDE 39.817955 **LONGITUDE** -90.565139
COUNTY Morgan **API** 121370060700 28 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

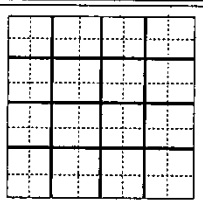
Water Well	Top	Bottom
sand	0	36
sand & gravel	36	67
fine to medium gravel	67	91
Total Depth		91

Casing: 16" STEEL .375 from 3' to 66'
Screen: 25' of 16" diameter .08 slot
Water from drift at 66' to 91'.
Static level 12' below casing top which is 0' above GL
Pumping level 22' when pumping at 1000 gpm for 8 hours

Owner Address: P.O. Box 153 Meredosia, IL
Location source: Location from permit

Permit Date: May 11, 1979 **Permit #:** 85480

COMPANY Hakala, Richard L.
FARM Grace, W.R. & Co.
DATE DRILLED May 15, 1979 **NO.** 4
ELEVATION 0 **COUNTY NO.** 20770
LOCATION 1980'N line, 450'W line of NW
LATITUDE 39.813373 **LONGITUDE** -90.562736
COUNTY Morgan **API** 121372077000 27 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Industrial Water Well	Top	Bottom
fine to medium sand	0	40
dium to coarse sand	40	50
medium sand	50	62
coarse sand to fine gravel	62	73
medium to coarse sand	73	78
fine to medium sand with gravel	78	85
coarse sand & fine to medium gravel	85	90
medium sand to fine gravel	90	91
coarse sand, gravel & boulders	91	95
Total Depth		95

Casing: 24" STEEL from -2' to 65'
24" STAINLESS STL SCREEN from 65' to 94'
Screen: 29' of 24" diameter .05 slot
Grout: NEAT CEMENT from 0 to 20.
Grout: BENTONITE CHIPS from 20 to 27.
Grout: SILICA #2 NORTHERN from 27 to 94.

Water from sand & gravel at 16' to 94'.
Static level 16' below casing top which is 2' above GL
Pumping level 40' when pumping at 2503 gpm for 20 hours
Permanent pump installed at 60'
on January 25, 2011, with a capacity of 1850 gpm
Remarks: driller's est. well yield 3000 gpm
Sample set # 69973 (0' - 95') Received: January 9, 2012
ner Address: ,
ddress of well: 1994 Old Grace Road
Location source: Location from permit

Permit Date: **Permit #:**

COMPANY Water Well Solutions
FARM T.A. Terminal
DATE DRILLED November 23, 2011 **NO.** 6
ELEVATION **COUNTY NO.** 22134
LOCATION NW NW SW
LATITUDE 39.81073 **LONGITUDE** -90.563186
COUNTY Morgan **API** 121372213400 27 - 16N - 13W

 ILLINOIS STATE GEOLOGICAL SURVEY

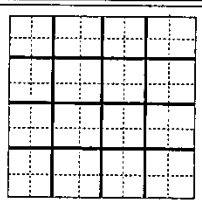
Industrial Water Well	Top	Bottom
fine to medium sand	0	40
medium to coarse sand	40	50
medium sand	50	62
coarse sand to fine gravel	62	73
medium to coarse sand	73	78
fine to medium sand with gravel	78	85
coarse sand & fine to medium gravel	85	90
medium sand to fine gravel	90	91
coarse sand, gravel & flat boulders	91	95
Total Depth		100

Casing: 24" STEEL from -2' to 65'
24" STAINLESS STL SCREEN from 65' to 94'
Screen: 29' of 24" diameter .05 slot
Grout: NEAT CEMENT from 0 to 20.
Grout: BENTONITE CHIPS from 20 to 27.
Grout: SILICA #3 NORTHERN from 27 to 94.

Water from sand & gravel at 20' to 94'.
Static level 20' below casing top which is 2' above GL
Pumping level 43' when pumping at 2485 gpm for 24 hours
Permanent pump installed at 60'
on January 19, 2011, with a capacity of 1850 gpm
Remarks: driller's est. well yield 3000 gpm
Sample set # 69972 (0' - 100') Received: January 9, 2012
Owner Address: ,
Address of well: 1994 Old Grace Road
Location source: Location from permit

Permit Date: **Permit #:**

COMPANY Water Well Solutions
FARM T.A. Terminal
DATE DRILLED November 23, 2011 **NO.** 5
ELEVATION **COUNTY NO.** 22133
LOCATION NW NW SW
LATITUDE 39.81073 **LONGITUDE** -90.563186
COUNTY Morgan **API** 121372213300 27 - 16N - 13W



ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
nd fine	0	30
d coarse	30	50
coarse sand and gravel	50	60
gravel small to large	60	73
Total Depth		73

Casing: 10" STEEL from 0' to 61'
" 12' SCREEN from 0' to 73'
Screen: 12' of 9.5" diameter 50 slot
Water from sand gravel at 61' to 73'.
Static level 4' below casing top which is 3' above GL
Pumping level 15' when pumping at 300 gpm for 2 hours

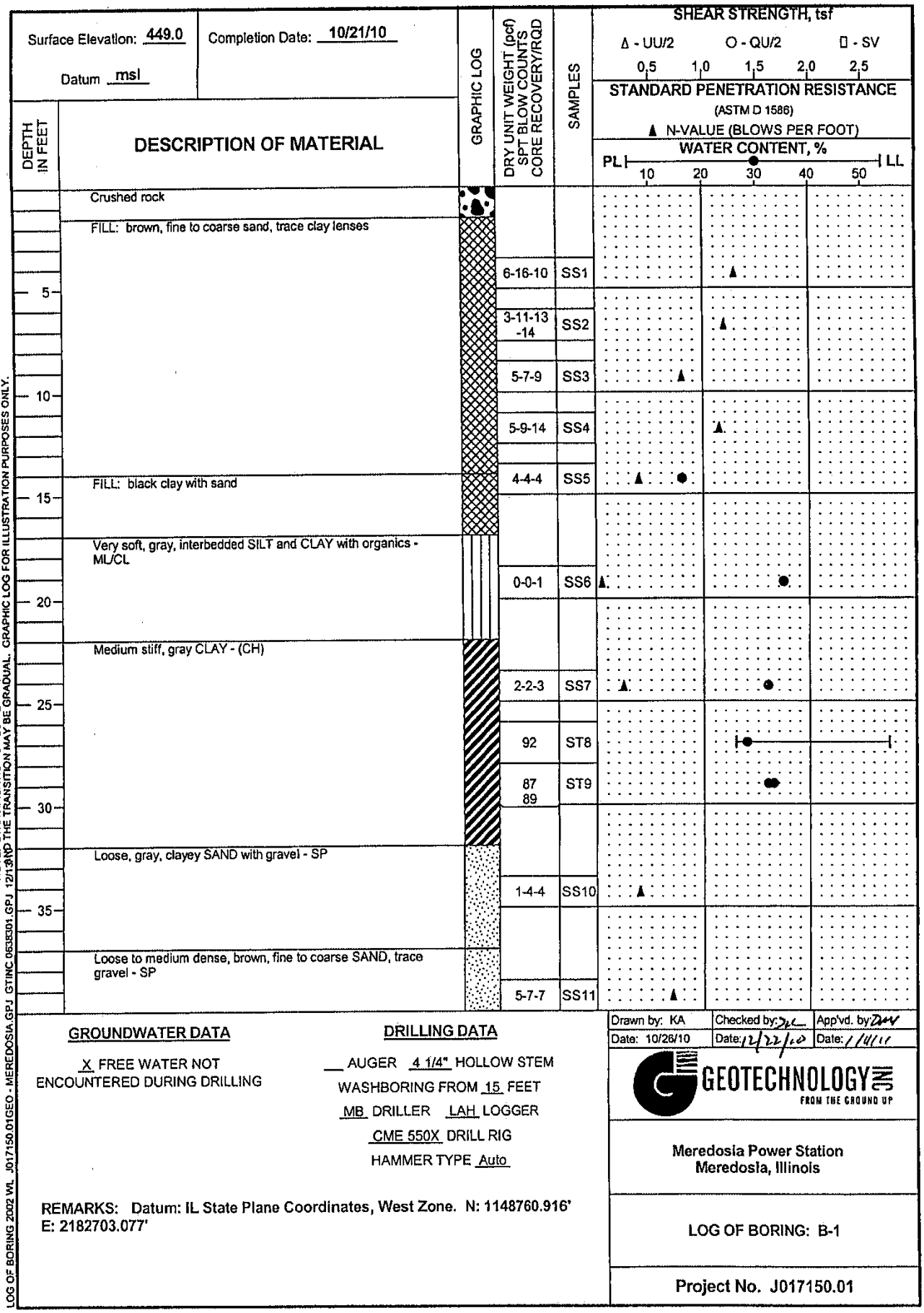
Owner Address: Box 328 Jacksonville, IL
Location source: Platbook verified

Permit Date: December 11, 1975 **Permit #:** 43710

COMPANY Chadwick, G. W.
FARM Ill. Road Contractors Inc.
DATE DRILLED December 20, 1975 **NO.**
ELEVATION 0 **COUNTY NO.** 20621
LOCATION SE SE NE
LATITUDE 39.832804 **LONGITUDE** -90.571759
COUNTY Pike **API** 121492062100 1 - 3S - 2W

APPDENDIX B

BORING LOGS



Surface Elevation: 449.0 | Completion Date: 10/21/10
Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Crushed rock			
	FILL: brown, fine to coarse sand, trace clay lenses		6-16-10	SS1
5			3-11-13 -14	SS2
			5-7-9	SS3
10			5-9-14	SS4
			4-4-4	SS5
15	FILL: black clay with sand			
	Very soft, gray, interbedded SILT and CLAY with organics - ML/CL		0-0-1	SS6
20				
	Medium stiff, gray CLAY - (CH)		2-2-3	SS7
25			92	ST8
			87 89	ST9
30				
	Loose, gray, clayey SAND with gravel - SP		1-4-4	SS10
35				
	Loose to medium dense, brown, fine to coarse SAND, trace gravel - SP		5-7-7	SS11

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC 0635301.GPJ 12/13/11

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM 15 FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: Datum: IL State Plane Coordinates, West Zone. N: 1148760.916' E: 2182703.077'

Drawn by: KA	Checked by:	App'vd. by:
Date: 10/26/10	Date: 12/22/10	Date: 1/11/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

LOG OF BORING: B-1

Project No. J017150.01

Surface Elevation: 449.0 | Completion Date: 10/21/10

Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Loose to medium dense, brown, fine to coarse SAND, trace gravel - SP *(continued)*			
45			4-5-4	SS12
50			5-7-9	SS13
55			9-8-9	SS14
60			7-12-15	SS15
	Boring terminated at 60 feet			
65				
70				
75				

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC 063830I.GPJ 12/13/11

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM 15 FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: Datum: IL State Plane Coordinates, West Zone. N: 1148760.916' E: 2182703.077'

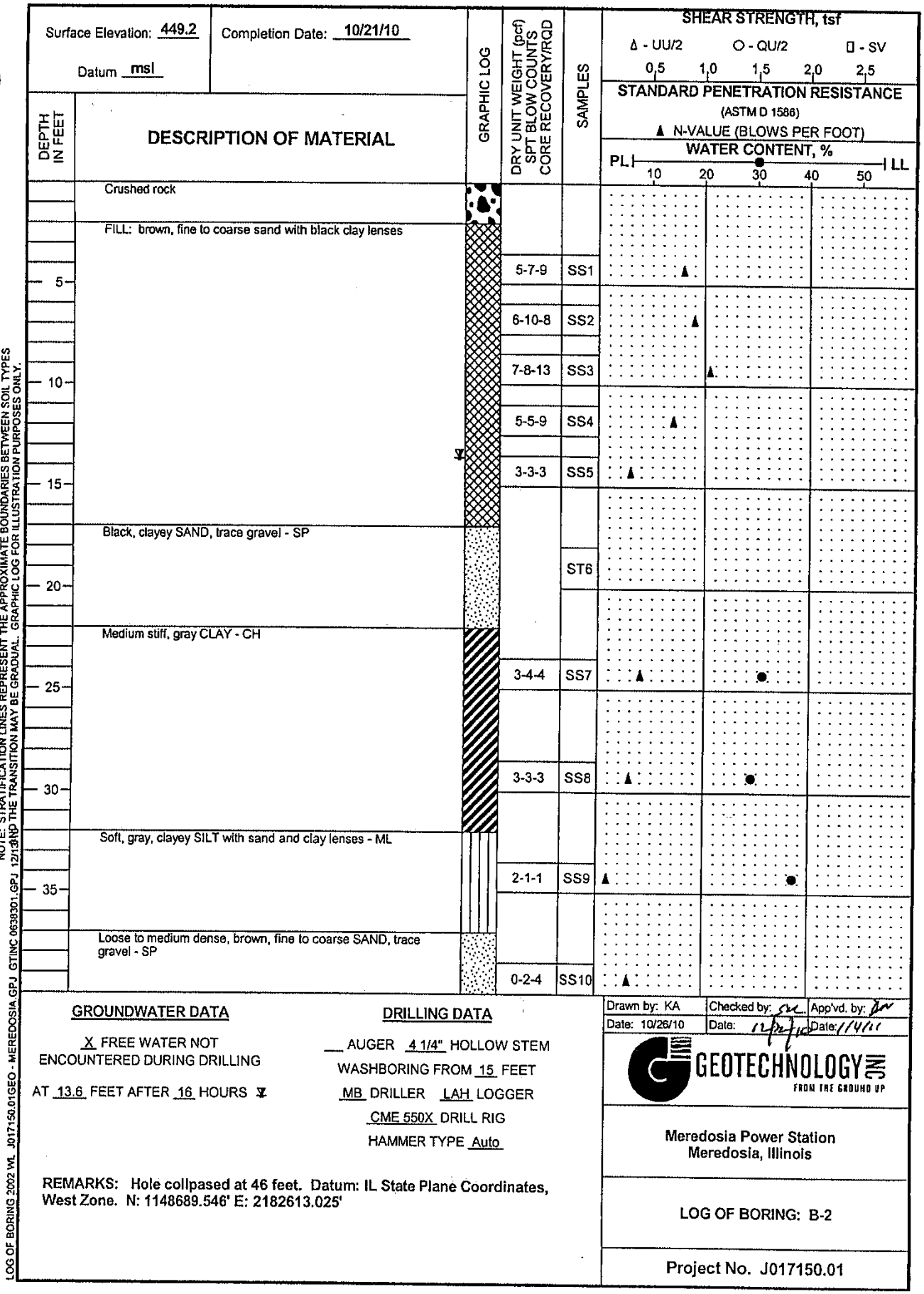
Drawn by: KA	Checked by: SK	App'vd. by: DM
Date: 10/26/10	Date: 12/22/10	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

CONTINUATION OF LOG OF BORING: B-1

Project No. J017150.01



GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

AT 13.6 FEET AFTER 16 HOURS ▼

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM

WASHBORING FROM 15 FEET

MB DRILLER LAH LOGGER

CME 550X DRILL RIG

HAMMER TYPE Auto

REMARKS: Hole collpased at 46 feet. Datum: IL State Plane Coordinates, West Zone. N: 1148689.546' E: 2182613.025'

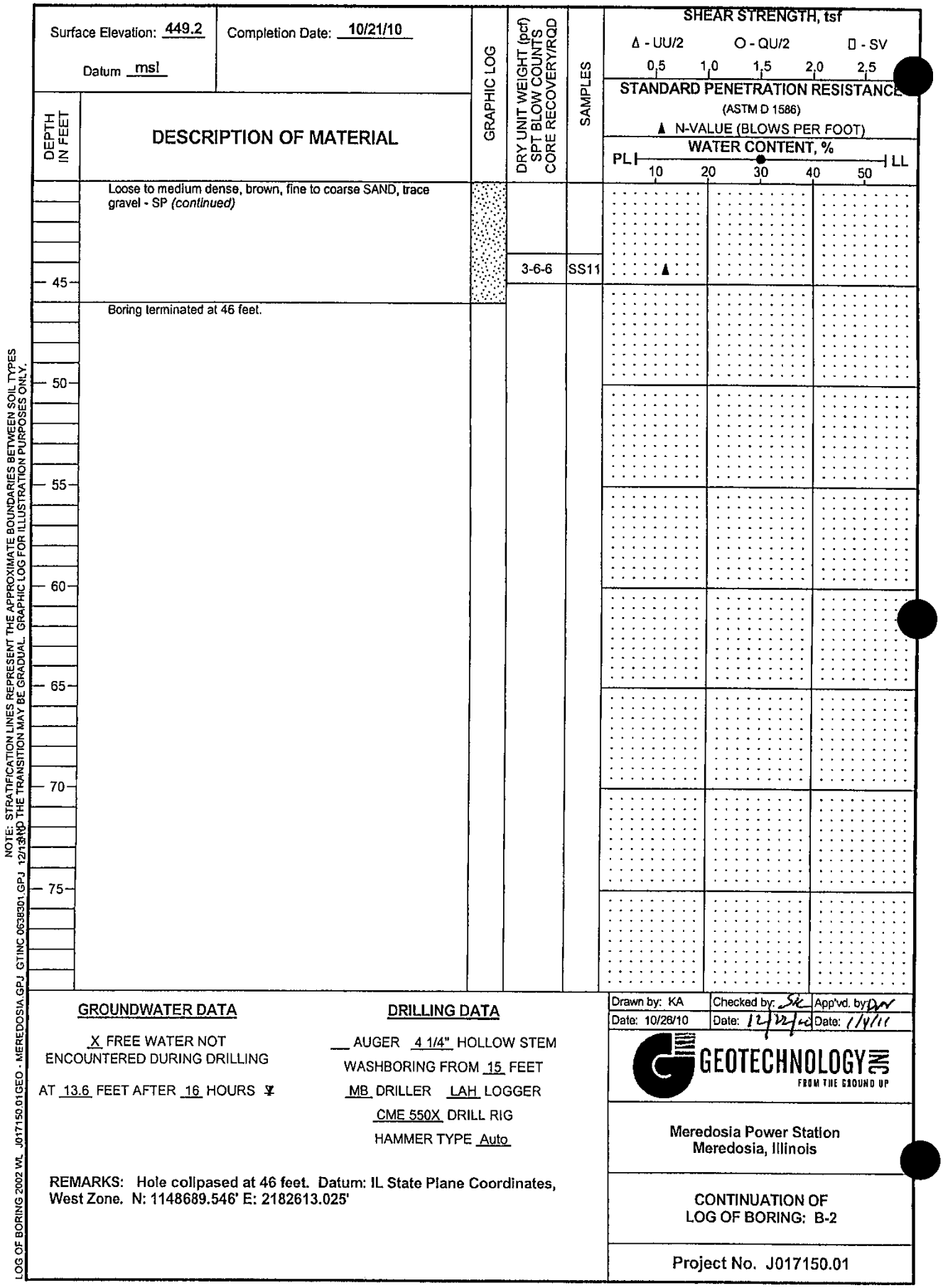
Drawn by: KA	Checked by:	App'vd. by:
Date: 10/26/10	Date: 12/2/10	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

LOG OF BORING: B-2

Project No. J017150.01



Surface Elevation: 449.2 | Completion Date: 10/21/10
Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
45	Loose to medium dense, brown, fine to coarse SAND, trace gravel - SP *(continued)*		3-6-6	SS11
	Boring terminated at 46 feet.			

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5
STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)
WATER CONTENT, %
PL LL
10 20 30 40 50

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 J017150.01GEO - MEREDOSIA.GPJ GTINC 063001.GPJ 12/13/10

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

AT 13.6 FEET AFTER 16 HOURS ▼

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM 15 FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: Hole collpased at 46 feet. Datum: IL State Plane Coordinates, West Zone. N: 1148689.546' E: 2182613.025'

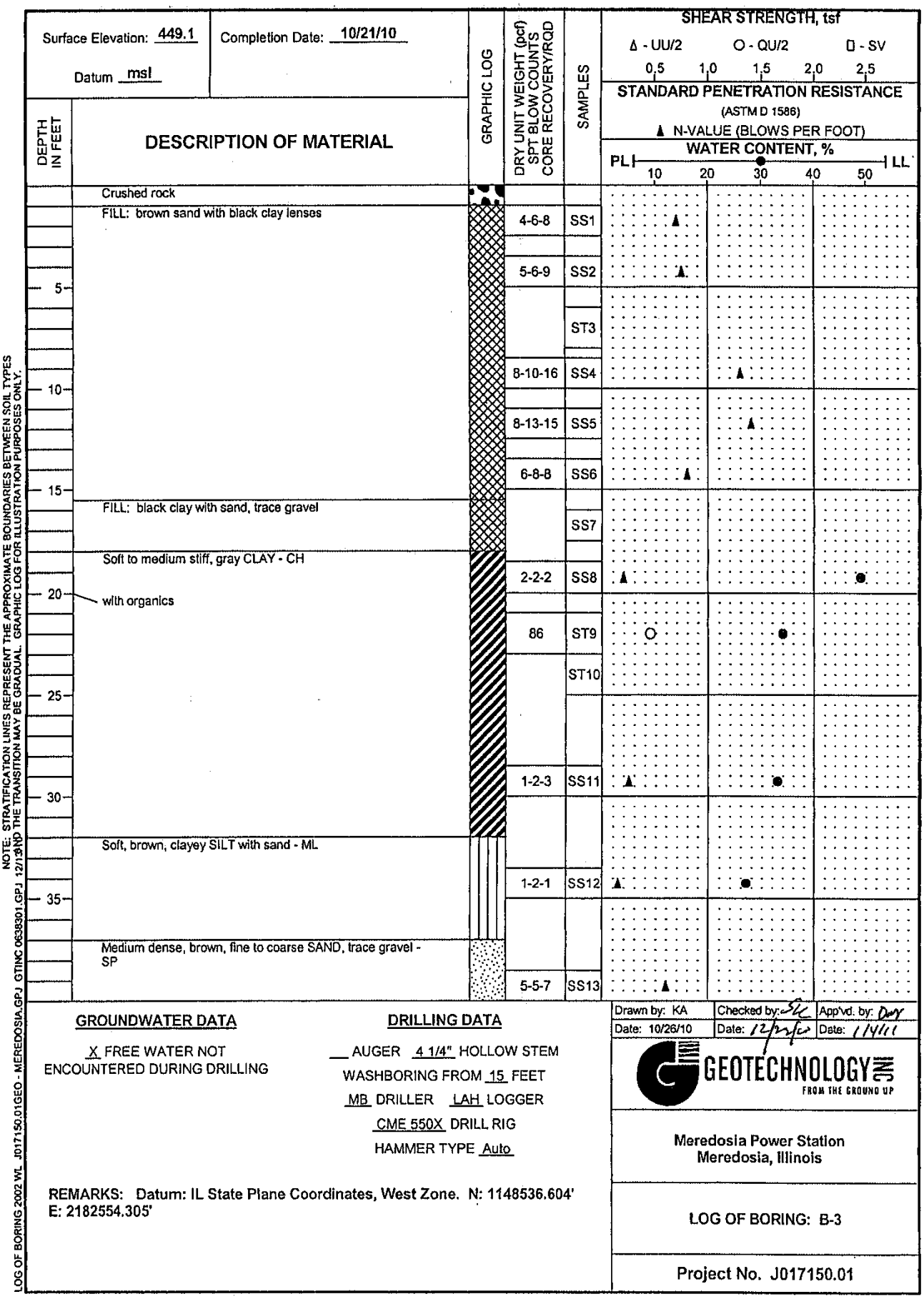
Drawn by: KA | Checked by: SK | App'vd. by: DW
Date: 10/26/10 | Date: 12/22/10 | Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

CONTINUATION OF
LOG OF BORING: B-2

Project No. J017150.01



Surface Elevation: 449.1 | Completion Date: 10/21/10 | Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Crushed rock			
	FILL: brown sand with black clay lenses		4-6-8	SS1
			5-6-9	SS2
5				ST3
			8-10-16	SS4
10			8-13-15	SS5
			6-8-8	SS6
15	FILL: black clay with sand, trace gravel			SS7
	Soft to medium stiff, gray CLAY - CH		2-2-2	SS8
20	with organics		86	ST9
				ST10
25				
			1-2-3	SS11
30				
	Soft, brown, clayey SILT with sand - ML		1-2-1	SS12
35				
	Medium dense, brown, fine to coarse SAND, trace gravel - SP		5-5-7	SS13

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC 0638301.GPJ 12/13/10

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM 15 FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: Datum: IL State Plane Coordinates, West Zone. N: 1148536.604' E: 2182554.305'

Drawn by: KA	Checked by: SC	App'vd. by: DMY
Date: 10/26/10	Date: 12/15/10	Date: 1/14/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

LOG OF BORING: B-3

Project No. J017150.01

Surface Elevation: 449.1 | Completion Date: 10/21/10

Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Medium dense, brown, fine to coarse SAND, trace gravel - SP *(continued)*			
			6-7-7	SS14
45				
			6-7-9	SS15
50				
			5-8-9	SS16
55				
			8-8-13	SS17
60	Boring terminated at 60 feet.			
65				
70				
75				

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
Δ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC 0638301.GPJ 12/13/10

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM 15 FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: Datum: IL State Plane Coordinates, West Zone. N: 1148536.604' E: 2182554.305'

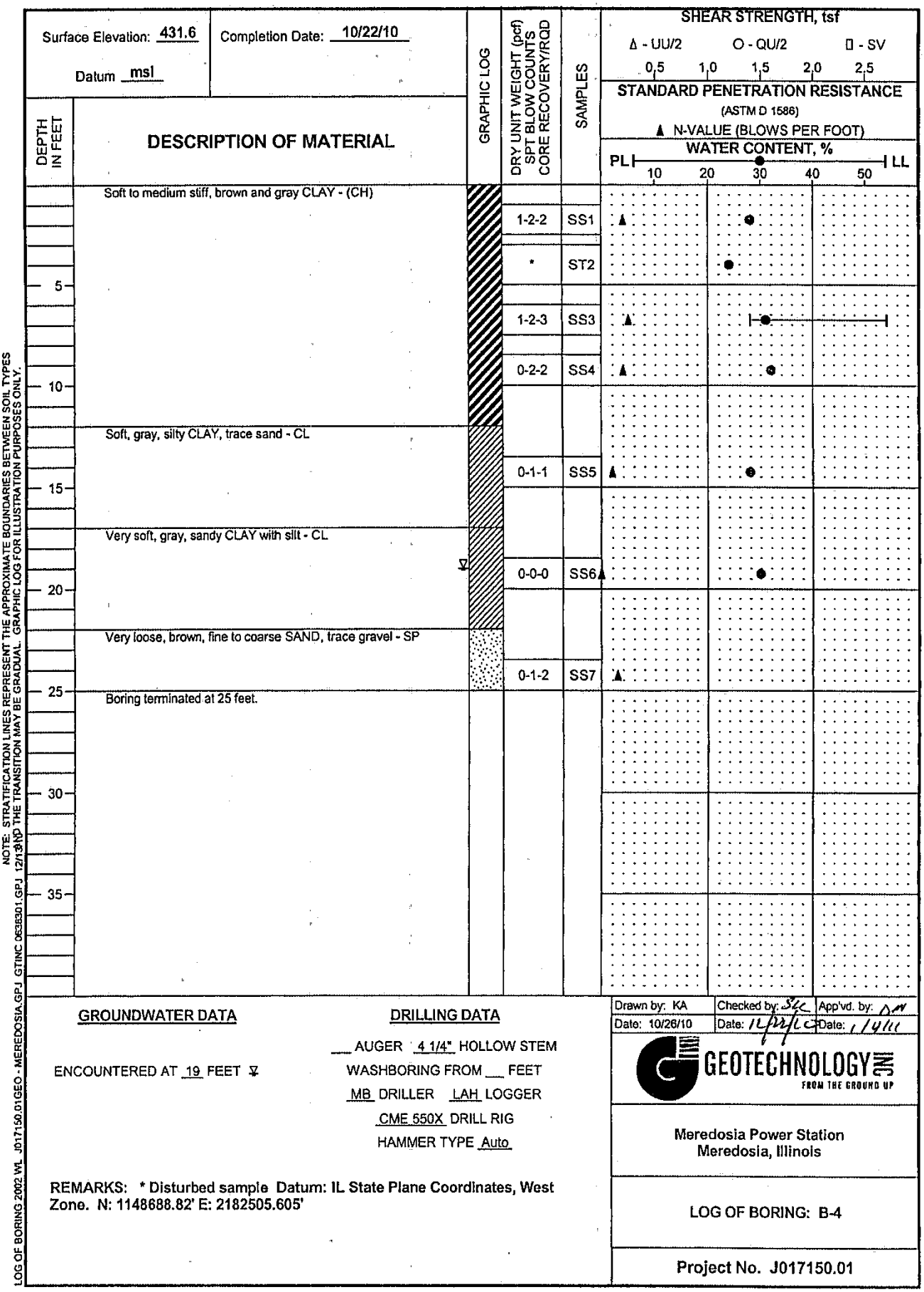
Drawn by: KA	Checked by:	App'vd. by:
Date: 10/26/10	Date: 12/17/10	Date: 1/11/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

CONTINUATION OF LOG OF BORING: B-3

Project No. J017150.01



Surface Elevation: 431.6 | Completion Date: 10/22/10

Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Soft to medium stiff, brown and gray CLAY - (CH)		1-2-2	SS1
			*	ST2
5			1-2-3	SS3
			0-2-2	SS4
10				
	Soft, gray, silty CLAY, trace sand - CL		0-1-1	SS5
15				
	Very soft, gray, sandy CLAY with silt - CL		0-0-0	SS6
20				
	Very loose, brown, fine to coarse SAND, trace gravel - SP		0-1-2	SS7
25	Boring terminated at 25 feet.			
30				
35				

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC 063301.GPJ 12/13/10

GROUNDWATER DATA

ENCOUNTERED AT 19 FEET ▽

DRILLING DATA

___ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM ___ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: * Disturbed sample Datum: IL State Plane Coordinates, West Zone. N: 1148688.82' E: 2182505.605'

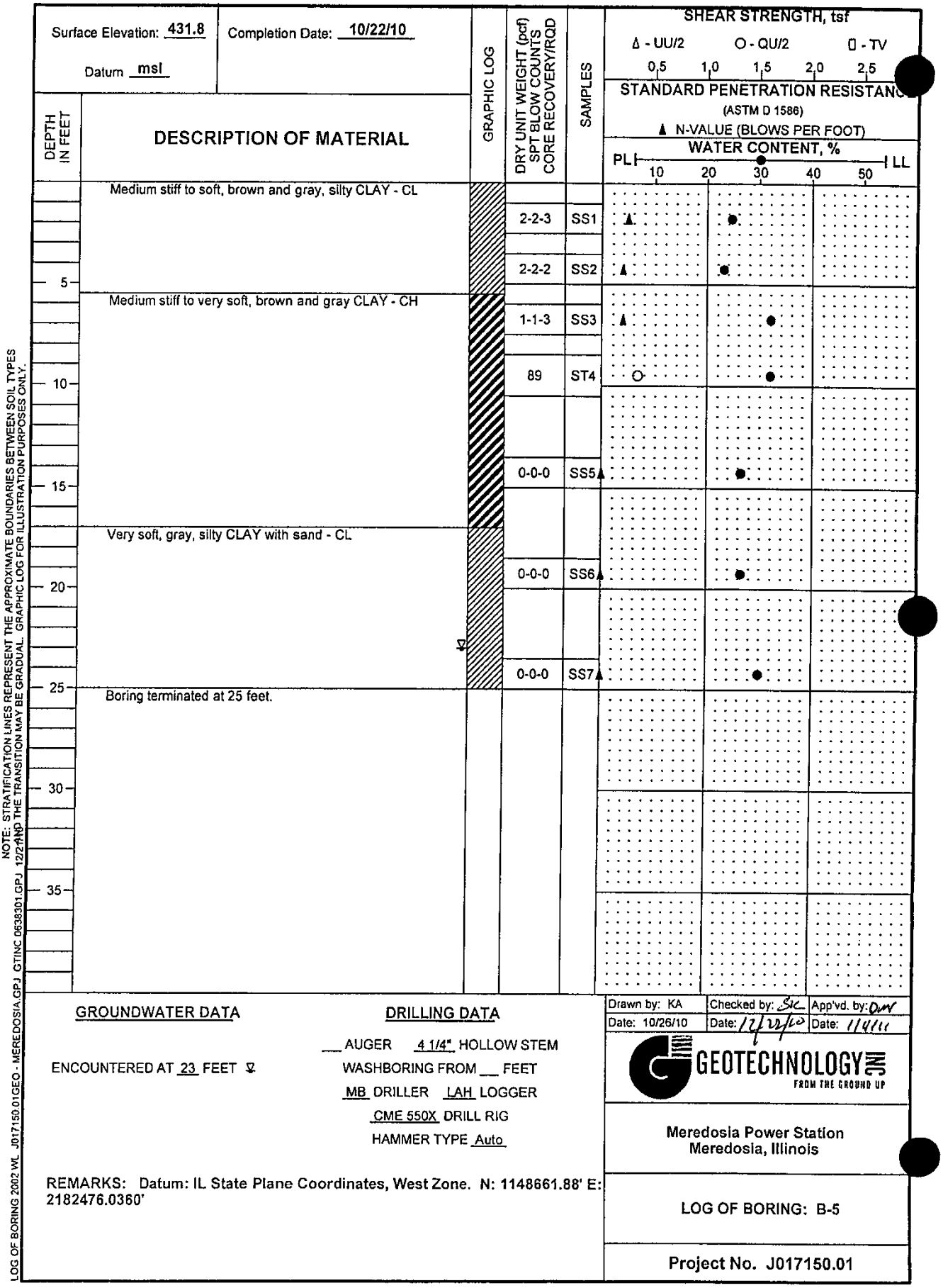
Drawn by: KA	Checked by: SJC	App'vd. by: DAM
Date: 10/26/10	Date: 12/22/10	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

LOG OF BORING: B-4

Project No. J017150.01



Surface Elevation: 431.8 | Completion Date: 10/22/10
Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Medium stiff to soft, brown and gray, silty CLAY - CL			
			2-2-3	SS1
			2-2-2	SS2
5				
	Medium stiff to very soft, brown and gray CLAY - CH			
			1-1-3	SS3
			89	ST4
10				
			0-0-0	SS5
15				
	Very soft, gray, silty CLAY with sand - CL			
			0-0-0	SS6
20				
			0-0-0	SS7
25	Boring terminated at 25 feet.			
30				
35				

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - TV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC 0638301.GPJ 12/2/10

GROUNDWATER DATA

ENCOUNTERED AT 23 FEET ▽

DRILLING DATA

___ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM ___ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: Datum: IL State Plane Coordinates, West Zone. N: 1148661.88' E: 2182476.0360'

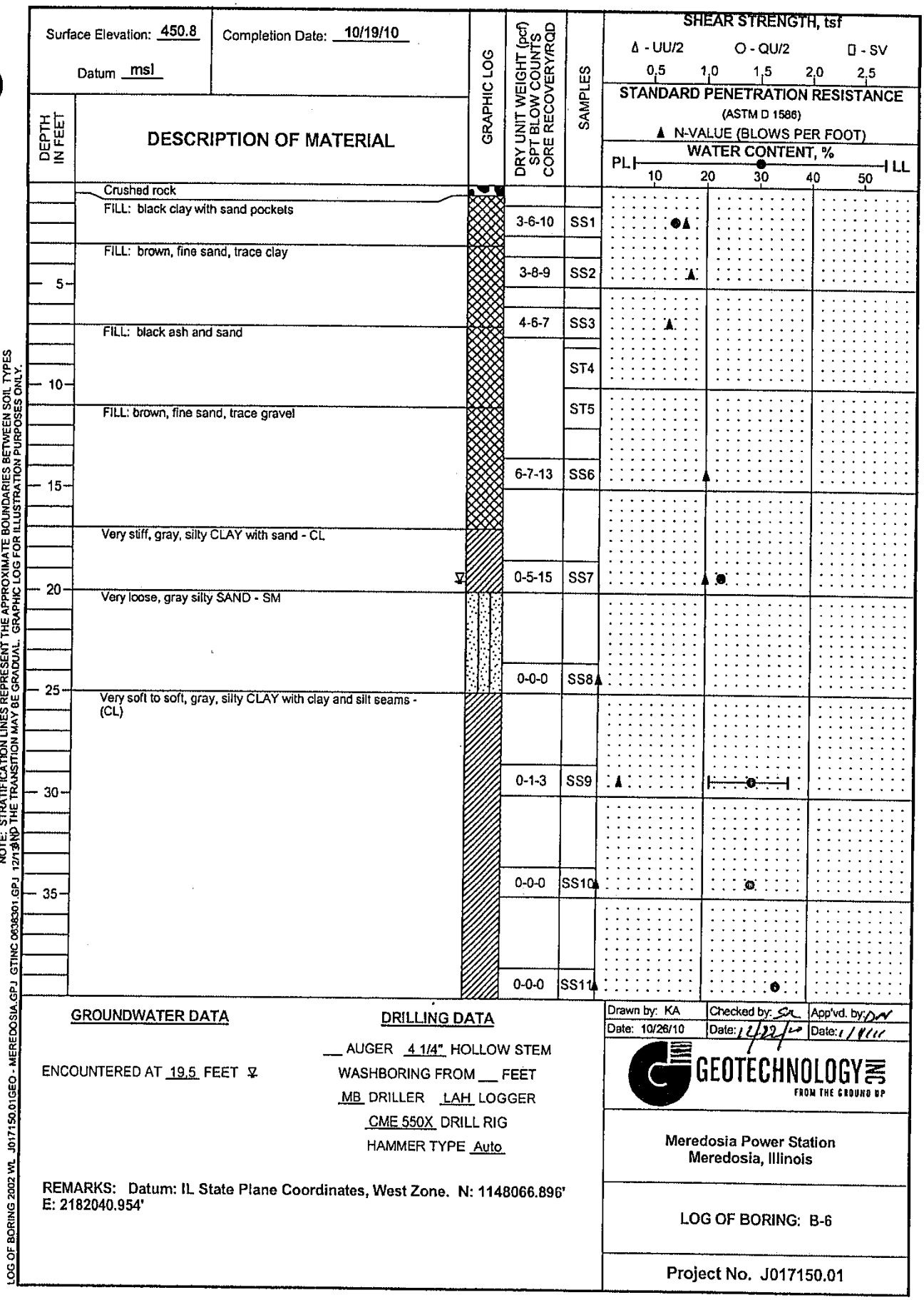
Drawn by: KA	Checked by: SJC	App'vd. by: DMV
Date: 10/26/10	Date: 12/22/10	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

LOG OF BORING: B-5

Project No. J017150.01



Surface Elevation: 450.8 | Completion Date: 10/19/10
Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Crushed rock		
	FILL: black clay with sand pockets	3-6-10	SS1
	FILL: brown, fine sand, trace clay	3-8-9	SS2
5		4-6-7	SS3
	FILL: black ash and sand		ST4
10			ST5
	FILL: brown, fine sand, trace gravel	6-7-13	SS6
15			
	Very stiff, gray, silty CLAY with sand - CL	0-5-15	SS7
20	Very loose, gray silty SAND - SM	0-0-0	SS8
25	Very soft to soft, gray, silty CLAY with clay and silt seams - (CL)	0-1-3	SS9
30		0-0-0	SS10
35		0-0-0	SS11

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC 063630.GPJ 12/13/10

GROUNDWATER DATA

ENCOUNTERED AT 19.5 FEET ▽

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: Datum: IL State Plane Coordinates, West Zone. N: 1148066.896' E: 2182040.954'

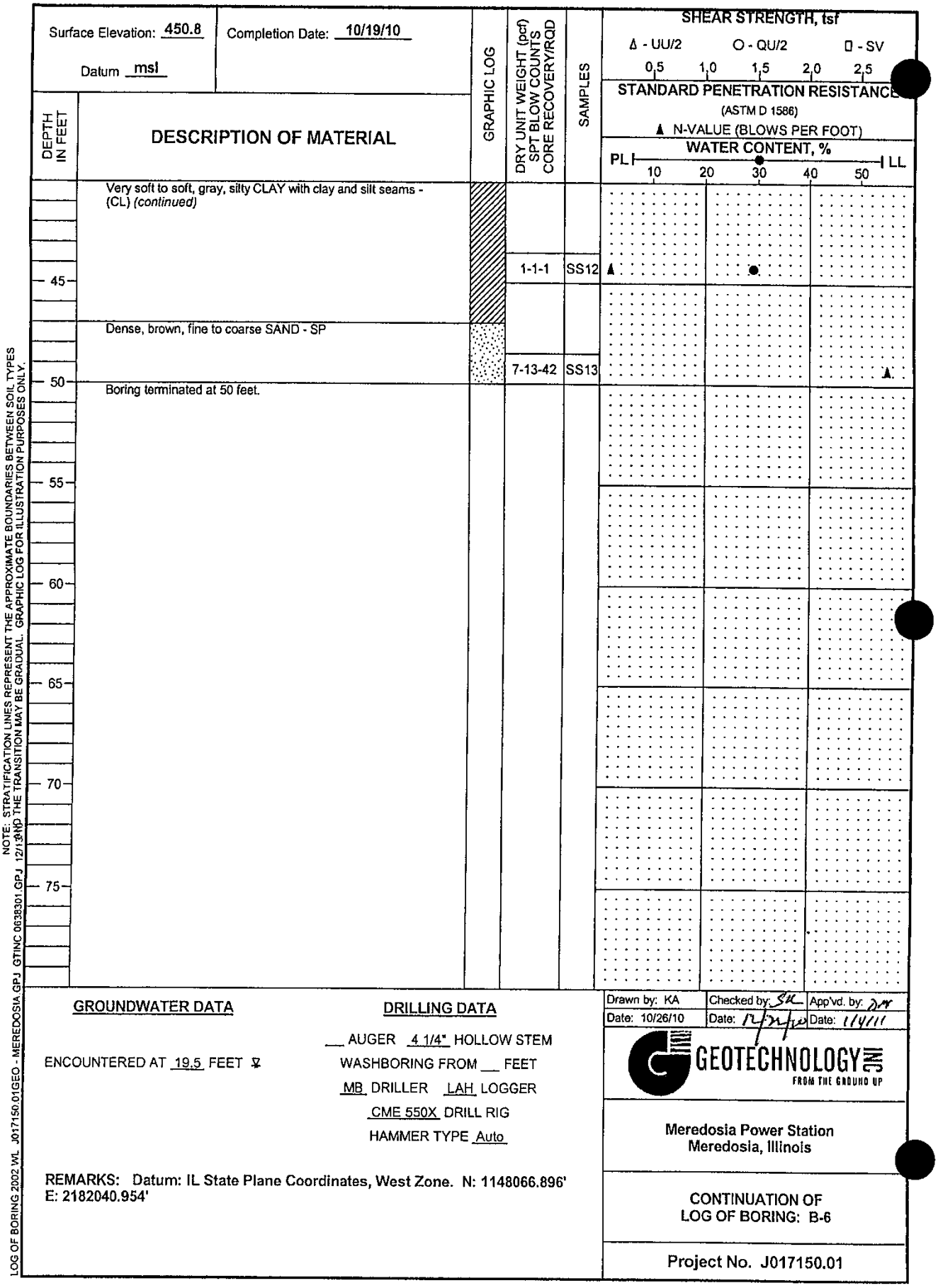
Drawn by: KA	Checked by: SR	App'vd. by: DW
Date: 10/26/10	Date: 12/22/10	Date: 1/19/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

LOG OF BORING: B-6

Project No. J017150.01



Surface Elevation: 450.8 | Completion Date: 10/19/10
Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Very soft to soft, gray, silty CLAY with clay and silt seams - (CL) *(continued)*			
45			1-1-1	SS12
	Dense, brown, fine to coarse SAND - SP			
50			7-13-42	SS13
	Boring terminated at 50 feet.			
55				
60				
65				
70				
75				

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5
STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)
WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC.0638301.GPJ 12/13/10

GROUNDWATER DATA

ENCOUNTERED AT 19.5 FEET ▽

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: Datum: IL State Plane Coordinates, West Zone. N: 1148066.896' E: 2182040.954'

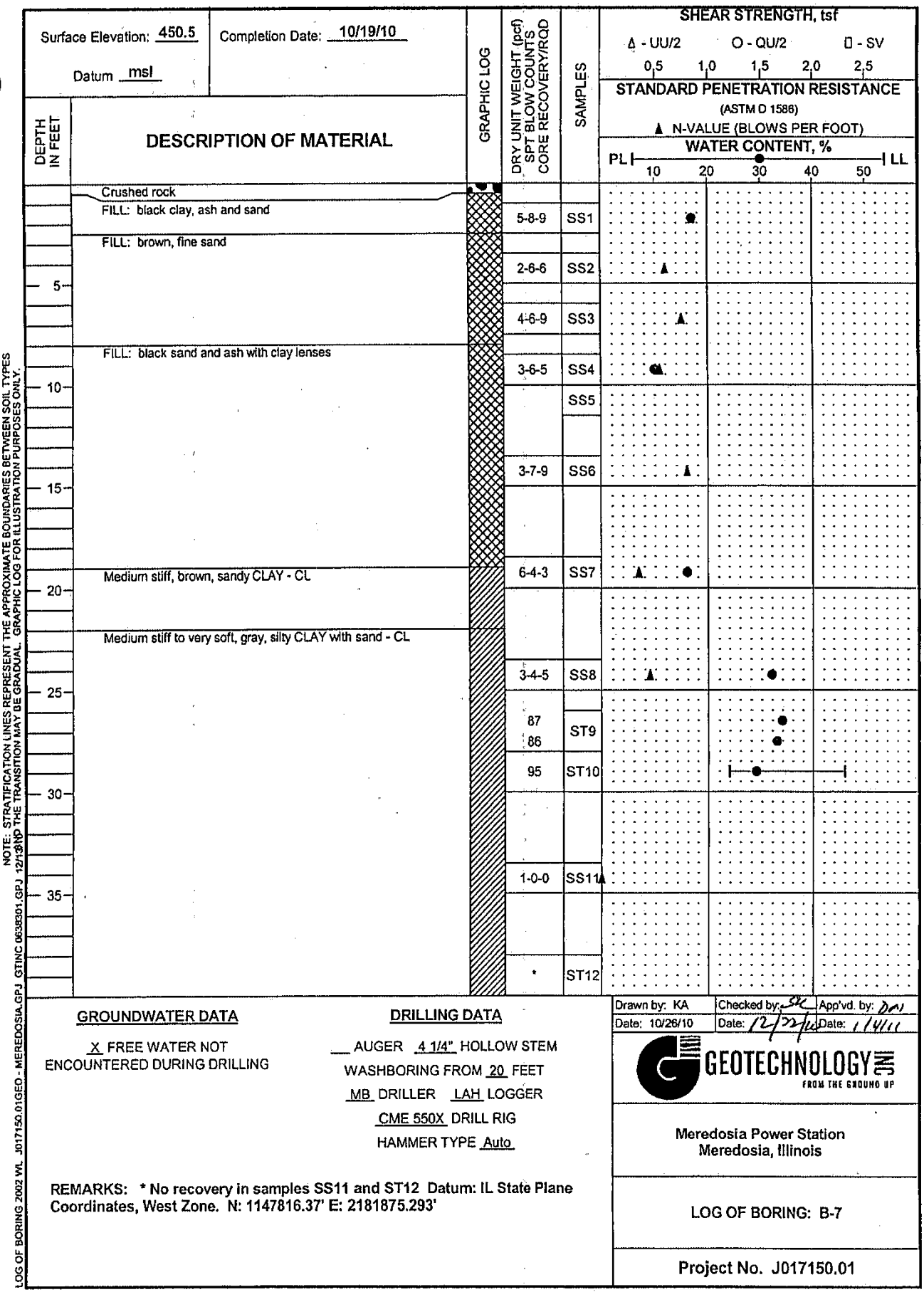
Drawn by: KA	Checked by: SK	App'vd. by: DM
Date: 10/26/10	Date: 11/2/10	Date: 11/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

CONTINUATION OF
LOG OF BORING: B-6

Project No. J017150.01



Surface Elevation: 450.5 | Completion Date: 10/19/10
Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Crushed rock		
	FILL: black clay, ash and sand	5-8-9	SS1
	FILL: brown, fine sand	2-6-6	SS2
5		4-6-9	SS3
	FILL: black sand and ash with clay lenses	3-6-5	SS4
10			SS5
		3-7-9	SS6
15			
	Medium stiff, brown, sandy CLAY - CL	6-4-3	SS7
20			
	Medium stiff to very soft, gray, silty CLAY with sand - CL	3-4-5	SS8
25		87 / 86	ST9
		95	ST10
30			
		1-0-0	SS11
35			
		*	ST12

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC 0638301.GPJ 12/13/10

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM 20 FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: * No recovery in samples SS11 and ST12 Datum: IL State Plane Coordinates, West Zone. N: 1147816.37' E: 2181875.293'

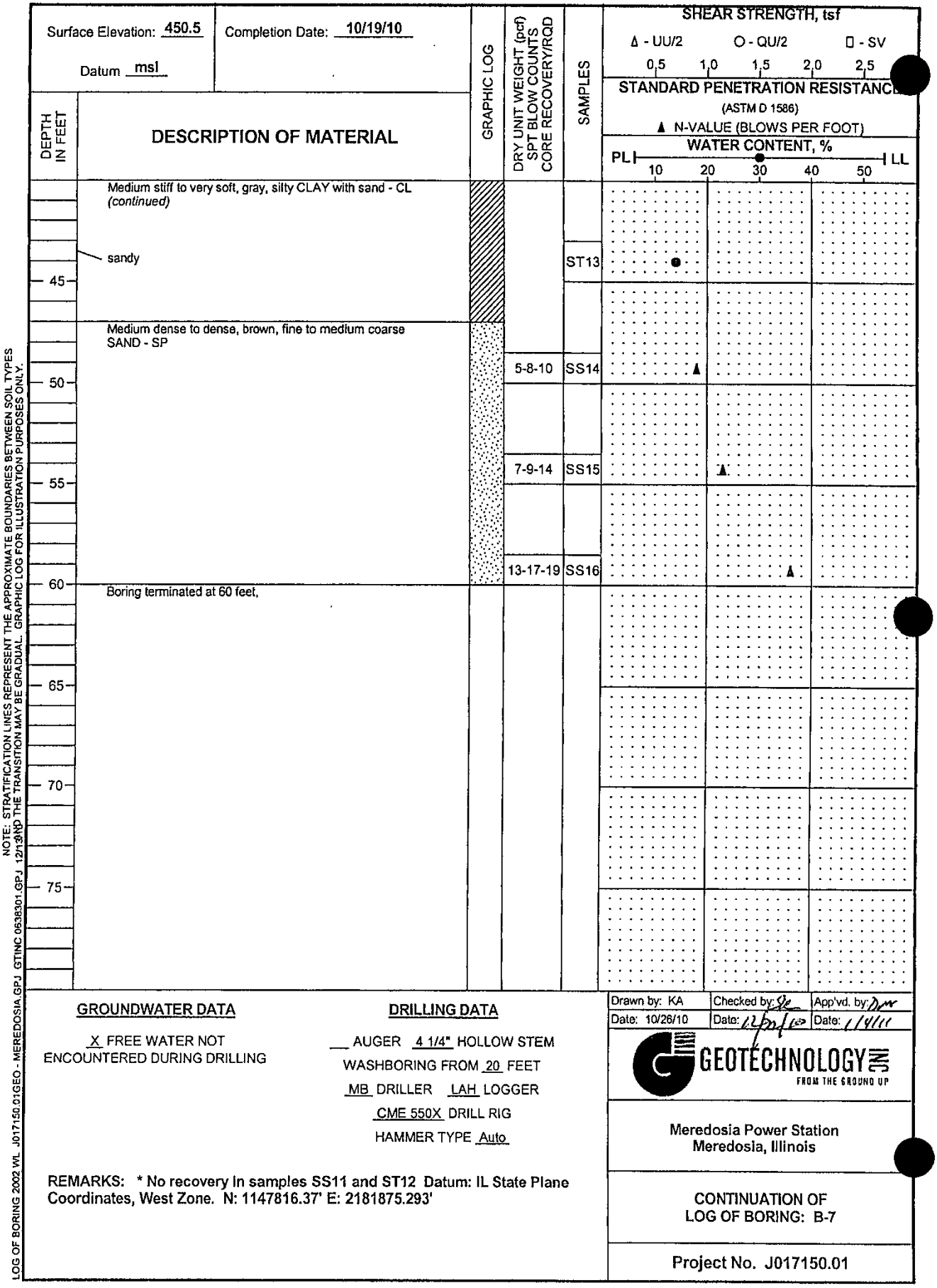
Drawn by: KA	Checked by:	App'vd. by:
Date: 10/26/10	Date: 12/22/10	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

LOG OF BORING: B-7

Project No. J017150.01



Surface Elevation: 450.5 | Completion Date: 10/19/10
Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Medium stiff to very soft, gray, silty CLAY with sand - CL *(continued)*			
	sandy			ST13
45				
	Medium dense to dense, brown, fine to medium coarse SAND - SP		5-8-10	SS14
50				
			7-9-14	SS15
55				
			13-17-19	SS16
60	Boring terminated at 60 feet.			
65				
70				
75				

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC 0538301.GPJ 12/13/10

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM 20 FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: * No recovery in samples SS11 and ST12 Datum: IL State Plane Coordinates, West Zone. N: 1147816.37' E: 2181875.293'

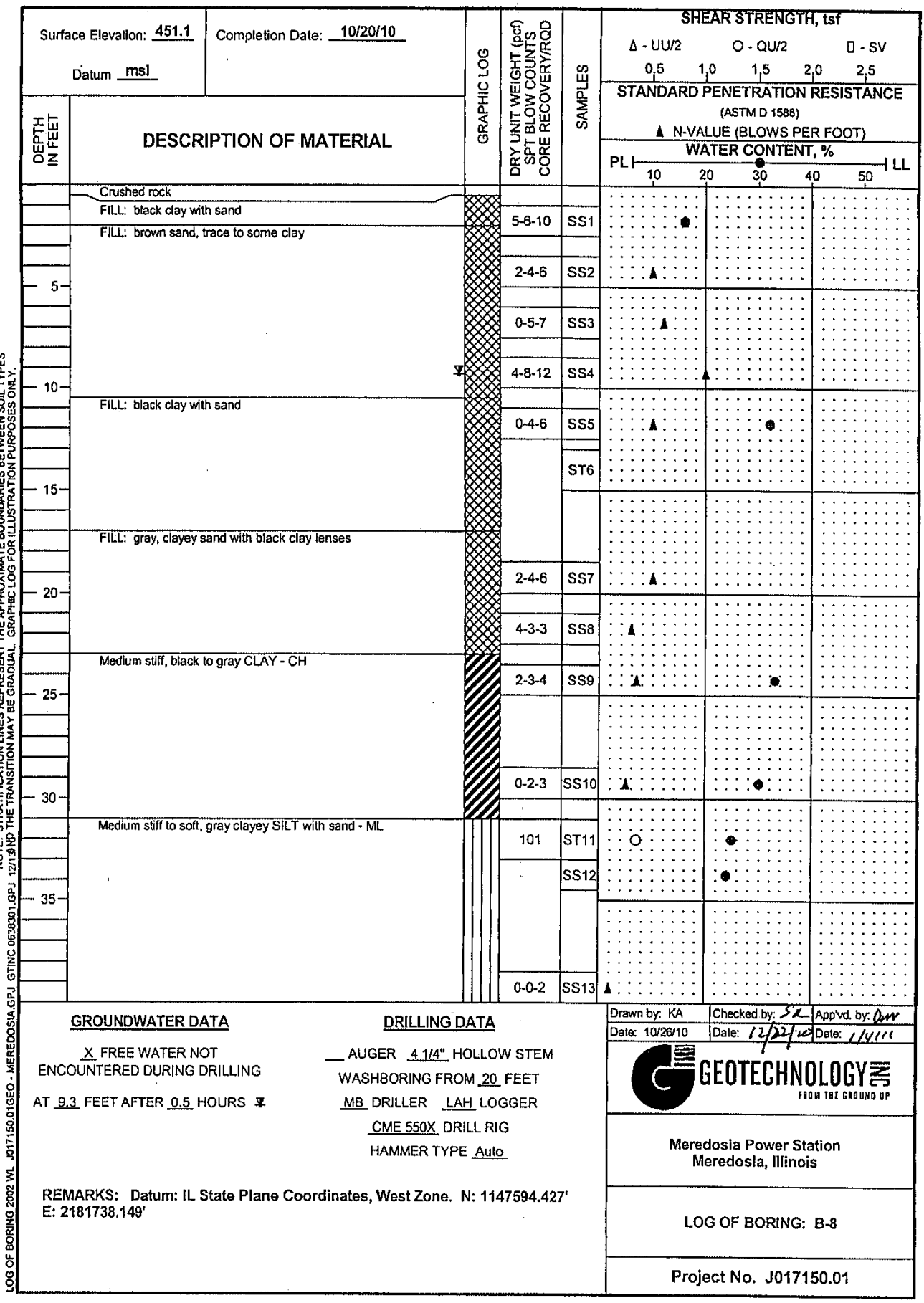
Drawn by: KA	Checked by:	App'vd. by:
Date: 10/26/10	Date: 12/30/10	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

CONTINUATION OF
LOG OF BORING: B-7

Project No. J017150.01



Surface Elevation: 451.1 | Completion Date: 10/20/10 | Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Crushed rock		
	FILL: black clay with sand	5-6-10	SS1
	FILL: brown sand, trace to some clay	2-4-6	SS2
5		0-5-7	SS3
		4-8-12	SS4
10		0-4-6	SS5
	FILL: black clay with sand		ST6
15			
	FILL: gray, clayey sand with black clay lenses	2-4-6	SS7
20		4-3-3	SS8
	Medium stiff, black to gray CLAY - CH	2-3-4	SS9
25			
		0-2-3	SS10
30			
	Medium stiff to soft, gray clayey SILT with sand - ML	101	ST11
			SS12
35			
		0-0-2	SS13

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC 0638301.GPJ 12/13/10

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

AT 9.3 FEET AFTER 0.5 HOURS ▼

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM 20 FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: Datum: IL State Plane Coordinates, West Zone. N: 1147594.427' E: 2181738.149'

Drawn by: KA	Checked by: SL	App'vd. by: DW
Date: 10/26/10	Date: 12/22/10	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

LOG OF BORING: B-8

Project No. J017150.01

Surface Elevation: 451.1 | Completion Date: 10/20/10

Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Medium stiff to soft, gray clayey SILT with sand - ML *(continued)*			
	Dense to medium dense, brown, fine to coarse SAND with gravel - SP			
45			13-16-16	SS14
50			7-9-11	SS15
55			5-7-9	SS16
60			10-13-14	SS17
	Boring terminated at 60 feet.			
65				
70				
75				

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC 0636301.GPJ 12/1/11

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

AT 9.3 FEET AFTER 0.5 HOURS ▼

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM 20 FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: Datum: IL State Plane Coordinates, West Zone. N: 1147594.427' E: 2181738.149'

Drawn by: KA	Checked by: SK	App'vd. by: DW
Date: 10/26/10	Date: 12/22/10	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

CONTINUATION OF LOG OF BORING: B-8

Project No. J017150.01

Surface Elevation: 433.6 | Completion Date: 10/25/10

Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Medium stiff to soft, black and gray CLAY - (CH)			
			2-3-4	SS1
			1-1-1	SS2
5				ST3
			86	ST4
10				
	Soft to very soft, gray, silty CLAY with silt seams and sand - CL			
15			0-1-1	SS6
			0-1-2	SS7
20				
			0-0-0	SS8
25	Boring terminated at 25 feet.			
30				
35				

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)

WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC 0638301.GPJ 12/13/10

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: Datum: IL State Plane Coordinates, West Zone. N: 1148133.361' E: 2182009.017'

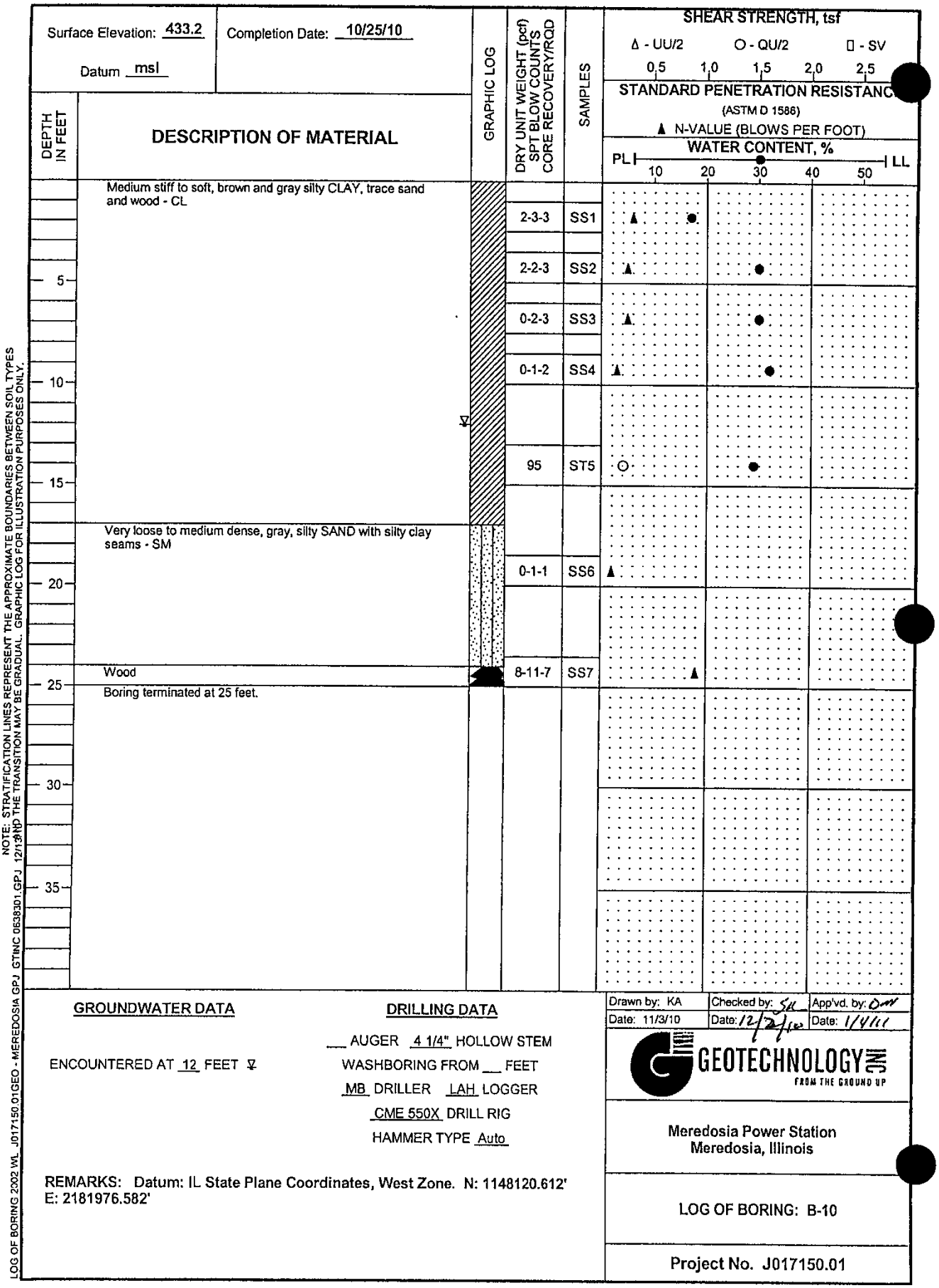
Drawn by: KA	Checked by: SJC	App'vd. by: DJM
Date: 11/3/10	Date: 12/22/10	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

LOG OF BORING: B-9

Project No. J017150.01



Surface Elevation: 433.2 | Completion Date: 10/25/10
Datum msl

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Medium stiff to soft, brown and gray silty CLAY, trace sand and wood - CL			
			2-3-3	SS1
			2-2-3	SS2
5			0-2-3	SS3
			0-1-2	SS4
10				
			95	ST5
15				
	Very loose to medium dense, gray, silty SAND with silty clay seams - SM			
20			0-1-1	SS6
	Wood		8-11-7	SS7
25	Boring terminated at 25 feet.			
30				
35				

SHEAR STRENGTH, tsf
Δ - UU/2 O - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5
STANDARD PENETRATION RESISTANCE
(ASTM D 1586)
▲ N-VALUE (BLOWS PER FOOT)
WATER CONTENT, %
PL 10 20 30 40 50 LL

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 J017150.01GEO - MEREDOSIA.GPJ GTINC 0638301.GPJ 12/13/10

GROUNDWATER DATA

ENCOUNTERED AT 12 FEET ▽

DRILLING DATA

___ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM ___ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS: Datum: IL State Plane Coordinates, West Zone. N: 1148120.612' E: 2181976.582'

Drawn by: KA	Checked by: SH	App'vd. by: DM
Date: 11/3/10	Date: 12/22/10	Date: 1/4/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

LOG OF BORING: B-10

Project No. J017150.01

Surface Elevation: 446.06 | Completion Date: 10/26/10
Datum msl | Northing: 1147018.68 | Easting: 2185605.2

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Loose, brown, fine SAND - SP			
			1-1-1	SS1
			2-2-1	SS2
5			2-4-4	SS3
			3-3-3	SS4
10				
	Loose, brown fine to coarse SAND, trace gravel - SP ▽		1-1-2	SS5
15				
			1-1-2	SS6
20				
	Loose, brown, fine SAND - SP		0-1-2	SS7
25	Boring terminated at 25 feet.			
30				
35				

WELL DIAGRAM

Stickup Diameter: 6-inch

Depth (ft)	Elev. (ft)	
-3.2	449.2	
		Concrete
1.0	445.1	
1.0	445.1	2" sch 40 PVC
		Bentonite
9.8	436.3	
14.7	431.4	
		Filter sand
		2" sch 40 PVC 0.10 slotted
24.7	421.4	Bottom cap
25.2	420.9	

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 - MEREDOSIA.GPJ GTINC 0638301.GPJ 1/11/11

GROUNDWATER DATA

ENCOUNTERED AT 13 FEET ▽

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: KA	Checked by: DK	App'vd. by: KBP
Date: 11/3/10	Date: 2-17-11	Date: 2/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren Power Generating Facility
Meredosia, Illinois

LOG OF BORING: APW-1

Project No. J017150.01

Surface Elevation: 433.97 | Completion Date: 10/25/10
Datum msl | Northing: 1148489.69 | Easting: 2182485.19

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Soft to medium stiff, brown and gray CLAY, trace sand - CH			
			2-2-2	SS1
5			2-2-2	SS2
			2-2-4	SS3
10			0-2-3	SS4
15			2-2-3	SS5
	Soft, gray, silty CLAY with shells, trace to some sand - CL			
20			0-1-1	SS6
	Very loose, brown, fine to medium SAND - SP			
25	Boring terminated at 25 feet.		0-0-1	SS7
30				
35				

WELL DIAGRAM

Stickup
Diameter: 6-Inch

-3.0 (Depth, ft) 437 (Elev., ft)

Concrete 1.0 433.0
1.0 433.0
2" sch 40 PVC
Bentonite
6.1 425.9
12.9 421.1
Filter sand
2" sch 40 PVC
0.10 slotted
Bottom cap
22.9 411.1
23.4 410.6

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 - MEREDOSIA.GPJ GTINC 0638301.GPJ 12/22/10

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: KA	Checked by DTK	App'vd. by: KSP
Date: 11/3/10	Date: 2-17-11	Date: 2/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren Power Generating Facility
Meredosia, Illinois

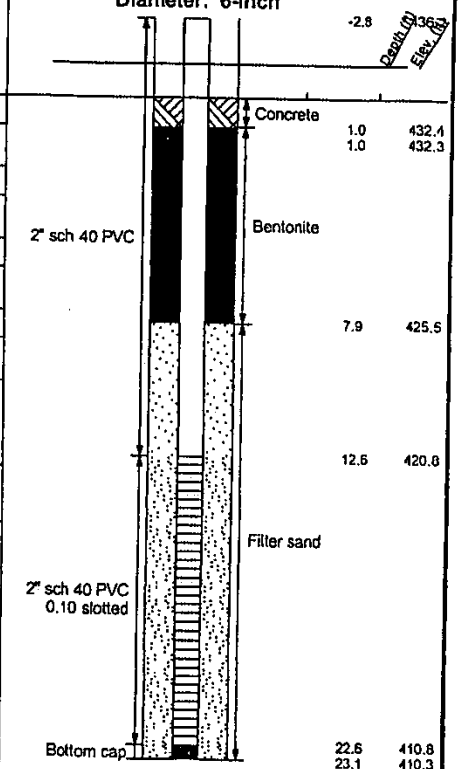
LOG OF BORING: APW-2/MW-2

Project No. J017150.01

Surface Elevation: 433.35
Datum msl
Completion Date: 10/25/10
Northing: 1148118.6
Easting: 2181973.76

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Medium stiff, brown and gray CLAY, trace sand and wood - CH			
			2-3-3	SS1
			2-2-3	SS2
5			0-2-3	SS3
			0-1-2	SS4
10				
	Gray, silty CLAY, trace sand - CL		95	ST5
15				
	Soft, gray, silty SAND with shells and silty clay seams - SM			
			0-1-1	SS6
20				
	Wood		8-11-7	SS7
25	Boring terminated at 25 feet.			
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 - MEREDOSIA.GPJ GTINC 0638301.GPJ 12/22/10

GROUNDWATER DATA

ENCOUNTERED AT 12 FEET ▽

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: KA	Checked by: DAK	App'vd. by: MSP
Date: 11/3/10	Date: 2-17-11	Date: 2/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren Power Generating Facility
Meredosia, Illinois

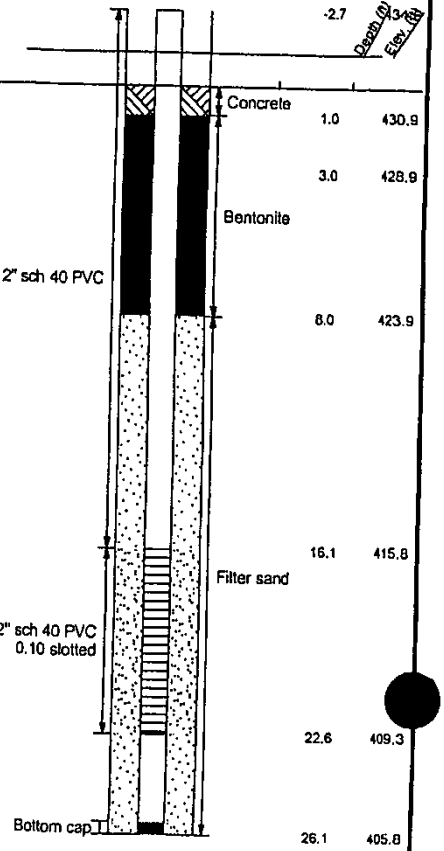
LOG OF BORING: APW-3/B-10

Project No. J017150.01

Surface Elevation: 431.90
Datum msl
Completion Date: 10/26/10
Northing: 1146935.94
Easting: 2181602.97

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Medium stiff to soft, brown and gray CLAY, trace sand and wood - CH			
			0-0-4	SS1
			2-4-4	SS2
5			1-1-1	SS3
			1-1-2	SS4
10	Loose, brown, fine SAND - SP			
			3-6-7	SS5
15				
			0-2-2	SS6
20				
			0-0-0	SS7
25	Boring terminated at 25 feet.			
30				
35				

WELL DIAGRAM



GROUNDWATER DATA

ENCOUNTERED AT 11.5 FEET ▽

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: KA	Checked by: DK	App'vd. by: RPE
Date: 11/3/10	Date: 2-17-11	Date: 2/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren Power Generating Facility
Meredosia, Illinois

LOG OF BORING: APW-4

Project No. J017150.01

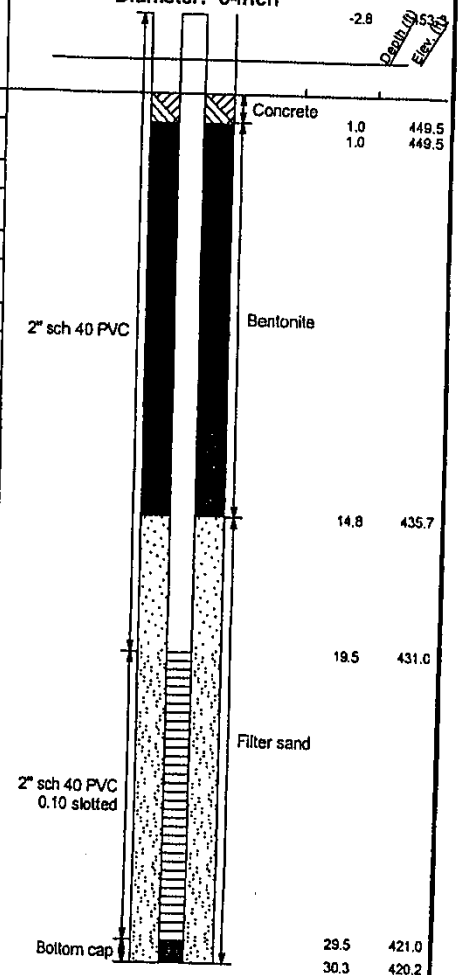
NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J017150.01 - MEREDOSIA.GPJ GTINC 0638391.GPJ 12/22/10

Surface Elevation: 450.48 | Completion Date: 10/26/10
Datum msl | Northing: 1146922.64 | Easting: 2183711.11

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Loose, brown, fine SAND - SP		3-3-3	SS1
5			2-2-2	SS2
			1-3-4	SS3
10			2-3-3	SS4
15			2-3-4	SS5
20	Loose, brown, fine to coarse SAND, trace to some gravel - SP		2-1-2	SS6
25			3-3-3	SS7
30	Boring terminated at 30 feet.		1-1-1	SS8
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 YL J017150.01 - MEREDOSIA.GPJ GTINC 0638301.GPJ 12/22/10

GROUNDWATER DATA

ENCOUNTERED AT 19.5 FEET ▽

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: KA	Checked by:	App'vd. by:
Date: 11/3/10	Date: 2-17-11	Date: 2/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren Power Generating Facility
Meredosia, Illinois

LOG OF BORING: APW-5

Project No. J017150.01

Surface Elevation: 448.55
Datum: _____
Completion Date: 10/1/2015
Latitude: 39.815833
Longitude: -90.570556

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Brown, fine grained SAND - SP		0-3-4	SS1
			3-4-6	SS2
5			2-3-1	SS3
			2-2-2	SS4
			3-3-5	SS5
10			4-5-6	SS6
			1-3-3	SS7
			1-2-3	SS8
15			4-6-7	SS9
	Brown, medium grained SAND - SP ▽		4-3-4	SS10
			1-2-2	SS11
20	Blind drilled - heaving sands			
25				
	Boring terminated at 28 feet.			
30				
35				

WELL DIAGRAM

Stickup = 3.3 ft
Diameter: 8 1/2 inch

Depth (ft) Elev. (ft)

2" sch 40 PVC
Bentonite Grout
13.0 435.6
Pel-Plug and Chips
15.5 433.1
17.5 431.1
2" sch 40 PVC 0.010 slotted
Filter Sand
Bottom cap
27.5 421.1
28.0 420.6

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 J024917.01 - MEREDOSIA WELL.GPJ 00.CLONE.ME.GPJ 12/29/22

GROUNDWATER DATA

ENCOUNTERED AT 18 FEET ▽

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
SMP DRILLER SJK LOGGER
CME 550 DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: AGB	Checked by:	App'vd. by:
Date: 10/9/2015	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Plant
Ameren Missouri

LOG OF BORING: APW-6

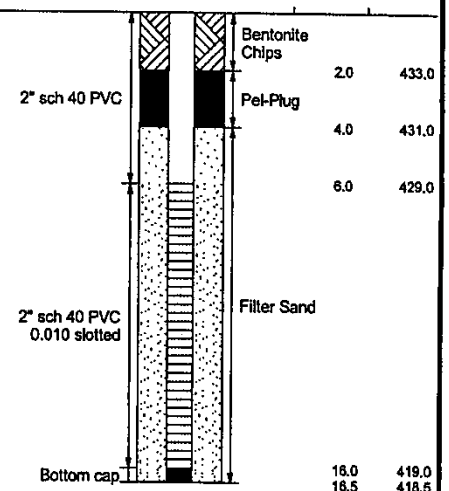
Project No. J024917.01

Surface Elevation: 435.03
Datum: _____
Completion Date: 10/1/2015
Latitude: 39.815833
Longitude: -90.573333

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Black, silty CLAY - CL		2-4-3	SS1
	Brown, silty CLAY - CL		2-3-4	SS2
5			1-2-1	SS3
	Brown, fine grained SAND - SP		1-1-1	SS4
			0-0-1	SS5
10	Blind drilled - heaving sands			
15				
	Boring terminated at 17 feet.			
20				
25				
30				
35				

WELL DIAGRAM

Stickup = 3.7 ft
Diameter: 8 1/2 inch



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 J024917.01 - MEREDOSIA WELL.GPJ 00 CLONE ME.GPJ 12/29/15

GROUNDWATER DATA

ENCOUNTERED AT 6 FEET ▽

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
SMP DRILLER SJK LOGGER
CME 550 DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: AGB	Checked by:	App'vd. by:
Date: 10/9/2015	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Plant
Ameren Missouri

LOG OF BORING: APW-7

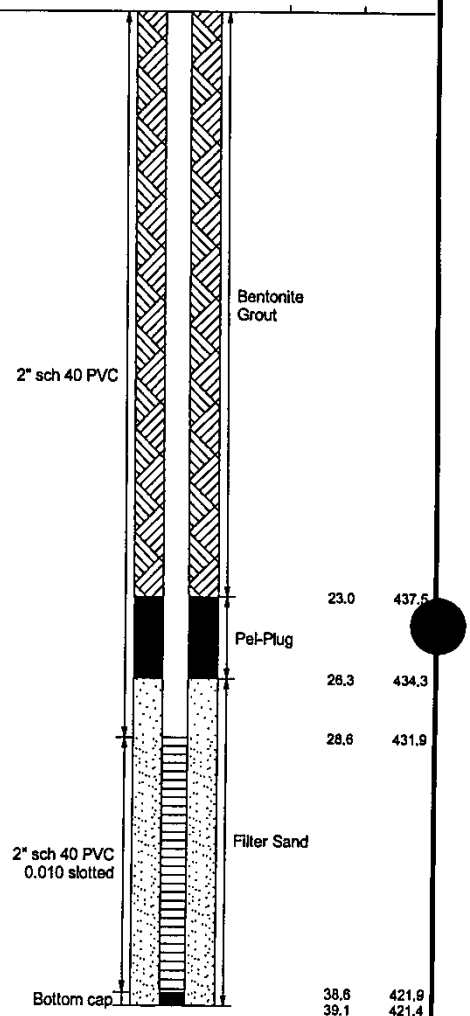
Project No. J024917.01

Surface Elevation: 460.54
Datum: _____
Completion Date: 10/1/2015
Latitude: 39.818611
Longitude: -90.5697222

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Brown, fine grained, poorly graded SAND - SP		3-9-9	SS1
			7-11-12	SS2
5			3-4-5	SS3
			2-3-3	SS4
			2-3-4	SS5
10			2-3-5	SS6
			3-5-9	SS7
			5-7-7	SS8
15			5-7-8	SS9
			5-7-8	SS10
			9-15-16	SS11
20			7-12-13	SS12
			8-13-14	SS13
			9-10-11	SS14
25	Brown, medium grained, poorly graded SAND - SP		6-6-9	SS15
			5-8-9	SS16
			4-5-6	SS17
30	Blind drilled - heaving sands			
35				
40	Boring terminated at 40 feet.			

WELL DIAGRAM

Stickup = 3.4 ft
Diameter: 8 1/2 Inch



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 32 FEET ▽

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
SMP DRILLER SJK LOGGER
CME 550 DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: AGB	Checked by:	App'vd. by:
Date: 10/9/2015	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Plant
Ameren Missouri

LOG OF BORING: APW-8

Project No. J024917.01

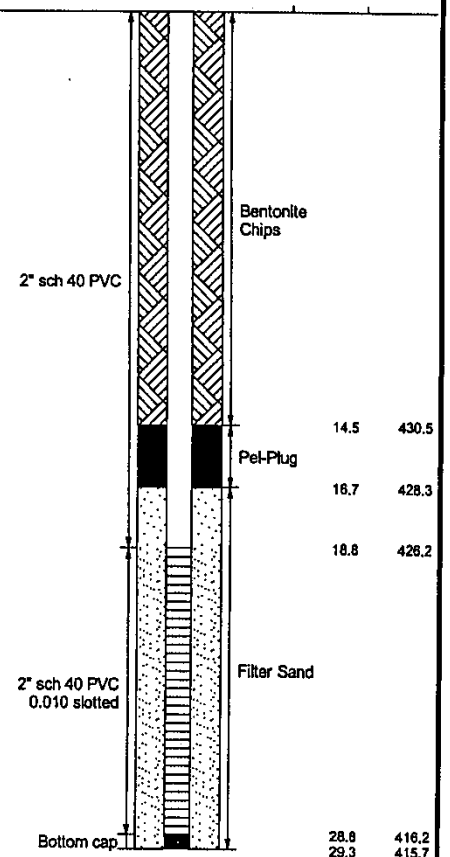
LOG OF BORING 2002 WL J024917.01 - MEREDOSIA WELL.GPJ 00 CLONE ME.GPJ 12/29/15

Surface Elevation: 444.97
Datum: _____
Completion Date: 10/1/2015
Latitude: 39.821388
Longitude: -90.569722

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	FILL: black, silty sand with coal CCR		4-3-2	SS1
			2-3-3	SS2
5			3-8-8	SS3
			2-4-1	SS4
			2-3-10	SS5
10	Gray SILT - ML		4-3-2	SS6
	Brown, fine grained SAND - SP		5-6-5	SS7
			3-4-3	SS8
15			3-3-4	SS9
	Brown, medium grained SAND - SP		3-3-4	SS10
20		▽	1-2-1	SS11
			2-2-4	SS12
	Blind drilled - heaving sands			
25				
30	Boring terminated at 30 feet.			
35				

WELL DIAGRAM

Stickup = 3.1 ft
Diameter: 8 1/2 inch



GROUNDWATER DATA

ENCOUNTERED AT 20 FEET ▽

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
SMP DRILLER SJK LOGGER
CME 550 DRILL RIG
HAMMER TYPE Auto

REMARKS:
CCR = Coal Combustion Residuals

Drawn by: AGB	Checked by:	App'vd. by:
Date: 10/9/2015	Date:	Date:

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Plant
Ameren Missouri

LOG OF BORING: APW-9

Project No. J024917.01

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

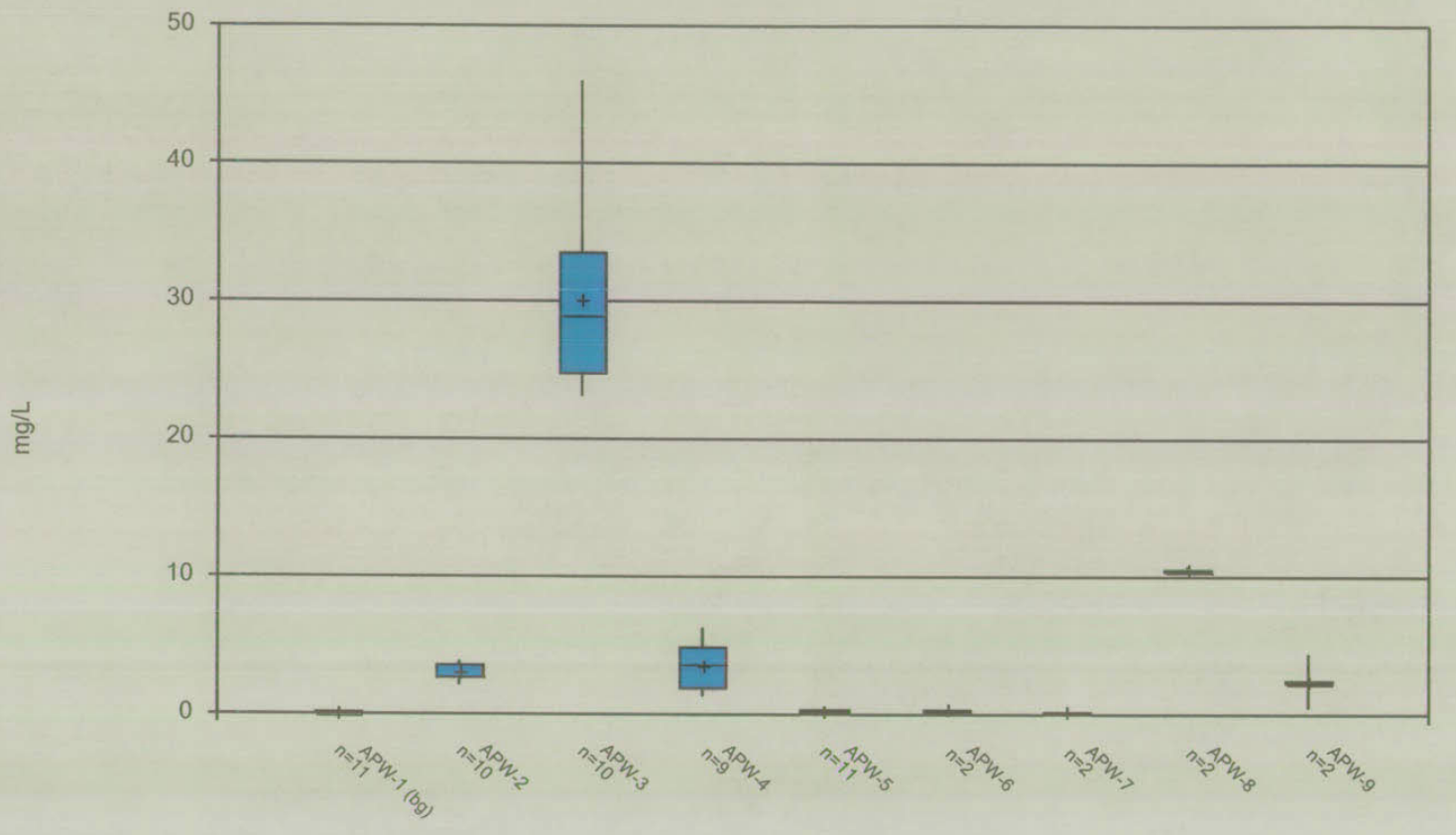
LOG OF BORING 2002 WL J024917.01 - MEREDOSIA WELL.GPJ 00 CLONE ME.GPJ 12/29/22

APPENDIX C

STATISTICAL ANALYSIS PLOTS

Sanitas™ v.9.4.41 Sanitas software licensed to Geotechnology. EPA

Box & Whiskers Plot

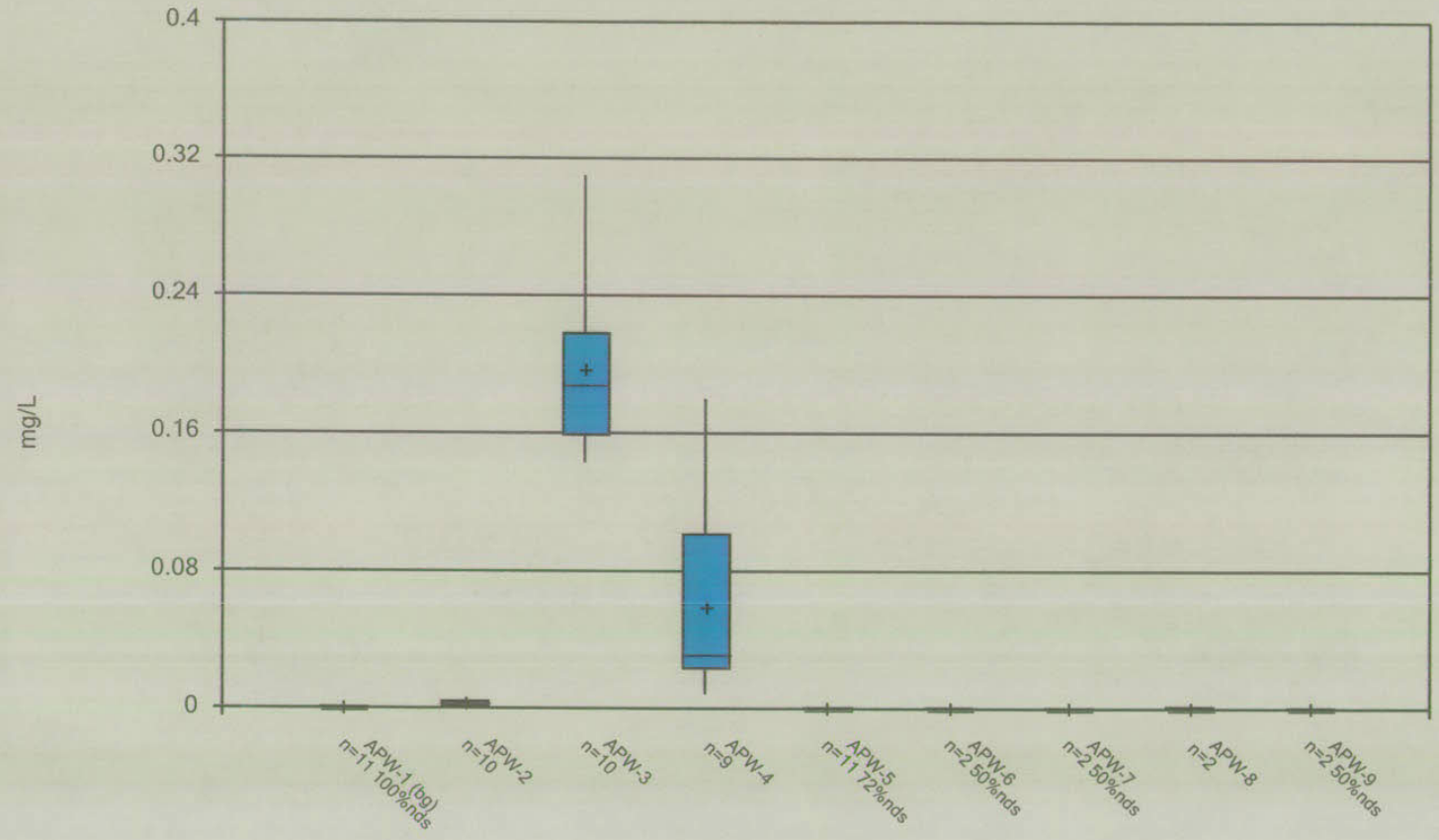


Constituent: Boron Dissolved Analysis Run 4/18/2016 3:06 PM

Facility: Meredosia Client: Geotechnology Data File: Final EDD

Sanitas™ v.9.4.41 Sanitas software licensed to Geotechnology. EPA

Box & Whiskers Plot



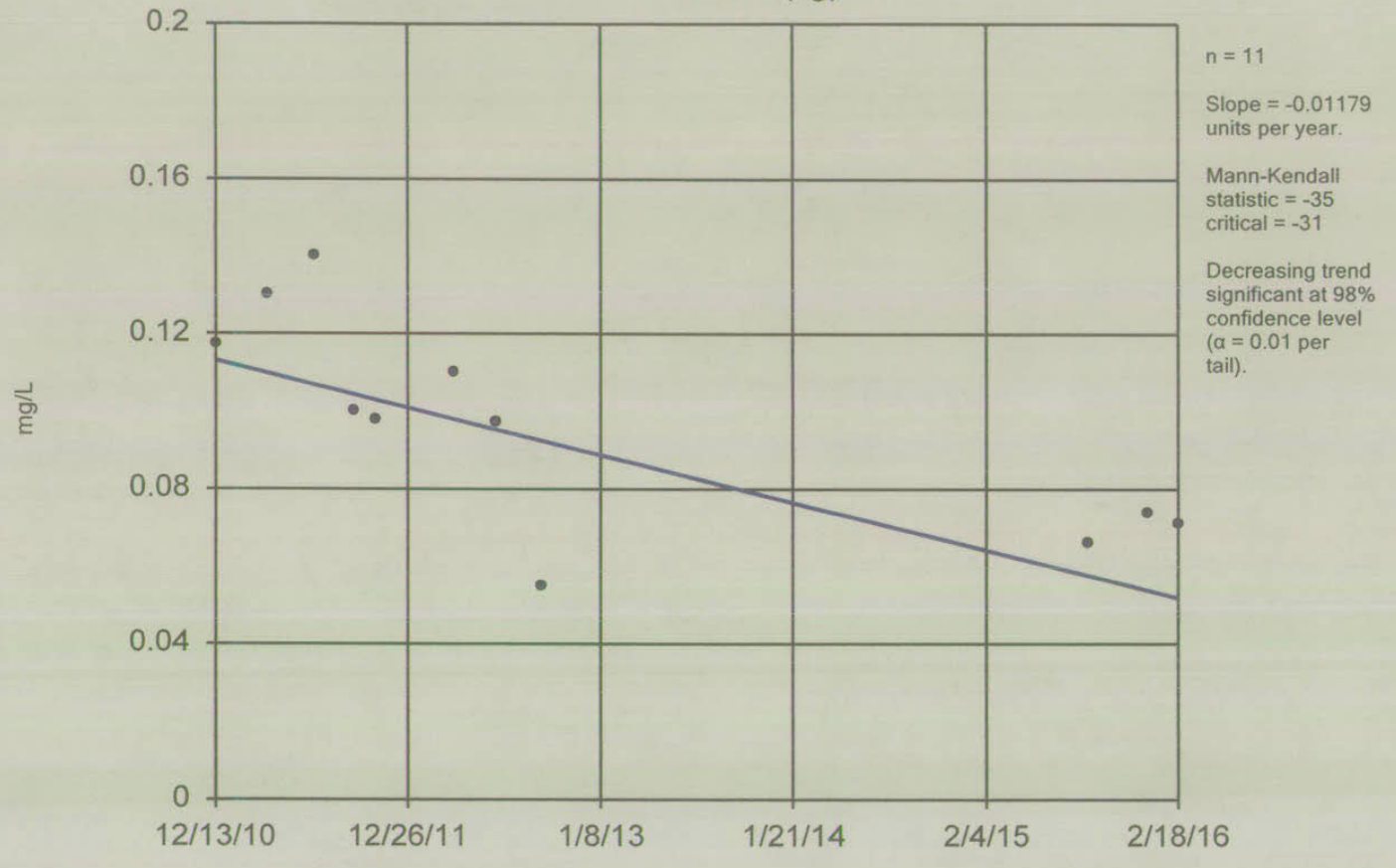
Constituent: Arsenic Dissolved Analysis Run 4/18/2016 3:07 PM

Facility: Meredosia Client: Geotechnology Data File: Final EDD

Sanitas™ v.9.4.41 Sanitas software licensed to Geotechnology. EPA

Sen's Slope Estimator

APW-1 (bg)



n = 11

Slope = -0.01179 units per year.

Mann-Kendall statistic = -35
critical = -31

Decreasing trend significant at 98% confidence level (α = 0.01 per tail).

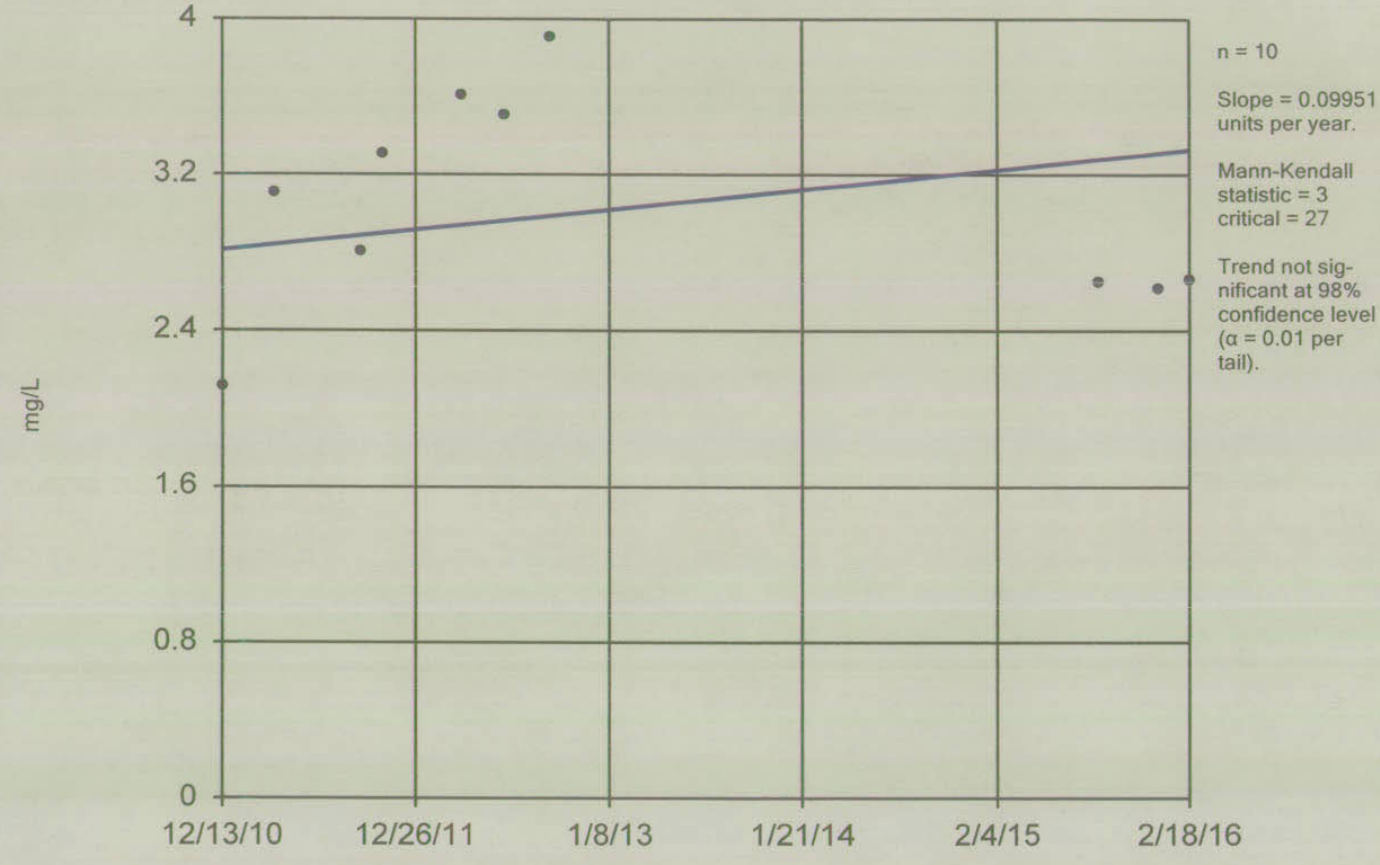
Constituent: Boron Dissolved Analysis Run 4/18/2016 3:04 PM

Facility: Meredosia Client: Geotechnology Data File: Final EDD

Sanitas™ v.9.4.41 Sanitas software licensed to Geotechnology. EPA

Sen's Slope Estimator

APW-2



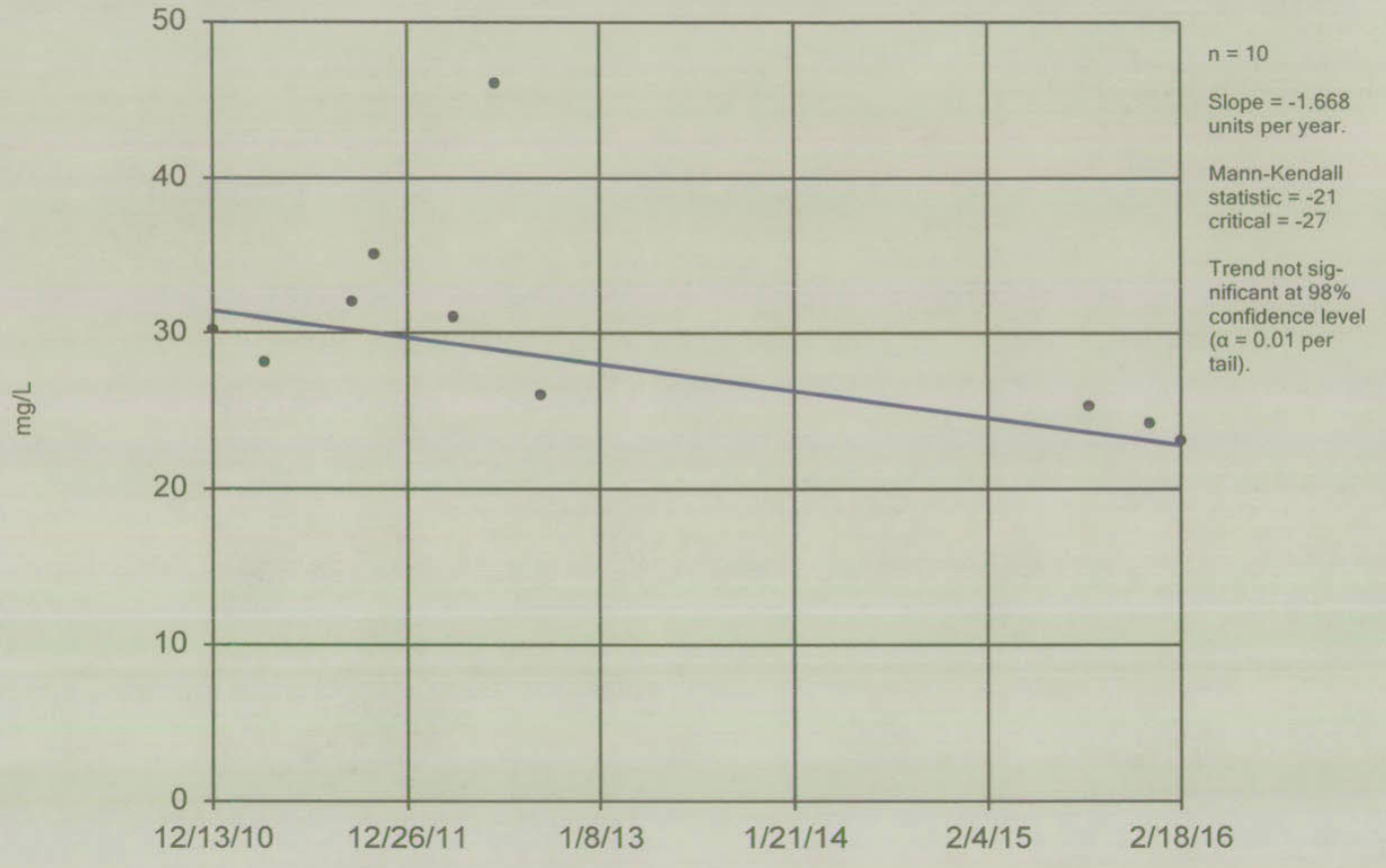
Constituent: Boron Dissolved Analysis Run 4/18/2016 3:04 PM

Facility: Meredosia Client: Geotechnology Data File: Final EDD

Sanitas™ v.9.4.41 Sanitas software licensed to Geotechnology. EPA

Sen's Slope Estimator

APW-3



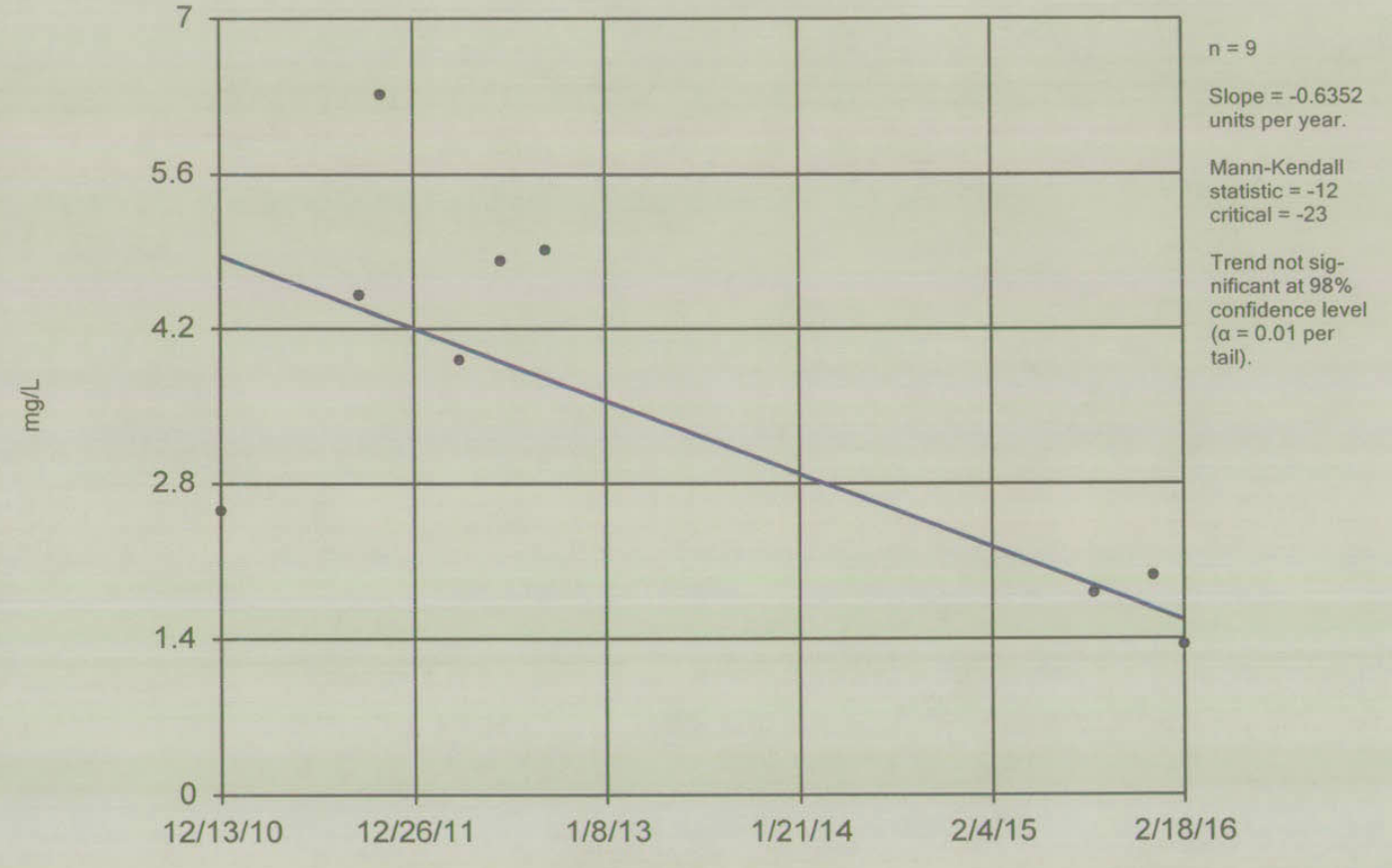
Constituent: Boron Dissolved Analysis Run 4/18/2016 3:04 PM

Facility: Meredosia Client: Geotechnology Data File: Final EDD

Sanitas™ v.9.4.41 Sanitas software licensed to Geotechnology. EPA

Sen's Slope Estimator

APW-4



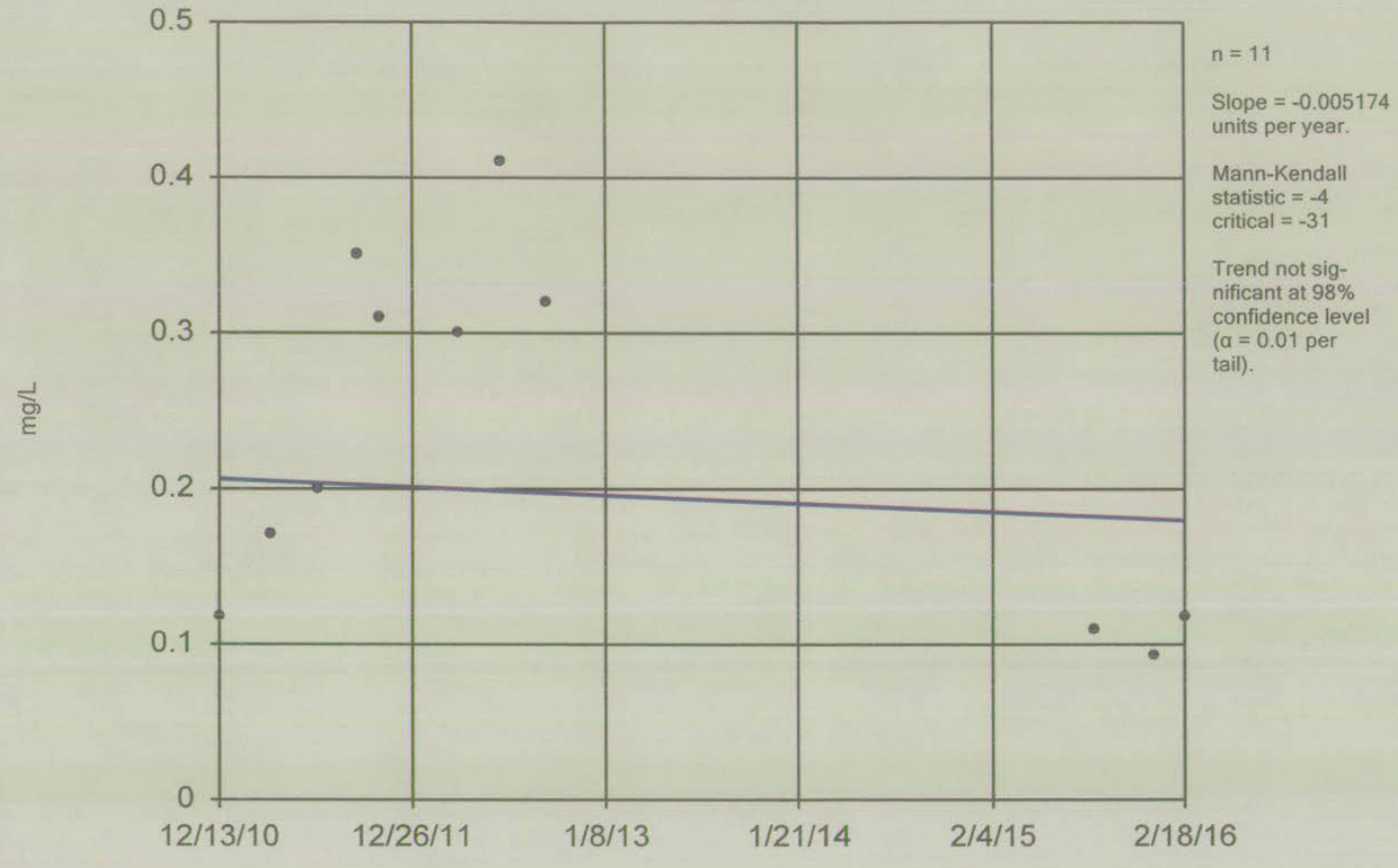
Constituent: Boron Dissolved Analysis Run 4/18/2016 3:04 PM

Facility: Meredosia Client: Geotechnology Data File: Final EDD

Sanitas™ v.9.4.41 Sanitas software licensed to Geotechnology. EPA

Sen's Slope Estimator

APW-5



n = 11

Slope = -0.005174 units per year.

Mann-Kendall statistic = -4
critical = -31

Trend not significant at 98% confidence level (α = 0.01 per tail).

Constituent: Boron Dissolved Analysis Run 4/18/2016 3:05 PM

Facility: Meredosia Client: Geotechnology Data File: Final EDD

APPENDIX D

HELP GROUNDWATER MODEL DATA

In order to assess the drainage capabilities of the proposed Meredosia Ash Pond, Geotechnology utilized the USEPA Hydrologic Evaluation of Landfill Performance (HELP) model to simulate conditions at the site. The version of software used was HELP 3.07 (1 November 1997). For the purposes of this evaluation, the ash pond designed cap has been divided into 6 layers as follows:

Layer 1 – Closure Turf (Geotextile/Turf Layer)
Layer 2 – Closure Turf Drainage Layer
Layer 3 – Membrane (50 mil HDPE)
Layer 4 – Fly Ash (at elevations above the piezometric surface of the pond, but 100% saturated to reflect conservative conditions at initial placement)
Layer 5 – Fly Ash (at elevations below the piezometric surface of the pond, at 100% saturation)
Layer 6 – Fine Silty Sand (conservative for the range of sands encountered)

Model parameters for the layers were the default values for each selected layer type as provided by the HELP software module, or were input by the user (for synthetic materials) with manufacturer provided parameters. Geotechnology utilized user-selected variables of 5 pinholes and 1 installation defect per each acre of membrane material as the modeled values, with a "good" initial installation quality. We assumed the Illinois River was at nominal stage and does not affect the drainage. During future flooding events, groundwater elevation may increase to the point where the lower levels of the ash are rewetted. In the case of a 100-year flood, it is not expected that the conditions in the ash will be as saturated as provided in this model due to the limited time of flooding and relatively low permeability of the ash compared to the underlying native sands.

Geotechnology utilized a user-generated Soil Conservations Service (SCS) Curve Number of 95% and an evaporative zone depth of 0.8 feet for the model based on the site location. Evapotranspiration data were calculated using site latitude, an artificial vegetative surface, and a growing season from April 19 to October 10. Average wind speed at the site was chosen from the Springfield, Illinois National Oceanic and Atmospheric Administration (NOAA) Station, and humidity input was calculated from NOAA data provided for Meredosia, Illinois. Precipitation and temperature coefficients were selected from the HELP database-provided site (Columbia, Missouri) and adjusted for site latitude. The model was run without groundwater influx parameters. The model indicates that steady state conditions (<0.05 inches of head on the sand layer) will be achieved within approximately six months of closure activities at the two ash ponds on site.

RBCA1

```
**********************************************************************
**********************************************************************
**                                                                  **
**                                                                  **
**            HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE          **
**              HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)          **
**                 DEVELOPED BY ENVIRONMENTAL LABORATORY            **
**                   USAE WATERWAYS EXPERIMENT STATION              **
**            FOR USEPA RISK REDUCTION ENGINEERING LABORATORY       **
**                                                                  **
**                                                                  **
**********************************************************************
**********************************************************************

PRECIPITATION DATA FILE:     C:\HELP3\DATA4.D4
TEMPERATURE DATA FILE:       C:\HELP3\DATA7.D7
SOLAR RADIATION DATA FILE:   C:\HELP3\DATA13.D13
EVAPOTRANSPIRATION DATA:     C:\HELP3\DATA11.D11
SOIL AND DESIGN DATA FILE:   C:\HELP3\DATAMER2.D10
OUTPUT DATA FILE:            C:\HELP3\RBCA1.OUT

TIME:  11:49     DATE:   4/15/2016

**********************************************************************

     TITLE:  Meredosia

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER.

                              LAYER  1
                              --------

                TYPE 1 - VERTICAL PERCOLATION LAYER
                    MATERIAL TEXTURE NUMBER   0
          THICKNESS                    =      0.60   INCHES
          POROSITY                     =      0.4170 VOL/VOL
          FIELD CAPACITY               =      0.0450 VOL/VOL
          WILTING POINT                =      0.0180 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.0180 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.720000011000E-03 CM/SEC

                              LAYER  2
                              --------

                TYPE 2 - LATERAL DRAINAGE LAYER
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RBCA1
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.20	INCHES
POROSITY	=	0.8500	VOL/VOL
FIELD CAPACITY	=	0.0100	VOL/VOL
WILTING POINT	=	0.0050	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0050	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.499999987000E-04	CM/SEC
SLOPE	=	4.00	PERCENT
DRAINAGE LENGTH	=	750.0	FEET

LAYER 3

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 0

THICKNESS	=	0.05	INCHES
POROSITY	=	0.0000	VOL/VOL
FIELD CAPACITY	=	0.0000	VOL/VOL
WILTING POINT	=	0.0000	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12	CM/SEC
FML PINHOLE DENSITY	=	5.00	HOLES/ACRE
FML INSTALLATION DEFECTS	=	1.00	HOLES/ACRE
FML PLACEMENT QUALITY	=	3 - GOOD	

LAYER 4

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 30

THICKNESS	=	240.00	INCHES
POROSITY	=	0.5410	VOL/VOL
FIELD CAPACITY	=	0.1870	VOL/VOL
WILTING POINT	=	0.0470	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.5410	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.499999987000E-04	CM/SEC

LAYER 5

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 30

THICKNESS	=	264.00	INCHES
POROSITY	=	0.5410	VOL/VOL
FIELD CAPACITY	=	0.1870	VOL/VOL
WILTING POINT	=	0.0470	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.5410	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.499999987000E-04	CM/SEC

LAYER 6

RBCA1

TYPE 3 - BARRIER SOIL LINER
MATERIAL TEXTURE NUMBER 7

THICKNESS	=	480.00	INCHES
POROSITY	=	0.4730	VOL/VOL
FIELD CAPACITY	=	0.2220	VOL/VOL
WILTING POINT	=	0.1040	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4730	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.520000001000E-03	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	95.00	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	41.900	ACRES
EVAPORATIVE ZONE DEPTH	=	0.8	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	0.012	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	0.420	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.012	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	499.716	INCHES
TOTAL INITIAL WATER	=	499.716	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
MEREDOSIA IL

STATION LATITUDE	=	39.83	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	109	
END OF GROWING SEASON (JULIAN DATE)	=	283	
EVAPORATIVE ZONE DEPTH	=	0.8	INCHES
AVERAGE ANNUAL WIND SPEED	=	9.40	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	73.70	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	67.70	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	72.80	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	74.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR COLUMBIA MISSOURI

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.57	1.86	3.19	3.83	4.47	3.76
3.51	2.93	3.64	3.34	2.02	1.95

RBCA1

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR COLUMBIA MISSOURI

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
27.50	32.50	41.70	54.80	64.10	72.90
77.60	76.00	68.40	57.10	43.50	32.90

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR COLUMBIA MISSOURI
AND STATION LATITUDE = 39.83 DEGREES

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MONTHLY TOTALS (IN INCHES) FOR YEAR 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.65	0.98	4.35	2.34	2.09	5.12
	1.99	2.71	2.91	5.84	0.59	3.18
RUNOFF	0.268	0.076	3.142	0.562	0.817	1.215
	0.076	0.413	1.655	4.155	0.135	2.372
EVAPOTRANSPIRATION	0.237	0.691	1.145	1.773	1.675	3.834
	1.966	2.312	1.253	1.680	0.453	0.559
LATERAL DRAINAGE COLLECTED FROM LAYER 2	0.0001	0.0004	0.0023	0.0009	0.0006	0.0007
	0.0001	0.0003	0.0004	0.0011	0.0003	0.0018
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.0004	0.0021	0.0071	0.0039	0.0029	0.0032
	0.0007	0.0014	0.0017	0.0041	0.0013	0.0053
PERCOLATION/LEAKAGE THROUGH LAYER 6	54.4649	19.1717	12.2311	8.0304	6.2079	4.7599
	4.0537	3.4231	2.8656	2.5884	2.2323	2.0824

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	0.026	0.122	0.487	0.254	0.179	0.209
	0.031	0.079	0.104	0.259	0.081	0.364
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	0.080	0.211	0.299	0.225	0.208	0.197
	0.107	0.164	0.187	0.285	0.183	0.370
AVERAGE DAILY HEAD ON TOP OF LAYER 6	4.633	0.242	0.140	0.095	0.071	0.056
	0.046	0.039	0.034	0.029	0.026	0.024

RBCA1

STD. DEVIATION OF DAILY	22.615	0.047	0.019	0.009	0.005	0.003
HEAD ON TOP OF LAYER 6	0.002	0.002	0.001	0.001	0.001	0.001

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.75	4981177.000	100.00
RUNOFF	14.887	2264236.500	45.46
EVAPOTRANSPIRATION	17.579	2673680.250	53.68
DRAINAGE COLLECTED FROM LAYER 2	0.0089	1348.050	0.03
PERC./LEAKAGE THROUGH LAYER 3	0.033986	5169.242	0.10
AVG. HEAD ON TOP OF LAYER 3	0.1828		
PERC./LEAKAGE THROUGH LAYER 6	122.111244	18572754.000	372.86
AVG. HEAD ON TOP OF LAYER 6	0.4529		
CHANGE IN WATER STORAGE	-121.836	-18530826.000	-372.02
SOIL WATER AT START OF YEAR	499.716	76005376.000	
SOIL WATER AT END OF YEAR	377.881	57474548.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	-0.0001	-17.406	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 2

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.86	1.75	3.39	5.43	9.02	6.65
	3.39	1.19	0.84	5.12	1.57	0.67
RUNOFF	0.146	2.270	3.338	2.979	6.238	3.405
	1.386	0.404	0.179	4.267	0.565	0.319

RBCA1

EVAPOTRANSPIRATION	0.611	0.427	1.316	2.334	3.009	3.243
	1.703	1.084	0.350	1.151	0.628	0.490
LATERAL DRAINAGE COLLECTED	0.0007	0.0001	0.0005	0.0009	0.0012	0.0010
FROM LAYER 2	0.0005	0.0001	0.0016	0.0013	0.0007	0.0027
PERCOLATION/LEAKAGE THROUGH	0.0040	0.0024	0.0032	0.0042	0.0043	0.0035
LAYER 3	0.0020	0.0008	0.0047	0.0043	0.0028	0.0084
PERCOLATION/LEAKAGE THROUGH	1.8995	1.5731	1.6060	1.4391	1.3817	1.2485
LAYER 6	1.2092	1.1317	1.0323	1.0082	0.9299	0.9066

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.237	0.131	0.178	0.276	0.288	0.243
TOP OF LAYER 3	0.132	0.041	0.343	0.294	0.176	0.581
STD. DEVIATION OF DAILY	0.214	0.000	0.191	0.232	0.272	0.281
HEAD ON TOP OF LAYER 3	0.223	0.115	0.327	0.304	0.267	0.230
AVERAGE DAILY HEAD ON	0.022	0.020	0.018	0.017	0.016	0.015
TOP OF LAYER 6	0.014	0.013	0.012	0.011	0.011	0.010
STD. DEVIATION OF DAILY	0.001	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 6	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	41.88	6369823.000	100.00
RUNOFF	25.496	3877910.000	60.88
EVAPOTRANSPIRATION	16.345	2486056.250	39.03
DRAINAGE COLLECTED FROM LAYER 2	0.0114	1726.946	0.03
PERC./LEAKAGE THROUGH LAYER 3	0.044646	6790.513	0.11
AVG. HEAD ON TOP OF LAYER 3	0.2433		
PERC./LEAKAGE THROUGH LAYER 6	15.365823	2337095.750	36.69
AVG. HEAD ON TOP OF LAYER 6	0.0149		
CHANGE IN WATER STORAGE	-15.339	-2332968.000	-36.63
SOIL WATER AT START OF YEAR	377.881	57474548.000	
SOIL WATER AT END OF YEAR	362.542	55141580.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00

SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	1.886	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 3

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.74	2.95	1.91	2.30	1.25	3.82
	8.48	0.95	5.48	2.08	2.67	1.16
RUNOFF	2.459	2.121	0.531	1.093	0.696	1.824
	4.299	0.054	3.751	0.637	1.542	0.260
EVAPOTRANSPIRATION	0.096	0.889	1.304	1.204	0.768	2.022
	4.004	1.227	1.642	1.371	1.250	0.372
LATERAL DRAINAGE COLLECTED FROM LAYER 2	0.0001	0.0021	0.0009	0.0008	0.0010	0.0007
	0.0011	0.0001	0.0006	0.0008	0.0017	0.0003
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.0027	0.0070	0.0036	0.0029	0.0031	0.0036
	0.0041	0.0006	0.0025	0.0036	0.0055	0.0023
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.8677	0.7468	0.7898	0.7322	0.7255	0.6688
	0.6678	0.6424	0.5990	0.5954	0.5543	0.5595

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	0.138	0.530	0.235	0.204	0.212	0.223
	0.259	0.030	0.162	0.227	0.377	0.134
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	0.030	0.237	0.258	0.253	0.320	0.194
	0.247	0.078	0.231	0.238	0.310	0.152
AVERAGE DAILY HEAD ON TOP OF LAYER 6	0.010	0.009	0.009	0.009	0.008	0.008
	0.008	0.007	0.007	0.007	0.007	0.006
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 6	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 3

RBCA1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	35.79	5443552.000	100.00
RUNOFF	19.266	2930366.500	53.83
EVAPOTRANSPIRATION	16.149	2456188.000	45.12
DRAINAGE COLLECTED FROM LAYER 2	0.0102	1553.305	0.03
PERC./LEAKAGE THROUGH LAYER 3	0.041437	6302.389	0.12
AVG. HEAD ON TOP OF LAYER 3	0.2274		
PERC./LEAKAGE THROUGH LAYER 6	8.149208	1239470.120	22.77
AVG. HEAD ON TOP OF LAYER 6	0.0079		
CHANGE IN WATER STORAGE	-7.785	-1184027.870	-21.75
SOIL WATER AT START OF YEAR	362.542	55141580.000	
SOIL WATER AT END OF YEAR	354.618	53936332.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.140	21218.414	0.39
ANNUAL WATER BUDGET BALANCE	0.0000	2.176	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 4

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.80	2.25	2.37	2.92	4.89	4.29
	2.02	4.10	3.72	1.07	2.94	2.40
RUNOFF	0.586	1.541	1.387	1.382	1.789	1.468
	0.137	1.452	1.793	0.022	1.683	1.930
EVAPOTRANSPIRATION	0.353	0.761	1.322	1.149	3.297	3.003
	1.881	2.388	1.942	0.917	1.206	0.461
LATERAL DRAINAGE COLLECTED FROM LAYER 2	0.0001	0.0015	0.0019	0.0006	0.0013	0.0006
	0.0002	0.0007	0.0010	0.0004	0.0020	0.0023
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.0027	0.0056	0.0062	0.0024	0.0051	0.0027
	0.0012	0.0025	0.0038	0.0022	0.0068	0.0074
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.5398	0.4892	0.5039	0.4772	0.4789	0.4493
	0.4517	0.4385	0.4116	0.4133	0.3914	0.3909

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.131	0.392	0.424	0.153	0.329	0.160
TOP OF LAYER 3	0.064	0.163	0.257	0.141	0.477	0.498
STD. DEVIATION OF DAILY	0.001	0.254	0.274	0.241	0.239	0.205
HEAD ON TOP OF LAYER 3	0.145	0.231	0.237	0.168	0.217	0.303
AVERAGE DAILY HEAD ON	0.006	0.006	0.006	0.006	0.005	0.005
TOP OF LAYER 6	0.005	0.005	0.005	0.005	0.005	0.004
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 6	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	33.77	5136316.500	100.00
RUNOFF	15.170	2307287.750	44.92
EVAPOTRANSPIRATION	18.679	2840977.500	55.31
DRAINAGE COLLECTED FROM LAYER 2	0.0124	1883.304	0.04
PERC./LEAKAGE THROUGH LAYER 3	0.048741	7413.380	0.14
AVG. HEAD ON TOP OF LAYER 3	0.2659		
PERC./LEAKAGE THROUGH LAYER 6	5.435782	826766.250	16.10
AVG. HEAD ON TOP OF LAYER 6	0.0052		
CHANGE IN WATER STORAGE	-5.527	-840596.500	-16.37
SOIL WATER AT START OF YEAR	354.618	53936332.000	
SOIL WATER AT END OF YEAR	349.231	53116956.000	
SNOW WATER AT START OF YEAR	0.140	21218.414	0.41
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-1.668	0.00

RBCA1

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MONTHLY TOTALS (IN INCHES) FOR YEAR 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.31	0.76	4.61	6.11	2.96	7.06
	0.87	1.98	3.38	2.79	3.89	2.30
RUNOFF	0.116	0.531	2.830	3.019	0.715	4.162
	0.103	0.369	1.915	1.795	2.559	0.983
EVAPOTRANSPIRATION	0.194	0.281	1.802	3.116	2.530	2.893
	0.767	1.562	1.247	1.254	1.317	0.911
LATERAL DRAINAGE COLLECTED FROM LAYER 2	0.0001	0.0001	0.0016	0.0015	0.0009	0.0011
	0.0001	0.0003	0.0006	0.0008	0.0017	0.0007
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.0027	0.0025	0.0054	0.0056	0.0036	0.0040
	0.0006	0.0014	0.0023	0.0029	0.0056	0.0030
PERCOLATION/LEAKAGE THROUGH LAYER 6	0.3862	0.3427	0.3694	0.3482	0.3489	0.3338
	0.3365	0.3309	0.3111	0.3122	0.2973	0.2996

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON TOP OF LAYER 3	0.131	0.143	0.364	0.385	0.230	0.267
	0.037	0.081	0.160	0.189	0.390	0.187
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 3	0.001	0.082	0.272	0.240	0.259	0.266
	0.108	0.155	0.236	0.259	0.290	0.240
AVERAGE DAILY HEAD ON TOP OF LAYER 6	0.004	0.004	0.004	0.004	0.004	0.004
	0.004	0.004	0.004	0.004	0.003	0.003
STD. DEVIATION OF DAILY HEAD ON TOP OF LAYER 6	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	37.02	5630630.500	100.00
RUNOFF	19.098	2904761.000	51.59
EVAPOTRANSPIRATION	17.872	2718264.500	48.28
DRAINAGE COLLECTED FROM LAYER 2	0.0095	1444.178	0.03

RBCA1

PERC./LEAKAGE THROUGH LAYER 3	0.039613	6025.084	0.11
AVG. HEAD ON TOP OF LAYER 3	0.2135		
PERC./LEAKAGE THROUGH LAYER 6	4.016714	610930.187	10.85
AVG. HEAD ON TOP OF LAYER 6	0.0039		
CHANGE IN WATER STORAGE	-3.976	-604767.562	-10.74
SOIL WATER AT START OF YEAR	349.231	53116956.000	
SOIL WATER AT END OF YEAR	345.255	52512188.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-1.523	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.47	1.74	3.33	3.82	4.04	5.39
	3.35	2.19	3.27	3.38	2.33	1.94
STD. DEVIATIONS	1.23	0.90	1.19	1.81	3.09	1.43
	3.00	1.27	1.67	2.03	1.28	1.01
RUNOFF						
TOTALS	0.715	1.308	2.246	1.807	2.051	2.415
	1.200	0.538	1.859	2.175	1.297	1.173
STD. DEVIATIONS	0.993	0.970	1.227	1.127	2.384	1.296
	1.819	0.532	1.270	1.965	0.960	0.950
EVAPOTRANSPIRATION						
TOTALS	0.298	0.610	1.378	1.915	2.256	2.999
	2.064	1.714	1.287	1.275	0.971	0.559
STD. DEVIATIONS	0.198	0.250	0.248	0.826	1.034	0.656
	1.185	0.606	0.599	0.282	0.399	0.208
LATERAL DRAINAGE COLLECTED FROM LAYER 2						
TOTALS	0.0002	0.0008	0.0014	0.0010	0.0010	0.0008
	0.0004	0.0003	0.0008	0.0009	0.0013	0.0016

RBCA1

STD. DEVIATIONS	0.0003	0.0009	0.0007	0.0004	0.0003	0.0002
	0.0004	0.0002	0.0005	0.0003	0.0007	0.0010

PERCOLATION/LEAKAGE THROUGH LAYER 3

TOTALS	0.0025	0.0039	0.0051	0.0038	0.0038	0.0034
	0.0017	0.0013	0.0030	0.0034	0.0044	0.0053
STD. DEVIATIONS	0.0013	0.0022	0.0017	0.0012	0.0009	0.0005
	0.0014	0.0008	0.0012	0.0009	0.0023	0.0027

PERCOLATION/LEAKAGE THROUGH LAYER 6

TOTALS	11.6316	4.4647	3.1000	2.2054	1.8286	1.4921
	1.3438	1.1933	1.0439	0.9835	0.8810	0.8478
STD. DEVIATIONS	23.9518	8.2352	5.1269	3.2834	2.4802	1.8604
	1.5515	1.2838	1.0552	0.9358	0.7930	0.7280

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	0.1323	0.2634	0.3375	0.2543	0.2476	0.2203
	0.1045	0.0789	0.2051	0.2219	0.3002	0.3528
STD. DEVIATIONS	0.0747	0.1867	0.1292	0.0871	0.0603	0.0400
	0.0953	0.0524	0.0948	0.0599	0.1649	0.1927

DAILY AVERAGE HEAD ON TOP OF LAYER 6

AVERAGES	0.9350	0.0564	0.0354	0.0260	0.0208	0.0176
	0.0153	0.0136	0.0123	0.0112	0.0104	0.0097
STD. DEVIATIONS	2.0672	0.1042	0.0585	0.0387	0.0283	0.0219
	0.0177	0.0146	0.0124	0.0107	0.0093	0.0083

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 5

	INCHES		CU. FEET	PERCENT
PRECIPITATION	36.24	(3.567)	5512299.0	100.00
RUNOFF	18.783	(4.2906)	2856912.50	51.828
EVAPOTRANSPIRATION	17.325	(1.0653)	2635033.25	47.803
LATERAL DRAINAGE COLLECTED FROM LAYER 2	0.01046	(0.00142)	1591.157	0.02887
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.04168	(0.00553)	6340.122	0.11502

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AVERAGE HEAD ON TOP OF LAYER 3	0.227 (0.031)		
PERCOLATION/LEAKAGE THROUGH LAYER 6	31.01575 (51.11133)	4717403.000	85.57959
AVERAGE HEAD ON TOP OF LAYER 6	0.097 (0.199)		
CHANGE IN WATER STORAGE	-30.892 (51.0256)	-4698637.00	-85.239

****

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 5

	(INCHES)	(CU. FT.)
PRECIPITATION	2.59	393931.219
RUNOFF	2.144	326045.4060
DRAINAGE COLLECTED FROM LAYER 2	0.00013	20.29407
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.000370	56.22432
AVERAGE HEAD ON TOP OF LAYER 3	0.800	
MAXIMUM HEAD ON TOP OF LAYER 3	1.569	
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	13.3 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 6	7.397256	1125100.62000
AVERAGE HEAD ON TOP OF LAYER 6	126.484	
SNOW WATER	2.25	342081.3750

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.5253
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0148

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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RBCA1

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FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	0.2646	0.4411
2	0.1556	0.7778
3	0.0000	0.0000
4	51.6723	0.2153
5	66.1214	0.2505
6	227.0400	0.4730
SNOW WATER	0.000	

****

****

APPENDIX E

MODFLOW AND MT3DMS MODEL DATA

MODFLOW was developed by the United States Geological Survey (USGS) to solve three-dimensional transient head distributions using finite difference approximations. The user can input soil properties, multiple layers, heterogeneities, variable thicknesses, variable gradients, flow boundaries, wells, and can define confined or unconfined flow systems. Major assumptions of the program include that groundwater is governed by Darcy's law; the formation behaves as a continuous porous medium; flow is not affected by chemical, temperature, or density gradients; and hydraulic properties are constant within a grid cell.

MT3DMS calculates concentration distributions for a single chemical as a function of time and location using a finite difference solution. Concentration is distributed over a three-dimensional, non-uniform, transient flow field. MT3DMS accounts for advection, diffusion, dispersion, sorption, and first order decay. Major assumptions of the module include changes in the concentration field do not affect the flow field; concentrations of solutes do not interact with each other; chemical and hydraulic properties are constant within a cell; sorption is instantaneous and fully reversible; and decay is not reversible.

The current configuration was calibrated to groundwater elevation data collected between 2009 and 2015 in the MODFLOW program and the boron concentration data was used to calibrate the MT3DMS module. The prediction scenario includes the clean closure and capping of the two ash ponds.

Model Setup

A two layer grid with twelve objects was established with 100-foot grid spacing parallel and perpendicular to the primary flow direction. The grid size was decreased to a 50-foot grid in the vicinity of the ash ponds. Areas adjacent to the flow and transport boundaries, soil properties, and river stage fluctuations were the same for the calibration and prediction scenarios. The upgradient (east) edge of the model was a general head boundary to allow for flow reversals due to the Illinois River fluctuations. The bottom of the aquifer (estimated), north boundary, and south boundary was modeled as no-flow boundaries. The downgradient boundary was a river object to model the Illinois River. The top boundary (land surface) was a specified flux boundary condition to model rainfall infiltration and seepage through the ash ponds.

Simplifying assumptions were made for this model.

- boron instantaneously dissolves into water;
- leachate instantaneously migrates to the groundwater;
- leachate concentrations remain constant over time and the source is not depleted;
- the Illinois River has a consistent annual pattern; and
- the cap has an instantaneous effect on the percolation rate.

MODFLOW and MT3DMS Input Values

Layers

The top layer included the two ash pond objects and the topographic surface. This layer was between 2 and 42 feet thick depending on the location of the layer. The bottom layer represented the unconfined sand aquifer and was 50 feet thick.

Soil Parameters

Soil parameters were estimated using published values for the units as observed during drilling activities, from laboratory testing results, or defaults provided within the MODFLOW and MT3DMS program. Soil parameters were refined during model calibration using observed data.

Recharge

Water recharge rates were modeled using results from the HELP model for the proposed closure configuration. Rainfall and infiltration rates were applied across the site using average annual rainfall data from the City of Meredosia.

River Parameters

The Illinois River was represented by a head-dependent flux that required inputs for river stage, width, bed thickness, and bed hydraulic conductivity. River stage data was obtained from the river gauge located adjacent to the site (National Weather Service http://water.weather.gov/) from years 2009 to 2015. River stages were split into high stage (March to July) and low stage (August to February) for each year.

Source Concentration

The source concentration of boron in the Fly Ash and Bottom Ash Ponds was based on calibration results at the end of 25 years. The Fly Ash Pond boron concentration was modeled as a constant source of 25 mg/L. The Bottom Ash Pond boron concentration was modeled as a constant source of 3 mg/L. Boron and other contaminants dissolve slower into water from bottom ash instead of fly ash due to the higher temperatures that form bottom ash stabilizing the chemicals as solids (Cox 1978; Leaching of Boron from Coal Ash). Retardation and decay were not used to be conservative.

Model Results

Boron concentrations for the current configuration were modeled for 25 years to represent a scenario where the ash ponds were not closed. After 25 years, monitoring well APW-3 (the well with historically highest concentrations) stabilized at 16.9 mg/L of boron, which exceeds the Class I Groundwater standards. As shown in the table below, APW-2,

APW-6, APW-7, and APW-8 also exceeded the Class I Groundwater standards at 25 years with no action.

Boron Concentration in Groundwater for the No Action Scenario at 25 Years

Well	Boron (mg/l)
APW-1	0.010
APW-2	10.2
APW-3	16.9
APW-4	0.330
APW-5	0.002
APW-6	7.60
APW-7	8.89
APW-8	12.9
APW-9	0.261

Yellow highlighting indicates a prediction exceeding the Class I Groundwater standard of 2 mg/l.

Within three years after dewatering and complete closure of the two ash ponds on site, boron modeling results indicate that boron will be below the Class I Groundwater standards for each well on the site. Boron concentrations at each of the monitoring wells after three years are shown in the table below.

Boron Concentration in Groundwater for the Ash Pond Closure Scenario at at 3 years after Closure and Dewatering

Well	Boron (mg/l)
APW-1	0.056
APW-2	0.124
APW-3	0.955
APW-4	0.011
APW-5	0.033
APW-6	0.067
APW-7	0.030
APW-8	1.17
APW-9	0.014

APPENDIX F

ILLINOIS RIVER LOADING DATA

Meredosia Power Plant J024917.01
Boron and Arsenic Loading in the Illinois River

L=C(Q)
Q=KIA

Cmax=highest single concentration
Cavg=mean concentration of APWs-2, 3, 4, and 9 (closest to river)
Q=groundwater discharge volume into river
K=hydraulic conductivity, from NRT value in report
Imax=maximum observed hydraulic gradient from all events
Iavg=mean hydraulic gradient from all events
A=cross section of aquifer, 52 feet thick x 2000 feet long
Q7,10=7-day, 10 year low flow, from IL Water Survey 1988 (most recent calculated value)
converted from cfs to gpd with factor of 1cfs = 646190.4 gpd
Qavg=average annual flow from 1936 to 1988, from USGS NWIS
converted from cfs to gpd with factor of 1cfs = 646190.4 gpd
Mixing Zone = 50 feet from shore, river is 750 feet wide

Boron Cmax=46	46
Arsenic Cmax=0.31	0.31
Boron Cavg=11.87	11.87
Arsenic Cavg=0.08	0.08
K=1,200 gpd/ft2	1200
Imax=11.98 feet	11.98
Iavg=6.72 feet	6.72
A=104,000 ft2	104,000

Qmax	1,495,104,000	gpd
Qavg	838,656,000	gpd

Boron Loading

Lmax	68,774,784,000	
Lavg	9,954,846,720	
(1) Q7,10	2,390,904,625	gpd
(2) Qavg	13,818,782,542	gpd

dB max (1)	28.76517251	div by 15 (750/50)	**1.917678 mg/L**
dB max (2)	4.976906163	div by 15 (750/50)	**0.331794 mg/L**
dB avg (1)	4.163631881	div by 15 (750/50)	**0.277575 mg/L**
dB avg (2)	0.720385221	div by 15 (750/50)	**0.048026 mg/L**

Arsenic Loading

Lmax	463,482,240	
Lavg	67,092,480	
(1) Q7,10	2,390,904,625	gpd
(2) Qavg	13,818,782,542	gpd

dB max (1)	0.19385225	div by 15 (750/50)	**0.012923 mg/L**
dB max (2)	0.03354002	div by 15 (750/50)	**0.002236 mg/L**
dB avg (1)	0.028061546	div by 15 (750/50)	**0.001871 mg/L**
dB avg (2)	0.004855166	div by 15 (750/50)	**0.000324 mg/L**

J024917.01 IL River Loading Calcs.xls

ATTACHMENT B

GROUNDWATER MONITORING PLAN
FLY ASH POND AND BOTTOM ASH POND
MEREDOSIA POWER STATION
800 SOUTH WASHINGTON STREET
MEREDOSIA, ILLINOIS

Prepared for:

AMERENENERGY MEDINA VALLEY COGEN, LLC
St. Louis, Missouri

Prepared by:

GEOTECHNOLOGY, INC.
St. Louis, Missouri

Project No. J024917.01

August 5, 2016

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GROUNDWATER MONITORING PLAN
FLY ASH POND AND BOTTOM ASH POND
MEREDOSIA POWER STATION
800 SOUTH WASHINGTON STREET
MEREDOSIA, ILLINOIS

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GROUNDWATER MONITORING PLAN
FLY ASH POND AND BOTTOM ASH POND
MEREDOSIA POWER STATION
800 SOUTH WASHINGTON STREET
MEREDOSIA, ILLINOIS

1.0 INTRODUCTION

The following groundwater monitoring plan is provided for the AmerenEnergy Medina Valley Cogen, LLC Meredosia Power Station Fly Ash Pond and Bottom Ash Pond closure project for the purpose of evaluating the performance of the ash pond closure activities. This is done in general accordance with Title 35, Illinois Administrative Code (IAC), Part 840 even though the regulation does not directly apply to this facility. Groundwater will be monitored to evaluate closure and post-closure groundwater quality by conducting statistical trend analysis and assessing compliance with the applicable standards. The site location and topography are shown on Plate 1.

A Groundwater Management Zone (GMZ) is proposed for the site. The purpose of the GMZ will be to remediate groundwater to the level of the Class I groundwater standard. The method of remediation is the closure and capping of the ash ponds which will reduce or eliminate the current primary contaminate infiltration source (precipitation).

2.0 GROUNDWATER MONITORING PROGRAM

The groundwater monitoring program is based on the geology and hydrogeology information presented in the April 2016 Hydrogeologic Assessment Report. This Groundwater Monitoring Plan (GMP) provides groundwater monitoring and sampling procedures; parameter list and analytical methods; and assessment of groundwater quality data.

2.1 Monitoring Locations. Groundwater samples will be obtained from existing groundwater monitoring wells (APW-1 through APW-9). If additional wells are constructed in the future (see Section 2.2), the construction, sampling, and analysis methods described herein will apply to those monitoring wells. Monitoring wells have a well identification number with an "APW" identifier, followed by a 1-, 2-, or 3-place alpha-numeric designation. The approximate locations of the monitoring wells are included on Plate 2. The monitoring program generally follows 35 IAC 620 by satisfying the following standards for the monitoring system:

- The monitoring wells are sufficiently located to represent the quality of groundwater at the compliance point(s);
- The monitoring wells are located within the stratigraphic unit(s) that may serve as potential contaminant migration pathways;

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- The groundwater monitoring wells are secure; and,
- Monitoring wells are installed to evaluate on-site and off-site groundwater quality.

2.2 Monitoring Well Installation. The current monitoring well network is comprised of five groundwater monitoring wells installed in October 2010 and four groundwater monitoring wells installed in October 2015. The nine groundwater monitoring wells are screened in the uppermost aquifer on the site.

The October 2015 groundwater monitoring wells were installed to better delineate groundwater impacts previously identified at the site. These wells were also installed to provide information on the effects of the ash pond closure activities on the groundwater. The monitoring well network data is included as Table 1 and includes the monitoring well identification numbers, screened intervals, and gradient designation. The groundwater monitoring wells were constructed in accordance with the Illinois Department of Public Health (IDPH) standards as cited in 77 IAC 920.170 and regulatory standards as cited in 35 IAC 620.505(a). As-built diagrams for the groundwater monitoring wells are included in Appendix A.

The current monitoring well network is adequate to design remedial activities, but is not adequate to fully delineate boron groundwater impacts and the future effects of the remedial activities (clean closure and capping) at the site. Installation of three additional monitoring wells is proposed: one to the southwest of the Fly Ash Pond; one to the east of the closed old ash pond, and one to the northeast of the Fly Ash Pond. The three proposed monitoring well locations are illustrated on Plate 3. These three locations will assist boron plume delineation to the southwest, east, and northeast of the ash ponds as well as provide information needed to evaluate the effect of remedial activities at the facility. It is anticipated that monitoring well installation will occur during the clean closure and capping activities on the site.

Monitoring wells will be maintained so representative groundwater samples may be collected. Items to observe during routine monitoring include: checking the concrete pad/seal for cracks, assessing the integrity of the protective casing, casing lock, seal of well cap, and integrity of the well riser. In the event a monitoring well is damaged, the well shall be repaired or replaced in accordance with regulatory requirements.

3.0 GROUNDWATER SAMPLING

3.1 Sampling Schedule. The initial sampling schedule for groundwater monitoring is provided in Table 2. Groundwater monitoring events are anticipated to be conducted quarterly until trend analysis indicates less frequent monitoring is acceptable.

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Table 2 - Quarterly Groundwater Monitoring Schedule

Sampling Quarter	Report Due	Parameter List
1 – January-March	May 31	Per Section 3.2
2 – April-June	August 31	Per Section 3.2
3 – July-September	November 30	Per Section 3.2
4 – October-December	February 28	Per Section 3.2

Five years after approval of the CQA Acceptance Report, 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 the following:

- Monitoring effectiveness will not be compromised by the reduced frequency of monitoring;
- Adequate data has been collected to characterize groundwater; and
- Concentrations of constituents monitored at the downgradient boundaries do not demonstrate statistically significant increasing trends that can be attributed to the former ash ponds.

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 when the IEPA approves the post-closure care completion report. This occurs after statistically significant increasing trends are not detected for five (5) consecutive years after changing to an annual monitoring frequency.

3.2 Parameter List. Routine sample collection will be conducted quarterly on the schedule outlined above, for the constituents listed below. Ameren may seek future reductions in the monitoring frequency and/or monitored parameters, consistent with criteria in the regulations, if approved, and found applicable to the closure of these ponds. Groundwater monitoring will continue until completion of the GMZ.

As stated in 35 IAC 620.410(a) and (d), the following laboratory analysis parameters are required to be monitored:

- Antimony,
- Arsenic,
- Barium,
- Beryllium,
- Boron,
- Cadmium,
- Chloride,
- Chromium,
- Cobalt,
- Copper,
- Cyanide,
- Fluoride,
- Iron,
- Lead,
- Manganese,
- Mercury,
- Nickel,
- Nitrate as nitrogen,
- Selenium,
- Silver,
- Sulfate,
- Thallium,
- Total dissolved solids,
- Vanadium, and
- Zinc.

Prior to 2015, groundwater samples were obtained and tested for dissolved constituents. Current regulatory preferences are to obtain and analyze groundwater samples for total constituents. Both dissolved and total parameters will be obtained for analytical testing for eight quarters after closure activities are completed or until there is enough statistical strength in the total analysis to warrant switching to total constituent analysis only. This provides information that is comparable to data obtained prior to the power station closing operations through the closure process.

Field monitoring parameters will include pH, specific conductance, groundwater surface elevation, well depth, temperature, depth to water, and elevation of measuring point.

3.3 Sampling Procedure. Groundwater samples shall be collected following the procedures presented in Appendix B, or equivalent methods developed by Ameren or its contractors.

4.0 SAMPLE ANALYSIS

Laboratory analysis and testing methods shall be in general accordance with those listed in the U.S. EPA publication Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, EPA/530/SW-846, 3rd Edition – Update V, amended October 2013 (U.S. EPA, 2013) or as superseded by future editions. The specific testing method used for analysis shall have Practical Quantitation Limit (PQL) values that are capable of assessing if regulatory and/or site groundwater standards are exceeded. Specific testing methods shall be referenced in the Laboratory Analysis Report.

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The Quality Assurance/Quality Control (QA/QC) program at the laboratory should generally follow the requirements outlined in the U.S. EPA publication Test Methods for Evaluation Solid Waste, Physical/Chemical Methods, EPA/530/SW-846, 3rd Edition –Update V, amended January 2013 (U.S. EPA, 2013) and which may be periodically revised in the future. However, other published QA/QC methods may be utilized as part of laboratory policy provided the QA/QC methodologies generally follow those numerated above. A copy of the laboratory Quality Assurance Manual is included as Appendix C.

5.0 DATA EVALUATION

5.1 Groundwater Quality Standards. Pursuant to 35 IAC 620.450, the on-site groundwater quality requirements shall be the Class I Potable Resource Groundwater standard (35 IAC 620.410) with the exception of the areas under the GMZ. If upon completion of the post-closure care period the observed concentrations in the site groundwater still exceed a Class I standard, the on-site standard may be adjusted provided criteria are addressed to the satisfaction of the IEPA. If off-site groundwater impacts are detected, the groundwater quality requirements shall be the Class I Potable Resource Groundwater standard or a GMZ will be obtained for those areas during the timeframe of remedial activities.

5.2 Compliance Demonstration. Compliance will be evaluated against the appropriate groundwater standard. On-site groundwater shall be considered to be in compliance when no statistically significant increasing trend can be attributable to the Fly Ash Pond or the Bottom Ash Pond at the compliance boundary for five (5) consecutive years following the change to an annual monitoring frequency and with IEPA concurrence.

Compliance will be demonstrated by performing an annual trend analysis for each downgradient monitoring well for all of the monitored constituents listed in Section 3.2 that exceed the Class I groundwater standards. The analysis shall be performed on a minimum of eight (8) consecutive samples and use Sen's Estimate of Slope for compliance assessment. Generally, if analyses for a parameter show an increasing trend at a down-gradient well, a Mann-Kendall analysis must be performed at a 95% tolerance interval to assess whether the increasing trend is statistically significant. If a statistically significant increase is observed, three (3) alternative statistical methods may be applied:

1. Notification of statistically significant increasing trends and revision to the sampling frequency must be reported to the IEPA within 30 days of making the determinations.

2. If an investigation determines that the statistically significant increasing trend is due to a superseding cause then the IEPA will be notified in writing, stating the cause of the increasing trend and the rationale used in its determination.

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3. If there is no superseding cause, and the monitoring frequency has been decreased to semi-annual or annual, then sampling must return to a quarterly frequency. If after four (4) consecutive quarters and no statistically significant increasing trend is observed, then sampling frequency can return to the previous frequency.

If a statistically significant increasing trend continues to be observed over two or more consecutive years and there is no superseding cause, a hydrogeologic investigation (and additional site investigation(s), if necessary) will be performed.

Based on the outcome of the additional activities, action must be taken to mitigate the statistically significant increasing trends that are causing, threatening or allowing exceedances of off-site groundwater quality standards. Any actions must be proposed as a modification to the post-closure care plan within 180 days after completion of the additional hydrogeologic and/or additional site investigations.

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TABLE 1

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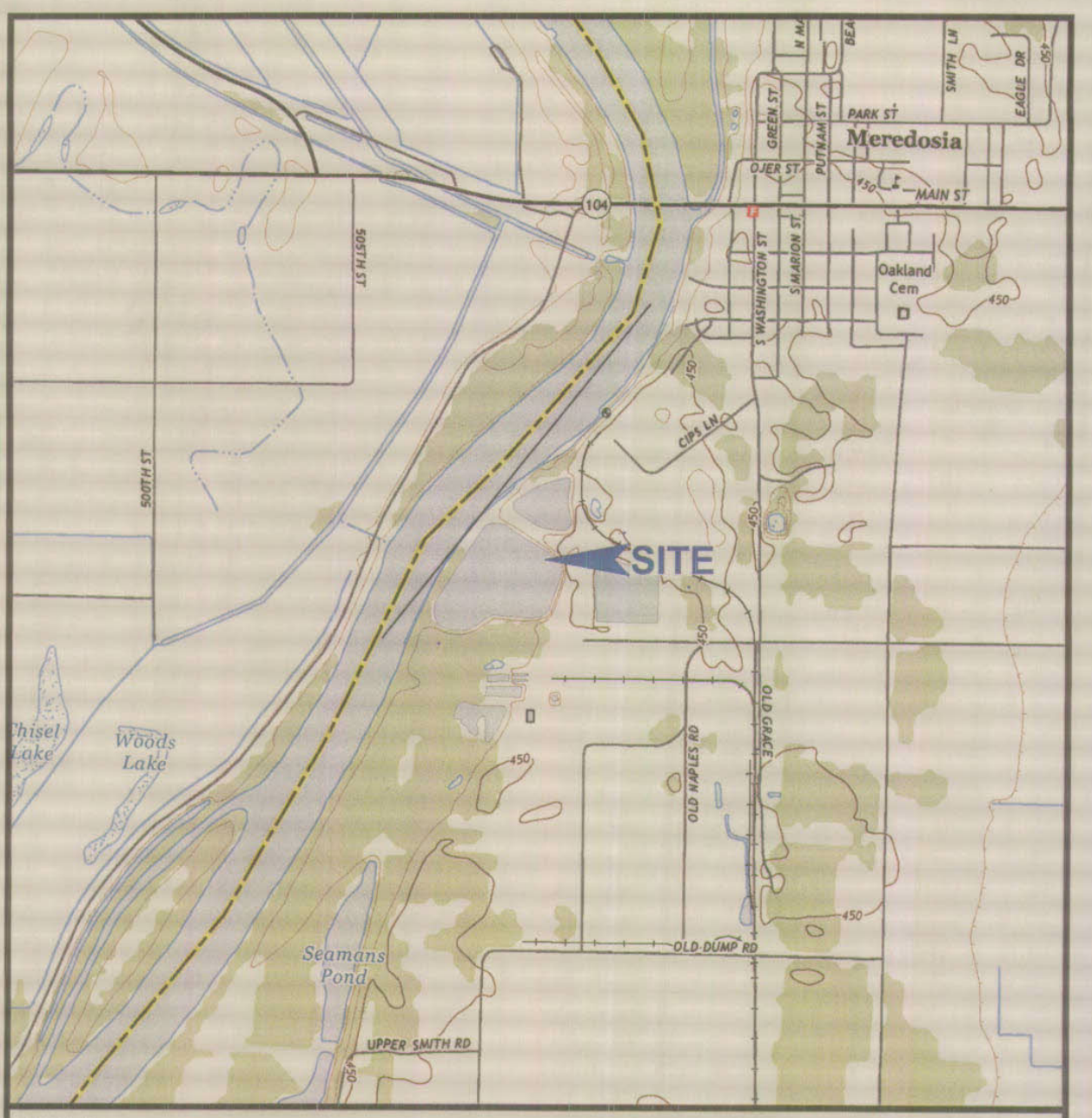
GROUNDWATER MONITORING NETWORK SUMMARY
MEREDOSIA POWER STATION
MORGAN COUNTY, ILLINOIS

Well ID	Gradient	Ground Surface Elevation	Bottom of Well Elevation	Screen Length (ft)	Top of Casing Elevation[1]	Installation Completion Date
APW-1	Upgradient	446.06	420.90	10.00	449.26	10/26/2010
APW-2	Downgradient	433.97	410.60	10.00	436.87	10/25/2010
APW-3	Downgradient	433.35	410.30	10.00	436.28	10/25/2010
APW-4	Downgradient	431.90	405.80	6.50	434.86	10/26/2010
APW-5	Downgradient	450.48	420.20	10.00	453.20	10/26/2010
APW-6	Downgradient	448.60	420.60	10.00	451.90	10/1/2015
APW-7	Downgradient	435.00	418.50	10.00	438.70	10/1/2015
APW-8	Downgradient	460.50	421.40	10.00	463.90	10/1/2015
APW-9	Downgradient	445.00	415.70	10.00	448.10	10/1/2015

[1]Elevations reported in feet above mean sea level.



NOTES

1. Plan adapted from a 7.5 minute U.S.G.S. map for Meredosia, Illinois quadrangle, last revised in 2015.

0 2,000 4,000

SCALE IN FEET

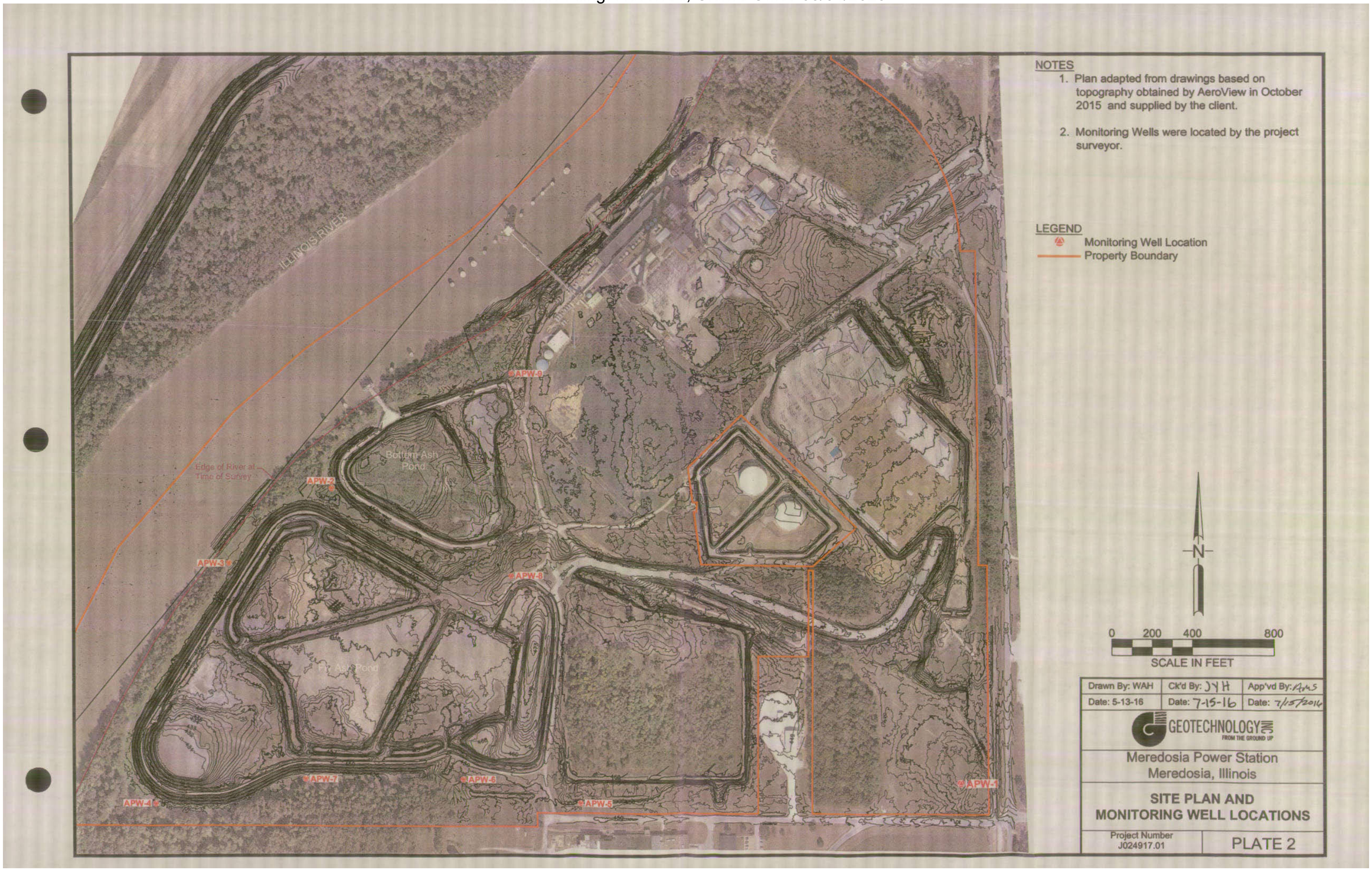
Drawn By: WAH	Ck'd By: [illegible]	App'vd By: AMS
Date: 5-9-16	Date: 5/9/16	Date: 5/9/2016

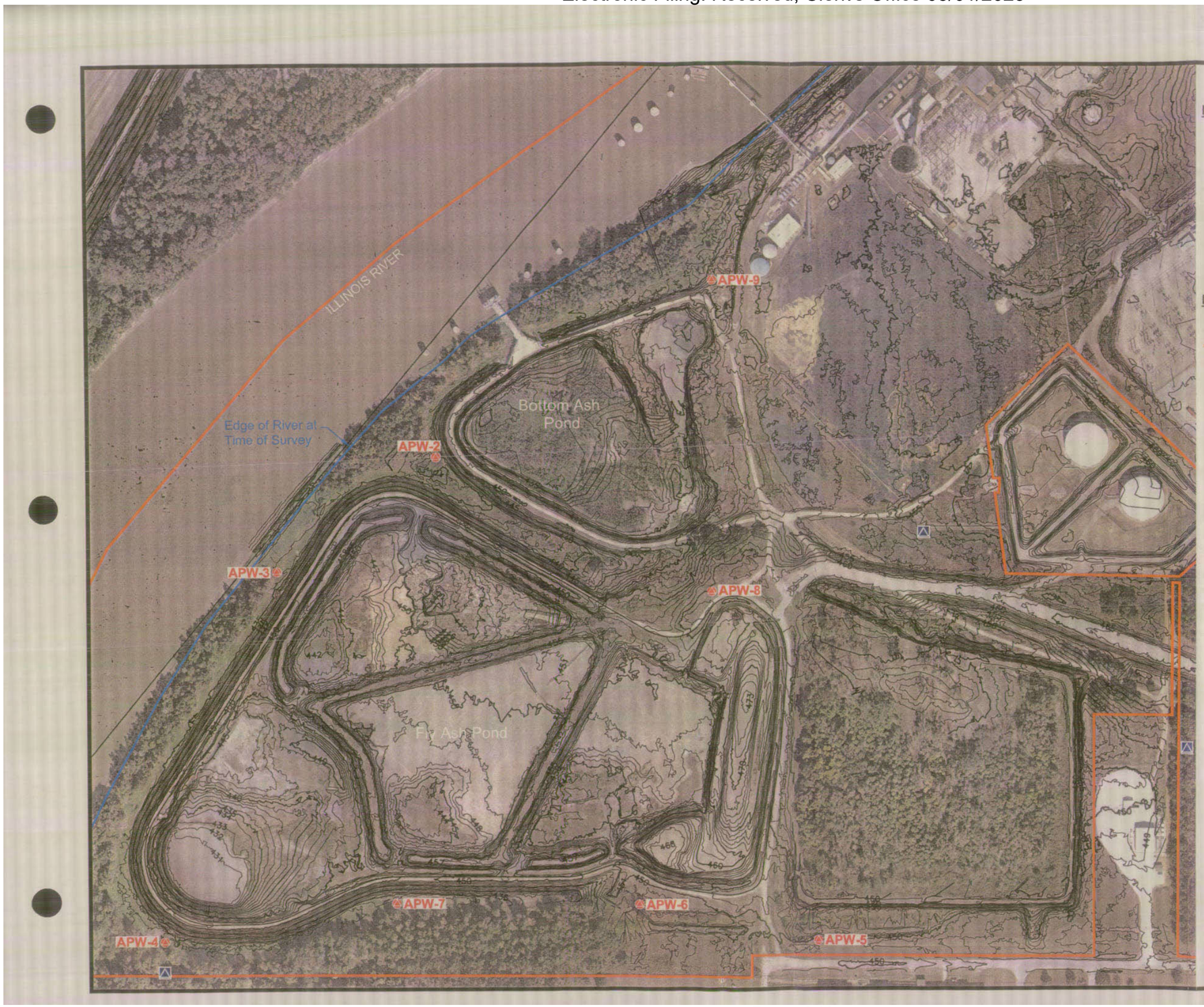
GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

SITE LOCATION AND TOPOGRAPHY

Project Number J024917.01	PLATE 1


ILLINOIS RIVER
APW-9
Edge of River at Time of Survey
APW-2
Bottom Ash Pond
APW-3
APW-8
Fly Ash Pond
APW-7
APW-6
APW-4
APW-5
APW-1
NOTES
1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
LEGEND
Monitoring Well Location
Property Boundary
N
0 200 400 800
SCALE IN FEET
Drawn By: WAH | Ck'd By: JYH | App'vd By: AMS
Date: 5-13-16 | Date: 7-15-16 | Date: 7/15/2016
GEOTECHNOLOGY INC
FROM THE GROUND UP
Meredosia Power Station
Meredosia, Illinois
SITE PLAN AND MONITORING WELL LOCATIONS
Project Number J024917.01
PLATE 2



NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

- Monitoring Well Location
- Proposed Monitoring Well Location
- Property Boundary

N

0 300 600

SCALE IN FEET

Drawn By: WAH	Ck'd By: JAE	App'vd By: AMS
Date: 5-9-16	Date: 5/9/16	Date: 5/9/2016

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

PROPOSED MONITORING WELL LOCATIONS

Project Number J024917.01	PLATE 3

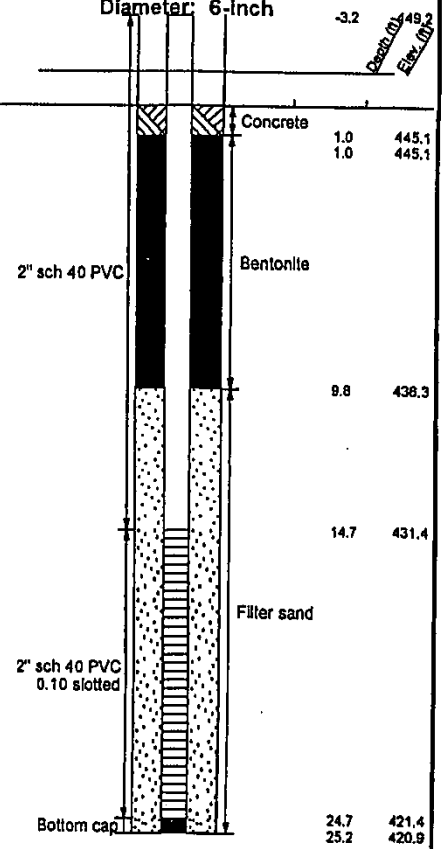
APPENDIX A

BORING LOGS AND MONITORING WELL DIAGRAMS

Surface Elevation: 446.06 | Completion Date: 10/26/10
Datum msl | Northing: 1147018.68 | Easting: 2185605.2

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Loose, brown, fine SAND - SP			
			1-1-1	SS1
			2-2-1	SS2
5			2-4-4	SS3
			3-3-3	SS4
10				
	Loose, brown fine to coarse SAND, trace gravel - SP ▽			
			1-1-2	SS5
15				
			1-1-2	SS6
20				
	Loose, brown, fine SAND - SP			
			0-1-2	SS7
25	Boring terminated at 25 feet.			
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 - MEREDOSIA.GPJ GTINC 0638301.GPJ 1/11/11

GROUNDWATER DATA

ENCOUNTERED AT 13 FEET ▽

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: KA	Checked by: DRK	App'vd. by: KBP
Date: 11/3/10	Date: 2-17-11	Date: 2/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren Power Generating Facility
Meredosia, Illinois

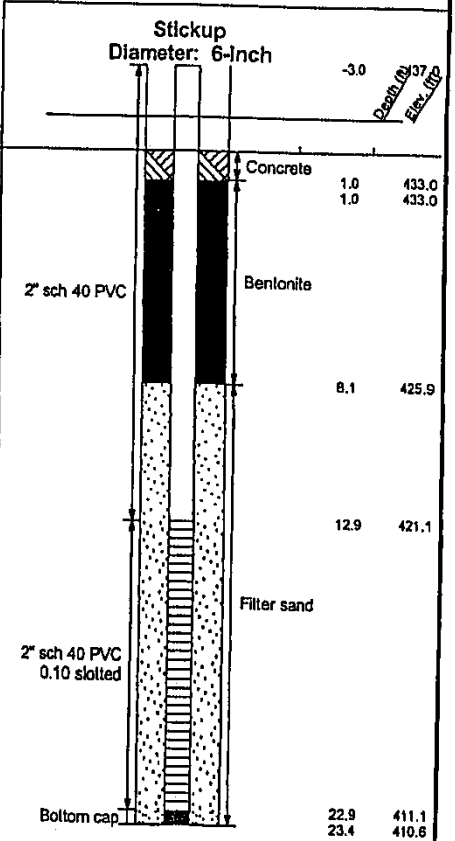
LOG OF BORING: APW-1

Project No. J017150.01

Surface Elevation: 433.97 | Completion Date: 10/25/10
Datum msl | Northing: 1148489.69 | Easting: 2182485.19

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Soft to medium stiff, brown and gray CLAY, trace sand - CH			
			2-2-2	SS1
			2-2-2	SS2
5			2-2-4	SS3
			0-2-3	SS4
10				
			2-2-3	SS5
15				
	Soft, gray, silty CLAY with shells, trace to some sand - CL		0-1-1	SS6
20				
	Very loose, brown, fine to medium SAND - SP		0-0-1	SS7
25	Boring terminated at 25 feet.			
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

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: KA	Checked by: DTK	App'vd. by: KGP
Date: 11/3/10	Date: 2-17-11	Date: 2/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren Power Generating Facility
Meredosia, Illinois

LOG OF BORING: APW-2/MW-2

Project No. J017150.01

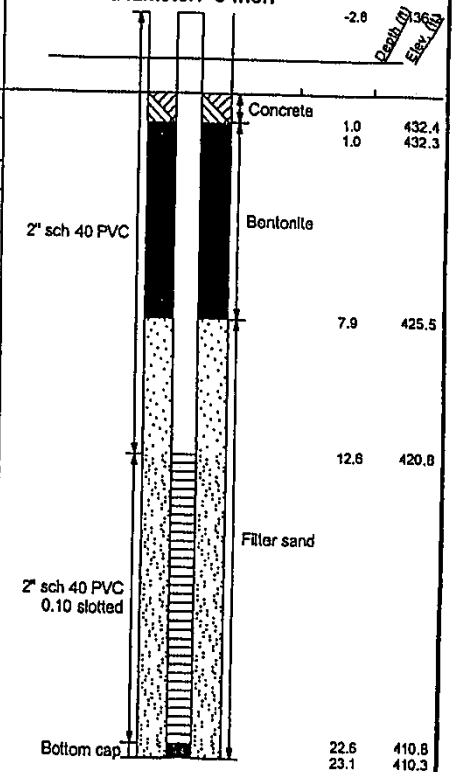
LOG OF BORING 2002.WL J017150.01 - MEREDOSIA.GPJ GTINC 0638301.GPJ 12/22/10

Surface Elevation: 433.35 Datum msl

Completion Date: 10/25/10
Northing: 1148118.6
Easting: 2181973.76

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Medium stiff, brown and gray CLAY, trace sand and wood - CH			
			2-3-3	SS1
5			2-2-3	SS2
			0-2-3	SS3
10			0-1-2	SS4
	Gray, silty CLAY, trace sand - CL			
15			95	ST5
	Soft, gray, silty SAND with shells and silty clay seams - SM			
20			0-1-1	SS6
	Wood		8-11-7	SS7
25	Boring terminated at 25 feet.			
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 - MEREDOSIA.GPJ GTINC 0638301.GPJ 12/22/10

GROUNDWATER DATA

ENCOUNTERED AT 12 FEET ▽

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: KA	Checked by: DTK	App'vd. by: RSP
Date: 11/3/10	Date: 2-17-11	Date: 2/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren Power Generating Facility
Meredosia, Illinois

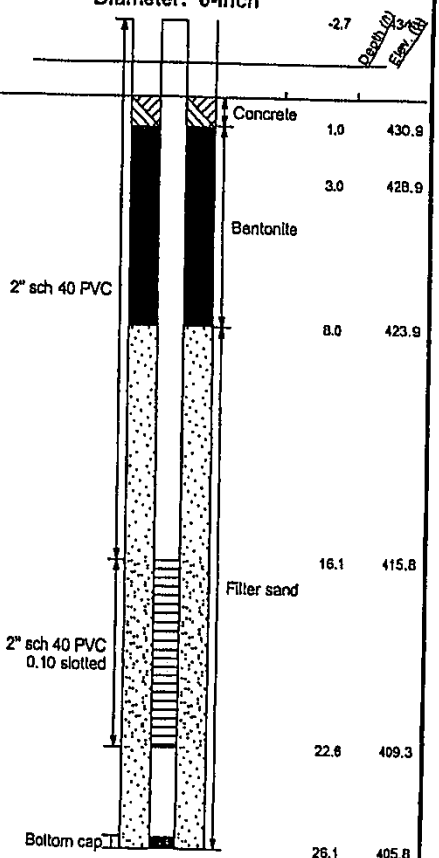
LOG OF BORING: APW-3/B-10

Project No. J017150.01

Surface Elevation: 431.90 | Completion Date: 10/26/10
Datum msl | Northing: 1146935.94 | Easting: 2181602.97

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Medium stiff to soft, brown and gray CLAY, trace sand and wood - CH			
			0-0-4	SS1
			2-4-4	SS2
5			1-1-1	SS3
			1-1-2	SS4
10				
	Loose, brown, fine SAND - SP			
			3-6-7	SS5
15				
			0-2-2	SS6
20				
			0-0-0	SS7
25	Boring terminated at 25 feet.			
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 - MEREDOSIA.GPJ GTINC 0633301.GPJ 12/22/10

GROUNDWATER DATA

ENCOUNTERED AT 11.5 FEET ▽

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: KA	Checked by: DAT	App'vd. by: HDP
Date: 11/3/10	Date: 2-17-11	Date: 2/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren Power Generating Facility
Meredosia, Illinois

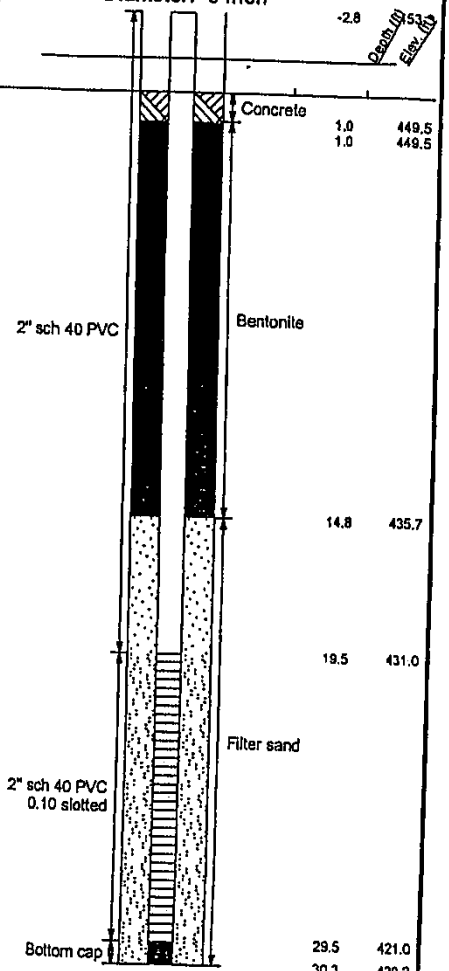
LOG OF BORING: APW-4

Project No. J017150.01

Surface Elevation: 450.48 | Completion Date: 10/26/10
Datum msl | Northing: 1146922.64 | Easting: 2183711.11

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Loose, brown, fine SAND - SP		3-3-3	SS1
5			2-2-2	SS2
			1-3-4	SS3
10			2-3-3	SS4
15			2-3-4	SS5
20	Loose, brown, fine to coarse SAND, trace to some gravel - SP		2-1-2	SS6
25			3-3-3	SS7
30	Boring terminated at 30 feet.		1-1-1	SS8
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 - MEREDOSIA.GPJ GTINC 0638301.GPJ 12/22/10

GROUNDWATER DATA

ENCOUNTERED AT 19.5 FEET ▽

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: KA	Checked by: DKT	App'vd. by: TBB
Date: 11/3/10	Date: 2-17-11	Date: 2/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

Ameren Power Generating Facility
Meredosia, Illinois

LOG OF BORING: APW-5

Project No. J017150.01

Surface Elevation: 448.55
Datum: _____
Completion Date: 10/1/2015
Latitude: 39.815833
Longitude: -90.570556

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
0	Brown, fine grained SAND - SP		0-3-4	SS1
			3-4-6	SS2
5			2-3-1	SS3
			2-2-2	SS4
			3-3-5	SS5
10			4-5-6	SS6
			1-3-3	SS7
15			1-2-3	SS8
	Brown, medium grained SAND - SP ▽		4-6-7	SS9
20			4-3-4	SS10
			1-2-2	SS11
	Blind drilled - heaving sands			
25				
	Boring terminated at 28 feet.			
30				
35				

WELL DIAGRAM

Stickup = 3.3 ft
Diameter: 8 1/2 Inch

Depth (ft) / Elev. (ft)

- 2" sch 40 PVC
- Bentonite Grout — 13.0 / 435.6
- Pel-Plug and Chips — 15.5 / 433.1
- 17.5 / 431.1
- 2" sch 40 PVC 0.010 slotted
- Filter Sand
- Bottom cap — 27.5 / 421.1; 28.0 / 420.6

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 J024917.01 - MEREDOSIA WELL.GPJ 00 CLONE ME.GPJ 12/29/15

GROUNDWATER DATA

ENCOUNTERED AT 18 FEET ▽

DRILLING DATA

___ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM ___ FEET
SMP DRILLER SJK LOGGER
CME 550 DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: AGB	Checked by: [illegible]	App'vd. by: AMS
Date: 10/9/2015	Date: 8/5/16	Date: 8/5/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Plant
Ameren Missouri

LOG OF BORING: APW-6

Project No. J024917.01

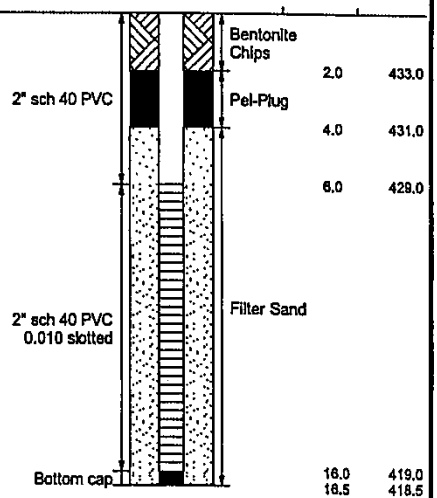
Surface Elevation: 435.03 Datum: _____

Completion Date: 10/1/2015
Latitude: 39.815833
Longitude: -90.573333

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Black, silty CLAY - CL		2-4-3	SS1
	Brown, silty CLAY - CL		2-3-4	SS2
5			1-2-1	SS3
	Brown, fine grained SAND - SP		1-1-1	SS4
			0-0-1	SS5
10	Blind drilled - heaving sands			
15				
	Boring terminated at 17 feet.			
20				
25				
30				
35				

WELL DIAGRAM

Stickup = 3.7 ft
Diameter: 8 1/2 Inch



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 6 FEET ▽

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
SMP DRILLER SJK LOGGER
CME 550 DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: AGB	Checked by: [illegible]	App'vd. by: AMS
Date: 10/9/2015	Date: 8/5/16	Date: 8/5/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Plant
Ameren Missouri

LOG OF BORING: APW-7

Project No. J024917.01

LOG OF BORING 2002 WL J024917.01 - MEREDOSIA WELL.GPJ 00 CLONE ME.GPJ 12/29/15

Surface Elevation: 460.54
Datum: _____
Completion Date: 10/1/2015
Latitude: 39.818611
Longitude: -90.5697222

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Brown, fine grained, poorly graded SAND - SP		3-9-9	SS1
			7-11-12	SS2
5			3-4-5	SS3
			2-3-3	SS4
			2-3-4	SS5
10			2-3-5	SS6
			3-5-9	SS7
			5-7-7	SS8
15			5-7-8	SS9
			5-7-8	SS10
			9-15-16	SS11
20			7-12-13	SS12
			8-13-14	SS13
			9-10-11	SS14
25	Brown, medium grained, poorly graded SAND - SP		6-6-9	SS15
			5-8-9	SS16
30			4-5-6	SS17
	Blind drilled - heaving sands			
35				
40	Boring terminated at 40 feet.			

WELL DIAGRAM

Stickup = 3.4 ft
Diameter: 8 1/2 inch

Depth (ft) / Elev. (ft)

- Bentonite Grout
- 2" sch 40 PVC
- 23.0 / 437.5
- Pel-Plug
- 26.3 / 434.3
- 28.6 / 431.9
- Filter Sand
- 2" sch 40 PVC 0.010 slotted
- Bottom cap
- 38.6 / 421.9
- 39.1 / 421.4

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 J024917.01 - MEREDOSIA WELL.GPJ 00 CLONE ME.GPJ 12/29/00

GROUNDWATER DATA

ENCOUNTERED AT 32 FEET ▽

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
SMP DRILLER SJK LOGGER
CME 550 DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: AGB	Checked by: [illegible]	App'vd. by: AMS
Date: 10/9/2015	Date: 8/5/16	Date: 8/5/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Plant
Ameren Missouri

LOG OF BORING: APW-8

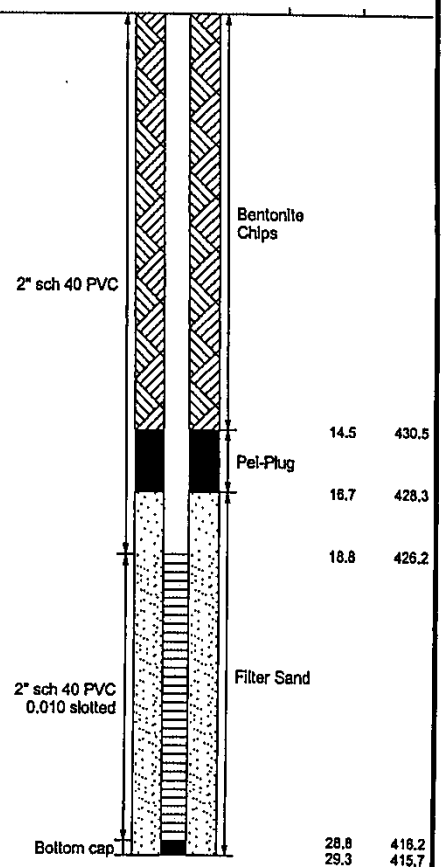
Project No. J024917.01

Surface Elevation: 444.97
Datum: _____
Completion Date: 10/1/2015
Latitude: 39.821388
Longitude: -90.569722

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	FILL: black, silty sand with coal CCR		4-3-2	SS1
			2-3-3	SS2
5			3-8-8	SS3
			2-4-1	SS4
			2-3-10	SS5
10	Gray SILT - ML		4-3-2	SS6
	Brown, fine grained SAND - SP		5-6-5	SS7
15			3-4-3	SS8
			3-3-4	SS9
	Brown, medium grained SAND - SP		3-3-4	SS10
20		▽	1-2-1	SS11
			2-2-4	SS12
	Blind drilled - heaving sands			
25				
30	Boring terminated at 30 feet.			
35				

WELL DIAGRAM

Stickup = 3.1 ft
Diameter: 8 1/2 inch



GROUNDWATER DATA

ENCOUNTERED AT 20 FEET ▽

DRILLING DATA

__ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM __ FEET
SMP DRILLER SJK LOGGER
CME 550 DRILL RIG
HAMMER TYPE Auto

REMARKS:
CCR = Coal Combustion Residuals

Drawn by: AGB	Checked by:	App'vd. by: AMS
Date: 10/9/2015	Date: 8/5/16	Date: 8/5/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Plant
Ameren Missouri

LOG OF BORING: APW-9

Project No. J024917.01

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 J024917.01 - MEREDOSIA WELL.GPJ 00 CLONE.ME.GPJ 12/29/10

APPENDIX B

GROUNDWATER SAMPLING PROTOCOL

Appendix B – Groundwater Sampling Procedure

The following procedure shall be used in sampling groundwater at the site. This sampling procedure applies to the routine quarterly and/or modified semi-annual or annual sampling events. A groundwater sampling field data sheet, comparable to the example located in Exhibit B-1, may be used to document the sampling activities at each well. If site conditions at the time of sampling could influence the results, sampling should be postponed until a later date. However, under no circumstances shall the sampling deviate from the schedule in Section 3.1.

To ensure samples are identified and collected at the correct location, monitoring wells should be marked with the monitoring identification designated in the groundwater monitoring program. Brass monument tags with the well identification stamped into the metal shall be installed on each well.

Wells must have permanently marked reference points from which groundwater levels and well depths will be measured. Elevations of reference points must be established relative to the *North American Vertical Datum of 1929 or 1983*, whichever is available. All sampling points should use the same datum.

Upgradient wells should be sampled first to avoid cross contamination. In general, this procedure is intended to sample the least potentially contaminated monitoring point first, and subsequently sample all other monitoring points with increasing contamination potentials.

The three principal steps in collecting groundwater samples from monitoring wells are measuring static groundwater levels; evacuating or purging well bores and casings; and collecting and preserving samples. Each step must be performed consistently from well to well, and from one sampling event to the next if accurate data and representative samples are to be obtained.

General Procedures

The date, time, ambient air temperature, general weather conditions, and individuals present, including sample team members and any observers shall be recorded on the groundwater sampling sheet for each well. The sampling equipment and containers should be stored so that contact with the ground surface is minimized.

All parts of sampling equipment coming in contact with groundwater must be thoroughly washed with a non-phosphate detergent and triple rinsed with deionized or distilled water before use. Decontamination shall be conducted initially upon arrival at the site and after each monitoring well has been sampled. Sampling equipment shall be calibrated in accordance to the manufacturer's specifications at the start of each day or as required by the manufacturer.

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Water Level Gauging

Static elevations of groundwater should be measured prior to purging each well. Initially, depths to static groundwater levels should be measured from the specified reference point of each well during each sampling event in order to calculate the initial groundwater volume. Groundwater elevations in wells are obtained by subtracting measured depths to groundwater from the specified reference point elevation. Water levels at all monitoring wells should be collected on the same day to prevent time distortion of the water surface data.

Monitoring well depths should be measured as the distance from the reference point to the well bottom. Record these depths at each sampling event after low-flow purging. A decrease in well depth, from the known installed total depth, may indicate that sediments have been deposited in the well. If accumulated sediment obstructs approximately 10 percent of the screened interval length, then the well should be redeveloped.

The most common device used to measure well depth and groundwater level is an electronic water level meter. Electronic water level meters are battery-powered devices with a probe that is lowered into the well until an audible signal and/or light indicates contact with the water surface has been made.

The difference between installed total well depth and depth to static groundwater level is the stabilized height of the groundwater column in the well. Accumulated sediment is not subtracted when calculating the volume of groundwater in the well, resulting in a greater and more conservative estimate of purge volume. These measurements are used to determine the static well volume (in gallons) of groundwater for each well as follows:

1. In order to obtain the height (H) of the groundwater column, measure the well total depth (TD) and subtract the measured depth to static water level (MSD)

$$H = TD - MSD$$

2. Use the following formula to calculate the static well volume (in gallons) of groundwater:

$$V = 5.875 \times D^2 \times H$$

Where:
V = Well volume (gallons)
D = Inside well diameter (feet)
H = Height of groundwater column (feet)

Monitoring Well Purging – Pump Method

Low flow sampling methods will be used to obtain representative samples from the groundwater bearing zone being monitored in wells that demonstrate consistent and sufficient yields. A dedicated pumping device installed permanently in the well or a portable pumping device will be used to conduct low flow sampling. The pump intake must be near the middle of the well screen. Pumping flow rates must be less than natural recovery rate of the well generally less than 0.5 liters per minute. The goal is to minimize drawdown in the well. Drawdown is limited to less than 0.3 feet or 10% of the total water column. Continuous monitoring of water level and water quality indicator parameters for stabilization will be obtained during purging.

Indicator parameters for stabilization will begin to be obtained after one equivalent volume of tubing has been removed from the well. For this facility, the following parameters and stabilization requirements are:

- pH ± 0.05 S.U.
- temperature ± 0.5°F
- specific conductivity ± 5%
- dissolved oxygen ± 10% (optional)
- redox potential ± 10% (optional)
- turbidity ± 10% (optional)

Samples should be directly placed into the appropriate laboratory containers and handled according to the Sample Handling section and laboratory protocols. If a well is dry or exhibits slow recharge, the well will be allowed to recharge for a minimum of 12 hours. Samples shall be collected until all sample containers have been filled or the well becomes dry. The sampling conditions including dry well conditions shall be documented on the groundwater sampling field data sheet.

Monitoring Well Purging – Bailer Method

Bailers shall only be used for sample collection in the event of a non-functioning pump. Only new, disposable bailers with new string attached shall be used for sampling. Stabilization indicator parameter readings will be collected at each 0.5 gallon interval until stabilization is achieved in accordance with the Low Flow sampling method described above. Well volumes will be calculated in accordance with well gauging formulas described above.

Sample Collection Procedures

Sample handling and preservation techniques depend on the parameters to be analyzed. Groundwater samples should be collected, preserved and containerized in their order of sensitivity to volatilization (most sensitive to least sensitive). The purpose of sample preservation is to stabilize parameters of interest by retarding chemical or biological changes. Methods of preservation are generally limited to pH adjustment, chemical addition and cooling.

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Samples requiring preservation should be preserved immediately upon collection or be placed in sealed containers with preservative added by the laboratory. Proper preservation will help ensure that samples are representative of groundwater.

Every sample must be cooled to 4° C (approximately 39° F) immediately after being containerized and preserved. Every sample must also be maintained at 4° C until analyzed. Laboratory protocol regarding appropriate containers, preservatives, and holding times should be followed.

Groundwater samples that are to be analyzed for total recoverable metals must not be field filtered. However, if dissolved metals analyses are required, then the samples must either be field filtered through a 0.45-micron filter immediately upon collection and prior to preservation and transport to a laboratory or filtered by the laboratory upon receipt.

Field measurements for the indicator parameters of pH, temperature and specific conductivity should be taken on a portion of the sample that has been placed in a separate clean container that will not be analyzed for any other parameters. This procedure avoids cross contamination from field instrument probes.

Sample Documentation and Transportation

Before samples are transported to the laboratory, a chain-of-custody record shall be provided. Chain-of-custody records document in a legally defensible manner the history of collection, transfer and transport of each sample. Every individual, who is responsible for the samples from the time of collection to the time they are received by a laboratory, must be documented in the Chain-of-Custody record. The Chain-of-Custody document records allow tracing the possession and handling of individual samples from the time of field collection through the time of laboratory analyses. The sample labels shall be completed in indelible ink and sample seals (if required) should be applied to each container prior to packing and shipment. Samples shall be transported to the laboratory in sealed, insulated shipping containers, ice chests, or coolers. The samples should be shipped/delivered to the laboratory as soon as practical, preferably within 24 hours of sample collection.

GEOTECHNOLOGY, INC. ENGINEERING AND ENVIRONMENTAL SERVICES ST LOUIS • COLLINSVILLE	GROUNDWATER SAMPLING FIELD DATA SHEET Project No:

WELL NUMBER		PROJECT:

Personnel _____ Date _____ Weather _____

WELL DATA

Depth to water (pre-purge):		Condition of Well	Yes	No
Depth to water (post-sample):		Is well easily accessible?		
Total drawdown (ft).		Is well clearly labeled?		
Total well depth (ft):		Is protective casing in good		
Water column (ft):		Is PVC casing in good condition?		
Casing diameter inches:		Is padlock present? Locked?		
Depth to top of screen (ft):		Any obstruction or kinks in well?		
Casing volume (liters):		Is concrete pad intact?		
Tubing volume (liters)		Weep hole adequately drain well		
Method of purging:		Does well have protective posts?		
Purge rate (liters/min):		Purge Equipment?		
Purging time:		Was flow through cell used?		
Vol. purged (liters):		Instruments calibrated?		

FIELD PARAMETERS

Purge vol (L)	Sample Time	pH (SU)	Temp (°C)	Dissolved Oxygen (mg/L)	Spec. Cond. (S/m)	Turbidity NTU	ORP mV

SAMPLE DATA

Sample Date	
Time:	
Pumping rate (liters/min):	
Sample appearance:	

Observations:	1 gallon = 3.8 liters Tubing volume 1/4 ID inch = 0.0094 liters/foot 2" well volume = 0.6 liters/foot

APPENDIX C

LABORATORY QUALITY ASSURANCE MANUAL

BOW REFERENCE SHEET --- SAME FACILITY

Facility Number:	**W1370300005**
Facility Name:	**Ameren Energy - Meredosia**
USEPA Number:	
File Category:	**06L – Groundwater Closure**

FOR ADDITIONAL INFORMATION ON THIS, SEE CATEGORY UNDER THIS SAME FILE HEADING:	**06L – Groundwater Closure** **(CD)**

DATE OF OTHER DOCUMENT	DESCRIPTION OF OTHER DOCUMENT:
08/22/2016	**Closure Plan – Fly Ash Pond and Bottom Ash Pond**
	CD: Teklab QA Manual

IEPA-DIVISION OF RECORDS MANAGEMENT
RELEASABLE
AUG 18 2017
REVIEWER: JKS

ATTACHMENT C

GROUNDWATER MANAGEMENT ZONE PLAN
FLY ASH AND BOTTOM ASH POND
MEREDOSIA POWER STATION
800 SOUTH WASHINGTON STREET
MEREDOSIA, ILLINOIS

Prepared for:

AMERENENERGY MEDINA VALLEY COGEN, LLC
St. Louis, Missouri

Prepared by:

GEOTECHNOLOGY, INC.
St. Louis, Missouri

Project No. J024917.01

August 15, 2016

Del/J024917.01 Meredosia GMZ RD.doc

J024917.01

GROUNDWATER MANAGEMENT ZONE PLAN
FLY ASH AND BOTTOM ASH POND
MEREDOSIA POWER STATION
800 SOUTH WASHINGTON STREET
MEREDOSIA, ILLINOIS

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J024917.01

GROUNDWATER MANAGEMENT ZONE PLAN
FLY ASH AND BOTTOM ASH POND
MEREDOSIA POWER STATION
800 SOUTH WASHINGTON STREET
MEREDOSIA, ILLINOIS

1.0 INTRODUCTION

The Meredosia Power Station in Morgan County, Illinois is owned by AmerenEnergy Medina Valley Cogen, LLC and operated by the Ameren Energy Generating Company from 1948 to 2011, when the power station was closed. The Meredosia Power Station has three coal combustion residual impoundments including: the Bottom Ash Pond, the Fly Ash Pond and the Old Ash Pond. The Old Ash Pond was previously closed. The ash ponds were reportedly constructed of native materials and do not have bottom liners.

The Bottom Ash Pond was constructed in 1972 with a current surface area of approximately 14.8 acres. The Bottom Ash Pond received low-volume wastewater, bottom ash and storm water runoff. The Fly Ash Pond was constructed in 1968 with a current surface area of approximately 44.8 acres. The Fly Ash Pond reportedly received fly ash, low-volume wastewater and storm water runoff.

This document comprises the plan to establish a Groundwater Management Zone (GMZ) for the Meredosia Power Station in accordance with 35 Illinois Administrative Code (IAC) Part 620.250. This GMZ plan includes Parts I, II, and III of the 35 IAC Part 620.250(a)(2) Illinois Bureau of Land Management Confirmation of Adequate Corrective Action forms which are included in Attachment 1. Some of the information contained in this plan was obtained from the April 2016 Hydrogeologic Assessment Report[1] and the Groundwater Monitoring Plan[2] (GMP). The four on-site water supply wells identified in the Hydrogeologic Assessment report will be abandoned during planned demolition activities that are scheduled to occur in 2016-2018. The four on-site water supply wells should not be considered when assessing the adequacy of this GMZ request.

[1] *Hydrogeologic Assessment Report, Fly Ash and Bottom Ash Ponds Meredosia Power Station, Meredosia, Illinois;* prepared for Ameren Energy Medina Valley Cogen, LLC; prepared by Geotechnology, Inc.; Report No. J024917.01, dated April 2016.

[2] *Groundwater Management Plan, Fly Ash and Bottom Ash Ponds Meredosia Power Station, Meredosia, Illinois;* prepared for Ameren Energy Medina Valley Cogen, LLC; prepared by Geotechnology, Inc.; Report No. J024917.01, dated April 2016.

Sections 2.0 through 6.0 below contain the text of the requirements specified in the Confirmation of Corrective Action forms in italics followed by the required information and/or response.

2.0 GENERAL FACILITY INFORMATION

a. Facility Name

The facility name is the Meredosia Power Station.

b. Facility Address

The facility address is 800 South Washington Street, Meredosia, Illinois 62665.

c. County in which facility is located

The facility is located in Morgan County, Illinois.

d. Illinois EPA, Bureau of Land, and USEPA Identification Numbers

The Illinois Bureau of Land identification number is 1370305002. The United States Environmental Protection Agency (USEPA) identification number is ILD065236226.

e. A general description of the type of industry, products manufactured, raw materials used, location and size of the facility, including SIC codes

The Meredosia Power Station was a coal-fired electricity-generating power plant. Coal was shipped by rail and barge to the facility, burned, and the CCR deposited on-site in storage ponds. The Bottom Ash Pond was constructed in 1972 with a current surface area of approximately 14.8 acres. The Bottom Ash Pond received low-volume wastewater, bottom ash and storm water runoff. The Fly Ash Pond was constructed in 1968 with a current surface area of approximately 44.8 acres. The Fly Ash Pond reportedly received fly ash, low-volume wastewater and storm water runoff. The SIC code for the facility is 4911.

f. An identification of special units (operating or closed) present at the facility for which the GMZ is proposed

The Bottom Ash Pond and the Fly Ash Pond are the units for which the GMZ is proposed. Due to their proximity and relative positioning on the site, the two ash ponds will be treated as a single unit for purposes of groundwater monitoring and this GMZ.

g. 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 Item 2.0 (f) above. Map scale must be specific and the location of the facility must be provided with respect to Township, Section, and Range.

A United States Geologic Survey (USGS) topographic map with the site location is attached in Plate 1. A scaled site plan of the facility including the surveyed area of the proposed aerial extent of the GMZ is included in Plate 2. The ash ponds are located in the south half of Section 21 and the north half of Section 28, Township 16 North, Range 13 West.

h. A description of the geology and hydrogeology within the proposed GMZ and the surrounding area

The following is a summary of the information provided in the Hydrogeologic Assessment Report.

The Meredosia Power Station is located near the western edge of the Springfield Plain Subsection of the Till Plains Section, Central Lowland Province, Interior Plains Physiographic Region. The Interior Plains Physiographic Region extends across the Laurentian craton of central North America. It is comprised of the Great Plains and Central Lowland Provinces. The Central Lowlands Province to the east formed from eroded sediments from the topographically-higher Great Plains Province to the west.

Bedrock Stratigraphy. The Meredosia Power Station and surrounding areas within the Illinois River valley are underlain by Mississippian System bedrock of the Lower Valmeyeran Series which consists of the Meppen Limestone, Fern Glen formation, and the Burlington-Keokuk Limestone (Kolata, 2005).

Willman et al. (1975) describe the Meppen Limestone as a tan or buff, very fine-grained dolomitic limestone or calcareous dolomite. The formation is slightly crinoidal and contains calcite geodes up to 2-inches in diameter. The maximum thickness of this formation is approximately 22 feet. The Fern Glen formation consists of calcareous shale, limestone, and dolomite. Dolomitic portions of the formation are partially argillaceous. The limestone portions of the formation contain nodules of greenish-gray chert. The thickness of the formation can range from approximately 50 to 100 feet. The Burlington formation of the Burlington-Keokuk Limestone is described as a "very pure, coarsely crystalline, crinoidal, light gray limestone in medium to thick beds." The Burlington formation also contains beds of fine-grained, brownish-gray, dolomitic limestone. The formation is approximately 100 to 150 feet thick in Illinois. The Keokuk formation of the Burlington-Keokuk Limestone is composed of beds of fossiliferous, crinoidal limestone interbedded with fine-grained limestone, argillaceous dolomite, and calcareous gray shale. The Keokuk formation is approximately 60 to 80 feet thick in Illinois.

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Surficial Geology. The Meredosia Power Station is situated within the Illinois River valley. The overburden soils consist of channel and floodplain deposits of the Cahokia formation underlain by glacial outwash deposits belonging to the Henry formation. Fine-grained lacustrine deposits of the Equality formation are present in the subsurface, but are discontinuous. These formations occur throughout Illinois in valley bottoms and floodplains as channel deposits in present-day rivers and streams.

The Cahokia Alluvium consists mainly of poorly-sorted silt, clay, and silty sand, but locally contains lenses of sand and gravel. The upper part consists of overbank silt and clays. The lower portion consists of coarse-textured sand and lateral accretion deposits. The Cahokia formation may be up to 20 feet thick in the area of the Meredosia Power Station (Berg and Kempton, 1987).

The Henry formation consists of glacial sand and gravel outwash. The Henry formation is subdivided into three members that differ in lithology: the Batavia Member (outwash plains), the Mackinaw Member (valley trains), and the Wasco Member (ice-contact deposits) (Willman and Frye, 1970; Willman et al., 1975). Based on information from well logs, the thickness of the Henry formation ranges from 60 to 84 feet in the area of the Meredosia Power Station.

The Equality formation consists of bedded silt and clay deposits in glacial and post-glacial lakes. Gravel, sand, and organic deposits occur in lenses that intertongue with the Henry formation. In the area of the Meredosia Power Station, the Equality formation overlies the Henry formation and generally occurs as lenses or patches not exceeding 20 feet thick.

Subsurface Conditions. Geotechnology has conducted subsurface explorations of the overburden soils at the Meredosia Power Station. The subsurface exploration and laboratory testing efforts are discussed further in the Hydrogeologic Assessment Report and the following is a summary of the site conditions.

Native soils consisting of brown and gray, very soft to medium stiff, silt and clay were encountered below the fill in Boring B-1 and Monitoring Well APW-9, and at the ground surface in Boring B-5. Native soils consisting of black, clayey sand with trace gravel were encountered below the fill in Boring B-2.

A stratum of very soft to medium stiff, brown, black, and gray clay with traces of sand and wood was encountered below the fill in Borings B-3 and B-8, below the native soils in Borings B-1, B-2, and B-5, and at the ground surface in Borings B-4, B-9, APW-2, APW-3, APW-4, and APW-7. This soil stratum ranged in thickness from approximately 8 to 17 feet bls.

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The clay layer described above was underlain by a stratum of granular and cohesive alluvial soils (except for Boring APW-4). The granular alluvium generally consisted of loose, gray, clayey sand with gravel. The cohesive alluvium generally consisted of very soft to medium stiff, gray and brown, clayey silt, silty clay, and sandy clay. This soil stratum ranges in thickness from approximately 5 to 11 feet bls in borings where it is encountered.

Alluvium was encountered below the fill soils in Borings B-6 and B-7, and at the ground surface in Boring B-10 and Monitoring Wells APW-6 and APW-8. This stratum is interpreted as alluvium placed in a buried valley that had been cut down through the soil stratum described above. The granular portions of this alluvium infill generally consisted of very loose, gray, silty sand. The cohesive portions generally consisted of very soft to very stiff, gray, silty clay with sand and silt seams. This soil stratum was at least 28 feet thick where encountered.

The native soils described above are interpreted as belonging to the Cahokia Alluvium, and were underlain by sand deposits interpreted as belonging to the Henry formation. Generalized east-west and north-south subsurface profiles based on the soil boring data at the Meredosia Power Station.

Surface Water. The major surface water body in the vicinity of the Meredosia Power Station is the Illinois River, which flows from the north-northeast to the south-southwest, and borders the west side of the site. The normal pool elevation of the Illinois River is approximately 421.0 feet[3]. Information from the U.S. Army Corps of Engineers indicates the Illinois River flood stage is 435.0 feet above mean sea level (MSL). The record high stage was 446.69 feet above MSL on May 26, 1943, and the record low stage was 418.40 feet above MSL on January 11, 1940.

Meredosia Lake is approximately 1.5 miles north of the Meredosia Power Station. Smith Lake is located approximately 1-mile south of the site. Westerly-flowing streams drain the uplands east of the site to the Illinois River located west of the site.

Groundwater Flow. Based on the monitoring well gauging data, the groundwater flow direction at the Meredosia Power Station is to the west-northwest toward the Illinois River. Groundwater flow direction may be influenced by the stage of the Illinois River.

i. Groundwater classification at the site

Groundwater at the site is classified as Class I Groundwater per 35 Illinois Administrative Code (IAC) Part 620.

[3] Elevations herein refer to the mean sea level datum in feet (msl-ft).

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j. A description of the circumstances under which the release from each waste management unit identified in Item 2.0 (f) above, to groundwater was identified

Five groundwater wells were installed near the facility Fly Ash and Bottom Ash Ponds at the request of the IEPA in 2010. A release was detected during routine groundwater monitoring at the site.

3.0 RELEASE INFORMATION

a. The chemical constituents released to groundwater

The analytical results from 11 groundwater sampling and testing events were compared to the Illinois Class I groundwater standards. Boron, arsenic, iron, manganese, and sulfate were identified in at least one sampling event as exceeding the Class I groundwater standards. Changes of oxidation/reduction (redox) potential in the subsurface due to fluctuations in pH make evaluation of manganese and iron concentrations unreliable at this facility. Comparison of manganese and iron to the respective Class I groundwater standard may be inappropriate for this site.

The chemical constituents released to groundwater are described in detail in the Hydrogeologic Assessment Report. In summary, boron is the chemical constituents of concern due to the extent of impacts. These are consistent with typical CCR residual releases.

b. Identification of the chemical constituents detected in groundwater that are above the applicable standard in 35 Ill. Adm. Code Part 620

The analytical results from 11 groundwater sampling and testing events were compared to the Illinois Class I groundwater standards. As of the February 2016 sampling event, the boron concentration exceeded the Class I groundwater standard (2 ppm) in Monitoring Wells APW-2, APW-3, APW-8, and APW-9. As of the February 2016 sampling event, the arsenic concentration exceeded the Class I groundwater standard in Monitoring Well APW-3. Concentrations of manganese exceeded the Class I groundwater standard in Monitoring Wells APW-2, APW-3, and APW-4. Historical concentrations of iron exceeded the Class I groundwater standards in Monitoring Wells APW-3 and APW-4, but the February 2016 results are below the Class I groundwater standard. A single event anomaly associated with flooding in February 2016 resulted in the concentration of sulfate in Monitoring Well APW-9 being above the Class I groundwater standard. Changes of oxidation/reduction (redox) potential in the subsurface due to fluctuations in pH make evaluation of manganese and iron concentrations unreliable at this facility. Comparison of manganese and iron to the respective Class I groundwater standard may be inappropriate for this site.

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c. *A description of how the site has been investigated to determine the source or sources of the release*

A detailed description of site investigation activities to date is included in the Hydrogeologic Assessment Report. A summary of the site investigation activities follows.

From October 19 through October 26, 2010, Geotechnology advanced 15 borings at the Meredosia Power Station. Ten of the borings (B-1 through B-10) were drilled in support of a global stability evaluation, while the remaining five borings were completed as Monitoring Wells APW-1 through APW-5 in support of groundwater monitoring activities. The borings were drilled to depths ranging from 25 to 60 feet below land surface (bls). Standard Penetration Tests (SPT) were performed using an automatic hammer and split spoon sampler.

From September 28 through October 1, 2015, Geotechnology advanced four additional borings at the site. The borings were drilled to depths ranging from 17 to 40 feet bls. SPTs were performed using an automatic hammer and split spoon sampler. Monitoring Wells APW-6 through APW-9 were installed in the borings in support of ongoing groundwater monitoring activities.

d. *A description of the groundwater monitoring network and groundwater sampling protocols in place at the facility*

Groundwater samples will be obtained from existing groundwater monitoring wells (APW-1 through APW-9). If additional wells are constructed in the future, the construction, sampling, and analysis methods described in the Groundwater Monitoring Plan will apply to those monitoring wells. Monitoring wells have a well identification number with an "APW" identifier, followed by a 1-, 2-, or 3-place alpha-numeric designation. The approximate locations of the monitoring wells are included on Plate 2. The monitoring program generally follows 35 IAC 620 by satisfying the following standards for the monitoring system:

- The monitoring wells are sufficiently located to represent the quality of groundwater at the compliance point(s);
- The monitoring wells are located within the stratigraphic unit(s) that may serve as potential contaminant migration pathways;
- The groundwater monitoring wells are secure; and,
- Monitoring wells are installed to evaluate on-site and off-site groundwater quality.

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The groundwater sampling protocols are provided in Appendix B of the Groundwater Monitoring Plan and a copy has been provided in Appendix B of this plan.

e. The schedule for monitoring of the groundwater

Groundwater monitoring events are anticipated to be conducted quarterly until trend analysis indicates less frequent monitoring is acceptable.

Five years after approval of the CQA Acceptance Report, 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 the following:

- Monitoring effectiveness will not be compromised by the reduced frequency of monitoring;
- Adequate data has been collected to characterize groundwater; and
- Concentrations of constituents monitored at the downgradient boundaries do not demonstrate statistically significant increasing trends that can be attributed to the former ash ponds.

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 when the IEPA approves the post-closure care completion report. This occurs after statistically significant increasing trends are not detected for five (5) consecutive years after changing to an annual monitoring frequency.

4.0 PROPOSED GMZ BOUNDARIES

The horizontal boundaries of the proposed GMZ are illustrated on Plate 2. The vertical component of the proposed GMZ will extend to 60 feet below the ground surface within the horizontal boundaries of the GMZ, concurrent with the bottom of the Henry Formation at the site.

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5.0 APPROVED REMEDIAL ACTION INFORMATION

a. A description of the approved remedial action

The remedial action for the facility is the relocation and clean closing of the east ash storage pile, capping of the Fly Ash Pond, and the partial clean closure and capping of the Bottom Ash Pond. The Bottom Ash Pond will be closed by the removal of most coal combustion residuals (CCR) to the Fly Ash Pond. The remaining CCR under the roadway and pipeline will be capped in-place. Because the groundwater contamination is a result of leaching inorganics from the CCR, this will effectively remove the majority of the contamination source material from the Bottom Ash Pond, and protect the remaining material from storm water infiltration.

The Fly Ash Pond will be closed by the installation of a cap. A capped closure will redirect precipitation that may otherwise pass through the CCR. The capped closure will reduce further leaching of inorganics into the groundwater.

b. A description of how the approved remedial action has impacted the release

It is anticipated that the closure of the ash ponds will reduce the concentrations of contaminants below the Illinois Class I groundwater standards in approximately 3 years after dewatering and closure. This is based on the general reduction of chemicals in groundwater since the plant was closed and modeling of the cap system using the HELP model, MODFLOW and MT3DMS models, and river concentration calculations. The remedial action will occur concurrently with the implementation of this proposed GMZ.

c. A description of how the approved remedial action is operated and maintained

Subject to IEPA approval, the remedial action is the closure of the Bottom Ash Pond and the Fly Ash Pond. Proposed ash pond closure activities include reducing the aerial extent of the Fly Ash Pond to 41.9 acres, moving approximately 12.3 acres of the Bottom Ash Pond to the Fly Ash Pond, grading the ash for storm water runoff, installing ClosureTurf (meets the performance requirements of Subtitle D) cover over the 41.9 acres of the Fly Ash Pond and the 2.5 acres of Bottom Ash Pond that is being closed-in-place. These activities will address the source of the impacts by directing storm water away from the CCR and reduce future infiltration of impacted water into the groundwater.

d. A projected schedule for completion of remediation

The completion of remediation activities are anticipated to be performed during the 2016 and 2017 construction seasons. Groundwater monitoring will continue in accordance with the schedule described in Section 3.0(e).

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e. An identification of any and all permits obtained from the Illinois EPA for the remedial action

An NPDES permit is pending renewal.

f. A description of how groundwater at the facility will be monitored following the future completion of the remedy to ensure that the groundwater quality standards have been attained

Groundwater will be monitored using the groundwater monitoring network of nine wells described in Section 3.0(d) in the GMP.

Compliance will be demonstrated by performing an annual trend analysis for each downgradient monitoring well for the monitored constituents listed in the Groundwater Monitoring Plan that exceed the Class I groundwater standards. The analysis shall be performed on a minimum of eight (8) consecutive samples and use Sen's Estimate of Slope for compliance assessment. Generally, if analyses for a parameter show an increasing trend at a down-gradient well, a Mann-Kendall analysis must be performed at a 95% tolerance interval to assess whether the increasing trend is statistically significant. If a statistically significant increase is observed, three (3) alternative statistical methods may be applied:

1. Notification of statistically significant increasing trends and revision to the sampling frequency must be reported to the IEPA within 30 days of making the determinations.

2. If an investigation determines that the statistically significant increasing trend is due to a superseding cause then the IEPA will be notified in writing, stating the cause of the increasing trend and the rationale used in its determination.

3. If there is no superseding cause, and the monitoring frequency has been decreased to semi-annual or annual, then sampling must return to a quarterly frequency. If after four (4) consecutive quarters and no statistically significant increasing trend is observed, then sampling frequency can return to the previous frequency.

If a statistically significant increasing trend continues to be observed over two or more consecutive years and there is no superseding cause, a hydrogeologic investigation (and additional site investigation(s), if necessary) will be performed.

g. A discussion addressing the adequacy of the controls and management of the proposed GMZ at the site

The controls and management of the GMZ are common practice in the industry and adequate to reduce the concentrations of contaminants below the Class I groundwater standards over time.

h. Course of action for future activities and/or request for modification in regards to the proposed GMZ at the site

Requests for future action or changes to the GMZ will be submitted in writing to the IEPA.

6.0 POINT OF COMPLIANCE

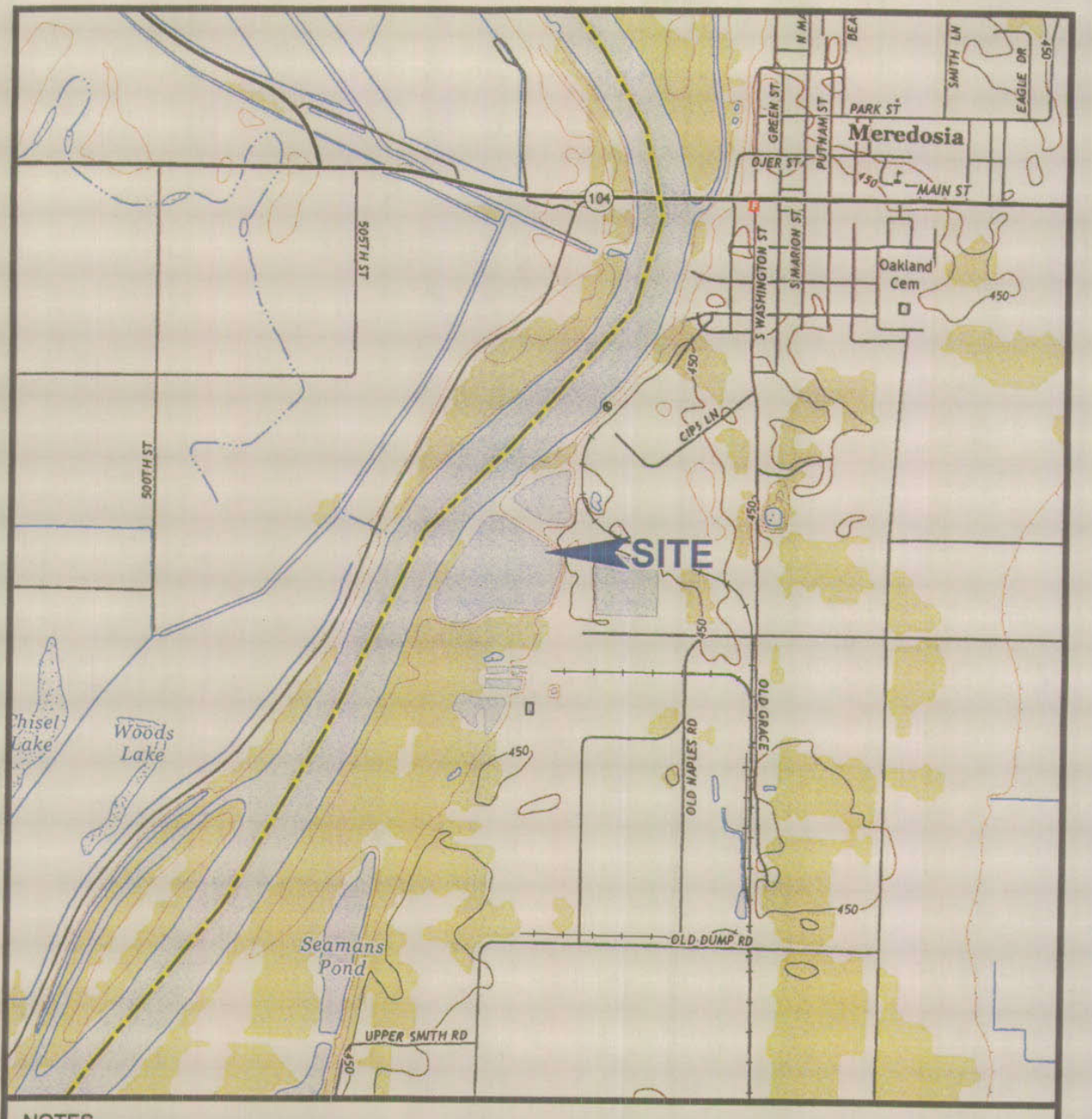
In any GMZ, the goal is remediation of the groundwater to the level of the standards applicable to that class of groundwater. This goal does not mean all groundwater within the GMZ must be returned to the groundwater standard. On the other hand, groundwater within the GMZ that is beyond the point of compliance as established under 35 Ill. Adm. Code part 620.505(a) is to be remediated to the level applicable to that groundwater class. However, groundwater contamination within the three-dimensional zone between the compliance point wells and the waste management unit could still exceed the applicable standards at completion of the corrective action. If this is the case, post-remediation monitoring may be necessary.

The point of compliance wells for the subject property will be APW-2 and APW-3. These wells are located adjacent to the Illinois River, and are located downgradient relative to the site. If remedial activities do not reduce the contaminant concentrations to levels below the Class I groundwater standards, a plan for post-remediation monitoring will be submitted to the IEPA.

7.0 LICENSED PROFESSIONAL SIGNATURE/SEAL

I hereby affirm that the information and design documents contained in this groundwater management zone plan are true and accurate to the best of my knowledge and professional opinion.

Rosanna M. Saindon, P.E., Ph.D.
Illinois Licensed Professional Engineer
Project Manager
Geotechnology, Inc.



NOTES

1. Plan adapted from a 7.5 minute U.S.G.S. map for Meredosia, Illinois quadrangle, last revised in 2015.

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SCALE IN FEET

Drawn By: WAH	Ck'd By: [illegible]	App'vd By: MSR
Date: 2-26-16	Date: 4/21/16	Date: 4/21/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Plant
Meredosia, Illinois

SITE LOCATION AND TOPOGRAPHY

Project Number J024917.01	PLATE 1

N

0 300 600

GRAPHIC SCALE

NOTE:
ALL BEARINGS AND COORDINATES ARE REFERENCED TO THE ILLINOIS STATE PLANE COORDINATE SYSTEM, NAD83, ILLINOIS WEST ZONE. ALL DISTANCES ARE GROUND

LEGAL DESCRIPTION

Part of the Northwest Quarter (NW 1/4) of Section Twenty-seven (27), part of the Northeast Quarter (NE 1/4) of Section Twenty-eight (28), and part of the Southeast Quarter (SE 1/4) of Section Twenty-One (21), all in Township Sixteen (16) North, Range Thirteen (13) of the Third Principal Meridian, Morgan County, Illinois, being more particularly described as follows: Beginning at the Southeast corner of the North Half (N 1/2) of the Northeast Quarter (NE 1/4) of said Section Twenty-eight (28); thence South 89°11'27" East (all bearings referenced to the Illinois State Plane Coordinate System, NAD 83, Illinois West Zone), 874.74 feet; thence North 00°23'32" West 1297.08 feet; thence North 89°02'55" West 1418.74 feet; thence North 07°18'23" West, 487.01 feet; thence North 44°46'00" East, 391.08 feet; thence North 58°53'16" West, 1658.73 feet; thence South 54°18'23" West 924.04 feet; thence South 48°53'44" West, 478.06 feet; thence South 40°26'07" West, 882.11 feet; thence South 27°15'47" West 1552.69 feet; thence South 89°40'31" East, 1015.01 feet; thence South 89°44'19" East, 496.63 feet; thence South 89°43'05" East 2641.92 feet to the point of beginning, except the following described parcel:

Part of the Northeast Quarter of Section 28, Township 16 North, Range 13 West of the Third Principal Meridian, Morgan County, Illinois, being more particularly described as follows:

Commencing at the Northeast corner of Section 28 (Southwest corner Section 22), Township 16 North, Range 13 West of the Third Principal Meridian, Morgan County, Illinois; thence South 89° 02' 55" East (basis of bearing is the Illinois State Plane Coordinate System, NAD 83, Illinois West Zone) along the South line of said Section 22, a distance of 19.06 feet; thence South 48° 18' 27" West a distance of 29.52 feet; thence North 89° 02' 55" West a distance of 19.76 feet; thence South 00° 09' 41" West a distance of 449.00 feet to the true point of beginning;

Thence continuing South 00° 09' 41" West a distance of 780.26 feet to a point on the now vacated North R.O.W. line of T.R. 59; thence North 89° 43' 05" West a distance of 250.00 feet; thence North 00° 09' 41" East a distance of 780.26 feet; thence South 89° 43' 05" East a distance of 250.00 feet to the true point of beginning.

Excepted parcel containing 4.478 acres, more or less.

Said Groundwater Management Zone tract containing 211.94 acres, more or less.

PROFESSIONAL LAND SURVEYOR
KENNETH E. STURGEON
035-003518
JACKSONVILLE
ILLINOIS
STATE OF ILLINOIS

SURVEYORS STATEMENT

I, KENNETH E. STURGEON, A PROFESSIONAL LAND SURVEYOR IN THE STATE OF ILLINOIS DO HEREBY STATE THAT THE PLAT AND DESCRIPTION SHOWN HEREON IS A TRUE AND CORRECT REPRESENTATION OF THE SURVEY MADE UNDER MY SUPERVISION.

Kenneth E. Sturgeon 8/15/16

KENNETH E. STURGEON
ILLINOIS PROFESSIONAL LAND SURVEYOR *3518
LICENSE EXPIRES 11/30/16

THIS PROFESSIONAL SERVICE CONFORMS TO THE CURRENT ILLINOIS MINIMUM STANDARDS FOR A BOUNDARY SURVEY.

B&A
BENTON & ASSOCIATES INC
Illinois Design Firm
Registration No. 184-000852

No.	Description	Date	Appr.

Kirksville Missouri
Macon Missouri
Moberly Missouri
Mexico Missouri

GROUND WATER MANAGEMENT ZONE
PLAT OF SURVEY
FOR
AMEREN, MEREDOSIA, ILLINOIS

BENTON & ASSOCIATES, INC.
1970 W. Lafayette Ave., Jacksonville IL 62650
(217) 245-4146 (217) 245-4149 Fax

Date:	August 2016
Designed by:	K. Sturgeon
Drawn by:	S. Weber
Reviewed by:	K. Sturgeon
Approved by:	K. Sturgeon

Job No. 12s3250

1

Sheet 1 of 2

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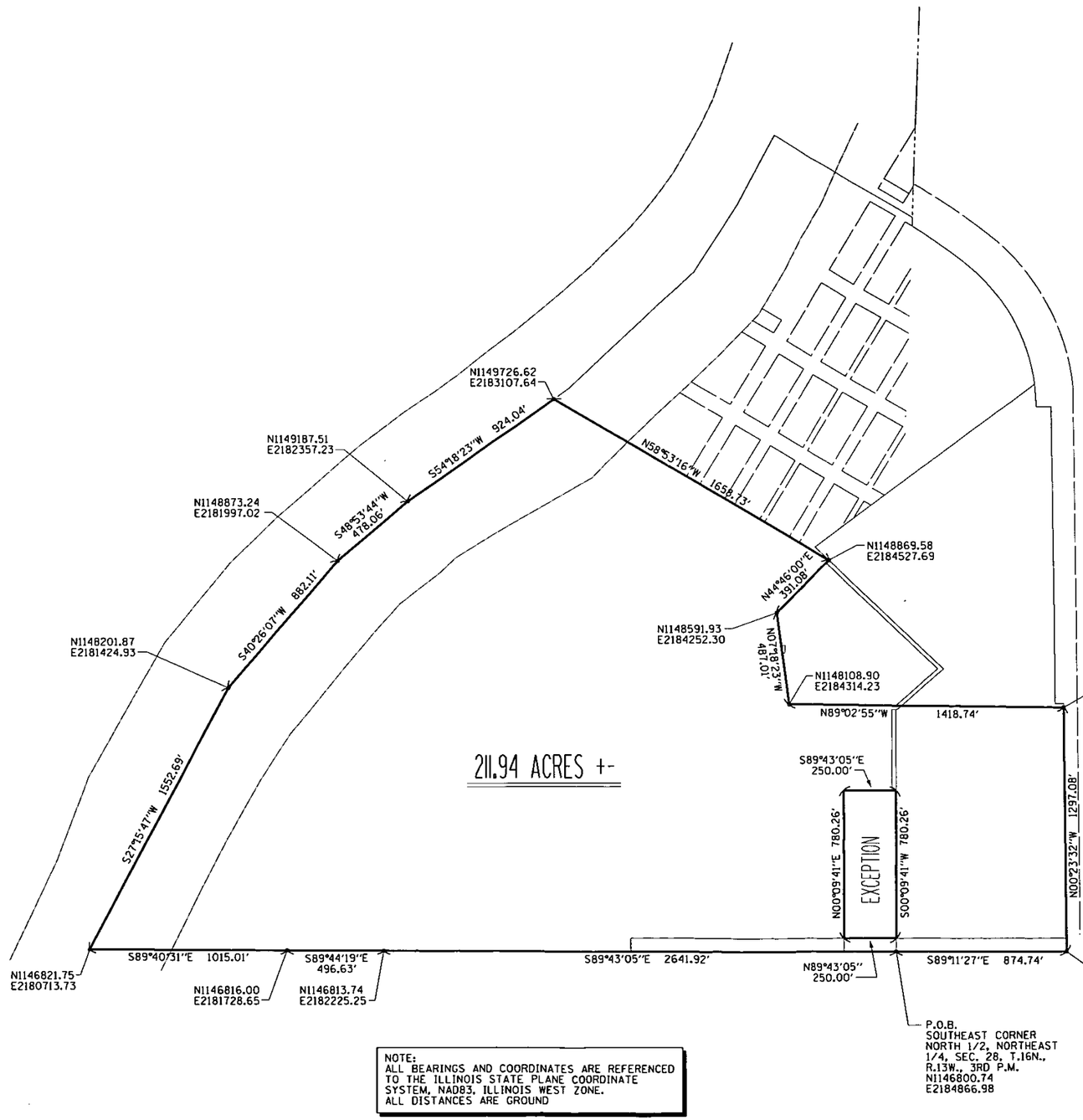

NOTE:
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ALL DISTANCES ARE GROUND

N

0 300 600
GRAPHIC SCALE

LEGAL DESCRIPTION

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PROFESSIONAL LAND SURVEYOR
KENNETH E. STURGEON
035-003513
JACKSONVILLE ILLINOIS
STATE OF ILLINOIS

SURVEYORS STATEMENT

I, KENNETH E. STURGEON, A PROFESSIONAL LAND SURVEYOR IN THE STATE OF ILLINOIS DO HEREBY STATE THAT THE PLAT AND DESCRIPTION SHOWN HEREON IS A TRUE AND CORRECT REPRESENTATION OF THE SURVEY MADE UNDER MY SUPERVISION.

Kenneth E. Sturgeon 8/15/16

KENNETH E. STURGEON
ILLINOIS PROFESSIONAL LAND SURVEYOR *3518
LICENSE EXPIRES 11/30/16

THIS PROFESSIONAL SERVICE CONFORMS TO THE CURRENT ILLINOIS MINIMUM STANDARDS FOR A BOUNDARY SURVEY.

B&A
BENTON & ASSOCIATES INC
Illinois Design Firm
Registration No. 184-000852

No.	Description	Date	Appr.

GROUND WATER MANAGEMENT ZONE
PLAT OF SURVEY
FOR
AMEREN, MEREDOSIA, ILLINOIS

Kirksville Missouri
Macon Illinois
Moon Missouri

BENTON & ASSOCIATES, INC.
1970 W. Lafayette Ave., Jacksonville IL 62650
(217) 245-4146 (217) 245-4149 Fax

Date: August 2016
Designed by: K. Sturgeon
Drawn by: S. Weber
Reviewed by: K. Sturgeon
Approved by: K. Sturgeon

Job No. 12s3250

Sheet 1 of 2

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ATTACHMENT 1

CONFIRMATON OF CORRECTIVE ACTION FORM

Electronic Filing: Received, Clerk's Office 05/01/2023

Joint Committee on Administrative Rules

ADMINISTRATIVE CODE

TITLE 35: ENVIRONMENTAL PROTECTION
SUBTITLE F: PUBLIC WATER SUPPLIES
CHAPTER I: POLLUTION CONTROL BOARD
PART 620 GROUNDWATER QUALITY
SECTION 620.APPENDIX D CONFIRMATION OF AN ADEQUATE CORRECTIVE ACTION PURSUANT TO 35 ILL. ADM. CODE 620.250(A)(2)

Section 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.

Part I. Facility Information

Facility Name Meredosia Power Station

Facility Address 800 South Washington Street; Meredosia, Illinois

County Morgan

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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. See Section 2.0(e.) of the GMZ Plan.

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. See Section 2.0(g.) of the GMZ Plan.

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 X If the answer to this question is "yes" generally describe these operations.

5. Has the facility generated, stored or treated hazardous waste as defined by the Resource Conservation and Recovery Act? Yes___ No X If the answer to this question is "yes" generally describe these operations.

6. Has the facility conducted operations which involved the processing, storage or handling of petroleum? Yes ___ No X If the answer to this question is "yes" generally describe these operations.

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 _X_ If the answer to this question is "yes", identify the IEPA permit numbers.

b. Interim Status under the Resources Conservation and Recovery Act (filing of a RCRA Part A application). Yes ___ No _X_ 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 _X_ 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 _X_

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 _X_ If the to this question is "yes", identify the caption and date of issuance.

b. Consent Decree or Order under RCRA, CERCLA, EPAct Section 22.2 (State Superfund), or EPAct Section 21(f) (State RCRA). Yes ___ No _X_

c. If either of Items a or b were answered by checking "yes", is the notice, order or decree still in effect? Yes ___ No _X_

10. What groundwater classification will the facility be subject to at the completion of the remediation?

Class I _X_ 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. See Section 2.0(j.) of the GMZ Plan.

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.

Facility Name	Signature of Owner/Operator
Location of Facility	Name of Owner/Operator
EPA Identification Number	Date

PART II: Release Information

1. Identify the chemical constituents release to the groundwater. Attach additional documents as necessary. See Section 3.0(a.) of GMZ Plan.

Electronic Filing: Received, Clerk's Office 05/01/2023

Chemical Description	Chemical Abstract No.
-	-
-	-
-	-

2. Describe how the site will be investigated to determine the source or sources of the release. See Section 3.0(c.) of the GMZ Plan.

3. Describe how groundwater will be monitored to determine the rate and extent of the release. See Section 3.0(d.) of the GMZ Plan.

4. Has the release been contained on-site at the facility? Yes

5. Describe the groundwater monitoring network and groundwater and soil sampling protocols in place at the facility. See Section 3.0(d.) of the GMZ Plan.

6. Provide the schedule for investigation and monitoring. See Section 3.0(e.) of the GMZ Plan.

7. Describe the laboratory quality assurance program utilized for the investigation. The laboratory quality assurance program is attached to this form.

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 summary of the results of available groundwater testing data is included in Appendix B of the GMZ Plan.

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.

Facility Name	Signature of Owner/Operator
Location of Facility	Name of Owner/Operator
EPA Identification Number	Date

Part III: Remedy Selection Information

1. Describe the selected remedy. The ash ponds will be clean closed.

2. Describe other remedies which were considered and why they were rejected. Other remedies were not considered.

Section 620

3. Will waste, contaminated soil or contaminated groundwater be removed from the site in the course of this remediation? Yes ___ No _X_ 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. See Section 5.0 of the GMZ Plan. 5a + C

5. Describe how the selected remedy will minimize any threat to public health or the environment. See Section 5.0 of the GMZ Plan. 5b and FI. Persistence @ 3415

6. Describe how the selected remedy will result in compliance with the applicable groundwater standards. See Section 5.0 of the GMZ Plan. 5b refer Attachment B

7. Provide a schedule for design, construction and operation of the remedy, including dates for the start and completion. See Section 5.0 of the GMZ Plan. 5d. tab. 9 retrieve

8. Describe how the remedy will be operated and maintained. See Section 5.0 of the GMZ Plan.

9. Have any of the following permits been issued for the remediation? refer to Attachment 5 D+E

   a. Construction or Operating permit from the Division of Water Pollution Control. Yes __ No ___ deferred for approval of plan

   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. deferred

   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. deferred

10. How will groundwater at the facility be monitored following completion of the remedy to ensure that the groundwater standards have been attained? See Appendix C of the GMZ Plan. refer to Attachment B

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.

Facility Name	Signature of Owner/Operator
Location of Facility	Name of Owner/Operator
EPA Identification Number	Date

ATTACHMENT 2

GROUNDWATER SAMPLING PROCEDURES

Appendix B – Groundwater Sampling Procedure

The following procedure shall be used in sampling groundwater at the site. This sampling procedure applies to the routine quarterly and/or modified semi-annual or annual sampling events. A groundwater sampling field data sheet, comparable to the example located in Exhibit B-1, may be used to document the sampling activities at each well. If site conditions at the time of sampling could influence the results, sampling should be postponed until a later date. However, under no circumstances shall the sampling deviate from the schedule in Section 3.1.

To ensure samples are identified and collected at the correct location, monitoring wells should be marked with the monitoring identification designated in the groundwater monitoring program. Brass monument tags with the well identification stamped into the metal shall be installed on each well.

Wells must have permanently marked reference points from which groundwater levels and well depths will be measured. Elevations of reference points must be established relative to the *North American Vertical Datum of 1929 or 1983*, whichever is available. All sampling points should use the same datum.

Upgradient wells should be sampled first to avoid cross contamination. In general, this procedure is intended to sample the least potentially contaminated monitoring point first, and subsequently sample all other monitoring points with increasing contamination potentials.

The three principal steps in collecting groundwater samples from monitoring wells are measuring static groundwater levels; evacuating or purging well bores and casings; and collecting and preserving samples. Each step must be performed consistently from well to well, and from one sampling event to the next if accurate data and representative samples are to be obtained.

General Procedures

The date, time, ambient air temperature, general weather conditions, and individuals present, including sample team members and any observers shall be recorded on the groundwater sampling sheet for each well. The sampling equipment and containers should be stored so that contact with the ground surface is minimized.

All parts of sampling equipment coming in contact with groundwater must be thoroughly washed with a non-phosphate detergent and triple rinsed with deionized or distilled water before use. Decontamination shall be conducted initially upon arrival at the site and after each monitoring well has been sampled. Sampling equipment shall be calibrated in accordance to the manufacturer's specifications at the start of each day or as required by the manufacturer.

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Water Level Gauging

Static elevations of groundwater should be measured prior to purging each well. Initially, depths to static groundwater levels should be measured from the specified reference point of each well during each sampling event in order to calculate the initial groundwater volume. Groundwater elevations in wells are obtained by subtracting measured depths to groundwater from the specified reference point elevation. Water levels at all monitoring wells should be collected on the same day to prevent time distortion of the water surface data.

Monitoring well depths should be measured as the distance from the reference point to the well bottom. Record these depths at each sampling event after low-flow purging. A decrease in well depth, from the known installed total depth, may indicate that sediments have been deposited in the well. If accumulated sediment obstructs approximately 10 percent of the screened interval length, then the well should be redeveloped.

The most common device used to measure well depth and groundwater level is an electronic water level meter. Electronic water level meters are battery-powered devices with a probe that is lowered into the well until an audible signal and/or light indicates contact with the water surface has been made.

The difference between installed total well depth and depth to static groundwater level is the stabilized height of the groundwater column in the well. Accumulated sediment is not subtracted when calculating the volume of groundwater in the well, resulting in a greater and more conservative estimate of purge volume. These measurements are used to determine the static well volume (in gallons) of groundwater for each well as follows:

1. In order to obtain the height (H) of the groundwater column, measure the well total depth (TD) and subtract the measured depth to static water level (MSD)

$$H = TD - MSD$$

2. Use the following formula to calculate the static well volume (in gallons) of groundwater:

$$V = 5.875 \times D^2 \times H$$

Where:
V = Well volume (gallons)
D = Inside well diameter (feet)
H = Height of groundwater column (feet)

Monitoring Well Purging – Pump Method

Low flow sampling methods will be used to obtain representative samples from the groundwater bearing zone being monitored in wells that demonstrate consistent and sufficient yields. A dedicated pumping device installed permanently in the well or a portable pumping device will be used to conduct low flow sampling. The pump intake must be near the middle of the well screen. Pumping flow rates must be less than natural recovery rate of the well generally less than 0.5 liters per minute. The goal is to minimize drawdown in the well. Drawdown is limited to less than 0.3 feet or 10% of the total water column. Continuous monitoring of water level and water quality indicator parameters for stabilization will be obtained during purging.

Indicator parameters for stabilization will begin to be obtained after one equivalent volume of tubing has been removed from the well. For this facility, the following parameters and stabilization requirements are:

- pH ± 0.05 S.U.
- temperature ± 0.5°F
- specific conductivity ± 5%
- dissolved oxygen ± 10% (optional)
- redox potential ± 10% (optional)
- turbidity ± 10% (optional)

Samples should be directly placed into the appropriate laboratory containers and handled according to the Sample Handling section and laboratory protocols. If a well is dry or exhibits slow recharge, the well will be allowed to recharge for a minimum of 12 hours. Samples shall be collected until all sample containers have been filled or the well becomes dry. The sampling conditions including dry well conditions shall be documented on the groundwater sampling field data sheet.

Monitoring Well Purging – Bailer Method

Bailers shall only be used for sample collection in the event of a non-functioning pump. Only new, disposable bailers with new string attached shall be used for sampling. Stabilization indicator parameter readings will be collected at each 0.5 gallon interval until stabilization is achieved in accordance with the Low Flow sampling method described above. Well volumes will be calculated in accordance with well gauging formulas described above.

Sample Collection Procedures

Sample handling and preservation techniques depend on the parameters to be analyzed. Groundwater samples should be collected, preserved and containerized in their order of sensitivity to volatilization (most sensitive to least sensitive). The purpose of sample preservation is to stabilize parameters of interest by retarding chemical or biological changes. Methods of preservation are generally limited to pH adjustment, chemical addition and cooling.

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Samples requiring preservation should be preserved immediately upon collection or be placed in sealed containers with preservative added by the laboratory. Proper preservation will help ensure that samples are representative of groundwater.

Every sample must be cooled to 4° C (approximately 39° F) immediately after being containerized and preserved. Every sample must also be maintained at 4° C until analyzed. Laboratory protocol regarding appropriate containers, preservatives, and holding times should be followed.

Groundwater samples that are to be analyzed for total recoverable metals must not be field filtered. However, if dissolved metals analyses are required, then the samples must either be field filtered through a 0.45-micron filter immediately upon collection and prior to preservation and transport to a laboratory or filtered by the laboratory upon receipt.

Field measurements for the indicator parameters of pH, temperature and specific conductivity should be taken on a portion of the sample that has been placed in a separate clean container that will not be analyzed for any other parameters. This procedure avoids cross contamination from field instrument probes.

Sample Documentation and Transportation

Before samples are transported to the laboratory, a chain-of-custody record shall be provided. Chain-of-custody records document in a legally defensible manner the history of collection, transfer and transport of each sample. Every individual, who is responsible for the samples from the time of collection to the time they are received by a laboratory, must be documented in the Chain-of-Custody record. The Chain-of-Custody document records allow tracing the possession and handling of individual samples from the time of field collection through the time of laboratory analyses. The sample labels shall be completed in indelible ink and sample seals (if required) should be applied to each container prior to packing and shipment. Samples shall be transported to the laboratory in sealed, insulated shipping containers, ice chests, or coolers. The samples should be shipped/delivered to the laboratory as soon as practical, preferably within 24 hours of sample collection.

ATTACHMENT 3

LABORATORY QUALITY ASSURANCE PROGRAM

BOW REFERENCE SHEET --- SAME FACILITY

Facility Number:	**W1370300005**
Facility Name:	**Ameren Energy - Meredosia**
USEPA Number:	
File Category:	**06L – Groundwater Closure**

FOR ADDITIONAL INFORMATION ON THIS, SEE CATEGORY UNDER THIS SAME FILE HEADING:	**06L – Groundwater Closure** **(CD)**

DATE OF OTHER DOCUMENT		DESCRIPTION OF OTHER DOCUMENT:
08/22/2016		**Closure Plan – Fly Ash Pond and Bottom Ash Pond**
		CD: Teklab QA Manual

IEPA-DIVISION OF RECORDS MANAGEMENT
RELEASABLE
AUG 18 2017
REVIEWER: JKS

IL 532 1596
PaperLPC 258 REV. JUN-93

Printed on Recycled

ATTACHMENT D

POST-CLOSURE CARE PLAN
FLY ASH POND AND BOTTOM ASH POND
MEREDOSIA POWER STATION
800 SOUTH WASHINGTON STREET
MEREDOSIA, ILLINOIS

Prepared for:

AMERENENERGY MEDINA VALLEY COGEN, LLC
St. Louis, Missouri

Prepared by:

GEOTECHNOLOGY, INC.
St. Louis, Missouri

Project No. J024917.01

August 4, 2016

Del/J024917.01 Meredosia Post Closure Care Plan RF.doc

J024917.01

POST-CLOSURE CARE PLAN
FLY ASH POND AND BOTTOM ASH POND
MEREDOSIA POWER STATION
800 SOUTH WASHINGTON STREET
MEREDOSIA, ILLINOIS

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2.0 SITE LAYOUT 1

3.0 POST-CLOSURE MAINTENANCE PROGRAM 1
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J024917.01

POST-CLOSURE CARE PLAN
FLY ASH POND AND BOTTOM ASH POND
MEREDOSIA POWER STATION
800 SOUTH WASHINGTON STREET
MEREDOSIA, ILLINOIS

1.0 INTRODUCTION

This Post-Closure Care Plan for the AmerenEnergy Medina Valley Cogen, LLC, Meredosia Power Station Fly Ash and Bottom Ash Ponds Coal Combustion Waste Surface Impoundments (Meredosia) has been prepared in general accordance with the requirements of the site-specific rule in 35 Illinois Administrative Code (IAC) Part 840. Supporting documents are listed in Section 6.0 of this report and are being submitted concurrently with the Post-Closure Care Plan.

A written record of monitoring will be made and retained at the main office of the owner since the site is in the process of being decommissioned and demolished. This written record typically includes completed standard inspection forms and photographs. The inspector will assess the condition and need for repair of cover components, embankments, monitoring wells, and surface water control features.

2.0 SITE LAYOUT

The Meredosia Power Station is located at 800 South Washington Street, Meredosia, Illinois. The facility is currently being decommissioned and will be demolished. The Fly Ash and Bottom Ash Ponds are located southwest of the coal pile and plant facilities. The site location and topography are shown on Plate 1. The structures and ash ponds are shown on Plate 2.

3.0 POST-CLOSURE MAINTENANCE PROGRAM

The post-closure operation and maintenance program includes site inspections of surface disturbances, failures, adequacy of sand infill, storm water drainage channel maintenance, and repairs as required. This Post-Closure Plan applies the Fly Ash Pond, the Bottom Ash Berm, groundwater monitoring wells associated with the former ash ponds, and surface water drainage from the former ash ponds.

Site monitoring and repair records will be created and retained at the main office of the owner until the Illinois Environmental Protection Agency (IEPA) approves a certified Post-Closure Completion Report.

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3.1 Frequency of Inspections

Quarterly site inspections of the Fly Ash Pond, the Bottom Ash Berm, and associated features will be performed for the first five (5) years after completion of closure activities and submittal of the Construction Quality Assurance (CQA) Acceptance Report. After the five year period, site inspections will be performed at the same rate as groundwater sampling (Groundwater Monitoring Plan, Geotechnology, 2016), with a minimum frequency of once per year. Site inspections will occur until the IEPA approves a Post-Closure Completion Report.

3.2 Erosion Control Maintenance

The embankments for both ash ponds will be capped with ClosureTurf® and HydroTurf®, which do not require vegetation. Ash pond embankments below the 100-year flood elevation will also have rip-rap protection. Some areas that are currently vegetated near the ash ponds may be impacted during construction activities. These areas will be regraded and vegetated.

3.3 Drainage Channel Maintenance

Drainage channels on the cover and along the ash pond embankments will be lined with HydroTurf®, which minimizes erosion and sedimentation issues. Drainage channels outside of the ash pond will be natural or rock-lined. Metal culverts will be installed under roads as needed. However, soil or sand at the connections from the HydroTurf® to the drainage channels outside the ash ponds may erode due to the sudden change in gradient at connections with other drainage ways. Repair of energy dissipaters at the connections or localized material infill may be required. The repair material will consist of material similar to the infill and will be capped with a liner material or vegetated.

Storm water from the cap will exit the surface water control system into existing waterways onsite. These waterways will be monitored and repaired as necessary to reduce pooling and erosion. Eroded areas will be infilled with material similar to that which was eroded and capped with like material or vegetated.

3.4 Final Cover Maintenance

The ash in the Fly Ash Pond and the Bottom Ash Pond has consolidated for a minimum of four years. The ClosureTurf® and HydroTurf® systems are not sensitive to settlement, but if post-closure cover settlement occurs, localized repairs to maintain the integrity of the cover may be needed.

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3.5 Vegetative Repair and Mowing

Vegetation and mowing is not required on the capped areas due to the use of ClosureTurf® and HydroTurf® to cover the ash ponds instead of vegetative cover.

3.6 Miscellaneous Repairs

Minor repairs may be required to maintain the integrity and proper function of fencing, surface water drainage structures, monitoring points, and groundwater monitoring wells. Repairs will be made as warranted.

4.0 GROUNDWATER MONITORING SYSTEM

The groundwater monitoring well locations, system, maintenance program, and monitoring program are provided under a separate cover titled the Groundwater Monitoring Plan (Geotechnology, 2016). Groundwater trend statistical analysis and mitigation of statistically significant increasing trends are addressed in the Groundwater Monitoring Plan. Two years after the ash ponds have been closed, the groundwater monitoring network will be re-evaluated based on the changes in the groundwater impacts.

5.0 OPERATION AND MAINTENANCE PLAN FOR STRUCTURES AND DEVICES

Operation and maintenance plans for currently planned structures are addressed in the associated sections of this report and the referenced reports. Operation and maintenance plans for future structures, if needed, will be prepared at the time those structures are installed.

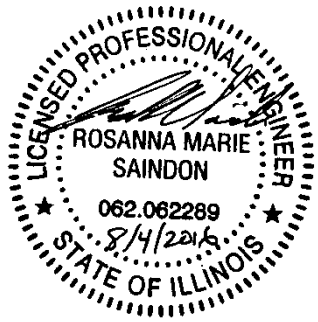
6.0 REFERENCES

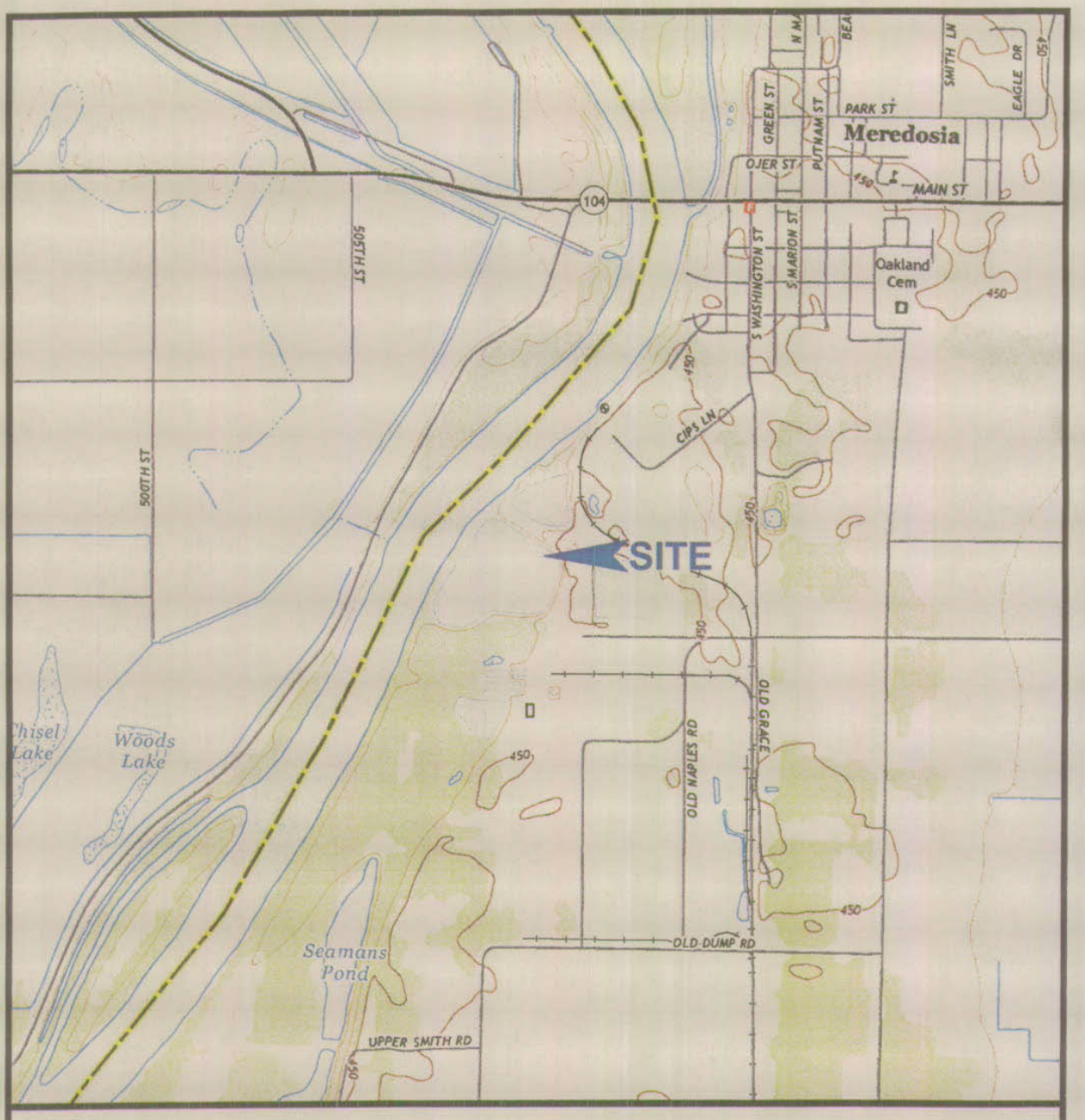
Geotechnology, 2016. "Groundwater Monitoring Plan, Fly Ash and Bottom Ash Ponds, Meredosia Power Station." Geotechnology, Inc., St. Louis, Missouri.

7.0 LICENSED PROFESSIONAL SIGNATURE/SEAL

I hereby affirm that the information contained in this Post-Closure Care Plan is true and accurate to the best of my knowledge and professional opinion.

Rosanna M. Saindon, P.E., Ph.D.
Illinois Licensed Professional Engineer
Project Manager
Geotechnology, Inc.





NOTES

1. Plan adapted from a 7.5 minute U.S.G.S. map for Meredosia, Illinois quadrangle, last revised in 2015.

0 2,000 4,000

SCALE IN FEET

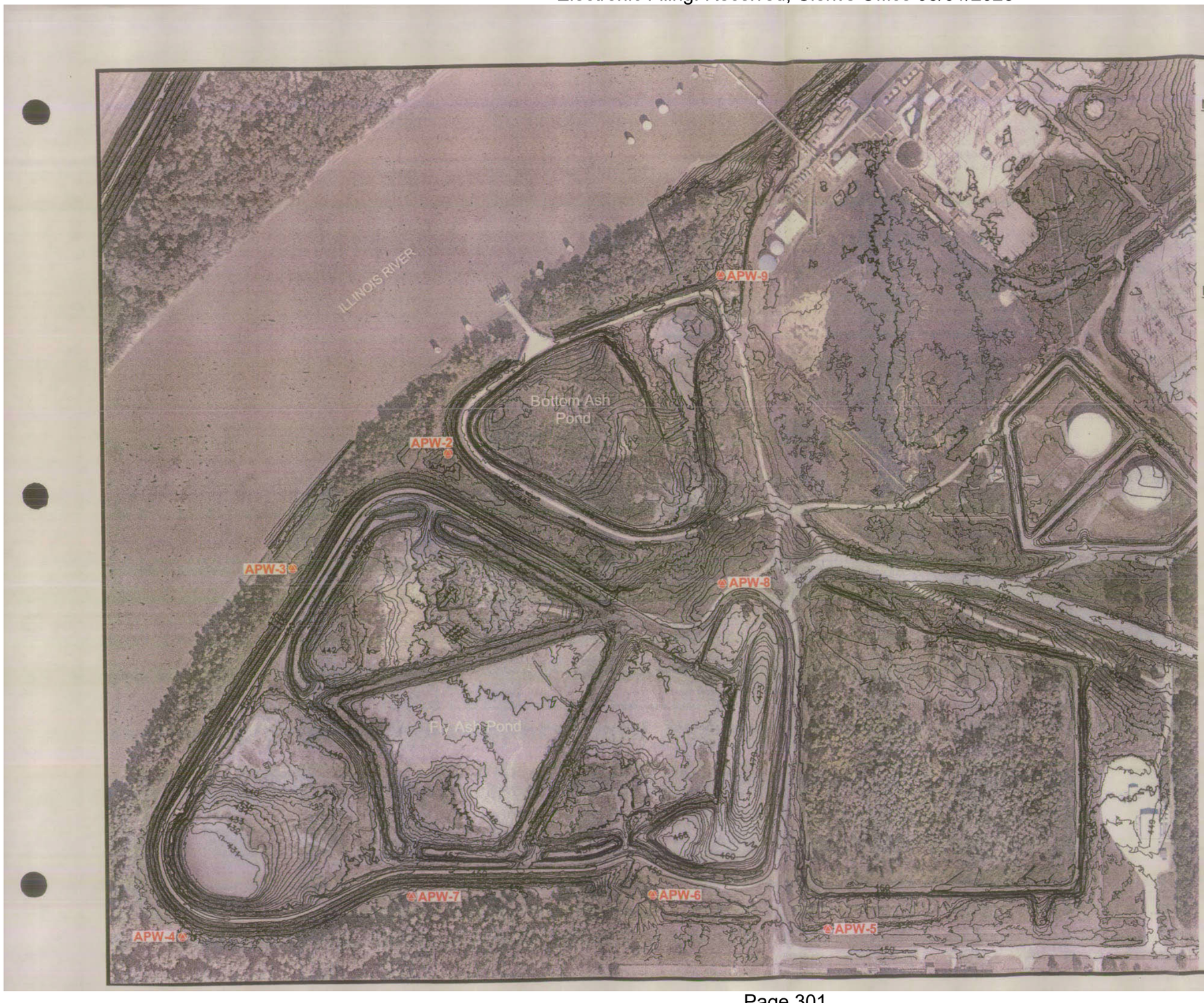
Drawn By: WAH	Ck'd By: AMS	App'vd By: DTK
Date: 2-26-16	Date: 7/1/16	Date: 7/5/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Plant
Meredosia, Illinois

SITE LOCATION AND TOPOGRAPHY

Project Number J024917.01	PLATE 1



NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

Monitoring Well Location

N

0 300 600

SCALE IN FEET

Drawn By: WAH	Ck'd By: AMS	App'vd By: DTR
Date: 5-26-16	Date: 7/1/16	Date: 7/5/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

SITE PLAN AND MONITORING WELL LOCATIONS

Project Number J024917.01	PLATE 2

ATTACHMENT E

CONSTRUCTION QUALITY ASSURANCE PLAN
FLY ASH POND AND BOTTOM ASH POND
MEREDOSIA POWER STATION
800 SOUTH WASHINGTON STREET
MEREDOSIA, ILLINOIS

Prepared for:

AMERENENERGY MEDINA VALLEY COGEN, LLC
St. Louis, Missouri

Prepared by:

GEOTECHNOLOGY, INC.
St. Louis, Missouri

Project No. J024917.01

August 15, 2016

J024917.01

CONSTRUCTION QUALITY ASSURANCE PLAN
FLY ASH POND AND BOTTOM ASH POND
MEREDOSIA POWER STATION
800 SOUTH WASHINGTON STREET
MEREDOSIA, ILLINOIS

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CONSTRUCTION QUALITY ASSURANCE PLAN
FLY ASH POND AND BOTTOM ASH POND
MEREDOSIA POWER STATION
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CONSTRUCTION QUALITY ASSURANCE PLAN
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CONSTRUCTION QUALITY ASSURANCE PLAN
FLY ASH POND AND BOTTOM ASH POND
MEREDOSIA POWER STATION
800 SOUTH WASHINGTON STREET
MEREDOSIA, ILLINOIS

1.0 INTRODUCTION

Geotechnology, Inc. prepared this Construction Quality Assurance (CQA) plan for the Fly and Bottom Ash Ponds closure at the Meredosia Power Station in Meredosia, Morgan County, Illinois. The CQA Plan was prepared in general accordance with the Coal Combustion Waste (CCW) surface impoundment closure guidance of 35 Illinois Administrative Code (IAC) 840.146 entitled Site-Specific Closures of Coal Combustion Waste Surface Impoundments Subpart A: Closure of Ash Pond D, Hutsonville Power Station Construction Quality Assurance Program.

This CQA plan includes information related to responsible personnel, project activities, monitoring, sampling, and testing of the coal combustion residual (CCR) cap. The purpose of the CQA plan is to achieve a reasonable degree of certainty that the construction of the CCR surface impoundment cap achieves the specified design parameters.

The CQA Plan requires preparation of an acceptance report at the end of construction by the CQA Officer. The acceptance report includes CQA documentation and a certification by the CQA Officer that the CQA Plan for the facility was followed. This CQA Plan is intended to supplement the project plans and specifications. Where a conflict exists, the current approved CQA Plan will govern.

The testing methods, acceptance requirements, and testing frequencies that guide the implementation of this plan are listed in Table 1. Appendix A includes example testing and observation forms. Alternative forms approved by the Ameren Missouri (Ameren) Project Manager that include the same information are acceptable. Appendix B includes the Watershed Geosynthetics ClosureTurf® and HydroTurf® reference material.

2.0 PROJECT PERSONNEL RESPONSIBILITY AND AUTHORITY

The project organization chart (Figure 1) illustrates the project personnel involved in the Fly and Bottom Ash Ponds closure activities. Project personnel responsibility and authority are presented below.

2.1 Owner. AmerenEnergy Medina Valley Cogen, LLC (Owner) currently holds permits for National Pollutant Discharge Elimination System (NPDES) and operation of the Fly and Bottom Ash Ponds. The Owner has an agreement with Ameren Missouri (Ameren) to complete this work. Ameren will submit the project closure plan, construction plan, specifications, CQA plan, groundwater monitoring plan, and post-closure care plan to the Illinois Environmental Protection Agency (IEPA) and Illinois Department of Natural Resources (IDNR) for approval prior to construction.

The Ameren designated representative is the Ameren Project Manager. The Ameren Project Manager coordinates overall construction and acts as the Owner's primary point of contact with the General Contractor. The Ameren Project Manager coordinates all matters involving contract issues, including approving changes to the project plans and specifications.

2.2 Design Engineer. The Design Engineer is responsible for development of plans and specifications that fulfill the requirements of the Owner and regulatory agencies. The Design Engineer is responsible for:

- responding to the Contractor requests for information (RFIs) during construction;
- addressing identified conflicts in the project plans and specifications; and
- developing modifications to the plans and specifications that may be required to address changed field conditions, field cost savings, design improvements, or other necessary or desired modifications as approved by the Owner.

2.3 Site Supervisor. The Site Supervisor is the field representative for the Owner that observes contractor activities and reports to the Owner. The Site Supervisor is responsible for:

- maintaining records of Contractor personnel on-site, equipment on-site, and material deliveries, as provided by contractors and suppliers;
- recording closure activity progress in daily reports;
- obtaining photographs of closure activities;
- attending progress and/or deficiency meetings;
- developing and maintaining a submittal log;
- coordinating schedules with the Owner, General Contractor, and CQA Personnel;
- assisting the Owner by reviewing work orders and field changes;

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- coordinating with the Owner, General Contractor, and CQA Personnel regarding Owner-approved additional work and/or field changes; and

- observing construction activities, and reporting to the Owner if discrepancies between the activities and the project plans and/or specifications occur.

2.4 CQA Personnel.

2.4.1 CQA Officer. Ameren will retain a CQA Officer for the project who will report directly to the Ameren Project Manager. The CQA Officer will be a Professional Engineer registered in the State of Illinois, who is a person other than the Owner or an employee of the Owner. The CQA Officer will supervise and be responsible for monitoring, testing, and other activities required in the CQA plan. The CQA Officer will also supervise firms who will perform the monitoring, testing, and sampling required by the CQA plan.

The CQA Officer will be present at the beginning of primary project tasks and at various times during construction. The time that the CQA Officer must be at the project site will depend on the construction methods used by the contractors. The CQA Officer will exercise professional judgment to be present at the project site as required to assume responsibility for the monitoring and testing performed by those persons under his/her direct supervision. The CQA Officer will have enough on-site staff (CQA Representatives) to adequately perform the quality assurance activities in the CQA Plan. If the CQA Officer cannot perform a required duty, a CQA Officer-In-Absentia, qualified for that portion of the work, may be designated by the CQA Officer.

The CQA Officer, with on-site support personnel as required, will provide observation of the monitoring, testing, and/or sampling of the following construction activities for the facility:

- placement and compaction of the subgrade to specified parameters;
- placement of final cover, including installation of the geosynthetics; and
- construction of surface water control features.

The CQA Officer will verify that the sampling, monitoring, and testing for the major elements of the construction are in compliance with the established design requirements before the next sequential item for construction is initiated. The elements of work requiring compliance verification include:

- the subgrade prior to placement of the ClosureTurf® and other geosynthetic materials; and

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- the geomembrane components of the ClosureTurf® and HydroTurf® have completed and passed testing prior to installation of the geotextile/turf component.

The CQA Officer will review the monitoring, sampling, and testing completed for the work item to assess compliance with design requirements. The CQA Officer will also visually observe the work item before completing and signing the CQA Certification form (Appendix A). The contractor or installer for the subsequent construction activity will not be allowed to initiate work for the next task until the forms are completed and signed by the CQA Officer.

The completed and signed CQA Certification forms will be filed as project records in accordance with the provisions of Section 9.0.

2.4.2 Document Controller. The Document Controller files all CQA records related to the monitoring, sampling, and testing specified in the CQA Plan. In addition, the Document Controller will control the CQA Plan distribution so that current documents are being used by the CQA staff. The duties of the Document Controller may be performed by other members of the CQA team.

Requirements for control of the CQA Plan and for filing of the project records are discussed in Section 9.0.

2.5 Testing and Monitoring Firms. The CQA Officer will provide guidance to the testing and monitoring firms during quality assurance sampling, monitoring, and/or testing discussed in the CQA Plan. Limited monitoring and independent sampling and testing are required for the geosynthetic liner installation. Product suppliers and installers of geosynthetic materials are responsible for the sampling and testing required.

2.5.1 Soil Testing (Laboratory and Field). One or more soil testing firms qualified by the IDOT or IEPA (as appropriate) will be retained to perform the field and laboratory testing outlined in CQA Plan. Materials will be sampled by the testing firm or persons designated by the CQA Officer.

Each firm will provide proof of calibration to the CQA Officer for measuring and/or testing equipment used in the field or laboratory. Proof of calibration for commercial grade equipment, such as rulers and tape measures that provide adequate accuracy for the intended purpose is not required.

Field and laboratory forms proposed for data collection will be subject to review by Ameren prior to use. Incomplete or otherwise unacceptable forms will be modified by the testing firm to meet the intent of the CQA Plan.

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2.5.2 Surveyor. One or more surveyors will survey specified elevations, slopes, and grades as required in the CQA Plan. The firm(s) selected will complete the work using or under the supervision of an Illinois Professional Land Surveyor.

Each surveyor will be required to provide proof of calibration to the CQA Officer for each surveying device that will be used. Proof of calibration for commercial grade equipment, such as rulers, tape measures or other devices that provide adequate accuracy for their intended purpose is not needed.

2.5.3 Geosynthetic Testing. A geosynthetic monitoring firm may be retained to perform quality assurance observations for geosynthetic monitoring, testing, and sampling performed by the suppliers and installers. Additional geosynthetic samples may be collected for independent testing.

The geosynthetic testing laboratory will be independent of both the manufacturer and the installer of the geosynthetics. The Ameren Project Manager and CQA Officer will review and approve the geosynthetic testing laboratory quality assurance (QA) plan prior to start of services.

Field and laboratory forms proposed for data collection will be subject to review by Ameren prior to use. Incomplete or otherwise unacceptable forms will be modified by the testing firm to meet the requirements of the CQA Plan.

2.6 Contractors, Suppliers, and Installers. The General Contractor is responsible for obtaining all necessary construction permits and the appropriate subcontractors, suppliers, and installers to complete the work in accordance with the contract. Acceptance of work by the CQA Officer does not relieve the General Contractor of obligations to furnish all work in accordance with the contract.

Contractors, subcontractors, suppliers, and installers are responsible for completing their portions of the work within specified schedules and in accordance with the requirements of the plans and specifications. The contractors, subcontractors, suppliers, and installers will accommodate the monitoring, sampling, and testing outlined in the CQA Plan. At least 7 days of notice is required to schedule CQA personnel and to review testing results.

The geosynthetic suppliers and installers will provide the quality assurance monitoring, sampling, and testing as required in the CQA Plan. The geosynthetic installers will be required to submit "certificates of acceptance" for certain items of work that precede their construction activities. The "certificates of acceptance" are discussed in Section 4.3.2.

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3.0 PROJECT MEETINGS

Periodic meetings will be held to provide coordination among the involved personnel. Descriptions of pre-construction meetings, routine progress meetings and work deficiency meetings are presented in the following paragraphs.

3.1 Pre-Construction Meetings. Pre-construction meetings will occur before site grading and geosynthetic installations. The Ameren Project Manager, CQA Officer, Site Supervisor, General Contractor, and the appropriate subcontractors will attend.

At a minimum, project plans, specifications, and CQA items that will be discussed during the pre-construction meeting will include:

- protocols for monitoring, testing, and sampling;
- items of work requiring CQA Officer certification or installer acceptance before subsequent work items can be initiated (see Section 4.0); and
- established protocol for handling construction deficiencies, corrective measures, and retesting (see Section 6.0).

The General Contractor's Project Manager shall coordinate meeting times, provide an agenda, and provide meeting minutes as required in the Project Specifications. The meeting documentation review by attendees will occur before documents are filed as project records in accordance with Section 9.0.

3.2 Progress Meetings. The Ameren Project Manager or CQA Officer will schedule progress meetings to discuss on-going and up-coming construction activities. Attendees will include the Ameren Project Manager, CQA Officer, Site Supervisor, General Contractor, and appropriate subcontractors. At a minimum, topics regarding progress and the following CQA items will be reviewed:

- protocol for monitoring, testing, and sampling;
- items of work requiring CQA Officer certification or installer acceptance before subsequent work items can be initiated (see Section 4.0);
- established protocol for handling construction deficiencies, corrective measures, and retesting (see Section 6.0); and
- upcoming scheduled activities and appropriate personnel.

The General Contractor's Project Manager shall coordinate meeting times, provide an agenda, and provide meeting minutes as required in the Project Specifications. The meeting documentation review by attendees will occur before documents are filed as project records in accordance with Section 9.0.

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3.3 Work Deficiency Meetings. The CQA Officer will require special meetings when a project issue or work deficiency is anticipated or encountered. Attendees will include the Ameren Project Manager, Site Supervisor, General Contractor, and appropriate subcontractors. The purpose of these meetings is to define and resolve the project issue or work deficiency in the following manner:

- define the project issue or work deficiency and its probable causes or influence on the project;
- discuss alternative actions to address the project issue or work deficiency;
- assign parties to implement the selected action;
- implement the selected action to resolve the project issue or work deficiency; and
- verify the implemented action has been effective through appropriate monitoring.

The General Contractor's Project Manager shall coordinate meeting times, provide an agenda, and provide meeting minutes as required in the Project Specifications. The meeting documentation review by attendees will occur before documents are filed as project records in accordance with Section 9.0.

4.0 SAMPLING AND TESTING REQUIREMENTS

4.1 Introduction. Prequalification and placement sampling and testing requirements for the various materials and construction activities are summarized in Table 1. Frequencies for the material placement testing listed in Table 1 are based on the volume of material used in construction and are recommended minimums. The CQA Officer will select the specific testing locations by exercising professional judgment. The testing and sampling locations will represent the construction activity.

The geosynthetic installers will be responsible for the required sampling for the Geosynthetic Prequalification and Placement Testing presented in Table 1. Independent laboratory testing will be coordinated through the CQA Officer.

Custody of samples and transfer from the sampling location to the testing facility will be established and documented through the use of a Chain of Custody Record. The sampling party will document sample description, date, time, material type, and testing method, then relinquish sample custody to the testing firm by signing and dating the form. The sampling party will retain a copy for their records. The samples will be shipped or delivered to the testing firm with the signed Chain of Custody Record.

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The testing firm will document sample receipt by signing and dating the Chain of Custody Record. The testing firm will return the original signed Chain of Custody Record to the Document Controller with the corresponding test results. The Document Controller will retain the signed original Chain of Custody form as a project record in accordance with Section 9.0.

The sampling and testing results will be documented on a daily basis by each testing firm or installer providing the quality assurance activities. The original copies of the sampling and testing results will be provided to the CQA Officer.

4.2 Subgrade.

4.2.1 Fly Ash Pond Subgrade. The CQA Officer will direct the sample collection and laboratory testing for the standard Proctor test in accordance with the American Standard of Testing and Materials (ASTM) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (ASTM D698-12). The subgrade material will be coal combustion residuals, but embankment material and other fill material may be included. A separate standard Proctor test for each material type will be required. The CQA Officer will direct field moisture/density testing of the top one foot of subgrade in accordance with Table 1.

4.2.2 Bottom Ash Road Subgrade. The CQA Officer will direct the sample collection and laboratory testing for the standard Proctor test in accordance with the ASTM Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (ASTM D698-12). The subgrade material will be coal combustion residuals, but embankment material and other fill material may be included. A separate standard Proctor test for each material type will be required. The CQA Officer will direct field moisture/density testing of each 6-inch lift of subgrade in accordance with Table 1.

Since the berm will be widened to account for heavy vehicle traffic, lifts will be placed horizontally, compacted, tested, then graded. Additional material will be blended into the current berm to reduce the chance of slope failure.

4.2.3 Bottom Ash Pond Backfill. The CQA Officer will direct the sample collection and laboratory testing of backfill material for the Bottom Ash Pond. One pre-qualification sample will be required per source for testing in accordance with Table 1. One confirmation sample will be required per 20,000 cubic yards of backfill placed in the Bottom Ash Pond per source in accordance with Table 1. If non-virgin material is being used, full IEPA Tiered Approach to Corrective Action (TACO) contaminants of concern will be tested.

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The CQA Officer will direct the sample collection and laboratory testing for the standard Proctor test in accordance with the ASTM Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (ASTM D698-12). The CQA Officer will direct field moisture/density testing of each 1-foot lift of subgrade in accordance with Table 1.

4.2.4 Subgrade Survey. The prepared subgrade will be surveyed on a 100-foot grid pattern and at breaks in grade. Prepared subgrade not within the control tolerance requirement of 0.0 to +0.4 feet of design grade (or as accepted by the CQA Officer and Ameren Project Manager) will be corrected. The maximum grade for the slopes is 10-percent. The surveyor will document the measured grades on "as-built" drawings furnished to the CQA Officer.

The CQA Officer will review the survey data for conformance to the requirements, and, if in agreement with design requirements, will provide approval for the work using the CQA Certification Form.

4.2.5 Post-Placement. Prior to placing geosynthetics, the entire subgrade will be proofrolled using a smooth drum roller. CQA Representatives will provide visual observation during proofrolling. Soft or pumping areas will be removed and replaced with acceptable material. Subgrade completion observation activities may include additional testing of subgrade material, observing subgrade surfaces, and additional surveys to measure elevations, slopes, and subgrade boundaries where discrepancies with the construction drawings are suspected.

4.3 ClosureTurf® and HydroTurf®. Where not otherwise specified, Geosythetic procedures shall be in accordance with the September 2015 Watershed Geosynthetics ClosureTurf® and HydroTurf® Installation Guidance Documents (Appendix B). Installers will be certified by Watershed Geosynthetics on both ClosureTurf® and HydroTurf® installation and CQA procedures. ClosureTurf® and HydroTurf® are composed of three main components:

1. The geomembrane liner component is 50-mil structured high-density polyethylene (HDPE) Agru Super Grip Net with the spikes placed on subgrade;

2. The synthetic turf component is made of woven polypropylene geotextiles tufted with polyethylene yarn; and

3. Infill is Sand (ClosureTurf®) or HydroBinder (HydroTurf®).

4.3.1 Manufacturer Guaranteed Properties for Geosynthetics. The manufacturer will submit documentation that the materials have been tested for the parameters listed in the manufacturers list of guaranteed properties. The test results, including identification of all individual geomembrane rolls tested will be submitted to the CQA Officer for review. The manufacturer will certify that all geomembrane rolls meet the manufacturer's guaranteed properties.

4.3.2 Prequalification Testing for Geosynthetics. The geosynthetic manufacturer will supply an inventory list of geomembrane rolls to the Owner's geosynthetics QA monitoring firm and/or CQA Officer, who will select geomembrane rolls to be prequalified for the type and frequency of prequalification testing in Table 1.

The geomembrane manufacturer will procure and submit samples from the designated prequalification geomembrane rolls to the independent geosynthetic laboratory for verification of selected manufacturer's guaranteed properties. Submitted samples will be 2 feet long by the entire width of the geomembrane roll. The machine direction, manufacturer's roll identification number, and date the sample was obtained will be marked on the sample by the geosynthetic laboratory prior to shipment.

Geomembrane prequalification testing shall be completed prior to delivery. If prequalification testing is not completed prior to delivery, the Contractor takes responsibility for any failed prequalification testing and the additional costs associated with having it delivered prior to acceptance.

4.3.3 Installer Certification of Placement Surface. The prepared subgrade surface shall be cleared of stones, sand, and similar materials that could damage the geosynthetics, cause clogging of drains or filters, or hamper seaming of geosynthetics. The geosynthetic installer accepts responsibility for inspecting the subgrade (on a daily basis) to verify unsuitable materials are not present within the prepared subgrade area to be covered each day. The geosynthetic installer will complete and sign the Installer Certificate of Acceptance form, which documents acceptance of the prepared subgrade for geosynthetic placement. The geosynthetic installer will provide the original signed document to the CQA Officer for signature of receipt.

Completed and signed forms will be filed as project records in accordance with the provisions in Section 9.0.

4.3.4 Placement Testing For Seam Overlap. The contractor and geosynthetic installer will arrange geomembrane sections to minimize field seams. A preliminary drawing illustrating the panel layout will be provided to the Ameren Project Manager and CQA Officer prior to placement for approval.

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Seam overlaps will be field-measured by the geosynthetic installer to verify the requirements in Table 1 are met for the seams. Seam overlap will be "shingled" in the downslope direction. The CQA Officer will provide appropriate personnel to obtain independent measurements of a representative number of seam overlaps.

The geosynthetic installer will provide the CQA Officer with "as-built" drawings of the geomembrane installation showing the panels, seam locations, and destruct locations, at a minimum.

4.3.5 Trial Weld Seams. Trial weld sample seams will be required before membrane seams can be welded. Trial weld sample seams must be 3 feet long and 12 inches wide, with the seam centered lengthwise. Both wedge and extrusion welder are required to produce a trial weld sample seam at daily startup, immediately after any break, anytime the machine is turned off for more than 30 minutes, and anytime the machine is operating for more than five hours. If at any time the CQA Officer or approved representative believes that an operator or welding apparatus is not functioning properly, an additional trial seam must be produced and tested.

Trial weld sample seams will be tested in the field for peel and shear using a field tensiometer. Four 1-inch coupons will be required for testing: two to be tested for peel and two to be tested for shear. The requirements for field testing are located in Table 1 and Geosynthetics Research Institute (GRI) Test Method GM-19 Table 1(a) (Appendix B)

4.3.6 Placement Non-Destructive Testing. The geosynthetic installer will conduct non-destructive testing as seaming progresses (Table 1). Seams will be non-destructively tested over the full length using an air pressure test, vacuum test unit, spark test, or other method approved by the CQA Officer.

The CQA Officer will provide appropriate personnel to monitor non-destructive testing performed by the installer.

The geosynthetic installer will submit all non-destructive field testing results to the CQA Officer for filing as project records in accordance with Section 9.0.

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Air Pressure Testing (For Double Fusion Seams Only)

Equipment

The air pressure test equipment includes:

- an air pump (manual or motor driven) equipped with pressure gauge, accurate to 1 pounds per square inch (psi), capable of generating and sustaining a pressure between 25 psi and 30 psi and mounted on a cushion to protect the geomembrane;
- a rubber hose with fittings and connections; and
- a sharp hollow needle, or other approved pressure feed device.

Procedure

The air pressure test procedure is as follows:

1. Seal both ends of the seam.
2. Insert a needle or other approved pressure feed device into the air channel created by the fusion weld.
3. Insert a protective cushion between the air pump and the geomembrane.
4. Pressurize the seam to between 25 psi and 30 psi. Close the valve and sustain the pressure for at least five minutes.
5. A pressure loss of 2 psi or less is a passing test.
6. A pressure loss of more than 2 psi is a failing test. Locate the faulty area, then repair and retest.
7. At the conclusion of the passing air pressure test, slit the opposite end of the seam and monitor the drop in pressure. This indicates that the entire seam was tested.
8. Remove needle or other approved pressure feed device and seal.

Vacuum Testing (Extruded Welds)

Equipment

The vacuum test equipment includes:

- a vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft neoprene gasket on the bottom, a valve assembly, and a vacuum gauge;

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- a vacuum tank and pump assembly equipped with a pressure controller and pipe connections or equipment capable of performing the same function;
- a rubber pressure or vacuum hose with fittings and connections;
- a bucket; and
- a soapy solution.

Procedure

The vacuum test procedure is as follows:

1. Energize the vacuum pump to approximately 5 psi.
2. Wet the extrusion weld area with the soapy solution.
3. Place the vacuum box over the wetted area.
4. Close the bleed valve and open the vacuum valve.
5. Check that a leak-tight seal is created.
6. Examine the geomembrane through the viewing window for the presence of soap bubbles for at least 10 seconds.
7. If no bubbles appear after 10 seconds, close the vacuum valve and open the bleed valve. Move the box over the next adjoining area and repeat the procedures in steps 1 through 6.
8. Mark, repair, and retest areas where soap bubbles appear.

Spark Testing (Extrusion Welds at Penetrations)

Equipment

The spark test equipment includes:

- an electrically conductive tape or wire placed beneath the seam prior to welding;
- a hand-held holiday spark tester; and
- a conductive wand that generates a high voltage.

Procedure

The spark test procedure is as follows:

1. Place the electrically conductive tape or wire beneath the seam prior to welding.

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2. A trial seam containing a non-welded segment shall be subject to a calibration test to ensure that such a defect will be identified under the planned machine settings and procedures (i.e., exposed wire will cause a spark to occur).
3. Upon completion of the weld, enable the spark tester and hold approximately 1 inch above the weld, moving slowly over the entire length of the weld in accordance with ASTM 6365.
4. If there is no spark, the weld is a passing test. A spark indicates a hole in the seam.
5. Mark, repair, and retest areas where sparks occur.
6. Care should be taken if flammable gases may be present in the area of testing.

4.3.7 Placement Destructive Testing. Destructive testing is used to evaluate seam strength. Destructive samples will be collected and field tested by the geosynthetic installer at randomly selected geomembrane locations as seaming work progresses at the direction of the CQA Representative. The remaining destructive sample will be sent to the independent geosynthetic testing laboratory for analysis.

The geosynthetic installer will submit results of destructive testing to the CQA Officer for filing as project records in accordance with Section 9.0.

Destructive samples will be collected within 24 hours of being chosen by the CQA Representative unless extenuating circumstances, previously approved by the Ameren Project Manager and CQA Officer, occur.

Location and Frequency

The CQA Representative shall select destructive testing locations based on:

1. Selected destructive testing will be at minimum frequency of one test location per 500 feet of seam length. This minimum frequency is the average taken throughout the entire area of placement and does not include retests.
2. A destructive test will be completed for each welding machine used per day.
3. A destructive test will be completed for individual repairs that are more than 150 feet long.

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4. Additional test locations will be chosen during seaming at the CQA Representative's discretion. Selection of such locations may be prompted by suspicion of excess crystallinity, contamination, offset welds, or any other potential cause of imperfect welding.
5. All samples obtained for destructive testing will include a 12-inch by 12-inch sample provided to the Owner for archive storage.

Destructive Sampling Procedure

The destructive sampling procedure is as follows:

1. Assign a number and label each sample (12 inches by 48 inches with the seam centered lengthwise).
2. Collect the sample within 24 hours of being marked.
3. Record the sample location(s) on layout ("as-built") drawing.
4. Record the reason for taking the sample(s) at this location.
5. Repair the sample location(s) the same day.
6. Vacuum test each repair.

Field Testing

The geosynthetic installer shall use a tensiometer to field-test a minimum of four 1-inch wide strips from the samples: two for peel and two for shear. The geosynthetic installer shall log the date, time, ambient temperature, number of seaming unit, name of seamer, welding apparatus temperature, and pass or fail description. The requirements and frequency for field testing is located in Table 1 and GRI Test Method GM-19 Table 2(a) (Appendix B).

Quality Assurance Laboratory Testing.

Field testing prequalifies destructive samples for independent laboratory testing. The quality assurance laboratory shall be selected by the CQA Officer with approval from the Ameren Project Manager.

Laboratory testing will include five tests each of shear strength and peel adhesion. Laboratory testing methods will be in accordance with ASTM D 4437 "Standard Practice for Non-destructive Testing (NDT) for Determining the Integrity of Seams Used in Joining Flexible Polymeric Sheet Geomembranes". Acceptance will be based upon the criteria in GRI Test Method GM-19 Table 1(a) (Appendix B).

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Procedures For Destructive Test Failure.

Failed destructive tests, in the field or quality assurance laboratory, will be remedied by either of the following options:

1. The geosynthetic installer may reconstruct the seam between two passed test locations; or
2. The geosynthetic installer may trace the welding path to an intermediate location at least 10 feet beyond the point of the failed test in each direction, and take a sample for an additional field test at each location. If these additional samples pass, then the seam shall be reconstructed between these locations. If either sample fails, then the process shall be repeated to establish the zone in which the seam should be reconstructed.

Acceptable reconstructed seams must be bounded by two locations with passing laboratory destructive tests. In cases where the reconstructed seam exceeds 150 feet, an additional destructive sample of the repaired area shall be obtained. The geosynthetic installer shall document all actions taken regarding destructive test failures.

4.3.8 Manufacturer Guaranteed Properties for the Turf Component. The manufacturer will submit documentation that the materials have been tested for the parameters listed in the manufacturer's list of guaranteed properties. The test results including identification of all individual geomembrane rolls tested will be submitted to the CQA Officer for review. The manufacturer will certify that all geomembrane rolls meet the manufacturer's guaranteed properties.

4.3.9 Prequalification Testing for the Turf Component. The geomembrane manufacturer will supply an inventory list of turf rolls to the Owner's geosynthetics QA monitoring firm and/or CQA Officer, who will select geomembrane rolls to be prequalified for the type and frequency of prequalification testing in Table 1.

The geosynthetic manufacturer will procure and submit samples from the designated prequalification turf rolls to the independent geosynthetic laboratory for verification of selected manufacturer's guaranteed properties. Submitted samples will be 2 feet long by the entire width of the turf roll.

Turf prequalification testing shall be completed prior to delivery.

4.3.10 Field Monitoring of the Turf Component. The CQA Officer or designated representative will observe the turf as it is placed and sewn. Vehicles and equipment are not permitted on slopes exceeding 15 percent until the infill (sand for ClosureTurf® and pozzolanic mixture for HydroTurf®) is in place. In flatter slopes, all-terrain vehicles

(ATVs) and similar vehicles will be allowed prior to infill placement if the tire pressure is less than 5 psi. After infill placement, tire pressures should be limited on slopes to 35 psi or less.

Wrinkles will be smoothed out or removed to the extent possible prior to field seaming. Wrinkles that can fold over must be repaired either by cutting out excess material, or by allowing the liner to contract by temperature reduction. The CQA Officer or designated representative will observe geomembrane for wrinkles and notify the Contractor if wrinkles are being formed that may fold over or are above the vertical 4-inch maximum tolerance level on slopes, or above the 2-inch maximum tolerance level in ditches. The CQA Representative is then responsible for documenting corrective action to remove the wrinkles.

4.3.11 Sand Prequalification Testing for ClosureTurf®. One sand prequalification sample and testing results will be provided by the contractor to the CQA Officer at least one week prior to sand delivery on site. Laboratory testing will occur in accordance with the testing listed in Table 1.

4.3.12 Sand Conformance Testing for ClosureTurf®. Sand conformance samples will be obtained by the CQA Officer or designated representative. Laboratory testing will occur in accordance with the type and frequency of testing listed in Table 1.

During placement, the geosynthetics will be observed to verify that they are not damaged. The average thickness of the sand layer will be measured and recorded at the frequency listed in Table 1. Sand thickness will be measured with a digital caliper. A standard washer will be used as a plate for the point of entry into the sand infill for consistent depth control.

4.3.13 Hydrobinder Prequalification Testing for HydroTurf®. The cement-sand mixture will be a brand of Portland Cement conforming to ASTM C 150 (AASHTO M 85) and shall be Type I or Type II. The contractor will provide information to the CQA Officer on which mix will be used at least one week prior to delivery on site.

4.3.14 Hydrobinder Conformance Testing for HydroTurf®. The CQA Officer or Representative will observe that the hydrobinder infill is placed in a method that does not damage the underlying geosynthetics in dry conditions. After the mixture is worked into the turf, the average thickness of the layer will be measured and recorded at the frequency listed in Table 1. The mixture will be observed by a CQA Representative during hydration, which must occur the same day as infill placement.

4.4 Anchor Trench. The anchor trench shall be excavated in accordance with the project plans and specifications prior to geosynthetic placement in that area. The corners of the anchor trench shall be slightly rounded where the geosynthetic enters the trench to minimize sharp bends in the geosynthetic. Fill placed on the geosynthetic shall adhere to the same standards as the subgrade, and must be free of debris, rocks, sand, or other material which could damage the geosynthetic.

4.5 Surface Water Management System. The surveyor shall document the elevations and grades of the constructed berms and channels on an "as-built" drawing. The surveyor will provide this data to the CQA Officer. The CQA Officer shall check the information against the requirements and frequency provided in Table 1.

5.0 CORRECTIVE MEASURES

The CQA Officer will reject and require replacement of material that fails prequalification or material placement requirements (Table 1). The lateral and/or vertical extent of corrective measures will be based on the frequency of testing and CQA Officer's professional judgment.

6.0 DOCUMENTATION

6.1 Daily Reports. The CQA Officer, or designated representative, shall prepare and sign a daily report for each day that materials or placement of materials are being observed, sampled, or tested.

6.2 Weekly Summary Reports. The CQA Officer or designated representative shall prepare and sign a weekly summary report for each week that materials or placement of materials are being observed, sampled, or tested. The daily reports, test data, photographic records, and test results will be included in the weekly summary report. The weekly report will be filed by the Document Controller in accordance with Section 9.0.

6.3 Photographs. Photographs will be included in the weekly summary report to provide a visual record of work progress, testing activity, and construction work. The photographs shall include:

- general location, date and time of the photograph;
- description of the item photographed;
- direction of view (north, south, east, or west); and
- name of photographer.

7.0 ACCEPTANCE REPORT

The CQA Officer shall prepare and submit an acceptance report to the IEPA. The acceptance report shall contain:

- material testing results;
- geosynthetic quality assurance and an "as-built" drawing including panel placement, seams, destructive sample locations, and repairs;
- "as-built" drawings as specified herein;
- weekly summary reports;
- certification by the CQA Officer that the CQA Plan has been followed during construction; and
- signature of the CQA Officer.

8.0 CONSTRUCTION MANAGEMENT ACTIVITIES

8.1 Request For Information (RFI). The General Contractor or subcontractor may, after exercising due diligence to locate required information, request from the CQA Officer or Design Engineer clarification or interpretation of the contract documents. The General Contractor or subcontractor will initiate the RFI in a timely manner using the Request for Information form (Appendix A) in accordance with project specifications. RFIs will be filed as project records in accordance with Section 9.0.

8.2 Review of Contractor Submittals. The General Contractor will submit shop drawings, product data, and samples (Table 2) to the CQA Officer or Ameren Project Manager in accordance with the project specifications and the CQA Plan in a timely manner to reduce work delays. Copies of submittals and the log will be filed as project records in accordance with Section 9.0.

8.3 Field Change Order. The contractor shall prepare requests for Field Change Order (FCO) in accordance with the project specifications and submit the FCO requests to the Ameren Project Manager. Copies of the FCO and logs of authorized FCOs will be retained as project records in accordance with Section 9.0.

9.0 DOCUMENT CONTROL AND PROJECT RECORDS

9.1 CQA Plan. The CQA Officer shall control the preparation, issue, and revision of CQA Plan. The CQA Plan, including all changes, will be reviewed for adequacy and approved for release by the Ameren Project Manager. The Document Controller will issue current copies of the CQA Plan and maintain records associated with its preparation.

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9.2 Project Records. The Document Controller shall maintain and protect documents during construction activities against damage, deterioration, and loss. Records will be readily identifiable and retrievable. Original CQA documents from the field and laboratories will be furnished to the Document Controller for filing and maintenance.

Project records will be made available to the Ameren Project Manager as requested during construction and, when requested, will be turned over to Ameren at completion of the construction contract. Ameren will retain the weekly summary reports provided by the CQA Officer until the completion of the post-closure care period and must make those reports available at reasonable times for viewing and photocopying by the IEPA.

Records include, but are not limited to, the following:

- CQA Plan;
- CQA Plan documentation;
- meeting minutes;
- weekly summary reports;
- daily reports;
- manufacturer's QA results and certifications;
- certificates of acceptance by geosynthetic installers;
- CQA certifications;
- certificates of calibration for monitoring, measuring and test equipment;
- "as-built" drawings;
- laboratory test results and chain of custody records;
- laboratory certifications of manufacturer's guaranteed properties for geosynthetics;
- Field Change Order requests;
- Log of Authorized Field Change Orders;
- shop drawing submittals;
- log of shop drawing submittals;
- RFI from contractor/installer;
- RFI responses; and
- acceptance reports.

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TABLE 1
SUMMARY OF TESTING FREQUENCY
MEREDOSIA POWER STATION - FLY ASH AND BOTTOM ASH PONDS

Test	Test Frequency[1]	Specification Criteria	Responsible Party
FLY ASH POND SUBGRADE			
Standard Proctor	1 per 10,000 cubic yard (minimum 1 per material type)	ASTM D 1557	CQA Officer
Field Moisture/Density	5 per acre per 6-inch compacted lift, top 1 foot of subgrade (on approximately 100-foot grid)	>90% maximum dry density from appropriate standard Proctor	
Survey[2]	CQA survey locations provided in project specifications. In general, survey points include 100-foot spacing along grade breaks and 200-foot grid between slope breaks.	>2% and ≤10% grade, positive drainage, no sharp changes in slope	
BOTTOM ASH BERM/ROAD SUBGRADE			
Standard Proctor	1 per 10,000 cubic yard (minimum 1 per material type)	ASTM D 1557	CQA Officer
Field Moisture/Density	5 per acre per 6-inch compacted lift (on approximately 100-foot grid)	>90% maximum dry density from appropriate standard Proctor	
vey[2]	CQA survey locations provided in project specifications. In general, survey points include 100-foot spacing along grade breaks and 200-foot grid between slope breaks.	>2% and ≤10% grade, positive drainage, no sharp changes in slope	
SURFACE WATER MANAGEMENT SYSTEM			
Survey[2]	CQA survey locations provided in project specifications. In general, survey points include inlets, outlets, grade breaks, and every 100 or 200 linear feet along channel (based on channel grade)	Field established for positive drainage	CQA Officer

Notes:

[1] Based on project plans, specifications, and CQA Plan.

[2] CQA survey locations are not intended to be sufficient for as-built surveys or construction staking. Electronic files of the design surface are available for use from Ameren Missouri.

[3] This is in addition to the manufacturer's internal QC testing to be provided to the CQA officer before delivery of the product.

[4] Sample 2 feet long by the full roll width.

[5] For Class 1 High Survivability.

TABLE 1 - CONTINUED
SUMMARY OF TESTING FREQUENCY
MEREDOSIA POWER STATION - FLY ASH AND BOTTOM ASH PONDS

Test	Test Frequency[1]	Specification Criteria	Responsible Party
BOTTOM ASH POND BACKFILL - PREQUALIFICATION			
Grain Size Analysis - ASTM C-33-03	1 per source	Sand or Gravel	Contractor
RCRA Metals and CCW Ions as TCLP: SW 846 1311 - Arsenic, Barium, Cadmium, Chromium, Lead, Silver, Selenium SW 846 7478 - Mercury SW 846 6010B - Boron SW 846 M4500-CLE - Chloride SW 846 9036 - Sulfate	1 per source (virgin material)	Below the Class I Groundwater Standards at Title 35 Illinois Administrative Code (IAC) 620.410(a).	
BTEX Constituents as TCLP: SW846 6260B - Benzene, Ethylbenzene, Toluene, Xylene	1 per source (virgin material)	Below the Class I Groundwater Standards at 35 IAC 620.410(b).	
pH - SW846 9045C	1 per source (virgin material)	Below the Class I Groundwater Standards at 35 IAC 620.410(e).	
IEPA TACO COCs	1 per source (non-virgin material)	Below the Class I Groundwater Standards at 35 IAC 620.410(e).	
BOTTOM ASH POND BACKFILL - MATERIAL PLACEMENT TESTING			
ndard Proctor	1 per 10,000 cubic yards (minimum 1 per material type)	ASTM D 1557	CQA Officer
Field Moisture/Density	5 per acre per 1-foot compacted lift (on approximately 100-foot grid)	>85% maximum dry density from appropriate standard Proctor	
Grain Size Analysis - ASTM C-33-03	1 per 20,000 cubic yards	Sand or Gravel	
RCRA Metals and CCW Ions as TCLP: SW 846 1311 - Arsenic, Barium, Cadmium, Chromium, Lead, Silver, Selenium SW 846 7478 - Mercury SW 846 6010B - Boron SW 846 M4500-CLE - Chloride SW 846 9036 - Sulfate	1 per 20,000 cubic yards	Below the Class I Groundwater Standards at Title 35 Illinois Administrative Code (IAC) 620.410(a).	
BTEX Constituents as TCLP: SW846 6260B - Benzene, Ethylbenzene, Toluene, Xylene	1 per 20,000 cubic yards	Below the Class I Groundwater Standards at 35 IAC 620.410(b).	
pH - SW846 9045C	1 per 20,000 cubic yards	Below the Class I Groundwater Standards at 35 IAC 620.410(e).	
Applied Sand Thickness	Approximately 100 foot grid intervals	Between 0.50 inches and 0.75 inches.	

Notes:

[1] Based on project plans, specifications, and CQA Plan.

[2] QA survey locations are not intended to be sufficient for as-built surveys or construction staking. Electronic files of the design face are available for use from Ameren Missouri.

[3] This is in addition to the manufacturer's internal QC testing to be provided to the CQA officer before delivery of the product.

[4] Sample 2 feet long by the full roll width.

[5] For Class 1 High Survivability.

TABLE 1 - CONTINUED
SUMMARY OF TESTING FREQUENCY
MEREDOSIA POWER STATION - FLY ASH AND BOTTOM ASH PONDS

Test	Test Frequency[1]	Specification Criteria	Responsible Party
50-MIL HDPE SUPERGRIPNET - PREQUALIFICATION[3]			
Density - ASTM D792	1 per 100,000 square feet per resin lot, with a minimum of 1 per resin lot.[4]	GRI Test Method GM13 (Appendix B)	The contractor and/or manufactuter shall provide samples to the independent laboratory chosen by the CQA officer for testing (testing cost to owner).
Carbon Black Content - ASTM D4218	1 per 100,000 square feet per resin lot, with a minimum of 1 per resin lot.[4]	GRI Test Method GM13 (Appendix B)	
Carbon Black Dispersion - ASTM D5596	1 per 100,000 square feet per resin lot, with a minimum of 1 per resin lot.[4]	GRI Test Method GM13 (Appendix B)	
Thickness - ASTM D5994	1 per 100,000 square feet per resin lot, with a minimum of 1 per resin lot.[4]	GRI Test Method GM13 (Appendix B)	
Tensile Strength and Elongation - ASTM D6693/Type IV Specimen	1 per 100,000 square feet per resin lot, with a minimum of 1 per resin lot.[4]	GRI Test Method GM13 (Appendix B)	
50-MIL HDPE SUPERGRIPNET - MATERIAL PLACEMENT TESTING			
Seam Overlap	All Seams	3-inch (Minimum)	Testing and sampling performed by installer. Destructive samples provided to CQA Officer for third party testing.
Wrinkle Height	All Panels	May Not Fold 4-inch (Maximum) on Slopes 2-inch (Maximum) on Ditches	
Non-Destructive Testing	All Seams	As per Section 4.4.4 of CQA Plan	
Destructive Testing	Minimum One Every 500 Feet (not including retesting)	As per Section 4.4.5 of CQA Plan	

Notes:

[1] Based on project plans, specifications, and CQA Plan.

[2] CQA survey locations are not intended to be sufficient for as-built surveys or construction staking. Electronic files of the design surface are available for use from Ameren Missouri.

[3] This is in addition to the manufacturer's internal QC testing to be provided to the CQA officer before delivery of the product.

[4] Sample 2 feet long by the full roll width.

[5] For Class 1 High Survivability.

TABLE 1 - CONTINUED
SUMMARY OF TESTING FREQUENCY
MEREDOSIA POWER STATION - FLY ASH AND BOTTOM ASH PONDS

Test	Test Frequency[1]	Specification Criteria	Responsible Party
GEOTEXTILE/TURF COMPONENT - PREQUALIFICATION[3]			
Total Product Weight	1 per 400,000 square feet.[4]	ClosureTurf Engineered Turf Component Product Datasheet	The contractor and/or manufactuter shall provide samples to the independent laboratory chosen by the CQA officer for testing (testing cost to owner).
Tensile Strength of Yarn - ASTM D2256	1 per 400,000 square feet.[4]	ClosureTurf Engineered Turf Component Product Datasheet	
Tensile Strength of Product - ASTM D4595	1 per 400,000 square feet.[4]	ClosureTurf Engineered Turf Component Product Datasheet	
Tensile Strength of Product - ASTM D4595	1 per 400,000 square feet.[4]	ClosureTurf Engineered Turf Component Product Datasheet	
Grab Tensile Strength - ASTM D4632	1 per 400,000 square feet.[4]	GRI Test Method GT13(a)[5] (Appendix B)	
Trapezoid Tear Strength - ASTM D4533	1 per 400,000 square feet.[4]	GRI Test Method GT13(a)[5] (Appendix B)	
CBR Puncture Strength - ASTM D6241	1 per 400,000 square feet.[4]	GRI Test Method GT13(a)[5] (Appendix B)	
Permittivity - ASTM D4491	1 per 400,000 square feet.[4]	GRI Test Method GT13(a)[5] (Appendix B)	
Apparent Opening Size - ASTM D4751	1 per 400,000 square feet.[4]	GRI Test Method GT13(a)[5] (Appendix B)	
Ultraviolet Stability - ASTM D7238	1 per 400,000 square feet.[4]	GRI Test Method GT13(a)[5] (Appendix B)	
GEOTEXTILE/TURF COMPONENT - MATERIAL PLACEMENT TESTING			
Seam Overlap	All Seams	3-inch (Minimum)	Testing and sampling performed by installer. Destructive samples provided to CQA Officer for third party testing.
Wrinkle Height	All Panels	May Not Fold 4-inch (Maximum) on Slopes 2-inch (Maximum) on Ditches	

Notes:

[1] Based on project plans, specifications, and CQA Plan.

[2] CQA survey locations are not intended to be sufficient for as-built surveys or construction staking. Electronic files of the design surface are available for use from Ameren Missouri.

[3] This is in addition to the manufacturer's internal QC testing to be provided to the CQA officer before delivery of the product.

[4] Sample 2 feet long by the full roll width.

[5] For Class 1 High Survivability.

TABLE 1 - CONTINUED
SUMMARY OF TESTING FREQUENCY
MEREDOSIA POWER STATION - FLY ASH AND BOTTOM ASH PONDS

Test	Test Frequency[1]	Specification Criteria	Responsible Party
SAND INFILL - PREQUALIFICATION			
Grain Size Analysis - ASTM C-33-03	1 per sand source	Fine Aggegates	Contractor
RCRA Metals and CCW Ions as TCLP: SW 846 1311 - Arsenic, Barium, Cadmium, Chromium, Lead, Silver, Selenium SW 846 7478 - Mercury SW 846 6010B - Boron SW 846 M4500-CLE - Chloride SW 846 9036 - Sulfate	1 per sand source	Below the Class I Groundwater Standards at Title 35 Illinois Administrative Code (IAC) 620.410(a).	
BTEX Constituents as TCLP: SW846 6260B - Benzene, Ethylbenzene, Toluene, Xylene	1 per sand source	Below the Class I Groundwater Standards at 35 IAC 620.410(b).	
pH - SW846 9045C	1 per sand source	Below the Class I Groundwater Standards at 35 IAC 620.410(e).	
SAND INFILL - MATERIAL PLACEMENT TESTING			
Grain Size Analysis - ASTM C-33-03	1 per 5,000 cubic yards	Fine Aggegates	CQA Officer
RCRA Metals and CCW Ions as TCLP: SW 846 1311 - Arsenic, Barium, Cadmium, Chromium, Lead, Silver, Selenium SW 846 7478 - Mercury SW 846 6010B - Boron SW 846 M4500-CLE - Chloride SW 846 9036 - Sulfate	1 per 5,000 cubic yards	Below the Class I Groundwater Standards at Title 35 Illinois Administrative Code (IAC) 620.410(a).	
BTEX Constituents as TCLP: SW846 6260B - Benzene, Ethylbenzene, Toluene, Xylene	1 per 5,000 cubic yards	Below the Class I Groundwater Standards at 35 IAC 620.410(b).	
pH - SW846 9045C	1 per 5,000 cubic yards	Below the Class I Groundwater Standards at 35 IAC 620.410(e).	
Applied Sand Thickness	Approximately 100 foot grid intervals	Between 0.50 inches and 0.75 inches.	
ALTERNATE INFILL HYDROBINDER - PREQUALIFICATION			
Manufacturer's Certification	1 per source	Per Specifications	Contractor
ALTERNATE INFILL HYDROBINDER - MATERIAL PLACEMENT TESTING			
Verification that Material Used is the Same as Material Submitted	1 per source	Per Approved Submittal	CQA Officer
Applied Thickness	Approximately 100 foot grid intervals	Between 0.75 inches and 1.0 inches.	

Notes:

[1] Based on project plans, specifications, and CQA Plan.

[2] CQA survey locations are not intended to be sufficient for as-built surveys or construction staking. Electronic files of the design surface are available for use from Ameren Missouri.

[3] This is in addition to the manufacturer's internal QC testing to be provided to the CQA officer before delivery of the product.

[4] Sample 2 feet long by the full roll width.

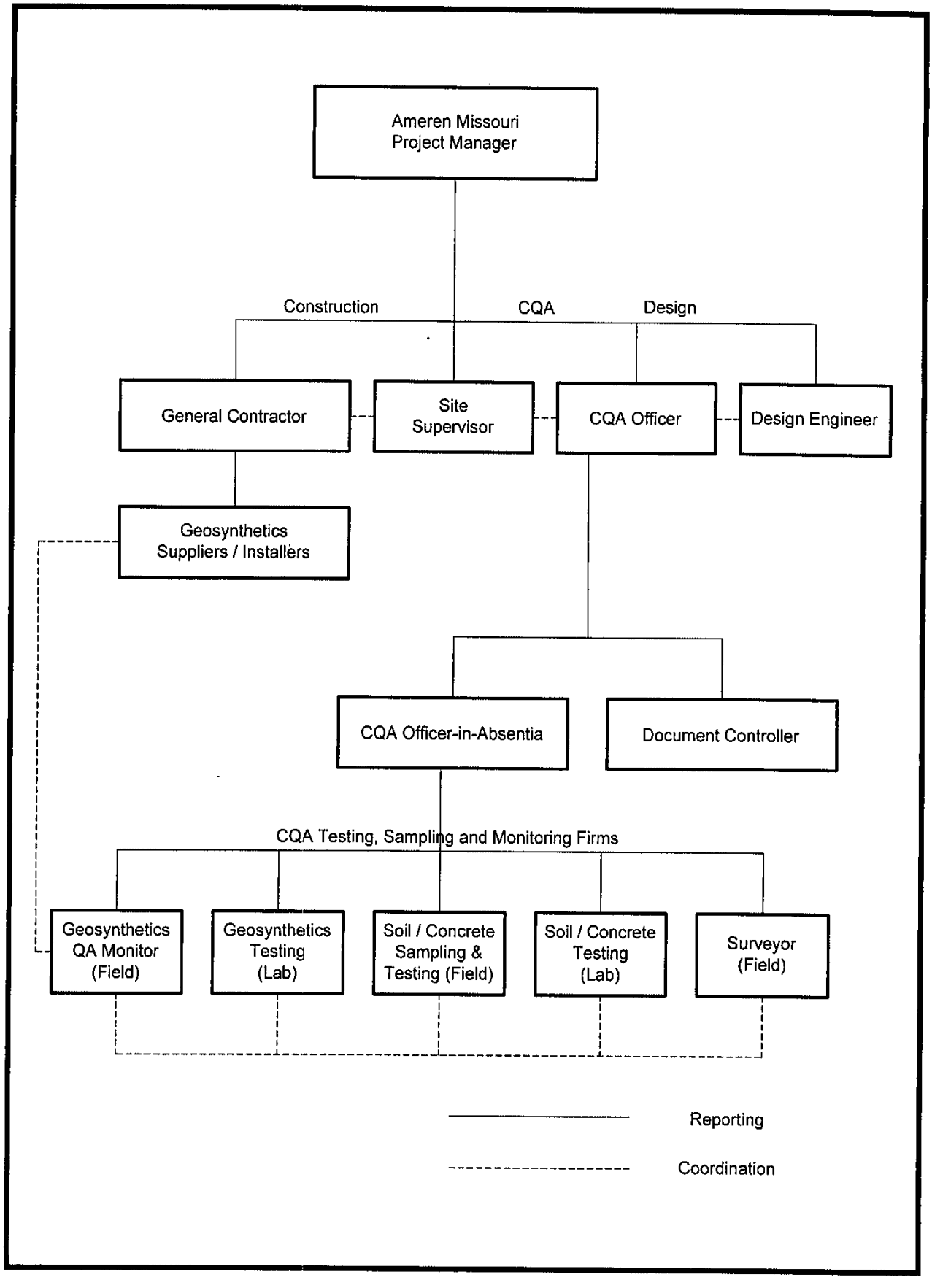
[5] For Class 1 High Survivability.

TABLE 2

J024917.01

SUMMARY OF CQA DOCUMENTATION
MEREDOSIA POWER STATION - FLY ASH AND BOTTOM ASH PONDS

Submittal	Responsible Party
Request for Information	General Contractor
Field Change Orders	General Contractor
Log of Authorized Field Change Orders	General Contractor
Shop Drawing Submittals	General Contractor
Calibration Forms	Soil Testing and Surveying Firms
Chain of Custody	Testing Firms
Laboratory Test Results	As appropriate
CQA Subgrade Certification Points	CQA Surveying Firm
"As-built" Surface Water Management System/Final Grade	General Contractor's Surveying Firm
Manufacturer's Guaranteed Properties for Geosynthetics	General Contractor's Geosynthetic Manufacturer
Geosynthetic Roll Inventory	General Contractor's Geosynthetic Manufacturer
Geosynthetic Manufacturer's Guarantee of Product	General Contractor's Geosynthetic Manufacturer
Alternate Fill - HydroBinder Manufacturer's Certification	General Contractor's Geosynthetic Installer
Certificates of Acceptance	General Contractor's Geosynthetic Installer
"As-built" Drawing of Exposed Geomembrane Installation	General Contractor's Geosynthetic Installer
Non-Destructive Field Testing Results	General Contractor's Geosynthetic Installer
Destructive Field Testing Results	General Contractor's Geosynthetic Installer
Meeting Summaries	General Contractor
Daily Reports	CQA Officer
Weekly Summary Reports	CQA Officer
Photographs	CQA Officer
CQA Certification Form	CQA Officer
CQA Acceptance Report	CQA Officer


Ameren Missouri
Project Manager
Construction
CQA
Design
General Contractor
Site
Supervisor
CQA Officer
Design Engineer
Geosynthetics
Suppliers / Installers
CQA Officer-in-Absentia
Document Controller
CQA Testing, Sampling and Monitoring Firms
Geosynthetics
QA Monitor
(Field)
Geosynthetics
Testing
(Lab)
Soil / Concrete
Sampling &
Testing (Field)
Soil / Concrete
Testing
(Lab)
Surveyor
(Field)
Reporting
Coordination

APPENDIX A

FORMS

Meredosia Power Station - Closure of Fly Ash and Bottom Ash Ponds

REQUEST FOR INFORMATION

RFI #: _____ **DATE:** _____

FROM: _____ **TO:** _____

COMPANY: _____ **COMPANY:** _____

PHONE: _____ **PHONE:** _____

FAX: _____ **FAX:** _____

RE: _____

CHECK CATEGORY:

☐ Information not shown on contract documents:
Contract Drawing Reference: _____
Shop Drawing Reference: _____
Specification Reference: _____

☐ Interpretation of Requirements
☐ Conflict in Requirements
☐ Coordination Problem
☐ Other Category
Possible Cost Impact: _____
Possible Time Impact: _____

DESCRIPTION (Use Attached Sheets as Necessary) _____

_____

_____

_____

CC: File

ATTACHMENTS: ☐ Yes ☐ No

_____

_____

_____

RESPONSE

(Use Attached Sheets as Necessary)

_____

_____

_____

_____

_____

_____

DATE: _____ **RESPONSE BY:** _____

J024917.01 RFI Form

Chain of Custody Record

Meredosia Power Station - Closure of Fly Ash and Bottom Ash Ponds

Client					Analysis and/or Method Requested								
Address													
City, State, Zip Code													
Phone / Facsimile No.													
Client Project													
Location													
Sampler(s) / Phone	/												
Turnaround Time	Standard [ ] Rush [ ] Date Required:												
P.O. # or Invoice To													
Contact Person													Remarks or Observations
Sample Description	Sampling		Sample Type[1]	# of Containers									
	Date	Time											

(1) Sample Type: S = Soil; GM = Geomembrane; GT = Geotextile; GCL = Geosynthetic Clay Liner; DM = Drainage Media; O = Other

Relinquished By	Date	Time	Received By	Date	Time	Method of Shipment

Special Instructions:

Copies: CQA Officer, Testing Firm, and Sampler

J024917.01 Chain of Custody Record.doc

Meredosia Power Station - Closure of Fly Ash and Bottom Ash Ponds

DAILY INSPECTION REPORT

TESTING FIRM/INSTALLER: _____ **DATE:** _____

1. CONSTRUCTION ACTIVITIES AND LOCATIONS:

_____

_____

_____

_____

_____

_____

2. TYPE, LOCATION, AND PROCEDURES FOR INSPECTION/SAMPLING/TESTING::

_____

_____

_____

_____

3. TEST DATA

☐ **Attached** ☐ **None Taken**

4. PHOTOGRAPHIC RECORDS

☐ **Attached** ☐ **None Taken**

5. RESULTS OF ACTIVITY:

☐ **Pass** ☐ **Fail** ☐ **Corrective Actions Required** ☐ **See Attached Results**

☐ **See Explanatory Notes on Continuation Sheet** ☐ **Other:** _____

Prepared By: _____

_____
Signature of CQA Officer or Designated Representative

Original Report/Attachments To: Document Controller

Copies to: _____

_____

_____

_____

SHEET ____ OF ____

Meredosia Power Station - Closure of Fly Ash and Bottom Ash Ponds

DAILY INSPECTION REPORT

ADDITIONAL NOTES: DATE: _____

SHEET _____ OF _____

Meredosia Power Station - Closure of Fly Ash and Bottom Ash Ponds

WEEKLY SUMMARY REPORT

1. SUMMARY OF WEATHER CONDITIONS: **Date:** _____

AM Conditions: _____

PM Conditions: _____

Weather Delays: _____

2. EQUIPMENT & PERSONNEL ON SITE:

Equipment: _____

Personnel: _____

Visitors: _____

3. CONSTRUCTION ACTIVITIES AND LOCATIONS:

_____

_____

_____

_____

_____

4. SUMMARY OF MEETINGS HELD/ATTENDEES:

☐ **None** ☐ **See Sheet 2 of 2** ☐ **See Attached Meeting Minutes**

5. MATERIALS USED & TESTING OR INSPECTION RESULTS:

Materials Used: ☐ Stockpiled Soil ☐ GCL ☐ Geomembrane ☐ Geotextile ☐ Aggregate

☐ Off-Site Borrow Soil ☐ CCB Material ☐ HDPE Pipe ☐ Riprap

☐ Other: _____

Testing and/or Inspection Results: ☐ None ☐ See Attached Daily Inspection Reports

Calibration Records for Equipment: ☐ None ☐ See Attached

Prepared By: _____ _____
Signature of CQA Officer-in-Absentia (if applicable)

_____ _____
Signature of CQA Officer

Original Report/Attachments To: Document Controller

Copies to: _____

SHEET ____ **OF** ____

Meredosia Power Station - Closure of Fly Ash and Bottom Ash Ponds

WEEKLY SUMMARY REPORT

ADDITIONAL NOTES: **Date:** _____

SHEET ____ OF ____

Meredosia Power Station - Closure of Fly Ash and Bottom Ash Ponds

INSTALLER CERTIFICATE OF ACCEPTANCE

INSTALLER: _____ **DATE :** _____

GEOSYNTHETIC MATERIAL: _____

AREA ACCEPTED: _____

_____

_____

_____

INSTALLER: The undersigned authorized representative of the Installer certifies that he has visually inspected the substrate for the above referenced area and has found the surface to be acceptable for installation of the above referenced geosynthetic material on the date so noted.

The Installer shall be responsible for the integrity and suitability of the finished geosynthetic material from this date to completion of the installation.

CERTIFICATION OF ACCEPTANCE:

Signature of Installer's Authorized Representative: _____

Printed Name of Installer's Authorized Representative: _____

Title of Installer's Authorized Representative: _____

Date: _____

CERTIFICATE OF ACCEPTANCE RECEIVED BY CQA OFFICER:

Signature of CQA Officer-in-Absentia (if applicable): _____

Printed Name of CQA Officer-in-Absentia: _____

Date: _____

Signature of CQA Officer: _____

Printed Name of CQA Officer: _____

Date: _____

Meredosia Power Station- Closure of Fly Ash and Bottom Ash Ponds

CQA CERTIFICATION

The CQA certification as provided herein is based on a review of available inspection, testing and sampling results for the subject Work and is for the sole purpose of noting compliance of these results with established design parameters and taking no exceptions to initiation of next sequential Work. CQA certification by the Owner's Representative does not relieve the Contractor of its obligations to furnish all Work in accordance with the Contract.

1. LOCATION AND DESCRIPTION OF THE SUBJECT WORK:

_____

_____

_____

_____

_____

2. CONTRACTOR COMPLETING THE SUBJECT WORK:

_____

_____

_____

_____

_____

3. NEXT SEQUENTIAL WORK TO BEGIN:

_____

_____

_____

_____

_____

_____

By CQA Officer-in-Absentia: _____ **Date:** _____
(if applicable) (Signature)

By CQA Officer: _____ **Date:** _____
(Signature)

Distribution: Original To: Document Controller Copies To: _____

J024917.01 CQA Certification Form.doc

APPENDIX B

GEOSYNTHETIC TESTING STANDARDS

ClosureTurf®

Installation Guidelines Manual

May 2016

Before utilizing this document as an installation tool, Installer should download the latest version of the Installation Guidelines Manual from the website at www.watershedgeo.com.

WG WatershedGeo®
Unearthing Solutions

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1.0 Introduction

ClosureTurf® is a patented, 3 Component System* that serves as the final cover system on landfills. The 3 components of this unique system are:

Component 1 - An Agru Super Gripnet® LLDPE (or HDPE) geomembrane liner, or other liner approved for use by WatershedGeo.

Component 2 - An Engineered Turf

Component 3 - A sand infill (and/or alternatively, Hydrobinder®, or AmorFill™ -E infill)

*A Watershed Geosynthetics® patented (patent no. 8,585,322) gas collection system is a separate component to be utilized on sites that produce gas emissions. Malfunction Relief Valves are provided at one per acre of ClosureTurf® on landfills where gas emissions are expected.

1.1 Purpose and Scope

The ClosureTurf® Installation Guidelines document has been prepared to provide the Engineer / Contractor / Installer general guidance to the proper installation of the ClosureTurf® System. This document should be used in conjunction with the ClosureTurf® CSI (Construction Standards Institute) Specifications for the proper installation of the product.

2.0 Disclaimer

This manual is meant as a guideline only. Watershed Geosynthetics LLC cannot anticipate the many ways this product may be applied either in design or installation. Varying site conditions will require close coordination between the engineer and the installer to account for site conditions and adjust accordingly. When required by state and/or local regulations, a licensed professional engineer or architect will be required.

ClosureTurf® (US Patent No. 7,682,105, 8,585,322, 9,163,375 and 9,199, 287; Canadian Patent No. 2,663,170; and other Patents Pending) and trademark are the property of Watershed Geosynthetics LLC. All information, recommendations and suggestions appearing in this literature concerning the use of our products are based upon tests and data believed to be reliable; however, this information should not be used or relied upon for any specific application without independent professional examination and verification of its accuracy, suitability and applicability. Since the actual use by others is beyond our control, no guarantee or warranty of any kind,

expressed or implied, is made by Watershed Geosynthetics LLC as to the effects of such use or the results to be obtained, nor does Watershed Geosynthetics LLC assume any liability in connection herewith. Any statement made herein may not be absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations. Nothing herein is to be construed as permission or as a recommendation to infringe any patent.

3.0 Definitions

Whenever the terms listed below are used, the intent and meaning will be interpreted as indicated.

Acclimation

Physiological/thermal adjustment. Required in the geomembrane deployment process.

ArmorFill™

Armor-Fill™ Liquid Emulsion is a proprietary Polymer Emulsion product used to bind the ASTM-C33 sand infill component of the ClosureTurf® System.

ASTM

ASTM International, known until 2001 as the American Society for Testing and Materials, is an international standards organization that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services.

ClosureTurf®

A patented 4 component system consisting of a Watershed Geosynthetics specific Gas Management System (if applicable), a Structured Geomembrane (LLDPE or HDPE), an Engineered Turf, and a specific grade of sand infill (or alternatively a HydroBinder® infill material).

Construction Quality Assurance (CQA)

Construction Quality Assurance includes but is not limited to observations and documentation of materials and workmanship necessary to show that a particular project is being constructed according to site-specific specifications and within regulatory guidelines.

Construction Quality Assurance (CQA) Personnel

Construction Quality Assurance (CQA) personnel are representatives of the Professional of Record (POR) who work under direct supervision of the POR. The CQA personnel are responsible for quality assurance monitoring, applicable conformance sampling and performing onsite tests and observations.

Construction Quality Assurance Professional of Record (POR)

The POR is an authorized representative of the Owner and has overall responsibility for CQA efforts and to confirm the project was constructed in general accordance with site-specific specifications approved by the regulatory authority and contract documents. The POR must be

licensed as a Professional Engineer in the State the project is located and experienced in geosynthetics.

Construction Quality Control (CQC) Personnel

CQC Personnel are representatives of the Geosynthetics Installer who work under direct supervision of the Geosynthetics Installer. The Geosynthetics Installers' CQC Personnel are responsible for construction quality control, applicable conformance sampling and performing onsite tests and observations.

Contract Documents

Written, printed, or electronic matter that provides information or evidence that serves as an official record and are issued by the owner or operator. The documents include bidding requirements that include but are not limited to, contract forms, contract conditions, contract specifications, CQA plan, contract drawings, addenda, and contract modifications.

Contract Specifications

The requirements which are to be followed in the construction of the ClosureTurf® System. The standard specifications, supplemental specifications, special provisions, and all written or printed agreements and instructions that pertain to the method and manner of performing the work.

Contractor

One that agrees to furnish materials or perform services at a specified price, especially for construction work.

Design Engineer

An individual licensed to practice as a Professional Engineer or a Professional Service Firm that is responsible for the preparation of the project construction drawings and specifications.

Earthwork

A general engineering term relating to the relocation and utilization of soil during the process of construction.

Engineered Turf

A component of the ClosureTurf® System. A synthetic structured material consisting of one or more geotextiles tufted with polyethylene yarns that resemble grass blades.

Final Cover System Evaluation Report (FCSER)

Upon substantial completion of closure activities, the POR is responsible for the documentation of construction activities relating to the project, and any other inspections or verifications required by the regulatory authority. The FCSER will be signed and stamped by the POR and include documentation necessary for certification closure.

Fish Mouth

A semi-conical opening of the seam that is formed by an edge wrinkle in one sheet of the geomembrane component.

Geomembrane

A synthetic lining material that is a component of the ClosureTurf® System. Used as the primary barrier to infiltration and exfiltration of covered materials.

GSI

Geosynthetic Institute

475 Kedron Avenue

Folsom, PA 19033-1208 USA

TEL (610) 522-8440

FAX (610) 522-8441

HydroTurf®

A patented 3 component system consisting of a Structured Geomembrane Liner, a specialized Engineered Turf, and HydroBinder® infill material.

HydroBinder®

A proprietary pozzolanic infill utilized where higher surface water velocities may occur as well as in anchor trenches where specified.

Geosynthetics Contractor / Installer

The entity responsible for geosynthetic installation.

Independent Testing Laboratory

An organization, person, or company that tests products and materials, etc. according to agreed requirements. The entity shall be independent of ownership or control by the Owner or any party to the construction of the final cover or the manufacturer of the final cover products used. The entity shall also have proper legal authority where required to issue opinions and document the results of tests requested by the Owner.

Installation Supervisor

The person on-site who works for the Geosynthetics Installer and is in charge of the Geosynthetics Personnel and following the site specifications for the installation of the geosynthetics.

Manufacturing Quality Control (MQC)

A planned system of inspection and verification to ensure the quality of the final product.

Nonconformance

A deficiency in characteristics, documentation, or procedures that render the quality of an item or activity unacceptable or indeterminate. Examples of non-conformances include, but are not limited to, physical defects, test failures, and inadequate documentation.

Operator

The entity in control and responsible for the facility.

Owner

The entity that owns facility and land.

Owner's or Operators Representative

An official representative of the Owner or Operator responsible for planning, organizing, and controlling construction activities.

Panel

A general reference to a unit area of either the Structured Geomembrane (LLDPE or HDPE), or the Engineered Turf component of the ClosureTurf® System.

Quality Assurance

A planned and systematic pattern of procedures and documentation to ensure that items of work or services meet the requirements of the contract documents.

Quality Control

These actions provide a means to measure and regulate the characteristics of an item or service to comply with the requirements of the contract documents.

Relief Valve

A mechanical device used specifically to relieve gas buildup pressure underneath the ClosureTurf® system.

Representative Sample

(With respect to geomembrane destructive testing) - A random specimen of either the Structured Geomembrane (LLDPE or HDPE) or the Engineered Turf component consisting of 1 or more cut pieces (commonly referred to as coupons) from the same rectangular portion of material, oriented along a seam that is removed for field or laboratory testing purposes.

Ripple

Smaller in nature than a wrinkle. A result of thermal/or manufacturing that cannot be folded over.

Snapping

A manual method to an open ended seam to remove tenting as a result of the welding of the geomembrane seams.

Spike

A systematic design for interface friction located on the bottom of the Super Gripnet®.

Specimen

(With respect to geomembrane destructive testing) - A specimen is the individual test strip (sometimes called coupon) from a sample location. A sample location can consist of many specimens.

Studs

A systematic design for drainage located on the top side of the Super Gripnet®.

Surficial Collection Foot

A manufactured device utilized specifically for collection of gas beneath the Super Gripnet®.

Surficial Strip

A strip of Super Gripnet® used for gas conveyance below the ClosureTurf® system.

Tenting

A vertical ridge that is caused by wedge welding geomembrane.

Wrinkle

A portion of the geomembrane that does not lay relatively flat and is not a result of subgrade irregularity and which can be folded over.

4.0 Subgrade Preparation

Prior to ClosureTurf® system installation, the subgrade (e.g., protective cover soil) will be inspected. Observe the following:

- The protective cover soil is substantially free of surface irregularities and protrusions.
- The protective cover soil surface does not contain stones or other objects that could damage any of the ClosureTurf® components.
- The surface will be substantially smooth and free of foreign and organic material, sharp objects, particles or other deleterious material.

- Maximum particle size (e.g. rocks) will be specified by the by the design and contract specifications.
- The anchor trench dimensions have been checked, and the trenches are free of sharp objects and other deleterious material.
- Construction stakes and hubs have been removed and the resultant holes have been backfilled.
- The geosynthetics contractor, POR or his representative, and the permittee or his representatives have certified in writing that the surface on which the ClosureTurf® System will be installed is acceptable.
- Final grades on the slopes as well as benches dimensions and grades conform to the design grades.
- Survey shots and as-built drawings will be carefully reviewed and evaluated to insure the surface grades will drain as intended in the design drawings.

5.0 Installation – Surficial Gas Management System

5.1 Minimum Requirements

The gas management plan will include at a minimum, the use of provided ClosureTurf® Malfunction Relief Valves, (See Figure 3) to meet the specific needs of the intended site. The minimum required gas emission venting device will be installed at a rate of at least one vent per acre of installed ClosureTurf® (See Figure 1). Watershed Geosynthetics LLC supplies the minimum number of Malfunction Relief Valves with delivery of the ClosureTurf® product.

5.2 Surficial Collection Design (Where Applicable)

While it should be noted that not all projects will incorporate a surficial collection design, the ClosureTurf® system serves as an effective tool for control of fugitive emissions and can be incorporated into a conventional gas collection system or in some cases as a standalone gas collection and control system. A ClosureTurf® surficial collection design will incorporate the use of surficial collection strips (See Figure 1) that provide high flow capacity (See Figure 2) and a larger radius of influence. The system design will also incorporate the surficial collection foot (See Figure 4) that serves as a wellhead base, geomembrane interface and gas conveyance path from the strips to the collection wellhead (not provided).

5.2.1 Surficial Strips (Where Applicable)

Surficial strips are to be placed prior to the placement of geomembrane. Surficial Strips may consist of SuperGripnet®, single sided geocomposite or other techniques that will allow for the proper flow of gas without causing ballooning. The placement of the strips will be determined by the design engineer and included in the gas management plan.

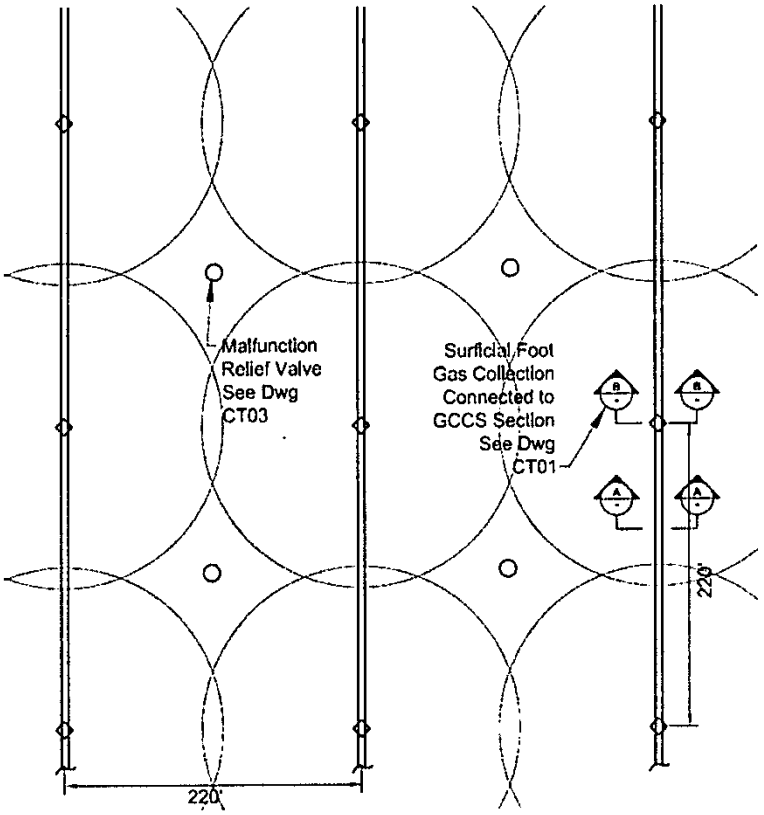
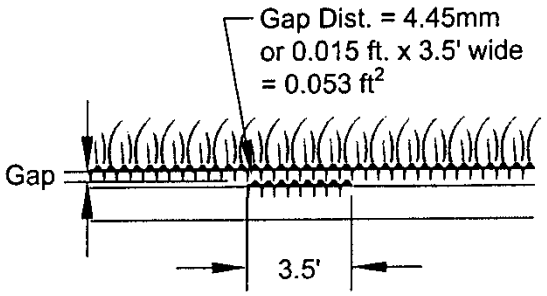


Figure 1: Typical Surficial Collection Strip Placement



Use Super Gripnet or Single Sided Geocomposite for Strips

Figure 2: Effective Cross Sectional Area: Surficial Strips

5.2.2 ClosureTurf® Malfunction Relief Valve

The Malfunction Relief Valve is a mandatory component of the ClosureTurf® System. The primary purpose of this component is to provide for necessary release of pressure in the event the gas collection system malfunctions. The Malfunction Relief Valves will be placed at one per acre as indicated by the site's gas management plan and installed during construction of the ClosureTurf® system.

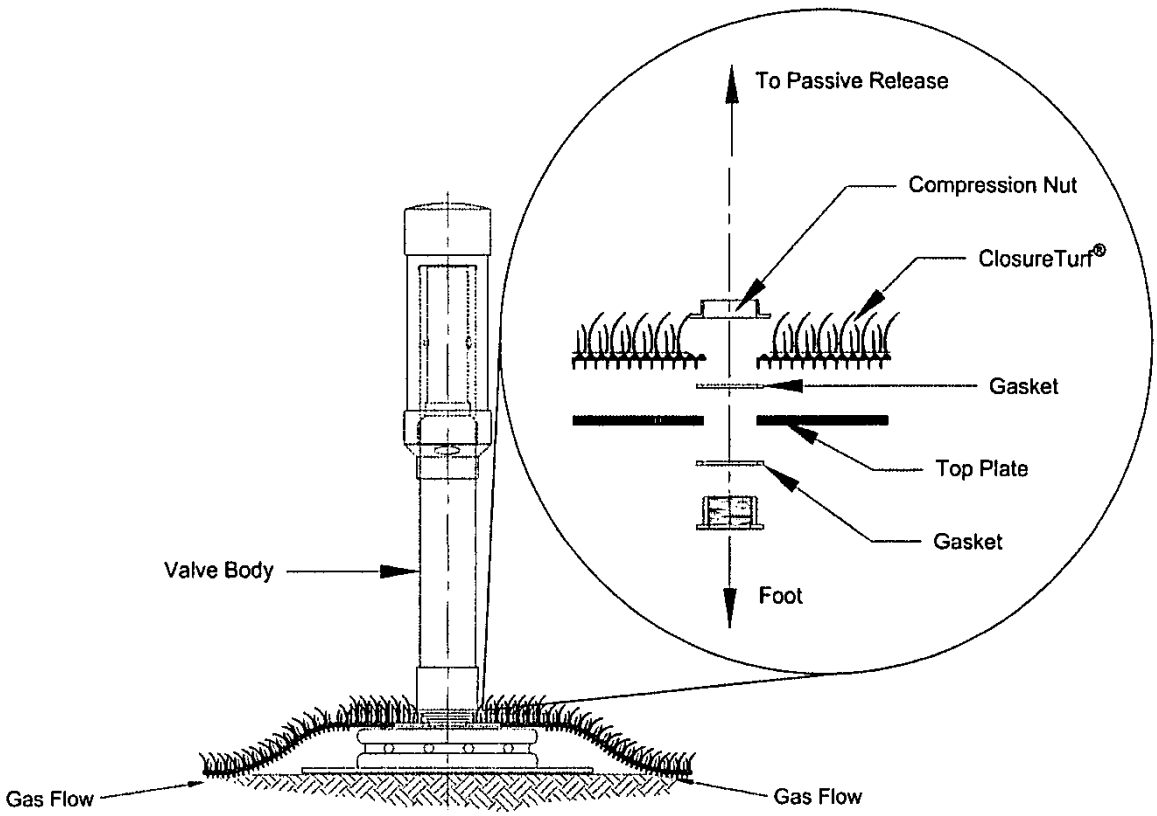


Figure 3: ClosureTurf® Malfunction Relief Valve (Patent Pending)

5.2.3 ClosureTurf® Collection Foot

This device is designed to be the interface between the surficial collection strips, the geomembrane and a gas collection wellhead (not provided). The unit allows vacuum to flow in from beneath the geomembrane and from the surficial collection strips to create a larger radius of influence for gas collection. Placement will be determined by the gas collection system design.

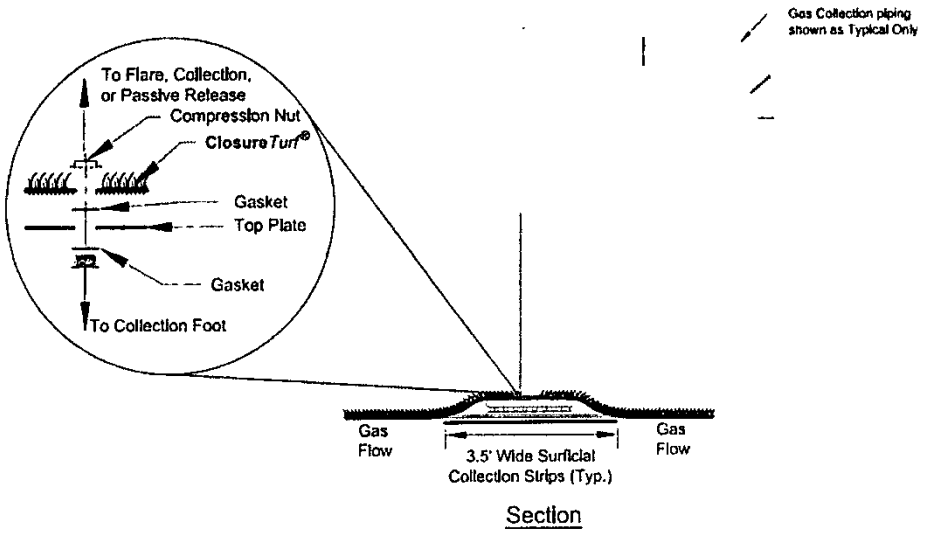


Figure 4: ClosureTurf® Surficial Collection Foot Connection to GCCS System

6.0 Installation - Geomembrane Liner

Installation of the Geomembrane Liner must be completed by a geosynthetics contractor approved by Watershed Geosynthetics. Qualification requirements for geosynthetics personnel are shown in WatershedGeo Installation Specification 01 73 19. Each component of the ClosureTurf® system will require specific testing and submittals before, during and after installation of the component. For information concerning submittals, see contract specifications. It is the responsibility of the contractor to ensure that each prior component installation has been approved by the POR before continuing with installation of the next ClosureTurf® component.

6.1 Delivery – Geomembrane Liner

Upon delivery of the geomembrane, observe that:

- The geomembrane is delivered in rolls and not folded. Any evidence of folding or other shipping damage is cause for rejection of the material.
- Equipment used to unload and store the rolls or pallets does not damage the geomembrane component.
- The geomembrane is stored in an acceptable location in accordance with the specifications and stacked no more than five rolls high.
- The geomembrane component is protected from puncture, dirt, grease, water, moisture, mud, mechanical abrasions, excessive heat, or other damage.
- Manufacturing documentation required by the specifications has been received and reviewed for compliance with the technical specifications. This documentation will be included in the FCSER.
- The geosynthetics receipt log form has been completed for materials received.
- Geomembrane component that is damaged or has been rejected due to improper manufacturer documentation will be removed from the site or stored at a location separate from the accepted geomembrane component.

6.2 Installation - Panel Deployment and Field Seaming

ClosureTurf® installation requires some additional care and techniques beyond those of the typical geomembrane installation. General panel deployment techniques as well as special techniques are listed below.

General

- Observe that the geomembrane component is placed in direct and uniform contact with underlying protective cover soil or subgrade soil.
- Observe the sheet surface as it is deployed and record panel defects and repair of the defects (e.g. panel rejected, patch installed, etc.) on the repair sheet. Repairs must be made in accordance with the contract specifications and located on a repair drawing.
- Observe that support equipment is not allowed on the geomembrane component during handling (See Section 6.4).
- Observe that the subgrade beneath the geomembrane component has not deteriorated since previous acceptance.
- Observe that there are no stones, construction debris, soil clogs or other deleterious items on the subgrade that could cause damage to the geomembrane component.
- The geomembrane component will not be deployed during inclement weather conditions as defined in the site specific specifications.
- Observe that people working on the geomembrane component do not smoke, wear boots/shoes that could damage the ClosureTurf® system components, or engage in activities that could damage the ClosureTurf® system components.
- Observe that the method used to deploy the sheet reduces wrinkles but does not cause bridging and that the sheets are anchored to prevent lifting or movement by the wind (geosynthetics contractor is responsible for any damage to or from windblown geomembrane).
- Observe that horizontal or cross seams on the side slopes are staggered so that long horizontal seams across the slope are not produced.
- The POR shall be responsible for approving the integrity of horizontal seams.

Acclimation and Adjustments

- The geomembrane component requires acclimation to ambient temperature after being deployed and before seaming operations begin.
- Acclimation time is dependent on the current weather conditions.
- By allowing the panels to acclimate, excessive wrinkling can be avoided.
- Final panel adjustments can be completed after the panel has properly acclimated to ambient temperature.
- After the panel has acclimated and before seaming operations begin, wrinkles will be worked toward the toe of slope.
- Once the above items are addressed, a final adjustment is required to pull the liner at the bottom of the slope.

Wedge Welding

- After proper acclimation and final adjustments/wrinkle removal, wedge welding may proceed.
- Wedge welding machines are a low profile machine with a vertical height (wedge height) not to exceed 3 inches, measured from flat surface to top of heating wedge.
- Wedge welding will be completed in accordance with the contract specifications.
- Sand bags will be applied as the wedge welding progresses to reduce tenting.

Snapping

- As a result of wedge welding, "ridges" or "tenting" of the seams may occur. A process called "snapping" must be employed to remove the excess slack caused by the welding process.
- Normally, this technique requires several people lined up along the open seam at the edge of the geomembrane and applying clamps to the edge. The panel is then "snapped" into positon and when applied properly, the excess slack is removed.
- The snapping technique will be applied while the welding seam is still warm.
- Previously applied sand bags along the wedge welded seam will reduce rebound tenting.

6.3 Anchor Trench Backfill

ClosureTurf® only relies on the anchor trenches to serve as a termination point. Top anchor trenches should be backfilled as quickly as practical after Engineered Turf Component is installed (prior to sand infill placement).

Vertical anchor trenches as well as anchor trenches along the toe will not be backfilled until sand infill of the engineered turf is in place. Anchor trench dimensions will be shown in the drawings.

Backfilling or sand bag loading the bottom and side anchor trenches should be considered and applied when cool temperatures are anticipated to assist with creep reduction.

6.4 Equipment on ClosureTurf® Geomembrane

Construction equipment on the ClosureTurf® geomembrane component will be limited to reduce the potential for geosynthetics damage. Observe/provide the following:

- Use power source generators capable of providing constant voltage to all required equipment under combined-line load.
- Secondary containment to catch spilled fuel under equipment where applicable.
- No equipment with tire or track pressures exceeding 5 psi will be allowed on the partially constructed ClosureTurf® system until after the completed installation of the sand infill component.
- No equipment will be left running and unattended over the constructed geomembrane component.
- Equipment operators shall check for sharp edges, embedded rocks, or other foreign materials stuck into or protruding from tires prior to operating equipment on the geomembrane component.
- Path driven on geomembrane component will be as straight as possible with no sharp turns, sudden stops or quick starts.

6.5 Wrinkles

Wrinkles occur during the geomembrane installation due to changes in geomembrane temperatures and deployment methods. The wrinkles may interfere with the installation of the engineered turf layer as well as the final appearance of the ClosureTurf® system. Observe that:

- Snapping procedures are followed.
- Wrinkles are repaired if they can be folded over as defined the morning after the seam is developed and the liner is in a cool state.

7.0 Installation – Engineered Turf

Qualification requirements for the personnel who the Engineered Turf component are shown in WatershedGeo Installation Specification 01 73 19.

7.1 Delivery – Engineered Turf

Box trucks will deliver 27 rolls per truck. Rolls will be strapped in groups of 9 allowing equipment (i.e. pick-up truck, skid steer) to pull the grouped rolls to the front of the truck. Rolls can be pulled directly to the ground or carpet stingers can move the rolls to a designated area. Observe the following:

Observe the following:

- The engineered turf is wrapped in rolls with protective covering.
- The rolls are not stacked more than 3 high.
- The rolls are not damaged during unloading.
- Protect the engineered turf from mud, soil, dirt, dust, debris, cutting, or impact forces.
- Each roll must be marked or tagged with proper identification.
- Rolls that have been rejected due to damage are be removed from the site or stored at a location separate from accepted rolls, designated by the Owner/Operator.
- Rolls that do not have proper manufacturer's documentation will be stored at a separate location until documentation has been received and approved.

7.2 Installation – Engineered Turf - Surface Preparation

Prior to installation of Engineered Turf, observe the following:

- ClosureTurf® geomembrane has been installed in accordance with the contract specifications.
- The geomembrane installation documentation has been completed and approved by the POR for areas were the Engineered Turf is to be installed.
- The supporting surface (i.e., the geomembrane) does not contain stones, debris, membrane grindings or large scraps left over from the installation process that could damage or impede surface water flow through the Engineered Turf.

7.2.1 Installation – Engineered Turf – Deployment & Field Seaming

During deployment of Engineered Turf, observe the following:

- Observe the turf as it is deployed.
- Verify that equipment used does not damage the turf or underlying geomembrane by handling, trafficking, leakage of hydrocarbons, or by other means.
- Verify that during deployment, the Engineered Turf filaments point upslope a majority of the time.
- Verify that the turf is anchored to prevent movement by the wind (the contractor is responsible for any damage resulting to or from windblown Engineered Turf).
- Verify that the turf remains free of contaminants such as soil, grease, fuel, etc.
- Observe that the turf is laid substantially smooth and substantially free of tension, stress, folds, wrinkles, or creases.
- Observe the deployment of the panels to insure proper flipping in order to expose the turf surface up after seaming operations. After the first panel of the project is deployed, deployment will be done on the adjacent turf panel to avoid damage.

7.2.1.1 Installation – Engineered Turf – Sewn Seam Method

- A single stitch prayer type seam is constructed using an American Newlong sewing machine or equivalent.
- The thread will be Polyester or equivalent.
- Sewing will occur between the 1st and 2nd row of tufts from the edge.

7.2.1.2 Installation – Engineered Turf – Fusion Seaming Method

- Engineered Turf fusion seaming device will be a DemTech VM20/4/A fusion welder only.
- Fusion seams require a minimum of 5 inches of overlap.
- Frayed or loose geotextile strands will be cut off or removed.
- Prior to starting the production fusion seaming, trial seams must be performed as outlined in Section 7.2.1.3 below.
- Demonstrate the preparation methods and equipment utilized for removal of the salvage from the outside edge of the rolls of turf (i.e. trimming & cutting devices).
- Mechanical trimming and cutting devices will be utilized for salvage trimming.
- Demonstrate and control the fraying of geotextile strands when performing the removal of salvage.
- Any damage that occurs due to production seaming will be repaired as outlined in WG Installation Guidance Documents.
- Any defects will be repaired as outlined in 7.2.2.

7.2.1.3 Installation – Engineered Turf – Fusion Seaming Method Trial Seam Requirements

1. Prior to turf component welding, CQA personnel shall observe and document the following:
    a. Turf welding apparatus are tested;
    b. at daily start-up; and
    c. immediately after any break; or

d. anytime the machine is turned off for more than 30 minutes.

2. Procedures:

a. The turf trial weld will be completed under conditions similar to those under the panels that will be welded.

b. If at any time, the CQA Personnel believe that an operator or fusion welding apparatus is not functioning properly, a Field Trial Seam Test must be performed.

c. Any dispute concerning proper installation techniques or the proper function of fusion welding equipment will be resolved by the OWNER'S REPRESENTATIVE.

d. The trial weld must be allowed to cool to ambient temperature before seam snapping or panel adjustments are applied.

3. Trial Sample Test Results:

a. Trial weld samples must comply with "VISUAL PASSING CRITERIA" Visual passing criteria is verified when a manual peel/pull test is performed and the top turf panel tufts transfer to the bottom turf panel. The transfer of approx. 75% of the tufts constitutes a passing trial weld.

4. Field Seam Test Failure:

a. Less than approx.75% of the top turf panel tufts do not transfer to the bottom turf panel.

5. Additional Trial Sample Testing Requirements:

a. Two consecutive trial welds meet the visual passing criteria.

6. The trial weld sample must be a minimum of 3 feet long and 12 inches wide, with the seam centered lengthwise.

7. If a welding apparatus exceeds 5 hours in the second half of the day, another trial seam must be performed.

8. CQA documentation of trial seam procedures will include the following:

a. The names of the seaming personnel;

b. The name of the fusion seaming technician;

c. the welding apparatus number, time, date;

d. ambient air temperature; and

e. welding apparatus temperature & speed setting.

7.2.2 Installation - Engineered Turf Repairs and Tie-In Procedures

When Repairs and Tie-Ins to Engineered Turf occur, observe the following:

- Tie-In's to Engineered Turf will be completed by using a fusion seam.
- Seaming equipment for Engineered Turf will be a DemTech VM 20/4/A welder.
- A hand held heat gun should be used in smaller/concentrated areas.

7.2.3 Installation - Equipment on Engineered Turf

No equipment will be allowed on slopes exceeding 15% until Sand Infill is in place. On slopes less than 15%, such as top decks, ATV type vehicles will be allowed prior to infill placement if the rubber tire or track pressure is less than 5 psi. Post construction (full specified sand infill thickness) drivability tire pressures on slopes greater than 10% should be limited on the ClosureTurf® system to less than 35 psi.

Allowable rubber tire or track pressures on top decks may increase to as much as 120 psi as long as sustained traffic load is not expected.
In all phases of construction, equipment used on the ClosureTurf® product will not be allowed to change speed or direction in a manner that could displace or damage the ClosureTurf® system.
High traffic areas will require sand to be placed at the full height of the turf. ArmorFill may also be utilized in high traffic areas to reduce sand migration due to the increased sand thickness.

8.0 Installation - Sand Infill

This component of the ClosureTurf® system is a specialized mixture of sand infill that is placed between the tufts of the Engineered Turf component.

Observe that the following general requirements regarding Sand Infill are met:

- Sand Infill will meet ASTM C-33 specifications.
- Areas that are to receive sand infill must be inspected and accepted by the POR or CQA Personnel before placement of sand infill takes place.

8.1 Submittals and Testing - Sand Infill

See contract specifications for Sand Infill MQC Submittals and submittal/testing requirements regarding the Sand Infill.

8.2 Installation - Sand Infill Deployment

Observe that the following installation guidelines regarding the Sand Infill:

- Sand infill thickness will be verified at a frequency of 20 measurements per acre of final cover installed.
- The sand infill layer will be placed to a ½ inch minimum thickness not to exceed ¾ inch thick.
- The sand infill will be worked into Engineered Turf as infill between the synthetic yarn blades.
- No equipment will be allowed on slopes exceeding 15% until the sand infill is in place.
- Conveyor systems and/or Express Blowers are the preferred method to spread and place the sand infill.
- Contractor shall explain in detail in the pre-construction meeting the method of sand infill deployment to be used.
- The sand infill deployment method will be approved prior to installation of the sand infill.
- For slopes 3H: 1V or steeper the sand infill shall be placed using long reach conveyor belts or using water or air express blower methods that demonstrate achievable results.
- The sand infill placement will be done in front of the deployment equipment to improve the bearing capacity of the previously installed ClosureTurf® components.
- Sand infill placement cannot occur with snow or ice on the Engineered Turf component.
- Verify that underlying geosynthetics installations are not damaged during placement operations. Mark damaged geosynthetics and verify that damage is repaired.

The method for measuring the Sand Infill thickness will be performed utilizing a digital caliper with depth rod capabilities, or a POR approved alternate measuring device.

8.3 - Alternate Infill - ClosureTurf® with HydroBinder® Infill for Ditches and Downslope Channels

Alternate Infill - HydroBinder® is provided by Watershed Geosynthetics or approved supplier. When the ClosureTurf® system is installed and HydroBinder® infill is placed in lieu of sand infill, it creates a ditch/downslope lining armor that will allow high flow velocities to convey without damage or maintenance to the underlying ClosureTurf® components. Typical ClosureTurf® installation procedures are used for the first three ClosureTurf® components, and then the HydroBinder® infill is placed dry and hydrated after placement. Figure 4 shows a typical ClosureTurf® with HydroBinder® infilled ditch section.

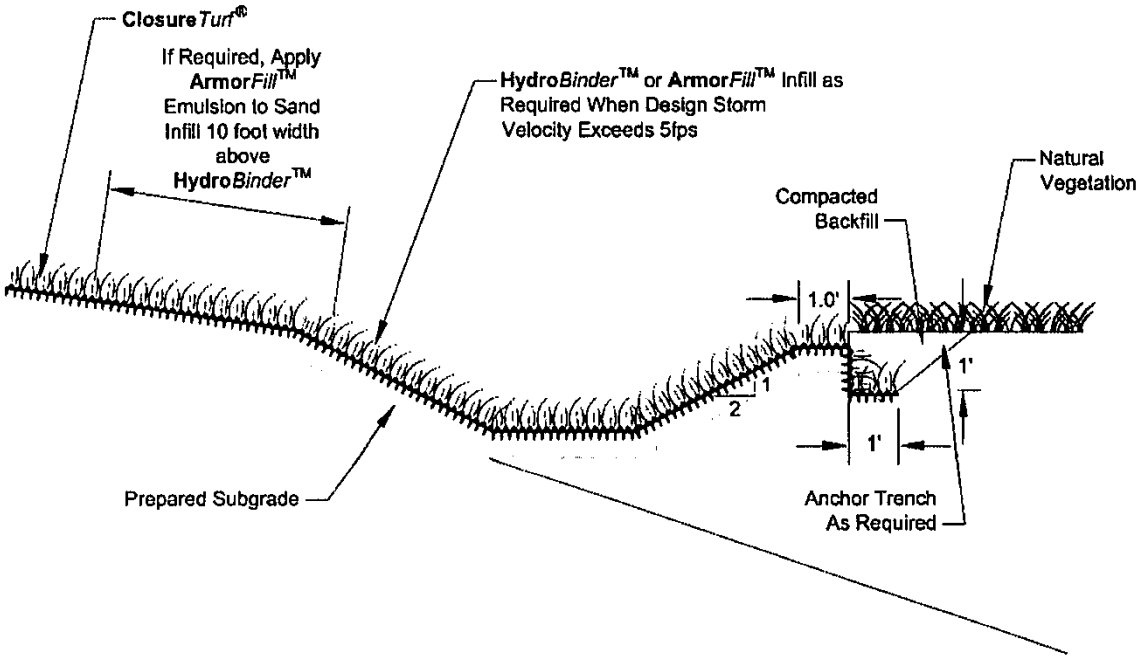


Figure 4: Typical ClosureTurf® with HydroBinder® Infilled Ditch Section

8.4.1 Installation – Alternate Infill - HydroBinder®

Verify the following regarding installation of HydroBinder® Infill:

- The HydroBinder® infill layer may be placed using any appropriate equipment capable of completing the work while meeting loading requirements specified herein.
- Manual hand spreading is acceptable when equipment isn't practical.
- Contractor / Installer will explain in detail in the pre-construction meeting the method of HydroBinder® infill deployment.
- Installation of HydroBinder® infill will only be performed by a Watershed Geosynthetics' licensed and approved installer using techniques and equipment approved by Watershed Geosynthetics.
- The HydroBinder® will be installed into the turf while it is in a dry state.
- The HydroBinder® will be worked into the tufts so the tufts are in an upright position.
- The HydroBinder® infill layer will be placed to a ¾ inch minimum thickness not to exceed 1 inch thick.

- Do not backfill anchor trenches until turf has been installed with HydroBinder® infill.
- The hydration process must occur the day of the HydroBinder® infill placement.
- The desired HydroBinder® infill thickness will be achieved prior to the hydration process.
- The cemented infill is hydrated thoroughly however care must be taken to avoid displacement of the non-hydrated infill.
- The objective is to soak the area to start the hydration process but not to inundate with water beyond saturation.
- Once hydration is completed as described, backfill and compaction of the vertical anchor trenches should take place.
- The HydroBinder® will be at minimum performance levels within 24 hours.

8.4.2 Installation – Alternate Infill - ArmorFill™

Verify the following regarding installation of ArmorFill™ Infill:

- Installation of ArmorFill™ will be completed by an installer certified by Watershed Geosynthetics.
- Apply ArmorFill™ under dry weather conditions and when precipitation is not expected for at least 24 hours after installation.
- Apply ArmorFill™ on a previously installed ClosureTurf® system that is free of leaves and other material that may inhibit the penetration of the ArmorFill™ into the sand component.
- Apply ArmorFill™ only after approval of the finished ClosureTurf® product installation.
- Verify ArmorFill™ and water mix ratio by logging volume mixed of each component.
- Verify that ArmorFill™ has saturated the sand by inserting a probe and displacing a 1 inch area of sand.
- Check saturation randomly at a rate of 20 probes per acre.
- Verify proper application rate by marking a known area and applying the proper volume to that area.
- Adjust delivery rate to match the delivery volume per area.
- Mix in a hydraulic conveyance system such as a water truck or portable tank.
- Utilize a small agitation pump to mix and recirculate the ArmorFill™ within the tank to impede separation of the mix.
- Place ½ of the water component in the tank, then add the full strength ArmorFill™ and complete the mix by then adding the other ½ of the water into the tank.
- ArmorFill™ application equipment will have a 2 inch diameter hose with a spray adjustment nozzle and cut off function in the nozzle head.
- Reduce the number of equipment set-ups required and take care with the application hose so as

previously applied ArmorFill™ is not displaced by dragging of the hose.

- Spray product evenly.
- Apply ArmorFill™ at a rate of approximately 2600 gallons of the mixed product per acre (Approx. 0.06 gallons per square foot)
- Do not apply ArmorFill™ in inclement weather or in freezing temperatures.
- At the completion of ArmorFill™ placement activities, clean the equipment thoroughly and purge the tank and hoses of the product.
- All waste product will be disposed of in accordance to site regulations
- Avoid unnecessary foot traffic on the applied product for 24 hours.
- No vehicle traffic is allowed on the applied product for 7 calendar days.

8.5 Installation – Coverage - ArmorFill™

For most applications, use a 6:1 mix ratio unless otherwise stated by the Engineer.

8.5.1 Installation – Coverage - HydroBinder®

Table 1

Approximate Coverage Area for HydroBinder™ Infill

Product	Bag Size	Yield (Cubic Feet)	Coverage in Sq. Ft. for 3/4 in. Thick[1]	Coverage in Sq. Ft. for 1 in. Thick[1]	Amount of Water to Mix per Bag (gal)	Amount of Water (gal) to Apply per Sq. Ft. (3/4 in. Thick)[1]	Amount of Water (gal) to Apply per Sq. Ft. (1 in. Thick)[1]
HydroBinder Infill	40 lbs.	0.3	4.8	3.6	0.6	0.12	0.16
	60 lbs.	0.45	7.2	5.4	0.9	0.12	0.16
	80 lbs.	0.6	9.6	7.2	1.2	0.12	0.16
	1 Cubic Yard (Super Sack)	27	432	324	55	0.13	0.17

[1] - Values are approximate

8.6 Post Installation - Maintenance and Monitoring

The ClosureTurf® System is designed to be a very low maintenance final cover. If maintenance issues or damage occurs to the ClosureTurf® System, please refer to the following guidelines.

8.6.1 Exposed Geotextiles

If the engineered turf backing becomes exposed, then the ASTM C-33 graded infill is to be placed and brushed into the exposed turf backing areas. WG suggested guidance is to evaluate the closure system at a frequency of no less than once every 5 years.

Additionally, UV resistant coating can be applied to the exposed area and sand immediately applied onto the coating material, this provides a flexible UV barrier for the underlying geotextiles. The UV coating product is manufactured by Quikrete, product number 8640 and Sakrete, product number 60205006, concrete sealants and can be purchased at most Lowes & Home Depot Home Improvement stores. ArmorFill™ can also be utilized for this purpose.

8.6.2 Damage to the Geomembrane or Engineered Turf Components

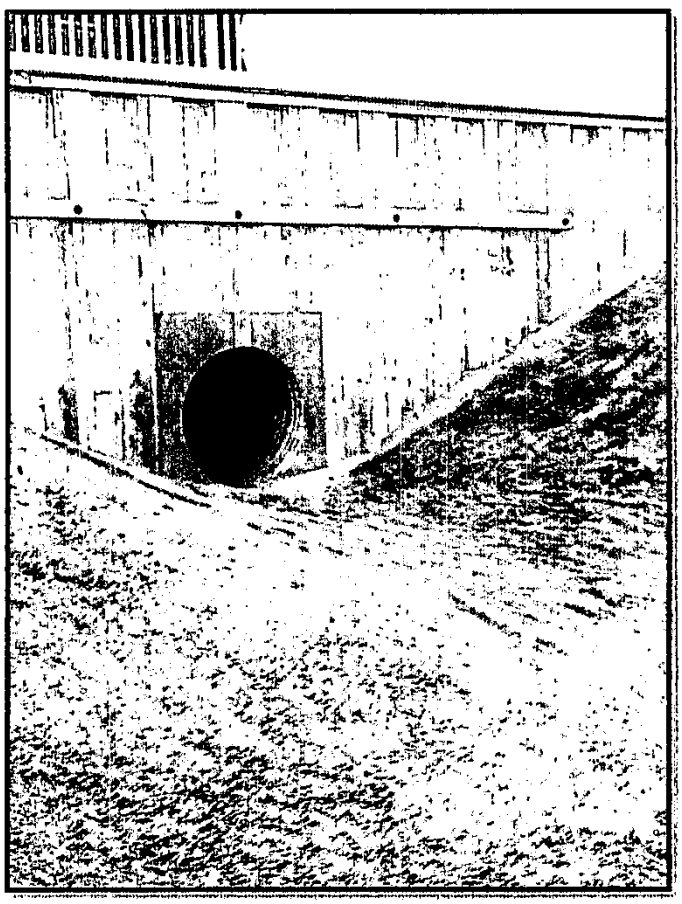
If damage occurs to the geomembrane or geotextile Components, call an approved ClosureTurf® installer for repairs. Contact WatershedGeo® at 770 777 0386 for a list of qualified installers.

HydroTurf®

INSTALLATION GUIDELINES MANUAL

March 2015, Revision 2.1

Before utilizing this document as an installation tool, Installer should download the latest version of the Installation Guidelines Manual from the website at www.watershedgeo.com.



WG WatershedGeo® Unearthing Solutions

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WG WatershedGeo Unearthing Solutions

1.0 Introduction

HydroTurf® Advanced Revetment Technology is a patented system which is used as a hardened armoring for protection against erosion from hydraulic forces. There are two HydroTurf® Systems. These systems are as follows:

HydroTurf® CS is shown in Figure 1. The components of this system are as follows:

- Structured LLDPE (or HDPE) Geomembrane Liner
- Engineered Synthetic Turf
- HydroBinder® Infill
- Penetrating Colloidal Concrete Treatment (PCCT) -Optional for Freeze / Thaw Protection

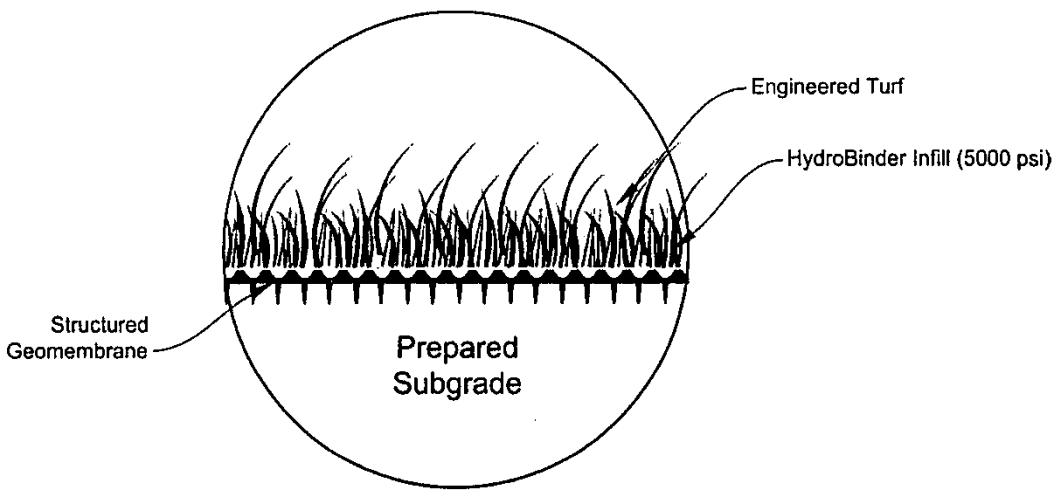

Figure 1 – Section of HydroTurf® CS

HydroTurf® Z is shown in Figure 2. The components of this system are as follows:

- Engineered Synthetic Turf with Integrated Polyethylene Backing
- HydroBinder® Infill
- Penetrating Colloidal Concrete Treatment (PCCT) -Optional for Freeze / Thaw Protection

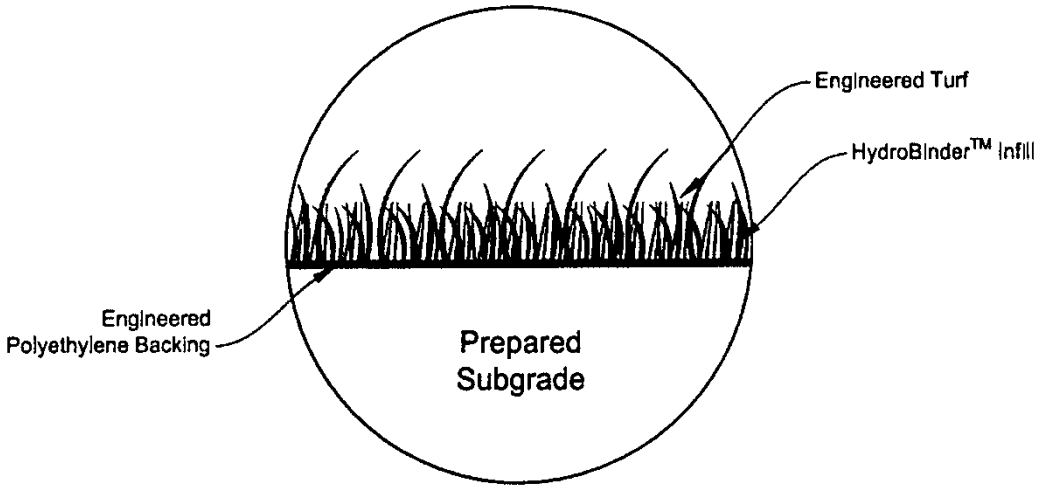

Figure 2 – Section of HydroTurf® Z

2.0 Limitations

This manual is meant as a guideline only. Watershed Geosynthetics LLC cannot anticipate the many ways this product may be applied either in design or installation. Varying site conditions will require close coordination between the engineer and the installer to account for site conditions and adjust accordingly. When required by state and/or local regulations, a licensed professional engineer or architect will be required.

HydroTurf® (US Patent Nos. 7,682,105, 8,585,322; Canadian Patent No. 2,663,170; and other Patents Pending) and registered trademark are the property of Watershed Geosynthetics LLC. All information, recommendations and suggestions appearing in this literature concerning the use of our products are based upon tests and data believed to be reliable; however, this information should not be used or relied upon for any specific application without independent professional examination and verification of its accuracy, suitability and applicability. Since the actual use by others is beyond our control, no guarantee or warranty of any kind, expressed or implied, is made by Watershed Geosynthetics LLC as to the effects of such use or the results to be obtained, nor does Watershed Geosynthetics LLC assume any liability in connection herewith. Any statement made herein may not be absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations. Nothing herein is to be construed as permission or as a recommendation to infringe any patent.

3.0 Subgrade Preparation (HydroTurf® CS and Z)

Prior to HydroTurf® system installation, the soil subgrade shall be inspected by the Engineer and geosynthetics contractor. The following shall be observed:

- The soil subgrade shall be compacted to the requirements as specified by the engineer. The subgrade shall be firm and unyielding.
- The soil subgrade shall be smooth and uniform, and shall be substantially free of surface irregularities and protrusions.
- The soil surface shall be free of foreign and organic material, sharp objects, particles or other deleterious material, and shall not contain stones or other objects that could damage any of the HydroTurf® components.
- Maximum particle size (e.g. stones) shall be specified by the design and site-specific specifications.
- The anchor trench dimensions have been checked, and the trenches are free of sharp objects and other deleterious material.
- Construction stakes and hubs have been removed and the resultant holes have been backfilled.
- Final grades on the slopes as well as benches dimensions and grades conform to the design grades.
- Survey shots and as-built drawings shall be carefully reviewed and evaluated to ensure the surface grades will drain as intended in the design drawings.

4.0 Structured Geomembrane Liner Component (HydroTurf® CS only)

Installation of the Structured Geomembrane LLDPE (or equivalent HDPE) Liner must be completed by an approved geosynthetics contractor who can demonstrate significant experience with installation of structured geomembranes. Each component of the HydroTurf® system will require specific testing and submittals before, during or after installation of the component. It is the responsibility of the contractor to ensure that each prior component installation has been approved by the owner's representative before continuing with installation of the next HydroTurf® component.

4.1 Geomembrane Panel Deployment

Engineer shall ensure that all Pre-Installation procedures have been followed before proceeding with deployment of geomembrane. As geomembrane component panel deployment proceeds, the Engineer and the Geosynthetics Contractor shall:

- Ensure the geomembrane component is placed in direct and uniform contact with underlying protective cover soil or subgrade soil.
- Observe the geomembrane surface as it is deployed and record panel defects and repair of the defects (e.g. panel rejected, patch installed, etc.) on the repair sheet. Repairs must be made in accordance with the technical specifications and located on a repair drawing.
- Support equipment is not allowed on the geomembrane component during handling.
- Confirm that the surface beneath the geomembrane component has not deteriorated since previous acceptance.
- Confirm that there are no stones, construction debris, soil clogs or other deleterious items on the subgrade that could cause damage to the geomembrane component.
- The geomembrane component shall not be dragged across a surface that could damage the material. If the geomembrane component is dragged across an unprotected surface, it must be inspected for scratches and repaired or rejected, as necessary.

- The geomembrane component shall not be deployed during inclement weather conditions as defined in the project specific specifications.
- Personnel working on the geomembrane component shall not smoke, wear boots/shoes that could damage the HydroTurf® system components, or engage in activities that could damage the HydroTurf® system components.
- The method used to deploy the geomembrane shall minimize ripples and eliminate wrinkles but does not cause bridging, and that the geomembrane is anchored to prevent lifting or movement by the wind (geosynthetics contractor is responsible for any damage to or from windblown geomembrane). A wrinkle is a portion of the geomembrane that does not lay relatively flat and is not the result of a subgrade irregularity. A wrinkle is large enough that it can be folded over. A ripple is the result of manufacturing or thermal expansion. It is smaller in nature than a wrinkle and cannot be folded over.
- Excess geomembrane materials should be walked-out or removed to the extent practical.
- The geosynthetics contractor shall apply tension techniques to pull out excess material / slack prior to seaming.
- The geomembrane component shall acclimate to the ambient temperature prior to welding. The ambient temperature is defined as the temperature of previously deployed and welded geomembrane panels.
- Additional acclimation time will be required when temperatures drop below 50 degrees Fahrenheit and when solar heating is reduced.
- The horizontal or cross seams on the side slopes shall be staggered so that long horizontal seams across the slope are not produced.

4.2 Geomembrane Field Seaming/Welding

Geomembrane field seaming and welding operations shall be performed as follows:

- Wedge welding machines shall be a low profile machine with a vertical height to not exceed 3 inches to the highest point of the wedge. Installer shall demonstrate that each wedge welding machine meets this requirement.
- The geosynthetics contractor shall have the number of welding apparatuses and spare parts necessary to perform the work.
- Equipment used for welding will not damage any HydroTurf® system components.
- The extrusion welding machine is purged prior to beginning a weld until the heat degraded extrudate is removed.
- The ambient temperature, measured 6 inches above the geomembrane surface, is between 35°F and 104°F, or geomembrane manufacturer's recommended temperature limits if they are more stringent.
- The contact surfaces of the sheets are clean, free of dust, grease, dirt, debris, and moisture prior to welding.
- The weld is substantially free of dust, soil / mud, rocks, and other debris.
- The seams are overlapped a minimum of 3 inches for extrusion and hot wedge welding, or in accordance with geomembrane manufacturer's recommendations, whichever is more stringent.
- Panels shall be overlapped (shingled) in the downgrade direction.
- No solvents or adhesives are present in the seam area.

- The procedure used to temporarily hold the panels together does not damage the panels and does not preclude CQA testing.
- The panels are being welded in accordance with the plans and site specific specifications.
- There is no obvious free moisture in the weld area.
- Observe that at the end of each day or installation segment, unseamed edges are anchored with sandbags or other approved anchoring device.
- Penetration anchors shall not be used to secure the geomembrane.
- Once two panels have been seamed together or at the approx. 1/3 seaming process a seam "snapping" process should be applied. This method is performed with manual labor by utilizing 3-4 technicians on the open side of the panel applying a pulling pressure to snap out the tented welded seam.
- The "snapping" requirement is important in that it allows the engineered turf component to lie more evenly over the geomembrane component.

4.3 Defects

Any portion of the geomembrane with a detected flaw, must be repaired in accordance with the project specifications (e.g., material requirements, installation, testing, etc.).

5.0 Engineered Turf Component (HydroTurf® CS and Z)

The installation of HydroTurf® engineered turf consists of the placement and seaming of the engineered turf component over the structured geomembrane liner (HydroTurf® CS) or over the soil subgrade (HydroTurf® Z).

Box trucks will deliver up to 27 rolls engineered turf per truck. Nine (9) rolls will be strapped together allowing equipment (i.e. pick-up truck, skid steer) to pull the strapped rolls to the front of the truck. Rolls can be moved to a designated area by using a carpet stinger or lifted by straps.

During unloading, the contractor and / or CQA personnel shall confirm that the following is practiced and performed:

- The engineered turf is wrapped in rolls with protective covering.
- The rolls are not stacked more than 3 high.
- The rolls are not damaged during unloading.
- Protect the engineered turf from damage (i.e., mud, soil, dirt, dust, debris, cutting, impact forces, etc.).
- Each roll must be marked or tagged with proper identification.
- Rolls that have been rejected due to damage are to be removed from the site or stored at a location separate from accepted rolls, designated by the Owner/Operator.

5.1 Surface Preparation (HydroTurf® CS)

Prior to installation of Engineered Turf, the following shall be completed:

- The geomembrane component of the HydroTurf® CS has been installed in accordance with the site specific specifications.
- The required geomembrane installation documentation has been completed and approved by the Engineer prior to installation of the Engineered Turf.
- The surface of the geomembrane does not contain soil / mud, stones, debris or large scraps left over from the installation process.

5.2 Engineered Turf Deployment (HydroTurf® CS and Z)

Engineered Turf shall be deployed as follows:

- Observe the engineered turf as it is deployed and record defects and disposition of the defects (panel rejected, patch installed, etc.). Repairs are to be made in accordance with the specifications.
- Equipment used shall not damage the engineered turf, underlying geomembrane or subgrade by handling, trafficking, leakage of hydrocarbons, or by other means.
- The panels shall be deployed from the top of the slope in a way that the leading edge of the roll stays at the top of the slope with the Engineered Turf filaments pointing upwards. Also, the turf has colored marker fibers (yellow) on one side of the roll. These colored fibers shall be lined up on the same side of every panel. This will ensure that the turf filaments are pointing in the same direction.
- The turf shall be ballasted to prevent movement by the wind or other means (the contractor is responsible for any resulting damage).
- The turf shall remain free of contaminants such as soil / mud, debris, grease, fuel, etc.
- The turf shall be laid smooth and substantially free of tension (but not loose), stress, folds, ripples / wrinkles, or creases. The geomembrane (for HydroTurf® CS) or the turf (for HydroTurf® Z) shall be in intimate contact with the underlying subgrade
- On slopes, the turf shall be secured with sandbag anchoring at the top of the slope and then rolled down the slope.

5.3 Engineered Turf Seaming

5.3.1 Sewing (HydroTurf® CS)

Seaming of the engineered turf component of HydroTurf® CS may be performed by sewing. This is described as follows:

- The panels shall be deployed to ensure proper flipping in order to expose the turf surface up after seaming (sewing) operations. After the first panel of the project is deployed, deployment shall be done on the adjacent turf panel to avoid damage.
- The panels shall be deployed in a manner to ensure that the turf filaments are pointing upslope and in the same direction as the adjacent panel.
- The adjacent panels are sewn together with a single stitch prayer type seam. This is constructed using a heavy-duty textile stitching machine (i.e., Nulong sewing machine or equivalent).

- The thread shall be 207 Polyester or equivalent.
- Sewing shall occur between the 1st and 2nd row of tuft stiches of the engineered turf in order to avoid exposure of the black geotextile backing after flipping the panel. Incorrect sewing, which creates "fishmouths" and / or exposed geotextile backing, shall be repaired.

5.3.2 Heat-Bond Welding (HydroTurf® Z)

Seaming of the engineered turf component of HydroTurf® Z may be performed by heat-bond welding. This is described as follows:

- Panels shall be deployed such that the seam overlaps are shingled with the flow of water. The panel on the up-flow / upstream side shall have the overlap placed on top of the down-flow / downstream panel.
- The panels shall be deployed in a manner to ensure that the turf filaments are pointing upslope and in the same direction as the adjacent panel.
- The DemTech 4-inch, single-wedge welder (Model No. VM-20/4/A Pro-Wedge Welder 120V, VM20 Outfitted with 100-KIT/4S/VC/A.2 Welding Kit, 4-in, 220V, S.S.) shall be used to heat-bond the seams for the engineered synthetic turf.
- Since the temperature and speed controls of the DemTech VM-20 machine are variable and can be increased / decreased depending on weather and environment conditions, the temperature and speed shall be confirmed with a trial seam. This trial seam shall be field tested. Trial seams shall be performed at the being of each day and during the day when the weather (i.e., temperature) conditions change.
- Field testing of this trial seam consists of the following:
  - Observe the weld and confirm that the geotextile backings are not melting. If they are melting, then the machine is too hot.
  - Observe and feel the welded seam in order to confirm that there is a stiff, inner core which is continuous along the weld.
  - Observe and confirm that the welds may not be pulled or peeled apart. If it can, there was not enough heat during the welding process. Pulled or peeled seams shall be re-seamed or patched with a cap.
  - All seams shall be continuous. These seams shall be verified by the installer that they are continuous by running their fingers along the seam. If there is any penetration of their fingers into the seam, the installer will need to use a hand-held Leister at the location of the penetration in the seam in order to weld it continuously. The seam will need to be re-inspected by the installer.
- Production field seams shall be performed in the same manner as trial seams. The field seams shall be inspected every hour at a minimum. This inspection of the field seams shall be the same as the inspection for the trial seams.
- Burnouts shall be patched.
- All seams not passing the visual inspection shall be repaired.
- After seaming operations, the edges of the synthetic turf panels shall be sufficiently anchored with sandbags in the top of slope perimeter anchor trenches unless otherwise noted on the construction drawings.

5.3.3 Repairs and Tie-Ins Procedures for Engineered Turf (HydroTurf® CS and Z)

When Repairs, caps and tie-ins of engineered turf are needed, the following shall be performed:

- Repairs to engineered turf shall be completed by using a heat-bonded seam.
- All tie-in seams along flatter slope (i.e. 15% or less) with length greater than 25 feet shall use the DemTech VM-20 single wedge welder (outfitted with the synthetic turf welding kit) so a continuous, consistent pressure is achieved throughout the seam.
- A hand-held heat gun (i.e. Leister) with a pressure wheel should be used in shorter or smaller concentrated areas (i.e., butt seams, caps or patches). The hand leister shall be immediately followed by a press wheel providing a constant pressure.
- Hand leistering shall be field tested with a trial seam to confirm proper seaming.
- The quality of these trial and field welds shall be confirmed by the following visual observations:
  - Observe the weld and confirm that the geotextile backings are not melting. If they are melting, then the machine is too hot.
  - Observe and feel the welded seam in order to confirm that there is a stiff, inner core which is continuous along the weld.
  - Observe and confirm that the welds may not be pulled or peeled apart. If it can, there was not enough heat during the welding process. Pulled or peeled seams shall be re-seamed or patched with a cap.
  - All hand-leistered seams shall be continuous. These seams shall be verified by the installer that they are continuous by running their fingers along the seam. If there is any penetration of their fingers into the seam, the installer will need to use a hand-held Leister at the location of the penetration in order to weld the seam continuously. The seam will need to be re-inspected by the installer.

5.4 Equipment on Engineered Turf (HydroTurf® CS and Z)

No equipment shall be allowed on slopes exceeding 15% until HydroBinder® Infill is in place. On flatter slopes, ATV type vehicles and / or rubber tracked skid steer machines will be allowed prior to infill placement if their ground pressure is less than 5 psi. Post construction and after 28 days of curing of the HydroBinder®, vehicle (ground) tire pressures should be limited on the HydroTurf® system to less than 35 psi. Driving should be limited to areas where the subgrade under the HydroTurf® is well-compacted, firm and unyielding.

6.0 HydroBinder® Infill (HydroTurf® CS and Z)

HydroBinder® Infill is a dry, high-strength cementitious mix. It is provided by Watershed Geosynthetics with the HydroTurf™ system. When the HydroTurf™ system is installed and HydroBinder® infill is placed, it creates a hardened revetment armoring that can resist the forces from high hydraulic flow velocities. The HydroBinder® infill is placed dry, groomed into the engineered synthetic turf and hydrated after placement.

6.1 Placement of HydroBinder™ Infill (HydroTurf™ CS and Z)

HydroBinder® Infill shall be placed as follows:

- HydroBinder® is delivered to the jobsite on pallets in either 3000# bulk bags (1 per pallet) or 80# bags (42 per pallet). It is delivered on a flatbed with 16 pallets (typical) per truckload.
- The HydroBinder® shall be installed into the turf while it is in a dry state.
- Prior to placing the HydroBinder®, the engineered turf shall be dry. If the turf is wet from rain or dew, the installer shall wait until it is dry. The installer may attempt to speed up the drying process by using a blower (i.e., leaf blower, industrial blower, etc.).
- HydroBinder™ shall not be installed in inclement, wet or rainy weather, or the threat of inclement weather. Also, the HydroBinder® shall not be installed in freezing temperatures.
- The HydroBinder® infill shall be placed at a minimum thickness of ¾-in. This thickness is achieved by placing approximately 6 to 7 lbs/sf of the dry HydroBinder® over the engineered turf.
- The infill is to be placed / spread using a manual drop spreader, top-dresser and/or drop spreader attached to low ground pressure equipment with adequate dust control.
- Manual hand spreading is acceptable when equipment is not practical.
- If weep holes are required for draining the internal drainage layer through the engineered turf (HydroTurf® CS), remove the HydroBinder® in the areas of the weep holes prior to hydration or block the weep hole locations prior to infilling. Blocks may consist of pipe, dowels, etc. Weep holes are typically ½ to ¾-in diameter and are located at the toe of slope on 2-ft centers.

6.2 Brushing of the HydroBinder™ Infill (HydroTurf® CS and Z)

The HydroBinder® infill will need to be worked into the tufted fibers of the engineered turf such that the turf fibers are in an upright position. This can be achieved as follows:

- The infill shall be worked into the tuft fibers so the tuft fibers are in an upright position with the infill at a measurable ¾ inch minimum depth. This is achieved with common mechanical turf broom, power broom, shop broom, yard rakes, or greens groomer rakes.
- Brushing should be performed in all four directions starting with the direction against the lay of the fibers. Multiple passes may be required.
- The HydroBinder® may need to be placed in 2 to 4 lifts with brushing in between lifts to effectively work the material into the tufts and achieve fibers that are upright.
- The engineered turf shall be visually inspected to confirm that the turf fibers are upright and that there are no trapped fibers.
- Thickness measurements of the HydroBinder® infill shall be taken using a caliper or equivalent device. Measurements shall be taken at a minimum frequency of 5 measurements per 1,000 sf (for smaller projects) or 20 per acre (for larger projects) of installed area.
- The desired HydroBinder® infill thickness shall be achieved prior to the hydration process.

6.3 Hydration of the HydroBinder® Infill (HydroTurf® CS and Z)

The HydroBinder® infill shall be hydrated in place as follows:

- The hydration process shall occur on the same day as the HydroBinder® infill placement.
- The infill shall be hydrated thoroughly with a light and consistent spray of water to avoid displacement of the non-hydrated infill. Estimated application rate is between 0.12 and 0.20 gallons per square foot of area.
- The installer shall not overhydrate the infill so that water begins to runoff and cause loss of cement infill during the process. The general objective is to soak the area to start the hydration process but not to inundate with water beyond saturation of the infill.
- Visual verification can be performed that the HydroBinder® infill has been fully hydrated, and not over hydrated. Visually observe that the top of the HydroBinder has a wet sheen (denoting saturation) but that water is not ponding on top. Also, excavate (with finger or small tool) into the HydroBinder® to confirm full hydration of the section has been achieved.
- To improve curing, the hydrated area may be covered with plastic sheeting.
- If freezing temperatures are expected during the night, the hydrated area should be covered with burlap and / or plastic sheeting.
- The HydroBinder® infill shall harden within 24 hours following hydration, and shall reach its maximum compressive strength at 28 days. If the HydroBinder has not hardened in 24 hours, it will need to be removed and replaced.
- Personnel access on the HydroTurf® shall be prohibited for 24-hr following the hydration of the HydroBinder®.
- Once hydration is completed and the HydroBinder® has set up, backfill and compaction of the anchor trenches may be performed.

6.4 Cold Weather Placement and Curing of the HydroBinder® Infill (HydroTurf® CS and Z)

Cold weather placement and curing techniques for HydroBinder® shall be consistent with industry standard techniques used for concrete and cement products. The following guidelines are suggested:

- Follow the procedures in American Concrete Institute (ACI) 306 – Guide to Cold Weather Concreting.
- ACI 306 defines cold weather as three consecutive days of the following:
  - Average daily temperature falls below 40 dg F; or
  - The air temperature does not rise above 50 deg F for more than half of a day in one 24 hour period.
- At the time of HydroBinder® placement, the subgrade and surface of the engineered turf shall be at a temperature of at least 36 deg F and rising.
- Ensure that frost or frozen surfaces are thawed with no standing water.
- If the temperature can fall below 32 °F within 24 hours of application, heated tarps and/or insulated blankets are required to maintain the temperature above 50 deg F.
- Heated tarps and/or insulated blankets are required to maintain the temperature above 50 deg F for a period of at least 7 days.

- Heated tarps may dry out the HydroBinder®. Do not allow it to dry out. You may need to add moisture and use impermeable covers.

The project design engineer and/or resident engineer shall provide technical specifications and guidance for cold weather concreting based upon your specific project particulars (i.e., geographical location, weather, and time of year), and the engineer should review and approve all proposed installation methods.

6.5 Penetrating Colloidal Concrete Treatment for the HydroBinder® Infill (Optional for HydroTurf® CS and Z)

Penetrating colloidal concrete treatment (PCCT) is an optional liquid application and treatment for the freeze / thaw protection of the HydroBinder® infill. It should be applied to the HydroBinder® when specified. The PCCT shall be applied as follows:

- PCCT shall ideally be stored in a location that is dry and between 35 °F to 100 °F (2 °C to 38 °C) ambient temperature. Optimal storage is at the middle of the temperature range. Protect the PCCT from freezing.
  - The following shall be followed when applying the PCCT:
    - The PCCT product and the HydroBinder® surface shall be at temperature of at least 36 deg F (2 deg C) and rising.
    - Do not apply on frozen substrate or when temperature can fall below 32 °F within 24 hours of application.
    - Ensure that frost or frozen surfaces are thawed with no standing water.
    - Areas of standing water shall be removed prior to application.
    - Do not apply unprotected during periods of high winds.
    - PCCT shall not be applied in inclement, wet or rainy weather, or the threat of inclement weather.
    - Do not apply when substrate is 90°F (32°C) or higher. If surface temperature is higher than 90°F (32°C) then pre-wetting with water is required. Be sure to remove any puddles before applying of SCP.
    - When hot temperature and direct sunlight conditions exist, apply a fine mist spray of water on the surface after application of PCCT.
  - Apply PCCT as soon as the HydroBinder® infill is hard enough to walk on without damage to the surface.
  - Use a 1,500-psi (10.5 MPa) airless sprayer set at a pressure that will not damage the surface [i.e., approximately 400 to 900 psi (2.5 to 6.5 MPa)].
  - Hold wand and spray the PCCT 6 inches (15 cm) from the surface of the HydroBinder® at a 90º angle.
  - PCCT must be applied using an overlapping spray pattern of 50% on the previous run.
  - Any area that absorbs product faster than 10 minutes will need to be reapplied until the product no longer absorbs faster than 15 minutes.
  - If PCCT has absorbed thoroughly in the majority of the area, but there is pooling in the low areas, use a broom to spread additional PCCT into the areas already penetrated. Do not allow PCCT to dry in pools. Remove excess PCCT with a damp mop. Apply at a rate of approximately 160 ft^2 per gallon of PCCT. If necessary, spray a second application of PCCT.

- For sloped applications, work from lowest to highest elevation. Very light and repeated spray passes should be made on the same area until the concrete surface no longer accepts PCCT. Move onto next area after achieving "point of rejection".

7.0 Backfilling of the Anchor Trenches (HydroTurf® CS and Z)

Backfilling of the anchor trenches for the HydroTurf® CS shall be performed as follows:

- The structured geomembrane component shall be in intimate contact with the anchor trench inside wall and bottom. Wrinkles, ripples, fish mouths, and/or bunching shall be removed and properly patched.
- The structured geomembrane shall not extend up the outside wall of the anchor trench. It shall be trimmed short of the outside wall and shall extend a minimum of ¾ of the width of the anchor trench.
- The engineered synthetic turf component shall be in intimate contact with the structured geomembrane. Wrinkles, ripples, fish mouths, and/or bunching shall be removed and properly patched.
- The engineered synthetic turf shall be trimmed so that it does not extend onto the bottom of the anchor trench. It shall be trimmed just short of the bottom and shall extend a minimum of ¾ of the depth of the anchor trench.
- During filling of the anchor trench with compacted soil or concrete backfill, the contractor shall maintain that the geomembrane is in intimate contact with the trench wall and bottom and that the engineered synthetic turf is in intimate contact with the structured geomembrane.
- Soil backfill shall be compacted in accordance with the specifications for engineered fill. Concrete backfill shall be vibrated in place in accordance with standard industry techniques.

Backfilling of the anchor trenches for the HydroTurf® Z shall be performed as follows:

- The engineered synthetic turf component shall be in intimate contact with the anchor trench inside wall and bottom. Wrinkles, ripples, fish mouths, and/or bunching shall be removed and properly patched.
- The engineered synthetic turf shall not extend up the outside wall of the anchor trench. It shall be trimmed short of the outside wall and shall extend a minimum of ¾ of the width of the anchor trench.
- During filling of the anchor trench with compacted soil or concrete backfill, the contractor shall maintain that the geomembrane is in intimate contact with the trench wall and bottom and that the engineered synthetic turf is in intimate contact with the structured geomembrane.
- Soil backfill shall be compacted in accordance with the specifications for engineered fill. Concrete backfill shall be vibrated in place in accordance with standard industry techniques.

ClosureTurf™
Brought to you by Agru America

50 mil SUPER GRIPNET®

Product Data	Test Method	LLDPE Values	HDPE Values
Thickness (min. avg.), mil (mm)	ASTM D5994	50 (1.25)	50 (1.25)
Thickness (lowest indiv.), mil (mm)	ASTM D5994	45 (1.15)	45 (1.15)
Drainage Stud Height (min. avg.), mil (mm)	ASTM D7466	130 (3.30)	130 (3.30)
Friction Spike Height (min. avg.), mil (mm)	ASTM D7466	175 (4.45)	175 (4.45)
Density, g/cc	ASTM D792, Method B	0.939 (max)	0.94 (min)
Tensile Properties (avg. both directions)	ASTM D6693, Type IV		
Strength @ Yield (min. avg.), lb/in width (N/mm)	ASTM D6693, Type IV	N/A	110 (19.3)
Elongation @ Yield (min. avg.), % (GL=1.3in)	ASTM D6693, Type IV	N/A	13
Strength @ Break (min. avg.), lb/in width (N/mm)	ASTM D6693, Type IV	110 (19.3)	110 (19.3)
Elongation @ Break (min. avg.), % (GL=2.0in)	ASTM D6693, Type IV	300	200
Tear Resistance (min. avg.), lbs. (N)	ASTM D1004	30 (133)	33 (169)
Puncture Resistance (min. avg.), lbs. (N)	ASTM D4833	55 (245)	80 (356)
Carbon Black Content (range in %)	ASTM D4218	2-3	2-3
Carbon Black Dispersion (Category)	ASTM D5596	Only near spherical agglomerates for 10 views: 9 views in Cat. 1 or 2, and 1 view in Cat. 3	
Stress Crack Resistance (Single Point NCTL), hours	ASTM 5397, Appendix	N/A	300
Oxidative Induction Time, minutes	ASTM D3895, 200°C, 1 atm O_2	≥140	≥140
Melt Flow Index, g/10 minutes	ASTM D1238, 190°C, 2.16 kg	≤1.0	≤1.0
Oven Aging with HP OIT, (% retained after 90 days)	ASTM D5721 ASTM D5885, 150°C, 500 psi O_2	60	80
UV Resistance with HP OIT, (% retained after 1600 hours)	ASTM D7238 ASTM D5885, 150°C, 500 psi O2	20 hr. Cycle @ 75° C/4 hr. dark condensation @ 60° 35	50
2% Secant Modulus (max), lb/in (N/mm)	ASTM D5323	3,000 (520)	N/A
Axi-Symmetric Break Resistance Strain, % (min)	ASTM D5617	30	N/A

Agru America's geomembranes are certified to pass Low Temp. Brittleness via ASTM D746 (-80°C), and Dimensional Stability via ASTM D1204 (± 2% @ 100°C)

TURF COMPONENT

Product Data	Test Method	Values
CBR Puncture	ASTM D6241	900 lb, (MARV)
Tensile Product (MD/XD)	ASTM D4595	1,000 lb/ft min (MARV)
Rainfall Induced Erosion	ASTM D96459	< 0.45% Infill Loss 6 in/hr
Aerodynamic Evaluation	GTRI Wind Tunnel	120 mph with maximum uplift of 0.12 lb/sf
DuraTurf™ Fiber UV Stability	ASTM G147	> 60% retained tensile strength at 100 years (projected)
Backing System UV Stability (Exposed)	ASTM G1545 Modified Cycle 1.UVA340	110 lbs/ft retained tensile strength at 6500 hours (projected)
Steady State Hydraulic Overtopping (ClosureTurf™ with HydroBinder™)	ASTM D7277/D7276	5 ft overtopping resulting in 29 ft/s velocity and 8.8 psf shear stress for Manning N Value of 0.02
Full Scale Wave Overtopping Test Cumulative Volume (ClosureTurf™ with HydroBinder™)	Colorado State University Wave Simulator	165,000 ft3/ft
Full Scale Wave Overtopping Test Wave Overtopping Discharge(ClosureTurf™ with HydroBinder™)	Colorado State University Wave Simulator	4.0 ft3/s/ft
Transmissivity w/ underlying structured geomembrane Normal stress 50 psf and 0.33 gradient (m2/sec)	ASTM D4716	2.5E -03m^2/sec., min.
Internal Friction of combined components	ASTM D5321	35°, min.
Sand Infill Gradation and Ballast	ASTM D6913	ASTM C-33 Fine Aggregates

SUPPLY INFORMATION (Standard Roll Dimensions)

	Thickness		Width		Length		Area (approx.)		Weight (avg)	
	mil	mm	ft	m	ft	m	ft^2	m^2	lbs	kg
Super Gripnet	50	1.25	23	7	300	91.44	6900	640	2855	1300
Turf Component	N/A	N/A	15	4.6	300	91.44	4500	418	840	381

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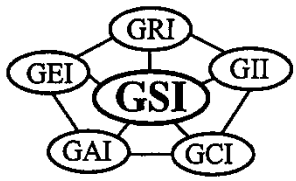

Revision 3: December 19, 2012
Revision Schedule on pg. 9

GRI GT13(a) – ASTM Version*

Standard Specification for

"Test Methods and Properties for Geotextiles Used as Separation Between Subgrade Soil and Aggregate"

This specification was developed by the Geosynthetic Research Institute (GRI) with the cooperation of the member organizations for general use by the public. It is completely optional in this regard and can be superseded by other existing or new specifications on the subject matter in whole or in part. Neither GRI, the Geosynthetic Institute, nor any of its related institutes, warrant or indemnifies any materials produced according to this specification either at this time or in the future.

1. Scope

1.1 This specification covers geotextile test methods properties for subsequent use as separation between subgrade soil and aggregate predominantly in pavement systems.

Note 1: While separation occurs in every geotextile application, this pavement-related specification focuses on subgrade soils being "firm" as indicated by CBR values in ASTM D1883 higher than 3.0 (soaked) or 8.0 (unsoaked).

1.2 This specification sets forth a set of physical, mechanical and endurance properties that must be met, or exceeded, by the geotextile being manufactured.

1.3 In the context of quality systems and management, this specification represents a manufacturing quality control (MQC) document. However, its general use is essentially as a recommended design document.

1.4 This specification is intended to assure both good quality and performance of fabrics used as geotextile separators but is possibly not adequate for the complete

*This GRI standard is developed by the Geosynthetic Research Institute through consultation and review by the member organizations. This specification will be reviewed at least every 2-years, or on an as-required basis. In this regard it is subject to change at any time. The most recent revision date is the effective version.

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specification in a specific situation. Additional tests, or more restrictive values for the tests indicated, may be necessary under conditions of a particular application.

1.5 This standard specification does not address installation practice. This item is addressed in the geosynthetics literature dealing with this particular application and under unique situations might require modifications, e.g., higher values and/or additional test properties.

2. Referenced Documents

2.1 ASTM Standards

D 1883 Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils
D 4354 Practice for Sampling of Geosynthetics for Testing
D 4533 Test Method for Trapezoidal Tearing Strength of Geotextiles
D 4632 Test Method for Grab Breaking Load and Elongation of Geotextiles
D 4759 Practice for Determining the Specification Conformance of Geosynthetics
D 4873 Guide for Identification, Storage and Handling of Geotextiles
D 5261 Test Method for Measuring Mass per Unit Area of Geotextiles
D 6241 Test Method for Static Puncture Strength of Geotextiles and Geotextile Related Product Using a 50-mm Probe
D 7238 Test Method for Effect of Exposure of Unreinforced Polyolefin Geomembrane Using Fluorescent UV Condensation Apparatus

2.2 AASHTO Specification

M288-05 Geotextile Specification for Highway Applications

3. Definitions

3.1 Formulation - The mixture of a unique combination of ingredients identified by type, properties and quantity. For geotextiles, a formulation is defined as the exact percentages and types of resin(s), additives and/or carbon black.

3.2 Manufacturing Quality Control (MQC) - A planned system of inspections that is used to directly monitor and control the manufacture of a material which is factory originated. MQC is normally performed by the manufacturer of geosynthetic materials and is necessary to ensure minimum (or maximum) specified values in the manufactured product. MQC refers to measures taken by the manufacturer to determine compliance with the requirements for materials and workmanship as stated in certification documents and contract specifications [ref. EPA/600/R-93/182].

3.3 Minimum Average Roll Value (MARV) – For geosynthetics, a manufacturing quality control tool used to allow manufacturers to establish published values such that the user/purchaser will have a 97.7% confidence that the property in question will meet published values. For normally distributed data, "MARV" is calculated

as the typical value minus two (2) standard deviations from documented quality control test results for a defined population from one specific test method associated with one specific property.

3.4 Minimum Value – The lowest sample value from documented manufacturing quality control test results for a defined population from one test method associated with one specific property.

3.5 Maximum Value – The highest sample value from documented manufacturing quality control test results for a defined population from one test method associated with one specific property.

3.6 Separation – The placement of a flexible porous geosynthetic between dissimilar materials so the integrity and functioning of both materials can remain intact or be improved.

Note 2: For separation of stone base courses overlying soil subgrades this primary function simultaneously prevents the stone from intruding down into the soil and the soil from pumping up into the stone.

4. Material Classification and Formulation

4.1 This specification covers geotextiles used as separation materials.

4.2 The polymer types are mainly polypropylene, but also polyester or polyethylene. Other polymers are also possible in this regard.

4.3 The type of geotextile style is not designated. However a distinction can be made based on the elongation criteria of 50%.

Note 3: It is assumed that nonwoven fabrics break at elongations higher than 50%. Woven fabrics always break at elongations significantly lower than 50%.

5. Specification Requirements

5.1 The geotextiles for use as separator shall conform to Tables 1or 2. Table 1 is given in English units and Table 2 is in SI (Metric) units. The conversion from English to SI units is "soft", i.e., rounded off to an approximate value. All test methods are based on ASTM Standards.

Note 4: The numeric relationships between this specification based on ASTM Test Methods and GRI –GT13(b) based on ISO Test Methods have been developed at the Geosynthetic Institute.

5.2 The required values for most properties in Tables 1 and 2 are to be minimum average roll values (MARV). The exceptions are AOS which is a maximum average roll value (MaxARV), and UV stability which is a minimum average value.

5.3 The required class is determined by the severity of installation conditions (i.e., size of equipment, condition of subgrade, thickness of covering lift, etc.). Table 3 gives guidance in this respect.

6. Workmanship and Appearance

6.1 The finished geotextile shall have good appearance qualities. It shall be free from such defects that would affect the specific properties of the geotextile, or its proper functioning.

6.2 General manufacturing procedures shall be performed in accordance with the manufacturer's internal quality control guide and/or documents.

7. MQC Sampling, Testing, and Acceptance

7.1 Geotextiles shall be subject to sampling and testing to verify conformance with this specification. Sampling shall be in accordance with the most current modification of ASTM Standard D 4354, using the section titled, "Procedure for Sampling for Purchaser's Specification Conformance Testing." In the absence of purchaser's testing, verification may be based on manufacturer's certifications as a result of testing by the manufacturer of quality assurance samples obtained using the procedure for Sampling for Manufacturer's Quality Assurance (MQA) Testing. A lot size shall be considered to be the shipment quantity of the given product or a truckload of the given product, whichever is smaller.

7.2 Testing shall be performed in accordance with the method referenced in this specification for the indicated application. The number of specimens to test per sample is specified by each test method. Geotextile product acceptance shall be based on ASTM D4759. Product acceptance is determined by comparing the average test results of all specimens within a given sample to the specification MARV. Refer to ASTM D 4759 for more details regarding geotextile acceptance procedures.

8. MQC Retest and Rejection

8.1 If the results of any test do not conform to the requirements of this specification, retesting to determine conformance or rejection should be done in accordance with the manufacturing protocol as set forth in the manufacturer's quality manual.

9. Shipment and Storage

9.1 Geotextile labeling, shipment, and storage shall follow ASTM D 4873. Product labels shall clearly show the manufacturer or supplier name, style, and roll number. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.

9.2 Each geotextile roll shall be wrapped with a material that will protect the geotextile, including the ends of the roll, from damage due to shipment, water, sunlight and

contaminants. The protective wrapping shall be maintained during periods of shipment and storage.

Note 5: The project specification shall be very explicit as to the maximum exposure time between the geotextile being removed from the wrapper and being backfilled with soil or covered with another geosynthetic.

9.3 During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from the following: site construction damage, precipitation, extended ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, flames including welding sparks, temperatures in excess of 160°F (71°C), and any other environmental condition that may damage the property values of the geotextile.

10. Certification

10.1 The contractor shall provide to the engineer a certificate stating the name of the manufacturer, product name, style number, chemical composition of the filaments or yarns, and other pertinent information to fully describe the geotextile.

10.2 The manufacturer is responsible for establishing and maintaining a quality control program to assure compliance with the requirements of the specification. Documentation describing the quality control program shall be made available upon request.

10.3 The manufacturer's certificate shall state that the finished geotextile meets the requirements of the specification as evaluated under the manufacturer's quality control program. A person having legal authority to bind the manufacturer shall attest to the certificate.

10.4 Either mislabeling or misrepresentation of materials shall be reason to reject those geotextile products.

English Units

Table 1(a) – Geotextile Properties Class 1 (High Survivability)

Property[1]	ASTM Test	Unit	Elongation < 50%	Elongation ≥ 50%
Grab Tensile Strength	D 4632	lb	315	203
Trapezoid Tear Strength	D 4533	lb	112	79
CBR Puncture Strength	D 6241	lb	630	440
Permittivity	D 4491	sec-1	0.02	0.02
Apparent Opening Size	D 4751	in.	0.024	0.024
Ultraviolet Stability[2]	D 7238	% Str. Ret. @ 500 lt. hrs.	50	50

Table 1(b) – Geotextile Properties Class 2 (Moderate Survivability)

Property[1]	ASTM Test	Unit	Elongation < 50%	Elongation ≥ 50%
Grab Tensile Strength	D 4632	lb	248	158
Trapezoid Tear Strength	D 4533	lb	90	56
CBR Puncture Strength	D 6241	lb	500	320
Permittivity	D 4491	sec-1	0.02	0.02
Apparent Opening Size	D 4751	in.	0.024	0.024
Ultraviolet Stability[2]	D 7238	% Str. Ret. @ 500 lt. hrs.	50	50

Table 1(c) – Geotextile Properties Class 3 (Low Survivability)

Property[1]	ASTM Test	Unit	Elongation < 50%	Elongation ≥ 50%
Grab Tensile Strength	D 4632	lb	180	113
Trapezoid Tear Strength	D 4533	lb	68	41
CBR Puncture Strength	D 6241	lb	380	230
Permittivity	D 4491	sec-1	0.02	0.02
Apparent Opening Size	D 4751	in.	0.024	0.024
Ultraviolet Stability[2]	D 7238	% Str. Ret. @ 500 lt. hrs.	50	50

Notes:

(1) All values are minimum average roll values (MARV) except AOS which is a maximum average roll value (MaxARV) and UV stability which is a minimum average value.

(2) Evaluation to be on 50 mm strip tensile specimens after 500 hours exposure.

SI Metric Units

Table 2(a) – Geotextile Properties Class 1 (High Survivability)

Property[1]	ASTM Test	Unit	Elongation < 50%	Elongation ≥ 50%
Grab Tensile Strength	D 4632	N	1400	900
Trapezoid Tear Strength	D 4533	N	500	350
CBR Puncture Strength	D 6241	N	2800	2000
Permittivity	D 4491	sec-1	0.02	0.02
Apparent Opening Size	D 4751	mm	0.60	0.60
Ultraviolet Stability[2]	D 7238	% Str. Ret. @ 500 lt. hrs.	50	50

Table 2(b) – Geotextile Properties Class 2 (Moderate Survivability)

Property[1]	ASTM Test	Unit	Elongation < 50%	Elongation ≥ 50%
Grab Tensile Strength	D 4632	N	1100	700
Trapezoid Tear Strength	D 4533	N	400	250
CBR Puncture Strength	D 6241	N	2250	1400
Permittivity	D 4491	sec-1	0.02	0.02
Apparent Opening Size	D 4751	mm	0.60	0.60
Ultraviolet Stability[2]	D 7238	% Str. Ret. @ 500 lt. hrs.	50	50

Table 2(c) – Geotextile Properties Class 3 (Low Survivability)

Property[1]	ASTM Test	Unit	Elongation < 50%	Elongation ≥ 50%
Grab Tensile Strength	D 4632	N	800	500
Trapezoid Tear Strength	D 4533	N	300	180
CBR Puncture Strength	D 6241	N	1700	1000
Permittivity	D 4491	sec-1	0.02	0.02
Apparent Opening Size	D 4751	mm	0.60	0.60
Ultraviolet Stability[2]	D 7238	% Str. Ret. @ 500 lt. hrs.	50	50

Notes:

(1) All values are minimum average roll values (MARV) except AOS which is a maximum average roll value (MaxARV) and UV stability which is a minimum average value.

(2) Evaluation to be on 50 mm strip tensile specimens after 500 hours exposure.

Table 3 - Required Degree of Survivability as a Function of Subgrade Conditions, Construction Equipment and Lift Thickness
(Class 1, 2 and 3 Properties are Given in Table 1 and 2; Class 1 + Properties are Higher than Class 1 but Not Defined at this Time)

	Low ground-pressure equipment ≤ 25 kPa (3.6 psi)	Medium ground-pressure equipment > 25 to ≤ 50 kPa (>3.6 to ≤ 7.3 psi)	High ground-pressure equipment > 50 kPa (> 7.3 psi)
Subgrade has been cleared of all obstacles except grass, weeds, leaves, and fine wood debris. Surface is smooth and level so that any shallow depressions and humps do not exceed 450 mm (18 in.) in depth or height. All larger depressions are filled. Alternatively, a smooth working table may be placed.	Low (Class 3)	Moderate (Class 2)	High (Class 1)
Subgrade has been cleared of obstacles larger than small to moderate-sized tree limbs and rocks. Tree trunks and stumps should be removed or covered with a partial working table. Depressions and humps should not exceed 450 mm (18 in.) in depth or height. Larger depressions should be filled.	Moderate (Class 2)	High (Class 1)	Very High (Class 1+)
Minimal site preparation is required. Trees may be felled, delimbed, and left in place. Stumps should be cut to project not more than ± 150 mm (6 in.) above subgrade. Fabric may be draped directly over the tree trunks, stumps, large depressions and humps, holes, stream channels, and large boulders. Items should be removed only if placing the fabric and cover material over them will distort the finished road surface.	High (Class 1)	Very high (Class 1+)	Not recommended

*Recommendations are for 150 to 300 mm (6 to 12 in.) initial lift thickness. For other initial lift thicknesses:
300 to 450 mm (12 to 18 in.): reduce survivability requirement one level;
450 to 600 mm (18 to 24 in.): reduce survivability requirement two levels;
> 600 mm (24 in.): reduce survivability requirement three levels

Note 1: While separation occurs in every geotextile application, this pavement-related specification focuses on subgrade soils being "firm" as indicated by CBR values higher than 3.0 (soaked) or 8.0 (unsoaked).

Source: Modified after Christopher, Holtz, and DiMaggio

Adoption and Revision Schedule

GRI-GT13(a) – ASTM Version

"Test Methods and Properties for Geotextiles Used as Separation Between Subgrade Soil and Aggregate"

Original:	March 10, 2004
Revision 1:	May 6, 2005: Editorial changes
Revision 2:	August 29, 2008: Editorial changes
Revision 3:	December 19, 2012: Changed ASTM D4355 to ASTM D7238 and editorial changes

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Revision 10: April 11, 2011
Revision schedule on pg. 11

GRI Test Method GM13*

Standard Specification for

"Test Methods, Test Properties and Testing Frequency for
High Density Polyethylene (HDPE) Smooth and Textured Geomembranes"

This specification was developed by the Geosynthetic Research Institute (GRI), with the cooperation of the member organizations for general use by the public. It is completely optional in this regard and can be superseded by other existing or new specifications on the subject matter in whole or in part. Neither GRI, the Geosynthetic Institute, nor any of its related institutes, warrant or indemnifies any materials produced according to this specification either at this time or in the future.

1. Scope

1.1 This specification covers high density polyethylene (HDPE) geomembranes with a formulated sheet density of 0.940 g/ml, or higher, in the thickness range of 0.75 mm (30 mils) to 3.0 mm (120 mils). Both smooth and textured geomembrane surfaces are included.

1.2 This specification sets forth a set of minimum, physical, mechanical and chemical properties that must be met, or exceeded by the geomembrane being manufactured. In a few cases a range is specified.

1.3 In the context of quality systems and management, this specification represents manufacturing quality control (MQC).

Note 1: Manufacturing quality control represents those actions taken by a manufacturer to ensure that the product represents the stated objective and properties set forth in this specification.

1.4 This standard specification is intended to ensure good quality and performance of HDPE geomembranes in general applications, but is possibly not adequate for the complete specification in a specific situation. Additional tests, or more restrictive

*This GRI standard is developed by the Geosynthetic Research Institute through consultation and review by the member organizations. This specification will be reviewed at least every 2-years, or on an as-required basis. In this regard it is subject to change at any time. The most recent revision date is the effective version.

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values for test indicated, may be necessary under conditions of a particular application.

Note 2: For information on installation techniques, users of this standard are referred to the geosynthetics literature, which is abundant on the subject.

2. Referenced Documents

2.1 ASTM Standards

D 792 Specific Gravity (Relative Density) and Density of Plastics by Displacement
D 1004 Test Method for Initial Tear Resistance of Plastics Film and Sheeting
D 1238 Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer
D 1505 Test Method for Density of Plastics by the Density-Gradient Technique
D 1603 Test Method for Carbon Black in Olefin Plastics
D 3895 Test Method for Oxidative Induction Time of Polyolefins by Thermal Analysis
D 4218 Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique
D 4833 Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products
D 5199 Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes
D 5397 Procedure to Perform a Single Point Notched Constant Tensile Load – (SP-NCTL) Test: Appendix
D 5596 Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics
D 5721 Practice for Air-Oven Aging of Polyolefin Geomembranes
D 5885 Test method for Oxidative Induction Time of Polyolefin Geosynthetics by High Pressure Differential Scanning Calorimetry
D 5994 Test Method for Measuring the Core Thickness of Textured Geomembranes
D 6370 Standard Test Method for Rubber-Compositional Analysis by Thermogravimetry (TGA)
D 6693 Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes
D 7466 Test Method for Measuring the Asperity Height of Textured Geomembranes

2.2 GRI Standards

GM10 Specification for the Stress Crack Resistance of Geomembrane Sheet
GM 11 Accelerated Weathering of Geomembranes using a Fluorescent UVA-Condensation Exposure Device

2.3 U. S. Environmental Protection Agency Technical Guidance Document "Quality Control Assurance and Quality Control for Waste Containment Facilities," EPA/600/R-93/182, September 1993, 305 pgs.

3. Definitions

Manufacturing Quality Control (MQC) - A planned system of inspections that is used to directly monitor and control the manufacture of a material which is factory originated. MQC is normally performed by the manufacturer of geosynthetic materials and is necessary to ensure minimum (or maximum) specified values in the manufactured product. MQC refers to measures taken by the manufacturer to determine compliance with the requirements for materials and workmanship as stated in certification documents and contract specifications.
ref. EPA/600/R-93/182

Manufacturing Quality Assurance (MQA) - A planned system of activities that provides assurance that the materials were constructed as specified in the certification documents and contract specifications. MQA includes manufacturing facility inspections, verifications, audits and evaluation of the raw materials (resins and additives) and geosynthetic products to assess the quality of the manufactured materials. MQA refers to measures taken by the MQA organization to determine if the manufacturer is in compliance with the product certification and contract specifications for the project.
ref. EPA/600/R-93/182

Formulation, n - The mixture of a unique combination of ingredients identified by type, properties and quantity. For HDPE polyethylene geomembranes, a formulation is defined as the exact percentages and types of resin(s), additives and carbon black.

4. Material Classification and Formulation

4.1 This specification covers high density polyethylene geomembranes with a formulated sheet density of 0.940 g/ml, or higher. Density can be measured by ASTM D1505 or ASTM D792. If the latter, Method B is recommended.

4.2 The polyethylene resin from which the geomembrane is made will generally be in the density range of 0.932 g/ml or higher, and have a melt index value per ASTM D1238 of less than 1.0 g/10 min.

4.3 The resin shall be virgin material with no more than 10% rework. If rework is used, it must be a similar HDPE as the parent material.

4.4 No post consumer resin (PCR) of any type shall be added to the formulation.

5. Physical, Mechanical and Chemical Property Requirements

5.1 The geomembrane shall conform to the test property requirements prescribed in Tables 1 and 2. Table 1 is for smooth HDPE geomembranes and Table 2 is for single and double sided textured HDPE geomembranes. Each of the tables are given in English and SI (metric) units. The conversion from English to SI (metric) is soft.

Note 3: The tensile strength properties in this specification were originally based on ASTM D 638 which uses a laboratory testing temperature of 23°C ± 2°C. Since ASTM Committee D35 on Geosynthetics adopted ASTM D 6693 (in place of D 638), this GRI Specification followed accordingly. The difference is that D 6693 uses a testing temperature of 21°C ± 2°C. The numeric values of strength and elongation were not changed in this specification. If a dispute arises in this regard, the original temperature of 23°C ± 2°C should be utilized for testing purposes.

Note 4: There are several tests often included in other HDPE specifications which are omitted from this standard because they are outdated, irrelevant or generate information that is not necessary to evaluate on a routine MQC basis. The following tests have been purposely omitted:

- Volatile Loss
- Dimensional Stability
- Coeff. of Linear Expansion
- Resistance to Soil Burial
- Low Temperature Impact
- ESCR Test (D 1693)
- Wide Width Tensile
- Water Vapor Transmission
- Water Absorption
- Ozone Resistance
- Modulus of Elasticity
- Hydrostatic Resistance
- Tensile Impact
- Field Seam Strength
- Multi-Axial Burst
- Various Toxicity Tests

Note 5: There are several tests which are included in this standard (that are not customarily required in other HDPE specifications) because they are relevant and important in the context of current manufacturing processes. The following tests have been purposely added:

- Oxidative Induction Time
- Oven Aging
- Ultraviolet Resistance
- Asperity Height of Textured Sheet (see Note 6)
- Trouser Tear (see Note 7)

Note 6: The minimum average value of asperity height does not represent an expected value of interface shear strength. Shear strength associated with geomembranes is both site-specific and product-specific and should be determined by direct shear testing using ASTM D5321/ASTM D6243 as prescribed. This testing should be included in the particular site's CQA conformance testing protocol for the geosynthetic materials involved, or formally waived by the Design Engineer, with concurrence from the Owner prior to the deployment of the geosynthetic materials.

Note 7: There are other tests in this standard, focused on a particular property, which are updated to current standards. The following are in this category:

- Thickness of Textured Sheet
- Puncture Resistance
- Stress Crack Resistance
- Carbon Black Dispersion (In the viewing and subsequent quantitative interpretation of ASTM D 5596 only near spherical agglomerates shall be included in the assessment).

Note 8: There is a GRI test currently included in this standard. Since this topic is not covered in ASTM standards, this is necessary. It is the following:

- UV Fluorescent Light Exposure

5.2 The values listed in the tables of this specification are to be interpreted according to the designated test method. In this respect they are neither minimum average roll values (MARV) nor maximum average roll values (MaxARV).

5.3 The properties of the HDPE geomembrane shall be tested at the minimum frequencies shown in Tables 1 and 2. If the specific manufacturer's quality control guide is more stringent and is certified accordingly, it must be followed in like manner.

Note 9: This specification is focused on manufacturing quality control (MQC). Conformance testing and manufacturing quality assurance (MQA) testing are at the discretion of the purchaser and/or quality assurance engineer, respectively.

6. Workmanship and Appearance

6.1 Smooth geomembrane shall have good appearance qualities. It shall be free from such defects that would affect the specified properties of the geomembrane.

6.2 Textured geomembrane shall generally have uniform texturing appearance. It shall be free from agglomerated texturing material and such defects that would affect the specified properties of the geomembrane.

6.3 General manufacturing procedures shall be performed in accordance with the manufacturer's internal quality control guide and/or documents.

7. MQC Sampling

7.1 Sampling shall be in accordance with the specific test methods listed in Tables 1 and 2. If no sampling protocol is stipulated in the particular test method, then test specimens shall be taken evenly spaced across the entire roll width.

7.2 The number of tests shall be in accordance with the appropriate test methods listed in Tables 1 and 2.

7.3 The average of the test results should be calculated per the particular standard cited and compared to the minimum value listed in these tables, hence the values listed are the minimum average values and are designated as "min. ave."

8. MQC Retest and Rejection

8.1 If the results of any test do not conform to the requirements of this specification, retesting to determine conformance or rejection should be done in accordance with the manufacturing protocol as set forth in the manufacturer's quality manual.

9. Packaging and Marketing

9.1 The geomembrane shall be rolled onto a substantial core or core segments and held firm by dedicated straps/slings, or other suitable means. The rolls must be adequate for safe transportation to the point of delivery, unless otherwise specified in the contract or order.

10. Certification

10.1 Upon request of the purchaser in the contract or order, a manufacturer's certification that the material was manufactured and tested in accordance with this specification, together with a report of the test results, shall be furnished at the time of shipment.

ENGLISH UNITS

Table 1(a) – High Density Polyethylene (HDPE) Geomembrane -Smooth

Properties	Test Method	Test Value							Testing Frequency (minimum)
		30 mils	40 mils	50 mils	60 mils	80 mils	100 mils	120 mils	
Thickness (min. ave.)	D5199	nom.	Nom.	Nom.	Nom.	Nom.	Nom.	Nom.	Per roll
• lowest individual of 10 values		-10%	-10%	-10%	-10%	-10%	-10%	-10%	
Density mg/l (min.)	D 1505/D 792	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	200,000 lb
Tensile Properties *(1)* (min. ave.)	D 6693								20,000 lb
• yield strength	Type IV	63 lb/in.	84 lb/in.	105 lb/in.	126 lb/in.	168 lb/in.	210 lb/in.	252 lb/in.	
• break strength		114 lb/in.	152 lb/in.	190 lb/in.	228 lb/in.	304 lb/in.	380 lb/in.	456 lb/in.	
• yield elongation		12%	12%	12%	12%	12%	12%	12%	
• break elongation		700%	700%	700%	700%	700%	700%	700%	
Tear Resistance (min. ave.)	D 1004	21 lb	28 lb	35 lb	42 lb	56 lb	70 lb	84 lb	45,000 lb
Puncture Resistance (min. ave.)	D 4833	54 lb	72 lb	90 lb	108 lb	144 lb	180 lb	216 lb	45,000 lb
Stress Crack Resistance *(2)*	D5397 (App.)	300 hr.	300 hr.	300 hr.	300 hr.	300 hr.	300 hr.	300 hr.	per GRI-GM10
Carbon Black Content (range)	D 4218 *(3)*	2.0-3.0%	2.0-3.0%	2.0-3.0%	2.0-3.0%	2.0-3.0%	2.0-3.0%	2.0-3.0%	20,000 lb
Carbon Black Dispersion	D 5596	note *(4)*	note *(4)*	note *(4)*	note *(4)*	note *(4)*	note *(4)*	note *(4)*	45,000 lb
Oxidative Induction Time (OIT) (min. ave.) *(5)*									200,000 lb
(a) Standard OIT	D 3895	100 min.	100 min.	100 min.	100 min.	100 min.	100 min.	100 min.	
— or —									
(b) High Pressure OIT	D 5885	400 min.	400 min.	400 min.	400 min.	400 min.	400 min.	400 min.	
Oven Aging at 85°C *(5), (6)*	D 5721								
(a) Standard OIT (min. ave.) - % retained after 90 days	D 3895	55%	55%	55%	55%	55%	55%	55%	per each formulation
— or —									
(b) High Pressure OIT (min. ave.) - % retained after 90 days	D 5885	80%	80%	80%	80%	80%	80%	80%	
UV Resistance *(7)*	GM 11								
(a) Standard OIT (min. ave.)	D 3895	N.R. *(8)*	N.R. *(8)*	N.R. *(8)*	N.R. *(8)*	N.R. *(8)*	N.R. *(8)*	N.R. *(8)*	per each formulation
— or —									
(b) High Pressure OIT (min. ave.) - % retained after 1600 hrs *(9)*	D 5885	50%	50%	50%	50%	50%	50%	50%	

(1) Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction.
Yield elongation is calculated using a gage length of 1.3 inches
Break elongation is calculated using a gage length of 2.0 in.
(2) The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer's mean value via MQC testing.
(3) Other methods such as D 1603 (tube furnace) or D 6370 (TGA) are acceptable if an appropriate correlation to D 4218 (muffle furnace) can be established.
(4) Carbon black dispersion (only near spherical agglomerates) for 10 different views:
9 in Categories 1 or 2 and 1 in Category 3
(5) The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
(6) It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.
(7) The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.
(8) Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.
(9) UV resistance is based on percent retained value regardless of the original HP-OIT value.

SI (METRIC) UNITS

Table 1(b) – High Density Polyethylene (HPDE) Geomembrane - Smooth

Properties	Test Method	Test Value							Testing Frequency (minimum)
		0.75 mm	1.00 mm	1.25 mm	1.50 mm	2.00 mm	2.50 mm	3.00 mm	
Thickness - mils (min. ave.) • lowest individual of 10 values	D5199	nom. (mil) -10%	nom. (mil) -10%	nom. (mil) -10%	nom. (mil) -10%	nom. (mil) -10%	nom. (mil) -10%	nom. (mil) -10%	per roll
Density (min.)	D 1505/D 792	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	90,000 kg
Tensile Properties *(1)* (min. ave.) • yield strength • break strength • yield elongation • break elongation	D 6693 Type IV	 11 kN/m 20 kN/m 12% 700%	 15 kN/m 27 kN/m 12% 700%	 18 kN/m 33 kN/m 12% 700%	 22 kN/m 40 kN/m 12% 700%	 29 kN/m 53 kN/m 12% 700%	 37 kN/m 67 kN/m 12% 700%	 44 kN/m 80 kN/m 12% 700%	9,000 kg
Tear Resistance (min. ave.)	D 1004	93 N	125 N	156 N	187 N	249 N	311 N	374 N	20,000 kg
Puncture Resistance (min. ave.)	D 4833	240 N	320 N	400 N	480 N	640 N	800 N	960 N	20,000 kg
Stress Crack Resistance *(2)*	D 5397 (App.)	300 hr.	300 hr.	300 hr.	300 hr.	300 hr.	300 hr.	300 hr.	per GRI GM-10
Carbon Black Content - %	D 4218 *(3)*	2.0-3.0%	2.0-3.0%	2.0-3.0%	2.0-3.0%	2.0-3.0%	2.0-3.0%	2.0-3.0%	9,000 kg
Carbon Black Dispersion	D 5596	note *(4)*	note *(4)*	note *(4)*	note *(4)*	note *(4)*	note *(4)*	note *(4)*	20,000 kg
Oxidative Induction Time (OIT) (min. ave.) *(5)* (a) Standard OIT — or — (b) High Pressure OIT	 D 3895 D 5885	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	90,000 kg
Oven Aging at 85°C *(5), (6)* (a) Standard OIT (min. ave.) - % retained after 90 days — or — (b) High Pressure OIT (min. ave.) - % retained after 90 days	D 5721 D 3895 D 5885	 55% 80%	 55% 80%	 55% 80%	 55% 80%	 55% 80%	 55% 80%	 55% 80%	per each formulation
UV Resistance *(7)* (a) Standard OIT (min. ave.) — or — (b) High Pressure OIT (min. ave.) - % retained after 1600 hrs *(9)*	 D 3895 D 5885	 N. R. *(8)* 50%	 N.R. *(8)* 50%	 N.R. *(8)* 50%	 N.R. *(8)* 50%	 N.R. *(8)* 50%	 N.R. *(8)* 50%	 N.R. *(8)* 50%	per each formulation

(1) Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction
Yield elongation is calculated using a gage length of 33 mm
Break elongation is calculated using a gage length of 50 mm

(2) The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer's mean value via MQC testing.

(3) Other methods such as D 1603 (tube furnace) or D 6370 (TGA) are acceptable if an appropriate correlation to D 4218 (muffle furnace) can be established.

(4) Carbon black dispersion (only near spherical agglomerates) for 10 different views:
9 in Categories 1 or 2 and 1 in Category 3

(5) The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.

(6) It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.

(7) The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.

(8) Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.

(9) UV resistance is based on percent retained value regardless of the original HP-OIT value.

ENGLISH UNITS

Table 2(a) – High Density Polyethylene (HDPE) Geomembrane - Textured

Properties	Test Method	Test Value							Testing Frequency (minimum)
		30 mils	40 mils	50 mils	60 mils	80 mils	100 mils	120 mils	
Thickness mils (min. ave.) • lowest individual for 8 out of 10 values • lowest individual for any of the 10 values	D 5994	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	per roll
Asperity Height mils (min. ave.) *(1)*	D 7466	10 mil	10 mil	10 mil	10 mil	10 mil	10 mil	10 mil	every 2nd roll *(2)*
Density (min. ave.)	D 1505/D 792	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	200,000 lb
Tensile Properties (min. ave.) *(3)* • yield strength • break strength • yield elongation • break elongation	D 6693 Type IV	 63 lb/in. 45 lb/in. 12% 100%	 84 lb/in. 60 lb/in. 12% 100%	 105 lb/in. 75 lb/in. 12% 100%	 126 lb/in. 90 lb/in. 12% 100%	 168 lb/in. 120 lb/in. 12% 100%	 210 lb/in. 150 lb/in. 12% 100%	 252 lb/in. 180 lb/in. 12% 100%	20,000 lb
Tear Resistance (min. ave.)	D 1004	21 lb	28 lb	35 lb	42 lb	56 lb	70 lb	84 lb	45,000 lb
Puncture Resistance (min. ave.)	D 4833	45 lb	60 lb	75 lb	90 lb	120 lb	150 lb	180 lb	45,000 lb
Stress Crack Resistance *(4)*	D 5397 (App.)	300 hr.	300 hr.	300 hr.	300 hr.	300 hr.	300 hr.	300 hr.	per GRI GM10
Carbon Black Content (range)	D 4218 *(5)*	2.0-3.0 %	2.0-3.0 %	2.0-3.0 %	2.0-3.0 %	2.0-3.0 %	2.0-3.0 %	2.0-3.0 %	20,000 lb
Carbon Black Dispersion	D 5596	note *(6)*	note *(6)*	note *(6)*	note *(6)*	note *(6)*	note *(6)*	note *(6)*	45,000 lb
idative Induction Time (OIT) (min. ave.) *(7)* Standard OIT — or — (b) High Pressure OIT	 D 3895 D 5885	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	200,000 lb
Oven Aging at 85°C *(7), (8)* (a) Standard OIT (min. ave.) - % retained after 90 days — or — (b) High Pressure OIT (min. ave.) - % retained after 90 days	D 5721 D 3895 D 5885	 55% 80%	 55% 80%	 55% 80%	 55% 80%	 55% 80%	 55% 80%	 55% 80%	per each formulation
UV Resistance *(9)* (a) Standard OIT (min. ave.) — or — (b) High Pressure OIT (min. ave.) - % retained after 1600 hrs *(11)*	GM11 D 3895 D 5885	 N.R. *(10)* 50%	 N.R. *(10)* 50%	 N.R. *(10)* 50%	 N.R. *(10)* 50%	 N.R. *(10)* 50%	 N.R. *(10)* 50%	 N.R. *(10)* 50%	per each formulation

(1) Of 10 readings; 8 out of 10 must be ≥ 7 mils, and lowest individual reading must be ≥ 5 mils; also see Note 6.
(2) Alternate the measurement side for double sided textured sheet
(3) Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction.
Yield elongation is calculated using a gage length of 1.3 inches
Break elongation is calculated using a gage length of 2.0 inches
(4) P-NCTL test is not appropriate for testing geomembranes with textured or irregular rough surfaces. Test should be conducted on smooth edges of textured rolls or on smooth sheets made from the same formulation as being used for the textured sheet materials.
The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer's mean value via MQC testing.
(5) Other methods such as D 1603 (tube furnace) or D 6370 (TGA) are acceptable if an appropriate correlation to D 4218 (muffle furnace) can be established.
(6) Carbon black dispersion (only near spherical agglomerates) for 10 different views:
9 in Categories 1 or 2 and 1 in Category 3
(7) The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
(8) It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.
(9) The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.
(10) Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.
(11) UV resistance is based on percent retained value regardless of the original HP-OIT value.

SI (METRIC UNITS)

Table 2(b) – High Density Polyethylene (HDPE) Geomembrane - Textured

Properties	Test Method	Test Value							Testing Frequency (minimum)
		0.75 mm	1.00 mm	1.25 mm	1.50 mm	2.00 mm	2.50 mm	3.00 mm	
Thickness mils (min. ave.) • lowest individual for 8 out of 10 values • lowest individual for any of the 10 values	D 5994	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	nom. (-5%) -10% -15%	per roll
Asperity Height mils (min. ave.) *(1)*	D 7466	0.25 mm	0.25 mm	0.25 mm	0.25 mm	0.25 mm	0.25 mm	0.25 mm	every 2nd roll *(2)*
Density (min. ave.)	D 1505/D 792	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	0.940 g/cc	90,000 kg
Tensile Properties (min. ave.) *(3)* • yield strength • break strength • yield elongation • break elongation	D 6693 Type IV	 11 kN/m 8 kN/m 12% 100%	 15 kN/m 10 kN/m 12% 100%	 18 kN/m 13 kN/m 12% 100%	 22 kN/m 16 kN/m 12% 100%	 29 kN/m 21 kN/m 12% 100%	 37 kN/m 26 kN/m 12% 100%	 44 kN/m 32 kN/m 12% 100%	9,000 kg
Tear Resistance (min. ave.)	D 1004	93 N	125 N	156 N	187 N	249 N	311 N	374 N	20,000 kg
Puncture Resistance (min. ave.)	D 4833	200N	267 N	333 N	400 N	534 N	667 N	800 N	20,000 kg
Stress Crack Resistance *(4)*	D 5397 (App.)	300 hr.	300 hr.	300 hr.	300 hr.	300 hr.	300 hr.	300 hr.	per GRI GM10
Carbon Black Content (range)	D 4218 *(5)*	2.0-3.0 %	2.0-3.0 %	2.0-3.0 %	2.0-3.0 %	2.0-3.0 %	2.0-3.0 %	2.0-3.0 %	9,000 kg
Carbon Black Dispersion	D 5596	note *(6)*	note *(6)*	note *(6)*	note *(6)*	note *(6)*	note *(6)*	note *(6)*	20,000 kg
Oxidative Induction Time (OIT) (min. ave.) *(7)* (a) Standard OIT — or — (b) High Pressure OIT	 D 3895 D 5885	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	 100 min. 400 min.	90,000 kg
Oven Aging at 85°C *(7), (8)* (a) Standard OIT (min. ave.) - % retained after 90 days — or — (b) High Pressure OIT (min. ave.) - % retained after 90 days	D 5721 D 3895 D 5885	 55% 80%	 55% 80%	 55% 80%	 55% 80%	 55% 80%	 55% 80%	 55% 80%	per each formulation
UV Resistance *(9)* (a) Standard OIT (min. ave.) — or — (b) High Pressure OIT (min. ave.) - % retained after 1600 hrs *(11)*	GM11 D 3895 D 5885	 N.R. *(10)* 50%	 N.R. *(10)* 50%	 N.R. *(10)* 50%	 N.R. *(10)* 50%	 N.R. *(10)* 50%	 N.R. *(10)* 50%	 N.R. *(10)* 50%	per each formulation

(1) Of 10 readings; 8 out of 10 must be ≥ 0.18 mm, and lowest individual reading must be ≥ 0.13 mm; also see Note 6.
(2) Alternate the measurement side for double sided textured sheet
(3) Machine direction (MD) and cross machine direction (XMD) average values should be on the basis of 5 test specimens each direction.
Yield elongation is calculated using a gage length of 33 mm
Break elongation is calculated using a gage length of 50 mm
(4) The SP-NCTL test is not appropriate for testing geomembranes with textured or irregular rough surfaces. Test should be conducted on smooth edges of textured rolls or on smooth sheets made from the same formulation as being used for the textured sheet materials.
The yield stress used to calculate the applied load for the SP-NCTL test should be the manufacturer's mean value via MQC testing.
(5) Other methods such as D 1603 (tube furnace) or D 6370 (TGA) are acceptable if an appropriate correlation to D 4218 (muffle furnace) can be established.
(6) Carbon black dispersion (only near spherical agglomerates) for 10 different views:
9 in Categories 1 or 2 and 1 in Category 3
(7) The manufacturer has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
(8) It is also recommended to evaluate samples at 30 and 60 days to compare with the 90 day response.
(9) The condition of the test should be 20 hr. UV cycle at 75°C followed by 4 hr. condensation at 60°C.
(10) Not recommended since the high temperature of the Std-OIT test produces an unrealistic result for some of the antioxidants in the UV exposed samples.
(11) UV resistance is based on percent retained value regardless of the original HP-OIT value.

Adoption and Revision Schedule
for
HDPE Specification per GRI-GM13

"Test Methods, Test Properties, Testing Frequency for
High Density Polyethylene (HDPE) Smooth and Textured Geomembranes"

Adopted:	June 17, 1997
Revision 1:	November 20, 1998; changed CB dispersion from allowing 2 views to be in Category 3 to requiring all 10 views to be in Category 1 or 2. Also reduced UV percent retained from 60% to 50%.
Revision 2:	April 29, 1999: added to Note 5 after the listing of Carbon Black Dispersion the following: "(In the viewing and subsequent quantitative interpretation of ASTM D5596 only near spherical agglomerates shall be included in the assessment)" and to Note (4) in the property tables.
Revision 3:	June 28, 2000: added a new Section 5.2 that the numeric table values are neither MARV or MaxARV. They are to be interpreted per the the designated test method.
Revision 4:	December 13, 2000: added one Category 3 is allowed for carbon black dispersion. Also, unified terminology to "strength" and "elongation".
Revision 5:	May 15, 2003: Increased minimum acceptable stress crack resistance time from 200 hrs to 300 hrs.
Revision 6:	June 23, 2003: Adopted ASTM D 6693, in place of ASTM D 638, for tensile strength testing. Also, added Note 2.
Revision 7:	February 20, 2006: Added Note 6 on Asperity Height clarification with respect to shear strength.
Revision 8:	Removed recommended warranty from specification.
Revision 9:	June 1, 2009: Replaced GRI-GM12 test for asperity height of textured geomembranes with ASTM D 7466.
Revision 10	April 11, 2011: Added alternative carbon black content test methods

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Original: February 28, 2002
Revision 8: February 12, 2015
Revision schedule is on pg. 13

GRI Test Method GM19*

Standard Specification for

Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes

This specification was developed by the Geosynthetic Research Institute (GRI), with the cooperation of the member organizations for general use by the public. It is completely optional in this regard and can be superseded by other existing or new specifications on the subject matter in whole or in part. Neither GRI, the Geosynthetic Institute, nor any of its related institutes, warrant or indemnifies any materials produced according to this specification either at this time or in the future.

1. Scope

1.1 This specification addresses the required seam strength and related properties of thermally bonded polyolefin geomembranes; in particular, high density polyethylene (HDPE), linear low density polyethylene both nonreinforced (LLDPE) and scrim reinforced (LLDPE-R) and flexible polypropylene both nonreinforced (fPP) and scrim reinforced (fPP-R).

1.2 Numeric values of seam strength and related properties are specified in both shear and peel modes.

Note 1: This specification does not address the test method details or specific testing procedures. It refers to the relevant ASTM test methods where applicable.

1.3 The thermal bonding methods focused upon are hot wedge (single and dual track) and extrusion fillet.

*This GRI standard is developed by the Geosynthetic Research Institute through consultation and review by the member organizations. This specification will be reviewed at least every 5-years, or on an as-required basis. In this regard it is subject to change at any time. The most recent revision date is the effective version.

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Note 2: Other acceptable, but less frequently used, methods of seaming are hot air and ultrasonic methods. They are inferred as being a subcategory of hot wedge seaming.

1.4 This specification does not suggest a specific distance between destructive seam samples to be taken in the field, i.e., the sampling interval. A separate GRI Standard Practice is focused on this issue, see GRI-GM29.

1.5 This specification is only applicable to laboratory testing.

1.6 This specification does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 ASTM Standards

D6392 Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods

D7747 Standard Test Method for Determining Integrity of Seams Produced Using Thermo-Fusion Methods for Reinforced Geomembranes by the Strip Tensile Method

2.2 EPA Standards

EPA 600/2.88/052 (NTIS PB-89-129670)
Lining of Waste Containment and Other Containment Facilities

2.3 GRI Standards

GM13 Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes

GM14 Selecting Variable Intervals for Taking Geomembrane Destructive Seam Samples Using the Method of Attributes

GM17 Test Properties and Testing Frequency for Linear Low Density Polyethylene (LLDPE) Smooth and Textured Geomembranes

GM18 Test Properties and Testing Frequency for Flexible Polypropylene (fPP and fPP-R) Geomembranes

GM20 Selecting Variable Intervals for Taking Geomembrane Destructive Seam Samples Using Control Charts

GM25 Test Property and Testing Frequency for Scrim Reinforced Linear Low Density Polyethylene Geomembranes

GM29 Practice for Field Integrity Evaluation of Geomembrane Seams (and Sheet) Using Destructive and Nondestructive Testing

3. Definition

3.1 Geomembrane, n – An essentially impermeable geosynthetic composed of one or more synthetic sheets used for the purpose of liquid, gas or solid containment.

3.2 Hot Wedge Seaming – A thermal technique which melts the two opposing geomembrane surfaces to be seamed by running a hot metal wedge or knife between them. Pressure is applied to the top or bottom geomembrane, or both, to form a continuous bond. Seams of this type can be made with dual bond tracks separated by a nonbonded gap. These seams are referred to as dual hot wedge seams or double-track seams.

3.3 Hot Air Seaming – This seaming technique introduces high-temperature air or gas between two geomembrane surfaces to facilitate localized surface melting. Pressure is applied to the top or bottom geomembrane, forcing together the two surfaces to form a continuous bond.

3.4 Ultrasonic Seaming - A thermal technique which melts the two opposing geomembrane surfaces to be seamed by running a ultrasonically vibrated metal wedge or knife between them. Pressure is applied to the top or bottom geomembrane, or both, to form a continuous bond. Some seams of this type are made with dual bond tracks separated by a nonbonded gap. These seams are referred to as dual-track seams or double-track seams.

3.5 Extrusion Fillet Seaming – This seaming technique involves extruding molten resin at the edge of an overlapped geomembrane on another to form a continuous bond. A depreciated method called "extrusion flat" seaming extrudes the molten resin between the two overlapped sheets. In all types of extrusion seaming the surfaces upon which the molten resin is applied must be suitably prepared, usually by a slight grinding or buffing.

4. Significance and Use

4.1 The various methods of field fabrication of seams in polyolefin geomembranes are covered in existing ASTM standards mentioned in the referenced document section. What is not covered in those documents is the numeric values of strength and related properties that the completed seam must meet, or exceed. This specification provides this information insofar as minimum, or maximum, property values are concerned when the field fabricated seams are sampled and laboratory tested in shear and peel. A separate GRI standard, GRI-GM29 (DRAFT), provides guidance as to the spacing that destructive samples should be taken in typical field installation projects.

5. Sample and Specimen Preparation

5.1 The spacing for taking field seam samples for destructive testing is provided in GRI-GM29 (DRAFT), a standard-of-practice. The process describes a progression from the most restrictive interval of 1 per 500 feet (1 per 150 m) to the complete use and reliance of the electrical leak location survey (ELLS) method. Intermediate between these extremes are variations depending upon the installers experience and performance.

5.2 The size of field seam samples is to be according to the referenced test method, e.g., ASTM D6392 or site-specific CQA plan.

5.3 The individual test specimens taken from the field seam samples are to be tested according to the referenced test method, i.e., ASTM D6392 for HDPE, LLDPE and fPP, and ASTM D751 (modified to a 150 mm + seam width gage length) for fPP-R. The specimens are to be conditioned prior to testing according to these same test methods and evaluated accordingly.

6. Assessment of Seam Test Results

6.1 HDPE seams – For HDPE seams (both smooth and textured), the strength of four out of five 1.0 inch (25 mm) wide strip specimens in shear should meet or exceed the values given in Tables 1(a) and 1(b). The fifth must meet or exceed 80% of the given values. In addition, five out five specimens should meet the shear percent elongation, calculated as follows, and exceed the values given in Tables 1(a) and 1(b):

$$E = \frac{L}{L_o}(100) \qquad (1)$$

where

E = elongation (%)
L = extension at end of test (in. or mm)
L_o = original average length (usually 1.0 in. or 25 mm)

Note 3: The assumed gage length is considered to be the unseamed sheet material on either side of the welded area. It generally will be 1.0 in. (25 mm) from the edge of the seam to the grip face.

For HDPE seams (both smooth and textured), the strength of four out of five 1.0 in. (25 mm) wide strip specimens tested in peel should meet or exceed the values given in Tables 1(a) and 1(b). The fifth must meet or exceed 80% of the given values.

In addition, the peel separation (or incursion) should not exceed the values given in Tables 1(a) and 1(b) for all five out of five specimens. The value shall be based on

the proportion of area of separated bond to the area of the original bonding as follows:

$$S = \frac{A}{A_o}(100) \qquad (2)$$

where

S = separation (%)
A = average area of separation, or incursion (in^2 or mm^2)
A_0 = original bonding area (in^2 or mm^2)

Note 4: The area of peel separation can occur in a number of nonuniform patterns across the seam width. The estimated dimensions of this separated area is visual and must be done with care and concern. The area must not include squeeze-out which is part of the welding process.

Regarding the locus-of-break patterns of the different seaming methods in shear and peel, the following are unacceptable break codes per their description in ASTM D6392 (in this regard, SIP is an acceptable break code);

Hot Wedge: AD and AD-Brk > 25%
Extrusion Fillet: AD1, AD2
Exception: AD-WLD (unless strength is achieved)

Note 5: Separation-in-plane (SIP) is a locus-of-break where the failure surface propagates within one of the seamed sheets during destructive testing (usually in the peel mode). It is not merely a surface skin effect producing a few ductile fibrils (sometimes called ductile drawdown). SIP is acceptable if the required strength, shear elongation and peel separation criteria are met.

In this regard, five out of five specimens shall result in acceptable break patterns.

6.2 LLDPE seams – For LLDPE seams (smooth, textured and scrim reinforced), the strength of four out of five 1.0 in. (25 mm) wide strip specimens in shear should meet or exceed the values given in Tables 2(a) through 2(d). The fifth must meet or exceed 80% of the given values. Note that the unreinforced specimens are 1.0 in. (25 mm) wide strips and the scrim reinforced specimens are 4.0 in. (100 mm) wide grab tests. In addition, the shear percent elongation, calculated as follows, should exceed the values given in Tables 2(a) through 2(d). All five out of five should meet the shear elongation requirement.

$$E = \frac{L}{L_0}(100) \qquad (1)$$

where
E = elongation (%)
L = extension at end of test (in. or mm)
L_o = original average length (usually 1.0 in. or 25 mm)

Note 3 (Repeated): The assumed gage length is considered to be the unseamed sheet material on either side of the welded area. It generally will be 1.0 in. (25 mm) from the edge of the seam to the grip face.

Shear elongation is not relevant to scrim reinforced geomembranes and as such is listed as "not applicable" in Tables 2 (c) and (d).

For LLDPE seams (smooth, textured and scrim reinforced), the strength of four out of five 1.0 in. (25 mm) wide strip specimens tested in peel should meet or exceed the values given in Tables 2(a) through 2(d). The fifth must meet or exceed 80% of the given values.

In addition, the peel separation (or incursion) should not exceed the values given in Tables 2(a) through 2(d). All five out of five specimens shall meet the peel separation value. The value shall be based on the proportion of area of separated bond to the area of the original bonding as follows:

$$S = \frac{A}{A_o}(100) \qquad (2)$$

where

S = separation (%)
A = average depth of separation, or incursion ($in.^2$ or mm^2)
A_0 = original bonding distance ($in.^2$ or mm^2)

Note 4 (Repeated): The area of peel separation can occur in a number of nonuniform patterns across the seam width. The estimated dimensions of this separated area is visual and must be done with care and concern. The area must not include squeeze-out which is part of the welding process.

Regarding the locus-of-break patterns of the different seaming methods in shear and peel, the following are unacceptable break codes per their description in ASTM D6392 (in this regard, SIP is an acceptable break code);

Hot Wedge: AD and AD-Brk > 25%
Extrusion Fillet: AD1, AD2
Exception: AD-WLD (unless strength is achieved)

Note 5 (Repeated): Separation-in-plane (SIP) is a locus-of-break where the failure surface propagates within one of the seamed sheets during destructive testing (usually in the peel mode). It is not merely a surface skin effect producing a few ductile fibrils (sometimes called ductile drawdown). SIP is acceptable if the required strength, shear elongation and peel separation criteria are met.

In this regard, five out of five specimens shall result in acceptable break patterns.

6.3 fPP Seams – For fPP seams (both nonreinforced and scrim reinforced), the strength of four out of five specimens in shear should meet or exceed the values given in Tables 3(a) and 3(b). The fifth must meet or exceed 80% of the given values. Note that the unreinforced specimens are 1.0 in. (25 mm) wide strips and the scrim reinforced specimens are 4.0 in. (100 mm) wide grab tests. In addition, the shear percent elongation on the unreinforced specimens, calculated as follows, should exceed the values given in Tables 3(a) and 3(b). All five out of five specimens should meet the shear elongation requirement.

$$E = \frac{L}{L_o}(100) \qquad (1)$$

where
E = elongation (%)
L = extension at end of test (in. or mm)
L_o = original gauge length (usually 1.0 in. or 25 mm)

Note 3 (Repeated): The assumed gage length is considered to be the unseamed sheet material on either side of the welded area. It generally will be 1.0 in. (25 mm) from the edge of the seam to the grip face.

Shear elongation is not relevant to scrim reinforced geomembranes and as such is listed as "not applicable" in Tables 3(a) and 3(b).

For fPP seams (both nonreinforced and scrim reinforced), the strength of four out of five specimens in peel should meet or exceed the values given in Tables 3(a) and 3(b). The fifth must meet or exceed 80% of the given values. Note that the unreinforced specimens are 1.0 in. (25 mm) wide strips and the scrim reinforced specimens are grab tests. In addition, the peel percent separation (or incursion) should not exceed the values given in Tables 3(a) and 3(b). All five out of five specimens should meet the peel separation value. The values should be based on the proportion of area of separated bond to the area of the original bonding as follows.

$$S = \frac{A}{A_o}(100) \qquad (2)$$

where

S = separation in (%)
A = average depth of separation, or incursion (in.^{2} or mm^2)
A_o = original bonding distance (in.^{2} or mm^2)

Note 4 (Repeated): The area of peel separation can occur in a number of nonuniform patterns across the seam width. The estimated dimensions of this separated area is visual and must be done with care and concern. The area must not include squeeze-out which is part of the welding process.

Regarding the locus-of-break patterns of the different seaming methods in shear and peel, the following are unacceptable break codes per their description in ASTM D6392 (in this regard, SIP is an acceptable break code);

Hot Wedge: AD and AD-Brk > 25%
Extrusion Fillet: AD1, AD2
Exception: AD-WLD (unless strength is achieved)

Note 5 (Repeated): Separation-in-plane (SIP) is a locus-of-break where the failure surface propagates within one of the seamed sheets during destructive testing (usually in the peel mode). It is not merely a surface skin effect producing a few ductile fibrils (sometimes called ductile drawdown). SIP is acceptable if the required strength, shear elongation and peel separation criteria are met.

In this regard, five out of five specimens shall result in acceptable break patterns.

7. Retest and Rejection

7.1 If the results of the testing of a sample do not conform to the requirements of this specification, retesting to determine conformance or rejection should be done in accordance with the construction quality control or construction quality assurance plan for the particular site under construction.

8. Certification

8.1 Upon request of the construction quality assurance officer or certification engineer, an installer's certification that the geomembrane was installed and tested in accordance with this specification, together with a report of the test results, shall be furnished at the completion of the installation.

Table 1(a) – Seam Strength and Related Properties of Thermally Bonded **Smooth and Textured** High Density Polyethylene (HDPE) Geomembranes **(English Units)**

Geomembrane Nominal Thickness	30 mils	40 mils	50 mils	60 mils	80 mils	100 mils	120 mils
Hot Wedge Seams[1]							
shear strength[2], lb/in.	57	80	100	120	160	200	240
shear elongation at break[3], %	50	50	50	50	50	50	50
peel strength[2], lb/in.	45	60	76	91	121	151	181
peel separation, %	25	25	25	25	25	25	25
Extrusion Fillet Seams							
shear strength[2], lb/in.	57	80	100	120	160	200	240
shear elongation at break[3], %	50	50	50	50	50	50	50
peel strength[2], lb/in.	39	52	65	78	104	130	156
peel separation, %	25	25	25	25	25	25	25

Notes for Tables 1(a) and 1(b):
1. Also for hot air and ultrasonic seaming methods
2. Value listed for shear and peel strengths are for 4 out of 5 test specimens; the 5th specimen can be as low as 80% of the listed values
3. Elongation measurements should be omitted for field testing

Table 1(b) – Seam Strength and Related Properties of Thermally Bonded **Smooth and Textured** High Density Polyethylene (HDPE) Geomembranes **(S.I. Units)**

Geomembrane Nominal Thickness	0.75 mm	1.0 mm	1.25 mm	1.5 mm	2.0 mm	2.5 mm	3.0 mm
Hot Wedge Seams[1]							
shear strength[2], N/25 mm.	250	350	438	525	701	876	1050
shear elongation at break[3], %	50	50	50	50	50	50	50
peel strength[2], N/25 mm	197	263	333	398	530	661	793
peel separation, %	25	25	25	25	25	25	25
Extrusion Fillet Seams							
shear strength[2], N/25 mm	250	350	438	525	701	876	1050
shear elongation at break[3], %	50	50	50	50	50	50	50
peel strength[2], N/25 mm	170	225	285	340	455	570	680
peel separation, %	25	25	25	25	25	25	25

Table 2(a) – Seam Strength and Related Properties of Thermally Bonded **Smooth and Textured** Linear Low Density Polyethylene (LLDPE) Geomembranes (English Units)

Geomembrane Nominal Thickness	20 mils	30 mils	40 mils	50 mils	60 mils	80 mils	100 mils	120 mils
Hot Wedge Seams[1]								
shear strength[2], lb/in.	30	45	60	75	90	120	150	180
shear elongation[3], %	50	50	50	50	50	50	50	50
peel strength[2], lb/in.	25	38	50	63	75	100	125	150
peel separation, %	25	25	25	25	25	25	25	25
Extrusion Fillet Seams								
shear strength[2], lb/in.	30	45	60	75	90	120	150	180
shear elongation[3], %	50	50	50	50	50	50	50	50
peel strength[2], lb/in.	22	34	44	57	66	88	114	136
peel separation, %	25	25	25	25	25	25	25	25

Notes for Tables 2(a) and 2(b):
1. Also for hot air and ultrasonic seaming methods
2. Values listed for shear and peel strengths are for 4 out of 5 test specimens; the 5th specimen can be as low as 80% of the listed values
3. Elongation measurements should be omitted for field testing

Table 2(b) – Seam Strength and Related Properties of Thermally Bonded **Smooth and Textured** Linear Low Density Polyethylene (LLDPE) Geomembranes (S.I. Units)

Geomembrane Nominal Thickness	0.50 mm	0.75 mm	1.0 mm	1.25 mm	1.5 mm	2.0 mm	2.5 mm	3.0 mm
Hot Wedge Seams[1]								
shear strength[2], N/25 mm	131	197	263	328	394	525	657	788
shear elongation[3], %	50	50	50	50	50	50	50	50
peel strength[2], N/25 mm	109	166	219	276	328	438	547	657
peel separation, %	25	25	25	25	25	25	25	25
Extrusion Fillet Seams								
shear strength[2], N/25 mm	131	197	263	328	394	525	657	788
shear elongation[3], %	50	50	50	50	50	50	50	50
peel strength[2], N/25 mm	95	150	190	250	290	385	500	595
peel separation, %	25	25	25	25	25	25	25	25

Table 2(c) – Seam Strength and Related Properties of Thermally Bonded **Scrim Reinforced** Linear Low Density Polyethylene (LLDPE-R) Geomembranes (English Units)

Geomembrane Nominal Thickness	36 mil[4]	45 mil[4]
Hot Wedge Seams[1]		
shear strength[2], lb	200	200
shear elongation[3], %	n/a	n/a
peel strength[2], lb	20	20
peel separation, %	n/a	n/a
Extrusion Fillet Seams		
shear strength[2], lb	200	200
shear elongation[3], %	n/a	n/a
peel strength[2], lb	20	20
peel separation, %	n/a	n/a

1. Also for hot air and ultrasonic seaming methods
2. Values listed for shear and peel strengths are for 4 out of 5 test specimens; the 5th specimen can be as low as 80% of the listed values
3. Elongation measurements should be omitted for field testing
4. Values are based on grab tensile strength and elongation per D7747 for laboratory tested specimens

Table 2(d) – Seam Strength and Related Properties of Thermally Bonded **Scrim Reinforced** Linear Low Density Polyethylene (LLDPE-R) Geomembranes (S.I. Units)

Geomembrane Nominal Thickness	36 mil[4]	45 mil[4]
Hot Wedge Seams[1]		
shear strength[2], N	890	890
shear elongation[3], %	n/a	n/a
peel strength[2], N	90	90
peel separation, %	n/a	n/a
Extrusion Fillet Seams		
shear strength[2], N	890	890
shear elongation[3], %	n/a	n/a
peel strength[2], N	90	90
peel separation, %	n/a	n/a

1. Also for hot air and ultrasonic seaming methods
2. Values listed for shear and peel strengths are for 4 out of 5 test specimens; the 5th specimen can be as low as 80% of the listed values
3. Elongation measurements should be omitted for field testing
4. Values are based on grab tensile strength and elongation per D7747 for laboratory tested specimens

Table 3(a) – Seam Strength and Related Properties of Thermally Bonded **Nonreinforced and Scrim Reinforced** Flexible Polypropylene (fPP) Geomembranes (English Units)

Geomembrane Nominal Thickness	30 mil-NR	40 mil-NR	36 mil-R[4]	45 mil-R[4]
Hot Wedge Seams[1]				
shear strength[2], lb/in. (NR); lb (R)	25	30	200	200
shear elongation[3], %	50	50	n/a	n/a
peel strength[2], lb/in. (NR); lb (R)	20	25	20	20
peel separation, %	25	25	n/a	n/a
Extrusion Fillet Seams				
shear strength[2], lb/in. (NR); lb (R)	25	30	200	200
shear elongation[3], %	50	50	n/a	n/a
peel strength[2], lb/in. (NR); lb (R)	20	25	20	20
peel separation, %	25	25	n/a	n/a

1. Also for hot air and ultrasonic seaming methods
2. Values listed for shear and peel strengths are for 4 out of 5 test specimens; the 5th specimen can be as low as 80% of the listed values
3. Elongation measurements should be omitted for field testing
4. Values are based on grab tensile strength and elongation per D7747 for laboratory tested specimens

Table 3(b) – Seam Strength and Related Properties of Thermally Bonded **Nonreinforced and Scrim Reinforced** Flexible Polypropylene (fPP) Geomembranes (S.I. Units)

Geomembrane Nominal Thickness	0.75 mm-NR	1.0 mm-NR	0.91 mm-R[4]	1.14 mm-R[4]
Hot Wedge Seams[1]				
shear strength[2], N/25 mm (NR); N (R)	110	130	890	890
shear elongation[3], %	50	50	n/a	n/a
peel strength[2], N/25 mm (NR); N (R)	85	110	90	90
peel separation, %	25	25	n/a	n/a
Extrusion Fillet Seams				
shear strength[2], N/25 mm (NR); N (R)	110	130	890	890
shear elongation[3], %	50	50	n/a	n/a
peel strength[2], N/25 mm (NR); N (R)	85	110	90	90
peel separation, %	25	25	n/a	n/a

1. Also for hot air and ultrasonic seaming methods
2. Values listed for shear and peel strengths are for 4 out of 5 test specimens; the 5th specimen can be as low as 80% of the listed values
3. Elongation measurements should be omitted for field testing
4. Values are based on grab tensile strength and elongation per D7747 for laboratory tested specimens

Adoption and Revision Schedule
for
Seam Specification per GRI-GM19

"Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes"

Adopted: February 18, 2002

Revision 1: May 15, 2003; Increased selected shear and peel test requirements, per the following:

Material	Test	Seam Type	Current GM19	Proposed GM19	Difference
HDPE	Shear	Hot Wedge	95% yield	95% yield	no change
		Extrusion	95% yield	95% yield	no change
	Peel	Hot Wedge	62% yield	72% yield	16% increase
		Extrusion	62% yield	62% yield	no change
LLDPE	Shear	Hot Wedge	1300 psi break	1500 psi break	15% increase
		Extrusion	1300 psi break	1500 psi break	15% increase
	Peel	Hot Wedge	1100 psi break	1250 psi break	14% increase
		Extrusion	1100 psi break	1100 psi break	no change

Revision 2: January 28, 2005; added Note 6 (in three locations) stating that incursion is measured on an area basis and not depth as in ASTM D6392.

Revision 3: June 4, 2010; Removed Note 6 on peel incursion since ASTM D6392 (2008) now uses area of incursion whereas previously they used linear length of incursion. Thus ASTM is now in agreement with GM19 in this regard.

Revision 4: November 15, 2010; Added Note 6 (in three locations) stating what separation-in-plane (SIP) is, and is not, and that it is acceptable if the required strength, shear elongation and peel separation criteria are met.

Revision 5: July 12, 2011; AD1 and AD2 breaks are now unacceptable even if strength is achieved.

Revision 6: October 3, 2011; Added LLDPE-R to the various geomembrane types, in particular, Tables 2(c) and 2(d) and made editorial changes.

Revision 7: November 3, 2013; clarified issues of 4 out of 5 passing strength and 5 out of 5 passing locus-of-break, shear elongation and peel separation.

Revision 8: February 12, 2015; upgraded standards and terminology

ATTACHMENT F

CONSTRUCTION SPECIFICATION
POS-SPEC-000167

FOR

MEREDOSIA ASH POND CLOSURES

AT

MEREDOSIA ENERGY CENTER

Technical Specifications and Drawings Prepared by:

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for

Ameren MISSOURI

Rev	Date	Revisions	Originator	Reviewer	Approver
0	08-12-2016	Submittal to I-EPA	S. Hilderbrand	A. Saindon	M. Wagstaff

Project Manual for the Meredosia Ash Pond Closures
at Meredosia Energy Center

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SECTION 1A - SUPPLEMENTAL GENERAL CONDITIONS
FOR AMEREN MISSOURI POWER OPERATIONS

For General Conditions of Contract – Construction:

http://www.ameren.com/BusinessPartners/Suppliers/Documents/GCCconstruction.pdf

For Supplemental General Conditions of Contract:

http://www.ameren.com/BusinessPartners/Suppliers/Documents/SupplementalGCCs.pdf

In addition to the above Contract Conditions, the following requirements apply:

1.0 GENERAL

1.1 This section of the specification clarifies and supplements the Ameren General Conditions of Contract (GCC) and other Contract documents. Specific duties set forth herein do not constitute an exclusive list of requirements, but complement the Ameren GCC. In the event of a conflict between this specification and the Ameren GCC, this specification shall be controlling.

1.2 Contractor shall assure that all tiers of Subcontractors comply with all requirements of Contract documents.

1.3 For any work performed for Ameren Missouri Power Operations, Contractor agrees to comply with Ameren's Supplemental Terms and Conditions, commonly referred to as Section 1A-Supplemental General Conditions for Ameren Missouri Power Operations.

2.0 DEFINITIONS

2.1 Accident/Incident An incident is defined as a near miss, vehicle accident, or property damage to Company-owned/leased equipment or facilities. Refer to Occupational Safety and Health Administration (OSHA) 29CFR1904 for definitions of reportable incidents and injuries.

2.2 Asbestos Containing Material (ACM) Material that contains asbestos in concentration greater than 1% and must be handled according to Ameren procedures and Federal and State regulations.

2.3 Barricade A physical obstruction such as barricade tape, chains, cones, concrete barriers, fencing, or "A" frame type wood and/or metal structures intended to warn and limit access to a work area. Barricade tape alone cannot be used to protect certain hazards such as unattended floor openings or fall hazards.

2.4 Competent Person An individual, who is trained and certified in applicable standards, is capable of identifying workplace hazards relating to specific operations, performs inspections of industrial and construction jobsite equipment, and has authority to take corrective actions when needed.

2.5 Computer Based Training (CBT) Computer Based Training is used for safety and job work rules orientation of new employees before they are permitted unescorted access to Company property.

2.6 Confined Space An enclosed area that is not normally designed or intended for human occupancy, has a restricted entrance or exit by way of location or size, and can represent a risk for the health and safety of anyone who enters, due to atmospheric, engulfment, entrapment, mechanical, electrical, or any other recognized hazard. See OSHA 29CFR1910.146 and Power Operations Administrative Procedure AUE-ADM-2415.

2.7 Hot Work Work that will generate sparks, such as; cutting, grinding, welding, and brazing. A permit may be required for hot work that is hazardous due to location or other factors.

2.8 Corporate Safety Department Ameren's Corporate Safety Department sets standards for safety and health issues and monitors compliance with Ameren policies, as well as with Federal, State and Local regulations.

2.9 Extra Work is defined in Article 1 of the GCCs.

2.10 Extra Work Order (EWO) is defined in Article 1 of the GCCs.

2.11 Job Working Rules Rules of conduct for Contractors working at Ameren facilities that include various types of prohibited behavior: off-limit areas, driving and parking instructions, and safety information that may be specific for the plant, such as fire alarms and evacuation procedures.

2.12 Single Point of Contact (SPOC) is defined in Article 1 of the GCCs.

2.13 Specifications are defined in Article 1 of the GCCs.

2.14 Work is defined in Article 1 of the GCCs.

2.15 Worker's Protection Assurance (WPA) or Hold Card Procedure Ameren's equipment lock-out procedure that ensures equipment and systems are in a safe state prior to service or testing. Employees must have WPA training and adhere to WPA procedures. Contractor supervisors must have plant-specific training prior to starting jobs requiring WPA protection.

3.0 INTENT OF SPECIFICATIONS AND DRAWINGS

3.1 The Contract Documents shall be interpreted as being complementary, requiring a complete Project. Any requirement occurring in any one of the Contract Documents is as binding as though occurring in all Contract Documents. Generally, Specifications address quality, types of materials and Contract conditions, while Plans show placement, sizes, and fabrication details of materials. Reference Article 2.01 of the GCCs.

4.0 BENCH MARKS

4.1 Company will furnish one site bench mark with its assigned elevation. Contractor shall furnish field layouts and shall be responsible for the use of field dimensions and elevations. All such Work shall be subject to approval at the discretion of the SPOC.

5.0 DRAWINGS, DETAILS & INSTRUCTIONS PROVIDED BY CONTRACTOR

5.1 Contractor shall submit to the Company copies of shop drawings, equipment details; installation, operating, and maintenance instructions, wiring diagrams, parts lists, cable termination sign-off sheets, etc. Reference Article 3.02 of the GCCs.

5.1.1 These submittals shall cause no delay in the performance of work. The minimum turn-around time for design changes shall be incorporated on drawings and shall not delay the performance of work. As-built drawings shall be submitted in accordance with Company's schedule.

5.1.2 Contractor shall submit five (5) copies of the above information, four (4) of which Company will retain. One (1) copy will be returned.

5.1.3 In addition to the copies listed above, Contractor shall submit drawings electronically in an approved CAD format. Ameren typically uses Bentley Microstation V7 or V8 (.dgn files).

5.1.4 Company will review submittals for general design features. Contractor is responsible for dimensions, quantities, accuracy, fit, adequacy of details, and coordination with other trades. Contractor must request deviations from contract documents in writing and receive written approval from Company.

5.1.5 Contractor must request field changes in writing and receive written approval from Company. Contractor shall promptly submit as-built drawings to Company.

5.2 Professional Engineering (PE) License Seals

5.2.1 All design documentation meant for fabrication, permitting, erection, or construction such as design drawings, specifications, and calculations shall have a Professional Engineering (PE) seal applied, signed and dated by Contractor's registered professional engineer(s).

5.2.1.1 The license shall be current, valid, and in good standing for the appropriate state where the work is taking place.

5.2.2 Documents where seals are not required include review items (not to be constructed), sketches, samples, design control documents, operations manuals, vendor material design documents, engineered product drawings (not related to permitting) and other documents agreed upon in writing between Ameren and Contractor.

5.2.2.1 Contractor shall be responsible to contact the main Ameren contact up-front to clarify the requirements to seal any project specific documentation.

6.0 LABOR CONDITIONS

6.1 Contractor's Work shall be performed under the National Maintenance Agreement (NMA), unless an exception is agreed upon in writing by the Construction Project Lead or his management, Contractor must furnish a copy of the site extension approval(s) granted by the International Union(s). Site extension requests for the NMA may be filed online at www.nmapc.org.

6.2 There shall be no limit on the work output of any employee, and no restrictions on what tools or equipment may safely be used to increase productivity. There shall be no minimum, other than what may be required by safety regulations, on the number of employees assigned to any crew or to any service.

6.3 Featherbedding practices of any kind will not be tolerated.

6.4 Actual work hours will be agreed upon during pre-job conferences; lunch breaks will be an unpaid one-half hour. No additional organized breaks are allowed. There shall be no non-working stewards. If a steward is included in the labor force, the steward must be a qualified worker and shall exercise no supervisory functions.

6.5 Contractors must conform to Construction Users Round Table (CURT) Tripartite Initiative report, dated June 2004, with respect to absenteeism, excessive overtime and work disruptions.

6.6 Contractor employees must be rested and fit for duty when they report to the Company's site. Contractor employees must not work in excess of 16 consecutive hours without prior approval of Contractor's Superintendent and Company, and then only when additional steps have been taken to ensure worker safety.

6.7 Contractor shall provide break/lunch facilities at a location in close proximity to the majority of the Work such locations to be approved by the SPOC or other Ameren Management personnel.

6.8 There shall be no slowdowns, illegal strikes, or unauthorized work stoppages of any kind. Contractor understands that its work must be completed in a timely fashion notwithstanding the presence of a labor strike or any pickets at or around the job site.

6.9 In the event that Company's employees, another contractor's or subcontractor's employees or Contractor's employees engage in a strike or established pickets, Contractor is expected to continue to meet its obligations under the terms of the contract and/or obligations with Company. Any such picketing activity is not an excuse for non-performance or delay in completing the project

6.10 Medical services provided by Ameren: On specified projects, contractors are not to include costs within bids associated with the following medical services:

- Random and for-cause substance abuse (SA) testing,
- First-aid expenses that can be addressed by an onsite nurse, if an onsite nurse is provided.

7.0 CONTRACTOR MANAGEMENT REQUIREMENTS

7.1 Prior to mobilization, Contractor shall submit an organizational chart and resumes for the entire management team that will utilize, on or offsite, for the project.

7.2 Contractor shall adhere to the Job Working Rules (Appendix B).

7.3 Contractor supervisory employees who will be responsible for requesting and signing the WPA must receive site-specific training before working onsite. The SPOC will arrange for the required WPA supervisor training to be located at the Ameren POS Training Center training facility.

7.4 Contractor supervisor shall comply with the specific plant's WPA procedure which is included as Appendix A, Section 2 of this specification. WPA procedure provides details of program and outlines responsibilities for supervisors.

CAUTION: The presence of WPA process does not relieve workers of the responsibility to verify that equipment is actually de-energized or in the designated state. Instruct employees to walk down the job, check energy sources and isolation points such as: voltages, temperatures, pressures, etc. to confirm status.

7.5 Contractor Site Representative shall read, understand, and sign the Contractor Agreement of Understanding Form (Appendix A, Attachment A18), prior to beginning work onsite.

7.6 Contractor supervisors shall instruct employees to observe WPA rules and comply with WPA tags at all times.

7.7 Contractor shall participate in individual Construction Progress meetings. The meetings are typically held weekly, but the SPOC may specify another frequency during the course of the Contract.

7.8.1 A Contractor representative with sufficient authority to make binding work and schedule commitments shall attend these meetings.

7.8.2 The individual progress meeting will typically concentrate on safety and housekeeping, schedule and work progress, job related problems, and site coordination.

7.8.3 Contractor shall come to the progress meeting with an updated schedule showing actual progress and the critical path of the work. See Contractor Schedule Requirements (Appendix D) for additional schedule requirements.

7.8.4 Contractor shall take and distribute meeting minutes within two (2) working days of the meeting.

7.9 A Contractor representative with sufficient authority to make binding commitments may also be required to attend a weekly Outage Coordination Meeting.

7.10 Contractor personnel, Business agents, Vendor/Sales representatives, etc., shall use the entrance designated for their Contractor, park in the Construction parking lot, and be escorted onsite unless they have a Contractor badge. Construction badge holders may use Contractor entrance or Ameren employee entrance, and park in the Construction parking lot or main parking lot depending on purpose of visit.

8.0 DELIVERY AND STORAGE

8.1 Contractor shall be responsible for receiving, unloading, inspecting and hauling materials unless otherwise stated in the Contract documents.

8.2 Contractor and the name of the project must be indicated on materials delivered to the site.

8.3 Contractor shall provide facilities to store materials and equipment on the jobsite. The SPOC will designate storage locations that will not interfere with Company's personnel or operations.

8.4 Payment for material or equipment stored onsite will not be made to Contractor until the material or equipment is installed. Contractor may apply for early payment only if early delivery and storage of the material or equipment will benefit Ameren.

8.5 A carrier that is compliant with the Depart of Transportation's (DOT) Hazardous Materials Security Plan must be used for deliveries of hazardous materials to Ameren. For a list of approved carriers visit http://vics.keyship.net/Ameren. Fill out the required fields & check the HazMat option. A list of qualified carriers will populate. Any vehicle carrying hazardous materials onto Company facilities will be refused entry until proof of compliance is provided.

8.6 If materials are provided by Ameren, they will be stored by Ameren until Contractor is onsite. Contractor will be responsible for loss or damage after acceptance of equipment or material provided by Company. Contractor shall inventory and haul excess material retained by Company to designated Company storage location(s) after completion of Work.

8.7 Contractor shall restore construction storage areas to a reasonable condition that satisfies the SPOC.

8.8 Material Receipt

8.8.1 Contractor must resolve all issues with contractor-procured material.

8.8.2 Contractor must identify, inspect, test and store material to purchase order requirements.

8.8.3 Contractor must ensure all receiving quality documentation is supplied to Ameren's SPOC upon receipt.

8.8.4 Contractor must have a program in place to ensure receipted critical plant material and equipment is not relocated or improperly stored without proper authorization from Ameren's SPOC.

8.8.5 Contractor will be provided a list of critical materials and equipment during pre-construction meetings.

8.8.6 Contractor must handle, store, and identify Critical Material in accordance with the paragraph below:

Ameren MISSOURI

MATERIAL HANDLING, STORAGE & IDENTIFICATION INSTRUCTIONS FOR CONTRACTORS

AUE-ADM-4203, Receiving Storage & Handling of Critical Materials

All Ameren purchased critical material received by a contractor or sub-contractor has specific requirements that must be met to comply with Ameren's Quality Management Program in accordance with AUE-ADM-4203. Contractor requirements contained in AUE-ADM-4203 are provided below. Contractors will be evaluated on their quality control and material management. A list of critical materials shall be provided to the contractor during Pre-Construction Meetings.

1) Notify Responsible Engineer (RE) of Ameren material received and the PO number. Ensure receiving documentation remains with the material until clear direction is provided by RE.

   NOTE: Steps 2-5 shall be directed by Responsible Engineer (RE)

2) Receiving documentation, number of containers, and intended storage location shall be taken to Storeroom personnel.

3) Storeroom shall create a Receipt Order (RO) number for traceability and provide identification labels for attachment to each container. Information will always include the RO tracking# and may include PO #, Job #, RE, PM, Storage Level, and intended location.

4) The RO number shall be clearly marked on all boxes, containers, equipment, and packing slip(s).

5) An Ameren Material Receipt Inspection Report (MRIR) shall be printed with the inspection requirements and shall be used to document inspection results. Contractors may perform additional inspections as directed by RE.

6) After successful acceptance, MRIR Inspector(s) shall sign the MRIR and each traceable barcode label; and shall attach labels to containers.

7) Hold tags shall be attached to any materials not accepted.

WARNING: **Contact Responsible Engineer or Ameren Designee immediately** if unidentified material is discovered, labels become unreadable, material needs to be relocated, or if material location or storage level differs from label.

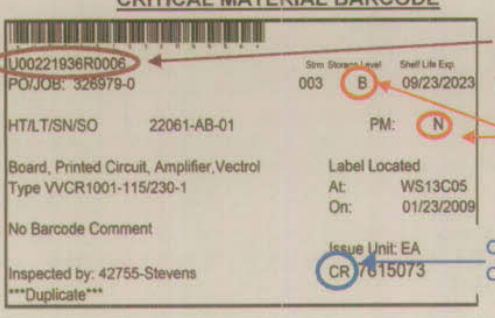
If during staging, prep work, etc., the material is repackaged or removed from labeled containers and the potential for identification or material loss exists, transfer the RO or barcode number, at a minimum, to the materials.

Storage Level B – Indoor storage. Temperatures controlled between 40°F and 140°F. This level includes the storeroom, turbine floor, or any other location inside the plant.

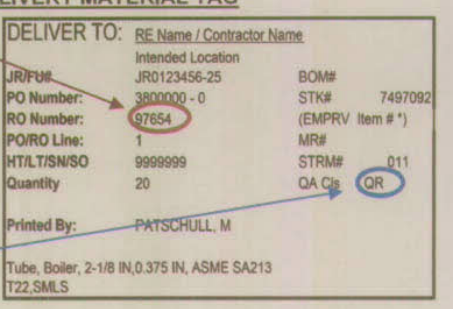
Storage Level C – Covered storage. Temperature control not required. These locations include secondary storerooms, covered parking areas, etc.

Storage Level D – Outside storage. Store in well drained areas in a manner allowing air circulation to minimize trapped water. Provide adequate protection from forces due to rain, wind and storms

CRITICAL MATERIAL BARCODE



DELIVERY MATERIAL TAG



9.0 REMOVALS AND PREPARATORY WORK

9.1 Contractor shall cooperate with the SPOC in scheduling removal work so there is no disruption to Company's personnel or operations.

9.2 Contractor shall provide protective enclosures, covers, water stops, etc. to prevent water or other weather-related damage to facilities during construction.

9.3 Before mobilizing tools, material and equipment, Contractor will install appropriate trash cans, cigarette butt receptacles, and dumpsters in designated areas.

9.4 Materials authorized to be removed become the property of Contractor, unless otherwise specified in the Contract documents, and shall be promptly removed from the worksite. An inventory of materials being removed must be submitted to the SPOC. If materials are retained, the SPOC will designate where materials shall be stored. Retained materials shall be neatly stored and protected from the elements.

9.5 Before mobilizing tools, material and equipment, Contractor shall install protection on both sides of all walkways in work area from top rail to toe board. This protection may include, but not limited to, orange fencing, plywood and sheet metal. However, openings in fencing shall be no larger than one inch square. Contractor shall install decking on open floor work areas, seal decking along edges and install toe boards, and install debris nets to further contain fallings objects. All wood subject to ignition sources shall have fire retardant cloth or tarps installed over the wood. Cloth shall be secured to avoid tripping hazards. All safety barriers shall be removed after the completion of the project.

9.6 For additional safety requirements to be performed prior to working on elevated platforms, walkways and scaffolds above 6 feet, refer to Safety Requirements for Working on Elevated Platforms (Appendix Y).

10.0 CUTTING& PATCHING AND TEMPORARY BUILDINGS, ETC.

10.1 Contractor shall do all cutting, fitting, or patching that may be necessary to make the several parts come together properly and fit to receive the Work of other Contractors and Subcontractors.

10.2 All temporary buildings/structures such as tool rooms, break rooms, lunch rooms, etc., shall be constructed with non-combustible materials.

11.0 TEMPORARY HEAT

11.1 Contractor shall provide temporary heat to protect Work materials against damage from dampness and cold to the satisfaction of the SPOC.

12.0 QUALITY REQUIREMENTS

12.1 The Quality Management System Manual, AUE-MAN-QMS-1001, provides the basis for the Ameren Missouri Power Operations Quality Management System (QMS) and provides the assurance that processes are in place to achieve our business objectives. The QMS performance standards and performance criteria provide requirements to achieve a controlled and systematic approach to quality management activities and promote continuous improvement. Contractors and Subcontractors can obtain a copy of the QMS from the Ameren Missouri Project Manager.

12.2 The Contractor's quality management program and supportive procedures are subject to Ameren review and audit. If a gap exists between the QMS, and the Contractor's quality management program and supportive procedures, the Contractor will be required to comply with the QMS.

12.3 Contractors and Subcontractors agree to comply with the applicable QMS requirements for the work scope included in this Ameren Missouri contract. The Contractor shall provide a copy of the Contractor's quality management program and supportive procedures with the bid submittal, if the Contractor is not on the Ameren Missouri 'Generation Approved Supplier List – Critical (GASLC)'.

12.4 The QMS Application Aid (QMS-AA) per Appendix Q contains the applicable QMS requirements in this Ameren Missouri contract. The Contractor shall complete and return the QMS-AA with the bid submittal, if the Contractor is not on the Ameren Missouri GASLC.

12.5 The Contractor shall upon award develop and provide to Ameren a 'Project-specific Quality Management Plan' which is compliant with the QMS-AA.

12.6 The Contractor's awarded work scope, including that of its Subcontractors, shall be performed to the requirements of the QMS-AA.

12.7 Ameren will be allowed to make quality inspections at Contractor's and Subcontractor's facilities at no cost to Ameren. Ameren will be allowed to view applicable Contractor's and Subcontractor's quality procedures and procedure generated records and documents.

12.8 Design Documents and Calculations:

12.8.1 Contractors and Sub Contractors shall meet the technical requirements included in Section 1D of this specification and the QMS-AA.

13.0 OWNER APPROVAL OF PROCEDURE

13.1 Ameren must consent to deviations from the procedures, methods and materials agreed to in the Contract. Reference Articles 2.01 and 4.01 of the GCCs.

13.2 Ameren reserves the right of approval over all procedures, methods, and materials to be employed by Contractor or its Subcontractors for this Work. Reference Articles 2.01 and 4.01 of the GCCs.

14.0 CONFIDENTIALITY

14.1 Contractor shall hold Ameren's Confidential Information confidential and shall not use or disclose to others during or subsequent to the performance of the Work (except as is necessary to perform the Work). Reference Article 9.02 of the GCCs.

14.2 Publication or advertising of information directly derived from Project or Work or data obtained in connection with services rendered under the Contract must first be approved in writing by Ameren (Ameren personnel need approval from Ameren Corporate Communications). Contractor shall not release any information for publication or advertising purposes relative to the material, equipment and/or services furnished under the Contract Documents without the prior written consent of Ameren. Ameren reserves the right to release all advertising or publicity concerning the Project or Work. Except as to signs required by building department regulations or any other governmental requirements, Contractor shall not display or permit any signs or advertisements to be displayed about the Project site nor publicize in any manner its performance of the Work without the express written permission of Ameren. Reference Article 9.02 of the GCC.

14.3 Contractor shall restrict the knowledge of all confidential information regarding the Work to as few as possible of its employees who are directly connected with performance of the Work and have a definite need for such knowledge. Upon request by Ameren's Representative, Contractor shall cause such persons or groups of persons involved in the Work on Contractor's behalf as Ameren may designate to sign individual secrecy agreements in a form satisfactory to Ameren. Reference Article 9.02 of the GCCs.

15.0 ACCOUNTING / INVOICING REQUIREMENTS / ACIP

15.1 Contractor shall furnish complete accounting information and cooperate with Ameren's accounting practices.

15.2 For Time and Material contracts prior to commencing work, Contractor shall furnish Company with a written estimate for Company approval. Once approved, Contractor shall promptly notify Company of any facts and circumstances that may adversely impact the estimate. Further, Contractor shall not exceed ninety percent (90%) of the time and materials estimate without Company approval. All overtime for Time and Material contracts shall be approved by Company in advance of working. Reference Articles 6 and 8 of the GCCs.

15.3 Company reserves the right not to honor charges associated with timesheets that are not provided daily.

15.4 Material invoices must be submitted as Work progresses. Total cost updates will be provided on a weekly basis.

15.5 If Work indicated or specified in Contract Documents is increased, Company may have Contractor perform Extra Work.

15.5.1 Contractor must obtain written approval from the SPOC prior to performing any Extra Work. Each Extra Work Order (EWO) shall be invoiced separately and shall reference the EWO number and Purchase Order (PO) number.

15.5.2 If work is performed on a time and material basis, then work shall be charged at the rates indicated on the Labor Rate Sheets in the Contract.

15.5.3 Ameren will pay Contractor the cost of extra work as follows:

NOTE:	Subcontractor labor and material charges shall be subject to the provisions of Items 15.5.3.1, 15.5.3.2 and 15.5.3.3 below.

15.5.3.1 Labor:

- Direct cost of payroll labor, including first line foreman, excluding job Superintendent and General Foreman
- Fringe benefits including welfare and pension
- Insurance
- Taxes including FICA, Federal, State and Local tax
- Overhead, including costs for home office, field office, consumables, and small tools with an original value under $1,200, as agreed by Company and Contractor at the award of Contract
- Profit, as agreed by Company and Contractor at the award of Contract

15.5.3.2 Material and third party rental equipment:

- Direct cost of material or rental equipment

Subcontractors:

- Direct cost of Subcontractor

Contractor-Owned Rental Equipment (excluding third party rental equipment):

- Contractor shall submit for approval an equipment rental rate schedule including all equipment, tools, and supplies required to perform the Work specified. These equipment rental rates will be used for extra work.

15.5.3.3 Ameren Coordinated Insurance Program (ACIP)

- If the project is part of the Ameren Coordinated Insurance Program (ACIP), all contractors of all tiers will be required to provide completed enrollment and monthly reporting forms for duration of their work on project. All prime contractors will be responsible for their subcontractors of all tiers with respect to compliance of enrollment and reporting requirements.
- If the project is part of the ACIP, contractors of all tiers must be enrolled and have a copy of ACIP certificate of insurance prior to mobilization onsite. Ameren will not allow non-enrolled contractors to access site prior to enrollment in ACIP.

END OF SECTION 1A

SECTION 1B – SUMMARY OF WORK

1.0 INTRODUCTION

1.1 Definitions

1.1.1 The term "Company" means the entity identified in the Company's Purchase Order, its agents, employees, representatives, successors, and assigns. The terms "Purchaser," "Owner," and "Buyer," if used in the Contract Documents, are considered synonymous and refer to the Company.

1.1.2 The term "Engineer" means the Engineer duly appointed to represent the Company as specified from time to time by the Company who may be employed by the Company or who may be employed by others.

1.1.3 The term "Contractor" means the entity identified in the Company's Purchase Order, and its agents, employees and authorized representatives undertaking the performance of the Work as defined in this Specification. The terms "vendor," "supplier," "manufacturer," or "fabricator" if used in the Contract Documents, are considered synonymous and refer to Contractor.

1.1.4 The term "Sub Contractor" means any individual, partnership, firm, corporation or business entity, other than an employee of Contractor, who contracts or agrees with Contractor (or another Sub Contractor or any tier thereof) to furnish any services, labor, materials or equipment for, or in connection with, the performance of the Work.

1.1.5 The term "Construction Project Lead" means the Company's representative as specified from time to time and located at job site.

1.2 Location

1.2.1 The Meredosia Energy Center is located at:

800 South Washington Street
Meredosia, IL 62665

1.2.2 This project is located at the Meredosia Energy Center in Morgan County, Illinois. The Bottom Ash Pond and the Fly Ash Pond are located on the western side of the site adjacent to the Illinois River. See figure on sheet 1B-7 for a location map showing the Bottom Ash Pond and the Fly Ash Pond.

1.3 Contacts

1.3.1 All commercial matters shall be directed to the Ameren purchasing agent designated on the Request for Proposal or listed on the purchase order.

1.3.2 All technical questions regarding this specification shall be directed to:

Ameren Energy Missouri
Michael Wagstaff, P.E.
3750 S. Lindbergh Blvd.
Sunset Hills, MO 63127

2.0 SUMMARY OF WORK

2.1 Project Objectives – The Project Objective is the closure of the Bottom Ash Pond and Fly Ash Pond at the Meredosia Energy Center. Material will be removed from the Bottom Ash Pond, including the southern berm and the top three feet of the northern berm, and will be placed in the larger Fly Ash Pond. Existing steam line piping, light poles, culverts, fencing and outfall structure associated with the Bottom Ash Pond will be demolished and removed in an approved manner. Electric power poles will be removed and relocated. All of these components are located either within the ash pond or along the berms.

2.2 The Closure documents for Ameren Energy Medina Valley Cogen's Meredosia Ash Pond Closures at Meredosia Energy Center has been prepared in accordance with the requirements of the site specific Rule in 35 Illinois Administrative Code Part 840, Subpart A. The following supporting documents will be submitted to the IEPA.

2.2.1 Closure Work Plan
2.2.2 Closure Plan
2.2.3 Hydrogeologic Report
2.2.4 Construction Quality Assurance Plan
2.2.5 Groundwater Monitoring Plan
2.2.6 Post-Closure Care Plan

2.3 Copies of the above documents, including IAC Part 840, Subpart A, are available upon request.

2.4 General Requirements

2.4.1 Contractor shall be responsible for furnishing all material (except those items of material specifically stated to be furnished by the Company), tools, equipment, labor, supervision and any other incidental items or services required to perform all of the work described herein.

2.4.2 Contractor shall be responsible for any and all engineering, drafting, field sketches, and field layout required for temporary supports, rigging, removals, and installation of all material.

2.4.3 Contractor shall be responsible for receiving, storage and security of all materials supplied by Contractor and material provided by Company. Contractor will be required to unload material in Construction Staging Area as shown on the plan (Sheet T-002) and/or designated by the Construction Project Lead. Contractor will also be required to obtain items, where specified, from the storeroom. Contractor is responsible for developing an inventory list of material received. Contractor shall provide adequate protection for equipment/material stored outside from forces due to rain, wind and storms. As an example, material such as precipitator collector plates – which would be subject to damage during a high wind event – would require Contractor to perform analysis of potential wind loading and create a detailed storage plan. For this example, Ameren shall review and provide approval of specific storage plan.

2.4.4 Contractor will be responsible for proper disposal of all demolition or surplus construction materials.

2.4.5 Contractor Design shall use the Design for Safety Guide (Appendix C).

2.4.6 Ameren **will not** provide a nurse and first aid trailer for Ameren and Contractor personnel.

2.5 Description of Work

2.5.1 The description of work, in general, includes but is not limited to:

- Installation and maintenance of a Stormwater Pollution Prevention Plan (SWPPP)
- Erosion control fences and blankets
- Clearing and Grubbing
- Removal of Improvements (Demolition)
- Excavation, Compaction and Grading of Ash
- Excavation, Compaction and Grading of Soil Materials
- Electric Poles relocated and dusk to dawn lights installed by local utility company
- Dust Control
- Installation of ClosureTurf™ and HydroTurf™
- Installation of Rip Rap and Energy Dissipators
- Installation of Crushed Stone Access Road
- Seeding and Mulching

2.5.2 Other Requirements:

- In order to facilitate procurement of a Construction Quality Assurance (CQA) contractor by a separate contract, a Level 2/3 construction schedule will be requested to be submitted by the apparent low bidder(s) within two weeks of receipt of bids. This schedule will be used as the basis for the CQA contractor whose scope is defined in the attached Construction Quality Assurance Plan and specifications. Please see "Appendix D - Contractor Schedule Requirements".
- A Construction Staging Area has been shown on the plans. This area shall be returned to original condition at the end of construction activities.

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- Ameren's Construction Project Lead will have an office in the Ameren trailer. A meeting room for weekly team meetings is also available in this building.
- Contractor's trailer location (proposed) shall be located in the Staging Area as shown on the plan. See sheet T-002. This area shall be returned to original condition at the end of construction activities.
- Existing monitoring wells shall be protected with snow fences. In the event a monitoring well is impacted by construction activities the Owner shall be notified immediately.
- Contractor is responsible for keeping as-built plan markups during construction. All markups shall be provided to the Owner at substantial completion of the project.

3.0 COMPANY AND MANUFACTURER'S DRAWINGS

3.1 The following drawings are intended to indicate the scope of the work to be done and details necessary for the items of work set forth in this specification, and are part of this specification. These drawings in general are to scale, but figures shall always be followed and drawings are not to be scaled. Contractor shall make any requests for additional drawings in writing to the Engineer.

3.1.1 Drawings prepared by CDG Engineers, Inc. dated August 12, 2016, include the following:

T-001	TITLE SHEET
T-002	PLANT VICINITY MAP
T-003	GENERAL NOTES
C-101	SITE INDEX MAP
C-102	SITE PLAN
C-103	SITE PLAN
C-104	SITE PLAN
C-105	SITE PLAN
C-106	SITE PLAN
C-107	SITE PLAN
C-108	NOT USED
C-109	NOT USED
C-110	SITE PROFILE
C-111	PROFILES
C-301	DETAILS
C-302	DETAILS
C-303	DETAILS
C-304	DETAILS
C-305	DETAILS
C-601	DRAINAGE AREA MAP
C-602	SWPPP PLAN
C-603	SWPPP DETAILS

3.1.2 The following drawings are intended as references and will be on a cd/dvd prepared by Ameren and included in back of the project manual:

B-331-O-E	Plan Ash Storage Pond
B-332-O-D	Bottom Ash Storage Pond Details
B-333-O-C	Fly Ash Storage Pond Details
K-584-A	Rev. 1 Meredosia closed ash ponds
K-584-A	Rev. 2 Meredosia closed ash ponds

4.0 WORK, MATERIALS AND EQUIPMENT SUPPLIED BY COMPANY

4.1 Not applicable.

5.0 WORK, MATERIALS AND EQUIPMENT FURNISHED BY CONTRACTOR

5.1 All supervision, components, labor, materials, equipment, tools, and any incidental items described herein (except those specifically stated above) necessary to completely install each portion or component of the work shall be furnished by Contractor.

6.0 UTILITIES AND FACILITIES

6.1 Contractor shall supply sanitary facilities, drinking water and shower facilities (if needed) equipped with water heaters.

6.2 The Company will provide telephone, fax, computer, and power hook-up connections for Contractor supplied trailers.

6.3 Temporary lighting, wiring, plumbing, globes, guard lights, barricades or any other items required for protection, facility of work, local regulation, or by law for public protection shall be provided by Contractor.

6.4 The Company shall furnish one source of 480 volt, three phase electric power per major work area as directed by the Construction Project Lead. Contractor shall furnish the tie-in and any extensions required. Contractor shall not use the Company's 120-volt outlets, unless directed otherwise by the Construction Project Lead. Contractor shall provide 480/120-volt transformers as required.

6.4.1 Contractor shall provide with bid proposal a list of his estimated temporary (construction) power requirements.

6.5 Non-potable (construction) water will be provided by the Company for Contractor for the purposes of clean up/wash down. Potable water for drinking will be provided by the Contractor.

6.6 Construction Staging Area/Lay down areas for equipment and material will be designated as close to work site as possible. Areas for tool, office, and change house trailers will be designated as close to work site as possible. Contractor's lay down area will be as determined by the Construction Project Lead.

7.0 RECORDING OF HISTORICAL DATA

7.1 Contractor shall make revisions to plans and specifications (red lines) during the course of the work. Plans and specifications shall be turned over to the Owner at Substantial Completion of the project.

8.0 CONTRACTOR'S FIELD SAFETY PROGRAM

8.1 Contractor shall comply with the Safety and Housekeeping procedures stated in Safety and Contractor Requirements (Appendix A), Attachment A18 and Attachment A19.

8.2 The Company has computerized the WPA request process. All organizations working on plant site shall be required to use the WPA computers to request WPA tags to be hung. The Company will provide training to one or two individuals per organization with training to be located at the Ameren POS Training Center.

9.0 TRANSFER OF INFORMATION (OSHA Safety Requirement)

9.1 Ameren shall inform the Contractor of known characteristics and conditions as it relates to the safety of the work being performed on all equipment associated with generation of electricity. This will be accomplished before work begins, after the contract is awarded during Ameren's pre-construction meeting.

9.2 The transfer of information will be shared with the primary contractor awarded the work. That primary contractor will share the same information with any sub-contractors hired by the primary contractor.

9.3 If any unique and/or hazardous conditions exist which were not mentioned by Ameren, Contractors must inform Ameren of those conditions in a timely manner.

10.0 PARTICIPATION IN COORDINATION ACTIVITIES

10.1 Contractor shall provide a representative for and participate in coordination and information exchange activities with representatives of the Company and other contractors involved with the plant improvements, including the following activities:

10.1.1 Exchange of information necessary for the work specified herein to interface with other Contractors.

10.1.2 Participation in multi-contact coordination, construction, installation, and startup meetings. One construction meeting per week and one multi-contractor outage coordination meeting per week is anticipated during the majority of the outage. Initial shutdown and startup meetings are on a more frequent basis; often daily.

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10.1.3 Participation in safety walk-down meetings. Safety meetings may occur bi-weekly. The Construction Project Lead will inform Contractor of meeting dates and times as necessary.

10.1.4 Contractor shall electronically track safety findings from safety walk-downs and document corrective actions taken.

10.2 Contractor shall provide daily schedule updates to the designated Company representative (Project Scheduler) for inclusion into the integrated outage schedule.

11.0 CONTRACTOR'S COST TRACKING PROGRAM

11.1 In addition to daily timesheets, Contractor shall furnish manpower and cost information to the Construction Project Lead for all "time & material" work on a weekly basis. Time & Material information is to be submitted on Contractor-supplied forms.

12.0 GENERAL INFORMATION

12.1 Upon completion, all work defined in this document shall be of a uniformly neat and workmanlike appearance. All costs of repair to meet this condition shall be to Contractor's account.

12.2 Contractor shall follow the manufacturer's or fabricator's guidelines and requirements for installation of all materials and equipment, except as modified by this Specification.

12.3 Contractor shall be aware that there may be other contractors onsite during the Work as described in this Specification as well as Company GCMS and Plant forces. Contractor shall coordinate his work to minimize interferences with the work of other contractors and/or crafts.

12.4 Contractor's employees shall park in designated parking areas only. Employees shall observe Ameren site requirements for driving and parking on-site. Employees are to report to the main entrance prior to proceeding to parking area.

12.5 Upon admittance into the Plant, Contractor (including each and every employee or sub-contractor's employees) shall be subjected to a computer based training (CBT) program that describes the Plant Construction Job Work Rules. These work rules are similar to those listed in Supplemental General Conditions Section 1A, Item 2.4. The training lasts approximately ¾ hour for the average worker. Employees cannot begin work until the training is completed.

12.6 Contractors must recognize the difference between special instrument air connections and service air connections and shall not use instrument air for their air supply needs.

12.7 Job Working Rules

Contractor must enforce the Ameren Job Working Rules (Appendix B) as well as the Contractor's own work rules. If the rules conflict, then the more restrictive rule applies.

Equipment skids supplied by the contractor shall have a P&ID diagram with equipment identifications, critical settings and pressure ratings identified. The skid pumps, blowers, motors, valves, instruments and other equipment shall have labels attached with the device number shown on the P&ID. The device numbers will be provided by Ameren and be compatible with plant equipment labels and numbering schemes.

13.0 EXTRA WORK ORDERS

13.1 Extra work will be authorized by an approved Extra Work Order (EWO). Contractor shall not start any additional work without written approval from the Company.

13.2 Extra work may be authorized on a lump sum firm price, time and materials (T&M), or a T&M-not-to-exceed basis. The Company will select the terms of the EWO.

13.2.1 Pricing for lump sum firm price and T&M-not-to-exceed work shall be based on the Engineering Inspection Report supplied by the Construction Project Lead.

13.2.2 The Company may accept or reject Contractor's proposal for any EWO. If an EWO proposal is rejected the Company may try to negotiate the price, reduce or cancel the work scope, or obtaining pricing from another contractor.

13.2.3 If Contractor's submitted EWO proposal is acceptable to the Company an approved EWO will be issued authorizing the work.

13.3 Invoices for all approved Extra Work Orders shall reference the purchase order number of the original contract, the EWO Number, and have a copy of the approved EWO attached.

END OF SECTION 1B

Ameren MISSOURI

Specification #000167
Sheet No. 1B - 7

Meredosia Energy Center Location Map

SECTION 1C – INFORMATION REQUIRED FROM BIDDERS

1.0 INFORMATION REQUIRED WITH BID PROPOSAL

1.1 Proposed Construction Schedule

- Contractor shall attend a mandatory **Pre-Bid Conference** at the Meredosia Energy Center on _____.
- Contractor shall submit a **Lump Sum Firm Price Bid Proposal** by _____.
- Contractor shall submit **Level 3 Schedule** by _____.
- Anticipated **Contract Award** for construction is _____.
- **Contractor shall complete all work by** _____.

1.2 Contractor shall submit the following items with the Bid Proposal:

- Pricing
- Project Schedule
- Preliminary Project Execution Plan
- Insurance Certification Statement
- Field Construction Safety Program
- Laydown and access requirements
- Diverse Supplier Business Plan
- Statement of Qualifications
- Contractor Safety & Health Data Form
- Bid Form

1.3 Pricing

1.3.1 Contractor to submit a Lump Sum Firm Price Bid Proposal

1.3.2 Contractor shall submit with bid proposal a schedule of time and material (T&M) rates as well as T&M rates for all planned subcontractors. The submitted schedules of T&M rates will be used for any additional work the Company may request or approve during the course of the specified work.

1.3.3 Break out cost for safety personnel per Safety and Contractor Requirements Appendix A, Item 4.2.

1.4 Project Schedule

1.4.1 A Level 2/3 Schedule shall be prepared.

1.5 Preliminary Project Execution Plan

1.5.1 Contractor shall submit with bid proposal a preliminary work plan describing how the project will be executed.

1.6 Insurance Certification Statement

1.6.1 Contractor shall submit acceptable Insurance Certification.

1.7 Field Construction Safety Program

1.7.1 Safety Program for Field Operations shall be submitted.

1.8 Laydown and Access requirements

1.8.1 A Staging Area is shown on the plans. (See sheet T-002) Contractor to address the adequacy of this area for their operations.

1.9 Diverse Supplier Business Plan

1.9.1 In order to support Ameren's policy on Supplier Diversity, Attachment A22 shall be filled out and submitted with bid. 2nd Tier Supplier shall be defined as work as set forth in bid proposal not being

self-performed. Ameren does not certify Diverse Suppliers and relies upon third party certifying organization. Ameren recognizes certification from the National Minority Council (NMSDC) and its affiliate councils, the Women's Business Enterprise National Council (WBENC) and its affiliate councils, and Federal, State and Local government certifying agencies.

Note: editable versions of Attachment A22 with instructions and reporting guidelines will be sent out as part of bid package. Questions on filling out form will be directed towards Ameren Supplier Diversity professionals at (888) 256-1150 or at http://www.ameren.com/BusinessPartners/SupplierDiversity/Pages/SupplierDiversityHome.as.

1.10 Statement of Qualifications

1.11 Contractor Safety & Health Data Form

1.11.1 Contractor shall submit with bid proposal a completed Contractor Safety & Health Data Form (Appendix A, Attachment A9).

1.12 Bid Form

1.12.1 Contractor shall submit the Bid Form found in Appendix AA of this specification.

1.13 Exceptions

1.13.1 Any contract award resulting from this Specification will incorporate all provisions specified herein. It is understood that Contractor agrees to all provisions of Specification unless exceptions are specifically listed in bid proposal.

1.14 Quality

1.14.1 Copies of the Contractor's quality management program and supportive procedures.

2.0 INFORMATION REQUIRED AFTER CONTRACT AWARD

2.1 Schedule

2.1.1 Contractor shall submit a construction schedule as described in Contractor Schedule Requirements (Appendix D). Failure to provide a schedule may result in rejection of the bid.

2.1.2 Contractor shall provide continuous (daily) updates of his project work schedule beginning after he mobilized at jobsite and continuing through completion of work. Failure to provide a schedule may result in charges to Contractor.

2.2 Revised Project Execution Plan

2.2.1 Contractor shall submit after award of contract a detailed work plan describing how the project will be executed. Included in the work plan shall be items/details such as:

2.2.1.1 Method of construction of the dewatering system.

2.2.1.3 Location of Contractor's proposed borrow area.

2.2.1.4 Quality control plan

2.2.1.6 List of subcontractors

2.2.1.7 Site-specific safety plan. At a minimum, Attachment A21 – Site-Specific Safety Plan (SSSP), shall be filled out in its entirety. The SSSP shall be submitted to Ameren for review, comment and approval. Editable version of Attachment A21 is to be supplied after issuance of PO.

2.2.1.8 Site-specific demolition plan (may be incorporated into the Safety Plan)

2.3 Contractor Project Management

2.3.1 Contractor shall provide an organizational chart depicting names and roles of individuals involved with project from Project Manager to Foreman level.

2.3.2 Contractor shall provide necessary resources to provide scheduling information and updates as defined in Contractor Schedule Requirements (Appendix D).

2.3.3 Contractor shall provide a full time Project Manager onsite unless an exemption is provided in writing by the Managing Supervisor of Construction.

2.6 Contractor and subcontractors shall submit a Quality Plan which is in compliance with the Quality Requirement in Supplemental General Conditions Section 1A, Item 12, prior to start of work. .

2.7 Diverse Supplier 2nd Tier Report

2.7.1 In accordance with Item 1.6.1 above, Attachment A23 shall be filled out with actual spent cost and issued per timeline agreed upon between Contractor and Ameren. Typical timeline for reporting will be monthly.

Note: editable version of Attachment A23 with instructions and reporting guidelines will be sent out as part of Contract Award. Questions on filling out form will be directed toward Ameren Supplier Diversity professionals at (888) 256-1150 or at http://www.ameren.com/BusinessPartners/SupplierDiversity/Pages/SupplierDiversityHome.as.

END OF SECTION 1C

SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on the Project including, but not limited to, the following:

1. Coordination drawings
2. Requests for Information (RFIs)
3. Project meetings

B. Related Requirements:

1. Section 01700 "Execution Requirements" for procedures for coordinating general installation and field-engineering services shall be followed, including establishment of benchmarks and control points.

1.2 DEFINITIONS

A. REQUEST FOR INFORMATION (RFI): An RFI is a request from Owner, Engineer, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

A. Subcontract List: The Contractor will prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products,
2. Number and title of related Specification Section(s) covered by subcontract, and
3. Drawing number and detail references, as appropriate, covered by subcontract.

1.4 GENERAL COORDINATION PROCEDURES

A. Coordination: The Contractor will coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Additionally, the Contractor shall coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation as indicated below.

1. Schedule construction operations in the sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. The Contractor shall prepare memoranda for distribution to each party involved that outlines special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: The Contractor shall coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule,
2. Preparation of the schedule of values,

3. Installation and removal of temporary facilities and controls,
4. Delivery and processing of submittals,
5. Progress meetings,
6. Preinstallation conferences,
7. Project closeout activities, and
8. Startup and adjustment of systems.

1.5 COORDINATION DRAWINGS

A. General Coordination Drawings: The Contractor shall prepare coordination drawings according to requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information should be drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
b. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to the Engineer indicating the proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

1.6 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, the Contractor shall prepare and submit an RFI in the form specified below:

1. All RFIs to be submitted by the Contractor; Engineer will not reply to RFIs submitted by subcontractors, vendors or suppliers.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in the Work or work of subcontractors.
3. Submit separate RFIs for each item requiring information or interpretation.

B. The Contractor will prepare RFIs on forms supplied by Owner.

C. The Content of the RFI should include a detailed, legible description of item needing information or interpretation and the following:

1. Project name,
2. Project number,
3. Date,
4. Name of Contractor,
5. Name of Engineer,
6. RFI number, numbered sequentially,
7. RFI subject,
8. Specification Section number and title and related paragraphs, as appropriate,
9. Drawing number and detail references, as appropriate,
10. Field dimensions and conditions, as appropriate,
11. Contractor's suggested resolution. (If Contractor's resolutions impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature, and
13. Attachments: Include sketches, descriptions, measurements, photos, product data, shop drawings, coordination drawings, and other information necessary to adequately describe items needing interpretation.

D. Engineer's Action: The Engineer will review each RFI, determine action required, and respond. Allow seven working days for Engineer's response for each RFI. RFIs received by Engineer after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

a. Requests for approval of submittals,
b. Requests for approval of substitutions,
c. Requests for coordination information already indicated in the Contract Documents,
d. Requests for adjustments in the Contract Time or the Contract Sum,
e. Requests for interpretation of Engineer's actions on submittals, and
f. Incomplete RFIs or inaccurately prepared RFIs.

2. The Engineer's action may include a request for additional information, in which case Engineer's time for response will date from the time of receipt of additional information.

a. If Contractor believes the RFI response warrants a change in the Contract Time or the Contract Sum, the Engineer must be notified in writing within 10 days of receipt of the RFI response.

E. RFI Log: The Contractor will prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. The log will be submitted monthly and will include the following:

1. Project name,
2. Name and address of Contractor,
3. Name and address of Engineer,
4. RFI number including RFIs that were dropped and not submitted,
5. RFI description,
6. Date the RFI was submitted, and
7. Date the Engineer's and Construction Manager's response was received.

F. On receipt of the Engineer's action, update the RFI log and immediately distribute the RFI response to the affected parties. Review the response and notify the Engineer within seven (7) days if Contractor disagrees with the response.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.7 PROJECT MEETINGS

A. General: The Contractor will schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify the Owner and Engineer of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda and distribute the agenda to all invited attendees.
3. Minutes: The Entity responsible for conducting meeting will record significant discussions and agreements achieved. The meeting minutes will be distributed to everyone concerned, including the Owner, and Engineer, within three (3) days of the meeting.

B. Preconstruction Conference: The Contractor will schedule and conduct a preconstruction conference before starting construction, at a time convenient to the Owner and Engineer, but no later than 15 days after execution of the Contract.

1. Attendees: Authorized representatives of the Owner, Contractor and/or Contractor superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.
2. Agenda: Items of significance will be discussed that could affect progress, and may include the following:

a. Tentative construction schedule,
b. Critical work sequencing and long-lead items,
c. Designation of key personnel and their duties,
d. Procedures for processing field decisions and Extra Work Orders,
e. Procedures for RFIs,
f. Procedures for testing and inspecting,
g. Procedures for processing Applications for Payment,

h. Distribution of the Contract Documents,
i. Submittal procedures,
j. Preparation of record documents,
k. Use of the premises and existing building,
l. Work restrictions,
m. Working hours,
n. Owner occupancy requirements,
o. Responsibility for temporary facilities and controls,
p. Procedures for disruptions and shutdowns,
q. Construction waste management and recycling,
r. Parking availability,
s. Office, work, and storage areas,
t. Equipment deliveries and priorities,
u. First aid, and
v. Security,

3. Minutes: The Contractor will record and distribute meeting minutes.

C. Progress Meetings: The Contractor will conduct progress meetings at monthly intervals.

1. Attendees: In addition to representatives of the Owner, Contractor, and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with the Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. The Contractor shall review present and future needs of each entity present, including the following:

1) Interface requirements,
2) Sequence of operations,
3) Status of submittals,
4) Deliveries,
5) Access,
6) Site utilization,
7) Temporary facilities and controls,
8) Quality and work standards,
9) Status of correction of deficient items,
10) Field observations,
11) Status of RFIs,
12) Status of proposal requests,
13) Pending changes,
14) Status of Change Orders and Extra Work Orders,
15) Pending claims and disputes, and
16) Documentation of information for payment requests.

3. Minutes: The Contractor will record and distribute the meeting minutes to each party present and to the parties requiring information.

a. Schedule Updating: The Contractor's construction schedule will be revised after each progress meeting where revisions to the schedule have been made or recognized. The revised schedule will be issued concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01310

SECTION 01322 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs, and
2. Periodic construction photographs.

B. Related Requirements:

1. Section 01770 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.

1.2 INFORMATIONAL SUBMITTALS

A. Key Plan: The Contractor shall submit key plan of Project site with notation of vantage points marked for location and direction of each photograph. Include same information as corresponding photographic documentation.

B. Digital Photographs: The Contractor shall submit unaltered, original, full-size image files as attachment to weekly reports.

1. Digital camera should have a minimum sensor resolution of 8 megapixels.
2. Identification: Provide the following information with each image description in the file metadata tag:

a. Name of Project,
b. Date photograph was taken, and
c. Description of vantage point, indicating location, and direction (by compass point).

C. Include date photograph was taken if not date stamped by camera.

D. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

E. Unique sequential identifier keyed to accompanying key plan.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in JPG format, with minimum size of 8 megapixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. The Contractor shall have a camera on site at all times for Ameren's Construction Project Lead's use. Camera should have a date stamp feature and software to download photos to computer.

B. General: Photographs should be taken using the maximum range of depth of field, and in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. The Contractor shall maintain key plan with each set of construction photographs that identifies each photographic location.

C. Digital Images: The Contractor shall submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: The date and time will be included in file name for each image.
2. Field Office Images: One set of images will be maintained accessible in the field office at Project site, available at all times for reference. The images should be identified in the same manner as those submitted to Engineer and Owner.

D. Preconstruction Photographs: Before commencement of excavation, commencement of selective demolition, and starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points.

1. Flag construction limits before taking construction photographs.
2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
3. Special attention should be given to existing pipeline foundations that are to remain undisturbed.

E. Periodic Construction Photographs: Take 20 photographs monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

F. Project Closeout Photographs: After construction has been completed, the Contractor shall document the condition of the existing oil pipeline foundations. The same vantage points should be utilized for the photographs.

G. Additional Photographs: The Engineer may request photographs in addition to periodic photographs specified.

1. Five (5) day notice will be given, where feasible.

2. In emergency situations, take additional photographs within 24 hours of request.

3. Circumstances that could require additional photographs include, but are not limited to, the following:

   a. Immediate follow-up when on-site events result in construction damage or losses,
   b. Photographs to be taken at fabrication locations away from Project site,
   c. Substantial Completion of a major phase or component of the Work, or
   d. Extra record photographs at time of final acceptance.

END OF SECTION 01322

SECTION 01330 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:

1. Section 01781 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action.

B. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements.

1.3 ACTION SUBMITTALS

A. Submittal Schedule: The Contractor shall submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer and Construction Manager and additional time for handling and reviewing submittals required by those corrections.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Engineer's Digital Data Files: Electronic copies of digital data files of the Contract Drawings will be provided by Engineer for Contractor's use in preparing submittals.

1. The Engineer will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.

a. The Engineer makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.

B. Refer to Submittal Requirement chart at the end of this section for the submittal required for each section.

C. Coordination: The Contractor shall coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

D. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.

E. Paper Submittals: Place a permanent label or title block on each submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Engineer and Construction Manager.
3. Include the following information for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name of Engineer.
    d. Name of Contractor.
    e. Name of subcontractor.
    f. Name of supplier.
    g. Name of manufacturer.
    h. Submittal number or other unique identifier, including revision identifier.

        1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06100.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06100.01.A).

    i. Number and title of appropriate Specification Section.
    j. Drawing number and detail references, as appropriate.
    k. Location(s) where product is to be installed, as appropriate.
    l. Other necessary identification.

4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Engineer or Construction Manager observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

    a. Contractor to submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Engineer and Construction Manager.

5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Engineer and Construction Manager will return without review submittals received from sources other than Contractor.

    a. Transmittal Form for Paper Submittals: Provide locations on form for the following information:

        1) Project name.
        2) Date.
        3) Destination (To:).
        4) Source (From:).
        5) Name and address of Engineer.
        6) Name of Contractor.
        7) Name of firm or entity that prepared submittal.
        8) Names of subcontractor, manufacturer, and supplier.
        9) Category and type of submittal.
        10) Submittal purpose and description.
        11) Specification Section number and title.
        12) Specification paragraph number or drawing designation and generic name for each of multiple items.
        13) Drawing number and detail references, as appropriate.
        14) Indication of full or partial submittal.
        15) Transmittal number, numbered consecutively.
        16) Submittal and transmittal distribution record.

17) Remarks.
18) Signature of transmitter.

F. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

   a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-06100.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-06100.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Engineer.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:

   a. Project name.
   b. Date.
   c. Name and address of Engineer.
   d. Name of Contractor.
   e. Name of firm or entity that prepared submittal.
   f. Names of subcontractor, manufacturer, and supplier.
   g. Category and type of submittal.
   h. Submittal purpose and description.
   i. Specification Section number and title.
   j. Specification paragraph number or drawing designation and generic name for each of multiple items.
   k. Drawing number and detail references, as appropriate.
   l. Location(s) where product is to be installed, as appropriate.
   m. Related physical samples submitted directly.
   n. Indication of full or partial submittal.
   o. Transmittal number, numbered consecutively.
   p. Submittal and transmittal distribution record.
   q. Other necessary identification.
   r. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:

   a. Project name.
   b. Number and title of appropriate Specification Section.
   c. Manufacturer name.
   d. Product name.

G. Options: Identify options requiring selection by Engineer.

H. Deviations: Identify deviations from the Contract Documents on submittals.

I. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Engineer's and Construction Manager's action stamp.

J. Distribution: The Contractor shall furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

K. Use for Construction: The Contractor shall retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer's and Construction Manager's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements:

1. Submit electronic submittals via email as PDF electronic files.

    a. Engineer will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Engineer, through Construction Manager, will return two copies.
3. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Engineer and Construction Manager will not return copies.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Statement of compliance with specified referenced standards.
    d. Testing by recognized testing agency.
    e. Application of testing agency labels and seals.
    f. Notation of coordination requirements.
    g. Availability and delivery time information.

4. Submit Product Data before or concurrent with Samples.
5. Submit Product Data in the following format:

    a. PDF electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Engineer's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 22 by 34 inches.
3. Submit Shop Drawings in the following format:

    a. PDF electronic file.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Submit product schedule in the following format:

a. PDF electronic file.

E. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Construction Quality Assurance Plan.

F. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01770 "Closeout Procedures."

G. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Engineers and owners, and other information specified.

H. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.

I. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

J. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

K. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

L. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

M. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

N. Schedule of Tests and Inspections: Comply with requirements specified in Section 01400 "Quality Requirements."

O. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

P. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

A. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

Electronic Filing: Received, Clerk's Office 05/01/2023

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 01770 "Closeout Procedures."

C. Approval Stamp: The Contractor shall stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ENGINEER'S ACTION

A. General: The Engineer will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: The Engineer will review each submittal, make marks to indicate corrections or revisions required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

C. Informational Submittals: Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 01330

Ameren MISSOURI

Section	Item	Catalog Cuts	Closeout	Coordination Drawings	Design Mixtures	Field Quality Control	Informational	Installer Certifications	Material Test Report	Product Certificates	Product Data	Sample Warranty	Samples	Source Quality Control	Shop Drawings & Design Calculations	Testing and Inspection Reports
01310	Subcontract List						X									
01322	Key Plan						X									
01322	Digital Photographs						X									
01500	Site Plan						X									
01500	Erosion & Sediment Control Compliance						X									
01500	Fire-Safety Program						X									
01700	Survey Certification						X									
01770	Contractor's List Incomplete Items		X													
01770	Certified List Incomplete Items		X													
01770	Certificates of Release		X													
01770	Inspection for Substantial Completion (min 10 days prior)		X													
01770	Final Completion		X													
01781	Record Drawings		X													
01781	Record Specifications		X													
01781	Record Product Data		X													
02060	Pre-demolition Photos or Video (before work begins)						X									
02060	Schedule of selective demolition						X									
02060	Flowable Fill				X					X						X
02200	Earthwork												X			X
02240	Dewatering plan						X									
02250	Site Drainage – Rock Blanket and Energy Dissipator										X					
02250	Geotextile Filter										X		X			
02511	Crushed Stone Paving												X			
02800	HDPE Geomembranes and Polypropylene Turf Grass		X			X		X	X	X		X	X	X	X	X
02821	Chain-Link Fences and Gates	X									X					
02936	Seeding and Mulching									X	X					
02950	Abandonment of Storm Sewer	X							X		X					

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Ameren Energy Generating

SECTION 01356 - SWPPP DESIGN, INSTALLATION, MAINTENANCE AND REMOVAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. A Stormwater Pollution Prevention Plan (SWPPP) has been provided by Ameren. A copy of these plans have been provided, see drawings C-602 and C-603.

B. Refer to Appendix CC for the SWPPP report.

C. Implement, maintain and remove SWPPP. Maintenance of the SWPPP includes adjustments to the SWPPP as deemed necessary by Ameren and any adjustments necessary to control stormwater pollution.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide all equipment and materials, suitable and in adequate quantity, required to accomplish the work as specified herein.

PART 3 - EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. Contractor shall install and maintain SWPPP BMP's during construction as necessary to control and prevent pollution of stormwater runoff leaving the site. Adjust SWPPP as directed and as necessary to prevent stormwater pollution. At an appropriate time after project completion, and only after all disturbed areas are fully vegetated or otherwise protected from erosion in a permanent fashion, remove SWPPP BMPs.

B. Contractor to provide and maintain a proper washdown station.

C. All BMPs shall be inspected weekly by the Contractor and after rainfall events of 1 inch or more. Contractor inspections must be scheduled at least once per week and no later than 48 hours after a rainfall that causes stormwater runoff to occur on-site. A typed inspection report must be delivered to the Engineer after each Contractor inspection.

END OF SECTION 01356

SECTION 01400 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
2. Requirements for Contractor to provide quality-assurance and -control services required by Engineer, Owner, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.
3. Specific test and inspection requirements are not specified in this Section.

1.2 DEFINITIONS

A. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Engineer or Construction Manager.

B. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

C. Construction Quality Assurance (CQA) contractor hired under separate contract by the owner to implement the Construction Quality Assurance Plan.

D. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

E. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

F. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

G. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

H. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Engineer for a decision before proceeding.

1.4 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Description of the Work and test and inspection method.
6. Identification of product and Specification Section.
7. Complete test or inspection data.
8. Test and inspection results and an interpretation of test results.
9. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
10. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
11. Name and signature of laboratory inspector.

B. Manufacturer's Field Reports: Prepare written information documenting tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
5. Other required items indicated in individual Specification Sections.

1.5 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

D. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

E. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

F. Manufacturer's Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.6 QUALITY CONTROL

A. Contractor Responsibilities: Check the CQA plan for responsibilities concerning all tests and inspections.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
2. Notify testing agencies and/or CQA Contractor at least three (3) working days in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

B. Manufacturer's Field Services: Where indicated, engage a manufacturer's representative to observe and inspect the Work. Manufacturer's representative's services include examination of substrates and conditions, verification of materials, inspection of completed portions of the Work, and submittal of written reports.

C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. CQA Responsibilities: Cooperate with Engineer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

E. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.7 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Conducted by a qualified special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Engineer and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Engineer, through the Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, this includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Engineer.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Engineer's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01700 "Execution Requirements."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01400

SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 1B "Summary of Work" for limitations on work restrictions and utility interruptions.

1.2 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Engineer, testing agencies, and authorities having jurisdiction.

B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.3 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire prevention program.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

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B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Engineer, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Section 1B "Summary of Work."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel.

D. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

E. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Install electric power service overhead unless otherwise indicated.

F. Telephone Service: Owner will provide telephone, fax, and computer connections for Contractor supplied construction trailers.

1. At each telephone, post a list of important telephone numbers.

a. Police and fire departments.
b. Ambulance service.
c. Contractor's home office.
d. Contractor's emergency after-hours telephone number.
e. Engineers' offices.
f. Owner's office.
g. Principal subcontractors' field and home offices.

2. Provide superintendent with cellular telephone.

3.3 SUPPORT FACILITIES INSTALLATION

A. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Section 02200 "Earthwork."

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

D. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

E. Waste Disposal Facilities: Paper waster form construction office trailers and waste from installation of new materials to be hauled off by licensed trash haulers. No paper or cardboard waster to be left on site or buried in designated disposal area.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to the SWPPP.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

END OF SECTION 01500

SECTION 01600 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Engineer will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: As specified in Section 01330 "Submittal Procedures."
b. Use product specified if Engineer does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01330 "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
3. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
4. Protect stored products from damage.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. Refer to other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01770 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Engineer will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

2. Manufacturers:

   a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.

C. Visual Selection Specification: Where Specifications include the phrase "as selected by Engineer from manufacturer's full range" or similar phrase, select a product that complies with requirements.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Engineer may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of engineers and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01600

Ameren MISSOURI

SECTION 01700 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Correction of the Work.

B. Related Requirements:

1. Division 1 Section 01770 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.2 INFORMATIONAL SUBMITTALS

A. Certificates: Submit certificate signed by Illinois licensed land surveyor certifying that location and elevation of improvements comply with requirements.

1.3 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in the State of Illinois and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Engineer for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Engineer according to requirements in Section 01310 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Owner or Engineer promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Construction Manager when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including grading, fill and topsoil placement, and utility slopes.

D. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Contractor.

3.4 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

B. Survey Control Points: Survey Control points have been established for this project, but are not limited by the established list. Contractor may establish additional control points as deemed necessary during construction.

C. Benchmarks: Establish and maintain a minimum of two (2) permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

D. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

B. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

C. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

D. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
2. Proceed with patching after construction operations requiring cutting are complete.

E. Patching: Patch construction by filling, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

3.7 PROGRESS CLEANING

A. Site: Maintain Project site free of waste materials and debris.

B. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

C. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

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3.9 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and property adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

END OF SECTION 01700

SECTION 01770 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Requirements:

1. Section 01781 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.2 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.5 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including extra materials, and similar items, and deliver to location designated by Construction Manager. Label with manufacturer's name where applicable.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Instruct Owner's personnel in maintenance of products.
3. Complete final cleaning requirements.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Engineer and Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by SPOC that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.6 FINAL COMPLETION PROCEDURES

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Company requirements.
2. Certified List of Incomplete Items: Submit certified copy of Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Engineer. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Instruct Owner's personnel in maintenance of products.

B. Inspection: Submit a written request for final inspection to determine acceptance. On receipt of request, Engineer and Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Submit list of incomplete items in the following format:

a. PDF electronic file. Engineer, through Contractor, will return annotated copy.

1.8 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

1. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
2. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
3. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
4. Remove tools, construction equipment, machinery, and surplus material from Project site.
5. Remove labels that are not permanent.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective materials, refinishing damaged surfaces. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

END OF SECTION 01770

SECTION 01781 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up record prints.
2. Number of Copies: Submit copies of record Drawings as follows:

a. Initial Submittal:

1) Submit PDF electronic files of scanned record prints and one set(s) of file prints.

b. Final Submittal:

1) Submit record digital data files and three set(s) of record digital data file plots.

B. Record Specifications: Submit one paper copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one paper copy of each submittal.

D. Photographs of the oil pipeline foundations after construction.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised Drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Record data as soon as possible after obtaining it.

2. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as paper copy.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders and record Drawings where applicable.

B. Format: Submit record Product Data as paper copy.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as paper copy.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Engineer's and Construction Manager's reference during normal working hours.

END OF SECTION 01781

SECTION 02060 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Work includes all items described in these specifications and as shown on Site Plan drawings C-101 through C-107.

B. Section Includes:

1. Demolition, removal, and disposal of selected site elements as indicated on drawings:
   a. Above grade steam line and foundations,
   b. Chain link fencing, including but not limited to the mesh, posts, supports, barbed wire, foundations, etc.
   c. Sluice piping and inflow structure at Bottom Ash Pond,
   d. Light poles and wiring around Bottom Ash Pond,
   e. Underground electric lines, boxes, panels, components and monitoring equipment on Berm of Fly Ash Pond,
   f. Other piping and miscellaneous items.
2. Salvage of existing items to be reused or recycled.
3. Temporary removal and replacement.
4. Removal and disposal of Outflow structure and pipe from Bottom Ash Pond.
5. Removal and disposal of Inflow structure, concrete vault structure and inlet pipe(s) from Bottom Ash Pond.
6. Removal and disposal of Outflow structure and plug outlet pipe with flowable fill in the Fly Ash Pond.
7. Removal of underground electric service and utility poles at dock and along north edge of Bottom Ash Pond.

1.2 DEFINITIONS

A. Demolish: Remove existing construction items and legally dispose of.

B. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 PREINSTALLATION MEETINGS

A. Pre-demolition Conference: Conduct conference at Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Pre-demolition Photographs or Video: Submit before Work begins.

B. Schedule of selective demolition activities with starting and ending dates for each activity.

C. Submittals shall be as outlined in Section 01330 Submittals.

1.5 FIELD CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

B. Notify Engineer of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If suspected hazardous materials are encountered, do not disturb; immediately notify Engineer and Owner. Hazardous materials will be removed by Owner under a separate contract.

D. Storage or sale of removed items or materials on-site is not permitted.

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1.6 SALVAGE

A. Contractor may salvage any materials within the scope of demolition, such as, metal piping, chain-link fencing, rock blanket, power poles, light poles, etc.

B. Salvage materials must be approved by Ameren personnel before leaving project site.

1.7 SUBMITTALS

A. Submit design mixture and testing certification of Flowable Fill.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

C. Flowable Fill: Density in place shall be 65 to 100 psi for non-air-entrained or conventionally air-entrained mixtures. Mixture to meet ASTM C403 standards. Provide mix design and specifications to engineers for review prior to beginning work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. When unanticipated electrical or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Engineer.

D. Survey of Existing Conditions: Record existing conditions by use of measured drawings and preconstruction photographs.

1. Comply with requirements specified in Section 01322 "Photographic Documentation."

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

1. Comply with requirements for existing services/systems interruptions specified in Section 1B "Summary of Work."

B. Existing Services/Systems To Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
2. Arrange to shut off indicated utilities with utility companies.

3. If systems are required to be removed, relocated, or abandoned, provide temporary systems that bypass area of selective demolition and that maintain continuity of systems to other parts of building.
4. Contractor to coordinate with local utility to remove and relocate the utility poles along the north side of the Bottom Ash Pond. New dusk to dawn lights and underground service to dock will be installed.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Section 01500 "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to facilities to remain.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Do not use cutting torches until work area is cleared of flammable materials. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
2. Dispose of demolished items and materials promptly.

B. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during demolition.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: All demolished materials from the site are to stay on-site and/or be disposed of in an approved manner.

1. Demolished materials remaining on-site shall be disposed of within the Fly Ash Pond as approved by Owner.
2. Do not allow demolished materials to accumulate on-site.
3. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn demolished materials.

C. The Contractor can salvage any materials within the scope of the demolition.

3.6 CLEANING

A. Clean adjacent areas, on-site or off-site, of debris caused by selective demolition operations. Return adjacent areas to condition existing before demolition operations began.

END OF SECTION 02060

SECTION 02200 - EARTH WORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Moving and shaping ash to the grading shown on the drawings.
2. Excavate the Bottom Ash Pond to elevation 424 and deposit into Fly Ash Pond and backfill with off-site borrow soil to elevation 430.
3. Excavating and shaping Eastern Fly Ash Stockpile area with off-site borrow soil as shown on drawings.
4. Moving, filling, and shaping of materials deposited into Fly Ash Pond.
5. Preparing subgrades for synthetic turf, turf, grasses and roadway.
6. Excavating and backfilling for synthetic turf, turfs, ditches and structures.
7. Excavating and backfilling for anchor trenches.
8. Shaping proposed ditches.
9. Scraping coal pile and removing approximately 18-24 inches and depositing into the Fly Ash Pond.
10. Hauling in and filling with off-site borrow soil.

1.2 DEFINITIONS

A. Ash Material: Consists of Coal Fines, Bottom Ash, Fly Ash, Ash/Soil/Rock mixture.

B. Backfill: Ash or Soil material used as fill.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Engineer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.

F. Fill: Soil materials used to raise existing grades.

G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

H. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

I. Synthetic Turf: A synthetic grass system for closure of mine spoils and landfills; turf is a combination of polypropylene grass tufts underlain by impermeable HDPE geomembrane, i.e. "Closureturf™" or "Hydroturf™".

J. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 QUALITY ASSURANCE

A. Pre-excavation Conference: Conduct conference at Project site.

1.4 PROJECT CONDITIONS

A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.

1.5 SUBMITTALS

A. Submit soil material samples as required by CQA Plan and as outlined in Section 01330 Submittals.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soils:

1. General Fill: Soil Classification Groups CL, ML, GW, GP, GM, SC, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
2. Ash Pond Subgrade within 1 foot of design grade - Soil Classification Groups CL, ML, SC, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; no bottom ash; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
3. Bottom Ash Pond Backfill: Soil Classification Groups GW, GM, GP, GC, SC, SW, SP, SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
4. Access Road on Bottom Ash Berm: Bottom Ash Berm Widening under ClosureTurf™ shall be constructed with Bottom Ash Material only.

B. Unsatisfactory Soils:

1. Unsatisfactory soils also include satisfactory soils not maintained within 4 percent of optimum moisture content at time of compaction.

C. Sand Infill for ClosureTurf™: Natural or manufactured sand material, fine aggregate meeting grain size distribution ASTM C 33 and Specification No. 02800-2.4C.

D. Hydrobinder Infill for HydroTurf™: Proprietary blended material manufactured by Agru America or approved equivalent.

E. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost.

3.2 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.3 EXCAVATION OF BOTTOM ASH POND

A. Excavate to elevation 424.0 and deposit material into the Fly Ash Pond.

B. Backfill Bottom Ash Pond with approved materials.

3.4 REMOVAL OF MATERIAL FROM COAL PILE

A. Remove material from top 18" – 24" of Coal Pile.

B. Deposit material into Fly Ash Pond.

C. Grade Coal Pile to drain.

3.5 MOVING, FILLING, AND SHAPING FLY ASH POND

A. Deposit on-site Ash Materials into Fly Ash Pond.

B. Demolition items, as approved by Owner, shall be disposed of within the Fly Ash Pond.

1. Allow a minimum of 3 feet of Ash Material cover over demolition items to ensure HDPE Geomembrane is protected from possible punctures, etc.

C. Grade and shape Ash Material as shown on drawings

D. Encapsulate Fly Ash Pond with ClosureTurf™ product, see specification section 02800.

3.6 SUBGRADE INSPECTION

A. Proof-roll subgrade with a loaded pneumatic-tired dump truck or equivalent to identify soft areas and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

3.7 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.8 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that is too wet to compact to specified dry unit weight.

3.9 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D1557:

1. Under turf or unpaved areas, scarify and re-compact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 90 percent.
2. For trench backfill, compact each layer of initial and final backfill soil material at 90 percent.
3. For crushed rock backfill, compact each layer of initial and final backfill material to 95 percent.

3.10 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

B. Site Rough Grading: Slope grades to direct water away to prevent ponding. Finish subgrades to required elevations as shown on the drawings.

C. In order to accommodate a final balanced cut and fill, the Contractor may adjust the final grade elevations provided that the profile slopes of the ditches are not reduced less that the minimum slopes as shown on the drawings.

D. Any additional cut shall be distributed evenly throughout the grading area of the Fly Ash Pond so as to produce a balance. There shall be no haul-off of material from this site.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

C. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.12 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.13 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. All waste materials, including trash and debris will be disposed of off-site in an approved manner.

END OF SECTION 02200

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SECTION 02230 - SITE CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Removing existing vegetation.
2. Clearing and grubbing.
3. Stripping and stockpiling topsoil.
4. Removing above- and below-grade site improvements.
5. Disconnecting, capping or sealing site utilities.
6. Temporary erosion- and sedimentation-control measures.
7. Cleaning and shaping existing ditches.

1.2 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property; cleared materials shall be disposed of on-site in the designated disposal area.

1.3 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads and other adjacent occupied or used facilities during site-clearing operations.

B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises.

C. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.

D. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other diggings unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 02200 "Earth Work."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated.

C. Protect existing site improvements from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

E. Refer to Section 01356 for the SWPPP requirements for soil and sedimentation control.

3.3 TREE AND PLANT PROTECTION

A. General: Protect trees and plants remaining on-site.

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Engineer.

3.4 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Engineer's written permission.
3. Should any underground utilities be encountered, stop work immediately and notify SPOC.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Remove top 6 inches of topsoil. Store topsoil for later use.
2. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
3. Use only hand methods for grubbing within protection zones.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other waste materials. Remove subsoil and non-subsoil materials including clay lumps, gravel and other objects more than 2 inches in diameter.

D. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including debris, and dispose of them in the designated on-site location.

END OF SECTION 02230

SECTION 02240 - DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes dewatering of the Ash Ponds and water disposal, which is Contractor's responsibility, if needed.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 FIELD CONDITIONS

A. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1.4 SUBMITTAL

A. Informational: Dewatering Plan

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

2.2 DEWATERING PLAN

A. The Contractor shall prepare a dewatering plan and submit it to Ameren. The plan must be approved by Ameren prior to implementation.

B. The Contractor shall dewater and monitor settlement of the ash as necessary in order to achieve final placement of the ash in accordance with the plans.

C. Geotechnical studies indicate known supersaturated and liquefiable materials on-site.

D. Dewatering well points within the Bottom Ash Pond need to be pumped and drained to a settling basin within the Fly Ash Pond prior to being discharged to the regulated NPDES Outfall 004 location in the Fly Ash Pond (shown on T-002).

E. There is a standing pond of water located at the southwest end of the Fly Ash Pond. This pond is equipped with an existing NPDES outflow structure. The structure is used to control the overflow elevation of the standing water. The Contractor may utilize this water for dust control during grading operations.

F. Water that is removed from Ash Ponds, from dewatering operations, must be discharged in an approved manner under the direction of Ameren personnel.

G. Water conditioning by Ameren personnel (Or contractor hired by Ameren) is available in order to balance pH and remove suspended solids (TSS).

PART 3 - EXECUTION

3.1 PREPARATION

A. Provide temporary grading to facilitate dewatering and control of surface water.

B. Protect and maintain temporary erosion and sedimentation controls, which are specified in Section 02230 "Site Clearing," during dewatering operations.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.

1. Space well points or wells at intervals required to provide sufficient dewatering.
2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.

C. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 WATER DISPOSAL

A. Dispose of water removed from excavations in such a manner as:

1. Will not endanger portions of work under construction or completed.
2. Will cause no inconvenience to Owner or to others working near site.

B. The Contractor shall provide, operate, and maintain all ditches, basins, sumps, culverts, site grading, and pumping facilities to divert, collect, and remove all water from the work areas.

C. Disposal water must be directed to the permitted site NPDES regulated discharge point for disposal. The southwest corner of the Fly Ash Pond shall be utilized to allow contaminants to settle out prior to discharge.

1. The Owner will have CQA personnel monitoring the discharge stream for contaminants in compliance with the site NPDES Permit. The Contractor shall allow time and access for testing the water prior to final discharge.
2. At no time shall dewatering be discharged to the Illinois River without going through the regulated NPDES Outfall 004 at the southwest corner of the Fly Ash Pond.

3.4 OPERATION

A. Operate system to control groundwater to permit excavation, installation of materials, and placement of fill materials on dry subgrades.

1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.

3.5 FIELD QUALITY CONTROL

A. Survey-Work Benchmarks: Resurvey benchmarks regularly during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Engineer if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

END OF SECTION 02240

Ameren MISSOURI

SECTION 02250 – SITE DRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Rock Blanket lining ditches and embankments,
2. Energy Dissipators, and
3. Geotextile Filter.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 SUBMITTALS

A. Product Data: Provide quarry name and material gradation prior to delivery. Provide manufacturer's certification for Geotextile Filter.

B. Product Sample: Geotextile Filter (18" x 18")

PART 2 - PRODUCTS

2.1 ROCK BLANKET

A. Rock Blanket shall meet the requirements of IDOT Specification Section 1005.01.

B. Material shall be stone, quarried from undisturbed consolidated deposits of rock reasonably free of shale. Ledges shall be sufficiently thick to produce the desired dimensions.

C. IDOT Gradation: RR-6, Equivalent Diameter of 24 inches.

2.2 ENERGY DISSIPATOR

A. Energy Dissipator shall meet the requirements of IDOT Specification Section 1005.01.

B. Material shall be stone, quarried from undisturbed consolidated deposits of rock reasonably free of shale. Ledges shall be sufficiently thick to produce the desired dimensions.

C. IDOT Gradation: RR-4, Equivalent Diameter of 15 inches.

2.3 GEOTEXTILE FILTER

A. Geotextile Filter Fabric shall meet IDOT spec. sect. 1080.03. Material shall be a nonwoven material not less than six (6) ft. wide, weighing no less than 8 oz./sq.yd.

PART 3 - EXECUTION

3.1 PREPARATION OF DITCH OR EMBANKMENT FOR GEOTEXTILE FILTER

A. Grade and compact to a relatively smooth surface free from sharp objects and large stones.

B. Unroll geotextile as smoothly as possible overlapping edges a minimum of 18 inches.

C. Staple or pin geotextile in place.

3.2 INSTALLATION OF ROCK BLANKET AND ENERGY DISSIPATORS

A. Place rock blanket/rip rap immediately after installing filter.

B. Install rock in one operation. Do not dump through chutes or use any method that causes segregation of stone sizes.

C. Be careful not to dislodge the underlying filter when placing the stones.

D. If fabric is damaged, remove rock blanket/energy dissipator and repair fabric by adding another layer, overlapping the damaged area by 12 inches.

E. Where rip rap is used for outlet protection, the rip rap should be placed before or in conjunction with the construction of the ditch so that it is in place when the channel begins to operate.

3.3 FIELD QUALITY CONTROL

A. Contractor to ensure a dense, well-graded mass of stone with a minimum of voids present.

END OF SECTION 02250

Ameren MISSOURI

SECTION 02511 CRUSHED STONE PAVING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes Roadways and drives; IDOT CA6 limestone.
B. This Section includes the geotextile filter located under the crushed stone roadway.

1.2 RELATED WORK

A. Section 02200 - Earthwork.

1.3 REFERENCES

A. ASTM C136- Sieve Analysis of Fine and Coarse Aggregates.
B. American Association of State Highway and Transportation Officials (AASHTO) T27.

1.4 TESTS

A. Gradation of stone material will be performed in accordance with ASTM C136.
B. Gradation of stone material will be performed in accordance with AASHTO No. T2

1.3 SUBMITTALS

A. Product Data:
1. Aggregate source list: submit a list of proposed aggregate sources.
2. Shipping Tickets for granular material delivered to site.

B. Samples:
1. Submit one (1) sample per source for each aggregate for use on the project. Samples shall be at least 1 lb. and shall be obtained and shipped according to ASTM D75.

PART 2 PRODUCTS

2.1 MATERIALS

A. IDOT CA6. Limestone, clean, tough, and durable, free of thin and elongated pieces of soft and objectionable material, graded in accordance with ASTM C136. The aggregate shall be in accordance with the following gradation:

Sieve Size	Percent Passing
1-1/2 inch	100
1 inch	95 +/- 5
1/2 inch	75 +/- 15
No.4	43 +/- 13
No. 16	25 +/- 15
No. 200	8 +/- 4

B. Water: Clean and free of injurious amounts of oil, acid, alkali, salt, organic matter, vegetable matter, or other deleterious substances.

C. Compacted subgrade as defined in section Earthwork 02200.

2.2 GEOTEXTILE FILTER

A. Geotextile Filter Fabric shall meet IDOT sec. 1080.03, it shall be a nonwoven material not less than 6

ft. wide, weighing no less than 8 oz/sq.yd.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify compacted subgrade is dry and ready to receive the work of this Section. Remove and replace or repair all soft or unstable areas to the satisfaction of the Construction Supervisor.

B. Verify gradients and elevations of sub-base are correct.

C. Beginning of installation means acceptance of existing condition

3.2 PREPARE 12" THICK SUBGRADE

A. Prepare subgrade as directed in section 02200 Earthwork.

3.3 INSTALLING GEOTEXTILE FILTER

A. Place the geotextile on the smooth and level subgrade. All depressions, humps, sharp objects, and large stones should be removed.

B. Fabric shall be laid out and stretched as flat as possible.

C. Overlap adjacent rolls a minimum of 18 inches or as specified by manufacturer.

D. Secure fabric with staples, pins, or other suitable methods. Fabric should be secured along the edges and then at overlapping portions.

3.4 PLACING IDOT CA6,

A. Spread the top layer of stone directly from trucks equipped with hydraulic hoists and adjustable tailgates, or with mechanical spreaders, or with spreader boxes to achieve a compacted thickness of 3 inches unless otherwise shown on the plans. If a mechanical spreader is not used, blade the material a sufficient number of times to form the required gradation. Spread stone to a uniform distribution of sizes throughout, remove any segregated areas, and replace with suitable materials.

B. Rolling shall be performed utilizing a self-propelled (10) ton roller.

C. Begin rolling at edges and progress gradually toward the center.

D. Uniformly overlap each preceding track and thoroughly cover the entire surface. A minimum of FOUR (4) complete passes with the roller is required in all areas accessible by the roller.

E. Check the stone for humps, hollows, or other irregularities. Loosen defective areas, remove surplus or add new material as required, re-roll, and treat as necessary to completely eliminate the defects

F. Where access restraints do not permit the use of the rolling equipment specified above, roll to levels specified above using appropriately sized mechanical rolling/vibrating-plate equipment.

3.5 COORDINATION

A. No paving work shall be done or paving materials placed until all excavation and backfill for all utilities and storm water drainage (under the roads and/or drives) is installed, inspected, and has been allowed to settle.

END OF SECTION 02511

SECTION 02800 – HDPE GEOMEMBRANES AND POLYPROPYLENE TURF GRASS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes geosynthetic cover system for ash ponds.

B. Section also includes "batten" and/or "flashing" requirements for sealing penetrations in the geomembrane.

1.2 PERFORMANCE REQUIREMENTS

A. Provide geosynthetic cover system that prevents the passage of water.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for geomembrane liners. Show panel layout, seams, penetrations, perimeter anchorage, and methods of attachment and sealing to other construction (batten and flashing). Differentiate between factory and field seams and joints.

C. Samples: Refer to CQA Plan for sample requirements. These samples will be used as control samples for the type of seams to be installed.

1.4 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Product test reports.

C. Source quality-control reports.

D. Field quality-control reports.

E. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Preinstallation Conference: Conduct conference at Project site.

1.7 WARRANTY

A. Special Warranty: Specified form in which geomembrane manufacturer, geomembrane liner fabricator, and geomembrane liner Installer agree to repair or replace geomembrane liner that fails in material or workmanship or that deteriorates under conditions of normal weather within specified warranty period. Warranty does not include deterioration or failure of geomembrane liner due to exposure to harmful chemicals, gases or vapors, abnormal and severe weather phenomena, fire, earthquakes, floods, vandalism, or abuse by persons, animals, or equipment.

1. Failures include, but are not limited to, the following:

a. Leaks in geomembrane liner.
b. Defects in seams.
c. Cracks and holes in floating cover.

2. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CLOSURETURF™

A. Basis of Design: The intent of the documents and specifications for the product is that the closure geosynthetic cover system shall be "ClosureTurf™" as manufactured by Agru America, Inc.

B. Manufacturers of similar types of material may be submitted for approval of the Engineer prior to bidding.

2.2 HYDROTURF™

A. Basis of Design: The intent of the documents and specifications for the product is that "HydroTurf™" as manufactured by Agru-America, Inc. be used for swales and drainage ways.

B. Manufacturers of similar types of material may be submitted for approval of the Engineer prior to bidding.

2.3 HDPE GEOMEMBRANE

A. Basis of Design: The intent of the documents and specifications for the geomembrane shall be "Super Grip Net Liner" as manufactured by Agru America, Inc.

B. Manufacturers of similar type of material may be submitted for approval by the Engineer prior to bidding.

2.4 MISCELLANEOUS MATERIALS

A. Provide types of adhesive primers, compounds, solvents, and tapes recommended in writing by geomembrane liner manufacturer.

B. Provide manufacturer's standard factory-fabricated assemblies for sealing penetrations. Include joint sealant recommended in writing by geomembrane liner manufacturer and compatible with geomembrane liner, containment conditions, and materials.

C. SAND INFIFLL COMPONENT of the ClosureTurf™ System will meet ASTM C 33; fine aggregate, natural or manufactured sand, gradation shown below:

ASTM C-33-03	
Sieve	Percent Passing
9.5 mm (3/8 in.)	100
4.75 mm (No. 4)	95 to100
2.36 mm (No. 8)	80 to 100
1.18 mm (No. 16)	50 to 85
600 µm (No. 30)	25 to 60
300 µm (No. 50)	5 to 30
150 µm (No. 100)	0 to 10

D. HydroTurf™ HYDROBINDER INFILL COMPONENT is a proprietary cementitious product used as the infill component of the HydroTurf™ system.

E. Cement: brand of Portland Cement, meeting ASTM C150 and will be Type I or Type II, one brand throughout the duration of the contract, conforming to ASTM C387 for high strength mortars, cementitious infill will have a minimum 28 day compressive strength of 5000psi.

2.5 FABRICATION

A. Fabricate geomembrane liner panels from sheets in sizes as large as possible with factory-sealed seams, consistent with limitations of weight and installation procedures. Minimize field seaming.

2.6 SOURCE QUALITY CONTROL

A. See Construction Quality Assurance Plan.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install per manufacturers recommended installation procedures.

B. Examine substrates, with Installer present, for compliance with requirements for soil compaction and grading; for subgrade free from angular rocks, rubble, roots, vegetation, debris, voids, protrusions, and ground water; and for other conditions affecting performance of geomembrane liner.

C. Examine perimeter anchor trench, where geomembrane liner will be secured, for substrate conditions indicated above and for correct location and configuration.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

E. Provide temporary ballast, until edges are permanently secured, that does not damage geomembrane liner or substrate, to prevent uplift of geomembrane liner in areas with prevailing winds.

F. Prepare surfaces of construction penetrating through geomembrane liner according to geomembrane liner manufacturer's written instructions.

G. Place geomembrane liner over prepared surfaces to ensure minimum handling. Install according to Shop Drawings and in compliance with geomembrane liner manufacturer's written instructions. Begin placing geomembrane liner at Project's upwind direction and proceed downwind. Install geomembrane liner in a relaxed condition, free from stress and with minimum wrinkles, and in full contact with subgrade. Do not bridge over voids or low areas in the subgrade. Fit closely and seal around inlets, outlets, and other projections through geomembrane liner. Permanently secure edges.

H. Install battens and/or flashing on required footings and/or utility/power poles.

I. Field Seams: Comply with geomembrane liner manufacturer's written instructions.

J. Installation in Anchor Trench: Install geomembrane liner in trench according to manufacturer's written instructions. Backfill and compact to lock liner into trench.

K. Protect installed geomembrane liner according to manufacturer's written instructions. Repair or replace areas of geomembrane liner damaged by scuffing, punctures, traffic, rough subgrade, or other unacceptable conditions.

L. Before initial placement of turf cover, inspect seams and patched areas to ensure tight, continuously bonded installation. Repair damaged geomembrane and seams and re-inspect repaired work.

3.2 FIELD QUALITY CONTROL

A. See Construction Quality Assurance Plan.

END OF SECTION 02800

SECTION 02821 CHAIN-LINK FENCES AND GATES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes chain-link fences and swing gates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each polymer-coated product and for each color and texture specified, in 6-inch lengths for components and on full-sized units for accessories.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of chain-link fence and gate, from manufacturer.

B. Product Test Reports: For framing strength according to ASTM F 1043.

C. Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which Installer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 CHAIN-LINK FENCE FABRIC

A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with CLFMI Product Manual and with requirements indicated below:

1. Fabric Height: Seven (7) feet plus embedment length into the ground.

2. Steel Wire Fabric: Wire with a diameter of 9 gauge steel wire.

a. Mesh Size: 1 inch

b. Aluminum-Coated Fabric: ASTM A 491, Type II aluminum coating of 0.4 oz/sf

3. Selvage: Twisted top and knuckled bottom.

2.2 FENCE FRAMING

A. Posts and Rails: Comply with ASTM F 1043 for framing, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 based on the following:

1. Fence Height: Seven (7) feet.

2. Heavy Industrial Strength: Material, post shall be made of Allied SS-40 or Wheatland WT-40, sized as follows

a. Line Post: 2.375" OD

b. End, Corner and Pull Post: 4.00" OD

3. Horizontal Framework Members: Intermediate, top and bottom rails complying with ASTM F 1043.

4. Brace Rails: Comply with ASTM F 1043.

5. Metallic Coating for Steel Framing:

a. Type A zinc coating.

2.3 TENSION WIRE

A. Metallic-Coated Steel Wire: 0.177-inch diameter, marcelled tension wire complying with ASTM A 817 and ASTM A 824, with the following metallic coating:

1. Type I, aluminum coated (aluminized).

2.4 SWING GATES

A. General: Comply with ASTM F 900 for gate posts and double swing gate types.

1. Gate Fabric Height: As indicated.

B. Pipe and Tubing:

1. Zinc-Coated Steel: Comply with ASTM F 1043 and ASTM F 1083; protective coating and finish to match fence framing.

C. Frame Corner Construction: Assembled with corner fittings.

D. Hardware:

1. Hinges: 180-degree outward swing.

2. Latches for drive gates shall be Pioneer Latch Model No. 2507 as manufactured by Merchant Metals, Minneapolis, MN

2.5 FITTINGS

A. General: Comply with ASTM F 626.

B. Barbed Wire Arms: Pressed steel, with clips, slots, or other means for attaching strands of barbed wire, integral with post cap; for each post unless otherwise indicated, and as follows:

1. Provide line posts with arms that accommodate top rail or tension wire.

2. Provide corner arms at fence corner posts.

3. Type I, single slanted arm.

C. Finish:

1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./ sq. ft. zinc.

2.6 BARBED WIRE

A. Steel Barbed Wire: Shall be Copperweld Steel Co. "Alumoweld" Four Point Type Light Weight (three 0.080" diameter strands)

2.7 CEMENT

A. Ultimate strength of 3,000 psi at 28 days; 5.5 sack (minimum) of cement per cubic yard; 6.5 gallons per sack of cement; ¾" maximum aggregate size/ 3%-5% air entrainment; mixed per ASTM C94.

PART 3 EXECUTION

3.1 INSTALLATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

D. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements indicated.

E. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

F. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.

2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

a. Exposed Concrete: Extend 1 inch above grade; shape and smooth to shed water.

G. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 30 degrees or more.

H. Line Posts: Space line posts uniformly at 96 inches o.c.

I. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Provide horizontal tension wire at the following locations:

1. Extended along top and bottom of fence fabric.

J. Chain-Link Fabric: Apply fabric to outside of enclosing framework. No gap shall remain between the finish grade and the fence fabric itself. Install edge of fencing fabric into the proposed grades 4-6 inches.

K. Barbed Wire: Install barbed wire uniformly spaced, angled toward security side of fence. Pull wire taut, install securely to extension arms, and secure to end post or terminal arms.

L. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

M. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

END OF SECTION 02821

SECTION 02936 - SEEDING AND MULCHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Seeding and mulching.

1.2 DEFINITIONS

A. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

B. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Certification of grass seed.

1. Certification of each seed mixture for grass.

B. Product certificates.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf establishment.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

1.7 SEEDING AND MULCHING LOCATIONS

A. Seeding and mulching shall occur in all areas within the limits of disturbance outside of ClosureTurf™ limits, rock blanket limits and energy dissipator limits. These areas include but not limited to:

1. Coal Pile
2. Bottom Ash Pond
3. Eastern Fly Ash Stockpile
4. Construction Staging Area

B. Contractor shall obtain approval from Owner prior to Seeding and Mulching.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species:

1. Quality: State-certified seed of grass species as listed below for solar exposure.
2. Quality: Seed of grass species as listed below for solar exposure, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
3. Full Sun:

a. 50 percent Tall (fine blade) Fescue – 4 lbs/1000 sf
b. 50 percent Perennial Rye – 4 lbs/1000 sf

2.2 FERTILIZERS

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.

B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

2.3 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

PART 3 - EXECUTION

3.1 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph.

1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
2. Do not use wet seed or seed that is moldy or otherwise damaged.
3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at a total rate of 4 lb/1000 sq. ft.

C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas.

1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.

E. Protect seeded areas from hot, dry weather or drying winds by applying planting soil within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch, and roll surface smooth.

END OF SECTION 02936

APPENDIX A – SAFETY AND CONTRACTOR REQUIREMENTS

1.0 GENERAL CONTRACTOR SAFETY REQUIREMENTS

Contractor and their employees are responsible for their safety.

1.1 Contractor General Requirements

1.1.1 Contractor supervision and personnel shall obtain site-specific training. This will include, but not be limited to:

- Workman's Protection Assurance (WPA) / Hold Tag Equipment Lock-out
- Hot Works
- Confined Spaces
- Commissioning WPA Procedure
- Other Safety Requirements listed in this specification

Note: Contractor employees may be barred from Ameren property for failure to comply with WPA procedures. Contract may be terminated or Contractor may lose future work for failure to enforce WPA. See the following WPA Authorization Form (Attachment A5) for sign-on access to the Ameren automated WPA system at each plant site.

1.1.2 Contractor administers appropriate disciplinary action if their employees violate Job Working Rules.

1.1.3 Contractor must hold daily job briefings.

1.1.4 All rolling equipment must be inspected prior to use.

1.1.5 Ameren reserves the right to bar any individual from Company property.

1.2 Rules to Live By (RTLB)

Rules to Live By (RTLB) is focused on activities that have the potential to produce a fatality or serious injury. While there are many hazards that can produce serious injuries, the items listed below are so significant that a single violation warrants immediate intervention by the Contractor. Actions determined to be in violation of these rules may result in permanent barring from all Ameren facilities. Ameren may conduct an independent investigation as necessary.

- Fall Protection – Failure to use proper fall protection when there is a risk of a fall that is greater than 6 feet
- WPA (Lock Out / Tag Out) – Violation of a tag, lock or tag-out device that is used for employee and contractor protection.
- Electrical Safety – Failure to follow proper procedures and wear proper personal protective equipment when working on energized equipment.
- Confined Space Entry – Failure to evaluate confined space and perform air monitoring checks prior to entry.
- Rigging / Hoisting – Walking or working under a suspended load.
- Trenching and Shoring – Entering excavation greater than 5 feet deep that has not been properly sloped or shored.

1.2.1 It is the expectation that the Contractor will enforce our RTLB program and discipline the RTLB violators. All violators will be removed immediately from the site, after which the Contractor will be required to formally submit on their letterhead a detailed report on the incident, noting internal meeting(s), additional training that was conducted, and what will be done to prevent a recurrence, prior to return of the employee.

1.2.2 Violations of other safe work practices may result in permanent barring from all Ameren Facilities.

1.2.3 Contractors will be assessed $2,000 per RTLB violation that Ameren personnel find during project. Contractor is to donate assessment to a mutually agreed-upon charity.

1.3 Safe Work Practices

1.3.1 Hard hats with bill facing forward, safety shoes and foam-lined safety glasses with side shields or wrap-around safety glasses **must be worn at all times in all locations** past the Construction Gate. Safety shoes must be compliant with ANSI Z41-1999. Safety glasses must be compliant with ANSI Z87.1-2003 or equivalent.

1.3.2 Wear a hardhat, safety glasses, leather gloves, and a welding helmet when welding.

1.3.3 Wear foam-lined safety goggles over non-safety rated prescription eyewear.

1.3.4 Foam-lined safety glasses shall be worn at all times. Contractor employees who wear prescription safety eyewear shall also have the foam-lined feature.

1.3.5 Face shields must be worn over safety glasses when grinding, chipping, jack hammering, power sawing, handling hazardous chemicals, or performing other tasks that could result in face or eye injury.

1.3.6 Wear appropriate gloves to protect hands from cuts, burns, temperature extremes, chemicals, biological agents or other hazards.

1.3.7 Wear hearing protection when performing noisy work, such as jack-hammering, or where posted.

1.3.8 Hair must be cut or contained above shoulder length and must not interfere with protective headgear.

1.3.9 Shorts, shirts without sleeves or with sleeves rolled up above the shoulder are not permitted.

1.3.10 Gas bottles must be secured to prevent tipping. Gas bottles must be capped or have a regulator installed. Oxy/acetylene bottles must be separated by at least 20-foot or a 5-foot barrier with a one-hour fire rating while in storage.

1.3.11 During welding or "burning":

- Use temporary shielding to protect personnel beside, above and below the work; free falling of sparks below a cutter/welder's feet is not allowed.
- Contain slag, sparks, etc.
- Place weld rod stubs in containers after removal from stingers, and place all other trash in appropriate containers.

1.3.12 Safety harnesses are required when working on surfaces over six (6) feet high that do not have guardrails or other fall protection. Attach lanyards and lifelines to structural members capable of supporting the load requirement (5000 lbs. anchor point).

1.3.13 On portable articulating man lifts, fall arrest is required per manufacturer's specifications. Fall arrest is not required on scissor-type man lifts unless recommended by manufacturer. The lift must be secure and stable prior to use.

1.3.14 For overhead work, rolling scaffolds and mechanical lift platforms are preferred over ladders.

1.3.15 If straight or extension ladders must be used, one worker must hold the ladder until another worker has tied the top to a substantial anchor point. Prior to working above 6 feet off the straight or extension ladder, and leaning beyond the side rails of the ladder, the worker is to don fall protection harness with lifeline, using or establishing an anchor point overhead for clip attachment.

1.3.16 If a step ladder must be used when worker's feet are on or above the fifth rung, then top of ladder must be tied to a substantial anchor or a second worker must hold ladder. When working on step ladder adjacent to and above guard/handrail where there is risk of significant fall over the rail, worker is to don fall protection harness with lifeline, using or establishing an anchor point overhead for clip attachment.

1.3.17 Daily clean-up of the work area is required. Keep stairways and aisles clear at all times. Tie extension cords, welding leads, air hoses, etc., to middle rail of the handrail and/or route overhead.

1.3.18 Barricade at least 6 feet from hole or edge if grating or handrail sections are being removed or installed.

1.3.19 Barricade below lifting/hoisting activities, including both critical and non-critical lifts.

1.3.20 All electrical junction boxes, duct panels, etc., are to be kept closed whenever possible.

1.3.21 All fuel-powered equipment such as welders, generators, compressors and power tools must be used so that the engine exhaust does not present a hazard to personnel inside the building; if this is not possible, then the equipment must be exhausted outside of the facility. Equipment near doors must be positioned so the exhaust will not enter the facility when the doors are open. In areas where fuel-powered equipment is being used, verify that carbon monoxide levels are safe by using a direct reading instrument that is capable of monitoring for carbon monoxide.

1.3.22 Plant fire hose stations and fire hydrants shall NOT be used for routine work unless specifically authorized by the Plant.

1.3.23 If the plant allows Contractor employees to use elevators, observe the following rules:

- No equipment on elevators may extend through the roof access opening.
- Transport bulk materials in freight elevators and obey the posted weight limits.
- Only tools and materials that can be carried by hand are allowed on passenger elevators.
- Contractor shall coordinate with Site Contact before any plant elevator is used to transport asbestos.
- Construction elevator (when available) is the preferred transport system for asbestos.
- All asbestos shall be double bagged before transported.
- No plant personnel other than asbestos workers shall be on elevators when asbestos is transported.

1.3.24 Qualified electricians are required to wear fire-retardant (FR) PPE when working on exposed, energized circuits. FR PPE must meet arc flash labels and be appropriate for tasks being performed.

1.3.25 Reflective safety vests must be worn by all personnel who work on or near active highways, roads, or parking lots. Vests are also required for other work that places personnel near motor vehicles such as flaggers, riggers, survey crews, etc. ANSI/ISEA 107, Class III high-visibility reflective safety vests shall be worn for maximum visibility. Ameren may require vests on other projects.

1.3.26 Ground Fault Circuit Interrupters (GFCI) shall be used to protect all 120 VAC electrical equipment including electric hand tools & cord sets. Use of 480 VAC GFCI is required when working in wet locations.

1.3.27 Adding slugs within electrical devices requires written approval by Ameren representative. Equipment rated fuses and/or circuit breakers shall not be removed and replaced with ones of different set parameters without written approval by an Ameren representative

1.3.28 Contractor shall follow safety requirements for working on elevated platforms per Elevated Platform Safety Requirements (Appendix Y).

1.3.29 We want this to be a SAFE job. YOU CAN HELP. Report all unsafe acts and conditions to your Supervisor. Consult a Contractor or Ameren Supervisor if there are any questions about work rules or safety requirements.

1.4 Other Safety Requirements

1.4.1 If outages are required, the Contractor shall coordinate with the SPOC to obtain lock-outs and releases in accordance with the Plant's WPA/Hold Card procedures and operating practices. Equipment with a WPA/Hold Card tag shall never be serviced or removed.

1.4.2 Contractors shall comply with all OSHA requirements for work in permit-required confined spaces. Contractors shall obtain information from the SPOC on the location and other pertinent information regarding confined space entry. Any entry involving both Contractor and Ameren employees shall be coordinated through the SPOC. For reference, review Appendix Z for a representative list of identified confined spaces at Ameren Energy Centers. Appendix Z shall be used as a guide and not be considered a complete list.

1.4.3 Only qualified and authorized persons shall work on energized electrical equipment as per Ameren procedure AUE-ADM-5002, Energized Equipment Electrical Safety Program. If applicable to specified work scope, the SPOC will supply a copy of AUE-ADM-5002.

Contractor shall not work on energized equipment without the express, written consent of the SPOC. In no case shall Contractor work on or near (within reach of) energized equipment without the use of appropriate insulated tools to perform the work. Violators of this policy will be subject to disciplinary action, including a minimum $10,000 fine, and up to and including termination of employment.

1.4.4 All lifting/hoisting activities near overhead, high tension power lines must include awareness of and observance of the following safe working clearances:

Minimum Clearance Distance	
Voltage (kV)	**Clearance (feet)**
Up to 50	10
Over 50 to 200	15
Over 200 to 350	20
Over 350 to 500	25
Over 500 to 750	35
Over 750 to 1,000	45

1.4.5 Ameren must review contractor qualifications before contractor employees may work in areas with high voltage equipment (over 600 volts).

1.4.6 Contractor shall coordinate hot work, (i.e., welding, brazing, heating and cutting), with Company personnel to assure that Ameren safety requirements are met as outlined on Hot Work Permit (Attachment A8).

1.4.6.1 Hot Work Checklist/Permit must be utilized when performing hot work such as welding, cutting, grinding, or any other activity that produces sparks. Contractor may use their own forms or Ameren's but work shall be coordinated through the SPOC.

1.4.7 Plant equipment identified with a nuclear radiation symbol (as seen below) is NOT to be serviced by unauthorized personnel):

1.4.8 All equipment on the project shall be used in accordance with Federal, State, and Local S&H requirements in addition to the manufacturer's instructions and guidelines. Equipment shall not be modified in any way for use other than what the manufacturer intended.

1.4.8.1 Any alterations must be approved by the manufacturer in writing. Only trained and authorized persons shall operate machinery or equipment.

1.4.8.2 Use hand-held power tools only for their intended purpose. Do not use tools that are broken, have dull blades, dull bits, have damaged cords, or have damaged/missing guards. Hand-held power tool switches shall not be modified by any means to maintain power without constant trigger pressure. (Ref. OSHA 29CFR1910.243.

1.4.8.3 All Grinders guards/handles must remain on grinders at all times. If a guard or handle is required to be removed because of a tight work area, a permit must be completed and maintained at work location. See Grinder Plan (Attachment A6).

1.4.9 Ameren expects that all Electrical Contractors will follow the common work practice that a check of all wires being demoed is performed to ensure that all wires are dead and de-terminated before wrecking. If wires are found live, they will be de-energized and re-verification will be made prior to wires being terminated or cut.

1.4.10 Barricade Tape

NOTE: Do not rely on barricade tape and flags to prevent a fall that is more than 6 feet.

- **When attended, install barricade tape no less than 6 feet from opening.**
- **Use fall protection if personnel are working closer than 6 feet to the opening.**
- **When unattended, cover the floor opening with a temporary cover, or temporary handrails 42 inches in height that include a mid-rail and toe board. Temporary covers must be able to support at least twice the load to which they will be subjected (including people, equipment and/or vehicle traffic).**
- **Temporary covers must be secured when installed in such a way as to prevent accidental movement by wind, traffic, or employees.**

1.4.10.1 Barricade tape must be used to warn employees about a hazard or restrict employees' access to a hazardous area. Barricade tape must have an information tag listing the responsible person, date of erection, and purpose. Barricade signs shall indicate the Contractor, reason, and expiration date/time. Remove the barricade when work is completed. See Barricade Tag (Attachment A4).

1.4.10.2 Any employee may erect barricade tape. The person responsible for the barricade tape must remove it when the hazard no longer exists.

NOTE: Any time red barricade tape is to be used, the Contractor must inform the Construction Project Lead/SPOC, who in turn will notify the Shift Supervisor.

- **Red barricade tape** shall be used to warn personnel DO NOT ENTER dangerous areas. These areas may only be entered with authorization from the person who erected the barricade.
- **Yellow and magenta barricade tape** shall be used to warn personnel DO NOT ENTER an area because radiography is creating a radiation hazard.
- **Yellow barricade tape** shall be used to warn personnel of immediate hazards that have the potential to cause injury. Areas barricaded with yellow may be entered once the hazard is identified and can be avoided.
- **Green barricade tape** shall be used to warn personnel of possible exposure to hexavalant chromium. Respiratory protection is required in these areas.

Contractors are responsible for compliance with the OSHA Regulation on Hexavalant Chromium. "Regulated Areas" shall be clearly demarcated with **Green** barricade tape with a caution tag that clearly states the hazard in the work area (e.g., "Hex Chrome Exposure – Respiratory Protection Required"). In general, regulated areas shall be established a minimum distance from the activity as described below:

1. 5 Feet – Welding on boiler tubes, steam piping and other materials that contain 2.5% chromium or less
2. 10 Feet – Welding on Stainless steel and other materials that contain more than 2.5% chromium.
3. 20 Feet and/or Visible plume – Plasma arc cutting, air arc cutting, chamfer-trodes, cut-trodes and other processes lacking sufficient air monitoring data by Ameren for the protection of our employees.

Contractors are responsible for air monitoring as required for their employee protection and validation of engineering controls. The guidelines for barricading are based on employee exposures based on collection of data by Ameren. These distances are guidelines and may be increased or decreased based on air monitoring data. Air monitoring data for each job shall be furnished to the Industrial Hygienist in the Ameren Corporate Safety Department.

- A Nuclear Radiation Sign (see Item 1.4.7 above) is used to warn unauthorized personnel not to tamper with or remove instruments or equipment.
- Flashing yellow lights may be used with barricades.
- Other barricades may be used for roadwork and for other special situations.

1.4.10.3 When determining and setting overhead load path barricade boundaries, Contractors shall include within the boundary the potential for dropping load during load swing (failed load path). All elevations affected per this potential 'failed load path' shall be barricaded.

1.4.11 Incident/Accident Reporting

1.4.11.1 In the event of incident/injury to a Contractor or Subcontractor employee, the SPOC shall be notified ASAP and a written report provided no later than 24 hours after incident/injury.

1.4.11.1.1 This notification shall include a detailed description of the accident or injury, including the names of those involved. (Incident/Accident Investigation Report (Attachment A1)) and (Witness Statement (Attachment A2)) must be utilized to provide the required notification.

1.4.11.1.2 OSHA Recordable injuries and minor injuries requiring first aid must be recorded using the First Aid Register (Attachment A3), which must be forwarded to the SPOC.

1.4.11.1.3 On Ameren Coordinated Insurance Program (ACIP) projects, copies of all first reports of injury and supporting investigation information shall be faxed to the designated claims manager and ACIP broker (see Ameren Safety Supervisor for contact numbers).

1.4.11.2 **For any serious incident or injury:**

- **First — Notify the Plant Shift Supervisor or designee immediately.** The Shift Supervisor will make the Emergency call and implement appropriate Plant Emergency Response procedures.
- **Second — Provide First Aid for the injured** as required until professional Emergency Responders arrive.
- **Third — Secure the area** to ensure safety of other personnel.
- **Fourth — Notify the SPOC** via phone, PA, radio, or in person.

1.4.11.3 The accident scene must be secured for accident investigation. Equipment or material can only be moved to prevent further injury until a review of the accident is completed.

1.4.11.4 Follow up verbal messages to the SPOC with written notifications within 24 hours as directed in Item 1.4.11.1.

1.4.12 Imminent Danger Situations

1.4.12.1 Contractor must suspend work immediately upon discovery of any situation that may, in their opinion, reasonably be expected to cause serious physical harm, illness, death, or significant environmental or equipment damage.

1.4.12.2 S&H concern(s) must be corrected, to the satisfaction of the Contractor and Company, before work may resume.

1.4.12.3 Examples of "imminent danger" situations may include, but are not limited to the following:

- Falls from elevations
- Excavations not properly sloped or shored
- Radiation hazards

- Electrocution hazards
- Injury to the public
- Unsafe operation of vehicles, machinery or heavy equipment
- Improper or non-existent WPA/Hold Card equipment lockout
- Release of hazardous substances (OSHA 40CFR Part 302) into the environment in excess of the reportable quantity
- Release of asbestos outside of containment work areas

1.4.13 Abandoned Piping and Demolishing Abandoned Piping

Ameren expects all Contractors to follow the Guidelines for Abandoned Piping and Demolishing Abandoned Piping (Attachment A20) while performing work on piping and/or utilities which are considered to be abandoned or will be abandoned in place.

1.4.14 Excavations

1.4.14.1 Contractor shall non-destructive excavate all underground construction activities, unless given approval by the SPOC to do otherwise.

1.4.14.2 High Suction Vacuum Contractors working at the Ameren site must have a vacuum relief valve located within equipment, a vacuum break at the point of operation, along with equipment that is grounded while operating.

2.0 WORKERS PROTECTION ASSURANCE PROCEDURE FOR OUTSIDE CONTRACT OR CONSTRUCTION PERSONNEL

GENERAL

It is necessary to assure the safety of outside contract personnel and Ameren personnel throughout construction of new system equipment and/or modification of existing system equipment. The following is a brief outline of procedures, to guide outside contract personnel in dealing with Ameren operating authorities to obtain Worker's Protection Assurances (WPA).

2.1 Definition

2.1.1 Worker's Protection Assurance

WPA is the name given to the process used by Ameren to ensure the safety of those who work on generation, transmission and substation equipment.

2.1.1.1 Its primary purpose is to ensure the SAFETY of the worker.

2.1.1.2 The Ameren WPA system uses a series of Tags and a Sign-On procedure.

2.1.1.3 The reliability and integrity of the WPA process relies upon all persons on the plant site understanding and honoring the WPA Tags and Sign-On procedure.

2.1.1.4 WPA is the Operating Authority's assurance to the person obtaining Worker's Protection Assurance that (see Operating Authority below):

Either 1) The equipment covered by the Worker's Protection Assurance has been completely isolated from energy sources (see Out of Service below).

Or 2) The equipment is placed in a special status requested by the person receiving the Worker's Protection Assurance (see Local Control below).

2.1.2 Types of WPA Authorities

2.1.2.1 Custody Authority

2.1.2.1.2 Custody Authority is the person responsible for and "in charge" of all of the equipment in a system or power plant (usually the Plant Manager).

2.1.2.2 Jurisdictional Authority

2.1.2.2.1 Jurisdictional Authority is the individual or group of individuals responsible for the overall direction and coordination of Ameren system equipment.

2.1.2.2.2 Jurisdictional Authority of Plant Equipment (coal pile to turbine) is the Plant Operating Supervisor.

2.1.2.2.3 Jurisdictional Authority (generator to Electrical System) is the Transmission Dispatcher / Power Dispatcher.

2.1.2.3 Functional Authority

2.1.2.3.1 Functional Authority is the individual or group of individuals who perform or direct someone else to perform detailed operations, such as switching or valving.

2.1.2.3.2 Functional Authority of Most Plant Equipment (coal pile to turbine) is the Operating Supervisor.

2.1.2.3.3 Functional Authority (Electrical System) is the Transmission Dispatcher.

In a power plant, one person, the Operating Supervisor in the Control Room, approves and issues the WPA.

2.1.2.4 Functional Agents

2.1.2.4.1 One type of Functional Agent is the Unit Operating Engineer (UOE) who creates the documentation.

2.1.2.4.2 Another type of Functional Agent is the Plant Operating Engineer (POE) who performs the work and hangs the tags.

The Plant's UOE and POE always perform the above duties – never Contractor personnel.

2.1.3 WPA Isolation Point

2.1.3.1 A WPA Isolation Point may be any of the following energy-isolating devices:

- Switch
- Circuit Breaker
- Valve
- Coupling
- Drive Belt
- Chain

2.1.4 Boundary

2.1.4.1 A Boundary is a collection of energy-isolation devices that form a "zone of protection or control" around the equipment to be serviced.

- The status of equipment within a WPA Boundary can only be changed after the Holder has Signed-Off the WPA and the WPA tag(s) have been removed.

2.2 Equipment Covered By Worker's Protection Assurance

2.2.1 All system equipment under the jurisdiction of an Operating Authority must be covered by Worker's Protection Assurance when it is to be worked on or tested.

2.2.2 The only equipment that can be covered by Worker's Protection Assurance is equipment under an Operating Authority's jurisdiction.

2.2.2.1 Equipment connected to energy sources but not released to the jurisdiction of an Operating Authority can only be protected by Worker's Protection Assurance on the isolating device (or devices) between the energy source and the equipment.

In this case it is only possible for the Operating Authority to assure the person receiving Worker's Protection Assurance that the particular isolating device(s) connecting the new equipment to his/her energy sources is protected and he/she cannot assure the person receiving the Worker's Protection Assurance that the equipment is completely isolated. Therefore, it is better for all new equipment to be released to the jurisdiction of an Operating Authority as soon as possible.

2.3 Description and Purpose of Tags

2.3.1 General Notes

2.3.1.1 When you see a WPA tag on equipment, it is telling you to stay clear of the equipment and keep hands off (violating WPA tags will result in disciplinary action up to and including termination).

2.3.1.2 Only the Functional Authority of the equipment may order tags to be placed or removed.

2.3.1.3 Tags will ordinarily be executed and attached by an Operator or his agent.

2.3.1.4 Tags, record sheets and WPA sheets will have the equipment name, etc., along with the serial number of the WPA record.

2.3.2 Function Authority's Hold Off Tag

2.3.2.1 Definition

2.3.2.1.1 The Hold Off is an inviolable order of a Functional Authority that the disconnect device(s) which it is intended to cover must not be closed (or opened in the case of valves) under any circumstances unless definitely ordered or approved by the Functional Authority and then only if the Hold Off tag is first ordered removed.

2.3.2.2 Issued to

2.3.2.2.1 Only to the Functional Authority (never to a worker).

2.3.2.3 Usage

2.3.2.3.1 The Hold Off is an Operating Authority's tool which he may choose to use any time he feels it would contribute to a safer working environment.

2.3.2.3.2 To properly isolate equipment from all sources of normal energy and tag them with Hold Off tags so the Functional Authority may issue an Out of Service or Restraint to a supervisor or workman so work on designated equipment may proceed.

2.3.2.4 Equipment Status

2.3.2.4.1 Operator must obtain the approval of, or be acting under the orders of, his Functional Authority before changing the status of, or working on any equipment bearing a Hold Off tag.

2.3.3 Worker's Hold Off Tag

2.3.3.1 Definition

The Worker's Hold Off is the method by which the Holder of a Local Control isolates equipment he is working on under the Local Control.

2.3.3.2 Workers will create their own Worker's Hold Off tag by legibly signing a blank Power Plant Hold Off Tag. If the Holder of a Local Control wants to work on the equipment, it must first be isolated from its energy supplies. The Holder would open the breaker, close the valves, etc. to isolate the equipment. The Holder must then hang a Worker's Hold Off on

top of the Local Control to ensure the breaker or valves remain in the de-energized position. A Worker's Hold Off tag when placed has the same meaning as a Functional Authority's Hold Off. The Holder would need to remove the Worker's Hold Off prior to closing the breaker or opening the valves and operating the equipment.

2.3.3.3 A Worker's Hold Off can only be placed over a Local Control Tag. It cannot be placed by itself.

EXAMPLE OF HOLD OFF TAG

EXAMPLE OF WORKER'S HOLD OFF TAG

Worker's Hold Off

Worker's Hold Off tag to be placed over plant-issued Local Control

2.4 Types of Worker's Protection Assurances

The following types of Worker's Protection Assurances are issued during construction at power plants:

2.4.1 Out of Service (Issued under Hold Off Tag)

2.4.1.1 Definition

- The Operating Authority's assurance that the equipment designated is properly isolated from all known energy sources and is appropriately tagged so that it will remain de-energized until the Out of Service is released.

2.4.1.2 Energy Status

- Isolated from all normal sources and emergency back-up energy sources.
- This does not relieve the person obtaining the protection of the responsibility of making prescribed tests or observations to assure himself that the equipment is safe

to work on. Points of isolation and points not to be changed are tagged, where possible, and those points cannot be changed while the Out of Service is in effect. However, equipment inside the zone of protection and not tagged, may be manually operated or tested, since it is in a de-energized state.

2.4.1.3 Usage

- Maintenance, including complete removal and disassembly.

2.4.1.4 Issued to

- Supervisors or Workers when authorized by Custody Authority.

2.4.1.5 Persons Covered

- Holder and anyone working directly for or with the Holder.

2.4.1.6 Physical Location of Holder

- Does not have to remain on Plant property.

2.4.1.7 Duration

- No time limitations. Remains in effect until equipment is ready to be restored to service.

2.4.1.8 Predominance

- Unlimited number of Out of Services may be issued on a single piece of equipment by various people for various reasons. Multiple tags may be required for isolation.

2.4.2 Restraint

2.4.2.1 Definition

- The Restraint, which is issued on the Functional Authority's Hold Off, is an assurance given by the Functional Authority to the person to whom it is issued that the equipment it covers has been properly isolated from its energy sources and that normal voltage will not be applied while the Restraint is in effect.

2.4.2.2 Energy Status

- Isolated from all normal sources and emergency back-up energy sources.

2.4.2.3 Usage

- The person to whom the Restraint is issued shall have control of the application of test energy in that his/her consent must be obtained before applying external energy of any magnitude, and he/she must be informed when the test is completed. Thus, the person shall be familiar with the status of the equipment at all times, and to this extent the person shall be responsible for seeing that other persons working on equipment with that person or under that person's specific direction are protected against the application of test energy.

- The operator of the high-energy source will direct test and connections required, following established standards or procedures or in special cases, specific instructions of the Functional Authority. The operator of the high-energy test source will communicate directly with the person who has the Restraint, but the operator may at no time apply energy until the Holder of the Restraint has given the operator permission to proceed.

2.4.2.4 Issued to

- Supervisors or Workers when authorized by Custody Authority. In cases where several workers will work on the equipment tested, a qualified worker or supervisor shall be designated to act coordinator on the job, and that person shall obtain the Restraint.

2.4.2.5 Persons Covered

- Holder and anyone working directly for and with the Holder.

2.4.2.6 Physical Location of Holder

- Must remain on Plant property and in control of the job. If the Holder leaves the site of the test, he/she must remain "on-call." The Holder shall not release the Restraint until all persons are removed from the equipment and informed of the intended release.
- The performance of maintenance will be permitted simultaneously with testing on equipment, provided that adequate safety can be maintained between the two jobs.
- If electrical testing is required, the procedures set forth in the System Operating Manual under Restraint, Item 207, will be followed.

2.4.2.7 Duration

- Released before Holder goes off duty for the day.

2.4.2.8 Predominance

- Only one Restraint and no other WPA.

2.4.3 Local Control

2.4.3.1 Definition

- An authority granted to a person (other than a regular operator) that permits him/her to operate or direct operation of equipment and gives him/her the assurance that no operations will be performed on the equipment unless requested or personally approved by him/her.

2.4.3.2 Energy Status

- May or may not be de-energized. This is why different tags are used. The Functional Authority's Hold Off is not in place for this type of WPA.

2.4.3.3 Usage

- Short duration maintenance or troubleshooting.

2.4.3.4 Issued to

- Supervisors or Workers when authorized by Custody Authority. Worker must give the reason for the request. Worker must specify if equipment is to be energized or isolated for him/her.

2.4.3.5 Persons Covered

- Holder and anyone working directly for or with the Holder.

2.4.3.6 Physical Location of Holder

- Must remain on Plant property and in direct control of the job since he/she is responsible for the safety of his/her workers.

2.4.3.7 Duration

- Released before Holder goes off duty. New equipment before acceptance has no time limit.

2.4.3.8 Predominance

- Only one Local Control and no other WPA.

EXAMPLE OF LOCAL CONTROL TAG

2.4.4 Clearance

2.4.4.1 Definition

- A Clearance is the assurance to Holder that system or equipment for which it is issued has been properly isolated from its normal energy sources (including any emergency back-up energy sources) and will remain isolated as long as Clearance is in effect.

2.4.4.2 Usage

- Used whenever it is necessary to completely isolate a system or piece of equipment from its normal energy sources (including any emergency back-up energy sources) to perform the desired work.

2.4.4.3 Issued to

- Supervisors or Workers when authorized by Custody Authority.

2.4.4.4 Persons Covered

- Holder and anyone working directly for or with the Holder.

2.4.4.5 Physical Location of Holder

- Must remain on Plant property and in direct control of the job since he/she is responsible for the safety of his/her workers.

2.4.4.6 Duration

- Released before Holder goes off duty.

2.4.4.7 Predominance

- None. An unlimited number of Clearances may be issued concurrently on a system or piece of equipment. Clearances may also be issued concurrently with Out of Services.

2.5 Exception

2.5.1 If a person holding Worker's Protection Assurance on a piece of equipment is not available and it is necessary because of plant or system emergency to place that piece of equipment in service, the Worker's Protection Assurance can be released to the Operating Authority by a person designated by the Holder of the Worker's Protection Assurance provided that:

2.5.1.1 Every attempt has been made to contact the holder of the Worker's Protection Assurance

and

2.5.1.2 A thorough examination by the person releasing the equipment reveals the equipment to be in proper operating order.

3.0 COMMISSIONING JURISDICTIONAL CONTROL AND EQUIPMENT TAGGING

3.1 Commissioning Team Leader, Commissioning Engineer and Specialist

3.1.1 Ensure the following, once a Construction Turnover Acceptance Form is signed by commissioning team leader:

- Any activities on the turned over system not authorized by a member of the Commissioning Team will promptly cease.
- Any Construction Cards within the boundaries of the turnover are promptly removed.

> **NOTE**
> Plant based WPA will be used if commissioning an existing system in the plant or if the new system is tied to existing plant systems. The sole WPA authority would be the control room.

3.1.2 Request "System Under Test" card or applicable WPA based on boundaries turned over to commissioning.

> **NOTE**
> In case the new system is independent of the existing plant. "System Under Test" card will be used and administered by commissioning.

3.1.3 Maintain AUE-FRM-ADM-2155-07, *System Under Test Card Log.*

3.1.4 In the event that a positive isolation device does not exist in a system being turned over, that system's boundary will be extended into the adjacent system to the first point of positive isolation.

4.0 SAFETY AND HEALTH

4.1 Contractor shall ensure worker and public safety during the course of this project.

4.1.1 Contractors must comply with all applicable Company, Federal, State, and Local health, safety and environmental regulations including, but not limited to, those concerning:

- Safety & Contractor Requirements (Appendix A) and Job Working Rules (Appendix B)
- Public and worker health and safety
- Public's "Right to Know"

- Fire safety
- Air and water quality
- Flammable materials storage
- Spill control, response and cleanup
- Hazardous and non-hazardous waste handling, identification and disposal

NOTE: Ameren's policies and procedures applicable to Contractors are available on www.ameren.com under Business Partners Suppliers / Standard Contracts

4.1.2 Refer to Ameren's Contractor's Substance Abuse Policy AUE-07-01 (Attachment A15) for minimum substance abuse testing requirements.

4.2 Contractor must have a full-time company corporate Safety Director who oversees and maintains the site safety program and site safety person, unless waived by the Ameren Manager of Construction. This person must also be available for safety-related questions and concerns. A full-time company safety person must also be onsite for each shift for the entire duration of the project. The cost for the safety person shall be broken out in the bids. Resumés of the safety person who will be associated with the project must be submitted with the bid.

4.2.1 Ameren reserves the right to request the safety representative be removed from the project and be replaced with a more competent individual, if they are not fulfilling expectations.

4.3 With contract bid, Contractors shall submit:

- Contractor Safety & Health Data Form (Attachment A9) (unless specifically exempted from this provision by Company).
- Their company's S&H program manual

4.4 After award, Contractor shall submit:

- A project-specific S&H Action Plan, including an Emergency Response Action Plan that is in accordance with Ameren, Federal, State & Local requirements.
- At a minimum, Attachment A21 – Site-Specific Safety Plan (SSSP), shall be filled out in its entirety. The SSSP shall be submitted to Ameren for review, comment and approval. Editable version of Attachment A21 is to be supplied after issuance of PO.

4.5 At mobilization, Contractor shall:

- Appoint a competent onsite S&H representative who will coordinate Contractor S&H activities, hazardous material and waste handling. The S&H representative will work with Ameren personnel on S&H related issues, and implement S&H rules necessary for safe execution of the project.
- Supply to the SPOC the frequencies of all walkie-talkie 2-way radios they intend to use. Frequencies must be listed to four (4) decimal places. Authorization for Two-Way Radios (Attachment A14) must be submitted to the designated SPOC.

4.6 Contractor shall be responsible for tool inspection/maintenance in accordance with the requirements of OSHA standards and manufacturer's recommendations/instructions.

4.7 Handling of Materials and Waste

4.7.1 If project involves use or presence of chemicals or products that are regulated under Section 112 (r) of the Clean Air Act, Sections 302 & 304 of Emergency Planning & Community Right to Know Act, OSHA 29CFR1926.65 or 29CFR1910.120, then Contractor has the choice of adopting the plant's Health and Safety Plan (HSP) or developing a similar plan that is at least as protective and compliant

If Contractor is responsible for arranging to dispose of a hazardous or otherwise regulated waste where Ameren is identified as the generator of the waste, Company shall review, and approve or reject the waste disposal method and/or facility.

Contractor site personnel shall read and acknowledge by signature that they will comply with the applicable HSP.

Certification of individual training is required prior to hazardous waste operations as defined by OSHA 29CFR1910.120 or equivalent applicable state regulations.

4.7.2 Contractor shall identify as part of the bid, and be prepared to discuss upon award of Contract, the quantities, timetables and characterization, of wastes generated during project.

4.7.3 Contractor shall minimize amount of waste generated and shall discuss waste handling, manifest preparation, record keeping, and disposal with the SPOC in advance of these activities. Contractor should coordinate waste handling Vendors/Subcontractors with Company personnel.

4.7.4 Contractor shall handle, package, label and store wastes in accordance with Ameren, Federal, State and Local requirements.

4.7.5 Contractor shall remove such wastes from the premises in a timely manner for treatment, storage and/or disposal in full compliance with applicable laws, regulations and ordinances, including documentation requirements.

4.7.6 If Contractor is considered the sole generator of waste, then, such waste is sole responsibility of Contractor, and Ameren assumes no responsibility for Contractor's compliance with applicable regulations.

4.7.7 Contractor shall notify the SPOC before using chemical/material that could create noxious or toxic vapors/fumes.

4.7.8 For materials brought onto jobsite, Contractor shall make copies available (upon request) of the Safety Data Sheets (SDS) to the appropriate personnel on the worksite.

Contractor shall provide written notification to the SPOC of any material requiring an SDS that is brought onsite by Contractor in quantities in excess of that material's Superfund Amendments and Reauthorization Act (SARA) Threshold Planning Quantity. Such notification is required for SARA Tier II reporting purposes. Chemical of Interest Reporting (Appendix I) in this specification must be filled out and submitted to the SPOC.

4.7.9 Contractor shall ensure that hazardous chemicals or materials are properly contained, labeled and stored, and that employees are adequately trained to recognize, handle and use hazardous chemicals safely.

Small quantities (i.e., <10 gal.) of hazardous liquids, such as gasoline, diesel fuels or solvents, brought onto site shall be stored in properly labeled safety containers with flame arrestors and self-closing lids. All container labels must include contents information and display hazard symbols clearly on exterior of each container in accordance with NFPA 704M, OSHA 29CFR1910.1200 or other applicable standard.

4.8 Asbestos-Containing Material (ACM) and Lead

4.8.1 In structures built prior to 1981, thermal system insulation, sprayed-on surfacing, and vinyl or asbestos floor tile shall be presumed to be ACM.

- Non-ACM will be labeled as such or otherwise identified by the SPOC and communicated to Contractor.
- Areas containing abatement activities will have warning signs, be barricaded, and will have limited access.

4.8.2 Ameren S&H Management Instruction Asbestos Exposure Controls and Work Practices, ES-REG-203, specifies policies and procedures for contractors performing asbestos abatement work. Hardcopies may be requested from the SPOC.

Proposals for an ACM abatement project must designate:

- Scaffolding needs.
- Glove bag and containment areas, including remote decontamination areas. Remote decontamination areas require Ameren SPOC approval.
- Potable water and shower requirements and locations.
- Methods to protect scaffolding tubing from contamination after containment is removed.
- Methods to minimize non-ACM dust outside the containment areas.
- Methods to move ACM bags from containment areas to ACM receptacles.
- List of asbestos workers with copies of current training and state license.

4.8.3 Ameren S&H Lead Management Instruction, ES-REG-211, specifies policies and procedures for Contractors performing lead abatement work. Hardcopies may be requested from the SPOC.

4.9 Safety & Health Training Requirements

4.9.1 Documentation of OSHA training for Contractor craft workers and supervisors must be maintained onsite and made available to Ameren. Effective September 1, 2006, the minimum training standard is OSHA 10 for Contractor craft workers and OSHA 30 for Contractor supervisors.

4.9.2 Contractor will maintain documentation of S&H training on project and must provide requested documentation of training to Company. Contractor shall retain verification of satisfactory training for as long as required by law or six months after completion of contract, whichever is greater.

4.9.3 Job safety awareness meetings will be held with Company and applicable contractors on a frequency determined by Company. The meetings will address industrial safety issues from Contractor job safety reviews.

4.10 Safety & Health Surveys

4.10.1 The SPOC and Ameren S&H personnel will conduct periodic S&H surveys of the project. Any discrepancies will be reported to Contractor management for immediate correction.

4.10.2 These S&H surveys do not relieve Contractors of their responsibility to self-inspect their work and equipment and to conduct their work in a safe and environmentally compliant manner.

4.11 Reporting and Investigating Incidents/Accidents

4.11.1 Contractor shall make an immediate report by telephone to the SPOC of any accident involving injury, death, fire, spill, mishandling of oil, regulated/hazardous waste spill, or any other emergency.

4.11.2 In the event of an emergency, Company has authorized the Plant Shift Supervisor and the SPOC to act as emergency coordinators. Contractor shall proceed with appropriate emergency response measures as directed by Plant Shift Supervisor and the SPOC, and take full responsibility for clean-up and disposal of any wastes or materials.

4.11.3 Contractor shall indemnify Company for all related costs and liabilities.

4.11.4 Contractor shall submit a Monthly Contractor Accident Statistics Report (Attachment A10) by the second day of each month for the preceding month's activities.

4.11.5 Contractor shall investigate all types of events listed in above Item 1.4.11 Incident/Accident Reporting, whether they result in an injury or not, and provide the results of said investigation to Company. An accident investigation does not assign blame; it does determine how to eliminate similar accidents in the future. Company reserves the right to monitor Contractor's investigation, and Contractor shall provide the SPOC with all necessary information to all required Company personnel to perform this monitoring function.

4.11.6 Ameren reserves the right to investigate any accidents that occur on its property or in completing work being performed by a Contractor's employee whether they result in an injury or not. Ameren will conduct further investigations for accidental environmental releases or spills, etc.

4.11.7 A signed Witness Statement (Attachment A2) must be completed by each witness providing factual observations.

4.11.8 An Incident/Accident Investigation Report (Attachment A1) must be submitted to the SPOC within 24 hours to document the investigation. Accident facts, causes, and corrective action shall be documented and communicated to employees through S&H meetings.

4.12 Certifications, Inspections, and Permits

4.12.1 Operations may require a Company permit. Such activities may include but are not limited to: hot work, confined space/vessel entry, excavations, asbestos abatement, lead abatement, etc. Contractor shall determine from the SPOC if any of Contractor's activities require a Company permit or Contractor permit.

4.12.2 Some states and local authorities require permits for activities such as: excavations, heavy lifts, asbestos/lead abatement, air permits, water permits, hazardous waste generation, etc.

4.12.3 Contractors shall be responsible to secure and comply with these permits, unless the SPOC has delegated this to others in writing.

4.12.4 A third-party-certified Competent Person shall make a thorough annual inspection of cranes and powered hoisting equipment. Cranes shall be inspected and have deficiencies corrected prior to being put into service. Documentation of crane inspections must be maintained onsite by Contractor.

- Crane hooks shall be inspected by a Competent Person prior to use. Rigging shall be inspected by a Competent Person before each shift. Defective components shall be removed from service immediately. Anti-Two-Block devices, that automatically disengage crane hoist/boom functions when the hook or block approaches the jib or boom tip, shall be used on all cranes.
- All outriggers on mobile cranes must be fully extended and fully deployed when crane is used to lift or support a load.
- If, due to configuration or physical location, all outriggers cannot be fully deployed, calculations must be made from the "on-rubber" section of the load chart. A certified crane specialist must have written calculations and lift instructions reviewed by Ameren. The SPOC may make an exception for light-weight, lift-and-carry operations.

4.12.5 Operators of forklifts, boom lifts, buses, and other mobile equipment must be trained and certified on the operation of the specific equipment.

4.12.6 Operators of cranes must be trained and certified by National Commission for Certification of Crane Operators (CCO), or Operating Engineers Certification Program (OECP). Crane operators must be qualified on each crane type and rating they operate.

4.12.7 Operators of cranes are responsible for completing the Crane Maintenance Safety Checklist (Attachment A16).

4.12.8 Operators of cranes are responsible for providing documentation to Ameren SPOC of required OSHA crane inspections.

4.12.9 Cranes shall not be used to hoist employees without Ameren SPOC approval. Cranes should not be used to hoist personnel except where the Contractor can demonstrate that the erection, use, and dismantling of conventional means of reaching the work area, such as a personnel hoist, ladder, stairways, aerial lift, elevating platform, or scaffold, would be more hazardous, or is not possible because of the project's structural design or worksite conditions.

4.12.10 A Competent Person shall design and a Competent Person shall erect scaffolding. Only the authorized scaffolding erector can make changes to scaffolding.

4.12.11 A Competent Person must inspect and tag scaffolding prior to initial use, before each work shift, and after any event that could affect its structural integrity. Untagged scaffolds must not be used.

4.13 Critical Lifts

4.13.1 Critical Determination

Contractor shall submit a Critical Lift Plan for any critical lift. Ameren reserves the right to designate any lift as critical. A lift shall be designated as a critical lift if any one of the following conditions exists:

4.13.1.1 Lifting over 50 tons.

4.13.1.2 Lift exceeds 75% of the rated capacity of the crane.

4.13.1.3 Lift requires the use of more than one crane.

4.13.1.3.1 In no case shall a multiple crane lift be performed in excess of 75% of any one of the crane's individual load rated capacity at the planned radius.

4.13.1.4 Lifting a non-rigid object.

4.13.1.5 Lifting over equipment or material that could cause or result in a release of hazardous material to the environment.

4.13.1.6 The lifted item requires exceptional care in handling because it is being lifted above critical operating equipment or material and/or building structure.

4.13.1.7 The lifted item requires exceptional care in handling because of size, weight, close-tolerance installation, high susceptibility to damage or other unusual factor.

4.13.1.8 Lift performed in proximity of live electrical connections.

4.13.1.9 Lifting of personnel in baskets and/or personnel harnesses. This shall be conducted in accordance with OSHA Standard 29CFR 1926.1431.

4.13.1.10 Lifting of equipment by helicopter.

Any lifts proposed by the contractor that meet the above criteria or determined to be critical by the Project Engineer will be subject to a Critical Lift Plan. Examples of lifts that are generally considered critical are: boiler tube panels, feedwater heaters, conveyor systems, coolers and pump skids, turbines and generators.

4.13.2 Critical Lift Plan

Contractor shall provide a detailed lifting and rigging plan for all lifts identified as critical. All critical lifts will require a Professional Engineer's seal. Prior to executing lift, lift plans must be submitted to the Project Engineer, reviewed and accepted by a structural engineer in the POS Civil/Structural Group. Ameren will review submittals for general design features. Contractor is responsible for accuracy of calculations. Also prior to executing lift, any changes made in the field to the approved lift plan must be approved by the contractor's engineer and accepted by the Ameren POS Project and Structural engineers. A copy of the lift plan must be onsite during the lift and must have been reviewed with all personnel involved with the lift, including the Ameren Construction Supervisor. Ameren's Construction Supervisor shall be provided sufficient notice to allow him/her to witness the critical lift. A critical lift plan shall contain the following, as applicable:

4.13.2.1 Identify the items to be lifted.

4.13.2.2 Weight of the lifted item and total weight of the load (for mobile cranes, see the manufacturer's instructions regarding components and attachments that must be considered as part of the load).

4.13.2.3 Center of gravity location.

4.13.2.4 Documented step-by-step instructions.

4.13.2.5 Special precautions, if any (such as outrigger or track cribbing for mobile cranes).

4.13.2.6 Evaluation of hazards associated with the lift that include ground support, soil conditions, allowable soil bearing capacity, underground utilities that could be damaged or suddenly collapse, maximum permissible wind speed and any other physical obstruction.

4.13.2.7 A list of each piece of equipment (e.g., crane, hoist, fork truck), accessory, and rigging component (e.g., slings, shackles, spreader bars, yokes) to be used for the lift. (This list shall identify each piece of equipment by type and rated capacity).

4.13.2.8 Designated checkpoints, hold points and estimated instrument readings, as relevant, so that job progress can be checked against the plan.

4.13.2.9 Rigging sketch(es), which include the following:

4.13.2.9.1 Lift point identification

4.13.2.9.2 Method(s) of attachment

4.13.2.9.3 Load vectors

4.13.2.9.4 Sling angles

4.13.2.9.5 Accessories used

4.13.2.9.6 Other factors affecting the equipment capacity

4.13.2.9.7 Rated capacity of equipment in the configuration(s) in which it will be used. (For cranes, many factors affect rated capacity, including boom length, boom angle and work area.)

4.13.2.9.8 Percentage of the total weight of the lift to the rated capacity of the equipment in the configuration(s) in which it will be used (see above). Ameren best practices recommend limiting this percentage to less than 90% and shall not exceed 95%.

4.13.2.9.9 If rigging points are attached to existing structural steel, it is the responsibility of the contractor's engineer to confirm that the additional loads do not overstress the existing structure, and to design additional bracing/reinforcement if required. Supporting calculations sealed by a Missouri Professional Engineer shall be included with the critical lift plan.

4.13.2.10 A load-path sketch that shows the load path and height at key points in the job. (For lifts with mobile cranes, include the crane position(s) relative to the load and relative to surrounding obstructions.) Where appropriate, include floor-loading diagrams.

4.13.2.11 A sketch indicating lifting and travel speed limitations. (This may be noted on the load path sketch or on a separate sketch.)

4.13.2.12 A sign-off sheet to verify that all inspections/tests required by OSHA are current for all equipment and rigging.

4.13.2.13 The lift plan shall provide specific information for each lift when multiple items of varying weights and/or shapes are included in the lift plan unless an exception is approved by the Ameren structural engineer.

4.13.2.14 With their bid proposal, Contractors shall submit a normal weather lay-down plan for each onsite lattice crane, wherein contractors specifically outline the manner in which the crane will be stored in normal weather conditions.

4.13.2.15 With their bid proposal, Contractors shall submit a severe weather lay-down plan for each onsite lattice crane, wherein contractors specifically outline the manner in which the crane will be stored in severe weather conditions.

4.13.2.16 Before construction begins, the selected Contractor shall meet with Ameren representatives and shall outline the means and methods of the Contractor's crane execution plan for each lattice crane expected to be utilized onsite. Execution plan shall include specifics about transition from normal to severe weather crane lay-down plans and critical wind speed for crane position. Cranes shall not be allowed onsite until after the crane execution plan(s) have been reviewed and approved by Ameren representatives.

4.13.2.17 Crane loading shall typically be based on 2,000 pounds per square foot ground pressure, unless known ground conditions dictate/allow otherwise. Ameren representatives shall review and approve planned crane ground loading.

4.13.2.18 When determining and setting load path barricade boundaries, Contractors shall include within the boundary the potential for dropping load during load swing (failed load path). All elevations affected per this potential 'failed load path' shall be barricaded.

4.14 Respiratory Protection

4.14.2 Contractors must provide a copy of their Respiratory Protection Program to the SPOC before they use respirators. The program must comply current Ameren, Federal, State and local requirements including OSHA 29CFR1910.134. The program must properly address the following:

- Respirator selection
- Respirator training and required test fit procedures
- Respirator cleaning, sanitizing, inspection and maintenance
- Respirator user's medical clearance
- Chemical cartridge change-out schedule when applicable.

4.15 S&H Adherence Policy

4.15.2 **Action Level One** – The SPOC will issue a written Notice of S&H Non-Compliance (Attachment A11) and Warning Letter for S&H Non-Compliance (Attachment A12) to Contractor's management and site S&H representative if Contractor fails to comply with an applicable S&H standard.

4.15.3 **Action Level Two** – The SPOC will issue a Written Notice of Temporary Job Suspension (Attachment A13) to Contractor if S&H non-compliance is not corrected by Action Level One, or if Contractor repeatedly fails to comply with applicable S&H regulations. The appropriate Ameren Manager and Contractor's Division Manager, or equivalent, must meet and agree on corrective actions acceptable to Company before Work may resume. Actions may include, but are not limited to:

- Removal of certain Contractor personnel from project.
- Alteration of Contractor's job procedures.
- Having Ameren implement corrective action and backcharge Contractor.

Contractor shall not resume Work until Ameren accepts the proposed corrective actions. Ameren will retain meeting minutes documenting the agreement.

4.15.4 **Action Level Three** – Ameren Management may terminate the contract for cause, if **Action Level One** and **Action Level Two** do not result in Contractor's S&H compliance.

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ATTACHMENT A1

INCIDENT/ACCIDENT INVESTIGATION REPORT

Date of Accident: _____ Time of Accident: _____ Job Number: _____

Contractor Company Name: _____ Date of Investigation: _____

Location of Accident: _____

Did injury result? Yes/No,: _____ Involved Employee Name(s): _____
Involved Employee SS Number _____

Employee Job Classification or Skill: _____ Years In this Skill: _____ Years With Company: _____

Describe Type of Injury: _____

Body Part(s) Involved, If applicable: _____

Injury Classification per OSHA 29CFR1904: _____

Was property damaged? Yes/No _____ Describe damage/owner: _____

Is damaged property secured/maintained? Yes/No _____ Person Maintaining _____

Names of Witnesses/Co-workers (With Social Security No.): _____

Weather/Wind Conditions: _____

List/Describe personal Protective Equipment (PPE) in use by person exposed or injured.

_____

Chemicals Involved:

Name(s) of Chemicals Encountered: _____

_____

Form of Chemicals (Solids, Liquid, Dust, Mist Fume): _____

Describe Radiological Materials (if any): _____

Volume or Quantity Released: _____

Description of Accident: _____

_____

_____

_____

(continued on next page)

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INCIDENT/ACCIDENT INVESTIGATION REPORT (continued)

Contributing Factors: _____

What **Corrective Actions** Were Taken to Secure the Scene? _____

Corrective Actions Being Taken to Prevent Recurrence:

Action Item:	List Responsible Person & Target Date for Implementation Name:	Date:

Job being performed at time of incident/accident: _____

Was permit required for task being performed? Yes/No _____

If so, was permit issued? Yes/No _____ If yes, attach a copy of permit in effect at time of accident.

Indirect cause of accident: _____ _____ _____

Investigation Team Members:

Injured/Involved:	Name		Signature
Supervisor:	Name		Signature
Ameren SPOC	Name		Signature
S&H Representative	Name		Signature
Name (Others)	Title		Signature
Name (Others)	Title		Signature

Contractor Representative(s) Contacted: _____

Ameren Representative(s) Contacted: _____

*Attach additional sheets and supplemental data & information as necessary.

**Distribution: Original must be filed on-site; 1 copy must be sent promptly to the Corporate S&H Dept.
Must Notify: CCMI and Huntleigh McGehee

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ATTACHMENT A2

WITNESS STATEMENT

Name: _____ Title: _____

Social Security Number: _____ Date: _____ Time: _____

Temporary Address: _____ Phone: _____

_____

Permanent Address: _____ Phone: _____

_____

Location at Time of Accident: _____

Your statement shall include, to the best of your knowledge, detailed facts relative to the following five categories:

1. What happened just before, during, and just after the incident?
2. When did it happen?
3. Where did it happen?
4. Why do you think it happened?
5. Who was involved?

_____
Signature

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ATTACHMENT A3

FIRST AID REGISTER

Company: _____ Project Name /Number: _____ Jobsite Location: _____

Month /Year: _____ Site Manager: _____ Page: _____ of _____

Date	Time	Name	Supervisor/Foreman	Type of Injury, Body Part, and Brief Description of Accident	*Class

***Class** = Classification **FAV** = First Aid Visit **E1**= Doctor's Visit **REC** – OSHA Recordable **Other**:

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ATTACHMENT A4

BARRICADE TAG

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ATTACHMENT A5

CONSTRUCTION WORKER'S PROTECTION ASSURANCE AUTHORIZATION

Date: _____

Operating Supervisor: _____

The following person(s) has authorization to receive W.P.A.: _____

Project Name: _____

Company Name: _____

Company Address: _____

Name	Title	Office	Cell	Home	E-Mail

	Beginning		Ending	
	Date	Time	Date	Time
Expected Duration:				

Training is Required for Automated WPA System.

_____
Plant Manager or Designee

(Designee: Admin. Supt., Operations Supt., Maintenance Supt., Planning/Scheduling, or Operations Supv. {Watch})

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ATTACHMENT A6

GRINDER SAFETY PLAN

Grinder Guard and Handle Removal PRE-PLAN

Date:	**Job #:**
Customer/Site:	**Location of Work/Unit:**
Description of Task:	**Equipment Identification:**

SCOPE OF WORK AND SCHEDULE (Please list complete description of task)

HAZARD ASSESSMENT TO DETERMINE ALTERNATE TOOL

procedures require a pre-plan whenever personnel remove the guard and handle on a grinder.

Reason:

- Grinding wheel cannot access point of work with guard and handle attached due to narrow gap for welding.

Alternate Methods to Removing Guard and/or Handle:

- Rotary file and die grinder?
- Conical grind stone and pole grinder?
- Other?

SAFETY PRECAUTIONS

- ☐ Cutting wheel CANNOT be used while guard and handle are detached.
- ☐ Grinder must be unplugged when removing guard and handle and when re-attaching.
- ☐ Guard and handle are only to be removed for this specific point of work. All other grinding in the work area must have safety devices attached.
- ☐ Pre-plan will only apply until the weld depth improves to allow for standard grinding operation, i.e. all safety devices attached.
- ☐ Wear face shield and sealed eyewear.
- ☐ Maintain control of grinder at all times, use two hands when operating the grinder.
- ☐ Keep hands/fingers clear of upper portion of the grinder near the wheel.
- ☐ Be aware of body positioning.

AFFECTED PERSONNEL INVOLVED IN WORK MUST READ AND SIGN THIS PRE-PLAN

PRE-PLAN REVIEW SIGN-IN

Employee Classification/Craft	Name (Print)	Signature	Date
1.			
2.			
3.			
4.			
Supervisor/Foreman			
Safety Representative			

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ATTACHMENT A7

CONTRACTOR REDUCTION IN FORCE REPORT

Contractor Name:	
Contractor Supervisor:	
Date Submitted:	
Time Submitted:	

Name of Employee (Please Print)	Badge #	Date of Reduction	Time of Reduction

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ATTACHMENT A8

POWER OPERATIONS HOT WORK CHECKLIST *(EXAMPLE)*

1. DESCRIPTION – JR# _____

Location _____ Elevation _____
Work to be done: Welding _____ Brazing _____ Open Flame Cutting / Heating _____
Equipment _____

NOTE: Before authorizing welding, cutting, heating, and brazing, this checklist must be completed.

2. PRE-WORK INSPECTION

Hot Work shall not be performed in the following situations:

a. In areas not authorized by Management.

b. In sprinklered buildings while such protection is impaired, unless authorized by Management.

c. In the presence of explosive atmospheres or explosive atmospheres that may develop inside unclean or improperly prepared tanks, pipes or equipment.

d. In areas near the storage of large quantities of exposed, readily ignitable materials.

Prior to welding, cutting heating, and brazing (W/C/H/B), you shall perform these basic precautions:

a. Move the object to be W/C/H/B to an area free of hazards.

b. If the object to be W/C/H/B cannot readily be moved, then you shall remove all movable fire hazards within the vicinity to a safe place.

c. If the object to be W/C/H/B cannot be moved and if all the fire hazards within 35 feet cannot be removed (including cable trays), then, immovable fire hazards shall be shielded and a fire watch provided.

IF THESE BASIC PRECAUTIONS ARE NOT FOLLOWED, WELDING, CUTTING HEATING AND BRAZING SHALL NOT BE PERFORMED. COMPLETE CHECK LIST.

3. ADDITIONAL FIRE WATCH PROVISIONS

N/A	YES	NO		
			a.	Can more than a minor fire develop?
			b.	Are combustible materials closer than 35-ft. to the point of operations?
			c.	Are combustible materials more than 35-ft. but easily ignitable by sparks?
			d.	Do wall or floor openings with a 35-ft. radius expose combustible materials in adjacent areas, including concealed spaces in walls or floors?
			e.	Are combustible materials adjacent to the opposite side of metal partitions, walls, ceilings, or roofs and are they likely to be ignited by conduction or radiation?

NOTE: If you answered yes to any of the above, a fire watch is required. Complete checklist. All of the following conditions must be met, if applicable.

(continued on next page)

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4. PRECAUTIONS

N/A	YES	NO		
			a.	A fire watch will be provided during and for 30 minutes following welding, cutting, heating and brazing.
			b.	The fire watch shall be supplied with a proper portable fire extinguisher in addition to installed operable plant equipment.
			c.	Cutting and welding equipment is in good condition.
			d.	Combustible materials are protected with covers, guards, or metal shields, or material is removed prior to start of work.
			e.	Nearby workers are suitably protected against heat, sparks, slag and flash.
			f.	Wall or floor openings are covered or enclosures provided. For elevated work, covers are suspended beneath to collect sparks or area below is free of combustibles.
			g.	Enclosed equipment is cleaned of all combustible material and purged of flammable vapors.
			h.	Ducts and /or conveyors are suitably protected or shutdown.
			i.	For work near walls, partitions, ceiling or roofs, proper precautions have been taken to prevent ignition of combustibles inside the barrier of adjacent areas.
			j.	For work on pipes or other metal in contact with combustible walls, partitions, ceilings, or roofs, precautions have been taken to prevent ignition by conduction of heat.
			k.	Other

PRE-WORK INSPECTION

Supervisors Initials _____ Date _____ Time _____
Supervisors Initials _____ Date _____ Time _____
Supervisors Initials _____ Date _____ Time _____
Supervisors Initials _____ Date _____ Time _____
Supervisors Initials _____ Date _____ Time _____
Supervisors Initials _____ Date _____ Time _____
Supervisors Initials _____ Date _____ Time _____

POST-WORK INSPECTION

Supervisors Initials _____ Date _____ Time _____
Supervisors Initials _____ Date _____ Time _____
Supervisors Initials _____ Date _____ Time _____
Supervisors Initials _____ Date _____ Time _____
Supervisors Initials _____ Date _____ Time _____
Supervisors Initials _____ Date _____ Time _____
Supervisors Initials _____ Date _____ Time _____

DEFINITIONS

1. Combustible Material: Any material that, if in the form and under the conditions used, could ignite and burn.

2. Minor Fire: A fire which, if no action is taken to extinguish it, will self-extinguish (burn out), will not propagate (spread to other materials through the continuity of combustibles), and will not damage any permanent plant equipment.

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ATTACHMENT A9

CONTRACTOR SAFETY & HEALTH DATA FORM

1. S&H PERFORMANCE HISTORY

A. Interstate or Intrastate Worker's Compensation Experience Modification Rate (EMR), as shown on Workers Compensation Insurance Policy for three most recent years.

Year	EMR	*WH/CL

*If self-insured, provide employee Work Hours per Claim. (WH/CL)

THE FOLLOWING DATA FOR LAST THREE (3) YEARS FROM CONTRACTOR'S OSHA LOG

		Year		
B-1.	Employee hours worked			
B-2.	Fatalities (Column G of OSHA 300 log). Attach explanation for any fatalities.			
B-3.	Cases involving days away from work (Column H of the OSHA 300 Log)			
B-4.	Job transfer or restricted duty cases (Column J of OSHA 300 log)			
B-5.	Cases defined as other recordable cases (Column J of OSHA 300 Log)			
B-6.	Total # of cases for B-2, 3, 4 & 5 above.			
B-7.	"OSHA Incidence Rate" – Formula: Total Recordable Cases x 200,000 / Total # of work hours.			
B-8.	Citations by OSHA and/or other S&H regulatory agencies in past 3 years (provide details of each)			
C-1.	Motor vehicle accidents.			
C-2	Miles driven per year, total fleet.			

(continued on next page)

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		Yes	No
2.	Do you have a written hazard communication program?	☐	☐
	Do you have a written S&H program?	☐	☐
	Do you have a written company substance abuse program?	☐	☐
	Do you have a written respiratory protection program?	☐	☐
3.	Do you have one or more full time:		
	A. Physicians	☐	☐
	B. S&H Professionals	☐	☐
	C. Industrial Hygienists	☐	☐
4.	Do you have a new employee orientation program?	☐	☐
	I it include the following?		
	A. Company S&H Policy	☐	☐
	B. Company S&H Rules	☐	☐
	C. S&H Meeting Attendance	☐	☐
	D. Company S&H Record	☐	☐
	E. Hazard Recognition	☐	☐
	F. Hazard Reporting	☐	☐
	G. Injury Reporting	☐	☐
	H. Personnel Protective Equipment	☐	☐
	I. Respiratory Protection	☐	☐
	J. Fire Protection	☐	☐
	K. Housekeeping	☐	☐
	L. Toxic Substances	☐	☐
	M. Electrical Safety	☐	☐
	N. Safety Harnesses and Lifelines	☐	☐
	O. First Aid	☐	☐
	P. Driving Safety	☐	☐
	Q. Lockout/Tagout	☐	☐
	R. Ladder/Stairway Safety	☐	☐
	S. Hearing Conservation	☐	☐
	T. Trenching and Excavation	☐	☐
	U. Asbestos Awareness	☐	☐
	V. Lead Awareness	☐	☐
5.	Do you have a training program for newly hired or promoted first line supervisors?	☐	☐
	I it include the following?		
	A. Hazard Recognition	☐	☐
	B. Safe Work Practices	☐	☐
	C. S&H Supervision	☐	☐
	D. New Employee Orientation	☐	☐
	E. Tailgate/Toolbox S&H Meetings	☐	☐
	F. First Aid Procedures	☐	☐
	G. Emergency Procedures	☐	☐
	H. Incident Reporting	☐	☐
	I. Accident Investigation	☐	☐

(continued on next page)

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6. How often do you hold periodic S&H meetings for your foremen/supervisors?

A. Weekly ☐ C. Bi-Weekly ☐

B. Monthly ☐ D. Less Often, As Needed ☐

7. Do you conduct field S&H inspection of work in progress? Yes ☐ No ☐

A. If yes, who conducts the inspection? _____

B. How often? _____

	Yes	No
8. Are accident reports circulated to your management?	☐	☐
9. Is S&H a (documented) weighted factor in evaluating the performance of:		
A. Foreman	☐	☐
B. Supervisor	☐	☐
C. Management	☐	☐
10. Does your firm hold "Toolbox S&H Meetings?	☐	☐

How often?

A. Weekly ☐

B. Bi-Weekly ☐

C. Monthly ☐

D. Less Often, As Needed ☐

11. List the most senior staff S&H professional at your company.

Name: _____ Title: _____ Phone: _____

12. List the person to contact to discuss the details of the information contained in this document.

Name: _____ Title: _____ Phone: _____

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ATTACHMENT A10

MONTHLY CONTRACTOR ACCIDENT STATISTICS REPORT

Month: _____ Project Name: _____

Contractor Name: _____

Work hours for the month: _____ Work hours year-to-date: _____

Number of First Aid only cases: _____

Number of injuries & illnesses that received treatment by a physician: _____

Total number of OSHA Recordable injuries & illnesses for the month: _____

Number of restricted duty cases: _____ Number of lost time (days away) cases: _____

Number of motor vehicle accidents: _____ Number of miles driven: _____

Please list injuries and illnesses, which have occurred to employees of your company on the above project this month. Include accident cause, injury/illness suffered and current disposition of injured/ill employee (i.e., returned to work, still off work, awaiting surgery, etc.):

_____

_____

_____

_____

_____

_____

_____

_____

_____

Person completing report: _____ Title: _____

Date: _____ Signature: _____

Please submit this report to the SPOC on above project by the second business day of each month, for the preceding month's work activities.

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ATTACHMENT A11

NOTICE OF SAFETY & HEALTH NON-COMPLIANCE

To: _____ Site Representative for: _____

Your company has been found to be in non-compliance with one or more Federal, State, or Ameren S&H requirements as specified below. This S&H con-compliance must be corrected immediately for your company to meet the requirements of your contract.

Item # Item of non-compliance

_____ _____

_____

_____

Applicable S&H Requirement _____

_____ _____

_____

_____

Applicable S&H Requirement _____

_____ _____

_____

_____

Applicable S&H Requirement _____

_____

Issued By: _____ _____
Signature of the SPOC Date

Received By: _____ _____
Signature of Representative Receiving Notice Date

cc: Superintendent-Construction Management Services
Safety Supervisor
Plant Outage Manager

Ameren MISSOURI

ATTACHMENT A12

WARNING LETTER OF SAFETY & HEALTH NON-COMPLIANCE

Project Name and Number _____

Your firm, _____, has been found to be in violation of your contract by non-compliance with applicable Federal, State, or Ameren S&H requirements.

On _____, in accordance with the Ameren S&H Adherence Policy, your representative, _____, was given a Notice of S&H Non-Compliance (copy attached). This notice specifies areas where your company does not comply with Federal, State, or Ameren S&H requirements, and requests that these items be corrected immediately. If they are not corrected, more stringent measures will be taken in accordance with Ameren S&H Adherence Policy.

Thank you for your prompt attention to this matter.

_____ Signature of the SPOC

_____ Date

cc: Superintendent-Construction Management Services
Safety Supervisor
Plant Outage Manager

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ATTACHMENT A13

WRITTEN NOTICE OF TEMPORARY JOB SUSPENSION

Your company, _____, while working on the _____ project, has been notified of S&H performance deficiencies in accordance with Ameren's S&H Policy. Despite these written notifications requesting that immediate corrective action be taken to improve your S&H performance, improvement has not occurred.

Therefore, in accordance with Action Level Two of the Ameren S&H Adherence Policy, we are hereby notifying you that after securing your equipment, job activities on the project named above are to cease. Activities on this project may be resumed only after your company meets requirements set forth in the Ameren Adherence Policy.

_____	_____	_____
Signature of the SPOC	Time	Date

cc: Superintendent-Construction Management Services
Safety Supervisor
Plant Outage Manager

ATTACHMENT A14
AUTHORIZATION FOR CONTRACTOR TWO-WAY RADIOS

AUTHORIZATION FOR CONTRACTOR TWO-WAY RADIOS (SAMPLE)

All frequencies must NOT fall between the two ranges of frequencies:

463.5500 to 463.5700 MHz (Plant-Specific)

464.5500 to 464.5700 MHz (Plant-Specific)

- When reporting the frequency, you must include digits four places past the decimal point (e.g., 123.4567).
- If a repeater is being used, you must report both transmit and receive frequencies.
- If no repeater is being used, receive and transmit frequencies will be the same.
- You must submit all frequencies to be used.

CONTRACTOR	
CONTRACTOR REPRESENTATIVE	Print Name
RADIO MANUFACTURER OR MAKE	
HOW MANY CHANNELS BEING USED?	
FCC License "Call Sign" e.g. WPUP269	

CHANNEL		RECEIVE FREQ (MHz)	TRANSMIT FREQ (MHz)
1			
2			
3			
4			
5			
6			
7			
8			

Ameren SPOC: _____ Contractor Rep: _____

Date: _____ Date: _____

ATTACHMENT A15
CONTRACTOR'S SUBSTANCE ABUSE POLICY
Policy No. AUE-POL-000001, Rev. 0

1.0 INTRODUCTION

1.1 In an effort to provide a drug- and alcohol-free workplace, Ameren establishes the following policy for Contractors:

2.0 SCOPE

2.1 Working on an Ameren work site and being under the influence of drugs or alcohol creates safety risks for all personnel who work on our work sites.

2.2 The term Contractor refers to all non-Ameren personnel hired to perform a service for Ameren who will be on Ameren property and includes all Contractors, their subcontractors and all other non-Ameren persons who are employed by them with active badges for site access. Visitors and delivery drivers are excluded from these requirements.

2.3 This Policy supersedes GP-06-01, Contractor Substance Abuse Policy.

3.0 IMPLEMENTATION

3.1 Contractors shall establish and maintain a confidential drug and alcohol testing program for each of their employees assigned to work on Ameren property, which shall meet the following minimum requirements.

3.1.1 All employees of a Contractor who are assigned to an Ameren site shall be subject to Contractor's drug and alcohol testing program. Contractor's program shall prohibit employees from buying, selling, consuming, or distributing alcohol or drugs while working for Ameren or while on Ameren property. The program shall also prohibit Contractor employees from reporting to an Ameren site or being on Ameren property while under the influence of alcohol or drugs.

3.1.1.1 Contractor's program shall provide for drug testing for substances listed in Section 3.1.4 of this Policy under the following circumstances: pre-assignment testing; random testing; testing for reasonable cause based on observations by Ameren or Contractor supervisor; and testing after any accident or incident that involves injury to personnel or damage to property.

3.1.2 Contractor shall require pre-assignment drug testing, or will assure that each person who will be assigned to an Ameren location has been tested for drug use within the 120-day period immediately prior to the start of work on Ameren premises. Contractor shall provide written documentation from the testing authority to Ameren Construction Project Lead or Plant Station Point of Contact that its employees are either compliant or non-compliant with this Policy. Contractor employees, who are not in compliance with this Policy, will be subject to Section 3.1.6 of this Policy. To maintain confidentiality, Ameren will not accept actual test results. A previous random drug test or drug test conducted for another reason is sufficient to satisfy the pre-assignment testing requirement if test was conducted during the 120-day period prior to working on Ameren premises, and otherwise satisfies the drug testing requirement in Section 3.1.4 of this Policy. Contractor employees who have taken a pre-assignment drug test will be allowed to work pending test results for no more than 5 working days. Testing may be waived pending Ameren management approval for Contractor employees who are working less than 40 hours annually providing site labor.

3.1.2.1 In lieu of pre-assignment testing, Contractor may accept a certificate signed by Department of Health and Human Services (DHHS), Substance Abuse Mental Health Service Administration (SAMHSA) DHHS/SAMHSA-certified drug testing laboratory indicating the results of drug test performed within the 120-day period immediately prior to working on Ameren premises. Identification cards, which indicate employee's name and date of his/her most recent drug test, may also be accepted if they are traceable to the certification from the DHHS/SAMHSA -certified drug-testing laboratory, which performed the test, and are attested to by Contractor management.

3.1.3 Contractor shall provide site specific random substance abuse testing for each of its employees and its subcontractors' employees assigned to be on Ameren premises. The random testing shall be conducted at a frequency such that a minimum of one test is performed for hours up to the first 2,000 man-hours worked and one additional test for every 2,000 man-hours worked by Contractor, or any of its subcontractors, on Ameren premises. Contractor shall establish a random selection process to ensure that each individual will have an equal chance of being selected and tested each time a

random test is scheduled. The random testing pool will include all crafts under the direction of the prime Contractor, including subcontractors. Employees selected for random testing shall not be informed of test until immediately prior to test and shall be accompanied to testing site by a responsible Contractor supervisor as soon as practical on the same day selected. Contractor shall notify Construction Project Lead or Plant Station Point of Contact of random selection results and an Ameren representative may exercise the option of being present during the selection process.

3.1.4 Samples used to comply with this policy shall be analyzed by a NIDA-certified laboratory or quick cup and/or instant cup method. Tests must screen at a minimum for the following substances and levels, however some labor consortium testing programs will be accepted for initial site access only pending Ameren approval. A confirmed positive drug testing will be considered a violation of this policy.

Substance	Initial Level	Confirmed Level
Amphetamines	500 ng/ml	250 ng/ml
Barbiturates	300 ng/ml	200 ng/ml
Benzodiazepines	300 ng/ml	200 ng/ml
Cocaine	150 ng/ml	100 ng/ml
Marijuana	50 ng/ml	15 ng/ml
Methadone	300 ng/ml	200 ng/ml
Opiates	300 ng/ml	150 ng/ml
Oxycodone	100 ng/ml	100 ng/ml
Propoxyphene	300 ng/ml	200 ng/ml
Methamphetamine	500mg/dl	250mg/dl

3.1.5 Contractor's program shall provide for alcohol testing under the following circumstances: random testing; testing for reasonable cause based on observations by Ameren or Contractor supervisor; and testing after any accident or incident that involves injury to personnel or damage to property. Pre-assignment alcohol testing shall not be required. A test result of .04% blood alcohol concentration or greater as indicated by a breathalyzer or similar test will be considered a violation of this Policy.

3.1.6 Individuals who fail a test, refuse to test or otherwise violate this Policy will be denied site access from all Ameren premises. In addition, Contractor shall notify the applicable consortium to remove employee from the active pool. A Contractor employee who is determined to have violated this policy will be denied site access for a period of one year. After a period of one year, if the individual can demonstrate successful completion of a required treatment program based on Contractor's consortium policy, the individual will be given a last-chance opportunity. However, site access will not be permitted unless the individual has a satisfactory return-to-duty drug test. If at any time an individual is found to have a second violation of this Policy, the individual will be permanently denied site access to all Ameren premises. Contractor shall document all non-compliance on a reduction force report and forward the report to Construction Project Lead or Plant Station Point of Contact. The reduction force report shall include the person's name, craft and reason stated "Non-Compliance with Ameren Substance Abuse Policy."

3.1.7 Contractors shall require all of their subcontractors to comply with all provisions of this Substance Abuse Policy. Failure of Contractor or any of its subcontractors to comply with the requirements of this Policy shall be grounds for removal from consideration for any future work and/or termination of the current contract at the discretion of Ameren. Ameren reserves the right to audit Contractor's drug and alcohol testing program at any time to verify compliance with this policy.

3.1.8 Ameren will not be responsible for any expense or loss of wages due to non-compliance with this Policy.

3.1.9 Ameren retains the right to change or modify this Policy at any time. Ameren also retains the right to waive this Policy for any Contractor that is badged as a visitor.

3.1.10 Any documents relating to this Policy will be maintained in confidence and will not be released without written authorization unless otherwise required by law.

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ATTACHMENT A16

CRANE MAINTENANCE SAFETY CHECKLIST

DATE: _____ CRANE: _____

JOB NUMBER/ LOCATION: _____

TASK: _____

☐ Has a Total Hazard Analysis (THA) been completed today? YES ☐ NO ☐

Comments: _____

☐ Is access to work area established? YES ☐ NO ☐

Comments: _____

☐ Is all safety equipment on hand and functioning properly? YES ☐ NO ☐

Comments: _____

☐ Have lines of communication between operator and affected employee(s) been established (visual &/or verbal)?

Comments: _____

☐ When servicing the crane (including crane lubrication), the operator must lower all loads to the ground, and move all controls to OFF. The engine MUST be stopped before the crane is serviced. The operator is to attach a WARNING sign to the engine start control to warn personnel that crane is being serviced and must not be started.

Comments: _____

☐ Do not operate crane until all safety guards and covers are securely reinstalled and all maintenance equipment is removed.

Comments: _____

☐ Before operator enters cab of crane, the affected employee(s) must be at a minimum safe distance of two feet from any moving parts.

Comments: _____

Additional Comments: _____

CREW SIGNATURES:

_____ _____

_____ _____

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ATTACHMENT A17
CONTRACTOR AGREEMENT OF UNDERSTANDING
(Form CONMGT0)

All Contractors and Subcontractors will be required to sign and submit this form prior to entering and/or starting work on any Ameren property.

- I have been informed of all expectations regarding Ameren Safety / Work rules and ZERO TOLERANCE policies and will immediately investigate and enforce all such rule and policy violations when they are reported or observed.
- I will cooperate to the fullest extent with any Ameren management or security person in investigating ZERO TOLERANCE policy violations.
- I am aware that Ameren plants contain asbestos, lead and flyash. Where necessary, I will abide by all Ameren, OSHA, State and Local policies, procedures and ordinances in all abatement, containment, waste-disposal, employee protection and reporting activities.
- I will obtain and promptly submit all of the required permits to the Ameren-designated Station Point of Contact (SPOC) prior to starting work.
- I will promptly forward all of the required submittals to the Ameren SPOC.
- I will not allow any employee to enter and / or start work on Ameren property before first conducting a Safety / Work Rules orientation and ensuring they have all required personal protective equipment.
- I will report all violations / actions taken to the Ameren SPOC, on form CONMGT1, each Friday before 9:00 AM.
- I will inform the Ameren SPOC of any sub-contractors in my employ and ensure that they are aware of and meet the conditions of this agreement before they enter and / or start work on Ameren property and will have them complete this Contractor Agreement of Understanding Form.
- Any employee found to have violated a ZERO TOLERANCE policy may be removed and barred immediately from Ameren property and will not be allowed to return to any Ameren property in the future.
- I understand that repeated violation of the Work / Safety rules or ZERO TOLERANCE policies may result in my company's removal from Ameren property.

Contractor Company (Print) _____

Contractor Representative (Print) _____

Representative's Signature _____ Date _____

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ATTACHMENT A18
HOUSEKEEPING SCORECARD

PROJECT NAME: _____

CONTRACTOR NAME: _____

DATE: _____

HOUSEKEEPING SCORECARD						
CATEGORY	RATING POOR				EXCELLENT	COMMENTS
General Cleanup	1	2	3	4	5	
Cords & Hoses (are out of the way)	1	2	3	4	5	
Barricades & Caution Tape (used & taken down appropriately)	1	2	3	4	5	
Other (e.g., material stored/staged appropriately, no tools on running equipment, no hazardous conditions, etc.)	1	2	3	4	5	
Total Housekeeping Score:						
Total Points (Total Housekeeping Score x 4) :						

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ATTACHMENT A19
SAFETY SCORECARD

SAFETY SCORECARD			
Notwithstanding the provisions below, a "work-related fatality" will result in maximum KPI reduction to the contractor regardless of any other safety criteria.			
KPI payment will be based on criteria that are equally weighted as follows:	Section 1	OSHA recordable rate	33⅓ %
	Section 2	"Rules to Live By" infraction	33⅓ %
	Section 3	Safety observation program	33⅓ %

SECTION 1	OSHA RECORDABLES		
OSHA rate is calculated by the following:			
		2 or more =	0%
		less than 2 =	100% of Section 1
Note: Review based on specific job criteria (i.e., duration of project). Ameren POS safety supervisor has final call on OSHA recordable determination.			

SECTION 2	"RULES TO LIVE BY" OBSERVATIONS		
		1 or more =	$2,000 penalized assessment per Appendix A
		less than 1 =	(add)
Note: Observations that are self-reported by contractor do not apply to this. Only observations by Owner or Owner's representative apply.			

SECTION 3	COMPLETED CARDS		
An agreed-upon safety observation card program will be developed as part of site safety process. Observations are based on number of fully completed, meaningful cards generated by contractor's employees and submitted to Ameren designated representative. These observation cards may show positive coaching as well as corrective coaching. Observation cards completed by Ameren will not be utilized KPI of this section.		< 70 cards =	(deduction)
		70 - 90 cards =	$0
		> 90 cards =	(add)

ATTACHMENT A20
GUIDELINE FOR ABANDONING PIPING AND DEMOLISHING ABANDONED PIPING

1.0 GENERAL GUIDELINE FOR PROPERLY ABANDONING AND/OR DEMOLISHING PIPING

The division of responsibility for the following actions to be decided at assignment of work:

1.1 A Competent Person shall pre-plan the job prior to the start of the work.

1.2 Determine pipe to be abandoned or demolished. Review P&ID's and piping isometrics to determine isolation points and material conveyed in piping.

1.3 If a JR is not already in EMPRV, Ameren Single Point of Contact (SPOC) shall create a JR in EMPRV.

1.4 Review WPA requirements with the Responsible Engineer listed on the JR. Ensure proper WPA is in place to isolate lines.

1.5 Conduct a pre-job briefing to discuss site specific safety plan and the following:

1.5.1 PPE required

- Chemical Protection
- Eye & Face Protection
- Foot Protection
- Hand Protection
- Head Protection
- Hearing Protection
- Respiratory Protection

1.5.2 Atmospheric conditions if working in enclosed spaces

1.5.3 WPA

1.6 Ensure proper WPA is in place to isolate lines. As part of WPA, drain lines and confirm all low spots have been drained.

1.7 Take special precautions to ensure environmental spills do not occur.

1.8 At extreme ends of pipe, remove at least a one foot section of pipe from equipment or process piping still in use to ensure complete isolation. Cap ends of process piping that will remain in service.

1.9 For piping that will be abandoned in place, permanently tag abandoned pipe in at least three locations (Steel or Brass tag wired to pipe). Tag shall indicate pipe to be "Abandoned in Place," applicable JR number, and material pipe conveyed.

1.10 For piping to be demolished, remove piping and dispose of properly.

1.11 Update P&ID's and piping isometrics as applicable.

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ATTACHMENT A21
SITE-SPECIFIC SAFETY PLAN (SSSP)

This plan shall be completed and reviewed with the Corporate Safety Department before work commences. Completed plans shall be maintained and kept on site with the project file.

Section 1: Company and Project Information	
Contractor Company:	
Contractor Address:	
Project Name:	
Project Address:	
Mobilization Date:	

Section 2: Contractor Info	Name	Phone	Email
Project Manager			
Superintendent			
Corporate Safety Representative			
General Foreman			
Site Safety Representative(s)			

Shifts working throughout project: 1st ☐ 2nd ☐ 3rd ☐	Maximum number of workers on site per shift: 1st 2nd 3rd	Number of safety representatives on site per shift: 1st 2nd 3rd

Job Responsibilities:	
Titles:	Description of Job Duties

Section 3: Site Emergency Information		
3.1	Identify the nearest medical facility (e.g., hospital, urgent care, occupational clinic etc.): Address: Phone # Note: Location and directions (including maps) to the nearest facility are required to be on this jobsite.	
3.2	List the local Fire & Rescue Squad Phone #	List the Police Phone #
3.3	Describe your emergency action plan for the project (e.g., response to fire, severe weather, etc.):	

Section 4: Company Safety Mission Statement

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Section 5: Scope of Work
Describe the activities your company will be performing while on this project. Ensure that all activities are referenced on the AHA of this plan, see Section 13.

Section 6: Subcontractor Information

Will subcontractor(s) be used on this project? ☐ Yes ☐ No

If yes, please provide the information below (add extra copies of this page as needed):

Note: All subcontractors are required to submit a Site Specific Safety Plan.

Subcontractor(s) Name:	Contact Person	Scope of Work	Phone	Email

Section 7: General Information

7.1	Describe how you will secure your jobsite, equipment, and materials to protect public safety and to prevent theft.
7.2	Will there be persons onsite trained in First Aid and CPR? ☐ Yes ☐ No
7.3	Will there be ANSI Z308.1 compliant First Aid Kit(s) and Bloodborne Pathogens Kit(s) located in strategic areas on this project: ☐ Yes ☐ No
7.4	Will restrooms and wash facilities be brought on site? ☐ Yes ☐ No
7.5	How will housekeeping be managed? Describe the control measures to be used and how often they will be performed.
7.6	Do you have a map of the worksite location that includes roads, waterways, railways, bridges, etc.? ☐ Yes ☐ No *Please provide a copy of the map when submitting this document*

Sections 8: Project Safety Management	
Owner shall have the authority to immediately stop contractor's work indefinitely for operations which, in the opinion of owner, constitute a safety concern. It is the responsibility of the contractor to adequately satisfy owner of any remediation necessary to provide a safe and healthful workplace. Contractor must have qualified and competent supervision at the site at all times to direct and observe the work.	
8.1	Do you require your supervision to successfully complete the OSHA 30-Hour for Construction Training?
8.2	Do you require your employees to successfully complete the OSHA 10-Hour Construction Training?
8.3	Outline the initial employee orientation on the job site:
8.4	Describe the process that you will use to verify that training within your scope of work has successfully been completed. *Note: Employee training records do not have to be submitted. Ameren reserves the right to review training records which must be readily available upon request.*
8.5	Describe your procedures for Contractor Event Reporting (CER) to Ameren.
8.6	Describe your Job Observation Process in detail:
8.7	Describe your Job Briefing Process in detail:
8.8	Will you have a Hazard Communication Program with a chemical inventory list and Safety Data Sheets (SDS) for chemicals used onsite? ☐ Yes ☐ No NOTE: Chemical inventory list must be onsite at the beginning of the work and Safety Data Sheets (SDS) shall be kept on file at the site by the contractor. SDSs must be available for the contractor and subcontractor employees' review and for review by the owner upon request.

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Section 9: Rules To Live By Hazards and Controls	
9.1	Explain how you will communicate Ameren "Rules to Live By" to your employees on this project and describe the procedures you will follow when a violation occurs.
9.2	Explain your company's disciplinary action protocol as it relates to jobsite safety rules:

Section 10: Employee Engagement and Communication	
10.1	Identify steps your company is going to take to engage your workforce in safety:
10.2	Explain how your company is going to communicate safety information and expectations to your employees?

Section 11: Personal Protective Equipment (PPE)
List the minimum PPE required to access the job site:

Section 12: Safety and Health – Describe how hazards are controlled in the AHA for each 'Yes' answer (see Section 13):	
Will the work scope require any traffic or pedestrian disruptions?	☐ Yes ☐ No ☐ N/A
Will your work require you to penetrate into any surface at any depth?	☐ Yes ☐ No ☐ N/A
Will your work involve any excavations/trenches?	☐ Yes ☐ No ☐ N/A
Will the work scope require work at heights greater than 6 feet?	☐ Yes ☐ No ☐ N/A
Will wire rope guardrail systems be used on this project to protect workers from fall hazards and will an inspection program be implemented to verify safe installation/condition?	☐ Yes ☐ No ☐ N/A
Will the project involve electrical line construction, maintenance or repair activities?	☐ Yes ☐ No ☐ N/A
Will the project involve substation or switchyard construction, maintenance or repair activities?	☐ Yes ☐ No ☐ N/A
Will there be worksite obstructions that may create a hazard to workers such as railroads, bridges, power lines or waterways?	☐ Yes ☐ No ☐ N/A
Will the work scope involve the need to control hazardous energy sources?	☐ Yes ☐ No ☐ N/A
Will the project include work on pressurized vessels or pipes that may affect the integrity of the system such as welding, cutting, brazing, etc.?	☐ Yes ☐ No ☐ N/A
Will steel erection be part of the scope of this project?	☐ Yes ☐ No ☐ N/A

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Section 12: Safety and Health – Describe how hazards are controlled in the AHA for each 'Yes' answer (see Section 13):	
Will there be potential impalement hazards such as protruding reinforcing steel (rebar)?	☐ Yes ☐ No ☐ N/A
Will any roofing be performed on this project?	☐ Yes ☐ No ☐ N/A
Will earthmoving or drilling equipment be used on this project?	☐ Yes ☐ No ☐ N/A
Will cranes, derricks, or other equipment be used on this project?	☐ Yes ☐ No ☐ N/A
Will a helicopter be used on this project?	☐ Yes ☐ No ☐ N/A
Will the work scope require the need for a critical lift plan that will include the safe rigging practices and prohibit work under suspended loads?	☐ Yes ☐ No ☐ N/A
Will hoists, elevators or conveyors be used on this project?	☐ Yes ☐ No ☐ N/A
Will employees be involved in erecting, disassembling, moving, operating, repairing, maintaining, or inspecting a scaffold system?	☐ Yes ☐ No ☐ N/A
Will the work scope include diving?	☐ Yes ☐ No ☐ N/A
Will the work scope require you to work in a confined space?	☐ Yes ☐ No ☐ N/A
Will welding, cutting, or brazing be performed on this worksite?	☐ Yes ☐ No ☐ N/A
Will the work involve the use of chemicals such as paints, solvents, adhesives, epoxy coatings, corrosives, fuels or other hazardous materials?	☐ Yes ☐ No ☐ N/A
Will lead based materials be used or disturbed on this project?	☐ Yes ☐ No ☐ N/A
Will asbestos containing materials be disturbed on this project?	☐ Yes ☐ No ☐ N/A
Will you be working in or generating a hazardous atmosphere?	☐ Yes ☐ No ☐ N/A
Will appreciable levels of dust be generated that will require control measures?	☐ Yes ☐ No ☐ N/A
Will abrasive blasting be performed on this project?	☐ Yes ☐ No ☐ N/A
Will the work scope involve any environmental hazards that generate flying debris, excessive noise levels, or any other air contaminants not mentioned above?	☐ Yes ☐ No ☐ N/A
Do you have a heat stress prevention program in place?	☐ Yes ☐ No ☐ N/A
Will radioactive materials/sources be used on this project?	☐ Yes ☐ No ☐ N/A
Will hazardous waste (e.g., lead, asbestos, contaminated soils) be generated and properly disposed of on this project?	☐ Yes ☐ No ☐ N/A

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Section 13: Risk Management

ANTICIPATED HAZARD ANALYSIS (AHA)

Use this form to identify activities that will occur on this project. List all potential hazards associated with that activity. Use the Risk Assessment Code table to determine the risk level of the activity/hazards. Lastly, list all of the controls that will be implemented to control those hazards. When a Job Hazard Analysis is needed, it must be performed, documented, and communicated to workers prior to the start of that activity, see footnote 2.

Contractor Name:	Project Name/Number:		Project Location:
ACME Contractor	123456		Anywhere, Missouri
	Date Prepared: 1/1/2014	Prepared By: ACME Manager	Reviewed By: John Doe

Risk Assessment Code (RAC) Color Ratings – *include color & numeric alpha characters for rating* Red =Extremely High Risk (Critical), e.g., Red IA Orange = High Risk (Serious), e.g., Orange 2B Yellow = Moderate Risk (Moderate), e.g., Yellow 3C Blue = Low Risk (Minor), e.g., Blue 3D Green = Extremely Low Risk (Negligible), e.g., Green 3E		PROBABILITY (how often the activity occurs)				
		Frequent (A) Occurs very often, known to happen regularly.	Likely (B) Occurs several times, a common occurrence.	Occasional (C) Occurs sporadically, but is not uncommon.	Seldom (D) Remotely possible, could occur at some time	Unlikely (E) Can assume it will not occur, but it is not impossible
Severity	Catastrophic (1) – Imminent and immediate danger of death or permanent disability to the public, employees or property.	Red (1A)	Red (1B)	Red (1C)	Orange (1D)	Yellow (1E)
	Critical (2) – Permanent partial disability, hospitalized injury, temporary total disability.	Red (2A)	Orange (2B)	Orange (2C)	Yellow (2D)	Blue (2E)
	Significant (3) – Reversible injury that would need ER care, reversible illness.	Orange (3A)	Yellow (3B)	Yellow (3C)	Blue (3D)	Green (3E)
	Negligible (4) – First aid or minor medical treatment	Yellow (4A)	Blue (4B)	Blue (4C)	Green (4D)	Green (4E)

Activity Category	Potential Hazards	RAC Rating[1]	JHA Required[2]	Controls
Cutting on steam pipe located 15 ft. above ground	Explosion, thermal burns, fire, fall from heights, lacerations, flying debris	1B	Yes	1) Lockout equipment, bleed/cool/drain line, blow air through line 2) Use aerial lift with anchor point, full body harness, laynard 3) Hot work permit, firewatch, fire extinguisher, no combustibles within 35 ft. 4) PPE (safety glasses, faceshield, leather gloves, hardhat)

1 RAC Rating – Risk Assessment Code Rating. Use the Risk Assessment Matrix to list the color and numeric alpha code

2 JHA required if red or orange RAC color (See sample JHA; JHA is not required to be submitted with this plan)

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JOB HAZARD ANALYSIS (JHA) FORM

JOB HAZARD ANALYSIS	COMPANY NAME:	JOB:	DATE
	JOB TITLE OF WORKERS WHO DO THIS JOB:	ANALYSIS BY:	
LOCATION:		REQUIRED PERSONAL PROTECTIVE EQUIPMENT:	

Sequence of Basic Job Steps	Critical Task	Potential Accidents or Hazards	Recommended Safe Job Procedures
	☐		
	☐		
	☐		
	☐		
	☐		
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	☐		
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	☐		
	☐		

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FOR AMEREN USE ONLY	
SAFETY HAZARDS CONTROL REVIEW OF CHECKLIST:	
DATE SUBMITTED:	
REVIEW STATUS: ☐ UNSATISFACTORY, RESUBMITTAL REQUIRED ☐ SATISFACTORY	
This plan is considered satisfactory if there are no comments below.	
AMEREN CORPORATE SAFETY REVIEW COMMENTS:	
Sections	**Comments**
Section 1:	
Section 2:	
Section 3:	
Section 4:	
Section 5:	
Section 6:	
Section 7:	
Section 8:	
Section 9:	
Section 10:	
Section 11:	
Section 12:	
Review Date:	
Resubmit Date:	
Approved Date:	
Ameren Project Manager and Date:	

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ATTACHMENT A22
DIVERSE SUPPLIER BUSINESS PLAN

SUPPLIER / SUBCONTRACTOR BUSINESS PLAN

Note: Please list all diverse and non-diverse sub-contractors on supplier/sub-contractor business plan. Ameren will require bidders to track spend amounts when sub-contracts are awarded to Diverse Suppliers. If bidder is unable to award to Diverse Supplier indicate name of diverse supplier contacted and reason(s) why bidder was unable to award.

Please specify in the pull down below the % diverse supplier participation as part of the bid.

Enter % participation here					
Name of Sub-Contractor	Email	Business Classification of Diverse Sub-Contractor (Select from the Pull Down)	Type of Work/Services to be Provided by Sub-Contractor	Anticipated Value of Work ($) to be Performed	Reason(s) why unable to award to Diverse Sub-Contractor (Select from the Pull Down)

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ATTACHMENT A23
DIVERSE SUPPLIER 2ND TIER REPORT

2nd TIER PROGRAM - DIRECT EXPENDITURES

1st Tier Supplier: _____ **Report Period:** _____

In accordance with Ameren's Request for Proposal/Quotation, the definitions and codes contained herein and the resulting contract/purchase order between Ameren and the Supplier, Supplier shall complete columns 1 through 8, reporting its use of Minority Business Enterprises (MBEs) and (WBEs) in direct connection with goods and services provided under the terms and conditions of said contract/purchase order. Supplier shall also include the name of the Ameren business segment in which the work is being performed.

Use this report when MBE & WBE expenditures are directly attributable to fulfilling a specific contract. You must be able to trace the expenditure directly to the specified contract.

	(1)	(2)	(3)		(4)		(5)							(6)	(7)	(8)
	SUBCONTRACTOR	BUSINESS SEGMENT	CONTACT		WORK		2ND TIER SPEND									
	2nd Tier COMPANY NAME	AMEREN BUSINESS SEGMENT	NAME	PHONE	DESCRIPTION	MBE /INDIRECT	AFRICAN AMERICAN	ASIAN PAC & SUB	HISPANIC	NATIVE AMERICAN	WBE	VETERAN	LGBT	TOTAL 2ND TIER	MONTHLY PAID by AMEREN	% OF MONTHLY DIVERSE SPENDING
1														$ -	$0	#DIV/0!
2														$ -	$0	#DIV/0!
3														$ -	$0	#DIV/0!
4														$ -	$0	#DIV/0!
5														$ -	$0	#DIV/0!
6														$ -	$0	#DIV/0!
7														$ -	$0	#DIV/0!
8														$ -	$0	#DIV/0!
9														$ -	$0	#DIV/0!
10														$ -	$0	#DIV/0!
11														$ -	$0	#DIV/0!
12														$ -	$0	#DIV/0!
13														$ -	$0	#DIV/0!
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19														$ -	$0	#DIV/0!
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23														$ -	$0	#DIV/0!
24														$ -	$0	#DIV/0!
25														$ -	$0	#DIV/0!
	TOTAL AMOUNT:						$ -	$ -	$ -	$ -	$ -	$ -		$ -	$0	#DIV/0!

Name _____ Phone _____ Email _____ Date _____

END OF APPENDIX A

APPENDIX B – JOB WORKING RULES AND CONTRACT WORK LIMITATIONS
CONTRACTOR REQUIREMENTS - POWER PLANTS

1.0 JOB WORKING RULES

1.1 Contractor must enforce the Ameren Job Working Rules, included in this specification here as Appendix B, as well as the Contractor's own work rules. If the rules conflict, the more restrictive rule applies.

2.0 PLANT ACCESS, PARKING AND SECURITY

2.1 Contractor employees must enter the plant ***only*** at the entrance where their company name is posted. Security cameras monitor entrances to inform supervisors of violations.

2.2 The speed limit is 10-MPH unless otherwise posted.

2.3 Contractor personnel may not ride in the back of a truck on company property or to/from/between job sites unless properly seated with a seat belt.

2.4 Contractor employee vehicles must park in Construction Parking lot or in areas designated for Contractor use.

2.5 Contractor employees must enter and leave through the designated Construction gate.

2.6 Contractor employees must check in and out of project with their immediate Foreman or General Foreman.

2.7 Security will issue an identification badge to Contractor employees after site orientation training. Badges must be visible at all times while on the site.

2.8 If the site has an electronic badge reader, a green LED light indicates that arrival/departure times have been recorded and the gate is unlocked.

2.8.1 If a badge reader is not available, employees must sign the gate register when arriving or departing.

2.9 Lunch boxes, toolboxes, coolers and other containers are subject to inspection when entering or leaving Ameren premises.

2.10 An Ameren Material Pass (Form 5532NS) signed by the Ameren Station Point of Contact (SPOC) and a Contractor supervisor must be presented to Security when tools or materials are taken off site.

2.11 The Security Guards can:

- De-activate / activate a badge when changing plant locations
- Replace a damaged badge or lost badge
- Update the employee name, Contractor company, or craft.

2.12 Cameras and video recording devices are prohibited unless specifically authorized by Ameren management.

3.0 GENERAL REQUIREMENTS

3.1 The more restrictive rule will govern in the event of any conflict between Ameren and Contractor work rules.

3.2 All Contractor/Subcontractor employees must not leave their work areas during assigned work periods. Any reasonable break periods will be established by the Contractor/Subcontractor.

3.3 Only drink water from drinking fountains or lavatories, other outlets may contain river water.

3.4 Certain plant locations, including cafeterias, locker rooms, and washrooms, may be posted as OFF LIMITS to construction or Contractor personnel.

3.5 Written permission is required before using Ameren equipment or tools, except for public pay phones.

3.6 Radios or "boom boxes" are not allowed because they can disrupt communication and distract workers.

3.7 Ameren's Smoking Policy
In keeping with Ameren's corporate values, Ameren strives to provide a work environment that promotes and ensures the health and safety of all employees. Smoking presents known health risks to smokers and non-smokers alike. This policy applies to cigarette, pipe, and cigar smoke, as well as e-cigarettes.

3.7.1 Persons Affected
This policy applies to all Ameren employees, vendors, contractors, and visitors at any Ameren facility.

3.7.2 Policy
Smoking is prohibited in all Ameren buildings and any outside posted areas where hazards may exist. Smoking is prohibited within 25 feet from all entrances, exits, windows that open, and ventilation intakes that serve an enclosed area for all Ameren locations. Smoking is not permitted in a multi-occupant Company vehicle or while operating motorized equipment.

3.7.3 Enforcement
Any violation of this policy may result in the individual being removed or barred from Ameren property.

3.8 Daily cleanup of the work area is required. Ameren reserves the right to clean up Contractor's area if Contractor is not fulfilling their housekeeping requirements. Any and all costs associated with the cleanup will be deducted from Contractor's base contract.

4.0 EVACUATION

4.1 If there is an emergency, an evacuation announcement may be made over the plant's public address system. The evacuation assembly area shall be communicated during orientation training.

4.2 In the event of severe weather, an announcement to seek shelter may be made over the public address system. The location of the plant tornado shelter shall be communicated during orientation training.

4.3 To report an emergency, contact the Shift Supervisor immediately using the plant's public address system. Do not hang up. Wait for instructions.

5.0 WORKER'S PROTECTION ASSURANCE OR HOLD CARD PROCEDURE

WARNING: Violation of Workers Protection Assurance (WPA) procedures can cause serious equipment damage, personal injury or death.

When WPA is present, verify that equipment is actually de-energized or in the designated state. Always walk down the job, check voltages, temperatures, pressures, etc. to confirm status.

5.1 WPA is Ameren's procedure to tag equipment or systems that have been de-energized or put in a specified state, to allow for service or testing. The energy in a system may be electrical, mechanical, pneumatic, hydraulic, chemical, kinetic or nuclear.

5.2 All employees should receive site-specific WPA training including descriptions of the tags and their functions. Workers must sign on and off WPA protection as directed by their supervisor.

5.3 Contractor/Subcontractor employees shall observe all WPA rules and comply with WPA tags at all times. Never use an elevator that has a WPA card on the call button.

6.0 SUBSTANCE ABUSE

ATTENTION: Employees who refuse to take a drug test or have been found to be non-compliant will be escorted off-site immediately and may be subject to permanent barring from Ameren facilities.

6.1 Possession, and/or use of alcohol or drugs, is STRICTLY PROHIBITED.

6.1.1 Drugs, stimulants, "pep pills," tranquilizers, and similar substances are allowed only if prescribed by a doctor.

6.2 Ameren's Contractor's Substance Abuse Policy requires pre-employment and random drug testing of Contractor employees.

7.0 HARASSMENT AND WORKPLACE VIOLENCE POLICIES

7.1 Ameren Corporation has a zero-tolerance policy for behavior that is prohibited under Ameren's EEO & Anti-Harassment Policy and Ameren's Workplace Violence Policy Statement. These policies apply to Ameren employees and Contractor/Subcontractor employees.

7.2 Ameren intends that employees, contractors, customers, vendors, and visitors, never feel threatened, intimidated, harassed, offended or demeaned by any individual's actions, presence, conduct, or communication while they are on Ameren property.

7.3 The following behaviors and actions are **STRICTLY PROHIBITED** anywhere on Company property and may result in permanent barring from all Ameren facilities:

- Willful violation of safety rules or safe working practices
- Possession of unauthorized firearms, weapons or explosives and/or materials/components that could be used to make explosive devices
- Damaging, mutilating, or willful abuse of supplies, equipment & tools, vandalism of company property, or property of others
- Gambling or stealing
- Urinating in an undesignated area
- Harassment by anyone and in any form
    - Harassment includes, but is not limited to, unwelcome or unsolicited conduct or hostility based on or directed at a person or group because of race, color, religion, sex, national origin, ethnicity, age, disability, veteran status, pregnancy, marital status, sexual orientation or any other protected factor.
    - Conduct that may be considered offensive, hostile, demeaning, or derogatory, regardless of whether it is physical, verbal, or graphic in nature and whether it is done in person, or delivered via phone, fax, e-mail, text message, over a PA system, company mail, or by any other means.
    - Examples of Prohibited Physical Conduct:
        - → Bullying, wrestling, fighting, horseplay, or spitting on an individual,
        - → Sexual conduct such as rape, sexual battery, molestation, stalking, or attempts to commit such assaults, unwelcome touching, hugging, massaging, etc.
    - Examples of Prohibited Verbal Conduct:
        - → Threatening/intimidating someone (both explicit and implied),
        - → Verbal abuse, jokes, derogatory comments, references, or derogatory slurs of a sexual, racial, ethnic, or religious nature.
    - Examples of Prohibited Non-Verbal Conduct:
        - → Wearing of offensive clothing, hats, patches, etc.
        - → Displaying stickers, drawings, or posters that depict nooses, confederate "Rebel" flags, KKK paraphernalia, swastikas, or magazines, books, pictures or videotapes with sexual content.
        - → Drawing/displaying graffiti, specifically graffiti that is sexual, racial, or otherwise offensive, hostile, demeaning or derogatory to any individual/group or known to incite anger/violence.
        - → Using gestures that are obscene, or known to incite anger/violence.

7.4 Other behaviors and actions, not specifically set forth in this list, may violate Ameren zero tolerance policies.

8.0 WORKPLACE HAZARDS

8.1 Work near coal dust, fly ash, lime, or ferric/lead paint removal projects can create airborne contaminates. Do not use compressed air to clean surfaces or clothing. Use properly equipped vacuum, wet methods or other approved methods for cleaning.

8.2 All plants have asbestos-containing insulation and building materials (ACM). Treat all suspect materials as if they are asbestos.

8.3 Asbestos abatement projects may be in progress. Barricades will restrict access to areas with abatement projects. Only trained personnel using Personal Protection Equipment (PPE) may handle asbestos.

8.4 Personnel who are medically required to use syringes shall take them home, properly packaged for disposal. Only trained employees using PPE shall handle items contaminated with blood or other body fluids. Report any bloodborne related issues to the SPOC.

9.0 FOREIGN MATERIAL EXCLUSION (FME)

9.1 Foreign Material Exclusion protects critical plant components and systems, from contamination or damage. Systems such as feed water, condensate, steam, oil, and electrical controls and motors may suffer significant damage from foreign materials. See Foreign Material Exclusion Requirements (Appendix X) for additional requirements and details.

9.2 Foreign material contamination can come from sources such as:

- Welding and gas cutting debris,
- Metal chips, shavings and filings,
- Corrosion that produces flakes of metallic substances,
- Cleaning materials, such as shot from blasting, rags & lint,
- Forgotten tools or any material that falls out of worker's pockets,
- Water leaks/spills, cutting fluids, solvents, etc.

9.3 To prevent damage from foreign objects follow these work practices:

- Clean dirt, oil and fly ash from around covers, caps and other devices before opening.
- Remove welding electrodes, stubs and broken flux coating material from internal work areas in closed systems.
- Cover openings on turbines, generators, pumps, pipes, tubes, electrical cabinets/motors and other critical components during maintenance activities.
- Track tools, parts and materials allowed in an FME work area.
- Allow only materials necessary for the task into the work area; do not allow personal items such as jewelry or change.
- Secure all tools, safety glasses, badges, gloves and other loose items with lanyards, tape or other means.
- Catch clippings from cable ties, stripped wires, etc.
- Vacuum or wipe out electrical cabinets after repairs/modifications to remove moisture, metal chips, knockouts, clippings, etc.

I, the undersigned, have read the Job Working Rules. I have completed site orientation training and I understand:

- The Job Working Rules
- Site-specific instructions, including Worker's Protection Assurance procedures
- Safety requirements

I acknowledge that a violation of any of these provisions will be grounds for immediate removal from Ameren property and I may be subject to permanent barring from all Ameren facilities.

Date _____

Employee Name (Print) _____

Employee Signature _____

Contractor _____

END OF APPENDIX B

APPENDIX C
DESIGN FOR SAFETY GUIDE

OBJECTIVE

Develop and maintain design guidelines to ensure engineering designs reduce safety risks for construction, operations, and maintenance of equipment and facilities.

These Guidelines reflect Ameren's commitment to incorporate safety into all designs. The designer of record is ultimately responsible for adherence to all governing Federal, State, and Local code requirements.

While attempts will be made to follow the recommendations in this guideline during the engineering phase there will be occasions where conditions and physical constraints may render some recommendations impractical or unattainable.

Several of the Design for Safety recommendations are subjective and can vary from plant to plant (i.e. serviceable access for equipment, pipe labeling, & color coding). Ameren Engineering and contracted consultants must engage plant stakeholders during the design phase to accommodate plant specific safety and operating requirements.

GENERAL FACILITY SAFETY DESIGN

YES	NO	N/A	
☐	☐	☐	General Arrangement layouts shall provide for adequate serviceable access for operation, maintenance, and replacement; i.e. personnel access, tool access, cart access, vertical lift access, fork truck access.
☐	☐	☐	Stairs shall not be used as access platforms. No valves, controls, equipment, etc., shall be positioned / designed to be accessed by personnel standing on stairs.
☐	☐	☐	Permanent, well identified and load rated fall protection tie-offs, shall be incorporated into the building structure at removable handrails and access hatchways.
☐	☐	☐	Self-closing swing gates are to be used instead of chains and clips at all personnel access openings for fall protection guarding where the elevated surface is used as a work platform or walkway.
☐	☐	☐	Non-slip "Mebac" ladder rung covers should be used on all fixed access ladders.

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YES	NO	N/A	
☐	☐	☐	All new handrails shall be fabricated utilizing 1 ½" diameter standard pipe rails and posts. Posts shall be spaced a maximum 6'-0 on centers. Rails shall include one (1) top rail (top of top rail shall be 42 inches above walking surface); **two (2) mid rails** *equally spaced to provide increased fall protection*; and a standard 4" high toeboard.
☐	☐	☐	OSHA required clearance to handrails on stairs (3") must be maintained. Structural bracing, electric conduit, or mechanical piping is not located within the required clearance space.
☐	☐	☐	No more than a 3" open gap is maintained between a walking surface and the side of a piece of equipment penetrating the walking surface.
☐	☐	☐	When practical, valves shall be located to allow for ergonomically correct operation.
☐	☐	☐	When practical, provide stairs rather than ladders to equipment, valves, etc. that requires routine access for operations and/or maintenance.
☐	☐	☐	Provide chain wheel operators for valves that cannot be accessed from a permanently installed ladder or platform.
☐	☐	☐	When possible, design stairs with lower angle of stairway rise (6½" R, 11" T). Stair landings are provided every 10 to 12 treads.
☐	☐	☐	When possible, no low mounted equipment, piping, ducting, conduit, etc. in travels paths. No "duck-unders". Use a minimum design head clearance of 7'-0".

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YES	NO	N/A	
☐	☐	☐	All 90 degree corners of structural steel members and plate trimmed / clipped where close to personnel access areas.
☐	☐	☐	Maintenance and replacement access considered when locating lighting fixtures (especially on stairways, over tops of equipment and high overhead locations).
☐	☐	☐	Underground utilities shall be designed and installed with warning and location indicators for future excavations in the areas of buried utilities.
☐	☐	☐	Underground utilities shall be designed and installed at shallowest depth possible (while maintaining freeze protection and surface surcharge loads) to minimize deep trenching hazards.
☐	☐	☐	Thermal protection guarding incorporated into design where required.
☐	☐	☐	Utilize above ground liquid containments or rigid structural underground containment. Avoid below grade lined pits.
☐	☐	☐	Incorporate seismic shut-off valves for gas service lines entering buildings and at meter locations. (Application mostly at non-power plant, off-site buildings / facilities).
☐	☐	☐	Walkways shall be clear of protruding obstructions and bump hazards. No valves, valve stems, valve handles, controls, equipment, etc. shall be positioned / designed within the normal walking path within personnel walkways. If not possible, paint or otherwise safeguard.

Ameren MISSOURI

YES	NO	N/A	
☐	☐	☐	Utilize yellow warning striping along edges of personnel walkways to guide / warn walking personnel of potential obstructions, ramps, bump hazards, grade / slope changes.
☐	☐	☐	Provide personnel access to all roofs for inspection and maintenance purposes.
☐	☐	☐	Provide permanent fall protection tie-offs that are well identified, load rated, and incorporated into the building structure on roofs where there are no parapets or guard railing. (Review the need for fall protection tie-offs on specific roof areas on a case-by-case basis).
☐	☐	☐	To eliminate the need for fall protection tie-offs, when practical building roof parapets should be designed high enough to meet OSHA fall protection guarding requirements.
☐	☐	☐	Where possible, roof mounted equipment shall not be designed and installed closer than 15' to open, unguarded edge of roof.
☐	☐	☐	Provide fall protection guarding at edge of roof (without parapet) where roof mounted equipment is installed closer than 15' to open edge of roof.
☐	☐	☐	Provide fall protection guarding on both sides of a fixed roof access ladder onto roofs with no parapet or guard railing.
☐	☐	☐	Provide fall protection guarding or tie-off point at all personnel access roof hatches.

Ameren MISSOURI

YES	NO	N/A	
☐	☐	☐	Provide fall protection guarding at roof mounted sky lights (many commercial skylights are available with security grills that will act as fall protection guarding).
☐	☐	☐	Design roof mounted equipment, ducting, and piping with adequate clearance for roof maintenance and replacement. Design clearances shall meet the NRCA recommendations for equipment to roof clearances.
☐	☐	☐	Provide service power for roof mounted equipment.
☐	☐	☐	Eliminate tripping hazards on roofs / floors. No low to roof / floor mounted electric conduits and drain pipes.
☐	☐	☐	Utilize safety balls on lightning protection air terminals. Eliminate impalement hazard of pointed air terminals on roofs.
☐	☐	☐	"Roof slippery when wet" signs shall be installed at all personnel access points onto roofs.
☐	☐	☐	Provide lighting on roofs in areas of personnel access for maintenance of equipment.
☐	☐	☐	Design mechanical / electrical equipment and components to be water tight for wash down cleaning.

Ameren MISSOURI

YES	NO	N/A	
☐	☐	☐	Provide the proper quantity and type of fire extinguishers and hose stations.
☐	☐	☐	Provide proper washdown facilities (hose reels, supply pipes, drains) to allow facility cleaning.
☐	☐	☐	Assure proper safety signage is in place (chemicals, hearing protection, etc.).
☐	☐	☐	Assure roof drains are not placed where water will freeze and become a slipping hazard.
☐	☐	☐	Provide ice dams on sloped roofs above doorways and walkways to prevent and/or break up sliding ice.

COMMENTS TO GENERAL FACILITY SAFETY DESIGN:

Ameren MISSOURI

ELECTRICAL SAFETY DESIGN

YES	NO	N/A	
☐	☐	☐	Walk down conduit and cable tray routes before installation to identify hazards such as tripping, head, thermal, chemical, etc.
☐	☐	☐	The location, cable tray material, and conduit shall be designed for the identified hazards for that specific location.
☐	☐	☐	Place electrical equipment in accessible locations.
☐	☐	☐	Electrical Room Egress: Provide at least two exit paths even if Code allows one exit for "un-occupied space". These spaces frequently become temporary Control Centers during construction, commissioning, and start-up.
☐	☐	☐	Cabinet/enclosures shall be designed to allow sufficient space for maintenance if maintenance to be performed inside the cabinet/enclosure.
☐	☐	☐	Provide sufficient space to allow for cabinet / enclosure access doors to fully open.
☐	☐	☐	Provide sufficient space for electrical equipment as defined by NEC in walkways, area between cabinets, etc. for forklifts, routine maintenance, etc.
☐	☐	☐	All control switches shall be accessible from outside of the cabinet.

Ameren MISSOURI

YES	NO	N/A	
☐	☐	☐	Provide the manufacturer's recommended spacing for equipment cooling.
☐	☐	☐	Obtain arc flash incident energy level and labels for any equipment rated 480V and higher or greater than 125KVA at 120VAC & above per NFPA 70E.
☐	☐	☐	Consider extra guarding of high voltages (Plexiglas) in electrical cabinets to reduce PPE requirements.
☐	☐	☐	Switchgear shall be specified to provide "Lock Out" capability.
☐	☐	☐	Equipment shall be designed for the ratings for which it will be subject to (i.e., maximum voltage, short circuit current, continuous current, ambient temperature, etc.).
☐	☐	☐	Equipment, cable, conduit, tray, etc. shall be labeled with the voltage level.
☐	☐	☐	Equipment shall be labeled with normal power feed and backup power feed (if applicable).
☐	☐	☐	Consider backup power feed for systems where failure of normal power feed would result in a hazardous event.

Ameren MISSOURI

YES	NO	N/A	
☐	☐	☐	Label all equipment with appropriate equipment description (if applicable).
☐	☐	☐	When possible, critical conduits shall be installed in a duct bank rather than direct buried.
☐	☐	☐	Control cabinets and wiring termination cabinets shall be accessible from platforms or at grade level. Ladders shall be avoided.
☐	☐	☐	Provide fall protection tie-off points at tops of transformers.

COMMENTS TO ELECTRICAL SAFETY DESIGN:

Ameren MISSOURI

MECHANICAL SAFETY DESIGN

YES	NO	N/A	
☐	☐	☐	Walking or climbing surfaces are sheltered or maintained in a manner to avoid slippery surfaces from rain or ice. (Review on a case-by-case basis).
☐	☐	☐	Emergency drainage systems are provided to direct flammable liquid leakage to a safe location.
☐	☐	☐	Provide eye wash stations at locations where liquids are sampled or "open fluids" are otherwise handled.
☐	☐	☐	Stairs, ladders, or ramps are provided at all locations where equipment design or maintenance actions require personnel to abruptly change elevation by more than 12 inches.
☐	☐	☐	Fixed ladders designed with a slope of 75 degrees or more where practical.
☐	☐	☐	Whenever practical, provide adequate access for maintenance personnel to all mechanical components, small-bore piping, ducts, valves, thermowells, flow meters and other appropriate instrumentation on piping runs and equipment units which require inspecting, testing, servicing, adjusting, greasing, removal, replacement, or repair.
☐	☐	☐	When practical, locate instruments, sample points, valves, etc. that require frequent readings, calibration, operation, etc. to allow for walk-up access.

YES	NO	N/A	
☐	☐	☐	Specify equipment to include handling features that will aid in grasping, removing, and carrying equipment.
☐	☐	☐	Labeling and coding is provided for service and adjustment points to clearly identify the key aspects of the maintenance activity.
☐	☐	☐	Equipment and components shall be labeled with weights for lifting and removing for later maintenance or replacement. When modifying existing equipment, determine the weight of the existing equipment plus modifications and label or revise the existing labels accordingly. When possible, the label shall include references to the calculation, project, and/or drawing number.
☐	☐	☐	Provide lifting devices (lifting lugs, beams, monorail, etc.) for maintenance and replacement of equipment. Lifting devices shall be labeled with the rated lifting capacity.
☐	☐	☐	Provide Indicators for convenient and reliable determination of fluid levels.
☐	☐	☐	Drain fittings are provided to support fluid removal readily and safely.
☐	☐	☐	Ensure design basis application for failure modes on all positioned equipment. Example, loss of air, loss of DC, etc.
☐	☐	☐	Standardize parts, maintenance and adjustment points as much as possible. For example, use the same size and type of bolts to eliminate special wrenches/tools. Utilize common rigging points to minimize types of rigging connections, etc. If standardization is not possible, clearly differentiate specialized items with signs, markings, etc.

Ameren MISSOURI

YES	NO	N/A	
☐	☐	☐	Minimize steam hazards, heat hazards, sharp corners, edges, and projections on equipment.
☐	☐	☐	Equipment should be placed on concrete housekeeping pads, especially where standing water might accumulate.
☐	☐	☐	Add equipment protection features to guard against hazards that cannot be removed or designed out of the system.
☐	☐	☐	Specify that equipment vendor technical manuals deal with one specific equipment model rather than with many different equipment models.
☐	☐	☐	Valves shall be provided with "Lock Out" devices.
☐	☐	☐	Provide adequate isolation valving and venting for WPA, maintenance, etc. on piping systems and equipment. Follow applicable code/standard section requirements.

COMMENTS TO MECHANICAL SAFETY DESIGN:

Ameren MISSOURI

CHEMICAL SAFETY DESIGN

YES	NO	N/A	
☐	☐	☐	Insure that bulk chemical tanks have separate containment areas. Containment areas shall be washable and have the ability to be drained.
☐	☐	☐	All materials used to construct storage tanks, containment, piping, etc. must be verified to be compatible for use with the chemicals used in each specific application.
☐	☐	☐	Lengths of chemical piping runs should be minimized. Chemical supply tanks and pumps should be designed to be as close to injection points as possible. Overhead chemical piping runs should be minimized. When used, labels shall be affixed to the floor beneath the piping with proper hazard communication. Chemical lines must be labeled a minimum of every 10 feet. All PVC/CPVC chemical piping must be protected from foot traffic.
☐	☐	☐	Chemical day tanks shall be properly sized to minimize the number of drums in the work area.
☐	☐	☐	Designate storage areas for each type of chemical, taking into account compatibility of each.
☐	☐	☐	Provide sufficient room for servicing instruments around bulk chemical storage tanks.
☐	☐	☐	Drains to sump shall be located around all chemical feed equipment. Local wash down water must be provided in chemical feed area. Include hose and hose reels for local wash down water.

Ameren MISSOURI

YES	NO	N/A	
☐	☐	☐	All laboratory areas must contain proper first-aid kit(s).
☐	☐	☐	Material for chemical spill control (pigs, pads, soda ash, etc.) shall be located in a designated area close to chemicals.
☐	☐	☐	Personal protective equipment shall be located in a designated area close to chemicals.
☐	☐	☐	Chemicals shall be transferred to equipment (mixing tanks or day tanks) in a way to minimize chances of contacting personnel and avoid manual dumping of bottles and drums.
☐	☐	☐	Chemical containers must be labeled with chemical names and HAZCOM placards.
☐	☐	☐	All safety showers shall be supplied with tepid water. Safety showers located outside shall also be covered and protected from the wind. Safety shower activation shall signal an alarm in the control room.
☐	☐	☐	All concrete and equipment exposed to chemicals shall be coated with an appropriate chemical-resistant coating.
☐	☐	☐	PA shall be located convenient to all chemical use areas, but beyond the area that could be engulfed by a chemical spill.

YES	NO	N/A	
☐	☐	☐	Operating and Maintenance personnel shall be isolated from all chemical pumps and feed systems by plastic screens or curtains.

COMMENTS TO CHEMICAL SAFETY DESIGN:

END OF APPENDIX C

APPENDIX D
STANDARD CONTRACTOR SCHEDULING REQUIREMENTS

1.0 PRE-BID/AWARD REQUIREMENTS

1.1 Contractor bids shall be rejected if they are not accompanied by a schedule. The scheduling tool shall be Primavera Enterprise (P6) unless otherwise authorized by Ameren Construction managing supervisor in writing.

1.2 Contractor's bid schedule shall reflect sufficient level of detail that effectively communicates the methodology of work/execution plan. The bid schedule shall be defined in compliance with the milestones, project constraints and deliverables required by Ameren.

1.3 Contractor shall indicate the calendar of their work schedule (days/week, shifts/day, hours/day) that is the basis for their schedule.

1.4 Contractor shall identify projected manpower required to execute project and shall also provide an assessment of labor availability based on prevailing market conditions.

1.5 Contractor shall identify the hierarchy of their project management team, including an organization chart of how they report to the Project Manager and how they report into the project management system.

1.6 The individual responsible for updating the Contractor's schedule shall be identified in the bid along with a personal resume.

1.7 Contractor's bid shall list any exceptions to the standard schedule requirements.

2.0 PRE-OUTAGE REQUIREMENTS AFTER AWARD

2.1 Contractor's point of contact for schedule submittals/updates will be the Ameren Project Scheduler. All schedule iterations and revisions shall be coordinated and approved through the Project Scheduler.

2.2 Contractor shall be required to organize the schedule according to requirements specified by Ameren's Project Scheduler, and shall include a work breakdown structure (WBS) that follows the provided sample schedule to facilitate schedule review and reporting.

2.2.1 Contractor shall develop their resource loaded schedule using Ameren's outage planning milestones within two weeks following contract award date. During this time frame, the Contractor and Project Scheduler will collaborate to develop a mutually acceptable schedule. Contractor's schedule will then be installed in the Ameren network to be used as the working schedule during pre-outage, outage execution and post outage.

2.2.2 Contractor is required to provide an onsite scheduler to provide updates to Ameren Project Scheduler for scheduling progress once installed in Ameren network.

2.2.3 Ameren will provide onsite network access to Contractor for scheduling review.

2.2.4 Ameren will make milestone to milestone ties, and other appropriate relationship ties between Contractor schedule and Ameren integrated outage schedule.

2.3 Contractor baseline shall be established after both Contractor and Project Scheduler mutually agree on schedule. This will be completed before the start of the outage. In accordance with outage planning milestones, the baseline schedule shall be compared to the actual schedule during the course of the outage.

3.0 OUTAGE EXECUTION/SUPPORT REQUIREMENTS

3.1 Contractor shall provide an onsite scheduler, unless otherwise authorized by Ameren, to provide updates to the Project Scheduler. Contractor scheduler will provide the following update information:

3.1.1 Activities worked on

3.1.2 Actual durations and resources used

3.1.3 Remaining durations

3.1.4 Percent complete

3.1.5 Expected finish dates

3.2 Contractor shall update/analyze the schedule daily. The schedule shall provide accurate reflection of progress throughout the outage. Schedule analysis should include risk management strategies to assure that outage milestones are achieved.

3.3 Contractor shall provide updates to Project Scheduler daily by 8:00 a.m. Several iterations of schedule edits/updates may be required before the Contractor's schedule may be scheduled with the integrated outage schedule. Ameren's Project Scheduler will analyze all schedules together with the integrated outage schedule and will post the updated integrated outage schedule to outage home page by 1:30 p.m.

3.4 Contractor will supply and develop activities, resources and associated project logic for added EWO work within one day of award of contract. Ameren will update Contractor with EWO work.

3.5 Ameren Project scheduler will inform the Contractor scheduler or single point of contact, Ameren engineering and responsible plant personnel of any high-risk activities that may impact the outage schedule and milestones on the Integrated Outage Schedule as required.

3.6 If Contractor progress is not meeting or will not meet the outage milestones, Ameren will require Contractor to participate in a re-evaluation of remaining work to ensure that milestone dates will be met for outage.

4.0 POST-OUTAGE SCHEDULE REQUIREMENTS

4.1 Contractor shall attend post-outage critique meetings that include a review of schedule performance.

END OF APPENDIX D

Ameren MISSOURI

APPENDIX E
SAFETY DATA SHEETS
CONTRACTOR AFFIDAVIT PURCHASE ORDER NO.

As the responsible party for the firm of _____, I do here state that I have requested, received, read, understand, and will abide by and enforce the guidelines and conditions set forth in the Safety Data Sheets (SDS) provided by the product manufacturer for each hazardous chemical product delivered to and/or used in connection with the work specified in _____. I further state that I have the most current copy of the SDS for each hazardous chemical my firm has brought on site.

I further state that I am aware of, understand, and will fully implement the requirements of the OSHA Hazard Communication Standard (CFR 29, Part 1910.1200) and other workers' right-to-know laws.

I further state that I understand that Ameren maintains copies of SDS's on chemical substances at this facility. If any question arises regarding any chemicals to which employees may come into contact, an SDS on that chemical shall be reviewed. A copy of the SDS's is available from the Ameren SPOC.

I further state that I will maintain copies of the required SDS for each hazardous chemical used while on Ameren property; and will insure that the Safety Data Sheets are readily accessible during each work shift to employees when they are in their work areas.

I further state that the information contained within the SDS has been disseminated to all parties who have a right or need to know; and that all workers and other effected parties have received adequate and appropriate training in the hazards, handling, and use of hazardous chemicals.

_____ _____
Contractor's Representative/Title Date

_____
Notary Public Signature & Seal

END OF APPENDIX E

Ameren MISSOURI

APPENDIX F
LEADED PAINT DISTURBANCE

NOT USED FOR THIS PROJECT

APPENDIX G
ASBESTOS REMOVAL

NOT USED FOR THIS PROJECT

APPENDIX H
FEDERAL ENERGY REGULATORY COMMISSION (FERC) STANDARDS OF CONDUCT

NOT USED FOR THIS PROJECT

Ameren MISSOURI

APPENDIX I
CHEMICAL OF INTEREST REPORTING

NOT USED FOR THIS PROJECT

APPENDIX J
VENDOR DRAWING TRANSMITTAL/CAD REQUIREMENTS

NOT USED FOR THIS PROJECT

APPENDIX K
PLANT ACCESS, PARKING & SECURITY

1.0 Plant Access, Parking and Security

1.1 Contractor employees, visitors and vendors must enter the plant *only* at the entrance where their company name is posted. Security cameras monitor entrances to inform supervisors of violations.

1.2 Security will direct contractor employees to work rules training the first time employees report to the site.

1.3 Employees must document their completion of site specific work rules training before they are allowed unescorted access to the site.

1.3.1 Computer Based Training (CBT) is typically used for work rules orientation and to document training.

1.3.2 Contractor employees must read and sign a hard-copy of the Job Working Rules if an orientation video or oral presentation is used for training.

1.3.3 If alternative training has been used due to a temporary CBT malfunction, then employees must take the CBT training when the system is restored.

1.4 Contractor's Employee Identification

1.4.1 Ameren Contractor ID badges containing the Contractor employee's name and Contractor ID number are issued when work rules training is completed.

1.4.2 Security will re-activate an existing badge if the employee has completed the site work rules orientation within the last 12 months.

1.4.3 Security will de-activate badges at the end of each job.

1.4.3.1 Contractor shall inform the Single Point of Contact (SPOC) when employees will complete their work on the site using the Reduction in Force Report (Attachment A7).

1.4.4 Daily gate logs will be used to validate invoices and may be provided to the Contractor upon request. If the plant has electronic badge readers, employee arrival and departure times are automatically recorded.

1.4.5 Contractor shall provide employees with hard hats of the same color. The hard hats must have Contractor's name or company logo on either the sides or the front of the hard hat.

1.4.6 Security will apply labels with the employee's first and last names to the front and back of each hard hat.

1.4.7 Contractor may provide a hard hat storage container at the Construction gate. PPE is required to access the site.

1.5 Contractor Access

1.5.1 Business agents, vendor/sales representatives, contractor executives and other contractor visitors shall park in the construction parking lot and be escorted on-site.

1.5.2 Consultant badge holders may park in either the construction parking lot or the Ameren employee parking lot visitor space, depending on the purpose of the visit.

1.5.3 A contractor employee who has completed CBT/Work Rules training may escort visitors and ensure Ameren work rules are followed.

1.5.4 Contractor visitors are issued a Visitor's badge and are required to wear a hard hat and safety glasses.

1.6 Vehicles Beyond the Security Gate

1.6.1 Only contractor work vehicles with an Ameren mirror tag are permitted beyond the security gate. Contractor can request a mirror tag for vehicles necessary to complete the Work by submitting an Authorization for Site Vehicle Pass form.

1.6.1.1 Vehicles must have Contractor name or Logo on each side and must have an insurance certificate verifying $1,000,000.00 minimum liability coverage.

1.6.1.2 Contractor work vehicles, commercial vehicles, or contract carrier vehicles without a mirror tag will be held at the gate until cleared by the SPOC.

1.6.2 Vehicle drivers and all passengers must swipe/sign-in at the construction gate.

1.6.3 Contractor vehicles leaving the plant will be inspected by Security.

1.6.3.1 Tools and materials being removed on Contractor vehicles must have an Ameren Material Pass (Form 5532NS) signed by the SPOC and a Contractor supervisor for Security to retain.

1.7 Use of Plant Facilities

Note: The policies are on Scholar, the Ameren intranet. Go to *Employee Center, Corporate Policies, Policies by Topic, Technology*.

1.7.1 Contractors who have Ameren computers, phones and fax machines are "Privileged Users" and must comply with the following policies.

- Electronic Mail Policy
- Facsimile Machine Usage Policy
- Information Resources Acceptable Use Policy
- Internet/Intranet Usage Policy
- System Access Control Policy
- Wireless Communication Policy

1.7.2 Work areas must be restored to a condition that is approved by the SPOC.

END OF APPENDIX K

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APPENDIX L
CYBER SECURITY

NOT USED FOR THIS PROJECT

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APPENDIX M
HAULING HEAVY EQUIPMENT

NOT USED FOR THIS PROJECT

APPENDIX N
PIPE AND FITTINGS: APPROVED MANUFACTURER LIST

NOT USED FOR THIS PROJECT

APPENDIX Q
QUALITY MANAGEMENT OVERSIGHT APPLICATION AID

NOT USED FOR THIS PROJECT

APPENDIX R
RADIOGRAPHY SAFETY REQUIREMENTS

NOT USED FOR THIS PROJECT

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APPENDIX W
WELDING AND NDE

NOT USED FOR THIS PROJECT

APPENDIX X
FOREIGN MATERIAL EXCLUSION REQUIREMENTS

NOT USED FOR THIS PROJECT

APPENDIX Z
CONFINED SPACE LOCATIONS

NOT USED FOR THIS PROJECT

Ameren MISSOURI

APPENDIX AA

BID FORM

MEREDOSIA ASH POND CLOSURES

AT

MEREDOSIA ENERGY CENTER
MORGAN COUNTY, ILLINOIS

FOR

AMEREN ENERGY MEDINA VALLEY COGEN, LLC
800 South Washington Street
Meredosia, IL 62665

DATE _____, 2016

BIDDER

FIRM _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

TELEPHONE NO (with AREA CODE) _____

Ameren MISSOURI

BASE BID

The scope of **BASE BID** shall include all work included in the Plans and Specification as outlined on this bid form.

Having examined all Bidding Documents, including the Request for Quotation, and Plans and Specification prepared by Geotechnology, Inc. and CDG Engineers, Inc. for the project entitled above dated 04-29-2016 and having visited the site and examined all conditions affecting work, the undersigned proposes to furnish all labor, materials, equipment, and appliances required by said work for a Stipulated Sum of:

BASE BID:

_____ DOLLARS (_____)

For purposes of progress payment submittals only, this base bid can be divided as follows:

Ash Pond Closure	Quantity	Unit	Total Cost
Mobilization/Demobilization	1.0	LS	$
Erosion and Sediment Control Measures	1.0	LS	$
Surface Water Management	1.0	LS	$
Clearing and Grubbing	1.0	LS	$
Removal of Improvements	1.0	LS	$
Earthwork (Ash)	427,216	CY	$
Earthwork (Borrow)	167,076	CY	$
Earthwork Misc. Grading (Ditches, Swales, etc)	5,943	CY	$
ClosureTurf™	42.8	AC	$
HydroTurf™	3.4	AC	$
Energy Dissipators	317.0	CY	$
Remove and Re-use Existing Rock Blanket	3,386.0	CY	$
Rock Blanket	1,145.0	CY	$
Dewatering	1.0	LS	$
Aggregate Access Road (6" thick)	156	CY	$
Aggregate Access Road (24" thick)	2873	CY	$
Seeding and Mulching	33.0	AC	$
Chain Link Fence	995.0	LF	$
30' Wide Gate	1.0	EA	$
Other / Misc.	1.0	LS	$
Utility Allowance (Local Utility)	1.0	AL	$ 60,000
		TOTAL	$

SUBCONTRACTOR INFORMATION

The Contractor shall list all Subcontractors that he proposes to use.

SUBCONTRACTOR: _____

ADDRESS: _____

CITY _____ STATE _____ ZIP _____

WORK: _____

SUBCONTRACT AMOUNT: $_____

SUBCONTRACTOR: _____

ADDRESS: _____

CITY _____ STATE _____ ZIP _____

WORK: _____

SUBCONTRACT AMOUNT: $_____

SUBCONTRACTOR: _____

ADDRESS: _____

CITY _____ STATE _____ ZIP _____

WORK: _____

SUBCONTRACT AMOUNT: $_____

LABOR AND EQUIPMENT RATES FOR TIME AND MATERIAL WORK

Provide on the following pages labor and equipment rates for miscellaneous work on Ameren Energy Medina Valley Cogen, LLC property at the Meredosia Energy Center as directed by the Owner.

Use of equipment included on the Small Tools Reference List shall be considered incidental to the labor and equipment rates provided.

Ameren MISSOURI

Specification #000167
Sheet No. AA - 4

TIME AND MATERIAL LABOR RATES

EXPIRE _____

	S.T.	T.H.	D.T.
Carpenter/Millwright			
Apprentice			
Journeyman			
Foreman			
General Foreman			
Laborer			
Apprentice			
Journeyman			
Foreman			
General Foreman			
Cement Mason			
Apprentice			
Journeyman			
Foreman			
General Foreman			
Ironworker (Rebar)			
Apprentice			
Journeyman			
Foreman			
General Foreman			
Operator			
Apprentice			
Journeyman			
Foreman			
General Foreman			
Ironworker (Structural)			
Apprentice			
Journeyman			
Foreman			
General Foreman			

Material Mark-up _____
Subcontractor Mark-up _____
Equipment Mark-up _____

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Specification #000167
Sheet No. AA - 5

BARE EQUIPMENT RATES

EXPIRE _____

	Daily	Weekly	Monthly
Compactors/Tampers			
Compactor (Plate Tamper)			
Compactor (Jumping Jack)			
Concrete Breaking & Drilling			
Jack Hammer (60-90#)			
Chipping Hammer			
Hel Dog			
Rock Drills (45# & Over)			
1 - 1/2" Hammer Drill			
Concrete Placing Equipment			
Concrete Bucket (1CY)			
Concrete Bucket (2CY)			
Concrete Buggy (Power)			
Concrete Power Trowel (36")			
Concrete Vibrator			
Concrete Vibrator High Cycle			
Concrete Vibrators Air			
Concrete Saws			
Concrete Chain Saw			
Hand Held Cut-Off-Saw			
K40 Hand Held Air Saw			
K50 Walk Behind Air Saw			
14" Walk Behind			
36" Walk Behind			
Drills - Electric			
Core Drill			
Magnetic Drill			
Engineering and Alignment Equipment			
Engineers Level (Including Rod)			
EL-1 Electronic Level (Rotating)			
Level (Self Leveling)			
Transit			
Laser Alignment			
Generators			
Electric Generator Up To 3500 Watts			
Hi-Cycle 3500 Watt Generator			

Ameren MISSOURI

Specification #000167
Sheet No. AA - 6

	Daily	Weekly	Monthly
Heavy Equipment			
Bobcat			
Gehl GX35 Hoe or equivalent			
John Deere 650G Dozer or equivalent			
Cat 426 Backhoe (4WD)(416B) or equivalent			
Ford 655A Backhoe or equivalent			
Long-Arm Crawler Excavator			
Backhoe Mounted Hydraulic Breaker			
Backhoe Mounted Auger			
Backhoe Mounted Compactor			
Track Skid Steer			
Gradall/Lull/Lift			
Trackhoe			
Flatbed Truck			
Pick-up			
Hoists			
Air Tugger			
Electric Chain Hoist			
3 Ton Chain Hoist			
Miscellaneous Equipment			
Light Plant			
Gang Box (Security Box)			
Port-a-Power			
Radio			
Radio Repeater			
Pumps			
Pump with 20' suction & 50' discharge			
3" Gas			
4" Gas			
6" Gas			
Pump Only			
3" Gas			
4" Gas			
6" Gas			
2" Submersible			
3" Submersible			
4" Submersible			
Safety			
Breathing Air Equipment			
Tripod Safety Hoist			

Ameren MISSOURI

Specification #000167
Sheet No. AA - 7

	Daily	Weekly	Monthly
Shoring			
Shoring 11' -6 x 8" Panel (Krings)			
Shoring 14" Beams (Each)			
Trailers			
Large (Office)			
Small (Office)			
Work or Change Trailer			
Welders			
110 Wire Feed Welders			
Gas Welder			
Electric Welder			
Additional Equipment Required to Complete the Work			

Ameren MISSOURI

Specification #000167
Sheet No. AA - 8

FIRM: _____

ADDRESS: _____

CITY _____ STATE _____ ZIP _____

TELEPHONE NO. (with AREA CODE) _____

AUTHORIZED SIGNATURE: _____

TITLE: _____

DATE: _____

ATTACHMENT G

SEE LARGE FORMAT MAP OR PLAN SHEET

DOCUMENT DESCRIPTION:

Tie #:	Batch #W006012
Document ID #:	2833912
Site #:	W137030 0005
Site Name:	Ameren Energy - Meredosia
Cat #:	064
Document Date:	08/15/2016
Permit #:	
Log #:	
Keyword:	
Comment:	

	Type or Description of Plan/Drawing	SEE COLOR	Date of Plan	Figure/Diagram
1.	Plant Vicinity Map	Y	8/12/16	T-002
2.	Title Sheet	Y	8/12/16	T-001
3.	Site Index Map	Y	8/12/16	C-101
4.	General Notes	N	8/12/16	T-003
5.	Site Plan	Y	8/12/16	C-102
6.	site plan	Y	8/12/16	C-103
7.	Site Plan	Y	8/12/16	C-104
8.	Site Plan	Y	8/12/16	C-105
9.				

IL 532-2702
LPC 602 5/2008

SEE LARGE FORMAT MAP OR PLAN SHEET

DOCUMENT DESCRIPTION:

Tie #:	Batch #W006012
Document ID #:	283392
Site #:	W1370300005
Site Name:	Ameren Energy - Meredosia
Cat #:	06L
Document Date:	8/15/16
Permit #:	
Log #:	
Keyword:	
Comment:	

	Type or Description of Plan/Drawing	SEE COLOR	Date of Plan	Figure/Diagram
1.	Site Plan	Y	08/12/16	C-106
2.	Site Plan	Y	8/12/16	C-107
3.	Site Profile	N	8/12/16	C-110
4.	Profiles	N	8/12/16	C-111
5.	Details	Y	8/12/16	C-301
6.	Details	Y	8/12/16	C-302
7.	Details	Y	8/12/16	C-303
8.	Details	Y	8/12/16	C-304
9.				

IL 532-2702
LPC 602 5/2008

SEE LARGE FORMAT MAP OR PLAN SHEET

DOCUMENT DESCRIPTION:

Tie #:	Batch #W006012
Document ID #:	283392
Site #:	W1370300005
Site Name:	Ameren Energy - Meredosia
Cat #:	06L
Document Date:	8/15/16
Permit #:	
Log #:	
Keyword:	
Comment:	

	Type or Description of Plan/Drawing	SEE COLOR	Date of Plan	Figure/Diagram
1.	Details	N	8/12/16	C-305
2.	Drainage Area Map	Y	8/12/16	C-601
3.	SWPPP Plan	Y	8/12/16	C-602
4.	SWPPP Details	N	8/12/16	C-603
5.				
6.				
7.				
8.				
9.				

IL 532-2702
LPC 602 5/2008

W1370300005
06L

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276 • (217) 782-3397
BRUCE RAUNER, GOVERNOR ALEC MESSINA, DIRECTOR

March 8, 2017

Mr. Mike Bollinger, Principal Environmental Scientist
Ameren Services
1901 Chouteau Avenue
P.O. Box 66149, MC 602
St. Louis, Missouri 63166-6149

IEPA - DIVISION OF RECORDS MANAGEMENT
RELEASABLE

APR 24 2017

REVIEWER: JMR

Dear Mr. Bollinger;

This transmittal responds to the AmerenEnergy Medina Valley Cogen, LLC (Ameren) supplemental data and responses received at the Illinois Environmental Protection Agency ("Agency") headquarters, dated February 6, 2017, which amends the "Closure Plan: Fly Ash Pond and Bottom Ash Pond, Meredosia Power Station". The Agency has reviewed the additional data and responses Ameren provided, and finds that the document adequately addresses the Agency's comments dated November 1, 2016.

The Agency notes that Ameren has committed to submitting a signed groundwater management zone ("GMZ") application upon the Agency's approval of the Meredosia Station Closure Plan which includes the initial plan dated August 15, 2016 as modified by the supplemental information dated February 6, 2017. The Agency hereby approves the Closure Plan for the Meredosia Station. The Agency will acknowledge approval of the signed GMZ application under separate cover.

Thank you for your attention to these matters. If you have any questions or concerns, please contact Lynn Dunaway of my staff or me at the letterhead address or 217/785-4787.

Sincerely,

William E. Buscher

William E. Buscher, P.G.
Supervisor, Hydogeology and Compliance Unit
Groundwater Section
Division of Public Water Supplies
Bureau of Water

CC: Lynn Dunaway
Darin LeCrone
Records

W1370300005
06L

Ameren MISSOURI

Development and Resource Center

W1370300005-5

January 31, 2019

IEPA - DIVISION OF RECORDS MANAGEMENT
RELEASABLE

AUG 27 2019

REVIEWER: RDH

IL0000116

Bill Buscher
Groundwater Protection
Division of Water Pollution Control
Illinois Environmental Protection Agency
PO Box 19276
Springfield, IL 62794-9276

RE: Medina Valley Cogen, LLC
Meredosia Energy Center
Ash Pond Closures

Mr. Buscher,

I am pleased to inform you that Medina Valley Cogen, LLC has completed closure of the inactive Fly Ash and Bottom Ash Ponds at Meredosia Power Station. The closure project was deemed substantially complete December 5, 2018 in accordance with the Closure Plan approved by IEPA on March 8, 2017.

Enclosed are two copies of the Construction Quality Assurance (CQA) Report and Certification dated January 18, 2019, as required by Title 35, Part 840, Subpart A, Section 840.134. Please note that the Post-Closure Care Plan was submitted previously and approved by IEPA as part of the Closure Plan.

In accordance with Section 840.144, Annual Reports are due no later than March 28 of each year during the closure and throughout the post-closure care period. Ameren plans to submit an annual report containing groundwater monitoring data and any closure or post-closure activities after December 5, 2018.

If you have any questions or comments regarding this submittal, please contact me at (314) 957-3202 or at mwagstaff@ameren.com.

Sincerely,

Michael J. Wagstaff, P.E.
Consulting Engineer
On behalf of Medina Valley Cogen, LLC

RECEIVED
FEB 06 2019
IEPA/CAS

RECEIVED
FEB 06 2019
IEPA/CAS

Encl.

cc: D. E. Harley, w/o enclosure
M. Frerking, w/o enclosure
C. Henderson, w/o enclosure
S. B. Knowles, w/o enclosure
C. Giesmann, w/o enclosure
M. Kohlbusch, w/ enclosure (2)

W1370300005
06L

GEOTECHNOLOGY INC
FROM THE GROUND UP

CONSTRUCTION QUALITY ASSURANCE REPORT
CLOSURE OF THE BOTTOM ASH POND AND FLY ASH POND
MEREDOSIA POWER STATION
800 SOUTH WASHINGTON STREET
MEREDOSIA, MORGAN COUNTY, ILLINOIS

IEPA - DIVISION OF RECORDS MANAGEMENT
RELEASABLE

AUG 27 2019

REVIEWER: RDH

Prepared for:

AMEREN ENERGY RESOURCES
ST. LOUIS, MISSOURI

Prepared by:

GEOTECHNOLOGY, INC.
ST. LOUIS, MISSOURI

Date:

JANUARY 18, 2019

Geotechnology Project No.:

J024917.04

SAFETY
QUALITY
INTEGRITY
PARTNERSHIP
OPPORTUNITY
RESPONSIVENESS

St. Louis, MO | Erlanger, KY | Memphis, TN | Overland Park, KS | Cincinnati, OH | Fairview Heights, IL
Lexington, KY | Dayton, OH | Oxford, MS | Jonesboro, AR

GEOTECHNOLOGY INC
FROM THE GROUND UP

January 18, 2019

Mr. Mike Wagstaff, P.E.
Ameren Energy Resources
3700 South Lindbergh Boulevard
St. Louis, Missouri

RE: Construction Quality Assurance Report
Closure of the Bottom Ash Pond and Fly Ash Pond
Meredosia Power Station
800 South Washington Street
Meredosia, Morgan County, Illinois
Geotechnology Project Number: J024917.04

Dear Mr. Wagstaff:

Attached is the Construction Quality Assurance report for the referenced site. This report is documentation of the activities associated with the closure of the Bottom Ash Pond and the Fly Ash Pond at the Meredosia Power Station in Meredosia, Morgan County, Illinois performed through December 5, 2018. Site activities ceased on December 5, 2018 after reaching substantial completion. Final punch-list activities will be performed after the conclusion of winter weather and will be summarized in an addendum letter.

If you have any questions or comments regarding the attached information, please contact the undersigned at (314) 997-7440.

Very truly yours,

GEOTECHNOLOGY, INC.

Anna M. Saindon, P.E., Ph.D.
Project Manager

JYG/AMS/JAW:jyg/jsj

11816 Lackland Road, Suite 150 | St. Louis, Missouri 63146
(314) 997-7440 | Fax: (314) 997-2067 | geotechnology.com

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PLATES

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Appendix

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1.0 PROJECT BACKGROUND

Geotechnology, Inc. prepared this Construction Quality Assurance (CQA) report for the Bottom Ash Pond and Fly Ash Pond closure at the Meredosia Power Station in Meredosia, Morgan County, Illinois. The CQA report was prepared in general accordance with the Coal Combustion Residual (CCR) surface impoundment closure guidance of 35 Illinois Administrative Code (IAC) 840.146 entitled Site-Specific Closures of Coal Combustion Waste Surface Impoundments Subpart A: Closure of Ash Pond D, Hutsonville Power Station Construction Quality Assurance Program.

The Meredosia Power Station is located in the floodplain east of the Illinois River, south of Meredosia in Morgan County, Illinois, which is located in west-central Illinois. The Meredosia Power Station ash ponds are located in the south half of Section 21 and the north half of Section 28, T.16N, R.13W. The plant generated electricity from 1948 until February 2012. A third ash pond referred to as the "Old Ash Pond" was previously closed, and will not be further discussed in this report. The Bottom Ash Pond and Fly Ash Pond were constructed of native materials. A site overview with key feature locations is provided on Figure 1.

The Bottom Ash Pond was constructed in 1972 with a design surface area of 11 acres, a height of 24 feet and a volume of approximately 90 acre-feet. The Bottom Ash Pond reportedly received low-volume wastewater, bottom ash, and storm water runoff. The site operates under NPDES Permit IL0000116 Outfall 003 for the Bottom Ash Pond.

The Fly Ash Pond was constructed in 1968. The Fly Ash Pond has a surface area of 34 acres, a height of 24 feet and a volume of approximately 500 acre-feet. The Fly Ash Pond reportedly received fly ash, low-volume wastewater, and storm water runoff. The site operates under NPDES Permit IL0000116 Outfall 004 for the Fly Ash Pond. A Fly Ash Stockpile formerly located southeast of the Fly Ash Pond was clean closed as part of closure activities.

Clean closure activities for the Bottom Ash Pond generally consisted of CCR material removal, backfill to design grade with soil fill, construction of surface water control structures, and vegetation. A berm with CCR materials was closed-in-place in order to provide access to a river dock on the site. Closure activities for the berm generally consisted of placement, grading, and compaction of bottom ash and soil fill to design grade and installation of a ClosureTurf system consisting of 40-mil high density polyethylene (HDPE) MicroSpike geomembrane, a synthetic turf geotextile, and sand infill. ArmorFill was placed in the sand infill.

Closure activities for the Fly Ash Pond included placement of CCR materials excavated from the Bottom Ash Pond and the Fly Ash Stockpile, grading and compacting the subgrade to design slopes, construction of surface water control structures, and installation of a ClosureTurf system consisting of 40-mil MicroSpike HDPE geomembrane, a synthetic turf geotextile, and sand infill. ArmorFill will be placed in the sand infill in the stormwater ditches at the perimeter of the Fly Ash Pond in the spring of 2019.

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2.0 CLEAN CLOSURE ACTIVITIES

2.1 CCR Removal Activities

CCR was removed from the Bottom Ash Pond and the Fly Ash Stockpile to facilitate clean closure of these areas. The berm in the Bottom Ash Pond was excluded from clean closure activities and is discussed later in this report. CCR removal at the Bottom Ash Pond began on March 12, 2018 and concluded on May 23, 2018. CCR removal at the Fly Ash Stockpile began on June 12, 2018 and concluded on July 11, 2018. A CQA representative periodically observed the CCR removal activities to assess the extent of CCR removal. CCR removed from the Bottom Ash Pond and the Fly Ash Stockpile was placed in the Fly Ash Pond. The CQA Certifications by the CQA Officer are provided in Appendix B. After CCR removal and CQA Officer approval, the areas were brought to final grade, stormwater controls were installed, and the areas were vegetated.

2.2 Coal Pile

The Coal Pile was used to store coal for use at the power plant during operation. The excess coal stored in the Coal Pile after the power plant operation ceased was removed prior to the beginning of this project. Residual coal spoils were present in the coal yard after removal activities were performed. Approximately two feet of soil and residual coal spoils were removed from the Coal Pile and a runoff area southwest of the Coal Pile. The residual coal materials and mixed soils were placed in the Fly Ash Pond. The CQA Certifications by the CQA Officer are provided in Appendix B.

2.3 Survey of Final Grade

The finished grade of the Bottom Ash Pond, the Coal Pile, and the Fly Ash Stockpile was surveyed by a licensed surveyor for a final as-built drawing. The results of the survey are illustrated and summarized on Figure 2.

2.4 Surface Water Management

Surface water management structures in the Bottom Ash Pond, the Coal Pile, and the Fly Ash Stockpile, including ditches and outfalls, were built in accordance with the design and approved modifications thereof.

2.5 Vegetation

After the Bottom Ash Pond, the Coal Pile, and the Fly Ash Stockpile were brought to final grade, they were fertilized and seeded using synthetic mats and straw to establish vegetation.

3.0 SUBGRADE PREPARATION

Subgrade preparation at the Bottom Ash Pond Berm began on June 5, 2018 and was completed on June 29, 2018. Subgrade preparation at the Fly Ash Pond began on May 7, 2018 and was completed on August 14, 2018.

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Subgrade preparation activities at the Bottom Ash Pond Berm generally consisted of placement and compaction of fill soils in approximately 12-inch lifts, performing compaction testing, and surveying the final subgrade elevations.

Subgrade preparation activities at the Fly Ash Pond generally consisted of placing CCR material excavated from the Bottom Ash Pond and the Fly Ash Stockpile, placing residual coal spoils and mixed soils from the Coal Pile, grading the CCR materials placed in the Fly Ash Pond, compacting the top 12-inches of subgrade material, performing compaction testing, and surveying the final subgrade elevations. In addition, the prepared subgrade was visually assessed by the CQA Officer to observe that the surface was relatively smooth and free of deleterious materials (i.e. jagged, irregularly-shaped protrusions) that could damage the geomembrane.

3.1 Laboratory Testing

Two soil fill bulk samples and four CCR bulk samples were collected and submitted to the Geotechnology soil laboratory for standard Proctor moisture-density relationship testing. The laboratory testing results are summarized and presented in Appendix C.

One pre-qualification sample was collected of off-site backfill soils to be used as backfill in the Bottom Ash Pond (outside the berm area) and in the Fly Ash Stockpile. Additional conformance samples were collected for every 25,000 cubic yards of backfill brought onto the site. The laboratory testing results are summarized and presented in Appendix C.

3.2 Subgrade Compaction

Moisture/density tests were performed on each 12-inch lift of soil fill placed at the Bottom Ash Pond Berm and on the upper 12 inches of the Fly Ash Pond subgrade. The moisture/density results were compared to the standard Proctor moisture-density relationship laboratory testing data to assess the compaction. The project specifications require the subgrade to be compacted to 90 percent of the maximum standard Proctor dry density. Areas of failed moisture/density tests were re-compacted and re-tested as needed. Based on the laboratory and field testing results, the subgrade was compacted in general conformance with the CQA plan. The field tests are summarized in Table 1 (Bottom Ash Pond Berm) and Table 2 (Fly Ash Pond), and field reports with results are provided in Appendix C.

In addition to moisture/density testing, the Fly Ash Pond and the Bottom Ash Pond Berm subgrade were proof rolled using an 84-inch Sakai smooth drum roller under the observation of a CQA Representative to visually confirm firmness and stability of fill prior to placement of HDPE geomembrane.

Compaction of backfill materials at the Bottom Ash Pond (outside of the berm area) was performed using an 84-inch Sakai smooth drum roller. A proof roll of each lift using the smooth drum roller was used to confirm compaction of the Bottom Ash Pond backfill materials.

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3.3 Survey of Final Grade

The finished grade of the Fly Ash Pond was surveyed by a licensed surveyor prior to installation of the geomembrane. The results of the survey are illustrated and summarized on Figure 2.

4.0 HDPE GEOMEMBRANE

40-mil HDPE MicroSpike geomembrane placement at the Bottom Ash Pond Berm began on August 6, 2018 and was completed on August 16, 2018.

40-mil HDPE MicroSpike geomembrane placement at the Fly Ash Pond began on August 17, 2018 and was completed on October 30, 2018.

Site activities ceased on December 5, 2018 after reaching substantial completion. Final punch-list activities will be performed after the conclusion of winter weather and will be summarized in an addendum letter.

Final punch-list activities are not required at the Bottom Ash Pond Berm. Final punch-list activities at the Fly Ash Pond include minor repair to the HDPE geomembrane.

4.1 Prequalification Testing

The geomembrane manufacturer, Agru America, Inc., supplied an inventory list of the 40-mil HDPE MicroSpike geomembrane rolls to the owner and the CQA Officer. The geomembrane manufacturer submitted samples from the prequalification rolls to an independent geosynthetics laboratory for verification of selected manufacturer's guaranteed properties (presented in Appendix D). On each geomembrane roll selected for sampling, a 2-foot long sample was collected along the entire width of the roll.

In addition, the manufacturer submitted documentation that the materials supplied were tested for the parameters listed in the manufacturers list of guaranteed properties at the required testing frequency. The results of the testing, including identification of tested rolls, were submitted to the CQA Officer for review. The manufacturer certified that all tested rolls met the manufacturer's guaranteed properties in accordance with the specified testing frequency rate (Appendix D).

Geomembrane prequalification testing was completed prior to delivery. Copies of the testing results are provided in Appendix D.

4.2 Installer Certification of Placement Surface

The geomembrane installer's inspection and acceptance of the prepared subgrade surface as suitable for the geomembrane installation is documented through Certificates of Acceptance (Appendix F). Certificates of Acceptance were provided to the CQA Officer each day for the area covered by geomembrane that day.

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4.3 Seam Overlap Testing

The geomembrane installer arranged the geomembrane panels in an orientation to reduce the number of field seams. Within the geomembrane footprint, seam overlaps were field measured by the geomembrane installer to verify that the required 3 inches of overlap was met for each seam. Seam overlaps were generally "shingled" in the direction of the downslope. The CQA Officer and field representatives made independent measurements of the seam overlaps for additional verification.

4.4 Non-Destructive Testing

The geomembrane installer performed non-destructive testing of seams at the frequency specified in the CQA Plan. The seams were non-destructively tested over the full-length using a vacuum test unit, air pressure test, or other methods (i.e., spark testing for geomembrane boots around penetrations for pipeline supports and electric pole guy wires) approved by the CQA Officer. Vacuum testing and air pressure testing procedures are presented in Sections 4.4.1 and 4.4.2. Testing was completed as the seaming progressed. The CQA Officer and field representatives observed the non-destructive testing performed by the geomembrane installer. The geomembrane installer submitted all non-destructive field-testing results to the CQA Officer (Appendix D).

4.4.1 Air Pressure Testing (Double Fusion Welds)

Double fusion welders were typically used to fuse two panels of geomembrane together. Air pressure testing procedures for double fusion welds follow.

The air pressure test equipment included:

- Air pump (manual or motor driven) or air compressor equipped with pressure gauge capable of generating and sustaining a pressure of 25 to 30 pounds per square inch (psi) and mounted on a cushion to protect the geomembrane,
- Rubber hose with fittings and connections, and
- Sharp hollow needle with pressure gauge.

The air pressure test procedure was as follows:

1. Both ends of the seam to be tested were sealed.
2. A needle was inserted into the tunnel created by the fusion weld.
3. A protective cushion was inserted between the air pump and the geomembrane.
4. The air pump was energized to a pressure between 25 psi and 30 psi. The valve was closed, and the pressure was sustained for a minimum of five minutes.
5. If loss of pressure exceeded 3 psi or did not stabilize, the leaking area was located, then repaired and retested until passing test results were obtained.

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6. At the conclusion of a passing air pressure test, the opposite end of the seam was slit and the subsequent drop in pressure was observed. Our observation of the pressure drop indicated that the seam passed.
7. The needle was removed. An extrusion-welded repair is required at each air test penetration.

4.4.2 Vacuum Testing (Extrusion Welds)

Extrusion welds were typically used for repairs and protrusions through the geomembrane. Vacuum testing procedures for extrusion welds follow.

The vacuum test equipment included:

- Vacuum box assembly consisting of a rigid housing with a transparent viewing window, soft neoprene gasket attached to the bottom, port hole or valve assembly and a vacuum gauge;
- Vacuum tank and pump assembly equipped with a pressure controller and pipe connections;
- Rubber pressure or vacuum hose with fittings and connections;
- Bucket; and
- Soapy solution.

The vacuum test procedure was as follows:

1. The vacuum pump was energized and tank pressure was adjusted to approximately 10 inches of mercury.
2. A strip of geomembrane approximately 12 inches wide by 48 inches long (an area larger than the coverage of the vacuum box) was wetted with the soapy solution.
3. The box was placed over the wetted area.
4. The bleed valve was closed and the vacuum valve opened.
5. A leak tight seal was verified.
6. The geomembrane was observed for at least ten seconds through the viewing window for the presence of soap bubbles.
7. When bubbles were not observed after 10 seconds, the vacuum valve was closed, and the bleed valve opened. The box was moved to the next adjoining area, and the process was repeated.
8. All areas where soap bubbles appeared were marked, repaired, and retested until passing test results were obtained.

4.4.3 Spark Testing (Extrusion Welds at Penetrations)

The spark test equipment included:

- An electrically conductive tape or wire placed beneath the seam prior to welding;
- A hand-held holiday spark tester; and
- A conductive wand that generates a high voltage.

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The spark test procedure was as follows:

1. Note: Care should be taken if flammable gases may be present in the area of testing.
2. Place the electrically conductive tape or wire beneath the seam prior to welding.
3. A trial seam containing a con-welded segment shall be subject to a visual calibration test to ensure that such a defect will be identified under the planned machine settings and procedures (i.e., exposed wire will cause a spark to occur).
4. Upon completion of the weld, enable the spark tester and hold approximately 1 inch above the weld, moving slowly over the entire length of the weld in accordance with ASTM 6365.
5. A spark indicates a hole in the seam. If there is no spark, the weld has a passing test.
6. Mark, repair, and retest areas where sparks occur.

4.5 Destructive Testing

Destructive seam tests were performed at randomly selected geomembrane locations as seaming work progressed. The purpose of the destructive seam tests was to evaluate seam strength. The CQA Officer or field representatives observed the field destructive testing performed by the geomembrane installer.

The geomembrane installer submitted the results of the field destructive testing to the CQA Officer. An independent laboratory selected by the CQA Officer performed the destructive seam tests, consisting of peel and shear strength testing. The destructive seam testing results (field-testing and independent testing) are presented in Appendix D.

4.5.1 Testing Location and Frequency

The CQA Officer or field representative selected the destructive test locations where seam samples were removed for testing at a minimum frequency of one sample per 500 feet of seaming. This minimum frequency is the average taken throughout the entire area of placement and does not include retests. In addition, the CQA Officer or field representative could select additional destructive seam sample locations at their discretion. Destructive seam test locations include random seam testing and areas of possible defects (excess crystallinity, contamination, offset welds, equipment malfunction).

4.5.2 Sampling Procedures

Destructive seam samples were obtained as the seaming progressed. This method was used to facilitate approval of the destructive testing results prior to covering the geomembrane with the next layer of the closure construction. The CQA Officer or field representative assigned a number to each destructive seam sample and marked the location and seaming information on each collected sample. The destructive seam sample location was recorded on an as-built drawing. The locations of the destructive seam samples were repaired in accordance with the CQA Plan. The repairs were subsequently vacuum tested.

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4.5.3 Field Testing

The geomembrane installer used a tensiometer to test four 1-inch wide strips from each sample identified for destructive testing. In accordance with the CQA Plan, the field destructive tests consisted of two samples for peel adhesion and two samples for shear strength. Upon successful field-testing, the remaining destructive seam samples were qualified to be submitted for independent laboratory testing.

4.5.4 Laboratory Testing

Samples that passed the prequalifying field tests were submitted to the independent testing laboratory. Ten specimens from each destructive seam sample were tested: five specimens were tested for shear strength and five specimens were tested for peel adhesion. Laboratory testing was in accordance with "Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods" (ASTM D 6392). Acceptance was based on the criteria outlined in the Geosynthetic Research Institute (GRI) standard GRI GM19 as provided in the CQA Plan.

4.5.5 Procedures for Failed Destructive Tests

If a destructive sample did not pass either a field or a laboratory test, the geomembrane installer had two options to remediate the failure. The geomembrane installer could reconstruct and repair the seam between any two passed test locations completed by the same technician on the same day. Alternatively, the geomembrane installer could trace the welding path to an intermediate location at least 10 feet from the failed test in either direction and take additional destructive seam samples. The additional samples were then field-tested prior to sending to the independent laboratory for testing as previously described. If the additional samples passed, then the seam was reconstructed between the two passing samples. If the additional samples failed, then the process was repeated to establish the zone in which the seam should be reconstructed.

Reconstructed seams were bounded by two locations with passing laboratory destructive tests. In cases that exceeded 150 feet of reconstructed seam, a destructive sample was taken from the zone in the reconstructed area. The geomembrane installer documented the actions taken in conjunction with destructive test failures (Appendix D).

5.0 SYNTHETIC TURF GEOTEXTILE

Synthetic turf geotextile placement at the Bottom Ash Pond Berm began on August 14, 2018 and was completed on August 16, 2018.

Synthetic turf geotextile placement at the Fly Ash Pond began on August 17, 2018 and was completed on November 22, 2018.

Site activities ceased on December 5, 2018 after reaching substantial completion. Final punch-list activities will be performed after the conclusion of winter weather and will be summarized in a Final Construction Quality Assurance Report.

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Final punch-list activities are not required at the Bottom Ash Pond Berm. Final punch-list activities at the Fly Ash Pond include minor repair of synthetic turf geotextile.

5.1 Prequalification Testing

The geomembrane manufacturer, Agru America, Inc., supplied an inventory list of the synthetic turf geotextile rolls to the owner and the CQA Officer. The synthetic turf geotextile manufacturer submitted samples from the roll list to an independent geosynthetics laboratory for verification of selected manufacturer's guaranteed properties (presented in Appendix E). On each synthetic turf geotextile roll selected for sampling, a 2-foot long sample was collected along the entire width of the roll.

In addition, the manufacturer submitted documentation that the materials supplied were tested for the parameters listed in the manufacturers list of guaranteed properties at the required testing frequency. The results of the testing, including identification of tested rolls, were submitted to the CQA Officer for review. The manufacturer certified that all tested rolls met the manufacturer's guaranteed properties in accordance with the specified testing frequency rate (Appendix E).

Synthetic turf geotextile prequalification testing was completed prior to delivery. Copies of the testing results are provided in Appendix E.

5.2 Field Installation Monitoring

The CQA Officer or designated representative observed the synthetic turf geotextile as it was placed and welded. The placed synthetic turf geotextile was observed for wrinkles that could fold over and, if observed, required repairs were performed in these areas. The synthetic turf geotextile welds were observed for locations where the surface synthetic turf was melted and, if observed, required repairs were performed in these areas.

6.0 SAND INFILL AND ARMORFILL

Sand infill placement at the Bottom Ash Pond Berm occurred on October 15-16, 2018. ArmorFill placement at the Bottom Ash Pond Berm occurred on October 17, 2018.

Sand infill placement at the Fly Ash Pond began on September 12, 2018 and was substantially completed on November 30, 2018.

One prequalification test and one conformance test were performed for the sand used as synthetic turf geotextile infill. The analytical testing results are provided and summarized in Appendix C.

The sand was spread and brushed into place on the synthetic turf geotextile with a thickness between 0.50 and 0.75 inch. The CQA Officer or designated representative measured the thickness of the sand using a caliper on an approximately 100-foot grid.

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Site activities ceased on December 5, 2018 after reaching substantial completion. Final punch-list activities will be performed after the conclusion of winter weather and will be summarized in an addendum letter.

Final punch-list activities are not required at the Bottom Ash Pond Berm.

At the Fly Ash Pond, cold temperatures and wet weather prevented effective sand placement and brushing near the conclusion of site activities for winter weather. Final punch-list activities at the Fly Ash Pond include final brushing and thickness testing of sand on the eastern portion and the perimeter ditch of the Fly Ash Pond, as well as placement, brushing, and testing at HDPE geomembrane repair locations.

7.0 SURFACE WATER MANAGEMENT

Surface water control structures generally included ditch and outlet structures at the Fly Ash Pond perimeter, two outfalls from the site to the Illinois River, and other piping/rip-rap placements on the site. A final as-built survey was performed.

A copy of the surface water management structure survey data is provided on Figure 2. Additional information on the field observations are provided in Appendix A.

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8.0 SIGNATURE

As Construction Quality Assurance (CQA) Officer for the construction of the closure of the Fly Ash Pond and the Bottom Ash Pond (from February 9, 2018 to December 5, 2018), located at the Ameren Energy Resources, Meredosia Power Station in Meredosia, Illinois, I am familiar with the plans and specifications, and the CQA Plan as prepared and approved for the project. Based on my observations and the observations of the Construction Quality Assurance Officers-In-Absentia (Steve Graham, Jessie Goodwin, Kyle Henson, and Alyssa Okom), it is my professional opinion that the construction was completed as described in this Report. CQA certification by the owner's representative does not relieve the contractor of their obligations to furnish all work in accordance with the contract.

Rosanna M. Saindon, P.E., Ph.D.
Illinois Licensed Professional Engineer
Project Manager
Geotechnology, Inc.

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NOTES

1. Ground surface contours and aerial photograph provided by David Mason & Associates, Inc. on November 30, 2018.

N

0 300 600

SCALE IN FEET

Drawn By: WAH	Ck'd By: JYG	App'vd By: AMS
Date: 1-16-19	Date: 1-17-19	Date: 1-17-19

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
800 South Washington Street
Meredosia, Illinois

SITE OVERVIEW

Project Number J024917.04	FIGURE 1

NOTES

1. Ground surface contours and aerial photograph provided by David Mason & Associates, Inc. on November 30, 2018.
2. Elevations reference to NAVD88.
3. Contour interval is 1 foot.

N

0 300 600

SCALE IN FEET

Drawn By: WAH	Ck'd By: JYG	App'vd By: AMS
Date: 1-16-19	Date: 1-17-19	Date: 1-17-19

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
800 South Washington Street
Meredosia, Illinois

FINAL AS-BUILT SURVEY

Project Number J024917.04	FIGURE 2

BOW REFERENCE SHEET (CD) --- SAME FACILITY

Site Number:	**W1370300005**
Facility Name:	**Ameren Energy Medina Valley Cogen LLC**
File Category:	**06L / Groundwater Closure Reports**
Document Date:	**02/06/2019**

FOR ADDITIONAL INFORMATION ON THIS, SEE CATEGORY UNDER THIS SAME FILE HEADING:	**06L Groundwater Closure Reports** **(CD)**

DATE OF OTHER DOCUMENT		DESCRIPTION OF OTHER DOCUMENT:
02/06/2019		**CD – 01/18/2019**
		CQA Report
		Closure of the Bottom Ash Pond & Fly Ash Pond
		Meredosia Power Station
		PDF files of appendices & other information
		J024917.04

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TECHNICAL MEMORANDUM ON

ENGINEERING REVIEW/EXPERT WITNESS SUPPORT PETITION FOR ADJUSTED STANDARD FOR OLD MEREDOSIA MEREDOSIA, ILLINOIS

by
Haley & Aldrich, Inc.
Cleveland, Ohio

for
Brown, Hay + Stephens, LLP
Springfield, Illinois

File No. 0206891
April 2023

TECHNICAL MEMORANDUM

19 April 2023
File No. 0206891

TO: Claire A. Manning, Attorney
Brown, Hay + Stephens, LLP
205 S. Fifth Street, Suite 1000
Springfield, Illinois 62705-2459

FROM: Haley & Aldrich, Inc.
Neal Kochis, Senior Project Manager
Steven F. Putrich, Principal Consultant

SUBJECT: Technical Memorandum – Engineering Review/Expert Witness Support
Petition for Adjusted Standard for Old Meredosia
Illinois Pollution Control Board Docket AS 2021-008

Introduction

Haley and Aldrich, Inc. (Haley & Aldrich) has been engaged to consult with Ameren Corporation, Ameren Legal, and its outside counsel, Brown, Hay + Stephens, LLP to provide an engineering review and expert witness support for the petition for adjusted standards for a long-closed Ameren Meredosia Power Station (Site) ash pond (Old Meredosia) as an alternative to closure-in-place (CIP) or closure-by-removal (CBR) in accordance with 35 Illinois Administrative Code (IAC) Part 845 Standards for the Disposal of Coal Combustion Residuals (CCR) in Surface Impoundments (Part 845). This technical memorandum provides a summary of our engineering review and findings based on available Site information and associated site civil and geotechnical engineering assessments and ancillary annual Site inspections completed for Old Meredosia on behalf of Ameren.

PROJECT APPROACH

The approach for this engineering review is to utilize available Site-related information to perform a comparative assessment of Old Meredosia's current conditions and overall engineering performance versus a theoretical condition, which includes the incorporation of engineered elements to satisfy a Part 845-compliant closure condition. Those closure conditions under Part 845 include two options: 1) CIP with the installation of a new cover system; and 2) performing a CBR of the ash contained within the footprint of Old Meredosia. The comparative assessment is based on an objective and systematic evaluation of the performance of Old Meredosia (under both the current conditions and as a Part 845-

compliant condition) using qualitative evaluation criteria, including short- and long-term engineering performance and environmental protectiveness (i.e., pond stratigraphy and positive groundwater separation, stability of embankments and cover erosion protection/management, infiltration management, cover and vegetative protection, ecological assessment conditions, highlights and benefits of the current ecosystem, and a human health and ecological risk assessment [risk under control]), and finally, the potential adverse impacts associated with the implementation of a Part 845-compliant closure condition.

Site Conditions and History of Operation

SITE CONDITIONS

The Meredosia Power Plant Site is located at 800 S. Washington Street, along the east bank of the Illinois River, just south of the Village of Meredosia. Old Meredosia is a closed coal ash impoundment constructed to support the Meredosia Power Station to manage CCR through the early 1970s. Old Meredosia is situated south of the former power block and facility infrastructure and is separated from the Illinois River to the west by two closed CCR Surface Impoundments (CCRSIs), the Bottom Ash Pond and the Fly Ash Pond[1] (**Figure 1**). The Old Meredosia footprint is trapezoidal in shape, with an approximate plan area of 17 acres. These acres are presently covered by a soil cap, mature vegetative growth, and a complementary wildlife habitat.

According to an ecological review performed by WSP USA Environment and Infrastructure, Inc. (WSP) dated March 2023 (2023 WSP Site Investigation Report; **Attachment A**), the vegetation and tree growth established on the footprint of Old Meredosia includes over 10 acres of deciduous forest, and the majority of the remaining 7 acres is vegetated with shrub-scrub and undeveloped herbaceous/grassland cover. This well-established and mature vegetative growth provides a habitat for a sand prairie ecosystem, which includes common wildlife and more notable high-profile residents, including nesting bald eagles and the Illinois Chorus Frog, which is protected by the Illinois Endangered Species Protection Act. According to the WSP Site Investigation Report, the deciduous forest may also provide suitable roosting and foraging habitat for various species of bats.

HISTORY OF OPERATION

As noted, Old Meredosia was operated as the plants' CCR pond through 1971, at which time it was closed-in-place using native materials from the Illinois River.[2] During that closure operation, materials were sluiced from the Illinois River and graded to adequately cover and cap the CCR material and to

[1] Constructed to replace Old Meredosia, these two CCRSIs were closed following the decommissioning of the Meredosia Generating Facility in 2011. They are subject to an Illinois Environmental Protection Agency (IEPA)-approved closure plan that includes a groundwater management zone and monitoring requirements. Ameren has filed an operating permit for them pursuant to Part 845.
[2] Old Meredosia ceased operation and closed prior to the effective dates of both the Resource Conservation and Recovery Act (RCRA) and the CCR Rule.

provide gentle slopes to convey stormwater off the Old Meredosia cover. The existing cover generally slopes from north to south, and the top of the Old Meredosia embankment is approximately 10 feet above the existing grade/surrounding natural ground surface (**Figure 2**). As stated previously, native vegetation has been established and allowed to mature naturally over the closed cover area for approximately 50 years.

Engineering Evaluation – Pond Management

As stated previously, the approach for this engineering evaluation is to perform a comparative assessment of Old Meredosia's current conditions and overall engineering performance, versus a hypothetical condition which incorporates engineered elements to satisfy Part 845 closure conditions. The comparative assessment that follows is based on available off-the-shelf, Site-related information (including engineering and scientific studies and annual facility inspections previously completed on behalf of Ameren) incorporated into an objective and systematic evaluation of the overall engineering and environmental performance of Old Meredosia.

OLD MEREDOSIA – STATUS QUO/CURRENT CONDITIONS

Pond Stratigraphy and Positive Groundwater Separation

One element considered when characterizing the overall current condition of Old Meredosia was to evaluate groundwater separation between the base of the unit and the Site's seasonal high groundwater table. To evaluate these conditions, publicly available resources and documents provided by Ameren were reviewed. All elevation data cited in this memorandum are referenced to mean sea level (MSL; North American Vertical Datum, 1988 [NAVD88]), and rounded to the tenth of one foot for comparison purposes.[3]

Base of the Unit Evaluation

For the base of unit evaluation, we reviewed two data sources. The first document was a copy of a historic, undated, hand-drawn Central Illinois Public Services Company (CIPS) Ash Disposal Ponds Survey that indicates a conceptual design base elevation for the pond at elevation 450.0 feet and a design top of embankment berm at approximate elevation 460.0 feet (**Figure 3**). The second document reviewed was a Geotechnology, LLC (Geotechnology) 28 September 2022 Sampling and Testing Report (**Attachment B**). In that report, Geotechnology performed four borings in May 2022 within the Old Meredosia footprint. These borings indicate the in-place CCR material layer (identified as bottom ash) ranges from 9.0 to 11.5 feet thick, and the base of the unit ranges from elevation 445.9 feet (Boring B) to 448.4 feet (Boring C). Although the design elevations are not significantly higher than the results of the 2022 borings (and were likely an original conceptual base elevation target), the 445.9-foot elevation

[3] An exception to that convention is the surface water elevation data (which is referenced in hundredths of one foot) publicly available from the U.S. Geological Survey (USGS) gauging station 05585500, Illinois River at Meredosia, Illinois (Meredosia USGS Gage) located proximate to the Site.

from the lowest of the field borings was used to conservatively represent the base of the "as-built" constructed unit for this evaluation.

Seasonal High Groundwater Table Evaluation

Several documents/data sources were reviewed as part of the seasonal high groundwater table evaluation, including the Geotechnology Sampling and Testing Report. The study reported that groundwater was encountered in three of the four borings during the May 2022 investigation, with elevations ranging from 425.4 to 431.4 feet, representing a separation between the bottom of CCR and top of groundwater at the time of the boring completion ranging from 14.5 to 22.1 feet.

A second source is quarterly groundwater data from the Meredosia Site performed as part of the Site's groundwater monitoring program. The monitoring program includes 12 on-Site wells labeled APW-1 through APW-12 (**Figure 4)**. Historic groundwater contour maps for Old Meredosia are included in **Attachment C**, which includes maps from the period between 2010 and 2015 from a 2016 Geotechnology Meredosia Fly Ash Bottom Ash Hydrogeologic Assessment Report and quarterly groundwater elevation contours from the Site's Annual Inspection Reports (Ramboll Engineering, 2019, 2020, and 2021). These maps indicate that groundwater generally flows to the west and northwest toward the Illinois River; however, during periods of extremely high river water levels, the groundwater flow reverses and flows in an easterly direction (an example of which is shown in **Figure 5**). The highest measured groundwater levels in the vicinity of Old Meredosia were recorded on 4 June 2019, during the second quarter groundwater monitoring event of that year. Groundwater elevations within the footprint of Old Meredosia interpreted from these data range from 442.1 to 443.0 feet, with the highest groundwater elevations observed in the southwest corner of the pond footprint (**Figure 5)**.

Publicly available data from USGS gauging station 05585500, Illinois River at Meredosia, Illinois (Meredosia USGS Gage) located proximate to the Site has also been utilized to monitor and model groundwater elevations. Appendix F of the 2022 Geotechnology Sampling and Testing Report (**Attachment B**) includes a table showing the 18 highest flood events at the Meredosia USGS Gage. The elevated groundwater levels recorded during the 4 June 2019 groundwater monitoring event correlate to a Meredosia USGS Gage reading of 28.49 feet (elevation 446.03), which is one of the four highest readings ever recorded at the gage[4], and within 0.50 feet of the highest gauge reading of 28.86 feet (elevation 446.50) recorded on 2 July 2015.

We understand that the determination of the seasonally high groundwater table is not intended to include the conditions resulting from rare extreme rainfall and/or flooding events. Considering the extreme nature of the 4 June 2019 flood event and the fact that groundwater elevation data was collected on that same day, it is concluded that the resulting Site groundwater conditions at that time

[4] Including Meredosia USGS Gage height records predating the construction of Old Meredosia (prior to April 1922).

are a conservative representation of the seasonally high groundwater table; therefore, they were appropriate to use for this evaluation.

Groundwater Separation

The resulting separation between the groundwater table and the base of the unit was conservatively calculated by subtracting the highest estimated groundwater elevation (443.0 feet) from the lowest estimated base of unit elevation (445.9 feet), resulting in a minimum 2.9-foot separation between the base of the unit and the maximum measured seasonal high-water table. Therefore, the seasonally high groundwater table is not expected to rise to the point where it would intersect the impounded CCR in Old Meredosia.

Stability of Embankments and Cover Erosion Protection/Management

Various documents were reviewed to assess the condition of the Old Meredosia embankments, cover soils, and overall unit conditions. Condition assessment considerations included the potential for local area flooding inundation, signs of embankment displacement/movement, cover or embankment erosion, and the presence of woody/deep-rooted vegetation on the embankments. The documents and publicly available information utilized in our review included Federal Emergency Management Agency (FEMA) floodplain mapping, a liquefaction analysis, Ameren's Annual Dam Inspection and Maintenance Reports, and historic aerial imagery.

Old Meredosia is situated east of the two closed CCRSIs, at distances exceeding 1,400 feet from the Illinois River and in an area topographically higher than the other Site ponds. As such, Old Meredosia is not situated within either the FEMA 100-year floodway or floodplain, while the other Site ponds are within the floodplain, as shown in the FEMA National Flood Hazard Layer FIRMette[5] (FIRMette) included as **Figure 6.** As shown on the FIRMette, the 100-year base flood elevation within the vicinity is at approximate elevation 447.4 feet. Since the lowest elevations around the exterior toe of the embankment of Old Meredosia are at elevation 450.0+/- and are, therefore, higher than the 100-year base flood elevation, there is no expected impact to the embankment associated with Illinois River flooding.

An engineering evaluation was performed by Geotechnology, dated 20 September 2017 (2017 Geotechnology Liquefaction Analysis), to determine the liquefaction potential of the perimeter impoundment and ash within Old Meredosia (**Attachment D**). That evaluation included subsurface investigation points via cone penetrometer soundings (CPTs O-01 through O-06), which were performed in the interior and at select locations in the perimeter impoundment (**Attachment D**, Plate 2). Although the 2017 Geotechnology Report does not specifically indicate if the CPTs were performed within the interior of the impoundment or on the embankments, Geotechnology has subsequently confirmed that CPT O-02 was performed on the outside of the road on the embankment, and CPT O-03 was performed

[5] A FIRMette is a smaller, digital/printable version of a FEMA Flood Insurance Rate Map (FIRM) for a specific property or area of interest.

on the inside of the pond near the interior toe of the embankment. Visual observation of the CPT data (tip resistance, sleeve resistance, and the depth of the penetration) supports the location of CPT O-02 within the embankment and suggests CPT O-03 partially penetrated the inner slope of the embankment. The four remaining CPTs were performed in the ash within the interior footprint of the impoundment. The 2017 Geotechnology Liquefaction Analysis concludes that the impounded CCR and embankments for Old Meredosia are not susceptible to instability due to liquefaction. This conclusion is further substantiated by the very low Site-specific seismic peak ground acceleration (PGA)[6] values associated with the Site, and the presence of the water table located below the base of the impoundment, both of which support the conclusion that the impounded CCR and embankments are not susceptible to liquefaction.

Four reports and related photos summarizing Annual Dam Safety Inspections, performed by Ameren's Dam Safety Engineers Jeff Greer and Marc Lueckenhoff for the years 2014, 2020, 2021, and 2022, were received from Ameren and reviewed by Haley & Aldrich as part of this assessment (**Attachment E**). General observations gathered from these reports indicate that ongoing maintenance of the unit has occurred. Specifically, those reports indicate ongoing maintenance activities for Old Meredosia that include the following:

- The 2014 inspection indicates tree removal along/on the southern embankment;
- Bare depressions along the south embankment from tree removal identified in the 2014 inspection report appear to be vegetated in the 2016 inspection photos;
- Photos from 2020 and 2022 show that the vegetation on the embankments is being mowed/managed;
- A 2022 photo shows localized erosion on the North Embankment (which was identified in previous inspection reports [2020, 2021, and 2022]), which was backfilled and covered with an erosion control mat and vegetative cover was re-established; and
- No trees/woody vegetation are visible on the Old Meredosia embankments in any inspection photos.

Additional observations from the inspection reports include the following:

- No evidence of unusual movement or disturbance at or beyond the toe of the embankment;
- No evidence of seepage/wetness/ponding water observed or documented in any of the annual inspection reports;
- Cap vegetation indicated as in "good condition" on all reports;

[6] PGA values are referenced to the ASCE 7-10, copyright 2010. The PGA value referenced in the Geotechnology Report for the Meredosia Site is 0.08.

- Animal burrows are indicated in 2020, 2021, and 2022 reports that Ameren has subsequently confirmed are routinely backfilled; and
- Minor localized sloughing, erosion, and rutting indicated in the 2022 report that Ameren has subsequently repaired.

In addition, historic aerial photographs were examined for indications of dike movement/failure/erosion from the period from 1941 to 2017). As shown in **Attachment F,** there are no obvious signs of berm instability or movement, or indications of significant areas of erosion (e.g., sediment migration or notable loss of vegetation). The aerial photographs also indicate the establishment and maturation/ density of consistent and mature Site vegetation over time.

In conclusion, based on our review of a variety of source documents and publicly available resources, Old Meredosia is a competent/stable and regularly inspected and maintained closed unit with stable embankments, and with cover soils with well-established vegetative cover and sound conditions overall. Lines of evidence including the lack of flooding potential, embankment and cover stability, and no notable or chronic erosion or water accumulation on the cover all point to an acceptable status quo field condition with a history of performing adequately over a period spanning five decades.

Infiltration Management – Cover and Vegetative Protection

As shown in **Figure 2,** Site contours indicate that the cover, consisting primarily of river sands, is generally graded to the south end of the unit. From supporting reports, the following soil cover descriptions were provided:

- Three of four boring logs in the 2022 Geotechnology Sampling and Testing Report identified cover soil as “poorly graded sand”;
- The 2022 Geotechnology Sampling and Testing Report also includes a description, which characterizes the cover soils as follows: “Clay and sand materials were used for the cap and range from 1-6 feet in thickness”; and finally,
- The 2023 WSP Site Investigation Report (which referenced a recent Site inspection in 2022) described the Old Meredosia cap surface as “a deep sand cover over the Site.”

There were no reported areas of ponded water across the surface of the unit from any previous annual Site inspections or more recent Site inspections associated with the 2022 Geotechnology Sampling and Testing Report and the 2023 WSP Site Investigation Report that included Site investigations and/or walk-over inspections. These observations support or infer the conclusion that stormwater naturally drains across the cover or is infiltrated into the cover system and/or evaporated via evapotranspiration effects.

The 2023 WSP Site Investigation Report states, “for the Old Meredosia Site the presence of a deep sand cover over the Site, and the active effects of an established forested community that removes soil

moisture by evapotranspiration processes, results in surficial soils that are relatively dry. As such, no areas exhibiting wetland functional characteristics were found on the Site."

Ecological Assessment Conditions – Highlights and Benefits of Current Ecosystem

In that same 2023 WSP Site Investigation Report, resident plant and wildlife communities were identified, and assessments were made to evaluate potential impacts and adverse effects/implications of implementing the closure requirements associated with IAC Part 845 for Old Meredosia. Section 4 of the WSP Report identifies numerous plant and wildlife species that have been established at Old Meredosia since the unit was capped in the 1970s. Specifically, Section 4 of the subject report states:

> "Old Meredosia represents a naturalized landscape that occurs within a highly fragmented, industrial landscape. As such, the Site provides moderate wildlife support for a range of flora and fauna as described in Section 3. Despite prior disturbance of the Site, the Site has not been disturbed in nearly 50 years and offers important features that have moderate to high ecological value."

The report concludes that capping or removal of CCR at Old Meredosia would predict adverse effects to resident wildlife, including nesting bald eagles, and the Illinois Chorus Frog, which is protected by the Illinois Endangered Species Protection Act. The report further explains that Old Meredosia may also provide suitable roosting and foraging habitat for various species of bats.

Human Health and Ecological Risk Assessment – Risk Under Control

According to the Old Meredosia Risk Evaluation report prepared by Haley & Aldrich for inclusion with Ameren Energy Medina Valley CoGen, LLC's petition for adjusted standards for Old Meredosia, dated April 2023, there is currently "no unacceptable risk from groundwater concentrations at Old Meredosia for people who may use the Illinois River for recreational purposes, or for aquatic receptors that live in or use the Illinois River." The report uses available analytical data from the Site's quarterly groundwater monitoring reports, applies a conservative surface water dilution and attenuation factor, and compares the values to state and national criteria to determine what level of impact the groundwater could have on the Illinois River. The report recognizes that neither groundwater, nor the Illinois River downstream from the Site, are used as a source of drinking water. Therefore, the only potentially complete exposure pathway for constituents from Old Meredosia is by precipitation infiltrating through the existing cover to groundwater, and groundwater migrating to surface water
(Illinois River). The report also summarizes USGS analytical data for the Illinois River both upstream and downstream of the Site, which indicates no adverse impact on the river.

OLD MEREDOSIA – CONDITIONS SUBSEQUENT TO COMPLIANCE WITH IAC PART 845

Alternatively, if Old Meredosia was required to be closed in accordance with Illinois state requirements, the physical Site and engineering changes that would be required are specified in Part 845. These requirements represent the basis for this portion of this engineering evaluation.

Part 845 Closure Requirements

Closure in accordance with IAC Part 845 allows for two approaches: 1) leaving CCR in place and installing a compliant final cover system (CIP); or 2) removal of the CCR and decontamination of the CCR surface impoundment (CBR).

Part 845 requires the preparation, review, and approval of numerous engineering design, planning, permitting, and certification elements; however, the activities associated with the physical construction of a Part 845 closure are of key interest in this discussion.

Recognizing and assessing the effects of activities identified with construction (e.g., disturbance of the existing vegetation and cover soils, potential removal of the CCR in Old Meredosia, material management required to construct a Part 845-compliant cover system, etc.), and secondly, understanding the post-construction state of the unit allows for an informed and objective comparison with the status quo conditions of Old Meredosia (i.e., allowing the Site to remain undisturbed).

Additional details regarding the relevant requirements for both CBR and CIP in accordance with Part 845 include:

- Clearing and grubbing of the existing cover, including destruction of a valuable ecosystem and associated wildlife habitat;
- CCR Removal – removing all CCR and CCR residues, contaminated subsoils, and CCR impoundment structures and ancillary equipment, and decontaminating all areas affected by releases of CCR from the CCR surface impoundment;
- Truck/Material Transport Across Public Roads – development of a CCR Transportation Plan;
- Protection Against Tracking Materials Off Site – installation of a vehicle washing station;
- Dust Control – development and implementation of on-Site fugitive dust controls;
- Establishing a Separate Temporary Stockpile Location – construction of a temporary storage location for excavated materials (lined landfill, CCR surface impoundment, enclosed structure, or lined CCR storage pile); and
- Protect Against Sedimentation and Erosion – development of a Stormwater Pollution Prevention Plan and National Pollutant Discharge Elimination System (NPDES) permitting for stormwater runoff that has come into contact with CCR.

In addition, requirements that are unique for CIP with a Part 845-compliant cover system would include the following:

- Solidification/stabilization of CCR to support the final cover system;
- Grading of the existing cover to provide a suitable subgrade for the final cover system;
- Installation of a low-permeability layer to include 3 feet minimum of compacted earth with a maximum hydraulic conductivity of 1 x 10^{-7} centimeters per second (cm/sec) OR a geomembrane with a minimum thickness of 40 mils that is equivalent or superior to a 3-foot layer of soil with a hydraulic conductivity of 1 x 10^{-7} cm/sec;
- Installation of a final protective layer to include 3 feet minimum soil material capable of supporting vegetation; and
- Construction Quality Assurance Program in accordance with Section 845.290.

Although there are perceived benefits with the installation of a Part 845 closure standard (for example for the CIP option, there will be a degree of infiltration reduction, and the new cover system provides additional drainage control, etc.), Old Meredosia in its current condition presents no risk and adequate environmental protection as noted in Old Meredosia Risk Evaluation report prepared by Haley & Aldrich. The implementation of a Part 845 closure provides no notable improvement or benefit to the overall environmental performance for the Site.

Potential Adverse Impacts of Activities Associated with IAC Part 845 Closure

Constructing a Part 845-compliant closure (e.g., following the CIP approach) is anticipated to provide some minor benefit by promoting controlled stormwater runoff and reducing or eliminating stormwater infiltration with the installation of the new cover system. However, it has been established that the current closed condition of Old Meredosia presents no risk and provides adequate environmental protection; therefore, the implementation of a Part 845 closure provides no notable benefit to the overall environmental protectiveness for the Site. Conversely, we have identified several unintended consequences associated with closing the unit in conformance with IAC Part 845 (with either the CIP or CBR approach).

The following sections summarize adverse effects related to conformity with Part 845, which would necessarily include the removal of the existing cover of Old Meredosia and re-closing a site that was decommissioned and closed some fifty years ago.

Destruction of Habitat

Comporting to a Part 845 Closure for Old Meredosia via CIP or CBR would result in the removal of approximately 17 acres of established forest, grass, and sand-prairie ecosystem and associated wildlife habitat. As discussed in prior sections of this memorandum, there are various plant and wildlife species within the footprint that would be affected, including nesting bald eagles, the protected Illinois Chorus

Frog, and the deciduous forested portion of the Old Meredosia that may also provide suitable roosting and foraging habitat for various species of bats.

Additionally, more vegetated areas outside of the Old Meredosia footprint may be disturbed to construct construction access roads, a vehicle washing station, staging and storage areas, etc.

Accidents/Traffic/Safety During and in Support of Construction

On-Site and near-Site traffic congestion associated with truck, equipment, and material hauling operations, in addition to heavy equipment operations for excavation, loading, and hauling occurring simultaneously will raise the risk and potential for traffic and construction safety accidents and associated concerns.

Fugitive Dust Generation/Pollution

Dust generated by excavation, loading, and hauling of CCR materials and soil materials is a concern, both on and off Site. Precautionary measures including wetting excavation areas, staging/storage areas, and access roads, as well as the use of a vehicle wash can be used to reduce the migration of particulates. Fugitive dust can enter waterways and public roadways via haul trucks if not mitigated properly.

Fuel Usage, Emissions, and Public Roadway Impacts

Fuel consumption and the associated emissions by on-Site construction equipment and hauling trucks would be an unavoidable consequence of CBR or CIP. At a minimum, closure would require excavators, loaders, bulldozers, and rollers on Site. Haul trucks would be utilized for importing fill materials and/or hauling excavated materials for off-Site disposal.

In the case of CBR, an estimated 400,000 cubic yards of removed woody vegetation, existing cover soils, and CCR material would be excavated and transported to an off-Site landfill. This equates to approximately 30,000 round trips by dump trucks assuming typical on-road truck capacities. This value could increase, depending on over-excavation beyond the limits of ash and does not include import of fill materials, including aggregate materials for roadway construction or topsoil which would likely be necessary to reclaim and revegetate the area.

CIP would also require the removal and disposal of woody and surficial vegetation and organic material, and the import of approximately 175,000 cubic yards of earthen materials to construct the low-permeability and final protective soil layers. This would amount to approximately 15,000 truck trips to/from an off-Site soil borrow area using the same assumptions as above.

In addition to fuel consumption and emissions, there are various other potential negative impacts related to the truck traffic that would be generated by closure of Old Meredosia. Haul trucks traveling to and from the Site will utilize public roadways to reach their intended destinations. This will increase the

potential for traffic congestion, accelerate the degradation of public roadways, increase noise pollution, and potentially directly or indirectly result in traffic accidents.

Consumption of Resources

Soil required for use in construction of the low-permeability and final protective layers of a final cover system would need to be imported from an off-Site source. As estimated above, 175,000 cubic yards of earthen material would be required. These are limited resources that could otherwise remain in-place or be used on other construction projects.

Materials removed from Old Meredosia, including vegetation, existing cover materials, CCR, and underlying soils, would need to be transported off Site to an existing landfill. As estimate above 400,000 cubic yards of material would be removed from the Site. This volume would take up space in a landfill that could otherwise be used by other waste streams (municipal solid waste, construction and demolition debris, etc.). Landfill airspace is a valued resource, and utilizing it unnecessarily will accelerate the need for more landfills and/or expansion of existing landfills.

Significant Expenditure of Capital Costs with No Added Protectiveness

There are notable financial implications associated with theoretically closing Old Meredosia in accordance with IAC Part 845. Those significant capital expenditures (and additional ongoing operations and maintenance [O&M] costs) are important to assess in the context of cost-benefit and potential additional level of overall protectiveness gained by that change.

In that regard, the following are an annotated list of potential work items/construction activities associated with Part 845 compliance (the work items and associated costs will be dependent of the closure strategy to be considered – CIP with compliant cover versus CBR (items below that are unique to CBR are indicated with asterisk [*]):

- Investigations, design, and permitting associated with construction, stormwater management, and habitat destruction/replacement;
- Stormwater Pollution Prevention Plan development and implementation;
- Final Closure Plan and Post-Closure Care Plan development and implementation;
- Transportation Plan development and implementation;
- On/Off-Site borrow investigation and material recovery/transportation management;
- Construction Quality Assurance Program development and implementation;
- Construction of on-Site access roads, staging/storage areas, a vehicle wash, and fugitive dust management systems;
- Excavation and hauling of CCR and earthen materials for off-Site disposal*;

- Off-Site Landfilling of excavated CCR materials*;
- Purchase and hauling of earthen materials and/or geosynthetic materials from off Site;
- Construction of the final cover system and post-construction surface water management improvements;
- Site restoration; and
- Closure Report and professional engineering certification.

There are notable financial implications associated with closing Old Meredosia in accordance with Part 845. Costs associated with CIP under Part 845 are estimated to range from $250,000 to $350,000 per acre (estimated at $4 to $6 million capital cost plus additional O&M), and costs for CBR are significantly higher, considering excavation, off-Site transportation/disposal, and post-removal Site management costs (estimated at $12 to $15 million).

The capital expenditures identified above (plus O&M costs) are significant. In the context of cost-benefit and consequential impacts to the established ecosystem at Old Meredosia and the lack of additional levels of overall environmental protectiveness gained, there is no apparent benefit, environmental or otherwise, in requiring Part 845 closure standards at Old Meredosia. Rather, from an ecosystem perspective, impacts from closure at Old Meredosia by any means "would result in a net loss of ecosystem value and potential direct and indirect effects on notable species and wildlife". **Attachment A**, at p. 23.

SUMMARY COMPARISON – STATUS QUO CONDITIONS VS. PART 845 IMPLICATIONS/IMPACTS

The previous discussion and analysis have provided engineering assessments and supporting lines of evidence regarding current considerations for the status quo Site conditions and the pursuit of Part 845 closure standards. The following table provides a high-level summary comparison of our analysis with consideration for overall risk/environmental performance for the status quo condition where there is currently no risk to human health or the environment (i.e., adequate environmental protection) versus no notable improvement or benefit (and significant capital costs expenditures) associated with implementing Part 845 at this Site.

Status Quo Condition Old Meredosia			IL Part 845 Implications / Impacts				
Engineering Element	Engineering Performance	Overall Risk / Environmental Performance	Construction Activity	CIP (Closure in Place with 845 Cover)	CBR (Closure by Removal)	Likelihood of Construction / Operational Impact	Improvement / Benefit to Overall Environmental Performance
Pond stratigraphy and positive groundwater separation	*positive groundwater separation*	No Risk and Adequate Environmental Protection in Current Condition	Removal of Vegetative Cover and Regrading of Footprint	X	X	*High Impacts to Ecosystem /Habitat*	No Notable Improvement or Benefit to Overall Environmental Performance
Stability of embankments and cover erosion protection/management	*stable conditions and erosion managed*		CCR removal and decontaminating all areas in pond footprint	N/A	X	*High - land disturbance and CCR handling*	
Infiltration management – cover and vegetative protection	*positive runoff and adequate infiltration management*		Truck/Material Transport Across Public Roads (either importing new materials or removal of CCRs)	X	X	*Medium/High - transport risks*	
Ecological assessment conditions – highlights and benefits of current ecosystem	*supports thriving ecosystem and protection of habitat*		Construction of Part 845 Compliant Cap (including importing of large quality of cover materials)	X	N/A	*Medium/High - land disturbance and CCR handling*	

Table Note

Regarding the evaluation of the **"Likelihood of Construction/Operational Impact"** referenced in the above table, a relative rating (assessment) of that impact has been assigned with best engineering judgment as follows:

- ***Low*** *– nominal impacts to environment/surrounding site environs, addressed/managed with simple engineering controls resulting in limited ground disturbance within or around unit footprint and limited import or export of natural resources;*
- ***Medium*** *– notable impacts to the environment and the Old Meredosia ecosystem resulting in temporary and possibly permanent habitat impacts plus possible impacts to surrounding environs; engineering controls and management resulting in moderate ground disturbance within or around unit footprint and import or export of natural resources, construction safety concerns; and*
- ***High*** *– significant impacts to the environment and Old Meredosia ecosystem and surrounding environs resulting in permanent habitat impacts, engineering controls, and management resulting in significant ground disturbance of the entire unit footprint and some surrounding area and import or export of significant natural resources, significant construction/public safety concerns.*

Summary of Findings and Conclusions

Haley & Aldrich has completed an engineering review in support of Ameren's petition for adjusted standards for Old Meredosia as an alternative to CIP or CBR in accordance with Part 845 of the Illinois Administrative Code. The approach used in our engineering review was to utilize available Site-related information to perform a comparative assessment of Old Meredosia's current conditions and overall engineering performance versus a theoretical condition, which includes the incorporation of engineered elements to satisfy a Part 845-compliant closure condition.

The comparative assessment that we performed utilized qualitative evaluation criteria, including positive groundwater separation, stability of embankments and cover erosion protection/management, infiltration management, cover and vegetative protection, ecological assessment of current Site ecosystem, a human health and ecological risk assessment, and for the purpose of comparison, the potential adverse impacts associated with the implementation of a Part 845-compliant closure condition.

Based on the engineering evaluation of the current conditions at Old Meredosia, it is reasonable to conclude that the embankment and impoundment plus existing cover and cover vegetative growth support the following conclusions:

- They provide for a closure scenario that is protective against risk to human health and the environment;
- They support a viable Site ecosystem with mature/established vegetative cover and valued wildlife habitat; and
- They demonstrate stable site civil/engineered conditions. That includes documented lines of evidence regarding overall positive performance of Old Meredosia as follows:
  - There is no notable ongoing erosion; the Site is inspected and maintained on an ongoing basis;
  - The existing cover system adequately addresses Infiltration management via the established cover configuration and associated vegetative protection;
  - the embankments (and the ash inside the impoundment) are stable with no potential for liquefaction impacts/effects associated with seismic events;
  - the impoundment is located outside of the Illinois River floodplain;
  - there is demonstrated positive separation between the base of ash in the impoundment and a conservative estimate of the peak expected groundwater table; and
  - Groundwater impacts, if any, will be detected and addressed via the groundwater management zone currently in place for the two closed CCRSIs at the Meredosia Site.

Regarding the comparative evaluation of the current conditions at Old Meredosia with a scenario where Ameren hypothetically pursues compliance with IAC Part 845, the following conclusions can be advanced:

- This approach would not provide additional protection to human health or the environment, and the current conditions of Old Meredosia provide the necessary environmental protection;
- Pursuing compliance with IAC Part 845 would destroy the existing Site ecosystem and its associated high-valued wildlife habitat, including nesting bald eagles, and the Illinois Chorus Frog, which is protected by the Illinois Endangered Species Protection Act;
- Implementation and associated construction of the IAC Part 845 closure requirements would result in a medium to high likelihood of impacts including land disturbance, transportation safety, and associated public safety risks; and
- This approach would result in the spending of significant capital resources without a commensurate benefit to environmental protectiveness or overall performance. There are notable financial implications associated with closing Old Meredosia in accordance with IAC Part 845 which can range upwards to $15 million, again with no additional levels of overall environmental protectiveness gained.

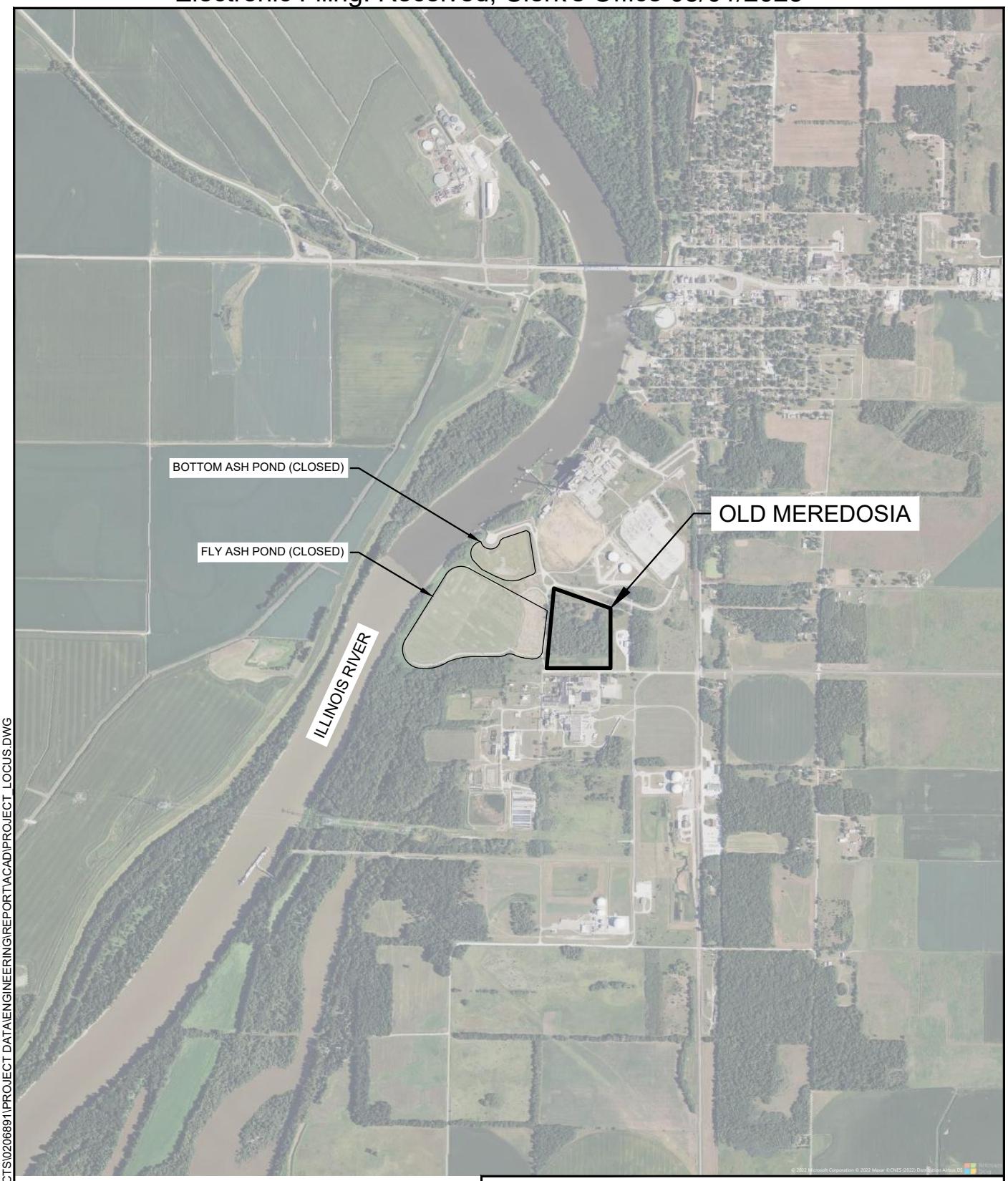
Enclosures:

Figure 1 – Site Location Map
Figure 2 – Topographic Contour Map
Figure 3 – Historic Design Drawing
Figure 4 – Groundwater Monitoring Well Location Map
Figure 5 – June 2019 Groundwater Elevations Map
Figure 6 – FEMA FIRMETTE Map

Attachment A – 2023 WSP Site Investigation Report, March 2023
Attachment B – 2022 Geotechnology Sampling and Testing Report, September 2022
Attachment C – Groundwater Flow Contour Maps
Attachment D – 2017 Geotechnology Liquefaction Analysis
Attachment E – Ameren Meredosia Annual Dam Safety Inspection Reports
Attachment F – EDR Historical Aerial Photographs

\\haleyaldrich.com\share\CF\Projects\0206891\Deliverables\2023-04-26 Meredosia_Ash Pond_Memo_F2.docx

FIGURES



SITE LOCATION

NOTE:

BASE MAP TAKEN FROM BING IMAGES

N

0 2000 4000

SCALE IN FEET

HALEY ALDRICH

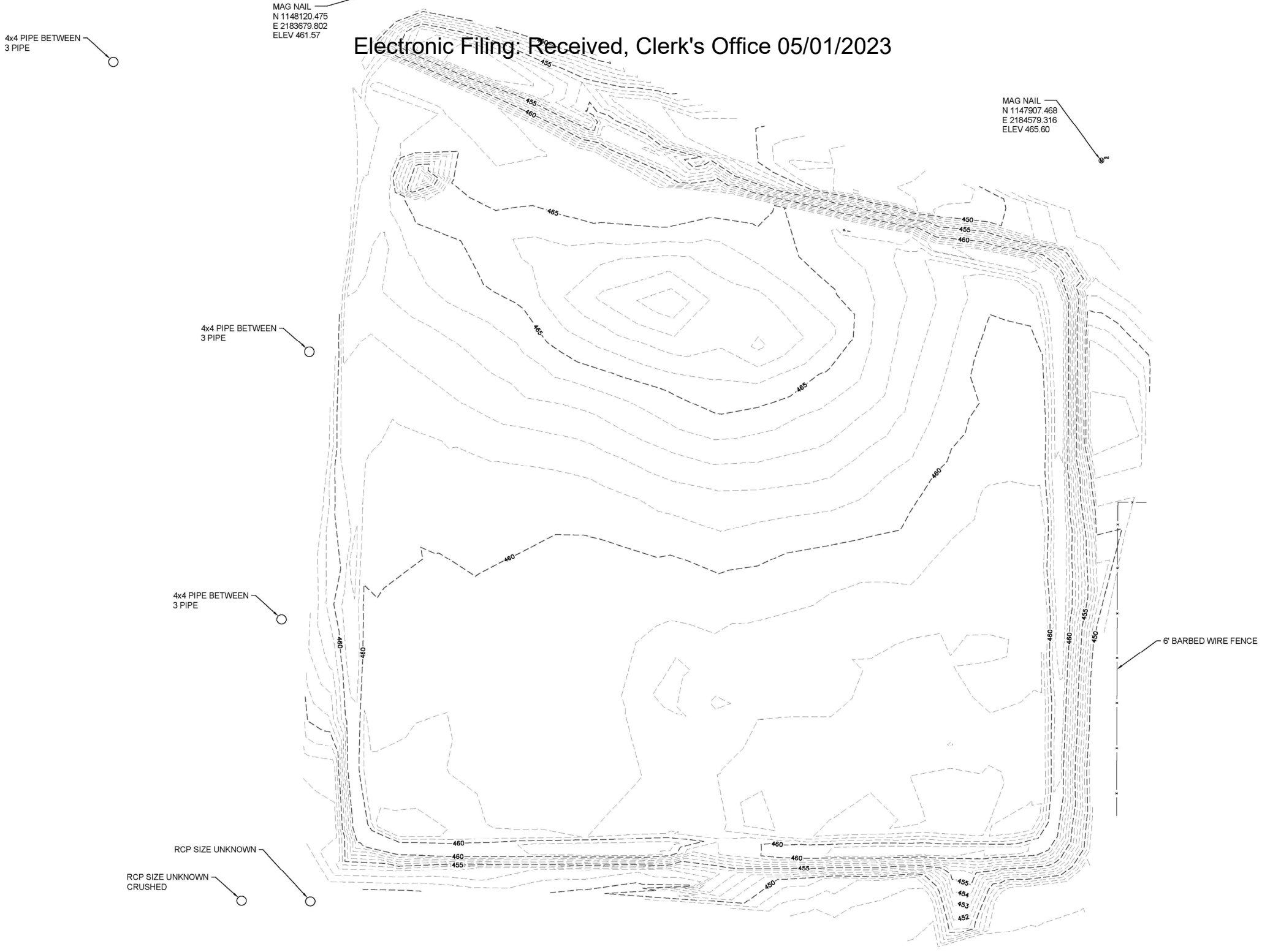
AMEREN ENERGY RSOURCES
MEREDOSIA POWER STATION
MORGAN COUNTY, ILLINOIS

SITE LOCATION MAP

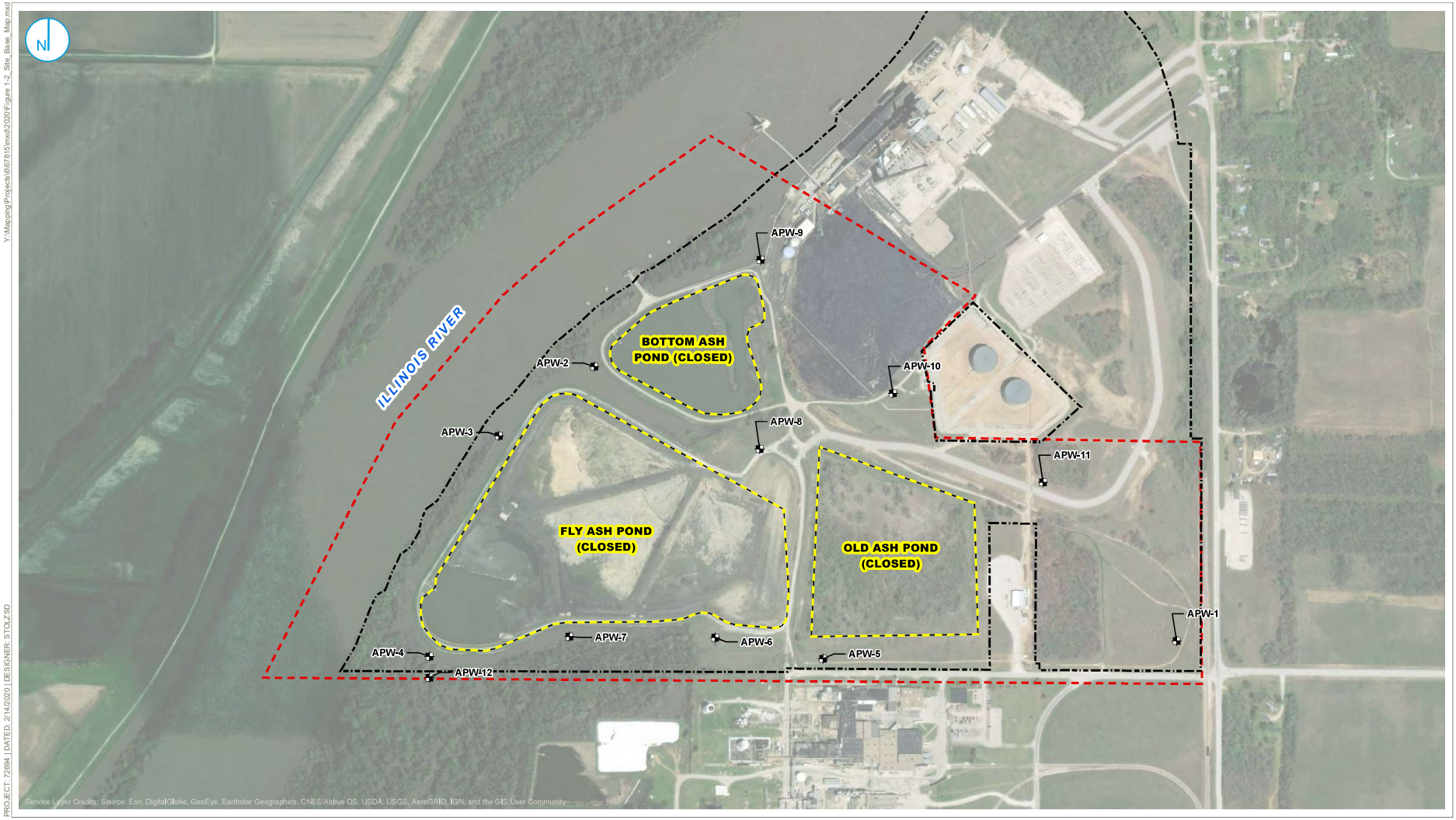
SCALE: AS SHOWN
DECEMBER 2022

FIGURE-1

Saved by: GRUENDLING, SETH Printed: 12/9/2022 8:30 AM Sheet: HA-FIG-A-P
\\HALEYALDRICH\SHARE\CF\PROJECTS\0206891\PROJECT DATA\ENGINEERING\REPORT\ACAD\PROJECT LOCUS.DWG


MAG NAIL
N 1148120.475
E 2183679.802
ELEV 461.57
4x4 PIPE BETWEEN
3 PIPE
MAG NAIL
N 1147907.468
E 2184579.316
ELEV 465.60
4x4 PIPE BETWEEN
3 PIPE
4x4 PIPE BETWEEN
3 PIPE
6' BARBED WIRE FENCE
RCP SIZE UNKNOWN
RCP SIZE UNKNOWN
CRUSHED
MAG NAIL
N 1146847.195
MAG NAIL
N 1146838.949

3014.4'±
2" Pipeline
Stone Headwall
2" Pipeline
0+00
1+00
2+00
3+00
4+00
5+00
6+00
7+00
8+00
9+00
10+00
ASH DISPOSAL PONDS
GRADE TO ELEV. 450
GRADE TO ELEV. 450
"A"
"B"
48" PRECAST CONCRETE TILE
48" TILE
48" TILE
48" TILE
A-A Latrine
DITCH
PROPOSED AMMONIA LINE BY OTHERS
PROPOSED AMMONIA LINE BY OTHERS
RIVER
1000'
DOCK AREA
ILLINOIS
Top
Of
Levee
3709.1'
P.I. 1+80.5
89°58'
South Property Line
Stone, 13+20.8
12 WIDE ROAD
Present Road
PC: 0+00
0+00
CURVE DATA
P.I. 1+80.5
Δ 89°58'
90°00'
T 180.5
L 282.6
NOTE: For location of Trucks And Buildings See Dwng "K511
1154.4'
℄ ROAD
SCALE 1" = 100'
60' ROAD DEDICATED DEC. 8, 1941 TO MORGAN CO. ROAD DISTRICT # 5
EL. 460
EL. 453
EL. 450
SECTION "A-A"
SECTION "B-B"
SECTION "C-C"
ALL SECTIONS TYPICAL
SCALE
1" = 10' HORIZ.
1" = 10' VERT.
CENTRAL ILLINOIS PUBLIC SERVICE C
A PORTION OF C.I.P.S. CO.
PROPERTY AT MERIDOSIA
ASH DISPOSAL PONDS SURVE
K-584



MONITORING WELL LOCATION
APPROXIMATE PROPERTY BOUNDARY
LIMITS OF CCP MANAGEMENT
APPROXIMATE GROUNDWATER MONITORING ZONE

0 240 480 Feet

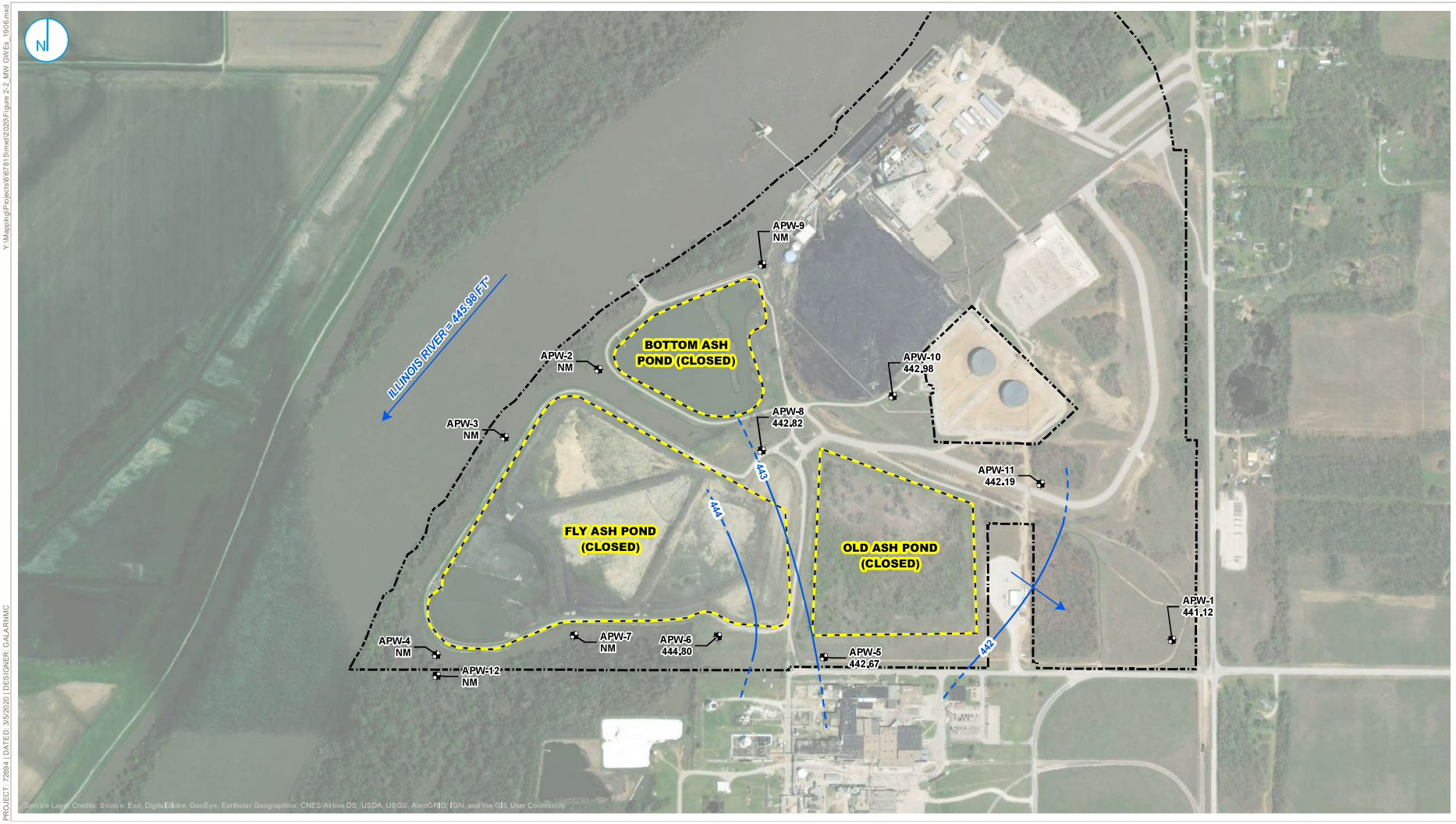
SITE BASE MAP

2019 ANNUAL REPORT
AMEREN ENERGY RESOURCES MEREDOSIA
POWER STATION
MORGAN COUNTY, ILLINOIS

FIGURE 1-2

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL



MONITORING WELL LOCATION
GROUNDWATER ELEVATION CONTOUR (1-FT INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION
0 240 480 Feet

APPROXIMATE PROPERTY BOUNDARY
LIMITS OF CCP MANAGEMENT

*River Elevation obtained from United States Geological Survey 05585500 Meredosia, IL gaging station. The elevation was reported in NGVD29 and then converted to NAVD88 at the time of this drawing.
NM = Not Measured, surrounding area flooded

GROUNDWATER ELEVATIONS - JUNE 4, 2019

FIGURE 2-2

2019 ANNUAL REPORT
AMEREN ENERGY RESOURCES MEREDOSIA
POWER STATION
MORGAN COUNTY, ILLINOIS

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

National Flood Hazard Layer FIRMette

Legal Online Filing Received, Clerk's Office 05/01/2023

FEMA

90°34'21"W 39°49'15"N

90°33'44"W 39°48'48"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 12/5/2022 at 11:07 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

ATTACHMENT A
2023 WSP Site Investigation Report

March 10, 2023

Claire A. Manning, Attorney
BROWN HAY + STEVENS
205 S. Fifth Street
Suite 1000
PO Box 2459
Springfield, IL 62705

Re: Expert Witness Support for Petition for Adjusted Standard for Old Meredosia, Illinois Pollution Control Board Docket AS 2021-008 – Site Investigation Report

Dear Ms. Manning:

At your request WSP USA Environment and Infrastructure, Inc. (WSP) has completed our review of information and site reconnaissance of a long-closed former ash pond, known as Old Meredosia, in Meredosia, Illinois. The attached document provides a summary of the technical approach of our work and key findings.

At your request I have also attached a copy of my resume in Appendix B.

Please let us know is you have any questions or would like to discuss further.

Sincerely,

WSP USA Environment and Infrastructure, Inc.

William Elzinga
Principal Manager
Enclosures

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3.2.1	Plant Community Composition	10
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1 INTRODUCTION

1.1 Background

WSP has been engaged by Ameren Legal and its outside counsel, Brown, Hay & Stephens, LLP (“Brown Hay”) to provide specialized knowledge and expertise relative to impacts to natural resources at Old Meredosia (Figure 1-1), should it be required to adhere to the rules of general applicability for the closure of Illinois ash ponds, as set forth in 35 Ill. Adm. Code Part 845.

1.2 Objectives

Objectives of work undertaken by WSP to review relevant data and site characteristics include the following:

1. Perform literature and database review of ecological and natural resource information
2. Conduct a reconnaissance site visit to identify resident plant communities, wildlife characteristics and potential function
3. Identify presence of habitats containing wetland characteristics and functional value
4. Assess potential effects and implications of Old Meredosia closure on ecological resources

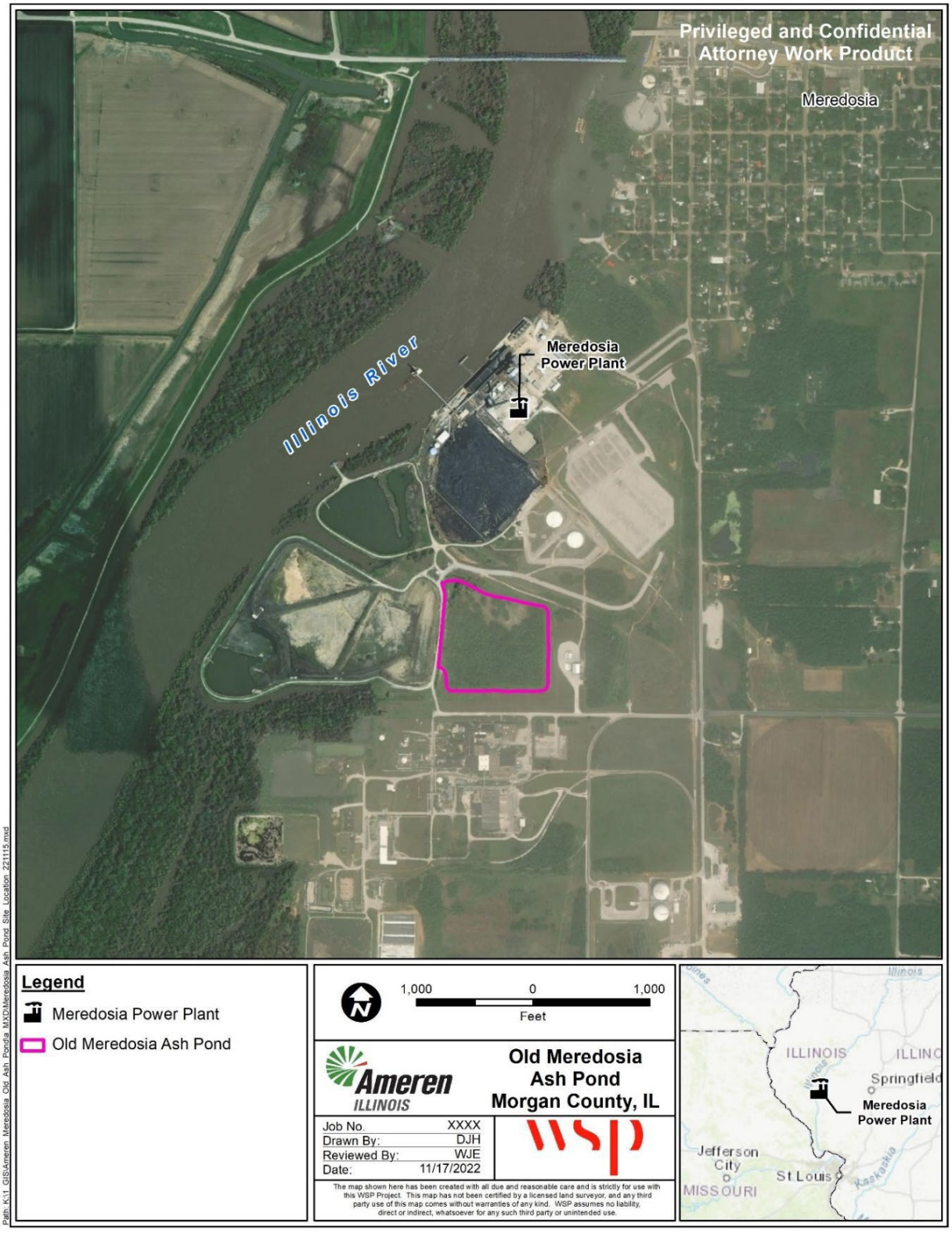

Figure 1-1 Old Meredosia Location

2 INVESTIGATION METHODOLOGY AND APPROACH

2.1 Desktop Review of Existing Information

WSP conducted a review of publicly available information for Old Meredosia and other information available to us in conjunction with prior work assignments from Ameren and publicly available information. Documents or information reviewed that are relevant to the objectives stated in Section 1.2 include the following:

- Illinois Department of Natural Resources (IDNR) Informational Ecological Compliance Assessment Tool (EcoCAT) review of sensitive species and habitats
- United States Fish & Wildlife Service's (USFWS) Information for Planning and Consultation (IPaC) informal review of sensitive species and habitats
- National Wetland Inventory (NWI)
- United States Geological Survey (USGS) National Hydrography Dataset (NHD)
- USGS topographic mapping
- Current and historical aerial photography

WSP conducted an initial agency records review for natural areas and sensitive species utilizing the USFWS IPaC (USFWS, 2022b) and the IDNR EcoCAT (IDNR, 2022b) databases. This information is publicly available and can be searched for a given project site to obtain a listing of sensitive habitats or species of concern that have been previously recorded for the project vicinity.

2.2 Field Reconnaissance Data Collection

WSP conducted field reconnaissance within Old Meredosia on November 11, 2022. Results of the initial field reconnaissance provide important information. For example, unique ecological communities identified in the IPaC report were field verified and evaluated for ecological significance.

Site reconnaissance was also conducted by WSP personnel with expertise in the identification and management of key resource issues such as aquatic resources, waters of the U.S. (WOTUS), and terrestrial and aquatic ecology. It is noted that Old Meredosia is a man-made treatment facility that was constructed above the floodplain and is therefore isolated and separate from other designated WOTUS. As such, it would not qualify as a jurisdictional wetland. Nonetheless, field investigation activities focused on determining the potential presence of habitats within Old Meredosia that may be periodically saturated and support a predominance of hydrophytic plant communities, that may perform typical wetland functions.

Specific reconnaissance elements at Old Meredosia included the identification and location of:

- Plant communities

- Bald eagle or other raptor nests
- Obvious communal nesting sites or rookeries
- Observations of encountered flora and fauna via direct observations or indirect observations (tracks, feathers, scat)
- Observations of flora or fauna listed on IPaC and/or EcoCAT reviews
- Habitats supporting communities exhibiting wetland function

3 RESULTS

3.1 Desktop Review of Existing Information

A desktop review was completed to summarize ecological information for the Old Meredosia Site and the vicinity. Information reviewed included site-specific information from the USFWS IPaC system, the NWI, and the IDNR EcoCAT.

The NWI review showed that the predominant wetland features in the vicinity of Old Meredosia is forested/shrub wetland and open water, including lakes, ponds, and river habitats (USFWS, 2022a). The IDNR EcoCAT identified three Illinois Natural Areas Inventory (INAI) sites in the vicinity of the project area (Table 3-1). Two of the INAI areas are considered category VI INAI sites, which are characterized by unusual concentrations of flora and fauna and/or high-quality streams and are all less than five acres. One of the INAI sites, Meredosia Refuge, is characterized with suitable habitat for state-listed species and is 5,715 acres in size (IDNR, 2022a).

Table 3-1 Illinois Natural Area Inventory Sites within the Vicinity of the Project Area

Site	Category[1]	Acres
George Smith Bed	VI	1.8
Meredosia Refuge	II	5714.
National Starch Bed	VI	2.7

Source: IDNR 2022a, IDNR 2022b

[1]Category VI: Unusual concentrations of flora or fauna and high-quality streams Category II: Specific suitable habitat for state-listed species or state-listed species relocations

As part of the desktop analysis, a list of protected species potentially occurring within or near the Project Area was developed. The resultant list of protected species is presented in Table 3-2 and summarized in the following paragraphs. Because Old Meredosia consists entirely of upland habitats, obligate aquatic species (fish, mussels) were excluded from the list.

A listing of federally threatened or endangered species currently listed or proposed for listing that may occur within the Project Area was obtained from the USFWS IPaC database in November 2022 (USFWS, 2022b). The USFWS IPaC identified three federally listed mammal species (Indiana bat [*Myotis sodalis*], northern long-eared bat [*Myotis septentrionalis*], and tricolored bat [*Perimyotis subflavus*]) and one federally listed insect species (monarch butterfly [*Danaus plexippus*]) that may occur on the Project Site. There was an additional mammal species (gray bat [*Myotis grisescens*]) that may potentially occur within a 5-mi radius of the project site. No critical habitat was identified on the IPaC system results. One federally listed plant species was identified that may occur within the project area, the federally threatened decurrent false aster (*Boltonia decurrens*). An additional federally listed plant species, the threatened eastern prairie fringed orchid (*Platanthera leucophaea*), was identified to potentially occur within 5 miles of Old Meredosia (USFWS, 2022b).

A review of the IDNR EcoCAT results in November 2022 identified three protected upland

species that may occur at or near Old Meredosia (IDNR, 2022b). This includes the Illinois chorus frog (*Pseudacris illinoensis*), the northern harrier (*Circus cyaneus*), and the regal fritillary butterfly (*Speyeria idalia*). All of these species are considered Imperiled in the State of Illinois, except the northern harrier, which is classified as Critically Imperiled.

Table 3-2 Protected Species Potentially Occurring within or near the Former Meredosia Project Site

		Status		
		Federal		State
Common Name	Scientific Name	ESA	BGEPA	
Mammals				
Indiana bat[1]	*Myotis sodalis*	Endangered		
Northern Long-eared bat[1]	*Myotis septentrionalis*	Threatened		
Tricolored bat[1]	*Perimyotis subflavus*	Proposed Endangered		
Gray bat[1,2]	*Myotis grisescens*	Endangered		
Birds				
Bald eagle[3]	*Haliaeetus leucocephalus*		X	
Northern harrier	*Circus cyaneus*			Critically Imperiled
Amphibians				
Illinois chorus frog	*Pseudacris illinoensis*			Imperiled
Insects				
Monarch butterfly	*Danaus plexippus*	Candidate		
Regal fritillary	*Speyeria idalia*			Imperiled
Plants				
Decurrent false aster[1]	*Boltonia decurrens*	Threatened		
Eastern prairie fringed orchid[1,2]	*Platanthera leucophaea*	Threatened		

Source: USFWS 2022b; IDNR 2022b
1-ESA, 2-Species may occur within 5-mi vicinity, 3-BGEPA

The USFWS IPaC identified 13 migratory birds of conservation concern that have the potential to be impacted by actions that would be required to effect closure pursuant to Part 845 (UWFWS, 2022b). These species are shown in Table 3-3. Of these species, the probability of presence is greatest for bald eagle (*Haliaeetus leucocephalus*) and red-headed woodpecker (*Melanerpes erythrocephalus*). In fact, as discussed later, bald eagles and a bald eagle nest were observed at Old Meredosia. The bald eagle, while no longer protected by the Endangered Species Act (ESA), is a federally listed species protected under the Bald and Golden Eagle Protection Act (BGEPA).

Table 3-3 Migratory Birds of Conservation Concern that have the Potential to be in the Vicinity of the Project Area

Common Name	Scientific Name	Breeding Season
American golden-plover	*Pluvialis dominica*	Breeds elsewhere
Bald eagle	*Haliaeetus leucocephalus*	Breeds Oct 15 to Aug 31
Black-billed cuckoo	*Coccyzus erythropthalmus*	Breeds May 15 to Oct 10
Chimney swift	*Chaetura pelagica*	Breeds Mar 15 to Aug 25
Eastern whip-poor-will	*Antrostomus vociferus*	Breeds May 1 to Aug 20
Golden eagle	*Aquila chrysaetos*	Breeds elsewhere
Kentucky warbler	*Oporornis formosus*	Breeds Apr 20 to Aug 20
Lesser yellowlegs	*Tringa flavipes*	Breeds elsewhere
Prothonotary warbler	*Protonotaria citrea*	Breeds Apr 1 to Jul 31
Red-headed woodpecker	*Melanerpes erythrocephalus*	Breeds May 10 to Sep 10
Rusty blackbird	*Euphagus carolinus*	Breeds elsewhere
Short-billed dowitcher	*Limnodromus griseus*	Breeds elsewhere
Wood thrush	*Hylocichla mustelina*	Breeds May 10 to Aug 31

Source: USFWS 2022b

3.2 Field Reconnaissance

3.2.1 Plant Community Composition

Based upon the field reconnaissance performed at Old Meredosia on November 11, 2022, none of the sensitive plant species listed in Table 3-2 were encountered. A list of plant species observed on Old Meredosia are included in Table 3-4.

Old Meredosia is characterized by 10.2 acres of deciduous forest, 2.3 acres of shrub-scrub, 3.5 acres of undeveloped herbaceous/grassland cover, and 1.3 acres of developed, low intensity land (Figure 3-1).

Deciduous forest, comprising most of Old Meredosia, is young and fairly uniform in structure and composition. Dominant canopy species include white mulberry (*Morus alba*), cottonwood (*Populus deltoides*), and black locust (*Robinia pseudoacacia*). Hackberry (*Celtis occidentalis*) and box edler (*Acer negundo*) are also common, but less frequently observed. In the shrub understory, Amur honeysuckle (*Lonicera maackii*) and roughleaf dogwood (*Cornus drummondii*) are dominant in the shrub layer. The herb layer is not well developed, but white avens (*Geum canadense*) and garlic mustard (*Alliaria petiolata*) are well distributed and common.

Shrub-scrub growing along the eastern and southern edges of the Old Meredosia site is distinguished by sapling trees and shrubs including ash, box elder, and roughleaf dogwood growing over Amur honeysuckle and an herb layer that includes American germander (*Teucrium canadense*), sunflower (*Helianthus* sp.), field thistle (*Cirsium discolor*), and late thoroughwort (*Eupatorium serotinum*).

Grassland, developed, low intensity lands, and sand prairie characterize the diversity of herbaceous cover types found within Old Meredosia. Grassland is found in a narrow strip of infrequently mowed herbaceous cover growing along the forested western edge of Old Meredosia and is dominated by smooth brome (*Bromus inermis*) growing alongside scattered common milkweed (*Asclepias syriaca*), American germander, green foxtail (*Setaria viridis*), and field garlic (*Allium vineale*). A frequently mowed ring of turfgrass that circumscribes the perimeter of the Old Meredosia site accounts for developed, low intensity land acreage.

Open, grassy sand prairie occupies the elevated slope in the north-central part of the Old Meredosia site. This habitat has developed in areas that were associated with the initial release point of sluiced sand material from the Illinois River in the 1970s in conjunction with initial closure of Old Meredosia by Ameren. Sandthread lovegrass (*Eragrostis trichodes var. trichodes)* is the dominant species and grows in evenly-spaced tufted clumps throughout the prairie. In the low interstitial valleys between tufts of grass, eastern prickly pear (*Opuntia cespitosa*), perennial ragweed (*Ambrosia psilostachya*), and spotted beebalm (*Monarda punctata* var. *villicaulis*) are common.

A Floristic Quality Assessment (FQA) is used to assist ecologists in quantifying the “floristic quality” of a site, and more qualitatively, in evaluating its ecological significance. FQA methodology followed the protocol developed by Swink and Wilhelm (1994) in the Plants of the Chicago Region. The concept of species conservatism is the foundation for FQA. Each native species is assigned a value reflecting its coefficient of conservatism (C), ranging from 0 - 10 and representing an estimated probability that it is likely to occur in a landscape relatively unaltered from what is believed to be pre-European settlement condition. Coefficient of conservatism values were updated by Taft et al. (1997) and are used in this FQA. A C-value of 0 is given to plants that have demonstrated little fidelity to any remnant natural community and thus may be found almost anywhere, especially in disturbed habitats. A C-value of 10 is applied to those plants that are almost always restricted to a pre-settlement remnant or high-quality natural area. Intermediate values are assigned to taxa such as swamp white oak (*Quercus bicolor*) or big bluestem (*Andropogon gerardii*), when it is certain that the species is representative of remnant natural communities, but it is uncertain that the condition of the community from which it comes is still representative of pre-settlement condition (i.e., the community may be somewhat degraded).

Old Meredosia’s floristic quality index (FQI) was calculated as follows:

$$\mathrm{FQI} = \mathrm{Mean\ C} * \sqrt{\mathrm{n}}$$

where n equals the number of native plant species at Old Meredosia.

Based on the equation, the FQI is a function of the C-value and provides a measure of the floristic integrity or level of site disturbance. Most of the remaining undeveloped landscapes have FQI values of less than 20 and have minimal significance from a natural quality perspective. Areas with an FQI above 35 possess conservatism and richness values that indicate an area is floristically important. Areas registering an FQI in the 50’s and higher are extremely rare and represent a significant component of the region’s native biodiversity and natural landscapes.

The different prairie types in Illinois are the result of variations in soil moisture, soil composition,

geological substrate, glacial history and topography. Within Illinois, sand prairies are relatively uncommon and are represented by only 2,360 acres (poor and good quality) of sand prairies statewide. Sand prairies formed on sand deposits and dunes that were left by glaciers or blown by the wind. Well-drained, sandy soils are characteristic of sand prairies (IDNR, 2022c). Remnant sand prairies area also present on sandy alluvial terraces along the Mississippi and Illinois rivers.

Plants that grow in the sand prairie are adapted to grow in well-drained soil. These plants are typically shorter than those in black soil prairies. While the overall floristic “quality” of the Old Meredosia site is fairly low (14.2 total FQI), see Table 3-4, the sand prairie features found in the north-central portion of site represents an uncommon plant community within Illinois and the central Midwest, and contains a number of fairly conservative species. The presence of sandthread lovegrass, eastern prickly pear, and spotted beebalm are indicative that the northern portion of the Old Meredosia site is developing as a sand prairie.

Table 3-2 Old Meredosia3 Site Vascular Plant Checklist

Botanical Name	Common Name	Native Status	C
Acer negundo	Box elder	Native	1
Ageratina altissima	White snakeroot	Native	2
Alliaria petiolate	Garlic mustard	Non-native	*
Allium vineale	Field garlic	Non-native	*
Ambrosia psilostachya	Perennial ragweed	Native	2
Asclepias syriaca	Common milkweed	Native	0
Bidens bipinnata	Spanish needles	Non-native	*
Boehmeria cylindrica	False nettle	Native	3
Bromus inermis	Smooth brome	Non-native	*
Carduus nutans	Musk thistle	Non-native	*
Carex frankii	Frank's sedge	Native	4
Celtis occidentalis	Hackberry	Native	3
Cirsium discolor	Field thistle	Native	5
Conyza canadensis	Horseweed	Native	1
Cornus drummondii	Roughleaf dogwood	Native	2
Daucus carota	Queen Anne's lace	Non-native	*
Eragorostis trichodes var. *trichodes*	Sandthread lovegrass	Native	5
Euonymus fortunei	Wintercreeper	Non-native	*
Eupatorium serotinum	Late thoroughwort	Native	1
Fraxinus pennsylvanica	Green ash	Native	5
Geum canadense	White avens	Native	2
Gleditsia triacanthos	Honey locust	Native	2
Hackelia virginiana	Virginia stickseed	Native	1
Helianthus sp.	Sunflower	Native	*
Heterotheca subaxillaris	Camphorweed	Native	2
Juniperus virginiana	Eastern red cedar	Native	1
Lonicera maackii	Amur honeysuckle	Non-native	*
Monarda punctata var. *villicaulis*	Spotted beebalm	Native	5
Morus alba	White mulberry	Non-native	*
Opuntia cespitosa	Eastern prickly pear	Native	5
Panicum philadelphicum	Philadelphia panicgrass	Native	5
Parthenocissus quinquefolia	Virginia creeper	Native	2
Phytolacca americana	Pokeweed	Native	1
Platanus occidentalis	Sycamore	Native	3

Poa pratensis	Kentucky bluegrass	Non-native	*
Populus deltoides	Eastern cottonwood	Native	2
Quercus velutina	Black oak	Native	5
Rhus aromatica	Fragrant sumac	Native	4
Ribes missouriense	Missouri gooseberry	Native	2
Robinia pseudoacacia	Black locust	Native	1
Rubus flagellaris	Northern dewberry	Native	4
Rubus occidentalis	Black raspberry	Native	2
Salix nigra	Black willow	Native	3
Saponaria officinalis	Soapwort	Non-native	*
Schizachyrium scoparium	Little bluestem	Native	4
Setaria viridis	Green foxtail	Non-native	*
Smilax hispida	Bristly greenbriar	Native	3
Solanum carolinense	Horsenettle	Native	0
Solanum ptychanthum	Eastern black nightshade	Native	0
Solidago altissima	Tall goldenrod	Native	1
Stellaria media	Common chickweed	Non-native	*
Teucrium canadense	American germander	Native	3
Tridens flavus	Purpletop	Native	5
Urtica dioica	Stinging nettle	Native	2
Verbascum thapsus	Common mullen	Non-native	*
Vitis sp.	Grape	Native	*
		Total native species (n)	**38**
		Total species (n)	**54**
		Mean Native C	**2.7**
		Total Mean C	**1.9**
		Native FQI	**16.9**
		Total FQI	**14.2**

c = conservation value, from 0 (habitat generalist) to 10 (extremely restricted habitat) (Swink and Wilhelm 1994)

***** indicates where no value has been assigned to the species

FQI = Floristic Quality Index

Figure 3-1 Old Meredosia Land Cover

3.2.2 Wetland Functional Characteristics

In conjunction with site reconnaissance activities, WSP field staff surveyed the Old Meredosia site for the presence of habitats exhibiting wetland functional characteristics. In other ash pond project sites evaluated by WSP, while not qualifying as jurisdictional WOTUS (due to their manmade and isolated characteristics), former ash ponds have been shown to exhibit wetland functional characteristics when the saturation zone is at or near the surface. However, for the Old Meredosia site the presence of a deep sand cover over Old Meredosia, and the active effects of an established forested community that removes soil moisture by evapotranspiration processes, results in surficial soils that are relatively dry. As such, no areas exhibiting wetland functional characteristics were found on Old Meredosia.

3.2.3 Wildlife

Based upon the field reconnaissance performed at the Old Meredosia site on November 11, 2022, with the exception of bald eagle, none of the sensitive species listed in Table 3-2 were encountered.

The onsite deciduous forest, shrub-scrub, sand prairie, and herbaceous/grassland cover types provide habitat for an array of common wildlife species. Observed bird species during the November 2022 field reconnaissance included bald eagle, American goldfinch (*Spinus tristis*), downy woodpecker (*Dryobates pubescens*), northern cardinal (*Cardinalis cardinalis*), black-capped chickadee (*Poecile atricapillus*), American robin (*Turdus migratorius*), yellow-rumped warbler (*Setophaga coronata*), mourning dove (*Zenaida macroura*), tufted titmouse (*Baeolophus bicolor*), and turkey vulture (*Cathartes aura*). Observed mammal species during the November 2022 field reconnaissance included white-tailed deer (*Odocoileus virginianus*), eastern cottontail (*Sylvilagus floridanus*), eastern gray squirrel (*Sciurus carolinensis*), virginia opossum (*Didelphis virginiana), raccoon* (*Procyon lotor*), and eastern mole (*Scalopus* aquaticus). Other notable wildlife observations included a bald eagle nest on the western portion of Old Meredosia, raptor nest on the eastern portion of Old Meredosia, and turtle nest on the northern portion of Old Meredosia (Figure 3-2).

Songbird nests were also observed throughout much of Old Meredosia (see representative picture in photo log). Based upon species and nests observed, onsite habitats also provide functional value to wildlife for roosting, nesting, foraging, and migratory use for both resident and nonresident bird species.

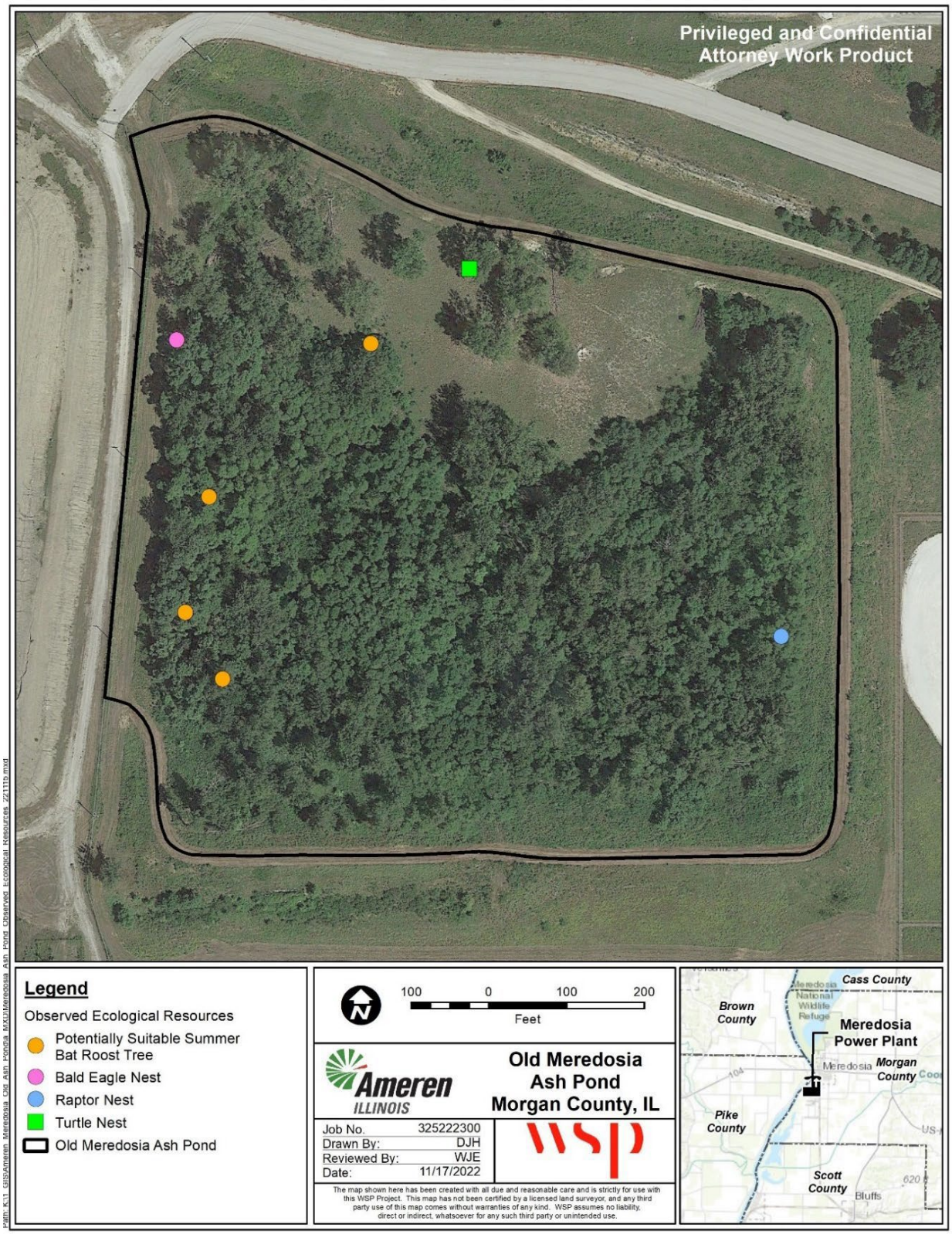

Figure 3-2 Old Meredosia Ash Pond Observed Ecological Resources

3.2.4 Sensitive Species

Long closed and covered with sand and clay, Old Meredosia provides notable habitat for a range of sensitive species as described below.

3.2.4.1 Bald Eagle

Bald eagles are protected under the BGEPA (USFWS 2013). Nesting habitat for this species is associated with larger mature trees capable of supporting its massive nests made of tree branches. These nests are usually found near larger waterways where the eagles forage on fish (USFWS 2007). A bald eagle nest was observed onsite in the western portion of Old Meredosia, thus Old Meredosia serves as suitable nesting habitat. The Illinois River serves as suitable nearby foraging habitat for a breeding pair to utilize the onsite nest.

3.2.4.2 Potentially Suitable Summer Bat Roost Habitat

Three federally listed bat species protected by the ESA (Indiana bat, northern long-eared bat, and tricolored bat) were identified as potentially occurring in the project area (see Table 3-2) The Indiana bat hibernates in caves in winter and uses areas around them for swarming (mating) in the fall and staging in the spring, prior to migrating back to summer habitat. In summer, Indiana bats roost under the exfoliating bark, crevices, or hollows of dead snags and living trees, typically greater than 5 inches in diameter, in mature forests with an open understory and a nearby source of water (Pruitt and TeWinkel 2007, Kurta et al. 2002). Indiana bats are known to change roost trees frequently throughout the season, while still maintaining roost site fidelity, returning to the same summer roosting areas in subsequent years (Pruitt and TeWinkel 2007). Indiana bats feed on terrestrial and aquatic insects while foraging in forested stream corridors, upland and bottomland forests, forested wetlands, and along wooded edges of agricultural fields, pastures, and impounded bodies of water at night (USFWS 2021a).

The federally threatened northern long-eared bat predominantly overwinters in large hibernacula such as caves, abandoned mines, and cave-like structures. During spring and fall, northern long-eared bats utilize entrances of caves and the surrounding forested areas for swarming and staging. In the summer, northern long-eared bats roost individually or in colonies beneath exfoliating bark, crevices, or hollows of both live and dead trees (typically greater than 3 inches in diameter). Roost selection by northern long-eared bat is similar to that of Indiana bat; however, northern long-eared bats are thought to be more opportunistic in roost site selection. Northern long-eared bats emerge at dusk to forage below the canopy of mature forests on hillsides and roads, and occasionally over forest clearings and along riparian areas (USFWS 2014).

The tricolor bat is proposed for federal listing as endangered due to the impacts of white-nose syndrome, a deadly disease/fungal pathogen affecting cave-dwelling bats within the US. During the winter these bats hibernate in caves then in the spring, summer and fall (the non-hibernating season) primarily roost among live and dead leaf clusters of deciduous hardwood

trees. Tricolored bats can also roost among pine needles, eastern red cedar, and within artificial/man- made structures. Tricolored bats opportunistically feed at night on small insects including caddisflies, moths, beetles, wasps, flying ants and flies, and then roost during the day (USFWS 2021b).

Old Meredosia was surveyed for the presence of potentially suitable summer roost habitat for federally listed bats during the November 2022 field reconnaissance in accordance with the 2022 Range-Wide Indiana Bat and Northern Long-eared Bat Survey Guidelines (USFWS 2022c) and habitat preferences of the tri-colored bat described in USFWS 2021b. Of the 10.2 acres of deciduous forest habitat in the project area, trees exhibiting potentially suitable summer roost habitat characteristics such as exfoliating bark, cracks, crevices, or hollows for Indiana bat and northern long-eared bat were observed in the west portion of Old Meredosia. Potential summer roost habitat for the tri-colored bat, in the form of leaf clusters of deciduous trees and eastern red cedar, is present throughout the deciduous forest of Old Meredosia. Location of potentially suitable bat roost trees are shown in Figure 3-2. Suitable foraging habitat also exists for the Indiana bat, northern long-eared bat, and tri-colored bat in and around onsite deciduous forests, and other nearby forest edges over the Illinois River.

3.2.4.3 Illinois Chorus Frog (ICF)

ICF is a state imperiled species that is fossorial, spending around 85% of its life burrowed underground in sparsely vegetated areas with sandy soil, near ephemeral (i.e., temporary) breeding ponds. ICF is found in loose soils that allow easy burrowing, such as sand, loamy sand, or sandy loam. Bare areas (blow outs) or sparsely vegetated areas, such as sand prairies and old fields, provide habitat that allow burrowing because plant roots do not fill the soil. Distribution of ICF in Illinois occurs in three widely separated sandy floodplain regions (Figure 3- 3). The northern region covers the largest area and encompasses Old Meredosia and Morgan County along the east side of the Illinois River (INHS, 2022).

ICF individuals spend most of the year buried in the ground, emerging only to move to ponds where they mate and lay their eggs during February and March. Like other frogs, Illinois chorus frogs go through development as tadpoles and then metamorphose into young frogs by late May to late June. The young frogs have been shown to migrate up to 0.9 km (2,953 feet) from breeding ponds to burrowing sites. They are able to move short distances and feed while buried. The fossorial habits of the Illinois chorus frog make surveys of their populations difficult except during the breeding season when they are vocalizing at their breeding ponds. The success of breeding varies greatly between years depending on precipitation patterns and the persistence of the breeding ponds, as well as the potential detrimental introduction of fish to the ponds (IDNR, 2016).

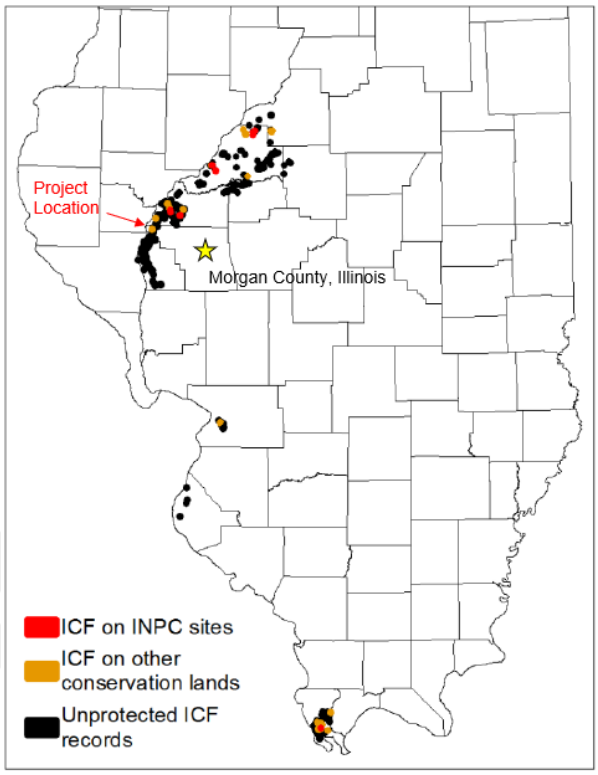

Figure 3-3 Current Distribution of ICF in Illinois (INHS, 2022)

The sand prairie features within Old Meredosia represents potential upland non-breeding habitat for ICF. According to INHS (2022) conservation guidance survey methods are not available for terrestrial habitat; thus, presence should be assumed in an area if it contains sandy soil and is within 1 mile of an occupied breeding pond. As indicated in Figure 3-4 from the Conservation Plan for the Meredosia Plant Ash Pond Closure report, documented presence of ICF breeding has been recorded within 1 mile of Old Meredosia. **Therefore, based on INHS conservation guidance, it is assumed that ICF is present at Old Meredosia.**

Recommended measures to protect and sustain ICF have also been established by INHS (2022). These measures include protection of upland sand prairie habitats and management of these areas by invasive species management and controlled burning to reduce encroachment by forested species. Due to the secretive nature of ICF, avoiding impacts from development is only possible through complete avoidance of suitable habitat. To avoid impact, breeding ponds and the surrounding terrestrial areas (within 1 mi) with sandy soil should not be impacted (INHS, 2022).

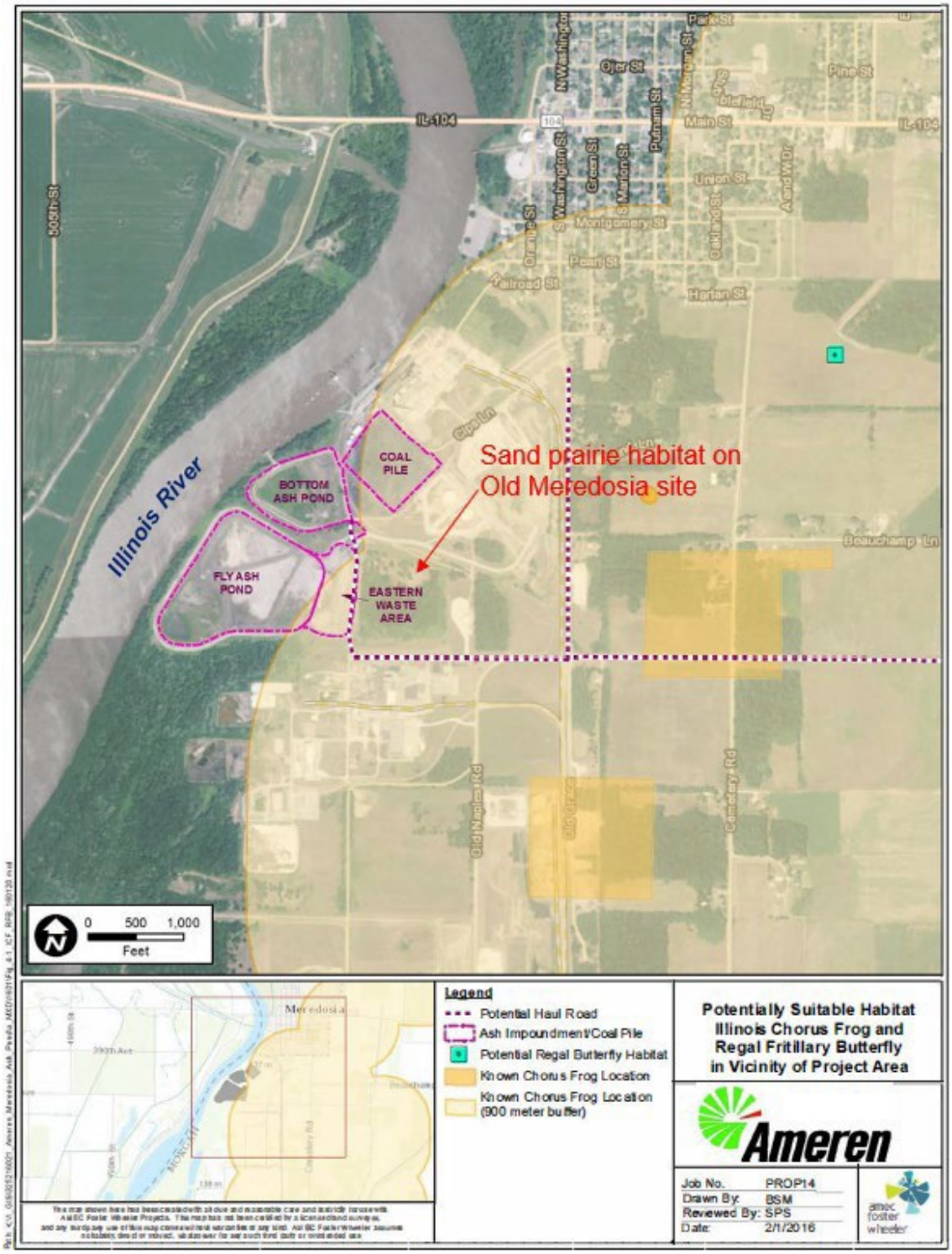

Figure 3-4 Location of Old Meredosia Sand Prairie Habitat in Relation to Previously Recorded ICF Breeding Site (Amec Foster Wheeler, 2016)

3.2.4.4 Sand Prairie Support to Other Species

According to the IDNR, sand prairies such as that evident on the Old Meredosia site are often suitable for use by other uncommon species in addition to the ICF. For example, plant species that may occur in sand prairies include little bluestem, leadplant, green milkweed, butterfly-weed, purple coneflower, prickly pear cacti, colic root, grass pink orchid, silvery bladderpod, blackjack oak, bearberry and winged sumac. In addition to ICF, animal species that may utilize sand prairies include the American badger, common tern, western meadowlark, yellow mud turtle, gopher snake and plains hog-nosed snake (IDNR, 2022c).

4 IMPLICATIONS OF ASH POND CLOSURE AND POTENTIAL EFFECTS

Old Meredosia represents a naturalized landscape that occurs within a highly fragmented, industrial landscape. As such, Old Meredosia provides moderate wildlife support for a range of flora and fauna as described in Section 3. Despite prior disturbance of Old Meredosia, Old Meredosia has not been disturbed in nearly 50 years and offers important features that have moderate to high ecological value based on the presence of an established bald eagle nest and suitable habitat for other sensitive species. Unlike the closure of recently active ash ponds that had not been previously addressed by placement of a sand and clay cap ranging from 1-6 feet in thickness, impacts of closure at Old Meredosia by any means (i.e., cover-in-place or clean closure) would result in tree and vegetation removal and disruption that would result in a net loss of ecosystem value and potential direct and indirect effects on notable species and habitats. The following is a summary of potential implications and effects:

- *Vegetation removal and general habitat loss.* During construction, mobile wildlife present within Old Meredosia would likely disperse to adjacent and/or similar habitat. However, wildlife that are less mobile or the wildlife that may be more limited in their habitat preferences, may be adversely impacted by the inability to find suitable replacement habitat in the vicinity of Old Meredosia. Breeding birds such as migratory songbirds and raptors such as those that use Old Meredosia as evidenced by observed nests, are also likely to be affected. Similarly, other species nesting or reproducing in forested and edge habitats may also be impacted by nest description and removal. Such losses and impacts on migratory birds is subject to regulatory compliance in accordance with the Migratory Bird Treaty Act.
- *Impacts to bald eagle.* Construction-related effects on Old Meredosia would inevitably result in the complete removal of vegetation on Old Meredosia including the loss of an established bald eagle nest located on the western portion of Old Meredosia. Observation of two adult bald eagles and two juvenile bald eagles in the vicinity of the project area during Old Meredosia visit seems to indicate some fidelity of these bald eagles to the nest on the Old Meredosia site. This suggests that the observed bald eagle nest on Old Meredosia is viable and active. As such, construction activities and the removal of all vegetation on Old Meredosia would expectedly result in stress imposed upon the breeding pair and may impair their ability to successfully establish

another nest in the project vicinity.

Both the direct take of the established bald eagle nest and the indirect effects of stress due to the unavailability of a preferred nest site, disturbance from construction related activities, and stress resulting from the additional effort to select and build a replacement nest site may be expected to result in adverse effects on the established nesting pair.

The Bald and Golden Eagle Protection Act (BGEPA)(*16 U.S.C. 668-668d*), enacted in 1940, prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald or golden eagles, including their parts (including feathers), nests, or eggs. BGEPA provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part (including feathers), nest, or egg thereof." Under BGEPA the term "take" is defined as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." Regulations further define "disturb" as “to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior" (*50 CFR 22.6*).

In addition to immediate “take” associated with nest destruction, this definition also covers effects that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that it interferes with or interrupts normal breeding behavior, reproductive success, feeding, or sheltering habits, and causes injury, death or nest abandonment.

- *Impacts to ICF*. Sand prairie habitat is evident at Old Meredosia based on the presence of sandy substrates and established plant species that are characteristic of Illinois sand prairies. Additionally, based on the presence of recorded breeding populations in the vicinity of Old Meredosia and INHS ICF conservation guidance, it is appropriate to assume that ICF is present at Old Meredosia. Adverse effects or “take” is prohibited in accordance with the Illinois Endangered Species Protection Act. Under this Act, “take” means, in reference to animals and animal products, to harm, hunt, shoot, pursue, lure, wound, kill, destroy, harass, gig, spear, ensnare, trap, capture, collect, or to attempt to engage in such conduct. As such, extensive direct impacts associated with site disturbance and the removal of sand prairie habitat at Old Meredosia would adversely affect resident populations of ICF. Secondarily, the extensive construction activities that would be required in conjunction with closure by any means would include extensive trucking operations that would very likely also result in disturbance of other reproductive and non-reproductive habitats in the vicinity and would result in further “take” impacts to ICF (See Figure 3-4).
- *Loss of sand prairie habitat*. As described above Old Meredosia is relatively unique in its composition and support of a developing sand prairie. Plant species having a relatively high C value that were generally characteristic of this area include sandthread lovegrass,

eastern prickly pear, and spotted beebalm. Each of these species are noted to have a relatively high (5) conservation index value. This portion of Old Meredosia is also relatively unique in its wildlife support function as it was noted to be a location supporting turtle nesting and having potential support for other sand prairie-dependent species.

- *Impacts to potential summer bat roost and foraging habitat*. Suitable foraging habitat is present onsite and in the vicinity of Old Meredosia for the Indiana bat, northern long-eared bat, and tri-colored bat. All of the onsite habitat would be impacted if vegetation were cleared/removed in association with potential closure of Old Meredosia. The 10.2 acres of deciduous forest that contains potentially suitable summer roosting habitat for Indiana bat, northern long-eared bat, and tri-colored would be removed in association with potential closure of Old Meredosia.
- *Disruption of natural evapotranspiration function*. The resident forested community present on the Old Meredosia site is a successionally developing forested area that will continue to mature over time. Trees as part of the resident forest community are composed of extensive root systems that effectively “pump” water from the soil and subsoil and release water to the atmosphere via the natural evapotranspiration processes. Water within the sandy soil overlying the deeply buried ash (up to 8 feet below grade) may be expected to be drawn up by the trees on site during the growing season. As such, for the Old Meredosia site, which has no other surface water inputs other than direct rainfall, the amount of downgradient water movement exerting a hydraulic head above the buried ash is likely to be minimal. Trees take up water from the ground via evapotranspiration. As a result, this naturalized plant community effectively reduces hydraulic head from groundwater that might otherwise force constituents to migrate offsite or downgradient. Removal of the vegetation community from Old Meredosia would interrupt this natural process that is affecting constituent transport.

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APPENDIX A:
Photo Log

Photo 1. Bald eagle nest within northwest portion of Old Meredosia site. Direction of view (DOV) is west. 11/11/2022.

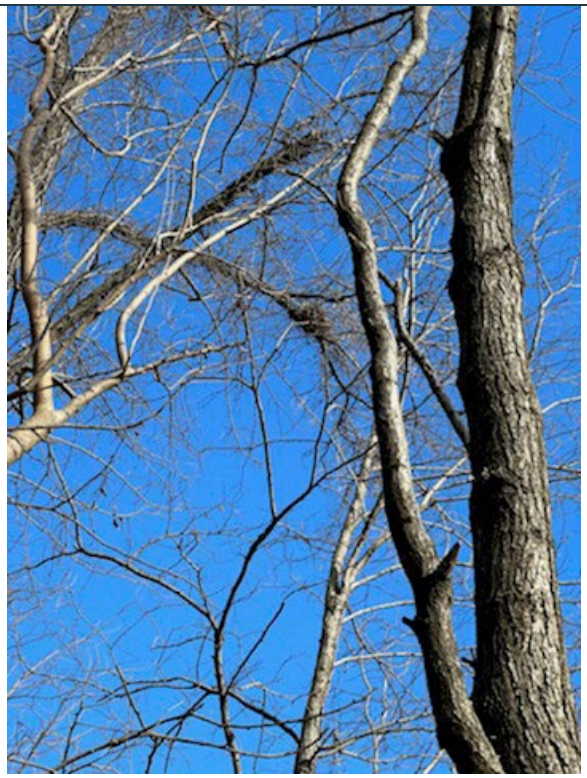


Photo 2. Unidentified raptor nest within west portion of Old Meredosia site. DOV is northeast. 11/11/2022.

Photo 3. Unidentified aquatic turtle nest within northern sand prairie portion of Old Meredosia site. DOV is south. 11/11/2022.

Photo 4. Songbird nest within west portion of Old Meredosia site. DOVis south. 11/11/2022.

Photo 5. Potentially suitable summer bat roost tree with exfoliating bark in west portion of Old Meredosia site. 11/11/2022.

Photo 6. Potentially suitable summer bat roost tree with exfoliating bark in west portion of Old Meredosia site. 11/11/2022.

Photo 7. Potentially suitable summer bat roost tree with hollows in west portion of Old Meredosia site. 11/11/2022.

Photo 8. Potentially suitable summer bat roost tree with exfoliating bark in west portion of Old Meredosia site. 11/11/2022.

Photo 9. Sand prairie within north portion of Old Meredosia site. DOV is south. 11/11/2022.

Photo 10. Herbaceous community along western edge of Old Meredosia site. 11/11/2022

Photo 11. Scrub-shrub thicket along southern edge of Old Meredosia site. 11/11/22

Photo 12. Black locust woodland in northwest corner of Old Meredosia site. 11/11/22

Photo 13. Dominant forested community representative of the majority of the Old Meredosia site. 11/11/22

Appendix B:
Resume of William Elzinga

William J. Elzinga

Principal

Professional Summary

Mr. Elzinga has had 38 years of professional experience in environmental planning, natural resources assessment, project siting and licensing, NEPA analysis and documentation, and project management. He has managed and performed more than 100 EAs and EISs and has worked extensively within a 22-state region ranging from Virginia to Montana. He has supported facility siting and development by providing expert witness testimony for a range of projects resulting in their successful licensing and permitting. Additionally, he has been adjunct professor at Southern Illinois University at Edwardsville where he has taught a graduate level class on Environmental Impact Analysis (NEPA) for more than 20 years.

Years Experience: 38

Education

Master of Science Biology, 1984, Southern Illinois University - Edwardsville
Bachelor of Science Biology, 1981, Calvin College

Memberships

- American Fisheries Society

Representative Projects

Ash Impoundment Closure Programmatic EIS, TVA (AL, KY, TN). WSP Project Manager for complex PEIS in support of system wide impoundment closure activities. Directed all project activities and responded to TVA's request for expanded areas of responsibility assigned to WSP subsequent to project initiation. Project entailed the evaluation of multiple closure actions on a fast track basis in order to support decision making for inactive impoundments. Analysis included full range of interdisciplinary studies and analysis of multiple project alternatives for closures of CCR facilities "in-place" and "by-removal". Work included a Tier I programmatic NEPA review coupled with six site-specific Tier II NEPA reviews in support of decisions for closure of 10 separate CCR impoundments. Project was performed on extremely fast track basis.

Allen East Impoundment, Ash Impoundment Closure EIS, TVA (TN). WSP Project Manager for EIS of proposed ash impoundment closure at the Allen Fossil Plant in Memphis, TN. Analysis included full range of interdisciplinary studies and analysis of multiple project alternatives for closures of CCR facilities "in-place" and "by-removal". Project was performed on extremely fast track basis.

Bull Run Fossil Plant Landfill EIS, TVA (TN). Foster Wheeler Project Manager for PEIS in support of system wide impoundment closure activities. Directed all project activities and responded to TVA's request for expanded areas of responsibility assigned to WSP subsequent to project initiation. Work included completion of a scoping report, screening analysis of 10 alternative landfill sites, and comprehensive interdisciplinary studies in support of preparation of the EIS

Paradise CCR Management EA, TVA (KY). Managed complex EA involving multiple CCR management actions (dewatering facilities, ash impoundment closures, landfill development). Directed all project activities and coordinated closely with TVA construction management team to clearly define elements of each proposed action, assess interdependencies and data needs, and evaluate environmental impacts. Project was performed on fast track in response to TVA management requests to support proposed construction timelines.

Cumberland Fossil Plant CCR Management EIS, TVA (TN). Managed complex EIS involving multiple CCR management actions (dewatering facilities, ash impoundment closures, landfill development). Directed all project activities and coordinated closely with TVA construction management team to clearly define elements of each proposed action, assess interdependencies and data needs, and evaluate environmental impacts. Worked with TVA to define and assess additional complexities related to borrow area development, sensitive historic properties, sensitive species, wetlands, and the analysis of additional alternatives related to offsite transport and disposal of CCR. Project is under way and is being performed on fast track in response to TVA management requests to support proposed construction timelines.

Ameren Corporation, 316(a) Thermal Investigation, Labadie Power Plant – WSP has recently been contracted by Ameren to conduct a thermal investigation at its Labadie generating station. In conjunction with

this extensive program, work included habitat evaluation and mapping, thermal plume studies, benthic invertebrate investigation, in situ temperature monitoring, and fisheries assessments using a full range of gear types including electroshocking, hoop netting, seining, Missouri mini-trawl, and ichthyoplankton sampling.

Project Manager - Allen Fossil Plant Ash Impoundment Closure EIS, TVA, Shelby County, Tennessee. Managed NEPA effort for EIS to address the environmental effects associated with closure of ash impoundments and disposal of CCR excavated from the impoundments. The project included a screening analysis of landfills within 600 miles of the plant to determine those suitable to accept CCR excavated from the impoundments at ALF, and the development of bounding criteria to evaluate impacts associated with the beneficial re-use of CCR excavated from the impoundments.

Project Manager - Gallatin Fossil Plant Ash Impoundment Closure EIS, TVA, Tennessee. Managed NEPA effort for EIS to address the environmental effects associated with closure of ash impoundments and disposal of CCR excavated from the impoundments. The project included a screening analysis of landfills within 100 miles of the plant to determine those suitable to accept CCR excavated from the impoundments at ALF, and the development of bounding criteria to evaluate impacts associated with the beneficial re-use of CCR excavated from the impoundments.

Johnsonville Steam Supply Environmental Assessment, TVA (TN). WSP Project Manager for EA to assess construction and operation of a cogeneration facility at the Johnsonville Fossil Plant to provide steam to a nearby industrial customer. Evaluated alternatives that considered optional steam supply lines, auxiliary boilers, and HRSG construction and operation.

Shawnee Fossil Plant Dewatering Facility Eenvironmental Assessment, TVA (KY). WSP Project Manager for EA to assess construction and operation of an ash dewatering facility associated with the Shawnee Fossil Plant in Paducah, Kentucky.

Program Director: AmerenUE Taum Sauk Reservoir Breach Emergency Response and Restoration Services, Lesterville, Missouri. Responsible for emergency response and overall program management for the restoration of natural resources and the Johnson's Shut-ins State Park following the breach of the Taum Sauk pump storage facility Upper Reservoir. The program has included Natural Resource Damage Assessment of resources impacted by the 2005 breach. Analyses performed in conjunction with the NRDA process included assessment of ecosystem losses, recreational features impacted at the Johnson's Shutins State Park, and the development of costs for restoration measures accepted by the NRDA trustees. Trustees for this assessment included the Missouri Department of Natural Resources and the Missouri Department of Conservation. Completed design and construction of ecosystem restoration measures including restoration of 4,200 lf of the East Fork of the Black River, remediation and restoration of a forested fen, and upland restoration by establishment of erosion control features and installation of more than 24,000 plants grown from local seed sources.

Project Manager, Ameren Meredosia-Austin Transmission Line Siting and Permitting. Performed work in support of the location and permitting of proposed 75-mile 345 kV transmission line crossing the Illinois River in central Illinois. Work included Section 10/404 permitting support, wetland delineation, endangered species studies (Indiana bat, Northern long-eared bat), forest stand evaluation, floristic quality assessment, and Section 408 reviews for crossing of a federal levee.

Principal, Ameren Herleman-Meredosia Transmission Line Siting and Permitting. Performed work in support of the location and permitting of proposed 47-mile 345 kV transmission line crossing the Illinois River in central Illinois. Work included Section 10/404 permitting support, wetland delineation, endangered species studies (Indiana bat, Northern long-eared bat), forest stand evaluation, floristic quality assessment, and Section 408 reviews for crossing of a federal levee.

Project Director, Environmental Report, Ameren Corporation, Callaway Nuclear Plant Unit 2 COLA. Performed work in conjunction with the preparation of the ER for a new unit COLA at an existing nuclear facility in the Midwest. This work is in accordance with the provisions of NUREG 1555 and related laws and regulations and entails the documentation of all baseline characteristics of the project site, and vicinity. Scope of activities included the identification/delineation of all waters of the US, Section 401/404 permitting, rare, threatened and endangered species evaluations, natural areas, terrestrial (flora, fauna) ecology, aquatic

ecology (fish, benthic invertebrates, mussels), forest stand evaluations, historic properties, and laboratory analysis of soil samples (NQA-1).

Assessment of the Reintroduction Potential of Five Federally Threatened and Endangered Plant Species at Midewin National Tallgrass Prairie, US Forest Service. Directed a study to evaluate the feasibility of restoring five federally listed endangered plant species to portions of their former range at the newly formed Midewin National Tallgrass Prairie, a 19,000-acre site located at the former Joliet Arsenal in northern Illinois. Five species currently listed by the U.S. Fish and Wildlife Service as Threatened or Endangered, that were considered for potential re-introduction into the site included Mead's Milkweed (*Asclepias meadii*, Threatened), Leafy Prairie Clover (*Dalea foliosa*, Endangered), Lakeside Daisy (*Hymenoxys herbacea* , Threatened), Prairie Bush Clover (*Lespedeza leptostachya* Threatened), and Eastern Prairie White-Fringed Orchid (*Platanthera leucophaea* , Threatened). The study entailed the use of GIS, extensive literature review and field reconnaissance to evaluate of the potential for establishment of each of the above species at MNTP.

Springfield Supplemental Water Supply SEIS, City of Springfield IL/USACE Rock Island District – WSP Project Manager for complex and controversial Supplemental EIS of proposed water supply system. Responsible for direction of all activities including resource allocation and assignment of project team, schedule adherence, and budget management. Technical direction and management of all SIES-related activities. Evaluations include the screening and analysis of 32 project alternatives that included a 3,000-acre new surface water supply reservoir, groundwater collection systems, dredging of existing Lake Springfield, and other alternatives. Technical direction and management of all project activities including socioeconomic analyses, ecology, water resources, visual and aesthetic impacts, noise, air, public heath, geology, soils, land use, historic properties, and cumulative effects analysis.

Allen Fossil Plant Emission Control Supplemental Environmental Assessment, TVA (TN) – WSP Project Manager for fast track EA to assess construction and operation of additional laydown areas and haul roads needed to support construction of a natural gas pipeline to supply the proposed CT/CC generation facility.

Multi-Reservoir Land Plan EIS, TVA (TN). Project Manager for Programmatic EIS to evaluate resignation of land uses within Reservoir Land Management Plans (RLMPs) for public lands surrounding eight reservoirs located in Alabama, Kentucky, and Tennessee. All lands under TVA management on these eight reservoirs, a total of approximately 138,322 acres, were considered in this planning process. The RLMPs are a tool to guide land use approvals, private water use facility permitting, and resource management decisions on TVA-managed public land around these facilities.

Environmental Report, Ameren Corporation, Callaway Nuclear Plant Unit 2 COLA. Performed work in conjunction with the preparation of the ER for a new unit COLA at an existing nuclear facility in the Midwest. This work is in accordance with the provisions of NUREG 1555 and related laws and regulations and entails the documentation of all baseline characteristics of the project site, and vicinity. Scope of activities included the identification/delineation of all waters of the US, Section 401/404 permitting, rare, threatened and endangered species evaluations, natural areas, terrestrial (flora, fauna) ecology, aquatic ecology (fish, benthic invertebrates, mussels), forest stand evaluations, historic properties, and laboratory analysis of soil samples (NQA-1).

Facility Siting and Permitting, Holcim Lee Island Project, Holcim (US) Inc., Project Manager. WSP was selected to perform comprehensive environmental services in support of the siting and permitting of a proposed cement kiln and associated quarry in northern Ste. Genevieve County, Missouri. The project entailed extensive field investigation of natural resources of the project site including fish, benthic invertebrates, reptiles and amphibians, bats, flora, and water quality. The project is highly controversial and has required the preparation of a BA pursuant to the ESA for six species including the Indiana bat, gray bat, bald eagle, and pallid sturgeon. Numerous technical reports including an EA have been prepared and submitted to the USACE, MDC, MDNR, USFWS (Columbia Field Office), and USEPA. Mitigative measures have included extensive wetland restoration totaling 61 acres, stream recreation and restoration (3.2 miles), and other conservation measures. WSP is currently developing detailed plans and specifications for wetland and stream mitigation that entailed design details, grading plans, stream restoration and bank stabilization measures including Rosgen methodology, planting plans, designs for water level control measures, and follow-up monitoring and maintenance procedures.

Facility Siting and Permitting, Coffeen Rail Development Project, Ameren Corporation, Project Manager. Performed services in support of siting of a new rail project aimed at supplying the Coffeen Power Plant with alternative sources of fossil fuel. Work included delineation of wetlands and other "waters of the US", rare threatened and endangered species surveys, water quality assessments, floodplain analyses, terrestrial floral and faunal characterizations, and consultation with agencies including USACE, IDNR, and IEPA. Field work was completed for multiple project alternatives. Additional work included the preparation of wetland and stream mitigation plans to support Section 401/404 permitting for the project.

Environmental Assessment for the Page-Olive Connector, St. Louis County, Missouri, Environmental Manager. Directed the preparation of an Environmental Assessment for the proposed extension of the Maryland Heights Expressway between Page Avenue and Olive Boulevard. This controversial project represents a final link in the overall out-outer belt expressway system around St. Louis. The project entails the consideration of important environmental resources and potential impacts including those associated with 4(f) lands, wetlands, water quality, noise, and community cohesion effects.

Gateway Connector Corridor Preservation Study, Illinois DOT, Environmental Leader. WSP provided transportation planning and engineering services, including a public involvement program, for a corridor protection study of a 37-mile transportation corridor in rapidly growing area in southwestern Illinois (metropolitan St. Louis) encompassing suburban, rural and agricultural areas and 3 counties. Identified and protected a critical transportation corridor in advance of future NEPA or preliminary engineering phases. Responsible for coordinating all environmental issue area investigations, including wetlands, threatened and endangered species (flora and fauna), socioeconomic and community resources, and hazardous waste investigations.

Howard Bend EIS, US Army Corps of Engineers, City of Maryland Heights, Project Manager. Directed the preparation of a complex EIS that focused on the extensive consideration and analysis of secondary and cumulative impacts resulting from the construction of a new 4-lane roadway and extensive levee improvements within the floodplain of the Missouri River. The project was complex and entailed multiple tiers of alternatives (regulatory, roadway projects, flood control). Assessments of new and proposed roadways that will enhance access (and hence, development) within the project area were conducted in the context of a cumulative impact analysis.

Coralville Lake Environmental Assessment, U.S. Army Corps of Engineers, Rock Island District. Prepared an Environmental Assessment for a highly controversial project entailing the issuance of a lease agreement to run and operate a Muslim youth camp (MYCA) within the federal fee title area. The study area includes an approximately 106+ acre tract of Federal land north of North Liberty, Iowa, along Coralville Lake. MYCA proposed to construct a main lodge, winterized cabins, and a caretakers lodge. Local residents from a nearby housing development have expressed concerns about the proposed action. Work consisted of extensive agency coordination and public scoping, conceptual layout of site utility infrastructure, (water and wastewater), traffic analysis, noise analysis, natural resources assessment, cultural resources assessment, and detailed social impact assessment.

Environmental Impact Statement for Route 60, Missouri Department of Transportation. Mr. Elzinga managed and directed the preparation of an EIS for a 42-mile roadway improvement project between Van Buren and Poplar Bluff, Missouri. Important aspects of the project included the crossing of extensive National Forest Lands, several rare, threatened and endangered species, difficult socioeconomic issues (Environmental Justice), black bear habitat impacts, and extensive agency coordination (including a merged NEPA/404 process, and multiple cooperating agencies), and a complex alternative development process. In addition to directing the overall environmental study, Mr. Elzinga conducted numerous additional surveys to identify and characterize the ecological conditions of the project area including threatened and endangered species, plant communities, aquatic communities, and wetland resources.

Environmental Impact Statement for US Route 34, Illinois Department of Transportation, Environmental Lead. Mr. Elzinga directed the preparation of an EIS for Route 34 between Gulfport and Monmouth, Illinois. This EIS was particularly complex due to the potential effects to the agricultural community with a complex array of parcel effects that impacted farm operations. Additional important factors evaluated included community cohesion, noise impacts, business impacts, hazardous waste sites, and impacts to wetlands and water quality.

Environmental Assessment for Route 159, Illinois Department of Transportation, Project Manager. Mr. Elzinga directed the preparation of an Environmental Assessment for Route 159 in Edwardsville, Illinois. This EA was particularly complex due to the potential effects to community cohesion, noise impacts, business impacts, hazardous waste sites, and impacts to wetlands. In addition to directing the overall environmental study, he also conducted numerous additional surveys to identify and characterize the ecological conditions of the project.

Environmental Impact Statement for Route 13, Missouri Department of Transportation-Environmental Lead Directed the preparation of the draft and final Environmental Impact Statement for Route 13 between Richmond and Lexington, Missouri. In addition to directing the overall environmental study, Mr. Elzinga conducted numerous additional surveys to identify and characterize the ecological conditions of the project area including threatened and endangered species, plant communities, aquatic communities, and wetland resources. Identification and mapping of wetlands within the project area was highly complex as a result of the dramatic impacts of the flood of 1993.

Environmental Assessment for I-70, Missouri Department of Transportation, Environmental Manager. Directed the preparation of a Tier Two Environmental Assessment for I-70 between Rocheport and Booneville, Missouri. This EA, produced as a second tier NEPA document under a First Tier EIS for a 200-mile corridor from Kansas City to St. Louis, was particularly complex as a result of the crossing of the Missouri River, extensive floodplain and wetland issues, several threatened and endangered species (bald eagle, Indiana bat) and concerns about business impacts at interchange locations.

Environmental Assessment for Route 72, Missouri Department of Transportation, Project Manager. Mr. Elzinga performed elements of the Environmental Assessment for the widening of Route 72 south of Rolla, Missouri. Specific resources for which he was responsible included land use, natural resources, sensitive species, water quality, and hazardous waste.

Additional Training

Project Management Training, April, 2010

Wetland Delineation--Application of the Unified Federal Manual for Identifying and Delineating Jurisdictional Wetlands. Wetland Training Institute, Inc. February 1991

Habitat Evaluation Procedures (HEP), U.S. Fish & Wildlife Service, 1987

ATTACHMENT B
2022 Geotechnology Sampling and Testing Report

SAMPLING AND TESTING REPORT
OLD ASH POND
MEREDOSIA POWER PLANT
MORGAN COUNTY, ILLINOIS

Prepared for:

AMEREN CORPORATION
ST. LOUIS, MISSOURI

Prepared by:

GEOTECHNOLOGY, LLC
ST. LOUIS, MISSOURI

Date:

SEPTEMBER 28, 2022

Geotechnology Project No.:

J024917.07

SAFETY
QUALITY
INTEGRITY
PARTNERSHIP
OPPORTUNITY
RESPONSIVENESS

GEOTECHNOLOGY
A Universal Engineering Sciences Company

CONFIDENTIAL ATTORNEY CLIENT INFORMATION

September 28, 2022

Ms. Susan Knowles
Director and Assistant General Counsel
Ameren Corporation
1901 Choteau Avenue
St. Louis, Missouri 63103

Re: Sampling and Testing Report
Old Ash Pond
Meredosia Power Plant
Morgan County, Illinois
Geotechnology Project No. J024917.07

Dear Ms. Knowles:

Geotechnology, LLC (Geotechnology) has prepared this Sampling and Testing Report for the referenced facility.

INTRODUCTION AND BACKGROUND

Three ash ponds are present at the decommissioned Meredosia Power Plant in Morgan County, Illinois. The site location and topography are shown on Figure 1. The Bottom Ash Pond and the Fly Ash Pond were closed by a combination of clean closure and capped closure completed in December 2018. The Old Ash Pond is east and upgradient of the Fly Ash Pond. The Old Ash Pond was closed in the early 1970s. A groundwater monitoring program is in place that addresses the three closed ash ponds and on November 1, 2017, the Illinois Environmental Protection Agency approved a 211.94-acre groundwater management zone (GMZ) pursuant to 35 Illinois Administrative Code Part 620.250. The GMZ encompasses a three-dimensional area beneath the closed ash ponds and the surrounding area east to Old Naples Road, south to Old Naples Road, north to the plant footprint, and west to the Illinois River.

The Old Ash Pond was constructed with two cells (east and west) and received fly ash until its closure. Clay and sand materials were used for the cap and range from 1-6 feet in thickness. The Old Ash Pond is approximately 15.7 acres, with ash ranging between 8-12 feet in thickness. As described more fully herein, the Old Ash Pond bottom elevation is located at approximately 445.92 to 448.44 feet above mean sea level (MSL) with the groundwater table ranging between 424.65 and 442.98 feet MSL. Under historical flood conditions, the impoundment has not been

inundated from surface waters or a rising groundwater table. Therefore, precipitation that percolates through the cap is the liquid coming into contact with the ash material.

EXPLORATORY BORINGS

Public utilities were located using the Illinois One-Call system (i.e., JULIE) prior to subsurface exploration activities. On May 16-18, 2022, at the request of Meredosia Power Plant (i.e., Ameren Corporation), Geotechnology advanced four borings (Boring A through Boring D) at the approximate locations shown on Figure 2. The boring locations were selected in coordination with Ameren personnel as approximate centroids of the two cells with consideration for access to the locations.

Boring A, Boring B, and Boring D were advanced and continuously sampled to a depth of approximately 60 feet below land surface (bls) using direct push drilling methods with a Geoprobe drill rig. Boring C was advanced and continuously sampled to a depth of 30 feet bls using direct push methods. From 30 to 60 feet bls, wash boring drilling methods and split-spoon sampling on 5-foot centers were used at Boring C due to the presence of heaving sands.

Subsurface materials encountered in the borings generally consisted of cover material, fly ash, and underlying sand. Bedrock was not encountered during drilling activities. Samples were characterized by an engineer in 2.5-foot intervals, photographed, and representative samples were containerized in jars. Boring logs are in Appendix A and a photographic log is in Appendix B.

Cover material at the two northern borings (Boring A and Boring B) was 6 feet of coarse, brown, poorly-graded sand. Cover material at Boring C (southwest) was 1.5 feet of brown sandy clay, and at Boring D (southeast) was 1 foot of coarse, tan, poorly-graded sand over one foot of brown lean clay. Representative samples of cover material were selected from each boring for grain size analysis.

Ash thicknesses ranged from 9 feet at Boring D to 11.5 feet at Boring B. The ash material encountered was generally fine-grained. Representative samples of ash were selected from each boring for environmental and grain size laboratory analysis.

The representative fly ash samples were placed into laboratory-supplied containers, labeled, and placed on ice in a cooler for subsequent environmental analytical testing. The ash samples were submitted to Teklab, Inc. (Teklab) of Collinsville, Illinois under chain-of-custody procedures for analytical testing. The ash samples were submitted for analysis of the Groundwater Monitoring Program parameters (Appendix C) that can be analyzed on a solid sample. Additionally, the samples were submitted for Synthetic Precipitation Leaching Procedure (SPLP) analysis of the same analytical list.

TEMPORARY MONITORING WELLS

Public utilities were located using the Illinois One-Call system (i.e., JULIE) prior to subsurface exploration activities. On September 13, 2022, Geotechnology advanced two borings (TMW-B and TMW-C) at the approximate locations shown on Figure 2. The boring locations were within approximately 5 feet of Boring B and Boring C, respectively.

The borings TMW-B and TMW-C were advanced without soil sampling to depths of approximately 42 and 45 feet bls, respectively, using hollow stem auger drilling methods with a Geoprobe drill rig. Wood plugs were used during boring installation due to the presence of heaving sands (as observed during the previous mobilization).

Temporary groundwater monitoring wells were installed in the two borings to facilitate the collection of groundwater samples. Temporary Monitoring Wells TMW-B and TMW-C extended to depths of approximately 42 and 45 feet bls, respectively, and consisted of approximately 10 feet of 1-inch diameter 0.010-inch slotted PVC screen and riser to the ground surface. Groundwater was observed at depths ranging from 32.5 to 35.1 feet bls on September 14, 2022.

Groundwater samples were collected from the monitoring wells by low-flow sampling methods using a bladder pump and disposable polyethylene tubing. Groundwater parameters were monitored and allowed to stabilize before groundwater samples were collected.

The groundwater samples were placed into laboratory-supplied containers, labeled, and placed on ice in a cooler for subsequent environmental analytical testing. The groundwater samples were submitted to Teklab of Collinsville, Illinois under chain-of-custody procedures for analytical testing. The groundwater samples were submitted for analysis of the Groundwater Monitoring Program parameters (Appendix C).

The temporary monitoring wells were abandoned by removal and backfilled with bentonite grout after sampling.

LABORATORY RESULTS

Fly Ash Analytical Results

Copies of the analytical laboratory reports are provided in Appendix D. Analytical results for fly ash totals and SPLP analysis are provided in Table 1 and Table 2, respectively.

Grain Size Distribution Results

The grain size distribution laboratory results are provided in Appendix E. Grain size distribution was analyzed for fly ash, cover material, and underlying material.

Fly ash materials were relatively fine-grained, with 71.4 percent to 98.0 percent silt- and clay-sized particles. Sand-sized particle content ranged from 2.0 percent to 28.6 percent.

Cover material at Boring A, Boring B, and Boring C were sandy materials with percent sand ranging from 65.4 percent to 95.7 percent. The cover material at Boring C contained finer material; sand ranged from 20.1 percent to 43.2 percent, and silt and clay ranged from 54.8 percent to 79.9 percent.

Material underlying the ash pond was assessed at Boring D at 35 feet bls, which was a poorly graded sand with 98.0 percent sand-sized particles.

Groundwater Analytical Results

Copies of the analytical laboratory reports are provided in Appendix D. Analytical testing results for groundwater analysis are provided in Table 3.

GROUNDWATER AND ILLINOIS RIVER ELEVATION STUDY

Historic Illinois River Elevation

Historic flood stage information for the Illinois River was assessed at the Meredosia, Illinois USGS gauging station[1], which is located at the Meredosia Power Plant. A data summary is provided in Appendix F. The gauging datum is at elevation 417.64 feet NAVD88.

Eighteen flood events exceeded 25 feet gauge height, as shown in the following table.

USGS Gauging Station:	Meredosia Power Station	
Datum of Gauge:	417.64 ft NAVD88	
Flood events over 25 ft gauge height		
Date	**Gauge height (ft NAVD88)**	**Elevation (ft NAVD88)**
7/2/2015	28.86	446.50
5/26/1943	28.70	446.34
4/27/2013	28.69	446.33
6/4/2019	28.39	446.03
5/30/1995	28.30	445.94
1/5/2016	28.03	445.67
3/10/1985	27.62	445.26
5/19/2002	27.57	445.21
4/19/1979	27.28	444.92
7/28/1993	26.96	444.60
12/12/1982	26.40	444.04
5/23/2009	26.25	443.89
5/2/1973	26.25	443.89
06/06/2013	25.79	443.43

[1] USGS 05585500 Illinois River at Meredosia, IL. National Weather Service: Web Interface. Accessed online at <https://nwis.waterdata.usgs.gov/nwis/peak?site_no=05585500&agency_cd=USGS&format=html> on July 6, 2022.

3/24/1982	25.56	443.20
5/23/1933	25.50	443.14
5/27/2020	25.39	443.03
4/20/1922	25.10	442.74

Groundwater Elevation

A groundwater elevation assessment was performed for elevation data provided in annual groundwater monitoring reports prepared by others from 2018 through 2021[2, 3, 4, 5]. A summary is provided in Appendix F. Groundwater elevations were reported in feet NAVD88.

Groundwater elevations at the Meredosia Power Plant ash pond complex generally ranged between 422 and 444 feet. Groundwater in the vicinity of the Old Ash Pond ranged from 424.65 to 442.98 feet during this time period. Groundwater flow was generally to the west and northwest, toward the Illinois River, with the exception of three sampling events:

- November 2018, low river conditions: Groundwater flow is split; northwest of the Old Ash Pond, groundwater flowed northwest toward the Illinois River; and southeast of the Old Ash Pond, groundwater flowed southeast. The flow divide was located under the Old Ash Pond.

- June 2019, high river conditions: Six of the western monitoring wells were inundated by Illinois River flood waters. Groundwater flow was to the east.

- November 2021, high river conditions: Two of the southwest monitoring wells were inundated by Illinois River flood waters. Groundwater flow was generally to the west and northwest with the exception of the southwest portion of the facility, near the Fly Ash Pond, where flow was to the northeast.

During the November 2018 and the June 2019 sampling events, groundwater under the Old Ash Pond experienced temporary flow reversal. Such flow reversal is temporary in nature, subsiding as surface water levels dropped.

[2] 2018 Second Annual Report, Fly Ash Pond and Bottom Ash Pond, Meredosia Power Station, Meredosia, Illinois; prepared for AmerenEnergy Medina Valley CoGen, LLC; prepared by OBG; Project 70232; Report dated March 26, 2019.
[3] 2019 Annual Report, Meredosia Power Station; prepared for AmerenEnergy Medina Valley CoGen, LLC; prepared by Ramboll; Project 72974; Report dated March 31, 2020.
[4] 2020 Annual Report, Meredosia Power Station; prepared for AmerenEnergy Medina Valley CoGen, LLC; prepared by Ramboll; Project 1940100175; Report dated March 31, 2021.
[5] 2021 Annual Report, Meredosia Power Station; prepared for AmerenEnergy Medina Valley CoGen, LLC; prepared by Ramboll; Project 1940100700; Report dated March 25, 2022.

Potential for Old Ash Pond Inundation in Groundwater

Based on the exploratory borings installed at the Old Ash Pond, the lowest elevation where ash was observed was 445.92 feet. As shown in the previous table, two recorded flooding events in the past century exceeded the lowest ash elevation: May 1943 and June 2019. Groundwater monitoring data are available for the June 2019 flooding event.

The maximum observed groundwater elevation in monitoring wells near the Old Ash Pond (APW-1, APW-5, APW-8, APW-10, and APW-11) was 442.98 feet during the June 2019 flooding event. **This is approximately 3 feet below the lowest observed ash elevation (445.92 feet).**

Based on this information, ash located in the Old Ash Pond is not inundated by groundwater during normal or flood conditions.

PRECIPITATION PERCOLATION POTENTIAL STUDY

Topography

The topography of the Old Ash Pond was surveyed by HRL Engineering on May 5-6, 2022. Survey results are depicted on Figure 2 and attached in digital format in Appendix I. The topography was also observed during the installation of exploratory borings.

The topographic survey shows that the Old Ash Pond is generally surrounded by a perimeter berm with lower elevations in the east and west cells. A medial berm separating the two cells is evident in the southern half of the pond when observed in the field due to the relative absence of trees; the subtle grade change from the surrounding cells somewhat masks this feature on the topographic map.

The general slope within the perimeter berm is to the south. The high point is near the center of the north end of the Old Ash Pond. Two localized low points are evident based on the survey and field observations: one in the southwest corner of the west cell and one in the southwest corner of the east cell. These low points were selected for vegetation survey points. Evidence of long-term inundation at the low points, such as ponded water, water marks, sediment or drift deposits, sparsely vegetated concave surface, and water-stained leaves was not observed.

Two concrete outlets are present near the southwest corner of the east and west cells, respectively. The ends of the culverts inside the Meredosia Old Ash Pond berm were buried in soil at the time of on-site observations. The outlets may allow pore water to pass through the perimeter berm. Indicators of concentrated surface water flow, such as swales, rills, water marks, sediment or drift deposits, and drainage patterns were not observed.

Generally, observations of topography indicate that surface water generally flows toward the south in the Old Ash Pond.

Vegetation

The Old Ash Pond is vegetated and the majority of its surface is covered by trees and shrub vegetation. Approximately 15 percent of total cover near the north end lacks tree cover. The perimeter berm is vegetated with grass.

Shrub and canopy vegetation was surveyed at the four boring locations (Boring A through Boring D) and the low points in the southwest corner of the east and west cells, respectively. A summary of results is provided in Appendix G. Absolute cover was estimated for the canopy and shrub stratums of vegetation for a 30-foot and 15-foot radius at each location, respectively. For boring locations where vegetation had been cleared, the radius was applied at the boundary of the clearing.

Species with greater than 20 percent absolute coverage in the canopy or shrub stratum included *Acer negundo* (box elder), *Cornus drummondii* (rough-leaf dogwood), *Juniperus virginiana* (eastern red cedar), *Lonicera mackii* (bush honeysuckle), *Morus alba* (white mulberry), *Populus deltoides* (eastern cottonwood), and *Robinia pseuroacacia* (black locust).

Precipitation

Precipitation data were obtained from the National Weather Service for Jacksonville, Illinois. A summary is provided in Appendix H. The average annual precipitation was 39.25 inches. The surface area of the Old Ash Pond is approximately 15.7 acres. Based on these values, the average annual input of precipitation that could infiltrate through the Old Ash Pond is 51.35 acre-feet, or 16.7 million gallons. This value would be further reduced by evaporation and transpiration by the trees present in the Old Ash Pond.

SPLP analysis is designed to represent leaching of analytes when exposed to precipitation. Analytical results performed by SPLP indicate potential for elevated antimony, boron, and vanadium in Old Ash Pond pore water. Of these, boron has been detected in groundwater monitoring wells at concentrations above the Class I Groundwater Standard. Boron has also been identified as the primary indicator constituent for coal ash impacts to groundwater at the Meredosia Power Plant site.

The SPLP results for boron ranged between 2.57 mg/L and 3.63 mg/L with an average of 3.15 mg/L. These values are greater than the Class I and Class II SROs for boron (both are 2 mg/L). This result reflects only the expected concentration in the pore water, and not concentration in groundwater. A conservative estimate of the annual boron input based on the average annual precipitation, area of the Old Ash Pond, and average SPLP boron result is 199 kilograms per year. This would be further reduced by evapotranspiration, which would reduce the pore water leaching and transporting boron, and by bioaccumulation of boron by vegetation, which would intercept leached boron prior to infiltration to groundwater.

CONCLUSIONS

Geotechnology conducted sampling and testing of the Old Ash Pond at the Meredosia Power Plant in Morgan County, Illinois. The sampling and testing consisted of exploratory borings, analytical and geotechnical laboratory testing, a groundwater and Illinois River elevation study, and a precipitation percolation potential study.

Cover material generally consisted of 6 feet of sand in the northern half of the Old Ash Pond and 1.5 to 2 feet of sand and lean clay in the southern half of the Old Ash Pond. Fly ash thicknesses ranged from 9 to 11.5 feet. Underlying materials consisted of sand.

Based on groundwater potentiometric surface maps and flood data assessed together, flooding of the Illinois River does not cause the inundation of ash material in the Old Ash Pond, including during the historic June 2019 flood event.

* * * * * *

The following are made part of and complete this report:

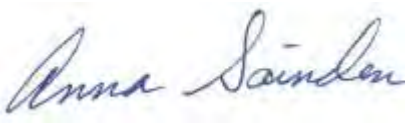
Table 1	-	Fly Ash Analytical Results Summary
Table 2	-	SPLP Fly Ash Analytical Results Summary
Table 3	-	Groundwater Analytical Results Summary
Plate 1	-	Site Location and Topography
Plate 2	-	Aerial Photograph of Site and Boring Locations
Appendix A	-	Boring Logs
Appendix B	-	Photographic Boring Logs
Appendix C	-	Groundwater Monitoring Program Parameter List
Appendix D	-	Laboratory Analytical Reports
Appendix E	-	Grain Size Distribution Results
Appendix F	-	Illinois River and Groundwater Elevation Summary
Appendix G	-	Shrub and Canopy Vegetation Survey
Appendix H	-	Precipitation Data Summary
Appendix I	-	Survey Data (Digital Format Only)
Appendix J	-	Limitations of Report

* * * * * *

We appreciate the opportunity to provide our services to Ameren Corporation.

Very truly yours,

GEOTECHNOLOGY, LLC



Anna M. Saindon, P.E.
Senior Project Manager

JYG/AMS/MSR:jyg/jsj

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TABLE 1
FLY ASH ANALYTICAL RESULTS SUMMARY
OLD ASH POND
MEREDOSIA POWER PLANT
MORGAN COUNTY, ILLINOIS

Analyte	IEPA TACO Industrial / Commercial SROs	IEPA TACO Construction Worker SROs	USGS Morgan County Background	Boring A 10-15 ft bls 5/17/2022		Boring B 10-15 ft bls 5/18/2022		Boring C 5-10 ft bls 5/16/2022		Boring D 5-10 ft bls 5/17/2022	
Chloride	NE	NE	NE	< 15	---	< 15	---	< 14	---	< 16	---
Nitrogen, Nitrate (as N)	1,000,000	330,000	NE	0.64 J	---	0.32 J	---	9.03	---	3.02	---
Sulfate	NE	NE	NE	743	---	959	---	1,100	---	839	---
Cyanide	41,000	4,100	NE	0.11 J	---	0.11 J	---	< 0.34	---	0.12 J	---
Fluoride	120,000	12,000	NE	0.85 J	---	0.94 J	---	1.2 J	---	1.1 J	---
Nitrogen, Nitrite (as N)	NE	NE	NE	< 0.75	---	< 0.73	---	0.09 J	---	< 0.79	---
Mercury	16	61	0.0077	0.008 J	0.018	0.013 J	0.010 J	0.014 J	< 0.014	< 0.015	0.016 J
Antimony	820	82	NE	11.8	6.56	26.0	16.1	7.82	18.0	16.3	8.28
Arsenic	1,200	61	19.034	53.5	51.7	263 S	176	33.0	101	105	87.3
Barium	140,000	14,000	NE	176	104	88.2	109	177	138	103	114
Beryllium	2,100	410	NE	7.41	5.69	9.15	7.75	5.96	10.2	6.13	7.35
Boron	410,000	41,000	NE	908	1,110	1,240 S	1,190	1,180	1,750	1,200	1,890
Cadmium	2,000	200	NE	26.1	14.2	17.3	16.0	17.0	18.9	13.4	24.0
Chromium	420	4,100	NE	52.0	58.2	72.7	53.0	43.9	67.5	60.8	65.3
Cobalt	120,000	12,000	NE	7.92	7.58	11.9	12.1	6.82	9.31	11.5	7.77
Copper	82,000	8,200	16.255	33.9	28.4	60.3	59.6	24.3	49.1	49.4	33.7
Iron	NE	NE	30,070	48,600	39400	44,000 S	48,800	42,900	44,800	41,800	30,900
Lead	800	700	40.132	124	148	321 S	268	98.8	163	160	161
Manganese	41,000	4,100	2712.662	523	399	324 S	344	715	448	361	491
Nickel	41,000	4,100	NE	29.0	34.8	72.2	40.4	24.5	38.9	36.7	28.3
Selenium	10,000	1,000	0.42	19.6	16.8	16.4	19.4	17.1	11.2	16.8	7.6
Silver	10,000	1,000	NE	0.31 J	0.25 J	0.34 J	0.25 J	0.25 J	0.19 J	0.32 J	0.15 J
Thallium	160	160	NE	< 4.63	< 4.90	< 4.72	< 4.90	< 4.81	6.03	< 4.72	4.7 J
Vanadium	14,000	1,400	NE	77.9	79.5	97.9	80.6	65.2	113	88.0	87.3
Zinc	610,000	61,000	65.006	997	783	1,210 S	807	955	1030	662	1350
Percent Moisture	NE	NE	NE	33.3	30.7	31.8	27.7	31.2	32.6	36.6	39.4

The material sampled is within a November 1, 2017 Illinois Environmental Protection Agency-approved 211.94-acre groundwater management zone (GMZ) pursuant to 35 Illinois Administrative Code Part 620.250.

Yellow highlight indicates the concentration is above the construction worker SRO.
Results are reported in units of mg/kg-dry.
J = Analyte detected below laboratory reporting limit.
S = Spike recovery outside recovery limits
Soil Remedial Objectives (SROs) are from Illinois Environmental Protection Agency (IEPA) 35 IAC 742: Tiered Approach to Corrective Action Objectives (TACO).
United States Geological Survey (USGS) Background is from the National Geochemical Survey, value is the mean plus two standard deviations.

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TABLE 2
SPLP FLY ASH ANALYTICAL RESULTS SUMMARY
OLD ASH POND
MEREDOSIA POWER PLANT
MORGAN COUNTY, ILLINOIS

Analyte	IEPA TACO Soil Component of GW Class I SROs	IEPA TACO Soil Component of GW Class II SROs	Boring A 10-15 ft bls 5/17/2022	Boring B 10-15 ft bls 5/18/2022	Boring C 5-10 ft bls 5/16/2022	Boring D 5-10 ft bls 5/17/2022
Sulfate, SPLP	400	400	35	37	55	54
Chloride, SPLP	200	200	< 1	< 1	< 1	< 1
Nitrogen, Nitrate-Nitrite (as N), SPLP	10	100	0.12 H	0.78 H	0.50 H	4.78 H
Cyanide, SPLP	0.2	0.6	< 0.005	< 0.005	< 0.005	< 0.005
Fluoride, SPLP	4	4	< 1.00	< 1.00	< 1.00	< 1.00
Nitrogen, Nitrite (as N), SPLP	NE	NE	0.03 BJ	0.02 BJ	0.04 BJ	0.03 BJ
Mercury, SPLP	0.002	0.01	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Antimony, SPLP	0.006	0.024	0.0088 J	0.015 J	< 0.0500	0.0091 J
Arsenic, SPLP	0.05	0.2	0.019 J	0.0451	0.018 J	0.018 J
Barium, SPLP	2	2	< 0.045	< 0.045	< 0.045	< 0.045
Beryllium, SPLP	0.004	0.5	0.0003 J	< 0.001	< 0.001	< 0.001
Boron, SPLP	2	2	2.82	2.57	3.63	3.58
Cadmium, SPLP	0.005	0.05	< 0.0020	< 0.0020	< 0.0020	< 0.0020
Chromium, SPLP	0.1	1	0.0073 J	0.0042 J	0.0089 J	0.0076 J
Cobalt, SPLP	1	1	< 0.0100	< 0.0100	< 0.0100	< 0.0100
Copper, SPLP	0.65	0.65	< 0.0100	0.0025 J	< 0.0100	< 0.0100
Iron, SPLP	5	5	< 0.0400	< 0.0400	< 0.0400	< 0.0400
Lead, SPLP	0.0075	0.1	< 0.0400	< 0.0400	0.0053 J	< 0.0400
Manganese, SPLP	0.15	10	< 0.0070	< 0.0070	< 0.0070	< 0.0070
Nickel, SPLP	0.1	2	< 0.0100	< 0.0100	< 0.0100	< 0.0100
Selenium, SPLP	0.05	0.05	< 0.0500	< 0.0500	< 0.0500	< 0.0500
Silver, SPLP	0.05	NE	< 0.0070	< 0.0070	< 0.0070	< 0.0070
Thallium, SPLP	0.002	0.02	< 0.0500	< 0.0500	< 0.0500	< 0.0500
Vanadium, SPLP	0.049	0.1	0.0484	0.0478	0.0545	0.0446
Zinc, SPLP	5	10	< 0.0100	< 0.0100	< 0.0100	< 0.0100

The material sampled is within a November 1, 2017 Illinois Environmental Protection Agency-approved 211.94-acre groundwater management zone (GMZ) pursuant to 35 Illinois Administrative Code Part 620.250.

Yellow highlight indicates the concentration is above the soil component of Class I groundwater SRO.
Orange highlight indicates the concentration is above the soil component of Class I and Class II groundwater SROs.
Gray highlight indicates the detection limit is above the soil component of Class I groundwater SRO.
SPLP = Synthetic Precipitation Leaching Procedure
Results are reported in units of mg/L.
B = Analyte detected in associated Method Blank.
J = Analyte detected below laboratory reporting limit.
H = Holding times exceeded.
Soil Remedial Objectives (SROs) are from Illinois Environmental Protection Agency (IEPA) 35 IAC 742: Tiered Approach to Corrective Action Objectives (TACO).

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TABLE 3

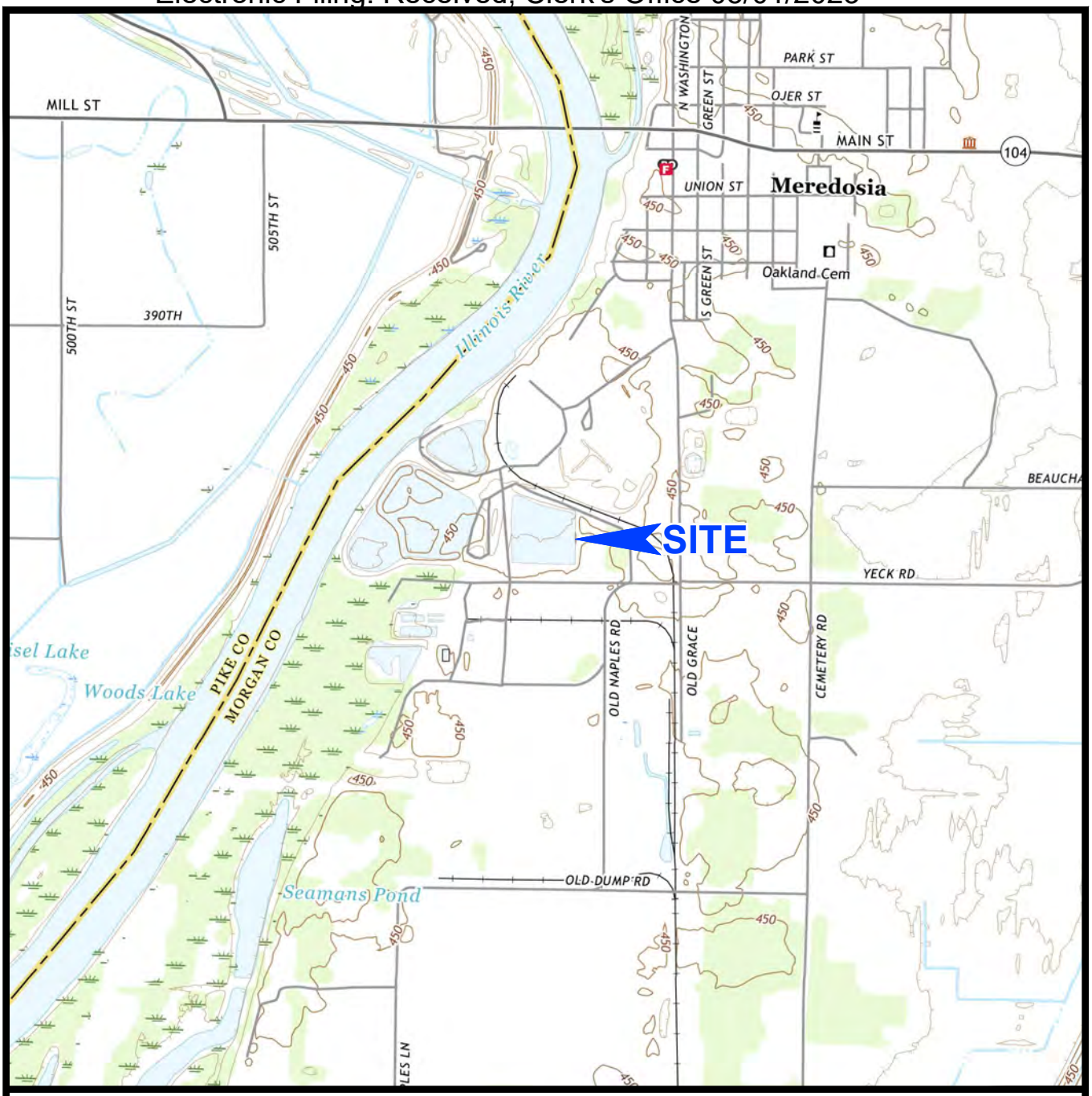
J024917.07

GROUNDWATER ANALYTICAL RESULTS SUMMARY
OLD ASH POND
MEREDOSIA POWER PLANT
MORGAN COUNTY, ILLINOIS

Analyte	IEPA TACO Soil Class I GROs	IEPA TACO Soil Class II GROs	TMW-B 9/14/2022	TMW-C 9/14/2022
Chloride, Dissolved	200	200	4.00	17.0
Chloride, Total	200	200	4.00	17.0
Nitrogen, Nitrate (as N)	10	100	5.35	3.06 H
Nitrogen, Nitrate (as N)	10	100	5.48	3.06 H
Sulfate, Dissolved	400	400	387	59.0
Sulfate, Total	400	400	401	59.0
Cyanide	0.2	0.6	< 0.0050	< 0.0050
Cyanide, Total	0.2	0.6	< 0.0050	< 0.0050
Fluoride, Dissolved	4	4	0.13	0.12
Fluoride, Total	4	4	0.13	0.12
Nitrogen, Nitrite, Dissolved	NE	NE	< 0.0500 H	< 0.0500 H
Nitrogen, Nitrite, Total	NE	NE	< 0.0500 H	< 0.0500 H
Total Dissolved Solids	NE	NE	740 H	300 H
Total Dissolved Solids	NE	NE	714 H	314 H
Antimony, Dissolved	0.006	0.024	< 0.0500	< 0.0500
Arsenic, Dissolved	0.05	0.2	< 0.0250	< 0.0250
Barium, Dissolved	2	2	0.0314	0.0163
Beryllium, Dissolved	0.004	0.5	< 0.0005	< 0.0005
Boron, Dissolved	2	2	7.45	2.83
Cadmium, Dissolved	0.005	0.05	< 0.0020	< 0.0020
Chromium, Dissolved	0.1	1	0.0123	< 0.0050
Cobalt, Dissolved	1	1	< 0.0050	< 0.0050
Copper, Dissolved	0.65	0.65	< 0.0050	< 0.0050
Iron, Dissolved	5	5	< 0.0400	< 0.0400
Lead, Dissolved	0.0075	0.1	< 0.0150	< 0.0150
Manganese, Dissolved	0.15	10	0.0066 J	0.0054 J
Nickel, Dissolved	0.1	2	< 0.0050	< 0.0050
Selenium, Dissolved	0.05	0.05	0.105	0.025 J
Silver, Dissolved	0.05	NE	< 0.0070	< 0.0070
Thallium, Dissolved	0.002	0.02	< 0.0500	< 0.0500
Vanadium, Dissolved	0.049	0.1	0.0023 J	0.0027 J
Zinc, Dissolved	5	10	< 0.0100	< 0.0100
Antimony, Total	0.006	0.024	0.010 J	< 0.0500
Arsenic, Total	0.05	0.2	< 0.0250	< 0.0250
Barium, Total	2	2	0.0406	0.0313
Beryllium, Total	0.004	0.5	< 0.0005	< 0.0005
Boron, Total	2	2	8.49	3.13
Cadmium, Total	0.005	0.05	< 0.0020	< 0.0020
Chromium, Total	0.1	1	0.0158	0.0029 J
Cobalt, Total	1	1	< 0.0050	0.0030 J
Copper, Total	0.65	0.65	< 0.0050	0.0030 J
Iron, Total	5	5	0.146	1.04
Lead, Total	0.0075	0.1	< 0.0150	< 0.0150
Manganese, Total	0.15	10	0.0418	0.218
Nickel, Total	0.1	2	< 0.0050	0.0046 J
Selenium, Total	0.05	0.05	0.116	0.026 J
Silver, Total	0.05	NE	< 0.0070	< 0.0070
Thallium, Total	0.002	0.02	< 0.0500	< 0.0500
Vanadium, Total	0.049	0.1	0.0023 J	0.0044 J
Zinc, Total	5	10	< 0.0100	0.0074 J
Mercury, Total	0.002	0.01	< 0.0002	< 0.0002
Mercury, Dissolved	0.002	0.01	< 0.0002	< 0.0002

The groundwater sampled is within a November 1, 2017 Illinois Environmental Protection Agency-approved 211.94-acre groundwater management zone (GMZ) pursuant to 35 Illinois Administrative Code Part 620.250.

Yellow highlight indicates the concentration is above the Class I groundwater GRO.
Orange highlight indicates the concentration is above the Class I and Class II groundwater GROs.
Gray highlight indicates the detection limit is above the Class I groundwater GRO.
Results are reported in units of mg/L.
J = Analyte detected below laboratory reporting limit.
H = Holding times exceeded.
Groundwater Remedial Objectives (GROs) are from Illinois Environmental Protection Agency (IEPA) 35 IAC 742: Tiered Approach to Corrective Action Objectives (TACO).



NOTES

1. Plan adapted from a 7.5 minute U.S.G.S. map for Meredosia, Illinois quadrangle, last revised in 2021.

0 2,000 4,000

SCALE IN FEET

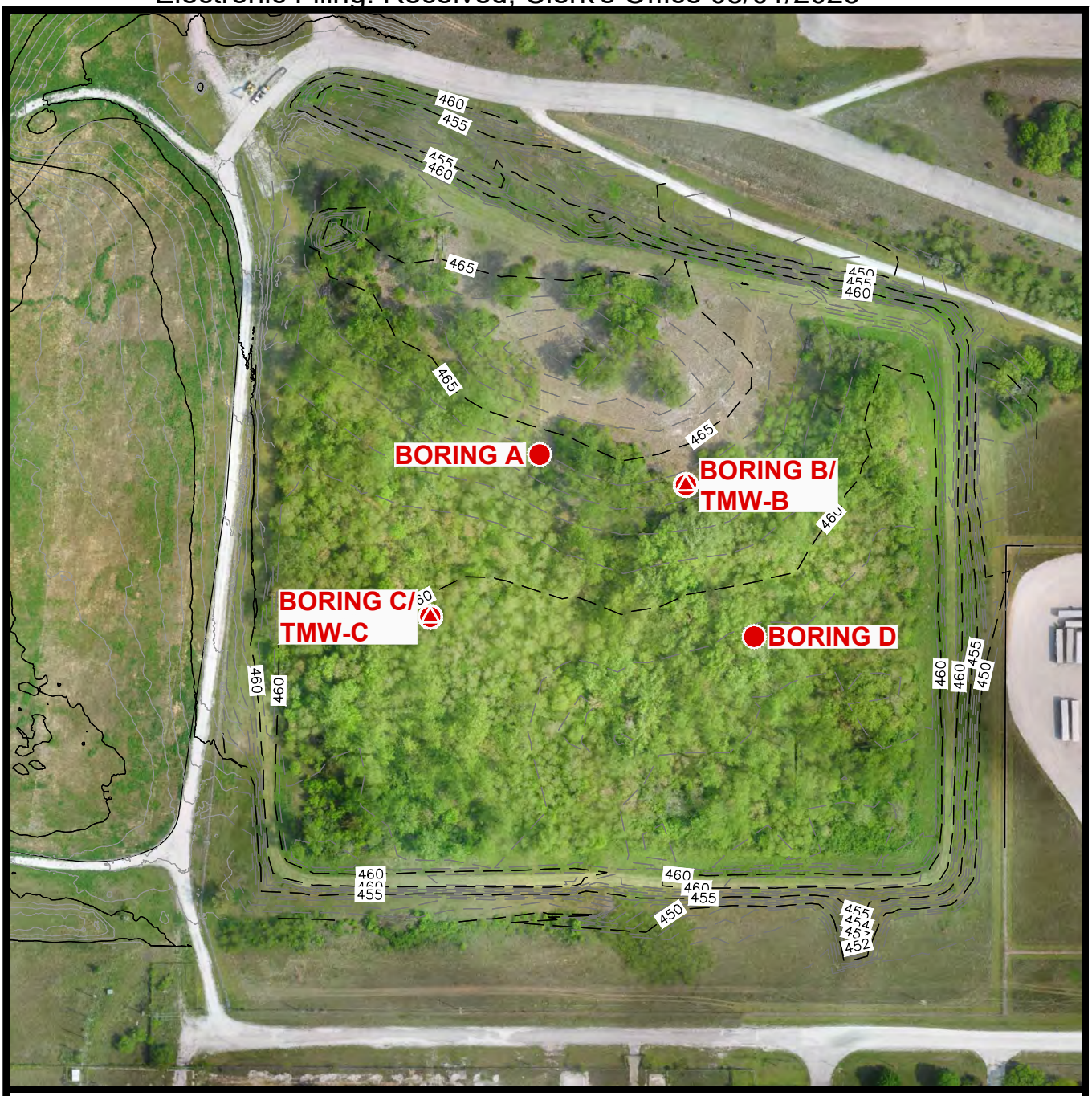
Drawn By: WAH	Ck'd By: JYG	App'vd By: AMS
Date: 8-11-22	Date: 8-25-22	Date: 8-25-22

GEOTECHNOLOGY
A Universal Engineering Sciences Company

Meredosia Old Ash Pond
Meredosia, Illinois

SITE LOCATION AND TOPOGRAPHY

Project Number J024917.07	FIGURE 1



NOTES

1. Plan adapted from a May 11, 2022 aerial photograph supplied by the client.

2. Borings were located in the field by Geotechnology and subsequently surveyed in May 2022 by the project surveyor.

LEGEND

● Boring Location

0 200 400

SCALE IN FEET

N

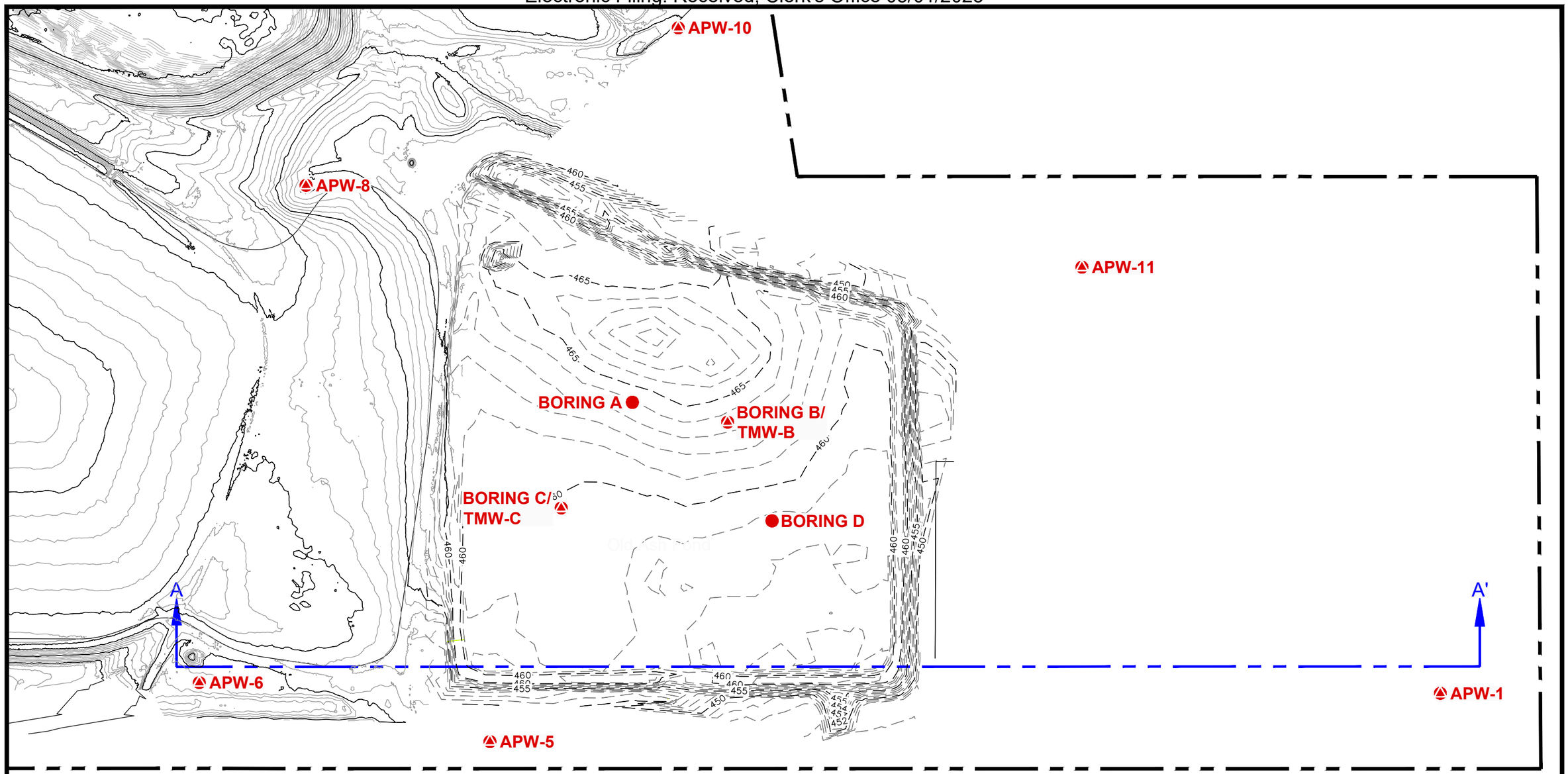
Drawn By: WAH	Ck'd By: JYG	App'vd By: AMS
Date: 8-24-22	Date: 8-25-22	Date: 8-25-22

GEOTECHNOLOGY
A Universal Engineering Sciences Company

Meredosia Old Ash Pond
Meredosia, Illinois

AERIAL PHOTOGRAPH OF SITE AND BORING LOCATIONS

Project Number J024917.07	FIGURE 2



NOTES

1. Plan adapted from a May 11, 2022 aerial surey supplied by the client.
2. Borings and monitoring wells were located in the field by Geotechnology and subsequently surveyed in May 2022 by the project surveyor.

LEGEND

- Boring Location
- Monitoring Well Location
- Subsurface Profile - Cross-Section A-A' (See Figure 3)

0 200 400
SCALE IN FEET

N

Drawn By: WAH	Ck'd By: JYG	App'vd By: AMS
Date: 8-11-22	Date: 8-25-22	Date: 8-25-22

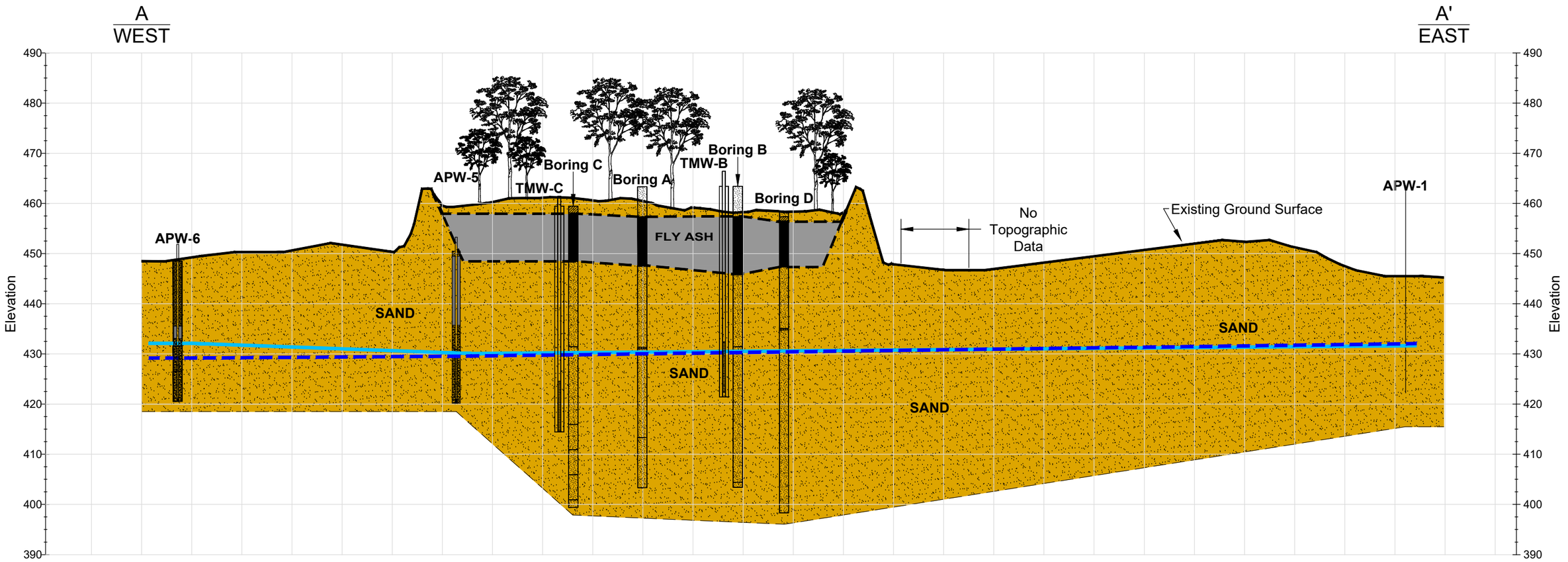
GEOTECHNOLOGY
A Universal Engineering Sciences Company

Meredosia Old Ash Pond
Meredosia, Illinois

AERIAL PHOTOGRAPH OF SITE AND BORING LOCATIONS

Project Number J024917.07

FIGURE 3



KEY TO BOREHOLE SYMBOLS

Bottom Ash | Lean Clay | Sand

LEGEND

- Groundwater Elevation - September 17, 2019
- Groundwater Elevation - June 30, 2021

NOTES

1. See Figure 3 for location of Subsurface Profile A-A'.
2. Data concerning subsurface conditions were obtained at boring locations only. Actual conditions at locations between borings could differ from the generalized profile shown here.

SCALE IN FEET
Horizontal 1" = 100'
Vertical 1" = 20'

Drawn By: WAH	Ck'd By: JYG	App'vd By: AMS
Date: 8-11-22	Date: 8-25-22	Date: 8-25-22

GEOTECHNOLOGY
A Universal Engineering Sciences Company

Meredosia Old Ash Pond
Meredosia, Illinois

GENERALIZED SUBSURFACE PROFILE - CROSS-SECTION A-A'

Project Number
J024917.07

FIGURE 4

APPENDIX A

BORING LOGS

Electronic Filing: Received, Clerk's Office 05/01/2023

Surface Elevation: 463.35
Datum: MSL
Completion Date: 5/17/22
Northing: 1147598.6880
Easting: 2183994.8820

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf (Δ - UU/2, ○ - QU/2, □ - SV; 0.5 1.0 1.5 2.0 2.5) / STANDARD PENETRATION RESISTANCE N-VALUE (BLOWS PER FOOT) (ASTM D 1586) / WATER CONTENT, % (PL 10 20 30 40 50 LL)
0	Coarse, brown, poorly-graded SAND - SP		33%	CS1	
5					
	Fine, gray, silty, fly ASH		60%	CS2	
10					
			97%	CS3*	
15					
	Coarse, brown, poorly-graded SAND - SP		55%	CS4	
20					
			57%	CS5	
25					
			40%	CS6	
30					
	3-inch, gray, lean clay layer Coarse, brown, poorly-graded SAND - SP		82%	CS7	
35					
		▽	48%	CS8	
40					
			75%	CS9	
45					
			80%	CS10	

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 38 FEET ▽

DRILLING DATA

___ AUGER ___ HOLLOW STEM
WASHBORING FROM ___ FEET
JCF DRILLER SDF LOGGER
Geoprobe DRILL RIG
HAMMER TYPE ___

REMARKS:
*** - Sample submitted to laboratory for analysis.**

Drawn by: WAH	Checked by: SDF	App'vd. by: AMS
Date: 6/2/22	Date: 6/6/22	Date: 6/6/22

GEOTECHNOLOGY
A Universal Engineering Sciences Company

Meredosia Old Ash Pond
Meredosia, Illinois

LOG OF BORING: Boring A

Project No. J024917.07

LOG OF BORING 2002 N/E J024917.07 LOGS.GPJ 00 CLONE ME.GPJ 4/20/23

CONFIDENTIAL ATTORNEY CLIENT INFORMATION

Electronic Filing: Received, Clerk's Office 05/01/2023

Surface Elevation: 463.35 Datum: MSL

Completion Date: 5/17/22
Northing: 1147598.6880
Easting: 2183994.8820

SHEAR STRENGTH, tsf
Δ - UU/2 ○ - QU/2 □ - SV
0.5 1.0 1.5 2.0 2.5

STANDARD PENETRATION RESISTANCE
▲ N-VALUE (BLOWS PER FOOT)
(ASTM D 1586)

WATER CONTENT, %
PL 10 20 30 40 50 LL

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Coarse, brown, poorly-graded SAND, some pebbles - SP		88%	CS11
55			12%	CS12
60	Boring terminated at 60 feet.			
65				
70				
75				
80				
85				
90				
95				

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 38 FEET ▽

DRILLING DATA

___ AUGER ___ HOLLOW STEM
WASHBORING FROM ___ FEET
JCF DRILLER SDF LOGGER
Geoprobe DRILL RIG
HAMMER TYPE ___

REMARKS:
*** - Sample submitted to laboratory for analysis.**

Drawn by: WAH	Checked by: SDF	App'vd. by: AMS
Date: 6/2/22	Date: 6/6/22	Date: 6/6/22

GEOTECHNOLOGY
A Universal Engineering Sciences Company

Meredosia Old Ash Pond
Meredosia, Illinois

CONTINUATION OF LOG OF BORING: Boring A

Project No. J024917.07

LOG OF BORING 2002 N/E J024917.07 LOGS.GPJ 00 CLONE ME.GPJ 4/20/23

CONFIDENTIAL ATTORNEY CLIENT INFORMATION

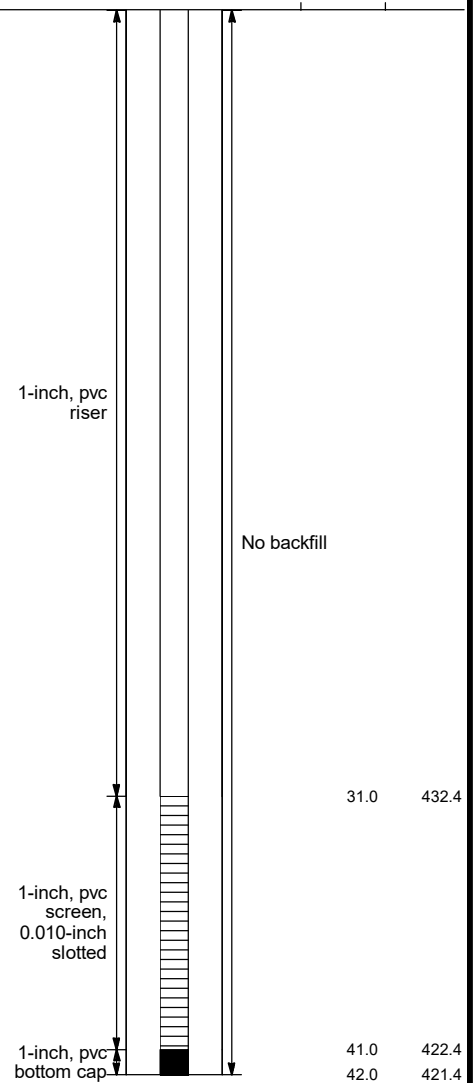
Electronic Filing: Received, Clerk's Office 05/01/2023

Surface Elevation: 463.42 | Completion Date: 5/18/22
Datum: MSL | Northing: 1147559.1730 | Easting: 2184184.6760

DEPTH IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
0	Coarse, brown and tan, poorly-graded SAND - SP	32%	CS1
5			
	Fine, gray, silty, fly ASH	42%	CS2
10		100%	CS3*
15		65%	CS4
	Coarse, brown, poorly-graded SAND - SP		
20		58%	CS5
25		65%	CS6
30		75%	CS7
	5/18/22 ▽		
	Coarse, brown, poorly-graded SAND, some pebbles - SP		
	9/14/22 ▽		
35		62%	CS8
40		100%	CS9
45		100%	CS10

WELL DIAGRAM

PVC riser to 3-feet above ground
Diameter: 1-inch



GROUNDWATER DATA

ENCOUNTERED AT 32 FEET ▽

DRILLING DATA

___ AUGER ___ HOLLOW STEM
WASHBORING FROM ___ FEET
JCF DRILLER SDF LOGGER
Geoprobe DRILL RIG
HAMMER TYPE ___

REMARKS:

*** - Sample submitted to laboratory for analysis.**
A temporary monitoring well was installed at a 5-foot offset from the original boring location on September 13, 2022, and was abandoned on September 14, 2022 after sampling.

Drawn by: WAH	Checked by: JYG	App'vd. by: AMS
Date: 6/2/22	Date: 9/28/22	Date: 9/28/22

GEOTECHNOLOGY
A Universal Engineering Sciences Company

Meredosia Old Ash Pond
Meredosia, Illinois

LOG OF BORING: Boring B

Project No. J024917.07

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 N/E J024917.07 LOGS.GPJ 00 CLONE ME.GPJ 4/20/23

CONFIDENTIAL ATTORNEY CLIENT INFORMATION

Electronic Filing: Received, Clerk's Office 05/01/2023

Surface Elevation: 463.42 Datum: MSL

Completion Date: 5/18/22
Northing: 1147559.1730
Easting: 2184184.6760

WELL DIAGRAM

PVC riser to 3-feet above ground
Diameter: 1-inch

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Coarse, brown, poorly-graded SAND, some pebbles - SP *(continued)*		68%	CS11
55			60%	CS12
	Coarse, brown, poorly-graded, gravelly SAND - SP			
60	Boring terminated at 60 feet.			
65				
70				
75				
80				
85				
90				
95				

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 32 FEET ▽

DRILLING DATA

___ AUGER ___ HOLLOW STEM
WASHBORING FROM ___ FEET
JCF DRILLER SDF LOGGER
Geoprobe DRILL RIG
HAMMER TYPE ___

REMARKS:

*** - Sample submitted to laboratory for analysis.**
A temporary monitoring well was installed at a 5-foot offset from the original boring location on September 13, 2022, and was abandoned on September 14, 2022 after sampling.

Drawn by: WAH	Checked by: JYG	App'vd. by: AMS
Date: 6/2/22	Date: 9/28/22	Date: 9/28/22

GEOTECHNOLOGY
A Universal Engineering Sciences Company

Meredosia Old Ash Pond
Meredosia, Illinois

CONTINUATION OF LOG OF BORING: Boring B

Project No. J024917.07

CONFIDENTIAL ATTORNEY CLIENT INFORMATION

LOG OF BORING 2002 N/E J024917.07 LOGS.GPJ 00 CLONE ME.GPJ 4/20/23

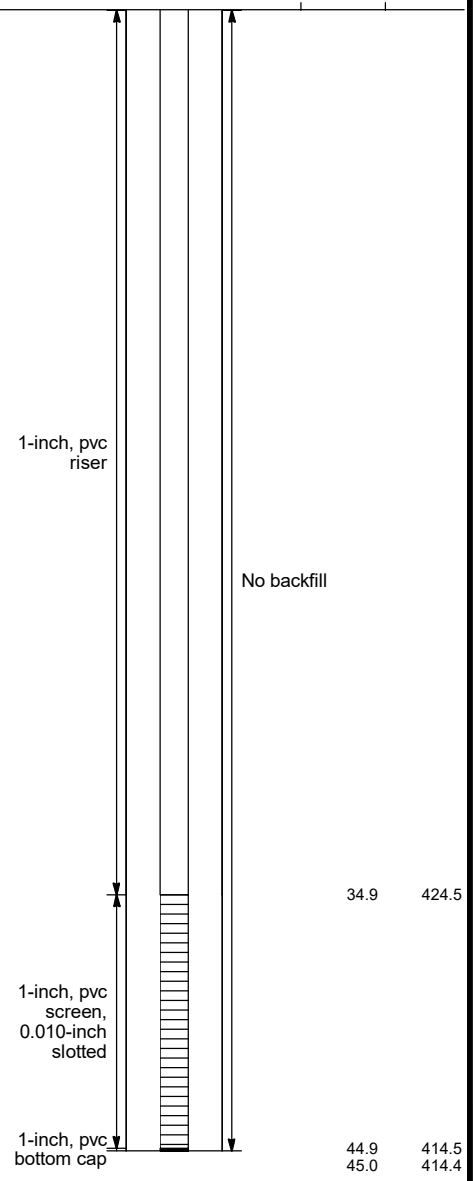
Electronic Filing: Received, Clerk's Office 05/01/2023

Surface Elevation: 459.44
Datum: MSL
Completion Date: 5/16/22
Northing: 1147388.0530
Easting: 2183853.1600

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Brown, SANDY CLAY - CL			
	Fine, gray, silty, fly ASH		100%	CS1
5			100%	CS2*
10	Coarse, brown, poorly-graded SAND - SP		72%	CS3
15			67%	CS4
20			0%	CS5
25			87%	CS6
30	Coarse, brown, poorly-graded SAND, some gravel - SP			
	9/14/22▽		55%/	CS7
35				
			20%/	CS8
40				
	Coarse, brown, poorly-graded SAND - SP		55%/	CS9
45				
	Coarse, brown and black, poorly-graded SAND - SP		61%/	CS10

WELL DIAGRAM

PVC riser to 2-feet above ground
Diameter: 1-inch



NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER ___ HOLLOW STEM
WASHBORING FROM 30 FEET
JCF DRILLER SDF LOGGER
Geoprobe DRILL RIG
HAMMER TYPE ___

REMARKS:

*** - Sample submitted to laboratory for analysis.**
A temporary monitoring well was installed at a 5-foot offset from the original boring location on September 13, 2022, and was abandoned on September 14, 2022 after sampling.

Drawn by: WAH	Checked by: SDF	App'vd. by: AMS
Date: 6/2/22	Date: 6/6/22	Date: 6/6/22

GEOTECHNOLOGY
A Universal Engineering Sciences Company

Meredosia Old Ash Pond
Meredosia, Illinois

LOG OF BORING: Boring C

Project No. J024917.07

CONFIDENTIAL ATTORNEY CLIENT INFORMATION

LOG OF BORING 2002 N/E J024917.07 LOGS.GPJ 00 CLONE ME.GPJ 4/20/23

Electronic Filing: Received, Clerk's Office 05/01/2023

Surface Elevation: 459.44 | Completion Date: 5/16/22
Datum: MSL | Northing: 1147388.0530 | Easting: 2183853.1600

WELL DIAGRAM

PVC riser to 2-feet above ground
Diameter: 1-inch

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	Coarse, brown and black, poorly-graded SAND - SP *(continued)*			
55	Coarse, brown, poorly-graded SAND, some silt - SP		72%/	CS11
	Coarse, brown, poorly-graded SAND, with pebbles - SP		56%/	CS12
60	Boring terminated at 60 feet.			
65				
70				
75				
80				
85				
90				
95				

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER ___ HOLLOW STEM
WASHBORING FROM 30 FEET
JCF DRILLER SDF LOGGER
Geoprobe DRILL RIG
HAMMER TYPE ___

REMARKS:

*** - Sample submitted to laboratory for analysis.**
A temporary monitoring well was installed at a 5-foot offset from the original boring location on September 13, 2022, and was abandoned on September 14, 2022 after sampling.

Drawn by: WAH	Checked by: SDF	App'vd. by: AMS
Date: 6/2/22	Date: 6/6/22	Date: 6/6/22

GEOTECHNOLOGY
A Universal Engineering Sciences Company

Meredosia Old Ash Pond
Meredosia, Illinois

CONTINUATION OF LOG OF BORING: Boring C

Project No. J024917.07

CONFIDENTIAL ATTORNEY CLIENT INFORMATION

LOG OF BORING 2002 N/E J024917.07 LOGS.GPJ 00 CLONE ME.GPJ 4/20/23

Electronic Filing: Received, Clerk's Office 05/01/2023

Surface Elevation: 458.33 | Completion Date: 5/16/22
Datum: MSL | Northing: 1147362.5530 | Easting: 2184273.2500

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf (Δ - UU/2, ○ - QU/2, □ - SV; 0.5 1.0 1.5 2.0 2.5) / STANDARD PENETRATION RESISTANCE N-VALUE (BLOWS PER FOOT) (ASTM D 1586) / WATER CONTENT, % (PL — 10 20 30 40 50 — LL)
	Coarse, tan, poorly-graded SAND - SP				
	Brown, LEAN CLAY - CL				
	Fine, gray, silty, fly ASH		70%	CS1	
5			100%	CS2*	
10	Coarse, brown, poorly-graded SAND - SP		40%	CS3	
15			65%	CS4	
20			63%	CS5	
	Gray, SANDY CLAY - CL				
25	Coarse, brown, poorly-graded SAND - SP		48%	CS6	
30			82%	CS7	
	6-inch layer of black staining				
35			72%	CS8	
40			0%	GB9	
45			62%	CS10	

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 28.5 FEET ▽

DRILLING DATA

___ AUGER ___ HOLLOW STEM
WASHBORING FROM ___ FEET
JCF DRILLER SDF LOGGER
Geoprobe DRILL RIG
HAMMER TYPE ___

REMARKS:
*** - Sample submitted to laboratory for analysis.**

Drawn by: WAH	Checked by: SDF	App'vd. by: AMS
Date: 6/2/22	Date: 6/6/22	Date: 6/6/22

GEOTECHNOLOGY
A Universal Engineering Sciences Company

Meredosia Old Ash Pond
Meredosia, Illinois

LOG OF BORING: Boring D

Project No. J024917.07

LOG OF BORING 2002 N/E J024917.07 LOGS.GPJ 00 CLONE ME.GPJ 4/20/23

CONFIDENTIAL ATTORNEY CLIENT INFORMATION

Electronic Filing: Received, Clerk's Office 05/01/2023

Surface Elevation: 458.33 | Completion Date: 5/16/22
Datum: MSL | Northing: 1147362.5530 | Easting: 2184273.2500

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GRAPHIC LOG	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES	SHEAR STRENGTH, tsf (Δ - UU/2, ○ - QU/2, □ - SV; 0.5 1.0 1.5 2.0 2.5) / STANDARD PENETRATION RESISTANCE N-VALUE (BLOWS PER FOOT) (ASTM D 1586) / WATER CONTENT, % (PL 10 20 30 40 50 LL)
	Coarse, brown, poorly-graded SAND - SP *(continued)*		82%	CS11	
55	6-inch gravel pocket		87%	CS12	
60	Boring terminated at 60 feet.				
65					
70					
75					
80					
85					
90					
95					

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 28.5 FEET ▽

DRILLING DATA

___ AUGER ___ HOLLOW STEM
WASHBORING FROM ___ FEET
JCF DRILLER SDF LOGGER
Geoprobe DRILL RIG
HAMMER TYPE ___

REMARKS:
*** - Sample submitted to laboratory for analysis.**

Drawn by: WAH	Checked by: SDF	App'vd. by: AMS
Date: 6/2/22	Date: 6/6/22	Date: 6/6/22

GEOTECHNOLOGY
A Universal Engineering Sciences Company

Meredosia Old Ash Pond
Meredosia, Illinois

CONTINUATION OF LOG OF BORING: Boring D

Project No. J024917.07

LOG OF BORING 2002 N/E J024917.07 LOGS.GPJ 00 CLONE ME.GPJ 4/20/23

CONFIDENTIAL ATTORNEY CLIENT INFORMATION

APPENDIX B

PHOTOGRAPHIC BORING LOGS

Photograph 1 - View of Boring A sample from depth interval 0-5 feet below land surface (bls.)

Photograph 2 - View of Boring A sample from depth interval 5-10 feet bls, top half.

Photographs taken by Scott Faulkner of Geotechnology, LLC on May 16-18, 2022.

Photograph 3 - View of Boring A sample from depth interval 5-10 feet bls, bottom half.

Photograph 4 - View of Boring A sample from depth interval 10-15 feet bls, top half.

Photographs taken by Scott Faulkner of Geotechnology, LLC on May 16-18, 2022.

Photograph 5 - View of Boring A sample from depth interval 10-15 feet bls, bottom half.

Photograph 6 - View of Boring A transition from ash to underlaying sand at 15.75 feet bls.

Photographs taken by Scott Faulkner of Geotechnology, LLC on May 16-18, 2022.

Photograph 7 - View of Boring A sample from depth interval 15-20 feet bls, top half.

Photograph 8 - View of ash interval in Boring A sample from depth interval 15-20 feet bls; this ash is considered an artifact of sampling due to boring collapse between samples.

Photographs taken by Scott Faulkner of Geotechnology, LLC on May 16-18, 2022.

Photograph 9 - View of Boring A sample from depth interval 15-20 feet bls, bottom half.

Photograph 10 - View of ash interval in Boring A sample from depth interval 20-25 feet bls; this ash is considered an artifact of sampling due to boring collapse between samples.

Photographs taken by Scott Faulkner of Geotechnology, LLC on May 16-18, 2022.

Photograph 11 - View of Boring A sample from depth interval 20-25 feet bls, top half.

Photograph 12 - View of Boring A sample from depth interval 20-25 feet bls, bottom half.

Photographs taken by Scott Faulkner of Geotechnology, LLC on May 16-18, 2022.

Photograph 13 - View of Boring A sample from depth interval 25-30 feet bls.

Photograph 14 - View of Boring A sample from depth interval 30-35 feet bls, top half.

Photograph 15 - View of Boring A sample from depth interval 30-35 feet bls, bottom half.

Photograph 16 - View of Boring A sample from depth interval 35-40 feet bls.

Photograph 17 - View of Boring A sample from depth interval 40-45 feet bls, top half.

Photograph 18 - View of Boring A sample from depth interval 40-45 feet bls, bottom half.

Photographs taken by Scott Faulkner of Geotechnology, LLC on May 16-18, 2022.

Photograph 19 - View of Boring A sample from depth interval 45-50 feet bls, top half.

Photograph 20 - View of Boring A sample from depth interval 45-50 feet bls, bottom half.

Photographs taken by Scott Faulkner of Geotechnology, LLC on May 16-18, 2022.

Photograph 21 ⮝ - View of Boring A sample from depth interval 50-55 feet bls, top half.

Photograph 22 ⮝ - View of Boring A sample from depth interval 50-55 feet bls, bottom half.

Photograph 23 - View of Boring A sample from depth interval 55-60 feet bls.

Photograph 24 - View of Boring B sample from depth interval 0-5 feet bls.

Photograph 25 - View of Boring B sample from depth interval 5-10 feet bls.

Photograph 26 - View of Boring B transition from cap material to ash at 6 feet bls.

Photograph 27 - View of Boring B sample from depth interval 10-15 feet bls, top half.

Photograph 28 - View of Boring B sample from depth interval 10-15 feet bls, bottom half.

Photograph 29 - View of Boring B sample from depth interval 15-20 feet bls, top half.

Photograph 30 - View of Boring B transition from ash to the underlaying sand at 17.5 feet bls.

Photograph 31 - View of Boring B sample from depth interval 15-20 feet bls, bottom half.

Photographs taken by Scott Faulkner of Geotechnology, LLC on May 16-18, 2022.

Photograph 32 - View of Boring B sample from depth interval 20-25 feet bls, top half.

Photograph 33 - View of Boring B sample from depth interval 20-25 feet bls, bottom half.

Photographs taken by Scott Faulkner of Geotechnology, LLC on May 16-18, 2022.

Photograph 34 - View of Boring B sample from depth interval 25-30 feet bls, top half.

Photograph 35 - View of Boring B sample from depth interval 25-30 feet bls, bottom half.

Photograph 36 - View of Boring B sample from depth interval 30-35 feet bls, top half.

Photograph 37 - View of Boring B sample from depth interval 30-35 feet bls, bottom half.

Photograph 38 - View of Boring B sample from depth interval 35-40 feet bls, top half.

Photograph 39 - View of Boring B sample from depth interval 35-40 feet bls, bottom half.

Photograph 40 - View of Boring B sample from depth interval 40-45 feet bls, top half.

Photograph 41 - View of Boring B sample from depth interval 40-45 feet bls, bottom half.

Photograph 42 - View of Boring B sample from depth interval 45-50 feet bls, top half.

Photograph 43 - View of Boring B sample from depth interval 45-50 feet bls, bottom half.

Photographs taken by Scott Faulkner of Geotechnology, LLC on May 16-18, 2022.

Photograph 44 - View of Boring B sample from depth interval 50-55 feet bls, top half.

Photograph 45 - View of Boring B sample from depth interval 50-55 feet bls, bottom half.

Photograph 46 ⮝ - View of Boring B sample from depth interval 55-60 feet bls, top half.

Photograph 47 ⮝ - View of Boring B sample from depth interval 55-60 feet bls, bottom half.

Photographs taken by Scott Faulkner of Geotechnology, LLC on May 16-18, 2022.

Photograph 48 - View of Boring C sample from depth interval 0-5 feet bls, top half.

Photograph 49 - View of Boring C transition from cap material to ash at 1.5 feet bls.

Photographs taken by Scott Faulkner of Geotechnology, LLC on May 16-18, 2022.

Photograph 50 - View of Boring C sample from depth interval 0-5 feet bls, bottom half.

Photograph 51 - View of Boring C sample from depth interval 5-10 feet bls, top half.

Photographs taken by Scott Faulkner of Geotechnology, LLC on May 16-18, 2022.

CONFIDENTIAL ATTORNEY CLIENT INFORMATION J024917.07
Meredosia Old Ash Pond
Meredosia, Illinois Boring C

Photograph 52 - View of Boring C sample from depth interval 5-10 feet bls, bottom half.

Photograph 53 - View of Boring C sample from depth interval 10-15 feet bls, top half.

Photographs taken by Scott Faulkner of Geotechnology, LLC on May 16-18, 2022.

Photograph 54 - View of Boring C transition from ash to underlaying sand at 11 feet bls.

Photograph 55 - View of Boring C sample from depth interval 10-15 feet bls, bottom half.

Photograph 56 - View of Boring C sample from depth interval 15-20 feet bls, top half.

Photograph 57 - View of Boring C sample from depth interval 15-20 feet bls, bottom half.

Photograph 58 - View of Boring C sample from depth interval 20-25 feet bls.

Photograph 59 - View of Boring C sample from depth interval 25-30 feet bls, top half.

Photograph 60 - View of Boring C sample from depth interval 25-30 feet bls, bottom half.

Photograph 61 - View of Boring C sample from depth interval 33.5-35 feet bls.
Note: Depths below 30 feet bls in Boring C were drilled using wash boring, which interferes with assessment of groundwater depth.

Photographs taken by Scott Faulkner of Geotechnology, LLC on May 16-18, 2022.

Photograph 62 - View of Boring C sample from depth interval 38.5-40 feet bls.
Note: Depths below 30 feet bls in Boring C were drilled using wash boring, which interferes with assessment of groundwater depth.

Photograph 63 - View of Boring C sample from depth interval 43.5-45 feet bls.
Note: Depths below 30 feet bls in Boring C were drilled using wash boring, which interferes with assessment of groundwater depth.

Photographs taken by Scott Faulkner of Geotechnology, LLC on May 16-18, 2022.

Photograph 64 - View of Boring C sample from depth interval 48.5-50 feet bls.
Note: Depths below 30 feet bls in Boring C were drilled using wash boring, which interferes with assessment of groundwater depth.

Photograph 65 - View of Boring C sample from depth interval 53.5-55 feet bls.
Note: Depths below 30 feet bls in Boring C were drilled using wash boring, which interferes with assessment of groundwater depth.

Photographs taken by Scott Faulkner of Geotechnology, LLC on May 16-18, 2022.

Photograph 66 - View of Boring C sample from depth interval 58.5-60 feet bls.
Note: Depths below 30 feet bls in Boring C were drilled using wash boring, which interferes with assessment of groundwater depth.

Photograph 67 - View of Boring D sample from depth interval 0-5 feet bls, top half.

Photograph 68 - View of Boring D sample from depth interval 0-5 feet bls, bottom half.

Photograph 69 - View of Boring D sample from depth interval 5-10 feet bls, top half.

Photograph 70 - View of Boring D sample from depth interval 5-10 feet bls, bottom half.

Photograph 71 - View of Boring D sample from depth interval 10-15 feet bls.

Photograph 72 - View of Boring D sample from depth interval 15-20 feet bls, top half.

Photograph 73 - View of Boring D sample from depth interval 15-20 feet bls, bottom half.

Photograph 74 - View of Boring D sample from depth interval 20-25 feet bls, top half.

Photograph 75 - View of Boring D sample from depth interval 20-25 feet bls, bottom half.

Photograph 76 - View of Boring D sample from depth interval 25-30 feet bls, top half.

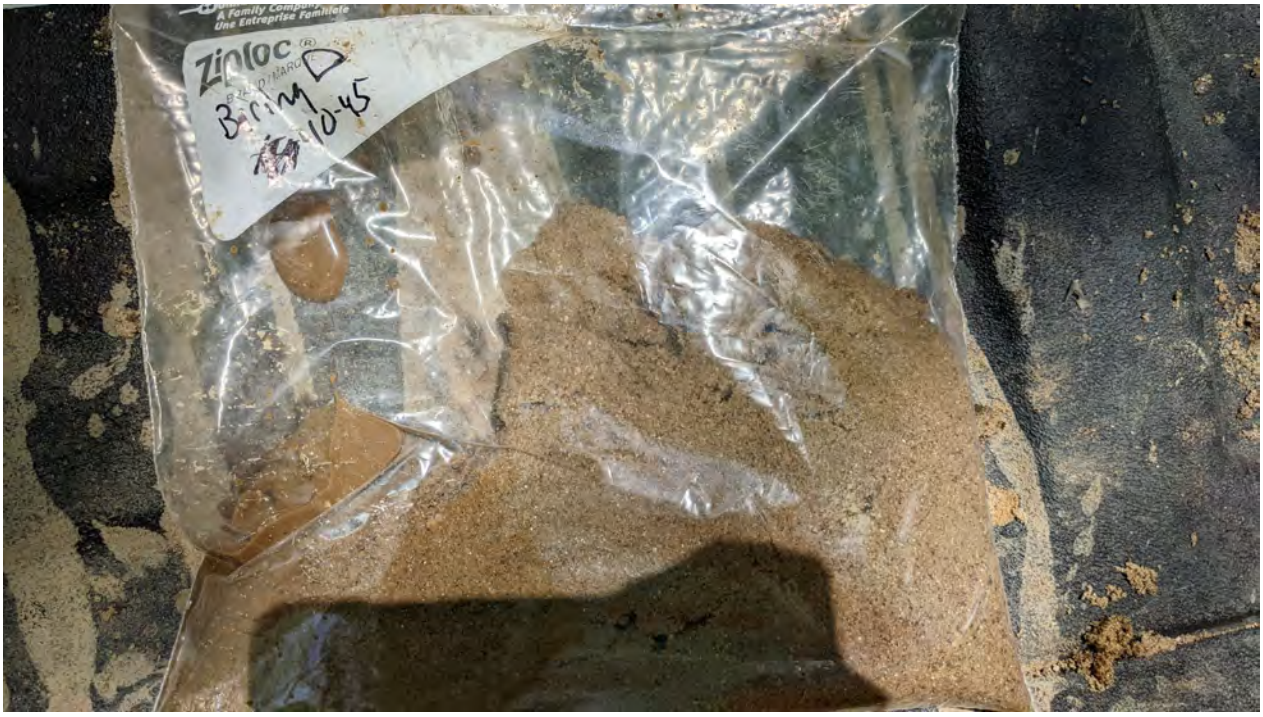
Photograph 77 - View of Boring D sample from depth interval 25-30 feet bls, bottom half.

Photograph 78 - View of Boring D sample from depth interval 30-35 feet bls, top half.

Photograph 79 - View of Boring D sample from depth interval 30-35 feet bls, bottom half.

Photograph 80 - View of Boring D sample from depth interval 35-40 feet bls, top half.

Photograph 81 - View of Boring D sample from depth interval 35-40 feet bls, bottom half.



Photograph 82 - View of Boring D sample from depth interval 40-45 feet bls.

Photograph 83 - View of Boring D sample from depth interval 45-50 feet bls, top half.

Photograph 84 - View of Boring D sample from depth interval 45-50 feet bls, bottom half.

Photograph 85 - View of Boring D sample from depth interval 50-55 feet bls, top half.

Photograph 86 - View of Boring D sample from depth interval 50-55 feet bls, bottom half.

Photographs taken by Scott Faulkner of Geotechnology, LLC on May 16-18, 2022.

Photograph 87 - View of Boring D sample from depth interval 55-60 feet bls, top half.

Photograph 88 - View of Boring D sample from depth interval 55-60 feet bls, bottom half.

Photographs taken by Scott Faulkner of Geotechnology, LLC on May 16-18, 2022.

APPENDIX C

GROUNDWATER MONITORING PROGRAM PARAMETER LIST

Table 1-3. Groundwater Monitoring Program Parameters
2021 Annual Report
Meredosia Power Station - Fly Ash Pond and Bottom Ash Pond

Field Parameters	STORET Code	
pH[2]	00400	
Specific Conductance[2]	00094	
Temperature (Fahrenheit)	00011	
Depth to Water (from TOC)	72109	
Elevation of GW Surface[2]	71993	
Depth of Well (BGS)[2]	72008	
Elevation of Measuring Point	72110	
Laboratory Parameters[1]	**STORET Code-Diss**	**STORET Code-Total**
Boron[2]	01020	01022
Iron[2]	01046	01045
Manganese[2]	01056	01055
Sulfate[2]	00946	- -
Total Dissolved Solids (TDS)[2]	70300	- -
Antimony	01095	01097
Arsenic	01000	01002
Barium	01005	01007
Beryllium	01010	01012
Cadmium	01025	01027
Chloride	00941	- -
Chromium	01030	01034
Cobalt	01035	01037
Copper	01040	01042
Cyanide	- -	00720
Fluoride	00950	- -
Lead	01049	01051
Mercury	71890	71900
Nickel	01065	01067
Nitrate as N	00613	- -
Nitrite as N	00618	- -
Selenium	01145	01147
Silver	01075	01077
Thallium	01057	01059
Vanadium	01085	01087
Zinc	01090	01092

[O: YD/SJC, C: YD/SJC]

Notes:

[1] Reported as dissolved (filtered) concentrations.

[2] Mandatory monitoring parameter per 35 IAC 840.114(a).

BGS: Below Ground Surface

TOC: Top of Casing

APPENDIX D

LABORATORY ANALYTICAL RESULTS

Teklab, Inc.
Environmental Laboratory
http://www.teklabinc.com/

June 13, 2022

Jessie Goodwin
Geotechnology, Inc.
11816 Lackland Road
St. Louis, MO 63146
TEL: (573) 270-1313
FAX: (314) 997-2067

Illinois	100226
Kansas	E-10374
Louisiana	05002
Louisiana	05003
Oklahoma	9978

RE: MOAP **WorkOrder:** 22060204

Dear Jessie Goodwin:

TEKLAB, INC received 4 samples on 5/18/2022 2:14:00 PM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Patrick Riley

Patrick Riley
Project Manager
(618)344-1004 ex 44
patrickriley@teklabinc.com

Teklab, Inc.
Environmental Laboratory

Report Contents

http://www.teklabinc.com/

Client: Geotechnology, Inc.
Work Order: 22060204
Client Project: MOAP
Report Date: 13-Jun-22

This reporting package includes the following:

Cover Letter	1
Report Contents	2
Definitions	3
Case Narrative	5
Accreditations	6
Laboratory Results	7
Quality Control Results	11
Chain of Custody	Appended

Teklab, Inc. Environmental Laboratory

Definitions

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22060204

Client Project: MOAP **Report Date:** 13-Jun-22

Abbr	Definition
*	Analytes on report marked with an asterisk are not NELAP accredited
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
CRQL	A Client Requested Quantitation Limit is a reporting limit that varies according to customer request. The CRQL may not be less than the MDL.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilution factors.
DNI	Did not ignite
DUP	Laboratory duplicate is a replicate aliquot prepared under the same laboratory conditions and independently analyzed to obtain a measure of precision.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample is a sample matrix, free from the analytes of interest,spiked with verified known amounts of analytes and analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	"The method detection limit is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results."
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
NC	Data is not acceptable for compliance purposes
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions.
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Teklab, Inc.
Environmental Laboratory

Definitions

http://www.teklabinc.com/

Client: Geotechnology, Inc.
Work Order: 22060204

Client Project: MOAP
Report Date: 13-Jun-22

Qualifiers

- # - Unknown hydrocarbon
- B - Analyte detected in associated Method Blank
- C - RL shown is a Client Requested Quantitation Limit
- E - Value above quantitation range
- H - Holding times exceeded
- I - Associated internal standard was outside method criteria
- J - Analyte detected below quantitation limits
- M - Manual Integration used to determine area response
- ND - Not Detected at the Reporting Limit
- R - RPD outside accepted recovery limits
- S - Spike Recovery outside recovery limits
- T - TIC(Tentatively identified compound)
- X - Value exceeds Maximum Contaminant Level

Teklab, Inc. Environmental Laboratory

Case Narrative

http://www.teklabinc.com/

Client: Geotechnology, Inc.
Work Order: 22060204
Client Project: MOAP
Report Date: 13-Jun-22

Cooler Receipt Temp: °C

Additional analyses to WO# 22051226.

Locations

Collinsville

Address 5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
Phone (618) 344-1004
Fax (618) 344-1005
Email jhriley@teklabinc.com

Springfield

Address 3920 Pintail Dr
Springfield, IL 62711-9415
Phone (217) 698-1004
Fax (217) 698-1005
Email KKlostermann@teklabinc.com

Kansas City

Address 8421 Nieman Road
Lenexa, KS 66214
Phone (913) 541-1998
Fax (913) 541-1998
Email jhriley@teklabinc.com

Collinsville Air

Address 5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
Phone (618) 344-1004
Fax (618) 344-1005
Email EHurley@teklabinc.com

Chicago

Address 1319 Butterfield Rd.
Downers Grove, IL 60515
Phone (630) 324-6855
Fax
Email arenner@teklabinc.com

Teklab, Inc. Environmental Laboratory

Accreditations

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22060204

Client Project: MOAP **Report Date:** 13-Jun-22

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2023	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2023	Collinsville
Louisiana	LDEQ	05002	NELAP	6/30/2023	Collinsville
Louisiana	LDEQ	05003	NELAP	6/30/2023	Collinsville
Oklahoma	ODEQ	9978	NELAP	8/31/2022	Collinsville
Arkansas	ADEQ	88-0966		3/14/2023	Collinsville
Illinois	IDPH	17584		5/31/2023	Collinsville
Kentucky	UST	0073		1/31/2023	Collinsville
Missouri	MDNR	00930		5/31/2023	Collinsville
Missouri	MDNR	930		1/31/2025	Collinsville

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22060204

Client Project: MOAP **Report Date:** 13-Jun-22

Lab ID: 22060204-001 **Client Sample ID:** Boring A 10-15

Matrix: SOLID **Collection Date:** 05/17/2022 15:30

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 1312, 3005A, 6010B, METALS IN SPLP EXTRACT BY ICP								
Antimony	*	0.050	J	**0.0088**	mg/L	1	06/09/2022 16:44	193484
Arsenic	*	0.025	J	**0.019**	mg/L	1	06/09/2022 16:44	193484
Barium	*	0.0450		**< 0.0450**	mg/L	1	06/09/2022 16:44	193484
Beryllium	*	0.0010	J	**0.0003**	mg/L	1	06/09/2022 16:44	193484
Boron	*	1.00	S	**2.82**	mg/L	1	06/09/2022 16:44	193484
Cadmium	*	0.0020		**< 0.0020**	mg/L	1	06/09/2022 16:44	193484
Chromium	*	0.010	J	**0.0073**	mg/L	1	06/09/2022 16:44	193484
Cobalt	*	0.0100		**< 0.0100**	mg/L	1	06/09/2022 16:44	193484
Copper	*	0.0100		**< 0.0100**	mg/L	1	06/09/2022 16:44	193484
Iron	*	0.0400		**< 0.0400**	mg/L	1	06/09/2022 16:44	193484
Lead	*	0.0400		**< 0.0400**	mg/L	1	06/09/2022 16:44	193484
Manganese	*	0.0070		**< 0.0070**	mg/L	1	06/09/2022 16:44	193484
Nickel	*	0.0100		**< 0.0100**	mg/L	1	06/09/2022 16:44	193484
Selenium	*	0.0500		**< 0.0500**	mg/L	1	06/09/2022 16:44	193484
Silver	*	0.0070		**< 0.0070**	mg/L	1	06/09/2022 16:44	193484
Thallium	*	0.0500		**< 0.0500**	mg/L	1	06/09/2022 16:44	193484
Vanadium	*	0.0100		**0.0484**	mg/L	1	06/09/2022 16:44	193484
Zinc	*	0.0100		**< 0.0100**	mg/L	1	06/09/2022 16:44	193484

Matrix spike control limits for B are not applicable due to high sample/spike ratio.

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22060204

Client Project: MOAP **Report Date:** 13-Jun-22

Lab ID: 22060204-002 **Client Sample ID:** Boring B 10-15

Matrix: SOLID **Collection Date:** 05/18/2022 10:45

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 1312, 3005A, 6010B, METALS IN SPLP EXTRACT BY ICP								
Antimony	*	0.050	J	**0.015**	mg/L	1	06/09/2022 16:49	193484
Arsenic	*	0.0250		**0.0451**	mg/L	1	06/09/2022 16:49	193484
Barium	*	0.0450		**< 0.0450**	mg/L	1	06/09/2022 16:49	193484
Beryllium	*	0.0010		**< 0.0010**	mg/L	1	06/09/2022 16:49	193484
Boron	*	1.00		**2.57**	mg/L	1	06/09/2022 16:49	193484
Cadmium	*	0.0020		**< 0.0020**	mg/L	1	06/09/2022 16:49	193484
Chromium	*	0.010	J	**0.0042**	mg/L	1	06/09/2022 16:49	193484
Cobalt	*	0.0100		**< 0.0100**	mg/L	1	06/09/2022 16:49	193484
Copper	*	0.010	J	**0.0025**	mg/L	1	06/09/2022 16:49	193484
Iron	*	0.0400		**< 0.0400**	mg/L	1	06/09/2022 16:49	193484
Lead	*	0.0400		**< 0.0400**	mg/L	1	06/09/2022 16:49	193484
Manganese	*	0.0070		**< 0.0070**	mg/L	1	06/09/2022 16:49	193484
Nickel	*	0.0100		**< 0.0100**	mg/L	1	06/09/2022 16:49	193484
Selenium	*	0.0500		**< 0.0500**	mg/L	1	06/09/2022 16:49	193484
Silver	*	0.0070		**< 0.0070**	mg/L	1	06/09/2022 16:49	193484
Thallium	*	0.0500		**< 0.0500**	mg/L	1	06/09/2022 16:49	193484
Vanadium	*	0.0100		**0.0478**	mg/L	1	06/09/2022 16:49	193484
Zinc	*	0.0100		**< 0.0100**	mg/L	1	06/09/2022 16:49	193484

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22060204

Client Project: MOAP **Report Date:** 13-Jun-22

Lab ID: 22060204-003 **Client Sample ID:** Boring C 5-10

Matrix: SOLID **Collection Date:** 05/16/2022 12:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 1312, 3005A, 6010B, METALS IN SPLP EXTRACT BY ICP								
Antimony	*	0.0500		**< 0.0500**	mg/L	1	06/09/2022 16:30	193484
Arsenic	*	0.025	J	**0.018**	mg/L	1	06/09/2022 16:30	193484
Barium	*	0.0450		**< 0.0450**	mg/L	1	06/09/2022 16:30	193484
Beryllium	*	0.0010		**< 0.0010**	mg/L	1	06/09/2022 16:30	193484
Boron	*	1.00		**3.63**	mg/L	1	06/09/2022 16:30	193484
Cadmium	*	0.0020		**< 0.0020**	mg/L	1	06/09/2022 16:30	193484
Chromium	*	0.010	J	**0.0089**	mg/L	1	06/09/2022 16:30	193484
Cobalt	*	0.0100		**< 0.0100**	mg/L	1	06/09/2022 16:30	193484
Copper	*	0.0100		**< 0.0100**	mg/L	1	06/09/2022 16:30	193484
Iron	*	0.0400		**< 0.0400**	mg/L	1	06/09/2022 16:30	193484
Lead	*	0.040	J	**0.0053**	mg/L	1	06/09/2022 16:30	193484
Manganese	*	0.0070		**< 0.0070**	mg/L	1	06/09/2022 16:30	193484
Nickel	*	0.0100		**< 0.0100**	mg/L	1	06/09/2022 16:30	193484
Selenium	*	0.0500		**< 0.0500**	mg/L	1	06/09/2022 16:30	193484
Silver	*	0.0070		**< 0.0070**	mg/L	1	06/09/2022 16:30	193484
Thallium	*	0.0500		**< 0.0500**	mg/L	1	06/09/2022 16:30	193484
Vanadium	*	0.0100		**0.0545**	mg/L	1	06/09/2022 16:30	193484
Zinc	*	0.0100		**< 0.0100**	mg/L	1	06/09/2022 16:30	193484

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22060204

Client Project: MOAP **Report Date:** 13-Jun-22

Lab ID: 22060204-004 **Client Sample ID:** Boring D 5-10

Matrix: SOLID **Collection Date:** 05/17/2022 9:40

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 1312, 3005A, 6010B, METALS IN SPLP EXTRACT BY ICP								
Antimony	*	0.050	J	**0.0091**	mg/L	1	06/09/2022 16:32	193484
Arsenic	*	0.025	J	**0.018**	mg/L	1	06/09/2022 16:32	193484
Barium	*	0.0450		**< 0.0450**	mg/L	1	06/09/2022 16:32	193484
Beryllium	*	0.0010		**< 0.0010**	mg/L	1	06/09/2022 16:32	193484
Boron	*	1.00		**3.58**	mg/L	1	06/09/2022 16:32	193484
Cadmium	*	0.0020		**< 0.0020**	mg/L	1	06/09/2022 16:32	193484
Chromium	*	0.010	J	**0.0076**	mg/L	1	06/09/2022 16:32	193484
Cobalt	*	0.0100		**< 0.0100**	mg/L	1	06/09/2022 16:32	193484
Copper	*	0.0100		**< 0.0100**	mg/L	1	06/09/2022 16:32	193484
Iron	*	0.0400		**< 0.0400**	mg/L	1	06/09/2022 16:32	193484
Lead	*	0.0400		**< 0.0400**	mg/L	1	06/09/2022 16:32	193484
Manganese	*	0.0070		**< 0.0070**	mg/L	1	06/09/2022 16:32	193484
Nickel	*	0.0100		**< 0.0100**	mg/L	1	06/09/2022 16:32	193484
Selenium	*	0.0500		**< 0.0500**	mg/L	1	06/09/2022 16:32	193484
Silver	*	0.0070		**< 0.0070**	mg/L	1	06/09/2022 16:32	193484
Thallium	*	0.0500		**< 0.0500**	mg/L	1	06/09/2022 16:32	193484
Vanadium	*	0.0100		**0.0446**	mg/L	1	06/09/2022 16:32	193484
Zinc	*	0.0100		**< 0.0100**	mg/L	1	06/09/2022 16:32	193484

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22060204

Client Project: MOAP **Report Date:** 13-Jun-22

SW-846 1312, 3005A, 6010B, METALS IN SPLP EXTRACT BY ICP

Batch 193484 **SampType:** MBLK Units **mg/L**

SampID: MBLK-193484

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	*	0.0500		**< 0.0500**	0.0068	0	0	-100	100	06/09/2022
Arsenic	*	0.0250		**< 0.0250**	0.0087	0	0	-100	100	06/09/2022
Barium	*	0.0450		**< 0.0450**	0.0160	0	0	-100	100	06/09/2022
Beryllium	*	0.0010		**< 0.0010**	0.0002	0	0	-100	100	06/09/2022
Boron	*	1.00		**< 1.00**	0.2500	0	0	-100	100	06/09/2022
Cadmium	*	0.0020		**< 0.0020**	0.0005	0	0	-100	100	06/09/2022
Chromium	*	0.0100		**< 0.0100**	0.0028	0	0	-100	100	06/09/2022
Cobalt	*	0.0100		**< 0.0100**	0.0020	0	0	-100	100	06/09/2022
Copper	*	0.0100		**< 0.0100**	0.0013	0	0	-100	100	06/09/2022
Iron	*	0.0400		**< 0.0400**	0.0200	0	0	-100	100	06/09/2022
Lead	*	0.0400		**< 0.0400**	0.0040	0	0	-100	100	06/09/2022
Manganese	*	0.0070		**< 0.0070**	0.0025	0	0	-100	100	06/09/2022
Nickel	*	0.0100		**< 0.0100**	0.0016	0	0	-100	100	06/09/2022
Selenium	*	0.0500		**< 0.0500**	0.0170	0	0	-100	100	06/09/2022
Silver	*	0.0070		**< 0.0070**	0.0027	0	0	-100	100	06/09/2022
Thallium	*	0.0500		**< 0.0500**	0.0111	0	0	-100	100	06/09/2022
Vanadium	*	0.0100		**< 0.0100**	0.0009	0	0	-100	100	06/09/2022
Zinc	*	0.0100		**< 0.0100**	0.0050	0	0	-100	100	06/09/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22060204

Client Project: MOAP **Report Date:** 13-Jun-22

SW-846 1312, 3005A, 6010B, METALS IN SPLP EXTRACT BY ICP

Batch 193484 **SampType:** LCS Units **mg/L**

SampID: LCS-193484

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	*	0.0500		**0.516**	0.5000	0	103.2	85	115	06/09/2022
Arsenic	*	0.0250		**0.548**	0.5000	0	109.5	85	115	06/09/2022
Barium	*	0.0450		**2.14**	2.000	0	107.0	85	115	06/09/2022
Beryllium	*	0.0010		**0.0526**	0.0500	0	105.2	85	115	06/09/2022
Boron	*	1.00	J	**0.57**	0.5000	0	114.9	85	115	06/09/2022
Cadmium	*	0.0020		**0.0534**	0.0500	0	106.8	85	115	06/09/2022
Chromium	*	0.0100		**0.207**	0.2000	0	103.4	85	115	06/09/2022
Cobalt	*	0.0100		**0.533**	0.5000	0	106.6	85	115	06/09/2022
Copper	*	0.0100		**0.268**	0.2500	0	107.0	85	115	06/09/2022
Iron	*	0.0400		**2.09**	2.000	0	104.5	85	115	06/09/2022
Lead	*	0.0400		**0.528**	0.5000	0	105.7	85	115	06/09/2022
Manganese	*	0.0070		**0.531**	0.5000	0	106.2	85	115	06/09/2022
Nickel	*	0.0100		**0.524**	0.5000	0	104.8	85	115	06/09/2022
Selenium	*	0.0500		**0.495**	0.5000	0	99.0	85	115	06/09/2022
Silver	*	0.0070		**0.0496**	0.0500	0	99.2	85	115	06/09/2022
Thallium	*	0.0500		**0.257**	0.2500	0	102.8	85	115	06/09/2022
Vanadium	*	0.0100		**0.520**	0.5000	0	104.0	85	115	06/09/2022
Zinc	*	0.0100		**0.529**	0.5000	0	105.8	85	115	06/09/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22060204

Client Project: MOAP **Report Date:** 13-Jun-22

SW-846 1312, 3005A, 6010B, METALS IN SPLP EXTRACT BY ICP

Batch 193484 **SampType:** MS Units **mg/L**

SampID: 22060204-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	*	0.0500		**0.534**	0.5000	0.008800	105.1	75	125	06/09/2022
Arsenic	*	0.0250		**0.576**	0.5000	0.01880	111.3	75	125	06/09/2022
Barium	*	0.0450		**2.15**	2.000	0	107.5	75	125	06/09/2022
Beryllium	*	0.0010		**0.0532**	0.0500	0.0003000	105.8	75	125	06/09/2022
Boron	*	1.00		**3.37**	0.5000	2.817	109.8	75	125	06/09/2022
Cadmium	*	0.0020		**0.0532**	0.0500	0	106.4	75	125	06/09/2022
Chromium	*	0.0100		**0.216**	0.2000	0.007300	104.4	75	125	06/09/2022
Cobalt	*	0.0100		**0.536**	0.5000	0	107.2	75	125	06/09/2022
Copper	*	0.0100		**0.271**	0.2500	0	108.3	75	125	06/09/2022
Iron	*	0.0400		**2.10**	2.000	0	105.0	75	125	06/09/2022
Lead	*	0.0400		**0.538**	0.5000	0	107.6	75	125	06/09/2022
Manganese	*	0.0070		**0.534**	0.5000	0	106.9	75	125	06/09/2022
Nickel	*	0.0100		**0.522**	0.5000	0	104.5	75	125	06/09/2022
Selenium	*	0.0500		**0.506**	0.5000	0	101.2	75	125	06/09/2022
Silver	*	0.0070		**0.0504**	0.0500	0	100.8	75	125	06/09/2022
Thallium	*	0.0500		**0.255**	0.2500	0	101.9	75	125	06/09/2022
Vanadium	*	0.0100		**0.577**	0.5000	0.04840	105.8	75	125	06/09/2022
Zinc	*	0.0100		**0.543**	0.5000	0	108.6	75	125	06/09/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22060204

Client Project: MOAP **Report Date:** 13-Jun-22

SW-846 1312, 3005A, 6010B, METALS IN SPLP EXTRACT BY ICP

Batch 193484 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 22060204-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony	*	0.0500		**0.552**	0.5000	0.008800	108.6	0.5342	3.22	06/09/2022
Arsenic	*	0.0250		**0.589**	0.5000	0.01880	114.1	0.5755	2.39	06/09/2022
Barium	*	0.0450		**2.21**	2.000	0	110.5	2.150	2.75	06/09/2022
Beryllium	*	0.0010		**0.0553**	0.0500	0.0003000	110.0	0.05320	3.87	06/09/2022
Boron	*	1.00	S	**3.51**	0.5000	2.817	138.3	3.366	4.14	06/09/2022
Cadmium	*	0.0020		**0.0544**	0.0500	0	108.8	0.05320	2.23	06/09/2022
Chromium	*	0.0100		**0.222**	0.2000	0.007300	107.4	0.2161	2.78	06/09/2022
Cobalt	*	0.0100		**0.555**	0.5000	0	111.0	0.5361	3.43	06/09/2022
Copper	*	0.0100		**0.280**	0.2500	0	111.9	0.2708	3.23	06/09/2022
Iron	*	0.0400		**2.17**	2.000	0	108.5	2.100	3.28	06/09/2022
Lead	*	0.0400		**0.556**	0.5000	0	111.3	0.5381	3.33	06/09/2022
Manganese	*	0.0070		**0.552**	0.5000	0	110.3	0.5344	3.17	06/09/2022
Nickel	*	0.0100		**0.501**	0.5000	0	100.1	0.5225	4.28	06/09/2022
Selenium	*	0.0500		**0.530**	0.5000	0	106.1	0.5058	4.75	06/09/2022
Silver	*	0.0070		**0.0521**	0.0500	0	104.2	0.05040	3.32	06/09/2022
Thallium	*	0.0500		**0.264**	0.2500	0	105.6	0.2547	3.55	06/09/2022
Vanadium	*	0.0100		**0.596**	0.5000	0.04840	109.4	0.5772	3.14	06/09/2022
Zinc	*	0.0100		**0.562**	0.5000	0	112.3	0.5432	3.33	06/09/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22060204

Client Project: MOAP **Report Date:** 13-Jun-22

SW-846 1312, 3005A, 6010B, METALS IN SPLP EXTRACT BY ICP

Batch 193484 **SampType:** MS Units **mg/L**

SampID: 22060204-002AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	*	0.0500		**0.553**	0.5000	0.01540	107.5	75	125	06/09/2022
Arsenic	*	0.0250		**0.604**	0.5000	0.04510	111.7	75	125	06/09/2022
Barium	*	0.0450		**2.20**	2.000	0	110.0	75	125	06/09/2022
Beryllium	*	0.0010		**0.0545**	0.0500	0	109.0	75	125	06/09/2022
Cadmium	*	0.0020		**0.0538**	0.0500	0	107.6	75	125	06/09/2022
Chromium	*	0.0100		**0.218**	0.2000	0.004200	106.8	75	125	06/09/2022
Cobalt	*	0.0100		**0.550**	0.5000	0	110.1	75	125	06/09/2022
Copper	*	0.0100		**0.280**	0.2500	0.002500	111.2	75	125	06/09/2022
Iron	*	0.0400		**2.17**	2.000	0	108.5	75	125	06/09/2022
Lead	*	0.0400		**0.553**	0.5000	0	110.6	75	125	06/09/2022
Manganese	*	0.0070		**0.548**	0.5000	0	109.7	75	125	06/09/2022
Nickel	*	0.0100		**0.511**	0.5000	0	102.2	75	125	06/09/2022
Selenium	*	0.0500		**0.524**	0.5000	0	104.9	75	125	06/09/2022
Silver	*	0.0070		**0.0521**	0.0500	0	104.2	75	125	06/09/2022
Thallium	*	0.0500		**0.270**	0.2500	0	107.8	75	125	06/09/2022
Vanadium	*	0.0100		**0.591**	0.5000	0.04780	108.6	75	125	06/09/2022
Zinc	*	0.0100		**0.557**	0.5000	0	111.4	75	125	06/09/2022

TEKLAB, INC
5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
TEL: (618) 344-1004
FAX: (618) 344-1005

CHAIN-OF-CUSTODY RECORD

22060204

WorkOrder: 22060204

Client:
Geotechnology, Inc.
11816 Lackland Road
St. Louis, MO 63146

TEL: (314) 997-7440
FAX: (314) 997-2067
Project: MOAP

03-Jun-22

Sample ID	ClientSampID	Matrix	Date Collected	Bottle	Requested Tests SW1312/6010 B						
22060204-001	Boring A 10-15	Solid	5/17/2022 3:30:00 PM		A						
22060204-002	Boring B 10-15	Solid	5/18/2022 10:45:00 AM		A						
22060204-003	Boring C 5-10	Solid	5/16/2022 12:00:00 PM		A						
22060204-004	Boring D 5-10	Solid	5/17/2022 9:40:00 AM		A						

Comments: turn off J flags for Kenny. EEP 6/22/18
STd EDD. EEH 5/4/2022 CC e-mail: invoice@geotechnology.com
All reports for Jessie Goodwin: standard EDD. All reports for Jon Truesdale: Terracon EDD. EEP 4/25/17

	Date/Time		Date/Time
Relinquished by:		**Received by:**	
Relinquished by:		**Received by:**	
Relinquished by:		**Received by:**	

NOTE: Samples are discarded 60 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

Bottle Type: L-Liter V-Voa S-Soil Jar O-Orbo T-Tedlar B-Brass P-Plastic OT-Other

Teklab, Inc.
Environmental Laboratory
http://www.teklabinc.com/

May 27, 2022

Jessie Goodwin
Geotechnology, Inc.
11816 Lackland Road
St. Louis, MO 63146
TEL: (573) 270-1313
FAX: (314) 997-2067

Illinois	100226
Kansas	E-10374
Louisiana	05002
Louisiana	05003
Oklahoma	9978

RE: MOAP **WorkOrder:** 22051225

Dear Jessie Goodwin:

TEKLAB, INC received 4 samples on 5/18/2022 2:14:00 PM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Patrick Riley

Patrick Riley
Project Manager
(618)344-1004 ex 44
patrickriley@teklabinc.com

Teklab, Inc.
Environmental Laboratory

Report Contents

http://www.teklabinc.com/

Client: Geotechnology, Inc.
Work Order: 22051225
Client Project: MOAP
Report Date: 27-May-22

This reporting package includes the following:

Cover Letter	1
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Chain of Custody	Appended

Teklab, Inc. Environmental Laboratory

Definitions

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051225

Client Project: MOAP **Report Date:** 27-May-22

Abbr	Definition
*	Analytes on report marked with an asterisk are not NELAP accredited
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
CRQL	A Client Requested Quantitation Limit is a reporting limit that varies according to customer request. The CRQL may not be less than the MDL.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilution factors.
DNI	Did not ignite
DUP	Laboratory duplicate is a replicate aliquot prepared under the same laboratory conditions and independently analyzed to obtain a measure of precision.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample is a sample matrix, free from the analytes of interest,spiked with verified known amounts of analytes and analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	"The method detection limit is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results."
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
NC	Data is not acceptable for compliance purposes
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions.
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Teklab, Inc. Environmental Laboratory

Definitions

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051225

Client Project: MOAP **Report Date:** 27-May-22

Qualifiers

- # - Unknown hydrocarbon
- B - Analyte detected in associated Method Blank
- C - RL shown is a Client Requested Quantitation Limit
- E - Value above quantitation range
- H - Holding times exceeded
- I - Associated internal standard was outside method criteria
- J - Analyte detected below quantitation limits
- M - Manual Integration used to determine area response
- ND - Not Detected at the Reporting Limit
- R - RPD outside accepted recovery limits
- S - Spike Recovery outside recovery limits
- T - TIC(Tentatively identified compound)
- X - Value exceeds Maximum Contaminant Level

Teklab, Inc. Environmental Laboratory

Case Narrative

http://www.teklabinc.com/

Client: Geotechnology, Inc.
Client Project: MOAP

Work Order: 22051225
Report Date: 27-May-22

Cooler Receipt Temp: 5.0 °C

Locations

Collinsville

Address 5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
Phone (618) 344-1004
Fax (618) 344-1005
Email jhriley@teklabinc.com

Springfield

Address 3920 Pintail Dr
Springfield, IL 62711-9415
Phone (217) 698-1004
Fax (217) 698-1005
Email KKlostermann@teklabinc.com

Kansas City

Address 8421 Nieman Road
Lenexa, KS 66214
Phone (913) 541-1998
Fax (913) 541-1998
Email jhriley@teklabinc.com

Collinsville Air

Address 5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
Phone (618) 344-1004
Fax (618) 344-1005
Email EHurley@teklabinc.com

Chicago

Address 1319 Butterfield Rd.
Downers Grove, IL 60515
Phone (630) 324-6855
Fax
Email arenner@teklabinc.com

Teklab, Inc. Environmental Laboratory

Accreditations

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051225

Client Project: MOAP **Report Date:** 27-May-22

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2023	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2023	Collinsville
Louisiana	LDEQ	05002	NELAP	6/30/2022	Collinsville
Louisiana	LDEQ	05003	NELAP	6/30/2022	Collinsville
Oklahoma	ODEQ	9978	NELAP	8/31/2022	Collinsville
Arkansas	ADEQ	88-0966		3/14/2023	Collinsville
Illinois	IDPH	17584		5/31/2023	Collinsville
Kentucky	UST	0073		1/31/2023	Collinsville
Missouri	MDNR	00930		5/31/2023	Collinsville
Missouri	MDNR	930		1/31/2025	Collinsville

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051225

Client Project: MOAP **Report Date:** 27-May-22

Lab ID: 22051225-001 **Client Sample ID:** Boring A 10-15

Matrix: SOLID **Collection Date:** 05/17/2022 15:30

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
EPA 600 353.2 R2.0								
Nitrogen, Nitrate (as N)	NELAP	0.75	J	**0.64**	mg/Kg-dry	1	05/20/2022 14:18	191881
EPA SW846 3550C, 5035A, ASTM D2974								
Percent Moisture	*	0.1		**33.3**	%	1	05/20/2022 15:13	R312281
STANDARD METHODS 4500-CL E (TOTAL) 1997, 2011								
Chloride	*	15		**< 15**	mg/Kg-dry	1	05/23/2022 15:31	191880
STANDARD METHODS 4500-NO2 B 2000, 2011								
Nitrogen, Nitrite (as N)	NELAP	0.75		**< 0.75**	mg/Kg-dry	1	05/20/2022 9:37	191882
SW-846 9012A (TOTAL)								
Cyanide	NELAP	0.35	J	**0.11**	mg/Kg-dry	1	05/20/2022 8:15	191878
SW-846 9036 (TOTAL)								
Sulfate	NELAP	149		**743**	mg/Kg-dry	1	05/23/2022 15:31	191879
SW-846 9214								
Fluoride	NELAP	1.5	J	**0.85**	mg/Kg-dry	1	05/20/2022 11:25	191883
SW-846 3050B, 6010B, METALS BY ICP								
Antimony	NELAP	4.72		**11.8**	mg/Kg-dry	1	05/24/2022 14:18	192912
Arsenic	NELAP	2.31		**53.5**	mg/Kg-dry	1	05/24/2022 15:48	192977
Barium	NELAP	0.46		**176**	mg/Kg-dry	1	05/24/2022 15:48	192977
Beryllium	NELAP	0.05		**7.41**	mg/Kg-dry	1	05/24/2022 15:48	192977
Boron	NELAP	1.85		**908**	mg/Kg-dry	1	05/24/2022 15:48	192977
Cadmium	NELAP	0.19		**26.1**	mg/Kg-dry	1	05/24/2022 15:48	192977
Chromium	NELAP	0.46		**52.0**	mg/Kg-dry	1	05/24/2022 15:48	192977
Cobalt	NELAP	0.46		**7.92**	mg/Kg-dry	1	05/24/2022 15:48	192977
Copper	NELAP	0.46		**33.9**	mg/Kg-dry	1	05/24/2022 15:48	192977
Iron	NELAP	4.63		**48600**	mg/Kg-dry	1	05/24/2022 15:48	192977
Lead	NELAP	1.39		**124**	mg/Kg-dry	1	05/24/2022 15:48	192977
Manganese	NELAP	0.42		**523**	mg/Kg-dry	1	05/24/2022 15:48	192977
Nickel	NELAP	0.46		**29.0**	mg/Kg-dry	1	05/24/2022 15:48	192977
Selenium	NELAP	3.70		**19.6**	mg/Kg-dry	1	05/24/2022 15:48	192977
Silver	NELAP	0.46	J	**0.31**	mg/Kg-dry	1	05/24/2022 15:48	192977
Thallium	NELAP	4.63		**< 4.63**	mg/Kg-dry	1	05/24/2022 15:48	192977
Vanadium	NELAP	0.93		**77.9**	mg/Kg-dry	1	05/24/2022 15:48	192977
Zinc	NELAP	2.78		**997**	mg/Kg-dry	1	05/24/2022 15:48	192977
SW-846 7471B								
Mercury	NELAP	0.014	J	**0.008**	mg/Kg-dry	1	05/19/2022 17:00	191873

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051225

Client Project: MOAP **Report Date:** 27-May-22

Lab ID: 22051225-002 **Client Sample ID:** Boring B 10-15

Matrix: SOLID **Collection Date:** 05/18/2022 10:45

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
EPA 600 353.2 R2.0								
Nitrogen, Nitrate (as N)	NELAP	0.73	J	**0.32**	mg/Kg-dry	1	05/20/2022 14:27	191881
EPA SW846 3550C, 5035A, ASTM D2974								
Percent Moisture	*	0.1		**31.8**	%	1	05/20/2022 15:13	R312281
STANDARD METHODS 4500-CL E (TOTAL) 1997, 2011								
Chloride	*	15		**< 15**	mg/Kg-dry	1	05/23/2022 15:55	191880
STANDARD METHODS 4500-NO2 B 2000, 2011								
Nitrogen, Nitrite (as N)	NELAP	0.73		**< 0.73**	mg/Kg-dry	1	05/20/2022 9:38	191882
SW-846 9012A (TOTAL)								
Cyanide	NELAP	0.34	J	**0.11**	mg/Kg-dry	1	05/20/2022 8:19	191878
SW-846 9036 (TOTAL)								
Sulfate	NELAP	293		**959**	mg/Kg-dry	2	05/23/2022 16:00	191879
SW-846 9214								
Fluoride	NELAP	1.5	J	**0.94**	mg/Kg-dry	1	05/20/2022 11:28	191883
SW-846 3050B, 6010B, METALS BY ICP								
Antimony	NELAP	4.72		**26.0**	mg/Kg-dry	1	05/24/2022 15:32	192912
Arsenic	NELAP	2.45	S	**263**	mg/Kg-dry	1	05/26/2022 12:16	193046
Barium	NELAP	0.47		**88.2**	mg/Kg-dry	1	05/24/2022 15:50	192977
Beryllium	NELAP	0.05		**9.15**	mg/Kg-dry	1	05/24/2022 15:50	192977
Boron	NELAP	1.89	S	**1240**	mg/Kg-dry	1	05/24/2022 15:50	192977
Cadmium	NELAP	0.19		**17.3**	mg/Kg-dry	1	05/24/2022 15:50	192977
Chromium	NELAP	0.47		**72.7**	mg/Kg-dry	1	05/24/2022 15:50	192977
Cobalt	NELAP	0.47		**11.9**	mg/Kg-dry	1	05/24/2022 15:50	192977
Copper	NELAP	0.47		**60.3**	mg/Kg-dry	1	05/24/2022 15:50	192977
Iron	NELAP	4.72	S	**44000**	mg/Kg-dry	1	05/24/2022 15:50	192977
Lead	NELAP	1.42	S	**321**	mg/Kg-dry	1	05/24/2022 15:50	192977
Manganese	NELAP	0.42	S	**324**	mg/Kg-dry	1	05/24/2022 15:50	192977
Nickel	NELAP	0.47		**72.2**	mg/Kg-dry	1	05/24/2022 15:50	192977
Selenium	NELAP	3.77		**16.4**	mg/Kg-dry	1	05/24/2022 15:50	192977
Silver	NELAP	0.47	J	**0.34**	mg/Kg-dry	1	05/24/2022 15:50	192977
Thallium	NELAP	4.72		**< 4.72**	mg/Kg-dry	1	05/24/2022 15:50	192977
Vanadium	NELAP	0.94		**97.9**	mg/Kg-dry	1	05/24/2022 15:50	192977
Zinc	NELAP	2.83	S	**1210**	mg/Kg-dry	1	05/24/2022 15:50	192977
Matrix spike did not recover for As within control limits due to sample composition. Verified by re-prep and re-analysis.								
Matrix spike control limits for B, Fe, Pb, Mn, and Zn are not applicable due to high sample/spike ratio.								
SW-846 7471B								
Mercury	NELAP	0.014	J	**0.013**	mg/Kg-dry	1	05/19/2022 17:02	191873

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051225

Client Project: MOAP **Report Date:** 27-May-22

Lab ID: 22051225-003 **Client Sample ID:** Boring C 5-10

Matrix: SOLID **Collection Date:** 05/16/2022 12:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
EPA 600 353.2 R2.0								
Nitrogen, Nitrate (as N)	NELAP	0.725		**9.03**	mg/Kg-dry	1	05/20/2022 14:29	191881
EPA SW846 3550C, 5035A, ASTM D2974								
Percent Moisture	*	0.1		**31.2**	%	1	05/20/2022 15:13	R312281
STANDARD METHODS 4500-CL E (TOTAL) 1997, 2011								
Chloride	*	14		**< 14**	mg/Kg-dry	1	05/23/2022 16:03	191880
STANDARD METHODS 4500-NO2 B 2000, 2011								
Nitrogen, Nitrite (as N)	NELAP	0.72	J	**0.09**	mg/Kg-dry	1	05/20/2022 9:39	191882
SW-846 9012A (TOTAL)								
Cyanide	NELAP	0.34		**< 0.34**	mg/Kg-dry	1	05/20/2022 8:45	191878
SW-846 9036 (TOTAL)								
Sulfate	NELAP	290		**1100**	mg/Kg-dry	2	05/23/2022 16:08	191879
SW-846 9214								
Fluoride	NELAP	1.4	J	**1.2**	mg/Kg-dry	1	05/20/2022 11:30	191883
SW-846 3050B, 6010B, METALS BY ICP								
Antimony	NELAP	5.00		**7.82**	mg/Kg-dry	1	05/24/2022 14:49	192912
Arsenic	NELAP	2.40		**33.0**	mg/Kg-dry	1	05/24/2022 16:05	192977
Barium	NELAP	0.48		**177**	mg/Kg-dry	1	05/24/2022 16:05	192977
Beryllium	NELAP	0.05		**5.96**	mg/Kg-dry	1	05/24/2022 16:05	192977
Boron	NELAP	1.92		**1180**	mg/Kg-dry	1	05/24/2022 16:05	192977
Cadmium	NELAP	0.19		**17.0**	mg/Kg-dry	1	05/24/2022 16:05	192977
Chromium	NELAP	0.48		**43.9**	mg/Kg-dry	1	05/24/2022 16:05	192977
Cobalt	NELAP	0.48		**6.82**	mg/Kg-dry	1	05/24/2022 16:05	192977
Copper	NELAP	0.48		**24.3**	mg/Kg-dry	1	05/24/2022 16:05	192977
Iron	NELAP	4.81		**42900**	mg/Kg-dry	1	05/24/2022 16:05	192977
Lead	NELAP	1.44		**98.8**	mg/Kg-dry	1	05/24/2022 16:05	192977
Manganese	NELAP	0.43		**715**	mg/Kg-dry	1	05/24/2022 16:05	192977
Nickel	NELAP	0.48		**24.5**	mg/Kg-dry	1	05/24/2022 16:05	192977
Selenium	NELAP	3.85		**17.1**	mg/Kg-dry	1	05/24/2022 16:05	192977
Silver	NELAP	0.48	J	**0.25**	mg/Kg-dry	1	05/24/2022 16:05	192977
Thallium	NELAP	4.81		**< 4.81**	mg/Kg-dry	1	05/24/2022 16:05	192977
Vanadium	NELAP	0.96		**65.2**	mg/Kg-dry	1	05/24/2022 16:05	192977
Zinc	NELAP	2.88		**955**	mg/Kg-dry	1	05/24/2022 16:05	192977
SW-846 7471B								
Mercury	NELAP	0.014	J	**0.014**	mg/Kg-dry	1	05/19/2022 17:04	191873

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051225

Client Project: MOAP **Report Date:** 27-May-22

Lab ID: 22051225-004 **Client Sample ID:** Boring D 5-10

Matrix: SOLID **Collection Date:** 05/17/2022 9:40

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
EPA 600 353.2 R2.0								
Nitrogen, Nitrate (as N)	NELAP	0.788		**3.02**	mg/Kg-dry	1	05/20/2022 14:31	191881
EPA SW846 3550C, 5035A, ASTM D2974								
Percent Moisture	*	0.1		**36.6**	%	1	05/20/2022 15:14	R312281
STANDARD METHODS 4500-CL E (TOTAL) 1997, 2011								
Chloride	*	16		**< 16**	mg/Kg-dry	1	05/23/2022 16:14	191880
STANDARD METHODS 4500-NO2 B 2000, 2011								
Nitrogen, Nitrite (as N)	NELAP	0.79		**< 0.79**	mg/Kg-dry	1	05/20/2022 9:39	191882
SW-846 9012A (TOTAL)								
Cyanide	NELAP	0.36	J	**0.12**	mg/Kg-dry	1	05/20/2022 8:49	191878
SW-846 9036 (TOTAL)								
Sulfate	NELAP	315		**839**	mg/Kg-dry	2	05/23/2022 16:24	191879
SW-846 9214								
Fluoride	NELAP	1.6	J	**1.1**	mg/Kg-dry	1	05/20/2022 11:33	191883
SW-846 3050B, 6010B, METALS BY ICP								
Antimony	NELAP	4.72		**16.3**	mg/Kg-dry	1	05/24/2022 15:43	192912
Arsenic	NELAP	2.36		**105**	mg/Kg-dry	1	05/24/2022 16:07	192977
Barium	NELAP	0.47		**103**	mg/Kg-dry	1	05/24/2022 16:07	192977
Beryllium	NELAP	0.05		**6.13**	mg/Kg-dry	1	05/24/2022 16:07	192977
Boron	NELAP	1.89		**1200**	mg/Kg-dry	1	05/24/2022 16:07	192977
Cadmium	NELAP	0.19		**13.4**	mg/Kg-dry	1	05/24/2022 16:07	192977
Chromium	NELAP	0.47		**60.8**	mg/Kg-dry	1	05/24/2022 16:07	192977
Cobalt	NELAP	0.47		**11.5**	mg/Kg-dry	1	05/24/2022 16:07	192977
Copper	NELAP	0.47		**49.4**	mg/Kg-dry	1	05/24/2022 16:07	192977
Iron	NELAP	4.72		**41800**	mg/Kg-dry	1	05/24/2022 16:07	192977
Lead	NELAP	1.42		**160**	mg/Kg-dry	1	05/24/2022 16:07	192977
Manganese	NELAP	0.42		**361**	mg/Kg-dry	1	05/24/2022 16:07	192977
Nickel	NELAP	0.47		**36.7**	mg/Kg-dry	1	05/24/2022 16:07	192977
Selenium	NELAP	3.77		**16.8**	mg/Kg-dry	1	05/24/2022 16:07	192977
Silver	NELAP	0.47	J	**0.32**	mg/Kg-dry	1	05/24/2022 16:07	192977
Thallium	NELAP	4.72		**< 4.72**	mg/Kg-dry	1	05/24/2022 16:07	192977
Vanadium	NELAP	0.94		**88.0**	mg/Kg-dry	1	05/24/2022 16:07	192977
Zinc	NELAP	2.83		**662**	mg/Kg-dry	1	05/24/2022 16:07	192977
SW-846 7471B								
Mercury	NELAP	0.015		**< 0.015**	mg/Kg-dry	1	05/19/2022 17:07	191873

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051225

Client Project: MOAP **Report Date:** 27-May-22

EPA 600 353.2 R2.0

Batch 191881 **SampType:** MBLK Units **mg/Kg**
SampID: MBLK-191881

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate (as N)		0.500		**< 0.500**						05/20/2022

Batch 191881 **SampType:** MBLK Units **mg/Kg**
SampID: MB-R312261

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate (as N)		0.500		**< 0.500**						05/20/2022

EPA SW846 3550C, 5035A, ASTM D2974

Batch R312281 **SampType:** LCS Units **%**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Percent Moisture	*	0.1		**99.0**	99.00	0	100.0	90	110	05/20/2022

Batch R312281 **SampType:** LCSQC Units **%**
SampID: LCSQC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Percent Moisture	*	0.1		**99.0**	99.00	0	100.0	90	110	05/20/2022

STANDARD METHODS 4500-NO2 B 2000, 2011

Batch 191882 **SampType:** MBLK Units **mg/Kg**
SampID: MBLK-191882

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.50		**< 0.50**	0.0125	0	0	-100	100	05/20/2022

Batch 191882 **SampType:** MBLK Units **mg/Kg**
SampID: MB-R311166

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.50		**< 0.50**	0.0250	0	0	-100	100	05/19/2022

Batch 191882 **SampType:** LCS Units **mg/Kg**
SampID: LCS-R311166

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		2.50		**12.4**	12.20	0	101.2	90	110	05/19/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051225

Client Project: MOAP **Report Date:** 27-May-22

STANDARD METHODS 4500-NO2 B 2000, 2011

Batch 191882 **SampType:** MS Units **mg/Kg-dry**

SampID: 22051225-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.75		**7.13**	7.474	0	95.4	85	115	05/20/2022

Batch 191882 **SampType:** MSD Units **mg/Kg-dry** RPD Limit **10**

SampID: 22051225-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.75		**7.16**	7.474	0	95.8	7.130	0.42	05/20/2022

SW-846 9012A (TOTAL)

Batch 191878 **SampType:** MBLK Units **mg/Kg**

SampID: MBLK 220519 TCN2

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Cyanide		0.25		**< 0.25**	0.0735	0	0	-100	100	05/20/2022

Batch 191878 **SampType:** LCS Units **mg/Kg**

SampID: LCS 220519 TCN2

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Cyanide		0.25		**1.27**	1.250	0	101.3	85	115	05/20/2022

Batch 191878 **SampType:** MS Units **mg/Kg-dry**

SampID: 22051138-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Cyanide		1.13	S	**4.67**	5.643	0.7298	69.9	75	125	05/20/2022

Batch 191878 **SampType:** MSD Units **mg/Kg-dry** RPD Limit **15**

SampID: 22051138-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Cyanide		1.15	SR	**3.85**	5.753	0.7298	54.2	4.675	19.40	05/20/2022

SW-846 9036 (TOTAL)

Batch 191879 **SampType:** MBLK Units **mg/Kg**

SampID: MBLK-191879

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		100		**< 100**	614.0	0	0	-100	100	05/23/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051225

Client Project: MOAP **Report Date:** 27-May-22

SW-846 9036 (TOTAL)

Batch 191879 **SampType:** MBLK Units **mg/Kg**
SampID: MB-R312360

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		100		**< 100**	61.40	0	0	-100	100	05/23/2022

Batch 191879 **SampType:** LCS Units **mg/Kg**
SampID: LCS-R312360

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		100		**209**	200.0	0	104.6	90	110	05/23/2022

Batch 191879 **SampType:** MS Units **mg/Kg-dry**
SampID: 22051225-004AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		315		**1440**	630.1	839.4	95.5	85	115	05/23/2022

Batch 191879 **SampType:** MSD Units **mg/Kg-dry** RPD Limit **10**
SampID: 22051225-004AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		315		**1480**	630.1	839.4	102.3	1441	2.92	05/23/2022

SW-846 9214

Batch 191883 **SampType:** MS Units **mg/Kg-dry**
SampID: 22051225-004AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		1.58		**31.1**	31.50	1.118	95.2	75	125	05/20/2022

Batch 191883 **SampType:** MSD Units **mg/Kg-dry** RPD Limit **15**
SampID: 22051225-004AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		1.58		**31.1**	31.50	1.118	95.1	31.11	0.10	05/20/2022

SW-846 3050B, 6010B, METALS BY ICP

Batch 192912 **SampType:** MBLK Units **mg/Kg-dry**
SampID: MBLK-192912

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		5.00		**< 5.00**	1.230	0	0	-100	100	05/23/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051225

Client Project: MOAP **Report Date:** 27-May-22

SW-846 3050B, 6010B, METALS BY ICP

Batch 192912 **SampType:** LCS Units **mg/Kg-dry**

SampID: LCS-192912

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		5.00		**46.4**	50.00	0	92.8	85	115	05/23/2022

Batch 192912 **SampType:** MS Units **mg/Kg-dry**

SampID: 22051225-002BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		4.55		**64.6**	45.45	25.99	85.0	75	125	05/24/2022

Batch 192912 **SampType:** MSD Units **mg/Kg-dry** RPD Limit **20**

SampID: 22051225-002BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		4.63		**65.9**	46.30	25.99	86.2	64.63	1.93	05/24/2022

Batch 192912 **SampType:** MS Units **mg/Kg-dry**

SampID: 22051226-003AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		4.81		**62.0**	48.08	18.01	91.5	75	125	05/24/2022

Batch 192912 **SampType:** MSD Units **mg/Kg-dry** RPD Limit **20**

SampID: 22051226-003AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		4.81		**60.2**	48.08	18.01	87.7	62.02	3.01	05/24/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051225

Client Project: MOAP **Report Date:** 27-May-22

SW-846 3050B, 6010B, METALS BY ICP

Batch 192977 **SampType:** MBLK Units **mg/Kg-dry**

SampID: MBLK-192977

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic		2.50		**< 2.50**	0.9700	0	0	-100	100	05/24/2022
Barium		0.50		**< 0.50**	0.1700	0	0	-100	100	05/24/2022
Beryllium		0.05		**< 0.05**	0.0110	0	0	-100	100	05/24/2022
Boron		2.00		**< 2.00**	0.8600	0	0	-100	100	05/24/2022
Cadmium		0.20		**< 0.20**	0.0500	0	0	-100	100	05/24/2022
Chromium		0.50		**< 0.50**	0.2300	0	0	-100	100	05/24/2022
Cobalt		0.50		**< 0.50**	0.1900	0	0	-100	100	05/24/2022
Copper		0.50		**< 0.50**	0.2100	0	0	-100	100	05/24/2022
Iron		5.00		**< 5.00**	3.550	0	0	-100	100	05/24/2022
Lead		1.50		**< 1.50**	0.5900	0	0	-100	100	05/24/2022
Manganese		0.45		**< 0.45**	0.1600	0	0	-100	100	05/24/2022
Nickel		0.50		**< 0.50**	0.1900	0	0	-100	100	05/24/2022
Selenium		4.00		**< 4.00**	1.680	0	0	-100	100	05/24/2022
Silver		0.50		**< 0.50**	0.1100	0	0	-100	100	05/24/2022
Thallium		5.00		**< 5.00**	0.7600	0	0	-100	100	05/24/2022
Vanadium		1.00		**< 1.00**	0.1600	0	0	-100	100	05/24/2022
Zinc		3.00		**< 3.00**	1.100	0	0	-100	100	05/24/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051225

Client Project: MOAP **Report Date:** 27-May-22

SW-846 3050B, 6010B, METALS BY ICP

Batch 192977 **SampType:** LCS Units **mg/Kg-dry**

SampID: LCS-192977

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic		2.50		**51.6**	50.00	0	103.2	85	115	05/24/2022
Barium		0.50		**203**	200.0	0	101.5	85	115	05/24/2022
Beryllium		0.05		**5.00**	5.000	0	100.0	85	115	05/24/2022
Boron		2.00		**49.2**	50.00	0	98.5	85	115	05/24/2022
Cadmium		0.20		**4.96**	5.000	0	99.2	85	115	05/24/2022
Chromium		0.50		**19.9**	20.00	0	99.5	85	115	05/24/2022
Cobalt		0.50		**51.1**	50.00	0	102.1	85	115	05/24/2022
Copper		0.50		**26.4**	25.00	0	105.6	85	115	05/24/2022
Iron		5.00		**206**	200.0	0	103.0	85	115	05/24/2022
Lead		1.50		**50.4**	50.00	0	100.9	85	115	05/24/2022
Manganese		0.45		**48.9**	50.00	0	97.7	85	115	05/24/2022
Nickel		0.50		**50.1**	50.00	0	100.3	85	115	05/24/2022
Selenium		4.00		**46.2**	50.00	0	92.3	85	115	05/24/2022
Silver		0.50		**5.07**	5.000	0	101.4	85	115	05/24/2022
Thallium		5.00		**24.9**	25.00	0	99.8	85	115	05/24/2022
Vanadium		1.00		**49.9**	50.00	0	99.8	85	115	05/24/2022
Zinc		3.00		**50.5**	50.00	0	101.1	85	115	05/24/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051225

Client Project: MOAP **Report Date:** 27-May-22

SW-846 3050B, 6010B, METALS BY ICP

Batch 192977 **SampType:** MS Units **mg/Kg-dry**

SampID: 22051225-002BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Barium		0.48		**269**	192.3	88.22	94.1	75	125	05/24/2022
Beryllium		0.05		**13.9**	4.808	9.151	99.1	75	125	05/24/2022
Boron		1.92	S	**1260**	48.08	1243	45.7	75	125	05/24/2022
Cadmium		0.19		**22.2**	4.808	17.26	102.7	75	125	05/24/2022
Chromium		0.48		**88.5**	19.23	72.67	82.4	75	125	05/24/2022
Cobalt		0.48		**58.6**	48.08	11.92	97.1	75	125	05/24/2022
Copper		0.48		**85.6**	24.04	60.33	105.3	75	125	05/24/2022
Iron		4.81	S	**45800**	192.3	44000	963.0	75	125	05/24/2022
Lead		1.44	S	**386**	48.08	321.3	135.2	75	125	05/24/2022
Manganese		0.43		**378**	48.08	324.0	111.4	75	125	05/24/2022
Nickel		0.48		**116**	48.08	72.17	90.8	75	125	05/24/2022
Selenium		3.85		**59.7**	48.08	16.37	90.1	75	125	05/24/2022
Silver		0.48		**5.12**	4.808	0.3396	99.5	75	125	05/24/2022
Thallium		4.81		**22.5**	24.04	0	93.8	75	125	05/24/2022
Vanadium		0.96		**139**	48.08	97.91	86.4	75	125	05/24/2022
Zinc		2.88	S	**1280**	48.08	1206	152.2	75	125	05/24/2022

Batch 192977 **SampType:** MSD Units **mg/Kg-dry** RPD Limit **20**

SampID: 22051225-002BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Barium		0.48		**277**	192.3	88.22	98.1	269.2	2.82	05/24/2022
Beryllium		0.05		**14.0**	4.808	9.151	100.3	13.91	0.41	05/24/2022
Boron		1.92	S	**1340**	48.08	1243	208.9	1265	6.02	05/24/2022
Cadmium		0.19		**22.8**	4.808	17.26	114.9	22.20	2.61	05/24/2022
Chromium		0.48		**89.3**	19.23	72.67	86.5	88.51	0.89	05/24/2022
Cobalt		0.48		**60.0**	48.08	11.92	100.0	58.59	2.40	05/24/2022
Copper		0.48		**85.5**	24.04	60.33	104.8	85.63	0.13	05/24/2022
Iron		4.81	S	**52100**	192.3	44000	4238	45850	12.86	05/24/2022
Lead		1.44		**371**	48.08	321.3	102.8	386.3	4.12	05/24/2022
Manganese		0.43	S	**433**	48.08	324.0	227.5	377.5	13.77	05/24/2022
Nickel		0.48		**118**	48.08	72.17	95.4	115.8	1.91	05/24/2022
Selenium		3.85		**64.2**	48.08	16.37	99.5	59.66	7.36	05/24/2022
Silver		0.48		**5.31**	4.808	0.3396	103.3	5.125	3.50	05/24/2022
Thallium		4.81		**21.7**	24.04	0	90.1	22.55	4.00	05/24/2022
Vanadium		0.96		**141**	48.08	97.91	90.0	139.4	1.26	05/24/2022
Zinc		2.88	S	**1300**	48.08	1206	188.2	1279	1.34	05/24/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051225

Client Project: MOAP **Report Date:** 27-May-22

SW-846 3050B, 6010B, METALS BY ICP

Batch 193046 **SampType:** MBLK Units **mg/Kg-dry**

SampID: MBLK-193046

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic		2.50		**< 2.50**	0.9700	0	0	-100	100	05/26/2022
Barium		0.50		**< 0.50**	0.1700	0	0	-100	100	05/26/2022
Boron		2.00		**< 2.00**	0.8600	0	0	-100	100	05/26/2022
Cadmium		0.20		**< 0.20**	0.0500	0	0	-100	100	05/26/2022
Chromium		0.50		**< 0.50**	0.2300	0	0	-100	100	05/26/2022
Cobalt		0.50		**< 0.50**	0.1900	0	0	-100	100	05/26/2022
Copper		0.50		**< 0.50**	0.2100	0	0	-100	100	05/26/2022
Iron		5.00		**< 5.00**	3.550	0	0	-100	100	05/26/2022
Lead		1.50		**< 1.50**	0.8000	0	0	-100	100	05/26/2022
Manganese		0.45		**< 0.45**	0.1600	0	0	-100	100	05/26/2022
Nickel		0.50		**< 0.50**	0.1900	0	0	-100	100	05/26/2022
Selenium		4.00		**< 4.00**	1.680	0	0	-100	100	05/26/2022
Silver		0.50		**< 0.50**	0.1100	0	0	-100	100	05/26/2022
Thallium		5.00		**< 5.00**	0.7600	0	0	-100	100	05/26/2022
Vanadium		1.00		**< 1.00**	0.1600	0	0	-100	100	05/26/2022
Zinc		3.00		**< 3.00**	1.100	0	0	-100	100	05/26/2022

Batch 193046 **SampType:** LCS Units **mg/Kg-dry**

SampID: LCS-193046

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic		2.50		**54.3**	50.00	0	108.6	85	115	05/26/2022
Barium		0.50		**207**	200.0	0	103.5	85	115	05/26/2022
Boron		2.00		**50.8**	50.00	0	101.7	85	115	05/26/2022
Cadmium		0.20		**5.09**	5.000	0	101.8	85	115	05/26/2022
Chromium		0.50		**20.4**	20.00	0	102.0	85	115	05/26/2022
Cobalt		0.50		**52.8**	50.00	0	105.7	85	115	05/26/2022
Copper		0.50		**26.9**	25.00	0	107.5	85	115	05/26/2022
Iron		5.00		**209**	200.0	0	104.5	85	115	05/26/2022
Lead		1.50		**52.4**	50.00	0	104.8	85	115	05/26/2022
Manganese		0.45		**51.4**	50.00	0	102.7	85	115	05/26/2022
Nickel		0.50		**52.7**	50.00	0	105.4	85	115	05/26/2022
Selenium		4.00		**50.1**	50.00	0	100.2	85	115	05/26/2022
Silver		0.50		**4.99**	5.000	0	99.8	85	115	05/26/2022
Thallium		5.00		**26.4**	25.00	0	105.5	85	115	05/26/2022
Vanadium		1.00		**51.5**	50.00	0	103.0	85	115	05/26/2022
Zinc		3.00		**52.6**	50.00	0	105.1	85	115	05/26/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051225

Client Project: MOAP **Report Date:** 27-May-22

SW-846 3050B, 6010B, METALS BY ICP

Batch 193046 **SampType:** MS Units **mg/Kg-dry**
SampID: 22051145-006AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Lead		1.50	S	**329**	50.00	190.8	275.7	75	125	05/26/2022

Batch 193046 **SampType:** MSD Units **mg/Kg-dry** RPD Limit **20**
SampID: 22051145-006AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lead		1.47	SR	**194**	49.02	190.8	6.3	328.7	51.58	05/26/2022

Batch 193046 **SampType:** MS Units **mg/Kg-dry**
SampID: 22051145-016AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Lead		1.44		**284**	48.08	235.4	102.2	75	125	05/26/2022

Batch 193046 **SampType:** MSD Units **mg/Kg-dry** RPD Limit **20**
SampID: 22051145-016AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lead		1.39		**274**	46.30	235.4	82.8	284.5	3.86	05/26/2022

Batch 193046 **SampType:** MS Units **mg/Kg-dry**
SampID: 22051145-024AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Lead		1.39	S	**1200**	46.30	967.4	506.6	75	125	05/26/2022

Batch 193046 **SampType:** MSD Units **mg/Kg-dry** RPD Limit **20**
SampID: 22051145-024AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lead		1.42	S	**1050**	47.17	967.4	176.1	1202	13.45	05/26/2022

Batch 193046 **SampType:** MS Units **mg/Kg-dry**
SampID: 22051145-053AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Lead		1.47	S	**213**	49.02	181.9	64.3	75	125	05/26/2022

Batch 193046 **SampType:** MSD Units **mg/Kg-dry** RPD Limit **20**
SampID: 22051145-053AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lead		1.42	S	**201**	47.17	181.9	39.7	213.4	6.17	05/26/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051225

Client Project: MOAP **Report Date:** 27-May-22

SW-846 3050B, 6010B, METALS BY ICP

Batch 193046 **SampType:** MS Units **mg/Kg-dry**

SampID: 22051225-002BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic		2.31		**299**	46.30	263.3	77.7	75	125	05/26/2022

Batch 193046 **SampType:** MSD Units **mg/Kg-dry** RPD Limit **20**

SampID: 22051225-002BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Arsenic		2.31	S	**297**	46.30	263.3	73.0	299.3	0.73	05/26/2022

SW-846 7471B

Batch 191873 **SampType:** MBLK Units **mg/Kg**

SampID: MBLK-191873

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.010		**< 0.010**	0.0045	0	0	-100	100	05/20/2022

Batch 191873 **SampType:** LCS Units **mg/Kg**

SampID: LCS-191873

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.010		**0.249**	0.2500	0	99.6	85	115	05/19/2022

Batch 191873 **SampType:** MS Units **mg/Kg-dry**

SampID: 22050989-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.012		**0.330**	0.3062	0	107.8	75	125	05/19/2022

Batch 191873 **SampType:** MSD Units **mg/Kg-dry** RPD Limit **15**

SampID: 22050989-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.013		**0.347**	0.3177	0	109.2	0.3301	4.94	05/19/2022

Batch 191873 **SampType:** MS Units **mg/Kg**

SampID: 22051226-004AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.010		**0.275**	0.2469	0.009402	107.4	75	125	05/19/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051225

Client Project: MOAP **Report Date:** 27-May-22

SW-846 7471B

Batch **191873** **SampType:** **MSD** Units **mg/Kg** RPD Limit **15**

SampID: 22051226-004AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.010		**0.269**	0.2410	0.009402	107.8	0.2745	1.99	05/19/2022

Teklab, Inc. Environmental Laboratory

Receiving Check List

http://www.teklabinc.com/

Client: Geotechnology, Inc.
Work Order: 22051225
Client Project: MOAP
Report Date: 27-May-22

Carrier: Scott Faulkner
Received By: RMW

Completed by: Mary E. Kemp
On: 18-May-22
Mary E. Kemp

Reviewed by: Elizabeth A. Hurley
On: 18-May-22
Elizabeth A. Hurley

Pages to follow: Chain of custody 1 Extra pages included 0

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C 5.0
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☑	No ☐		
Reported field parameters measured:	Field ☐	Lab ☐	NA ☑	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐		

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☐	NA ☑
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑

Any No responses must be detailed below or on the COC.

CHAIN OF CUSTODY

pg. 1 of 1 Work order # 22051225

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client:	Geotechnology, Inc.		
Address:	11816 Lackland Road		
City / State / Zip	St. Louis, MO 63146		
Contact:	Jessie Goodwin	**Phone:**	(314) 997-7440
E-Mail:	jgoodwin@geotechnology.com	**Fax:**	(314) 997-2067

Samples on: ☒ ICE ☐ BLUE ICE ☐ NO ICE 5.0 °C LTG# 3

Preserved in: ☒ LAB ☐ FIELD

FOR LAB USE ONLY

Lab Notes

Client Comments:
Metals: Sb As Ba Be B Cd Cr Co Cu Pb Fe Mn Hg Ni Se Ag Tl V Zn

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☒ No

Are these samples known to be hazardous? ☐ Yes ☒ No

Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☐ Yes ☒ No

Project Name/Number: MOAP

Sample Collector's Name: Scott Faulkner

Results Requested: ☒ Standard ☐ 1-2 Day (100% Surcharge) ☐ Other ☐ 3 Day (50% Surcharge)

Billing Instructions: GTI-4792-2022

Lab Use Only	Sample Identification	Date/Time Sampled	# and Type of Containers: UNPRES	HNO3	NaOH	H2SO4	HCL	MeOH	NaHSO4	OTHER	MATRIX: Aqueous	Drinking Water	Soil	Sludge	Special Waste	Groundwater	INDICATE ANALYSIS REQUESTED: NO3	Chloride	Fluoride	Mercury SW7471B	Metals	Nitrite	Percent Moisture	Sulfate	Total Cyanide
22051225001	Boring A 10-15	5/17/22 15:30	2										X				X	X	X	X	X	X	X	X	X
002	Boring B 10-15	5/18/22 10:45	2										X				X	X	X	X	X	X	X	X	X
003	Boring C 5-10	5/18/22 12:00	2										X				X	X	X	X	X	X	X	X	X
004	Boring D 5-10	5/17/22 09:40	2										X				X	X	X	X	X	X	X	X	X

Relinquished By	Date/Time	Received By	Date/Time
Scott Faulkner	5/18/22 14:11	Keanan Willis	5/18/22 14:14

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions.

BottleOrder: 72618

Teklab, Inc.
Environmental Laboratory
http://www.teklabinc.com/

May 31, 2022

Jessie Goodwin
Geotechnology, Inc.
11816 Lackland Road
St. Louis, MO 63146
TEL: (573) 270-1313
FAX: (314) 997-2067

Illinois	100226
Kansas	E-10374
Louisiana	05002
Louisiana	05003
Oklahoma	9978

RE: MOAP **WorkOrder:** 22051226

Dear Jessie Goodwin:

TEKLAB, INC received 4 samples on 5/18/2022 2:14:00 PM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Patrick Riley

Patrick Riley
Project Manager
(618)344-1004 ex 44
patrickriley@teklabinc.com

Report Contents

http://www.teklabinc.com/

Client: Geotechnology, Inc.
Work Order: 22051226
Client Project: MOAP
Report Date: 31-May-22

This reporting package includes the following:

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Teklab, Inc. Environmental Laboratory

Definitions

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051226

Client Project: MOAP **Report Date:** 31-May-22

Abbr	Definition
*	Analytes on report marked with an asterisk are not NELAP accredited
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
CRQL	A Client Requested Quantitation Limit is a reporting limit that varies according to customer request. The CRQL may not be less than the MDL.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilution factors.
DNI	Did not ignite
DUP	Laboratory duplicate is a replicate aliquot prepared under the same laboratory conditions and independently analyzed to obtain a measure of precision.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample is a sample matrix, free from the analytes of interest,spiked with verified known amounts of analytes and analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	"The method detection limit is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results."
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
NC	Data is not acceptable for compliance purposes
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions.
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Teklab, Inc.
Environmental Laboratory

Definitions

http://www.teklabinc.com/

Client: Geotechnology, Inc.
Work Order: 22051226

Client Project: MOAP
Report Date: 31-May-22

Qualifiers

- # - Unknown hydrocarbon
- B - Analyte detected in associated Method Blank
- C - RL shown is a Client Requested Quantitation Limit
- E - Value above quantitation range
- H - Holding times exceeded
- I - Associated internal standard was outside method criteria
- J - Analyte detected below quantitation limits
- M - Manual Integration used to determine area response
- ND - Not Detected at the Reporting Limit
- R - RPD outside accepted recovery limits
- S - Spike Recovery outside recovery limits
- T - TIC(Tentatively identified compound)
- X - Value exceeds Maximum Contaminant Level

Teklab, Inc. Environmental Laboratory

Case Narrative

http://www.teklabinc.com/

Client: Geotechnology, Inc.
Client Project: MOAP

Work Order: 22051226
Report Date: 31-May-22

Cooler Receipt Temp: 5.6 °C

Locations

Collinsville

Address 5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
Phone (618) 344-1004
Fax (618) 344-1005
Email jhriley@teklabinc.com

Springfield

Address 3920 Pintail Dr
Springfield, IL 62711-9415
Phone (217) 698-1004
Fax (217) 698-1005
Email KKlostermann@teklabinc.com

Kansas City

Address 8421 Nieman Road
Lenexa, KS 66214
Phone (913) 541-1998
Fax (913) 541-1998
Email jhriley@teklabinc.com

Collinsville Air

Address 5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
Phone (618) 344-1004
Fax (618) 344-1005
Email EHurley@teklabinc.com

Chicago

Address 1319 Butterfield Rd.
Downers Grove, IL 60515
Phone (630) 324-6855
Fax
Email arenner@teklabinc.com

Teklab, Inc. Environmental Laboratory

Accreditations

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051226

Client Project: MOAP **Report Date:** 31-May-22

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2023	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2023	Collinsville
Louisiana	LDEQ	05002	NELAP	6/30/2023	Collinsville
Louisiana	LDEQ	05003	NELAP	6/30/2023	Collinsville
Oklahoma	ODEQ	9978	NELAP	8/31/2022	Collinsville
Arkansas	ADEQ	88-0966		3/14/2023	Collinsville
Illinois	IDPH	17584		5/31/2023	Collinsville
Kentucky	UST	0073		1/31/2023	Collinsville
Missouri	MDNR	00930		5/31/2023	Collinsville
Missouri	MDNR	930		1/31/2025	Collinsville

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051226

Client Project: MOAP **Report Date:** 31-May-22

Lab ID: 22051226-001 **Client Sample ID:** Boring A 10-15

Matrix: SOLID **Collection Date:** 05/17/2022 15:30

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
ASTM D3987, SW-846 9036, IN SHAKE EXTRACT (TOTAL)								
Sulfate, SHAKE	*	10		**35**	mg/L	1	05/23/2022 16:53	R312360
EPA SW846 3550C, 5035A, ASTM D2974								
Percent Moisture	*	0.1		**30.7**	%	1	05/27/2022 14:33	R312583
SW-846 1312, 9012A, IN SPLP EXTRACT								
Cyanide	*	0.005		**< 0.005**	mg/L	1	05/24/2022 8:49	192974
SW-846 1312, 9214, IN SPLP EXTRACT								
Fluoride	*	1.00		**< 1.00**	mg/L	1	05/26/2022 14:18	R312507
SW-846 1312, 9251, IN SPLP EXTRACT								
Chloride	*	1		**< 1**	mg/L	1	05/23/2022 16:54	R312352
SW-846 1312, EPA 600 353.2, IN SPLP EXTRACT (TOTAL)								
Nitrogen, Nitrate-Nitrite (as N)	*	0.05	H	**0.12**	mg/L	1	05/24/2022 15:53	R312383
SW-846 1312, STANDARD METHODS 4500-NO2 B (TOTAL) 2000 IN SPLP EXTRACT								
Nitrogen, Nitrite (as N)	*	0.05	BJ	**0.03**	mg/L	1	05/24/2022 12:21	R312365
Contamination present in the MBLK. Sample results below the reporting limit are reportable per the TNI Standard.								
SW-846 1312, 7470A IN SPLP EXTRACT								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	05/24/2022 13:55	193009
SW-846 3050B, 6010B, METALS BY ICP								
Antimony	NELAP	4.90		**6.56**	mg/Kg-dry	1	05/24/2022 15:46	192912
Arsenic	NELAP	2.45		**51.7**	mg/Kg-dry	1	05/24/2022 16:09	192977
Barium	NELAP	0.49		**104**	mg/Kg-dry	1	05/24/2022 16:09	192977
Beryllium	NELAP	0.05		**5.69**	mg/Kg-dry	1	05/24/2022 16:09	192977
Boron	NELAP	1.96		**1110**	mg/Kg-dry	1	05/24/2022 16:09	192977
Cadmium	NELAP	0.20		**14.2**	mg/Kg-dry	1	05/24/2022 16:09	192977
Chromium	NELAP	0.49		**58.2**	mg/Kg-dry	1	05/24/2022 16:09	192977
Cobalt	NELAP	0.49		**7.58**	mg/Kg-dry	1	05/24/2022 16:09	192977
Copper	NELAP	0.49		**28.4**	mg/Kg-dry	1	05/24/2022 16:09	192977
Iron	NELAP	4.90		**39400**	mg/Kg-dry	1	05/24/2022 16:09	192977
Lead	NELAP	1.47		**148**	mg/Kg-dry	1	05/24/2022 16:09	192977
Manganese	NELAP	0.44		**399**	mg/Kg-dry	1	05/24/2022 16:09	192977
Nickel	NELAP	0.49		**34.8**	mg/Kg-dry	1	05/24/2022 16:09	192977
Selenium	NELAP	3.92		**16.8**	mg/Kg-dry	1	05/24/2022 16:09	192977
Silver	NELAP	0.49	J	**0.25**	mg/Kg-dry	1	05/24/2022 16:09	192977
Thallium	NELAP	4.90		**< 4.90**	mg/Kg-dry	1	05/24/2022 16:09	192977
Vanadium	NELAP	0.98		**79.5**	mg/Kg-dry	1	05/24/2022 16:09	192977
Zinc	NELAP	2.94		**783**	mg/Kg-dry	1	05/24/2022 16:09	192977
SW-846 7471B								
Mercury	NELAP	0.014		**0.018**	mg/Kg-dry	1	05/19/2022 17:09	191873

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051226

Client Project: MOAP **Report Date:** 31-May-22

Lab ID: 22051226-002 **Client Sample ID:** Boring B 10-15

Matrix: SOLID **Collection Date:** 05/18/2022 10:45

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
ASTM D3987, SW-846 9036, IN SHAKE EXTRACT (TOTAL)								
Sulfate, SHAKE	*	10		**37**	mg/L	1	05/23/2022 17:15	R312360
EPA SW846 3550C, 5035A, ASTM D2974								
Percent Moisture	*	0.1		**27.7**	%	1	05/27/2022 14:34	R312583
SW-846 1312, 9012A, IN SPLP EXTRACT								
Cyanide	*	0.005		**< 0.005**	mg/L	1	05/24/2022 8:53	192974
SW-846 1312, 9214, IN SPLP EXTRACT								
Fluoride	*	1.00		**< 1.00**	mg/L	1	05/26/2022 14:19	R312507
SW-846 1312, 9251, IN SPLP EXTRACT								
Chloride	*	1		**< 1**	mg/L	1	05/23/2022 17:15	R312352
SW-846 1312, EPA 600 353.2, IN SPLP EXTRACT (TOTAL)								
Nitrogen, Nitrate-Nitrite (as N)	*	0.05	H	**0.78**	mg/L	1	05/24/2022 16:02	R312383
SW-846 1312, STANDARD METHODS 4500-NO2 B (TOTAL) 2000 IN SPLP EXTRACT								
Nitrogen, Nitrite (as N)	*	0.05	BJ	**0.02**	mg/L	1	05/24/2022 12:22	R312365
Contamination present in the MBLK. Sample results below the reporting limit are reportable per the TNI Standard.								
SW-846 1312, 7470A IN SPLP EXTRACT								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	05/24/2022 13:57	193009
SW-846 3050B, 6010B, METALS BY ICP								
Antimony	NELAP	4.81		**16.1**	mg/Kg-dry	1	05/24/2022 15:50	192912
Arsenic	NELAP	2.45		**176**	mg/Kg-dry	1	05/24/2022 16:10	192977
Barium	NELAP	0.49		**109**	mg/Kg-dry	1	05/24/2022 16:10	192977
Beryllium	NELAP	0.05		**7.75**	mg/Kg-dry	1	05/24/2022 16:10	192977
Boron	NELAP	1.96		**1190**	mg/Kg-dry	1	05/24/2022 16:10	192977
Cadmium	NELAP	0.20		**16.0**	mg/Kg-dry	1	05/24/2022 16:10	192977
Chromium	NELAP	0.49		**53.0**	mg/Kg-dry	1	05/24/2022 16:10	192977
Cobalt	NELAP	0.49		**12.1**	mg/Kg-dry	1	05/24/2022 16:10	192977
Copper	NELAP	0.49		**59.6**	mg/Kg-dry	1	05/24/2022 16:10	192977
Iron	NELAP	4.90		**48800**	mg/Kg-dry	1	05/24/2022 16:10	192977
Lead	NELAP	1.47		**268**	mg/Kg-dry	1	05/24/2022 16:10	192977
Manganese	NELAP	0.44		**344**	mg/Kg-dry	1	05/24/2022 16:10	192977
Nickel	NELAP	0.49		**40.4**	mg/Kg-dry	1	05/24/2022 16:10	192977
Selenium	NELAP	3.92		**19.4**	mg/Kg-dry	1	05/24/2022 16:10	192977
Silver	NELAP	0.49	J	**0.25**	mg/Kg-dry	1	05/24/2022 16:10	192977
Thallium	NELAP	4.90		**< 4.90**	mg/Kg-dry	1	05/24/2022 16:10	192977
Vanadium	NELAP	0.98		**80.6**	mg/Kg-dry	1	05/24/2022 16:10	192977
Zinc	NELAP	2.94		**807**	mg/Kg-dry	1	05/24/2022 16:10	192977
SW-846 7471B								
Mercury	NELAP	0.013	J	**0.010**	mg/Kg-dry	1	05/19/2022 17:11	191873

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051226

Client Project: MOAP **Report Date:** 31-May-22

Lab ID: 22051226-003 **Client Sample ID:** Boring C 5-10

Matrix: SOLID **Collection Date:** 05/16/2022 12:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
ASTM D3987, SW-846 9036, IN SHAKE EXTRACT (TOTAL)								
Sulfate, SHAKE	*	20		**55**	mg/L	2	05/23/2022 17:41	R312360
EPA SW846 3550C, 5035A, ASTM D2974								
Percent Moisture	*	0.1		**32.6**	%	1	05/27/2022 14:34	R312583
SW-846 1312, 9012A, IN SPLP EXTRACT								
Cyanide	*	0.005		**< 0.005**	mg/L	1	05/24/2022 8:57	192974
SW-846 1312, 9214, IN SPLP EXTRACT								
Fluoride	*	1.00		**< 1.00**	mg/L	1	05/26/2022 14:21	R312507
SW-846 1312, 9251, IN SPLP EXTRACT								
Chloride	*	1		**< 1**	mg/L	1	05/23/2022 17:23	R312352
SW-846 1312, EPA 600 353.2, IN SPLP EXTRACT (TOTAL)								
Nitrogen, Nitrate-Nitrite (as N)	*	0.05	H	**0.50**	mg/L	1	05/24/2022 16:06	R312383
SW-846 1312, STANDARD METHODS 4500-NO2 B (TOTAL) 2000 IN SPLP EXTRACT								
Nitrogen, Nitrite (as N)	*	0.05	BJ	**0.04**	mg/L	1	05/24/2022 12:23	R312365
Contamination present in the MBLK. Sample results below the reporting limit are reportable per the TNI Standard.								
SW-846 1312, 7470A IN SPLP EXTRACT								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	05/24/2022 14:04	193009
SW-846 3050B, 6010B, METALS BY ICP								
Antimony	NELAP	4.72		**18.0**	mg/Kg-dry	1	05/24/2022 15:54	192912
Arsenic	NELAP	2.50		**101**	mg/Kg-dry	1	05/25/2022 14:15	193019
Barium	NELAP	0.50		**138**	mg/Kg-dry	1	05/25/2022 14:15	193019
Beryllium	NELAP	0.05		**10.2**	mg/Kg-dry	1	05/25/2022 14:15	193019
Boron	NELAP	2.00		**1750**	mg/Kg-dry	1	05/25/2022 14:15	193019
Cadmium	NELAP	0.20		**18.9**	mg/Kg-dry	1	05/25/2022 14:15	193019
Chromium	NELAP	0.50		**67.5**	mg/Kg-dry	1	05/25/2022 14:15	193019
Cobalt	NELAP	0.50		**9.31**	mg/Kg-dry	1	05/25/2022 14:15	193019
Copper	NELAP	0.50		**49.1**	mg/Kg-dry	1	05/25/2022 14:15	193019
Iron	NELAP	5.00		**44800**	mg/Kg-dry	1	05/25/2022 14:15	193019
Lead	NELAP	1.50		**163**	mg/Kg-dry	1	05/25/2022 14:15	193019
Manganese	NELAP	0.45		**448**	mg/Kg-dry	1	05/25/2022 14:15	193019
Nickel	NELAP	0.50		**38.9**	mg/Kg-dry	1	05/25/2022 14:15	193019
Selenium	NELAP	4.00		**11.2**	mg/Kg-dry	1	05/25/2022 14:15	193019
Silver	NELAP	0.50	J	**0.19**	mg/Kg-dry	1	05/25/2022 14:15	193019
Thallium	NELAP	5.00		**6.03**	mg/Kg-dry	1	05/25/2022 14:15	193019
Vanadium	NELAP	1.00		**113**	mg/Kg-dry	1	05/25/2022 14:15	193019
Zinc	NELAP	3.00		**1030**	mg/Kg-dry	1	05/25/2022 14:15	193019
SW-846 7471B								
Mercury	NELAP	0.014		**< 0.014**	mg/Kg-dry	1	05/19/2022 17:14	191873

Laboratory Results

Teklab, Inc. Environmental Laboratory
http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051226

Client Project: MOAP **Report Date:** 31-May-22

Lab ID: 22051226-004 **Client Sample ID:** Boring D 5-10

Matrix: SOLID **Collection Date:** 05/17/2022 9:40

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
ASTM D3987, SW-846 9036, IN SHAKE EXTRACT (TOTAL)								
Sulfate, SHAKE	*	20		**54**	mg/L	2	05/23/2022 17:49	R312360
EPA SW846 3550C, 5035A, ASTM D2974								
Percent Moisture	*	0.1		**39.4**	%	1	05/27/2022 14:34	R312583
SW-846 1312, 9012A, IN SPLP EXTRACT								
Cyanide	*	0.005		**< 0.005**	mg/L	1	05/24/2022 9:02	192974
SW-846 1312, 9214, IN SPLP EXTRACT								
Fluoride	*	1.00		**< 1.00**	mg/L	1	05/26/2022 14:23	R312507
SW-846 1312, 9251, IN SPLP EXTRACT								
Chloride	*	1		**< 1**	mg/L	1	05/23/2022 17:44	R312352
SW-846 1312, EPA 600 353.2, IN SPLP EXTRACT (TOTAL)								
Nitrogen, Nitrate-Nitrite (as N)	*	0.27	H	**4.78**	mg/L	5	05/24/2022 16:11	R312383
SW-846 1312, STANDARD METHODS 4500-NO2 B (TOTAL) 2000 IN SPLP EXTRACT								
Nitrogen, Nitrite (as N)	*	0.05	BJ	**0.03**	mg/L	1	05/24/2022 12:23	R312365
Contamination present in the MBLK. Sample results below the reporting limit are reportable per the TNI Standard.								
SW-846 1312, 7470A IN SPLP EXTRACT								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	05/24/2022 14:06	193009
SW-846 3050B, 6010B, METALS BY ICP								
Antimony	NELAP	4.90		**8.28**	mg/Kg-dry	1	05/25/2022 14:16	192912
Arsenic	NELAP	2.45		**87.3**	mg/Kg-dry	1	05/25/2022 14:17	193019
Barium	NELAP	0.49		**114**	mg/Kg-dry	1	05/25/2022 14:17	193019
Beryllium	NELAP	0.05		**7.35**	mg/Kg-dry	1	05/25/2022 14:17	193019
Boron	NELAP	1.96		**1890**	mg/Kg-dry	1	05/25/2022 14:17	193019
Cadmium	NELAP	0.20		**24.0**	mg/Kg-dry	1	05/25/2022 14:17	193019
Chromium	NELAP	0.49		**65.3**	mg/Kg-dry	1	05/25/2022 14:17	193019
Cobalt	NELAP	0.49		**7.77**	mg/Kg-dry	1	05/25/2022 14:17	193019
Copper	NELAP	0.49		**33.7**	mg/Kg-dry	1	05/25/2022 14:17	193019
Iron	NELAP	4.90		**30900**	mg/Kg-dry	1	05/25/2022 14:17	193019
Lead	NELAP	1.47		**161**	mg/Kg-dry	1	05/25/2022 14:17	193019
Manganese	NELAP	0.44		**491**	mg/Kg-dry	1	05/25/2022 14:17	193019
Nickel	NELAP	0.49		**28.3**	mg/Kg-dry	1	05/25/2022 14:17	193019
Selenium	NELAP	3.92		**7.60**	mg/Kg-dry	1	05/25/2022 14:17	193019
Silver	NELAP	0.49	J	**0.15**	mg/Kg-dry	1	05/25/2022 14:17	193019
Thallium	NELAP	4.9	J	**4.7**	mg/Kg-dry	1	05/25/2022 14:17	193019
Vanadium	NELAP	0.98		**87.3**	mg/Kg-dry	1	05/25/2022 14:17	193019
Zinc	NELAP	2.94		**1350**	mg/Kg-dry	1	05/25/2022 14:17	193019
SW-846 7471B								
Mercury	NELAP	0.016	J	**0.016**	mg/Kg-dry	1	05/19/2022 17:16	191873

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051226

Client Project: MOAP **Report Date:** 31-May-22

ASTM D3987, SW-846 9036, IN SHAKE EXTRACT (TOTAL)

Batch R312360 **SampType:** MBLK Units **mg/L**
SampID: MBLK-192945

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate, SHAKE	*	10		**< 10**	6.140	0	0	-100	100	05/23/2022

Batch R312360 **SampType:** MBLK Units **mg/L**
SampID: MB-R312360

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate, SHAKE	*	10		**< 10**	6.140	0	0	-100	100	05/23/2022

Batch R312360 **SampType:** LCS Units **mg/L**
SampID: LCS-R312360

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate, SHAKE	*	10		**21**	20.00	0	104.6	90	110	05/23/2022

Batch R312360 **SampType:** MS Units **mg/L**
SampID: 22051226-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate, SHAKE	*	10	E	**54**	20.00	35.49	93.6	85	115	05/23/2022

Batch R312360 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 22051226-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate, SHAKE	*	10	E	**54**	20.00	35.49	94.4	54.21	0.31	05/23/2022

EPA SW846 3550C, 5035A, ASTM D2974

Batch R312583 **SampType:** LCS Units **%**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Percent Moisture	*	0.1		**99.0**	99.00	0	100.0	90	110	05/27/2022

Batch R312583 **SampType:** LCSQC Units **%**
SampID: LCSQC

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Percent Moisture	*	0.1		**99.0**	99.00	0	100.0	90	110	05/27/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051226

Client Project: MOAP **Report Date:** 31-May-22

SW-846 1312, 9012A, IN SPLP EXTRACT

Batch 192974 **SampType:** MBLK Units **mg/L**
SampID: MBLK 220523 TCN1

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Cyanide		0.005		**< 0.005**	0.0015	0	0	-100	100	05/24/2022

Batch 192974 **SampType:** LCS Units **mg/L**
SampID: LCS 220523 TCN1

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Cyanide		0.005		**0.025**	0.0250	0	98.3	90	110	05/24/2022

Batch 192974 **SampType:** MS Units **µg/L**
SampID: 22051330-001CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Cyanide		5.00	S	**24.1**	25.00	8.170	63.6	90	110	05/24/2022

Batch 192974 **SampType:** MSD Units **µg/L** RPD Limit **15**
SampID: 22051330-001CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Cyanide		5.00	S	**26.9**	25.00	8.170	74.7	24.08	10.92	05/24/2022

Batch 192974 **SampType:** MS Units **mg/L**
SampID: 22051405-003DMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Cyanide		0.005		**0.025**	0.0250	0	99.8	75	125	05/24/2022

Batch 192974 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 22051405-003DMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Cyanide		0.005		**0.024**	0.0250	0	97.7	0.02494	2.07	05/24/2022

SW-846 1312, 9214, IN SPLP EXTRACT

Batch R312507 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		1.00		**< 1.00**	0.0370	0	0	-100	100	05/26/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051226

Client Project: MOAP **Report Date:** 31-May-22

SW-846 1312, 9214, IN SPLP EXTRACT

Batch R312507 **SampType:** MBLK Units **mg/L**
SampID: MBLK-192945

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	*	1.00		**< 1.00**	0.0370	0	0	-100	100	05/26/2022
Fluoride	*	1.00		**< 1.00**	0.0370	0	0	-100	100	05/26/2022

Batch R312507 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		1.00	J	**1.0**	1.000	0	99.7	90	110	05/26/2022

Batch R312507 **SampType:** MS Units **mg/L**
SampID: 22051226-004AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	*	1.00		**2.44**	2.000	0	121.9	75	125	05/26/2022

Batch R312507 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 22051226-004AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	*	1.00		**2.42**	2.000	0	120.8	2.438	0.91	05/26/2022

SW-846 1312, 9251, IN SPLP EXTRACT

Batch R312352 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		1		**< 1**	0.5000	0	0	-100	100	05/23/2022

Batch R312352 **SampType:** MBLK Units **mg/Kg**
SampID: MBLK-191779

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	*	10		**< 10**	4.975	0	0	-100	100	05/23/2022

Batch R312352 **SampType:** MBLK Units **mg/Kg**
SampID: MBLK-191880

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	*	10		**< 10**	4.988	0	0	-100	100	05/23/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051226

Client Project: MOAP **Report Date:** 31-May-22

SW-846 1312, 9251, IN SPLP EXTRACT

Batch R312352 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		1		**22**	20.00	0	109.0	90	110	05/23/2022

Batch R312352 **SampType:** MS Units **mg/L**
SampID: 22050545-001CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		1		**36**	20.00	16.20	99.2	85	115	05/23/2022

Batch R312352 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 22050545-001CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		1		**36**	20.00	16.20	99.8	36.03	0.33	05/23/2022

Batch R312352 **SampType:** MS Units **mg/L**
SampID: 22051201-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		1		**36**	20.00	16.95	94.2	85	115	05/23/2022

Batch R312352 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 22051201-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		1		**35**	20.00	16.95	92.5	35.78	0.95	05/23/2022

Batch R312352 **SampType:** MS Units **mg/Kg-dry**
SampID: 22051225-004AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	*	16		**321**	315.0	0	101.9	85	115	05/23/2022

Batch R312352 **SampType:** MSD Units **mg/Kg-dry** RPD Limit **15**
SampID: 22051225-004AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride	*	16		**317**	315.0	0	100.7	321.0	1.18	05/23/2022

Batch R312352 **SampType:** MS Units **mg/L**
SampID: 22051226-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	*	1		**20**	20.00	0	101.2	85	115	05/23/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051226

Client Project: MOAP **Report Date:** 31-May-22

SW-846 1312, 9251, IN SPLP EXTRACT

Batch R312352 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 22051226-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride	*	1		**20**	20.00	0	100.4	20.23	0.74	05/23/2022

Batch R312352 **SampType:** MS Units **mg/L**

SampID: 22051235-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		1		**38**	20.00	16.49	107.0	85	115	05/23/2022

Batch R312352 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 22051235-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		1		**38**	20.00	16.49	108.6	37.88	0.87	05/23/2022

Batch R312352 **SampType:** MS Units **mg/L**

SampID: 22051330-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		1		**32**	20.00	12.39	99.0	85	115	05/23/2022

Batch R312352 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 22051330-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		1		**32**	20.00	12.39	99.7	32.20	0.40	05/23/2022

SW-846 1312, EPA 600 353.2, IN SPLP EXTRACT (TOTAL)

Batch R312383 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**< 0.050**	0.0090	0	0	-100	100	05/24/2022

Batch R312383 **SampType:** MBLK Units **mg/L**

SampID: MBLK-192945

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	*	0.05		**0.05**	0.0540	0	100.0	-100	100	05/24/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051226

Client Project: MOAP **Report Date:** 31-May-22

SW-846 1312, EPA 600 353.2, IN SPLP EXTRACT (TOTAL)

Batch R312383 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.500**	0.5000	0	100.0	90	110	05/24/2022

Batch R312383 **SampType:** MS Units **mg/L**
SampID: 22051226-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	*	0.05	H	**0.35**	0.2500	0.1150	95.6	90	110	05/24/2022

Batch R312383 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 22051226-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	*	0.05	H	**0.35**	0.2500	0.1150	94.8	0.3540	0.57	05/24/2022

Batch R312383 **SampType:** MS Units **mg/L**
SampID: 22051347-001CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.244**	0.2500	0.01600	91.2	90	110	05/24/2022

Batch R312383 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 22051347-001CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050	S	**0.234**	0.2500	0.01600	87.2	0.2440	4.18	05/24/2022

Batch R312383 **SampType:** MS Units **mg/L**
SampID: 22051533-008AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50		**20.7**	12.50	8.613	96.8	90	110	05/24/2022

Batch R312383 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 22051533-008AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50		**20.6**	12.50	8.613	95.8	20.71	0.57	05/24/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051226

Client Project: MOAP **Report Date:** 31-May-22

SW-846 1312, STANDARD METHODS 4500-NO2 B (TOTAL) 2000 IN SPLP EXTRACT

Batch R312365 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**< 0.05**	0.0250	0	0	-100	100	05/24/2022
Nitrogen, Nitrite (as N)		0.05		**< 0.05**	0.0250	0	0	-100	100	05/24/2022

Batch R312365 **SampType:** MBLK Units **mg/L**
SampID: MBLK-192945

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	*	0.05	J	**0.02**	0.0250	0	80.0	-100	100	05/24/2022

Batch R312365 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.25		**1.26**	1.220	0	103.3	90	110	05/24/2022
Nitrogen, Nitrite (as N)		0.25		**1.26**	1.220	0	103.3	90	110	05/24/2022

Batch R312365 **SampType:** MS Units **mg/L**
SampID: 22051436-002AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.50**	0.5000	0	99.8	85	115	05/24/2022

Batch R312365 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 22051436-002AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.50**	0.5000	0	99.4	0.4990	0.40	05/24/2022

Batch R312365 **SampType:** MS Units **mg/L**
SampID: 22051475-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.50**	0.5000	0	101.0	85	115	05/24/2022

Batch R312365 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 22051475-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**0.51**	0.5000	0	101.4	0.5050	0.40	05/24/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051226

Client Project: MOAP **Report Date:** 31-May-22

SW-846 1312, 7470A IN SPLP EXTRACT

Batch 193009 **SampType:** MBLK Units **mg/L**
SampID: MBLK-193009

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**< 0.00020**	0.0001	0	0	-100	100	05/24/2022

Batch 193009 **SampType:** LCS Units **mg/L**
SampID: LCS-193009

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00516**	0.0050	0	103.2	85	115	05/24/2022

Batch 193009 **SampType:** MS Units **mg/L**
SampID: 22051226-002AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00503**	0.0050	0	100.6	75	125	05/24/2022

Batch 193009 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 22051226-002AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00501**	0.0050	0	100.1	0.005029	0.47	05/24/2022

SW-846 3050B, 6010B, METALS BY ICP

Batch 192912 **SampType:** MBLK Units **mg/Kg-dry**
SampID: MBLK-192912

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		5.00		**< 5.00**	1.230	0	0	-100	100	05/23/2022

Batch 192912 **SampType:** LCS Units **mg/Kg-dry**
SampID: LCS-192912

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		5.00		**46.4**	50.00	0	92.8	85	115	05/23/2022

Batch 192912 **SampType:** MS Units **mg/Kg-dry**
SampID: 22051225-002BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		4.55		**64.6**	45.45	25.99	85.0	75	125	05/24/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051226

Client Project: MOAP **Report Date:** 31-May-22

SW-846 3050B, 6010B, METALS BY ICP

Batch 192912 **SampType:** MSD Units **mg/Kg-dry** RPD Limit **20**

SampID: 22051225-002BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		4.63		**65.9**	46.30	25.99	86.2	64.63	1.93	05/24/2022

Batch 192912 **SampType:** MS Units **mg/Kg-dry**

SampID: 22051226-003AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		4.81		**62.0**	48.08	18.01	91.5	75	125	05/24/2022

Batch 192912 **SampType:** MSD Units **mg/Kg-dry** RPD Limit **20**

SampID: 22051226-003AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony		4.81		**60.2**	48.08	18.01	87.7	62.02	3.01	05/24/2022

Batch 192977 **SampType:** MBLK Units **mg/Kg-dry**

SampID: MBLK-192977

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic		2.50		**< 2.50**	0.9700	0	0	-100	100	05/24/2022
Barium		0.50		**< 0.50**	0.1700	0	0	-100	100	05/24/2022
Beryllium		0.05		**< 0.05**	0.0110	0	0	-100	100	05/24/2022
Boron		2.00		**< 2.00**	0.8600	0	0	-100	100	05/24/2022
Cadmium		0.20		**< 0.20**	0.0500	0	0	-100	100	05/24/2022
Chromium		0.50		**< 0.50**	0.2300	0	0	-100	100	05/24/2022
Cobalt		0.50		**< 0.50**	0.1900	0	0	-100	100	05/24/2022
Copper		0.50		**< 0.50**	0.2100	0	0	-100	100	05/24/2022
Iron		5.00		**< 5.00**	3.550	0	0	-100	100	05/24/2022
Lead		1.50		**< 1.50**	0.5900	0	0	-100	100	05/24/2022
Manganese		0.45		**< 0.45**	0.1600	0	0	-100	100	05/24/2022
Nickel		0.50		**< 0.50**	0.1900	0	0	-100	100	05/24/2022
Selenium		4.00		**< 4.00**	1.680	0	0	-100	100	05/24/2022
Silver		0.50		**< 0.50**	0.1100	0	0	-100	100	05/24/2022
Thallium		5.00		**< 5.00**	0.7600	0	0	-100	100	05/24/2022
Vanadium		1.00		**< 1.00**	0.1600	0	0	-100	100	05/24/2022
Zinc		3.00		**< 3.00**	1.100	0	0	-100	100	05/24/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051226

Client Project: MOAP **Report Date:** 31-May-22

SW-846 3050B, 6010B, METALS BY ICP

Batch 192977 **SampType:** LCS Units **mg/Kg-dry**

SampID: LCS-192977

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic		2.50		**51.6**	50.00	0	103.2	85	115	05/24/2022
Barium		0.50		**203**	200.0	0	101.5	85	115	05/24/2022
Beryllium		0.05		**5.00**	5.000	0	100.0	85	115	05/24/2022
Boron		2.00		**49.2**	50.00	0	98.5	85	115	05/24/2022
Cadmium		0.20		**4.96**	5.000	0	99.2	85	115	05/24/2022
Chromium		0.50		**19.9**	20.00	0	99.5	85	115	05/24/2022
Cobalt		0.50		**51.1**	50.00	0	102.1	85	115	05/24/2022
Copper		0.50		**26.4**	25.00	0	105.6	85	115	05/24/2022
Iron		5.00		**206**	200.0	0	103.0	85	115	05/24/2022
Lead		1.50		**50.4**	50.00	0	100.9	85	115	05/24/2022
Manganese		0.45		**48.9**	50.00	0	97.7	85	115	05/24/2022
Nickel		0.50		**50.1**	50.00	0	100.3	85	115	05/24/2022
Selenium		4.00		**46.2**	50.00	0	92.3	85	115	05/24/2022
Silver		0.50		**5.07**	5.000	0	101.4	85	115	05/24/2022
Thallium		5.00		**24.9**	25.00	0	99.8	85	115	05/24/2022
Vanadium		1.00		**49.9**	50.00	0	99.8	85	115	05/24/2022
Zinc		3.00		**50.5**	50.00	0	101.1	85	115	05/24/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051226

Client Project: MOAP **Report Date:** 31-May-22

SW-846 3050B, 6010B, METALS BY ICP

Batch 192977 **SampType:** MS Units **mg/Kg-dry**

SampID: 22051225-002BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Barium		0.48		**269**	192.3	88.22	94.1	75	125	05/24/2022
Beryllium		0.05		**13.9**	4.808	9.151	99.1	75	125	05/24/2022
Boron		1.92	S	**1260**	48.08	1243	45.7	75	125	05/24/2022
Cadmium		0.19		**22.2**	4.808	17.26	102.7	75	125	05/24/2022
Chromium		0.48		**88.5**	19.23	72.67	82.4	75	125	05/24/2022
Cobalt		0.48		**58.6**	48.08	11.92	97.1	75	125	05/24/2022
Copper		0.48		**85.6**	24.04	60.33	105.3	75	125	05/24/2022
Iron		4.81	S	**45800**	192.3	44000	963.0	75	125	05/24/2022
Lead		1.44	S	**386**	48.08	321.3	135.2	75	125	05/24/2022
Manganese		0.43		**378**	48.08	324.0	111.4	75	125	05/24/2022
Nickel		0.48		**116**	48.08	72.17	90.8	75	125	05/24/2022
Selenium		3.85		**59.7**	48.08	16.37	90.1	75	125	05/24/2022
Silver		0.48		**5.12**	4.808	0.3396	99.5	75	125	05/24/2022
Thallium		4.81		**22.5**	24.04	0	93.8	75	125	05/24/2022
Vanadium		0.96		**139**	48.08	97.91	86.4	75	125	05/24/2022
Zinc		2.88	S	**1280**	48.08	1206	152.2	75	125	05/24/2022

Batch 192977 **SampType:** MSD Units **mg/Kg-dry** RPD Limit **20**

SampID: 22051225-002BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Barium		0.48		**277**	192.3	88.22	98.1	269.2	2.82	05/24/2022
Beryllium		0.05		**14.0**	4.808	9.151	100.3	13.91	0.41	05/24/2022
Boron		1.92	S	**1340**	48.08	1243	208.9	1265	6.02	05/24/2022
Cadmium		0.19		**22.8**	4.808	17.26	114.9	22.20	2.61	05/24/2022
Chromium		0.48		**89.3**	19.23	72.67	86.5	88.51	0.89	05/24/2022
Cobalt		0.48		**60.0**	48.08	11.92	100.0	58.59	2.40	05/24/2022
Copper		0.48		**85.5**	24.04	60.33	104.8	85.63	0.13	05/24/2022
Iron		4.81	S	**52100**	192.3	44000	4238	45850	12.86	05/24/2022
Lead		1.44		**371**	48.08	321.3	102.8	386.3	4.12	05/24/2022
Manganese		0.43	S	**433**	48.08	324.0	227.5	377.5	13.77	05/24/2022
Nickel		0.48		**118**	48.08	72.17	95.4	115.8	1.91	05/24/2022
Selenium		3.85		**64.2**	48.08	16.37	99.5	59.66	7.36	05/24/2022
Silver		0.48		**5.31**	4.808	0.3396	103.3	5.125	3.50	05/24/2022
Thallium		4.81		**21.7**	24.04	0	90.1	22.55	4.00	05/24/2022
Vanadium		0.96		**141**	48.08	97.91	90.0	139.4	1.26	05/24/2022
Zinc		2.88	S	**1300**	48.08	1206	188.2	1279	1.34	05/24/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051226

Client Project: MOAP **Report Date:** 31-May-22

SW-846 3050B, 6010B, METALS BY ICP

Batch 193019 **SampType:** MBLK Units **mg/Kg-dry**

SampID: MBLK-193019

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic		2.50		**< 2.50**	0.9700	0	0	-100	100	05/25/2022
Barium		0.50		**< 0.50**	0.1700	0	0	-100	100	05/25/2022
Beryllium		0.05	J	**0.04**	0.0400	0	100.0	-100	100	05/25/2022
Boron		2.00		**< 2.00**	0.8600	0	0	-100	100	05/25/2022
Cadmium		0.20		**< 0.20**	0.0500	0	0	-100	100	05/25/2022
Chromium		0.50		**< 0.50**	0.2300	0	0	-100	100	05/25/2022
Cobalt		0.50		**< 0.50**	0.1900	0	0	-100	100	05/25/2022
Copper		0.50		**< 0.50**	0.2100	0	0	-100	100	05/25/2022
Iron		5.00		**< 5.00**	3.550	0	0	-100	100	05/25/2022
Lead		1.50		**< 1.50**	0.5900	0	0	-100	100	05/25/2022
Manganese		0.45		**< 0.45**	0.1600	0	0	-100	100	05/25/2022
Nickel		0.50		**< 0.50**	0.1900	0	0	-100	100	05/25/2022
Selenium		4.00		**< 4.00**	1.680	0	0	-100	100	05/25/2022
Silver		0.50		**< 0.50**	0.1100	0	0	-100	100	05/25/2022
Thallium		5.00		**< 5.00**	0.7600	0	0	-100	100	05/25/2022
Vanadium		1.00		**< 1.00**	0.1600	0	0	-100	100	05/25/2022
Zinc		3.00		**< 3.00**	1.100	0	0	-100	100	05/25/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051226

Client Project: MOAP **Report Date:** 31-May-22

SW-846 3050B, 6010B, METALS BY ICP

Batch 193019 **SampType:** LCS Units **mg/Kg-dry**

SampID: LCS-193019

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic		2.50		**50.9**	50.00	0	101.8	85	115	05/25/2022
Barium		0.50		**201**	200.0	0	100.5	85	115	05/25/2022
Beryllium		0.05		**5.07**	5.000	0	101.4	85	115	05/25/2022
Boron		2.00		**50.1**	50.00	0	100.1	85	115	05/25/2022
Cadmium		0.20		**4.94**	5.000	0	98.8	85	115	05/25/2022
Chromium		0.50		**19.8**	20.00	0	98.9	85	115	05/25/2022
Cobalt		0.50		**50.5**	50.00	0	100.9	85	115	05/25/2022
Copper		0.50		**26.0**	25.00	0	104.2	85	115	05/25/2022
Iron		5.00		**204**	200.0	0	102.0	85	115	05/25/2022
Lead		1.50		**50.5**	50.00	0	101.0	85	115	05/25/2022
Manganese		0.45		**47.8**	50.00	0	95.6	85	115	05/25/2022
Nickel		0.50		**50.5**	50.00	0	100.9	85	115	05/25/2022
Selenium		4.00		**47.5**	50.00	0	95.0	85	115	05/25/2022
Silver		0.50		**4.94**	5.000	0	98.8	85	115	05/25/2022
Thallium		5.00		**24.4**	25.00	0	97.7	85	115	05/25/2022
Vanadium		1.00		**49.6**	50.00	0	99.2	85	115	05/25/2022
Zinc		3.00		**51.0**	50.00	0	101.9	85	115	05/25/2022

Batch 193019 **SampType:** MS Units **mg/Kg-dry**

SampID: 22051013-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Manganese		0.45	S	**756**	50.00	651.1	210.5	75	125	05/25/2022

Batch 193019 **SampType:** MSD Units **mg/Kg-dry** RPD Limit **20**

SampID: 22051013-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Manganese		0.44	SR	**995**	49.02	651.1	701.2	756.4	27.24	05/25/2022

Batch 193019 **SampType:** MS Units **mg/Kg-dry**

SampID: 22051371-004AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Lead		1.44		**56.7**	48.08	9.692	97.7	75	125	05/25/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22051226

Client Project: MOAP **Report Date:** 31-May-22

SW-846 3050B, 6010B, METALS BY ICP

Batch 193019 **SampType:** MSD Units **mg/Kg-dry** RPD Limit **20**

SampID: 22051371-004AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lead		1.39		**55.6**	46.30	9.692	99.1	56.68	1.98	05/25/2022

SW-846 7471B

Batch 191873 **SampType:** MBLK Units **mg/Kg**

SampID: MBLK-191873

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.010		**< 0.010**	0.0045	0	0	-100	100	05/20/2022

Batch 191873 **SampType:** LCS Units **mg/Kg**

SampID: LCS-191873

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.010		**0.249**	0.2500	0	99.6	85	115	05/19/2022

Batch 191873 **SampType:** MS Units **mg/Kg-dry**

SampID: 22050989-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.012		**0.330**	0.3062	0	107.8	75	125	05/19/2022

Batch 191873 **SampType:** MSD Units **mg/Kg-dry** RPD Limit **15**

SampID: 22050989-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.013		**0.347**	0.3177	0	109.2	0.3301	4.94	05/19/2022

Batch 191873 **SampType:** MS Units **mg/Kg-dry**

SampID: 22051226-004AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.016		**0.453**	0.4072	0.01551	107.4	75	125	05/19/2022

Batch 191873 **SampType:** MSD Units **mg/Kg-dry** RPD Limit **15**

SampID: 22051226-004AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.016		**0.444**	0.3974	0.01551	107.8	0.4527	1.99	05/19/2022

Teklab, Inc. Environmental Laboratory

Receiving Check List

http://www.teklabinc.com/

Client: Geotechnology, Inc.
Work Order: 22051226
Client Project: MOAP
Report Date: 31-May-22

Carrier: Scott Faulkner
Received By: CET

Completed by: Ellie Hopkins
On: 18-May-22

Reviewed by: Elizabeth A. Hurley
On: 18-May-22

Pages to follow: Chain of custody 1 Extra pages included 0

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C 5.6
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☑	No ☐		
Reported field parameters measured:	Field ☐	Lab ☐	NA ☑	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐		

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☐	NA ☑
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑

Any No responses must be detailed below or on the COC.

CHAIN OF CUSTODY

pg. 1 of 1 Work order # 22051220

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client:	Geotechnology, Inc.		
Address:	11816 Lackland Road		
City / State / Zip	St. Louis, MO 63146		
Contact:	Jessie Goodwin	Phone:	(314) 997-7440
E-Mail:	jgoodwin@geotechnology.com	Fax:	(314) 997-2067

Samples on: ☒ ICE ☐ BLUE ICE ☐ NO ICE 5.6 °C LTG# 3

Preserved in: ☐ LAB ☐ FIELD

FOR LAB USE ONLY

Lab Notes ~~pH <2 SU~~. CET 5/18/2022 TE CET 5/18/2022

Client Comments:
Metals: Sb As Ba Be B Cd Cr Co Cu Pb Fe Mn Hg Ni Se Ag Tl V Zn

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☒ No

Are these samples known to be hazardous? ☐ Yes ☒ No

Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☐ Yes ☒ No

Project Name/Number: MOAP

Sample Collector's Name: Scott Faulk

Results Requested: ☒ Standard ☐ 1-2 Day (100% Surcharge) ☐ Other ☐ 3 Day (50% Surcharge)

Billing Instructions: GTI-4792-2022

Lab Use Only	Sample Identification	Date/Time Sampled	# and Type of Containers: UNPRES	HNO3	NaOH	H2SO4	HCL	MeOH	NaHSO4	OTHER	MATRIX: Aqueous	Drinking Water	Soil	Sludge	Special Waste	Groundwater	INDICATE ANALYSIS REQUESTED: Metals	Shake Sulfate	SPLP Chloride	SPLP Fluoride	SPLP Mercury	SPLP Nitrite	SPLP NO3	SPLP TCN
22051220-001	Boring A 10-15	5/17/22 15:30		1									X				X	X	X	X	X	X	X	X
-002	Boring B 10-15	5/18/22 10:45		1									X				X	X	X	X	X	X	X	X
-003	Boring C 5-10	5/16/22 12:00		1									X				X	X	X	X	X	X	X	X
-004	Boring D 5-10	5/17/22 09:40		1									X				X	X	X	X	X	X	X	X

Relinquished By	Date/Time	Received By	Date/Time
[signature]	5/18/22 14:11	[signature]	5/18/22 14:14

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions.

BottleOrder: 72619

CET 5/18/2022

Teklab, Inc.
Environmental Laboratory
http://www.teklabinc.com/

September 26, 2022

Jessie Goodwin
Geotechnology, Inc.
11816 Lackland Road
St. Louis, MO 63146
TEL: (573) 270-1313
FAX: (314) 997-2067

Illinois	100226
Kansas	E-10374
Louisiana	05002
Louisiana	05003
Oklahoma	9978

RE: MOAP GWS **WorkOrder:** 22091023

Dear Jessie Goodwin:

TEKLAB, INC received 2 samples on 9/15/2022 2:00:00 PM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Patrick Riley

Patrick Riley
Project Manager
(618)344-1004 ex 44
patrickriley@teklabinc.com

Teklab, Inc.
Environmental Laboratory

Report Contents

http://www.teklabinc.com/

Client: Geotechnology, Inc.
Work Order: 22091023
Client Project: MOAP GWS
Report Date: 26-Sep-22

This reporting package includes the following:

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Definitions

Client: Geotechnology, Inc. **Work Order:** 22091023

Client Project: MOAP GWS **Report Date:** 26-Sep-22

Abbr	Definition
*	Analytes on report marked with an asterisk are not NELAP accredited
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
CRQL	A Client Requested Quantitation Limit is a reporting limit that varies according to customer request. The CRQL may not be less than the MDL.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilution factors.
DNI	Did not ignite
DUP	Laboratory duplicate is a replicate aliquot prepared under the same laboratory conditions and independently analyzed to obtain a measure of precision.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample is a sample matrix, free from the analytes of interest,spiked with verified known amounts of analytes and analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	"The method detection limit is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results."
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
NC	Data is not acceptable for compliance purposes
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions.
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Teklab, Inc. Environmental Laboratory

Definitions

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22091023

Client Project: MOAP GWS **Report Date:** 26-Sep-22

Qualifiers

- # - Unknown hydrocarbon
- B - Analyte detected in associated Method Blank
- C - RL shown is a Client Requested Quantitation Limit
- E - Value above quantitation range
- H - Holding times exceeded
- I - Associated internal standard was outside method criteria
- J - Analyte detected below quantitation limits
- M - Manual Integration used to determine area response
- ND - Not Detected at the Reporting Limit
- R - RPD outside accepted recovery limits
- S - Spike Recovery outside recovery limits
- T - TIC(Tentatively identified compound)
- X - Value exceeds Maximum Contaminant Level

Teklab, Inc. Environmental Laboratory

Case Narrative

http://www.teklabinc.com/

Client: Geotechnology, Inc.
Client Project: MOAP GWS

Work Order: 22091023
Report Date: 26-Sep-22

Cooler Receipt Temp: 5.1 °C

Locations

Collinsville

Address 5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
Phone (618) 344-1004
Fax (618) 344-1005
Email jhriley@teklabinc.com

Springfield

Address 3920 Pintail Dr
Springfield, IL 62711-9415
Phone (217) 698-1004
Fax (217) 698-1005
Email KKlostermann@teklabinc.com

Kansas City

Address 8421 Nieman Road
Lenexa, KS 66214
Phone (913) 541-1998
Fax (913) 541-1998
Email jhriley@teklabinc.com

Collinsville Air

Address 5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
Phone (618) 344-1004
Fax (618) 344-1005
Email EHurley@teklabinc.com

Chicago

Address 1319 Butterfield Rd.
Downers Grove, IL 60515
Phone (630) 324-6855
Fax
Email arenner@teklabinc.com

Teklab, Inc. Environmental Laboratory

Accreditations

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22091023

Client Project: MOAP GWS **Report Date:** 26-Sep-22

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2023	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2023	Collinsville
Louisiana	LDEQ	05002	NELAP	6/30/2023	Collinsville
Louisiana	LDEQ	05003	NELAP	6/30/2023	Collinsville
Oklahoma	ODEQ	9978	NELAP	8/31/2023	Collinsville
Arkansas	ADEQ	88-0966		3/14/2023	Collinsville
Illinois	IDPH	17584		5/31/2023	Collinsville
Iowa	IDNR	430		6/1/2024	Collinsville
Kentucky	UST	0073		1/31/2023	Collinsville
Missouri	MDNR	00930		5/31/2023	Collinsville
Missouri	MDNR	930		1/31/2025	Collinsville

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22091023

Client Project: MOAP GWS **Report Date:** 26-Sep-22

Lab ID: 22091023-001 **Client Sample ID:** TMW-C

Matrix: GROUNDWATER **Collection Date:** 09/14/2022 9:30

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (DISSOLVED) 1997, 2011								
Total Dissolved Solids	NELAP	20	H	**300**	mg/L	1	09/23/2022 11:00	R318497
Sample analysis did not meet hold time requirements.								
STANDARD METHODS 2540 C (TOTAL) 1997, 2011								
Total Dissolved Solids	NELAP	20	H	**314**	mg/L	1	09/22/2022 16:55	R318497
Sample analysis did not meet hold time requirements.								
STANDARD METHODS 4500-NO2 B (DISSOLVED) 2000, 2011								
Nitrogen, Nitrite (as N)	NELAP	0.05	H	**< 0.05**	mg/L	1	09/16/2022 20:30	R318171
Sample analysis did not meet hold time requirements.								
STANDARD METHODS 4500-NO2 B (TOTAL) 2000, 2011								
Nitrogen, Nitrite (as N)	NELAP	0.05	H	**< 0.05**	mg/L	1	09/16/2022 20:31	R318171
Sample analysis did not meet hold time requirements.								
STANDARD METHODS 4500-NO3 F (DISSOLVED) 2000, 2011								
Nitrogen, Nitrate (as N)	NELAP	0.250	H	**3.06**	mg/L	5	09/16/2022 15:19	R318170
Sample analysis did not meet hold time requirements.								
STANDARD METHODS 4500-NO3 F (TOTAL) 2000, 2011								
Nitrogen, Nitrate (as N)	NELAP	0.250	H	**3.06**	mg/L	5	09/16/2022 16:03	R318170
Sample analysis did not meet hold time requirements.								
SW-846 9012A (DISSOLVED)								
Cyanide	NELAP	0.005		**< 0.005**	mg/L	1	09/19/2022 15:45	196703
SW-846 9012A (TOTAL)								
Cyanide	NELAP	0.005		**< 0.005**	mg/L	1	09/19/2022 14:01	196683
SW-846 9036 (DISSOLVED)								
Sulfate	NELAP	20		**59**	mg/L	2	09/21/2022 12:03	R318339
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**59**	mg/L	2	09/21/2022 12:09	R318339
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.12**	mg/L	1	09/20/2022 11:09	R318287
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.12**	mg/L	1	09/20/2022 11:14	R318287
SW-846 9251 (DISSOLVED)								
Chloride	NELAP	4		**17**	mg/L	1	09/21/2022 10:14	R318345
SW-846 9251 (TOTAL)								
Chloride	NELAP	4		**17**	mg/L	1	09/21/2022 10:30	R318345
SW-846 3005A, 6010B, METALS BY ICP (DISSOLVED)								
Antimony	NELAP	0.0500		**< 0.0500**	mg/L	1	09/20/2022 10:00	197756
Arsenic	NELAP	0.0250		**< 0.0250**	mg/L	1	09/20/2022 10:00	197756
Barium	NELAP	0.0025		**0.0163**	mg/L	1	09/20/2022 10:00	197756
Beryllium	NELAP	0.0005		**< 0.0005**	mg/L	1	09/20/2022 10:00	197756
Boron	NELAP	0.0200		**2.83**	mg/L	1	09/20/2022 10:00	197756
Cadmium	NELAP	0.0020		**< 0.0020**	mg/L	1	09/20/2022 10:00	197756
Chromium	NELAP	0.0050		**< 0.0050**	mg/L	1	09/20/2022 10:00	197756
Cobalt	NELAP	0.0050		**< 0.0050**	mg/L	1	09/20/2022 10:00	197756
Copper	NELAP	0.0050		**< 0.0050**	mg/L	1	09/20/2022 10:00	197756
Iron	NELAP	0.0400		**< 0.0400**	mg/L	1	09/20/2022 10:00	197756
Lead	NELAP	0.0150		**< 0.0150**	mg/L	1	09/20/2022 10:00	197756

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22091023

Client Project: MOAP GWS **Report Date:** 26-Sep-22

Lab ID: 22091023-001 **Client Sample ID:** TMW-C

Matrix: GROUNDWATER **Collection Date:** 09/14/2022 9:30

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 3005A, 6010B, METALS BY ICP (DISSOLVED)								
Manganese	NELAP	0.0070	J	**0.0054**	mg/L	1	09/20/2022 10:00	197756
Nickel	NELAP	0.0050		**< 0.0050**	mg/L	1	09/20/2022 10:00	197756
Selenium	NELAP	0.040	J	**0.025**	mg/L	1	09/20/2022 10:00	197756
Silver	NELAP	0.0070		**< 0.0070**	mg/L	1	09/20/2022 10:00	197756
Thallium	NELAP	0.0500		**< 0.0500**	mg/L	1	09/20/2022 10:00	197756
Vanadium	NELAP	0.010	J	**0.0027**	mg/L	1	09/20/2022 10:00	197756
Zinc	NELAP	0.0100		**< 0.0100**	mg/L	1	09/20/2022 10:00	197756
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)								
Antimony	NELAP	0.0500		**< 0.0500**	mg/L	1	09/20/2022 14:16	196682
Arsenic	NELAP	0.0250		**< 0.0250**	mg/L	1	09/20/2022 14:16	196682
Barium	NELAP	0.0025		**0.0313**	mg/L	1	09/20/2022 14:16	196682
Beryllium	NELAP	0.0005		**< 0.0005**	mg/L	1	09/20/2022 14:16	196682
Boron	NELAP	0.0200		**3.13**	mg/L	1	09/20/2022 14:16	196682
Cadmium	NELAP	0.0020		**< 0.0020**	mg/L	1	09/20/2022 14:16	196682
Chromium	NELAP	0.0050	J	**0.0029**	mg/L	1	09/20/2022 14:16	196682
Cobalt	NELAP	0.0050	J	**0.0030**	mg/L	1	09/20/2022 14:16	196682
Copper	NELAP	0.0050	J	**0.0030**	mg/L	1	09/20/2022 14:16	196682
Iron	NELAP	0.0400		**1.04**	mg/L	1	09/20/2022 14:16	196682
Lead	NELAP	0.0150		**< 0.0150**	mg/L	1	09/20/2022 14:16	196682
Manganese	NELAP	0.0070		**0.218**	mg/L	1	09/20/2022 14:16	196682
Nickel	NELAP	0.0050	J	**0.0046**	mg/L	1	09/20/2022 14:16	196682
Selenium	NELAP	0.040	J	**0.026**	mg/L	1	09/20/2022 14:16	196682
Silver	NELAP	0.0070		**< 0.0070**	mg/L	1	09/20/2022 14:16	196682
Thallium	NELAP	0.0500		**< 0.0500**	mg/L	1	09/20/2022 14:16	196682
Vanadium	NELAP	0.010	J	**0.0044**	mg/L	1	09/20/2022 14:16	196682
Zinc	NELAP	0.010	J	**0.0074**	mg/L	1	09/20/2022 14:16	196682
SW-846 7470A (DISSOLVED)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	09/20/2022 9:47	197741
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	09/20/2022 9:45	197741

Laboratory Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22091023

Client Project: MOAP GWS **Report Date:** 26-Sep-22

Lab ID: 22091023-002 **Client Sample ID:** TMW-B

Matrix: GROUNDWATER **Collection Date:** 09/14/2022 13:40

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (DISSOLVED) 1997, 2011								
Total Dissolved Solids	NELAP	20	H	**740**	mg/L	1	09/23/2022 11:00	R318497
Sample analysis did not meet hold time requirements.								
STANDARD METHODS 2540 C (TOTAL) 1997, 2011								
Total Dissolved Solids	NELAP	20	H	**714**	mg/L	1	09/22/2022 16:56	R318497
Sample analysis did not meet hold time requirements.								
STANDARD METHODS 4500-NO2 B (DISSOLVED) 2000, 2011								
Nitrogen, Nitrite (as N)	NELAP	0.05	H	**< 0.05**	mg/L	1	09/16/2022 20:31	R318171
Sample analysis did not meet hold time requirements.								
STANDARD METHODS 4500-NO2 B (TOTAL) 2000, 2011								
Nitrogen, Nitrite (as N)	NELAP	0.05	H	**< 0.05**	mg/L	1	09/16/2022 20:32	R318171
Sample analysis did not meet hold time requirements.								
STANDARD METHODS 4500-NO3 F (DISSOLVED) 2000, 2011								
Nitrogen, Nitrate (as N)	NELAP	0.500		**5.35**	mg/L	10	09/16/2022 13:22	R318170
STANDARD METHODS 4500-NO3 F (TOTAL) 2000, 2011								
Nitrogen, Nitrate (as N)	NELAP	0.500		**5.48**	mg/L	10	09/16/2022 13:24	R318170
SW-846 9012A (DISSOLVED)								
Cyanide	NELAP	0.005		**< 0.005**	mg/L	1	09/19/2022 15:49	196703
SW-846 9012A (TOTAL)								
Cyanide	NELAP	0.005		**< 0.005**	mg/L	1	09/19/2022 14:06	196683
SW-846 9036 (DISSOLVED)								
Sulfate	NELAP	100		**387**	mg/L	10	09/21/2022 10:28	R318339
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**401**	mg/L	10	09/21/2022 10:44	R318339
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.13**	mg/L	1	09/20/2022 11:12	R318287
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.13**	mg/L	1	09/20/2022 11:17	R318287
SW-846 9251 (DISSOLVED)								
Chloride	NELAP	4		**4**	mg/L	1	09/21/2022 10:22	R318345
SW-846 9251 (TOTAL)								
Chloride	NELAP	4		**4**	mg/L	1	09/21/2022 10:38	R318345
SW-846 3005A, 6010B, METALS BY ICP (DISSOLVED)								
Antimony	NELAP	0.0500		**< 0.0500**	mg/L	1	09/20/2022 10:01	197756
Arsenic	NELAP	0.0250		**< 0.0250**	mg/L	1	09/20/2022 10:01	197756
Barium	NELAP	0.0025		**0.0314**	mg/L	1	09/20/2022 10:01	197756
Beryllium	NELAP	0.0005		**< 0.0005**	mg/L	1	09/20/2022 10:01	197756
Boron	NELAP	0.0200		**7.45**	mg/L	1	09/20/2022 10:01	197756
Cadmium	NELAP	0.0020		**< 0.0020**	mg/L	1	09/20/2022 10:01	197756
Chromium	NELAP	0.0050		**0.0123**	mg/L	1	09/20/2022 10:01	197756
Cobalt	NELAP	0.0050		**< 0.0050**	mg/L	1	09/20/2022 10:01	197756
Copper	NELAP	0.0050		**< 0.0050**	mg/L	1	09/20/2022 10:01	197756
Iron	NELAP	0.0400		**< 0.0400**	mg/L	1	09/20/2022 10:01	197756
Lead	NELAP	0.0150		**< 0.0150**	mg/L	1	09/20/2022 10:01	197756
Manganese	NELAP	0.0070	J	**0.0066**	mg/L	1	09/20/2022 10:01	197756
Nickel	NELAP	0.0050		**< 0.0050**	mg/L	1	09/20/2022 10:01	197756

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22091023

Client Project: MOAP GWS **Report Date:** 26-Sep-22

Lab ID: 22091023-002 **Client Sample ID:** TMW-B

Matrix: GROUNDWATER **Collection Date:** 09/14/2022 13:40

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 3005A, 6010B, METALS BY ICP (DISSOLVED)								
Selenium	NELAP	0.0400		**0.105**	mg/L	1	09/20/2022 10:01	197756
Silver	NELAP	0.0070		**< 0.0070**	mg/L	1	09/20/2022 10:01	197756
Thallium	NELAP	0.0500		**< 0.0500**	mg/L	1	09/20/2022 10:01	197756
Vanadium	NELAP	0.010	J	**0.0023**	mg/L	1	09/20/2022 10:01	197756
Zinc	NELAP	0.0100		**< 0.0100**	mg/L	1	09/20/2022 10:01	197756
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)								
Antimony	NELAP	0.050	J	**0.010**	mg/L	1	09/20/2022 14:59	196684
Arsenic	NELAP	0.0250		**< 0.0250**	mg/L	1	09/20/2022 14:59	196684
Barium	NELAP	0.0025		**0.0406**	mg/L	1	09/20/2022 14:59	196684
Beryllium	NELAP	0.0005		**< 0.0005**	mg/L	1	09/20/2022 14:59	196684
Boron	NELAP	0.0200		**8.49**	mg/L	1	09/21/2022 11:52	196684
Cadmium	NELAP	0.0020		**< 0.0020**	mg/L	1	09/20/2022 14:59	196684
Chromium	NELAP	0.0050		**0.0158**	mg/L	1	09/20/2022 14:59	196684
Cobalt	NELAP	0.0050		**< 0.0050**	mg/L	1	09/20/2022 14:59	196684
Copper	NELAP	0.0050		**< 0.0050**	mg/L	1	09/20/2022 14:59	196684
Iron	NELAP	0.0400		**0.146**	mg/L	1	09/20/2022 14:59	196684
Lead	NELAP	0.0150		**< 0.0150**	mg/L	1	09/20/2022 14:59	196684
Manganese	NELAP	0.0070		**0.0418**	mg/L	1	09/20/2022 14:59	196684
Nickel	NELAP	0.0050		**< 0.0050**	mg/L	1	09/20/2022 14:59	196684
Selenium	NELAP	0.0400		**0.116**	mg/L	1	09/20/2022 14:59	196684
Silver	NELAP	0.0070		**< 0.0070**	mg/L	1	09/20/2022 14:59	196684
Thallium	NELAP	0.0500		**< 0.0500**	mg/L	1	09/20/2022 14:59	196684
Vanadium	NELAP	0.010	J	**0.0023**	mg/L	1	09/20/2022 14:59	196684
Zinc	NELAP	0.0100		**< 0.0100**	mg/L	1	09/20/2022 14:59	196684
SW-846 7470A (DISSOLVED)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	09/20/2022 9:56	197741
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	09/20/2022 9:54	197741

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Quality Control Results

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Client: Geotechnology, Inc. **Work Order:** 22091023

Client Project: MOAP GWS **Report Date:** 26-Sep-22

STANDARD METHODS 2540 C (TOTAL) 1997, 2011

Batch R318497 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	09/23/2022
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	09/22/2022
Total Dissolved Solids		20		**< 20**	16.00	0	0	-100	100	09/22/2022

Batch R318497 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids		20		**970**	1000	0	97.0	90	110	09/23/2022
Total Dissolved Solids		20		**954**	1000	0	95.4	90	110	09/22/2022
Total Dissolved Solids		20		**952**	1000	0	95.2	90	110	09/22/2022

Batch R318497 **SampType:** DUP Units **mg/L** RPD Limit **5**
SampID: 22081261-046ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20	H	**400**				388.0	3.05	09/22/2022

Batch R318497 **SampType:** DUP Units **mg/L** RPD Limit **5**
SampID: 22091019-013ADUP

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids		20	H	**2060**				2028	1.76	09/22/2022

STANDARD METHODS 4500-NO2 B (TOTAL) 2000, 2011

Batch R318171 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05		**< 0.05**	0.0250	0	0	-100	100	09/16/2022

Batch R318171 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.25		**1.08**	1.100	0	97.7	90	110	09/16/2022

Batch R318171 **SampType:** MS Units **mg/L**
SampID: 22091023-001CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)		0.05	H	**0.52**	0.5000	0	104.8	85	115	09/16/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

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Client: Geotechnology, Inc. **Work Order:** 22091023

Client Project: MOAP GWS **Report Date:** 26-Sep-22

STANDARD METHODS 4500-NO2 B (TOTAL) 2000, 2011

Batch R318171 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 22091023-001CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)		0.05	H	**0.48**	0.5000	0	97.0	0.5240	7.73	09/16/2022

STANDARD METHODS 4500-NO3 F (TOTAL) 2000, 2011

Batch R318170 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**< 0.050**	0.0090	0	0	-100	100	09/16/2022

Batch R318170 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.050		**0.517**	0.5000	0	103.4	90	110	09/16/2022

Batch R318170 **SampType:** MS Units **mg/L**

SampID: 22081261-005AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50		**26.2**	12.50	13.35	102.6	85	115	09/16/2022

Batch R318170 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 22081261-005AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		2.50		**26.3**	12.50	13.35	103.7	26.18	0.48	09/16/2022

Batch R318170 **SampType:** MS Units **mg/L**

SampID: 22081261-010AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.500	H	**6.44**	2.500	3.945	100.0	85	115	09/16/2022

Batch R318170 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 22081261-010AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.500	H	**6.38**	2.500	3.945	97.3	6.444	1.05	09/16/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22091023

Client Project: MOAP GWS **Report Date:** 26-Sep-22

STANDARD METHODS 4500-NO3 F (TOTAL) 2000, 2011

Batch R318170 **SampType:** MS Units **mg/L**
SampID: 22081261-043AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.500		**5.84**	2.500	3.394	97.8	85	115	09/16/2022

Batch R318170 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 22081261-043AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)		0.500		**5.83**	2.500	3.394	97.5	5.840	0.14	09/16/2022

SW-846 9012A (TOTAL)

Batch 196683 **SampType:** MBLK Units **mg/L**
SampID: MBLK 220916 TCN1

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Cyanide		0.005		**< 0.005**	0.0015	0	0	-100	100	09/19/2022

Batch 196683 **SampType:** LCS Units **mg/L**
SampID: LCS 220916 TCN1

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Cyanide		0.005		**0.026**	0.0250	0	104.0	90	110	09/19/2022

Batch 196683 **SampType:** MS Units **mg/L**
SampID: 22081261-009EMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Cyanide		0.005		**0.027**	0.0250	0	106.9	75	125	09/19/2022

Batch 196683 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 22081261-009EMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Cyanide		0.005		**0.027**	0.0250	0	108.1	0.02673	1.06	09/19/2022

Batch 196683 **SampType:** MS Units **mg/L**
SampID: 22090935-001CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Cyanide		0.025		**0.160**	0.1250	0.03660	98.9	90	110	09/19/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22091023

Client Project: MOAP GWS **Report Date:** 26-Sep-22

SW-846 9012A (TOTAL)

Batch 196683 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 22090935-001CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Cyanide		0.025		**0.166**	0.1250	0.03660	103.8	0.1602	3.74	09/19/2022

Batch 196703 **SampType:** MBLK Units **mg/L**

SampID: MBLK 220916 TCN2

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Cyanide		0.005		**< 0.005**	0.0015	0	0	-100	100	09/19/2022

Batch 196703 **SampType:** LCS Units **mg/L**

SampID: LCS 220916 TCN2

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Cyanide		0.005		**0.027**	0.0250	0	106.2	90	110	09/19/2022

Batch 196703 **SampType:** MS Units **mg/L**

SampID: 22081261-013FMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Cyanide		0.005		**0.027**	0.0250	0	107.6	75	125	09/19/2022

Batch 196703 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 22081261-013FMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Cyanide		0.005		**0.028**	0.0250	0	111.3	0.02689	3.44	09/19/2022

Batch 196703 **SampType:** MS Units **mg/L**

SampID: 22081261-044DMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Cyanide		0.005		**0.027**	0.0250	0	106.5	75	125	09/19/2022

Batch 196703 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 22081261-044DMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Cyanide		0.005		**0.024**	0.0250	0	97.1	0.02662	9.22	09/19/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22091023

Client Project: MOAP GWS **Report Date:** 26-Sep-22

SW-846 9036 (DISSOLVED)

Batch R318339 **SampType:** MS Units **mg/L**
SampID: 22081261-001CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		50		**167**	100.0	67.94	98.8	85	115	09/21/2022

Batch R318339 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 22081261-001CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		50		**170**	100.0	67.94	102.5	166.7	2.21	09/21/2022

SW-846 9036 (TOTAL)

Batch R318339 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		10		**< 10**	6.140	0	0	-100	100	09/21/2022

Batch R318339 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		10		**19**	20.00	0	96.7	90	110	09/21/2022

Batch R318339 **SampType:** MS Units **mg/L**
SampID: 22081261-012AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		50		**164**	100.0	64.25	99.5	85	115	09/21/2022

Batch R318339 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 22081261-012AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		50		**152**	100.0	64.25	87.4	163.8	7.67	09/21/2022

Batch R318339 **SampType:** MS Units **mg/L**
SampID: 22081261-029AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		50	S	**204**	100.0	88.16	116.1	85	115	09/21/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22091023

Client Project: MOAP GWS **Report Date:** 26-Sep-22

SW-846 9036 (TOTAL)

Batch R318339 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 22081261-029AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		50		**193**	100.0	88.16	104.8	204.2	5.67	09/21/2022

Batch R318339 **SampType:** MS Units **mg/L**

SampID: 22090932-001AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate		100		**378**	200.0	160.0	108.8	85	115	09/21/2022

Batch R318339 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 22090932-001AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate		100		**385**	200.0	160.0	112.6	377.7	1.95	09/21/2022

SW-846 9214 (DISSOLVED)

Batch R318287 **SampType:** MS Units **mg/L**

SampID: 22081261-003BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**2.29**	2.000	0.1350	107.6	75	125	09/20/2022

Batch R318287 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 22081261-003BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.10		**2.36**	2.000	0.1350	111.1	2.286	3.06	09/20/2022

Batch R318287 **SampType:** MS Units **mg/L**

SampID: 22081261-011BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**2.34**	2.000	0.2290	105.3	75	125	09/20/2022

Batch R318287 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 22081261-011BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.10		**2.39**	2.000	0.2290	108.0	2.335	2.33	09/20/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22091023

Client Project: MOAP GWS **Report Date:** 26-Sep-22

SW-846 9214 (DISSOLVED)

Batch R318287 **SampType:** MS Units **mg/L**
SampID: 22081261-042BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**2.37**	2.000	0.2010	108.4	75	125	09/20/2022

Batch R318287 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 22081261-042BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.10		**2.40**	2.000	0.2010	109.8	2.369	1.13	09/20/2022

Batch R318287 **SampType:** MS Units **mg/L**
SampID: 22081261-046BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**2.27**	2.000	0.1370	106.4	75	125	09/20/2022

Batch R318287 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 22081261-046BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.10		**2.30**	2.000	0.1370	108.2	2.266	1.49	09/20/2022

SW-846 9214 (TOTAL)

Batch R318287 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**< 0.10**	0.0370	0	0	-100	100	09/20/2022

Batch R318287 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**1.06**	1.000	0	105.6	90	110	09/20/2022

Batch R318287 **SampType:** MS Units **mg/L**
SampID: 22091049-003AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride		0.10		**2.48**	2.000	0.2830	109.8	75	125	09/20/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22091023

Client Project: MOAP GWS **Report Date:** 26-Sep-22

SW-846 9214 (TOTAL)

Batch R318287 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 22091049-003AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride		0.10		**2.48**	2.000	0.2830	109.8	2.480	0.00	09/20/2022

SW-846 9251 (DISSOLVED)

Batch R318345 **SampType:** MS Units **mg/L**

SampID: 22081261-011BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		40		**277**	200.0	90.36	93.1	85	115	09/21/2022

Batch R318345 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 22081261-011BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		40		**276**	200.0	90.36	93.0	276.6	0.06	09/21/2022

SW-846 9251 (TOTAL)

Batch R318345 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**< 4**	0.5000	0	0	-100	100	09/21/2022

Batch R318345 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		4		**19**	20.00	0	97.1	90	110	09/21/2022

Batch R318345 **SampType:** MS Units **mg/L**

SampID: 22081261-012AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		20		**178**	100.0	84.03	93.7	85	115	09/21/2022

Batch R318345 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 22081261-012AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		20		**173**	100.0	84.03	89.4	177.7	2.43	09/21/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22091023

Client Project: MOAP GWS **Report Date:** 26-Sep-22

SW-846 9251 (TOTAL)

Batch R318345 **SampType:** MS Units **mg/L**

SampID: 22081261-029AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride		20		**175**	100.0	82.28	92.7	85	115	09/21/2022

Batch R318345 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 22081261-029AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride		20		**173**	100.0	82.28	91.1	175.0	0.94	09/21/2022

SW-846 3005A, 6010B, METALS BY ICP (DISSOLVED)

Batch 197756 **SampType:** MBLK Units **mg/L**

SampID: MBLK-197756

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0500		**< 0.0500**	0.0068	0	0	-100	100	09/20/2022
Arsenic		0.0250		**< 0.0250**	0.0087	0	0	-100	100	09/20/2022
Barium		0.0025		**< 0.0025**	0.0007	0	0	-100	100	09/20/2022
Beryllium		0.0005		**< 0.0005**	0.0002	0	0	-100	100	09/20/2022
Boron		0.0200		**< 0.0200**	0.0090	0	0	-100	100	09/20/2022
Cadmium		0.0020		**< 0.0020**	0.0005	0	0	-100	100	09/20/2022
Chromium		0.0050		**< 0.0050**	0.0028	0	0	-100	100	09/20/2022
Cobalt		0.0050		**< 0.0050**	0.0020	0	0	-100	100	09/20/2022
Copper		0.0050		**< 0.0050**	0.0026	0	0	-100	100	09/20/2022
Iron		0.0400		**< 0.0400**	0.0200	0	0	-100	100	09/20/2022
Lead		0.0150		**< 0.0150**	0.0014	0	0	-100	100	09/20/2022
Manganese		0.0070		**< 0.0070**	0.0025	0	0	-100	100	09/20/2022
Nickel		0.0050		**< 0.0050**	0.0016	0	0	-100	100	09/20/2022
Selenium		0.0400		**< 0.0400**	0.0170	0	0	-100	100	09/20/2022
Silver		0.0070		**< 0.0070**	0.0040	0	0	-100	100	09/20/2022
Thallium		0.0500		**< 0.0500**	0.0111	0	0	-100	100	09/20/2022
Vanadium		0.0100		**< 0.0100**	0.0009	0	0	-100	100	09/20/2022
Zinc		0.0100		**< 0.0100**	0.0050	0	0	-100	100	09/20/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22091023

Client Project: MOAP GWS **Report Date:** 26-Sep-22

SW-846 3005A, 6010B, METALS BY ICP (DISSOLVED)

Batch 197756 **SampType:** LCS Units **mg/L**

SampID: LCS-197756

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0500		**0.439**	0.5000	0	87.9	85	115	09/20/2022
Arsenic		0.0250		**0.462**	0.5000	0	92.5	85	115	09/20/2022
Barium		0.0025		**1.77**	2.000	0	88.4	85	115	09/20/2022
Beryllium		0.0005		**0.0472**	0.0500	0	94.4	85	115	09/20/2022
Boron		0.0200		**0.456**	0.5000	0	91.3	85	115	09/20/2022
Cadmium		0.0020		**0.0513**	0.0500	0	102.6	85	115	09/20/2022
Chromium		0.0050		**0.184**	0.2000	0	91.8	85	115	09/20/2022
Cobalt		0.0050		**0.429**	0.5000	0	85.7	85	115	09/20/2022
Copper		0.0050		**0.215**	0.2500	0	85.8	85	115	09/20/2022
Iron		0.0400		**1.79**	2.000	0	89.4	85	115	09/20/2022
Lead		0.0150		**0.451**	0.5000	0	90.1	85	115	09/20/2022
Manganese		0.0070		**0.445**	0.5000	0	88.9	85	115	09/20/2022
Nickel		0.0050		**0.451**	0.5000	0	90.2	85	115	09/20/2022
Selenium		0.0400		**0.440**	0.5000	0	88.1	85	115	09/20/2022
Silver		0.0070		**0.0474**	0.0500	0	94.8	85	115	09/20/2022
Thallium		0.0500		**0.227**	0.2500	0	91.0	85	115	09/20/2022
Vanadium		0.0100		**0.440**	0.5000	0	88.1	85	115	09/20/2022
Zinc		0.0100		**0.435**	0.5000	0	87.0	85	115	09/20/2022

Batch 197756 **SampType:** MS Units **mg/L**

SampID: 22090986-003DMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Iron		0.0400		**1.80**	2.000	0	89.9	75	125	09/20/2022

Batch 197756 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 22090986-003DMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Iron		0.0400		**1.76**	2.000	0	88.1	1.798	2.00	09/20/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22091023

Client Project: MOAP GWS **Report Date:** 26-Sep-22

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 196682 **SampType:** MBLK Units **mg/L**

SampID: MBLK-196682

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0500		**< 0.0500**	0.0068	0	0	-100	100	09/19/2022
Arsenic		0.0250		**< 0.0250**	0.0087	0	0	-100	100	09/19/2022
Barium		0.0025		**< 0.0025**	0.0007	0	0	-100	100	09/19/2022
Beryllium		0.0005		**< 0.0005**	0.0002	0	0	-100	100	09/19/2022
Boron		0.0200		**< 0.0200**	0.0090	0	0	-100	100	09/19/2022
Cadmium		0.0020		**< 0.0020**	0.0005	0	0	-100	100	09/19/2022
Chromium		0.0050		**< 0.0050**	0.0028	0	0	-100	100	09/19/2022
Cobalt		0.0050		**< 0.0050**	0.0020	0	0	-100	100	09/19/2022
Copper		0.0050		**< 0.0050**	0.0013	0	0	-100	100	09/19/2022
Iron		0.0400		**< 0.0400**	0.0200	0	0	-100	100	09/19/2022
Lead		0.0150		**< 0.0150**	0.0040	0	0	-100	100	09/19/2022
Manganese		0.0070		**< 0.0070**	0.0025	0	0	-100	100	09/19/2022
Nickel		0.0050		**< 0.0050**	0.0016	0	0	-100	100	09/19/2022
Selenium		0.0400		**< 0.0400**	0.0170	0	0	-100	100	09/19/2022
Silver		0.0070		**< 0.0070**	0.0027	0	0	-100	100	09/19/2022
Thallium		0.0500		**< 0.0500**	0.0111	0	0	-100	100	09/19/2022
Vanadium		0.0100		**< 0.0100**	0.0009	0	0	-100	100	09/19/2022
Zinc		0.0100		**< 0.0100**	0.0050	0	0	-100	100	09/19/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22091023

Client Project: MOAP GWS **Report Date:** 26-Sep-22

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 196682 **SampType:** LCS Units **mg/L**

SampID: LCS-196682

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0500		**0.519**	0.5000	0	103.7	85	115	09/19/2022
Arsenic		0.0250		**0.534**	0.5000	0	106.8	85	115	09/19/2022
Barium		0.0025		**2.04**	2.000	0	102.1	85	115	09/19/2022
Beryllium		0.0005		**0.0510**	0.0500	0	102.0	85	115	09/19/2022
Boron		0.0200		**0.518**	0.5000	0	103.5	85	115	09/19/2022
Cadmium		0.0020		**0.0513**	0.0500	0	102.6	85	115	09/19/2022
Chromium		0.0050		**0.205**	0.2000	0	102.5	85	115	09/19/2022
Cobalt		0.0050		**0.514**	0.5000	0	102.9	85	115	09/19/2022
Copper		0.0050		**0.259**	0.2500	0	103.5	85	115	09/19/2022
Iron		0.0400		**2.04**	2.000	0	102.0	85	115	09/19/2022
Lead		0.0150		**0.512**	0.5000	0	102.3	85	115	09/19/2022
Manganese		0.0070		**0.507**	0.5000	0	101.4	85	115	09/19/2022
Nickel		0.0050		**0.513**	0.5000	0	102.7	85	115	09/19/2022
Selenium		0.0400		**0.510**	0.5000	0	102.0	85	115	09/19/2022
Silver		0.0070		**0.0505**	0.0500	0	101.0	85	115	09/19/2022
Thallium		0.0500		**0.248**	0.2500	0	99.2	85	115	09/19/2022
Vanadium		0.0100		**0.501**	0.5000	0	100.2	85	115	09/19/2022
Zinc		0.0100		**0.504**	0.5000	0	100.9	85	115	09/19/2022

Batch 196682 **SampType:** MS Units **mg/L**

SampID: 22090970-003BMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Cadmium		0.0020		**0.0558**	0.0500	0.005000	101.6	75	125	09/20/2022
Zinc		0.0100		**3.12**	0.5000	2.633	98.0	75	125	09/20/2022

Batch 196682 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 22090970-003BMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Cadmium		0.0020		**0.0562**	0.0500	0.005000	102.4	0.05580	0.71	09/20/2022
Zinc		0.0100		**3.13**	0.5000	2.633	100.0	3.123	0.32	09/20/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

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Client: Geotechnology, Inc. **Work Order:** 22091023

Client Project: MOAP GWS **Report Date:** 26-Sep-22

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 196684 **SampType:** MBLK Units **mg/L**

SampID: MBLK-196684

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0500		**< 0.0500**	0.0068	0	0	-100	100	09/20/2022
Antimony		0.0500		**< 0.0500**	0.0068	0	0	-100	100	09/19/2022
Arsenic		0.0250		**< 0.0250**	0.0087	0	0	-100	100	09/19/2022
Arsenic		0.0250		**< 0.0250**	0.0087	0	0	-100	100	09/20/2022
Barium		0.0025		**< 0.0025**	0.0007	0	0	-100	100	09/19/2022
Barium		0.0025		**< 0.0025**	0.0007	0	0	-100	100	09/20/2022
Beryllium		0.0005		**< 0.0005**	0.0002	0	0	-100	100	09/19/2022
Beryllium		0.0005		**< 0.0005**	0.0002	0	0	-100	100	09/20/2022
Boron		0.0200		**< 0.0200**	0.0090	0	0	-100	100	09/20/2022
Boron		0.0200		**< 0.0200**	0.0090	0	0	-100	100	09/19/2022
Cadmium		0.0020		**< 0.0020**	0.0005	0	0	-100	100	09/20/2022
Cadmium		0.0020		**< 0.0020**	0.0005	0	0	-100	100	09/19/2022
Chromium		0.0050		**< 0.0050**	0.0028	0	0	-100	100	09/19/2022
Chromium		0.0050		**< 0.0050**	0.0028	0	0	-100	100	09/20/2022
Cobalt		0.0050		**< 0.0050**	0.0020	0	0	-100	100	09/20/2022
Cobalt		0.0050		**< 0.0050**	0.0020	0	0	-100	100	09/19/2022
Copper		0.0050		**< 0.0050**	0.0013	0	0	-100	100	09/20/2022
Copper		0.0050		**< 0.0050**	0.0013	0	0	-100	100	09/19/2022
Iron		0.0400		**< 0.0400**	0.0200	0	0	-100	100	09/19/2022
Iron		0.0400		**< 0.0400**	0.0200	0	0	-100	100	09/20/2022
Lead		0.0150		**< 0.0150**	0.0040	0	0	-100	100	09/20/2022
Lead		0.0150		**< 0.0150**	0.0040	0	0	-100	100	09/19/2022
Manganese		0.0070		**< 0.0070**	0.0025	0	0	-100	100	09/20/2022
Manganese		0.0070		**< 0.0070**	0.0025	0	0	-100	100	09/19/2022
Nickel		0.0050		**< 0.0050**	0.0016	0	0	-100	100	09/19/2022
Nickel		0.0050		**< 0.0050**	0.0016	0	0	-100	100	09/20/2022
Selenium		0.0400		**< 0.0400**	0.0170	0	0	-100	100	09/20/2022
Selenium		0.0400		**< 0.0400**	0.0170	0	0	-100	100	09/19/2022
Silver		0.0070		**< 0.0070**	0.0027	0	0	-100	100	09/19/2022
Silver		0.0070		**< 0.0070**	0.0027	0	0	-100	100	09/20/2022
Thallium		0.0500		**< 0.0500**	0.0111	0	0	-100	100	09/19/2022
Thallium		0.0500		**< 0.0500**	0.0111	0	0	-100	100	09/20/2022
Vanadium		0.0100		**< 0.0100**	0.0009	0	0	-100	100	09/19/2022
Vanadium		0.0100		**< 0.0100**	0.0009	0	0	-100	100	09/20/2022
Zinc		0.0100		**< 0.0100**	0.0050	0	0	-100	100	09/20/2022
Zinc		0.0100		**< 0.0100**	0.0050	0	0	-100	100	09/19/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22091023

Client Project: MOAP GWS **Report Date:** 26-Sep-22

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 196684 **SampType:** MBLK Units **mg/L**

SampID: MBLK-196684

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed

Batch 196684 **SampType:** LCS Units **mg/L**

SampID: LCS-196684

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony		0.0500		**0.522**	0.5000	0	104.4	85	115	09/19/2022
Arsenic		0.0250		**0.534**	0.5000	0	106.7	85	115	09/19/2022
Barium		0.0025		**2.06**	2.000	0	102.9	85	115	09/19/2022
Beryllium		0.0005		**0.0510**	0.0500	0	102.0	85	115	09/19/2022
Boron		0.0200		**0.519**	0.5000	0	103.8	85	115	09/19/2022
Cadmium		0.0020		**0.0513**	0.0500	0	102.6	85	115	09/19/2022
Chromium		0.0050		**0.204**	0.2000	0	102.2	85	115	09/19/2022
Cobalt		0.0050		**0.518**	0.5000	0	103.5	85	115	09/19/2022
Copper		0.0050		**0.260**	0.2500	0	104.2	85	115	09/19/2022
Iron		0.0400		**2.03**	2.000	0	101.3	85	115	09/19/2022
Lead		0.0150		**0.513**	0.5000	0	102.7	85	115	09/19/2022
Manganese		0.0070		**0.509**	0.5000	0	101.8	85	115	09/19/2022
Nickel		0.0050		**0.514**	0.5000	0	102.8	85	115	09/19/2022
Selenium		0.0400		**0.516**	0.5000	0	103.2	85	115	09/19/2022
Silver		0.0070		**0.0507**	0.0500	0	101.4	85	115	09/19/2022
Thallium		0.0500		**0.244**	0.2500	0	97.8	85	115	09/19/2022
Vanadium		0.0100		**0.504**	0.5000	0	100.9	85	115	09/19/2022
Zinc		0.0100		**0.502**	0.5000	0	100.4	85	115	09/19/2022

Batch 196684 **SampType:** MS Units **mg/L**

SampID: 22090986-003CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Iron		0.0400		**2.07**	2.000	0	103.4	75	125	09/20/2022

Batch 196684 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 22090986-003CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Iron		0.0400		**2.08**	2.000	0	103.8	2.069	0.34	09/20/2022

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22091023

Client Project: MOAP GWS **Report Date:** 26-Sep-22

SW-846 7470A (TOTAL)

Batch 197741 **SampType:** MBLK Units **mg/L**
SampID: MBLK-197741

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**< 0.00020**	0.0001	0	0	-100	100	09/19/2022

Batch 197741 **SampType:** LCS Units **mg/L**
SampID: LCS-197741

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00570**	0.0050	0	114.0	85	115	09/19/2022

Batch 197741 **SampType:** MS Units **mg/L**
SampID: 22091039-007AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00586**	0.0050	0	117.3	75	125	09/19/2022

Batch 197741 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 22091039-007AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00570**	0.0050	0	114.0	0.005863	2.79	09/19/2022

Batch 197741 **SampType:** MS Units **mg/L**
SampID: 22091040-002AMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00567**	0.0050	0	113.5	75	125	09/19/2022

Batch 197741 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 22091040-002AMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00568**	0.0050	0	113.5	0.005675	0.04	09/19/2022

Batch 197741 **SampType:** MS Units **mg/L**
SampID: 22091049-031CMS

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury		0.00020		**0.00535**	0.0050	0	107.0	75	125	09/20/2022

Batch 197741 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 22091049-031CMSD

Analyses	Cert	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury		0.00020		**0.00550**	0.0050	0	110.0	0.005348	2.77	09/20/2022

Teklab, Inc. Environmental Laboratory

Receiving Check List

http://www.teklabinc.com/

Client: Geotechnology, Inc. **Work Order:** 22091023

Client Project: MOAP GWS **Report Date:** 26-Sep-22

Carrier: Justin Colp **Received By:** PWR

Completed by: Timothy W. Mathis **On:** 15-Sep-22

Reviewed by: Elizabeth A. Hurley **On:** 15-Sep-22

Pages to follow: Chain of custody 1 Extra pages included 0

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C 5.1
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☑	No ☐		
Reported field parameters measured:	Field ☐	Lab ☐	NA ☑	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐		

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	NA ☐
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑

Any No responses must be detailed below or on the COC.

pH strip #82999/79929. - PWR/TMathis - 9/15/2022 6:00:31 PM

Samples were filtered and preserved nitric acid (83663), sodium hydroxide (81662) and were left unpreserved for the dissolved parameters upon arrival at the laboratory. - TMathis - 9/15/2022 6:01:02 PM

CHAIN OF CUSTODY

pg. 1 of 1 Work order # 22091023

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client:	Geotechnology, Inc.
Address:	11816 Lackland Road
City / State / Zip	St. Louis, MO 63146
Contact:	Jessie Goodwin
Phone:	(314) 997-7440
E-Mail:	jgoodwin@geotechnology.com
Fax:	(314) 997-2067

Samples on: ☒ ICE ☐ BLUE ICE ☐ NO ICE 5.1 °C LTG# 6

Preserved in: ☐ LAB ☒ FIELD

FOR LAB USE ONLY

Lab Notes 74929 / 82949 PR 9/15/22

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☒ No

Are these samples known to be hazardous? ☐ Yes ☒ No

Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☐ Yes ☒ No

Client Comments:
Lab to Filter GW.

Metals* Sb As Ba Be B Fe Mn Cd Cr Co Cu Pb Hg Ni Se Ag Tl V Zn
Metals(D)* Sb As Ba Be B Fe Mn Cd Cr Co Cu Pb Hg Ni Se Ag Tl V Zn

Project Name/Number	Sample Collector's Name
MOAP GWS	Bob Haefner

Results Requested
☑ Standard ☐ 1-2 Day (100% Surcharge) ☐ Other ____ ☐ 3 Day (50% Surcharge)

Billing Instructions
GTI - 5034 - 2022

Lab Use Only	Sample Identification	Date/Time Sampled	# and Type of Containers: UNPRES	HNO3	NaOH	H2SO4	HCL	MeOH	NaHSO4	OTHER	MATRIX: Aqueous	Drinking Water	Soil	Sludge	Special Waste	Groundwater	INDICATE ANALYSIS REQUESTED: Cyanide(D)	Fluoride	Fluoride(D)	Metals(D)*	Metals*	NO2 + NO3	NO2 + NO3 (D)	Sulfate(D)/Chloride(D	Sulfate/Chloride	TDS	TDS(D)	Total Cyanide
22091023 001	TMW-C	9/14/22 09:30	6	1	1											X	X	X	X	X	X	X	X	X	X	X	X	X
002	TMW-B	9/14/22 13:40	6	1	1											X	X	X	X	X	X	X	X	X	X	X	X	X

Courier

Relinquished By	Date/Time	Received By	Date/Time
R J Haef	9/14/22 RJH	J. Glp	9-15-22 1450
	9/15/22 06:45		
J. Glp	9-15-22		9/15/22 1400

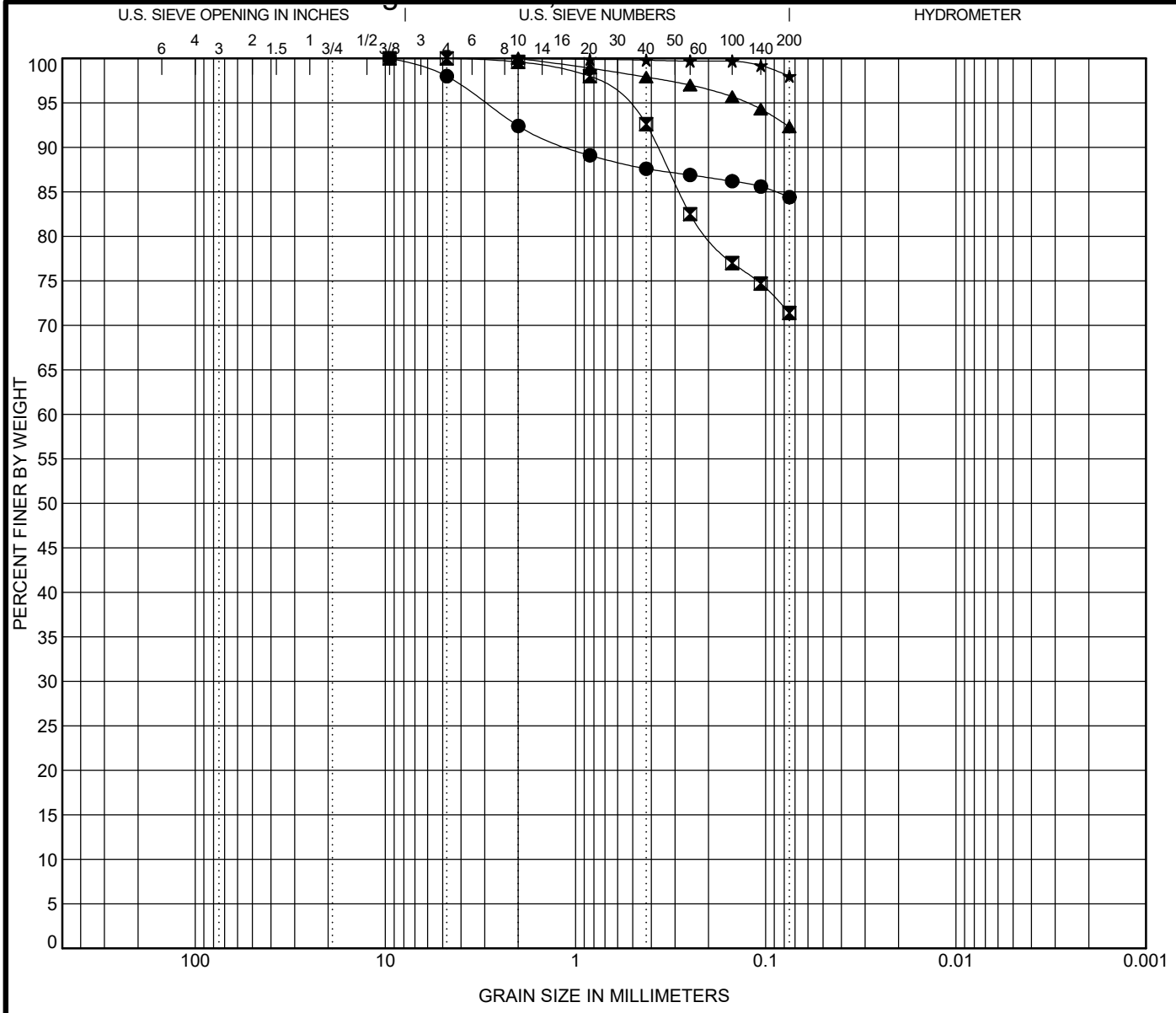
The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions.

BottleOrder: 75138

PR 9/15/22

APPENDIX E

GRAIN SIZE DISTRIBUTION RESULTS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring	Depth (ft.)	Sample Description	LL	PL	PI	Cc	Cu
●	**Boring A**	**10.0**	Fly Ash					
⊠	**Boring B**	**15.0**	Fly Ash					
▲	**Boring C**	**2.0**	Fly Ash					
★	**Boring D**	**5.0**	Fly Ash					

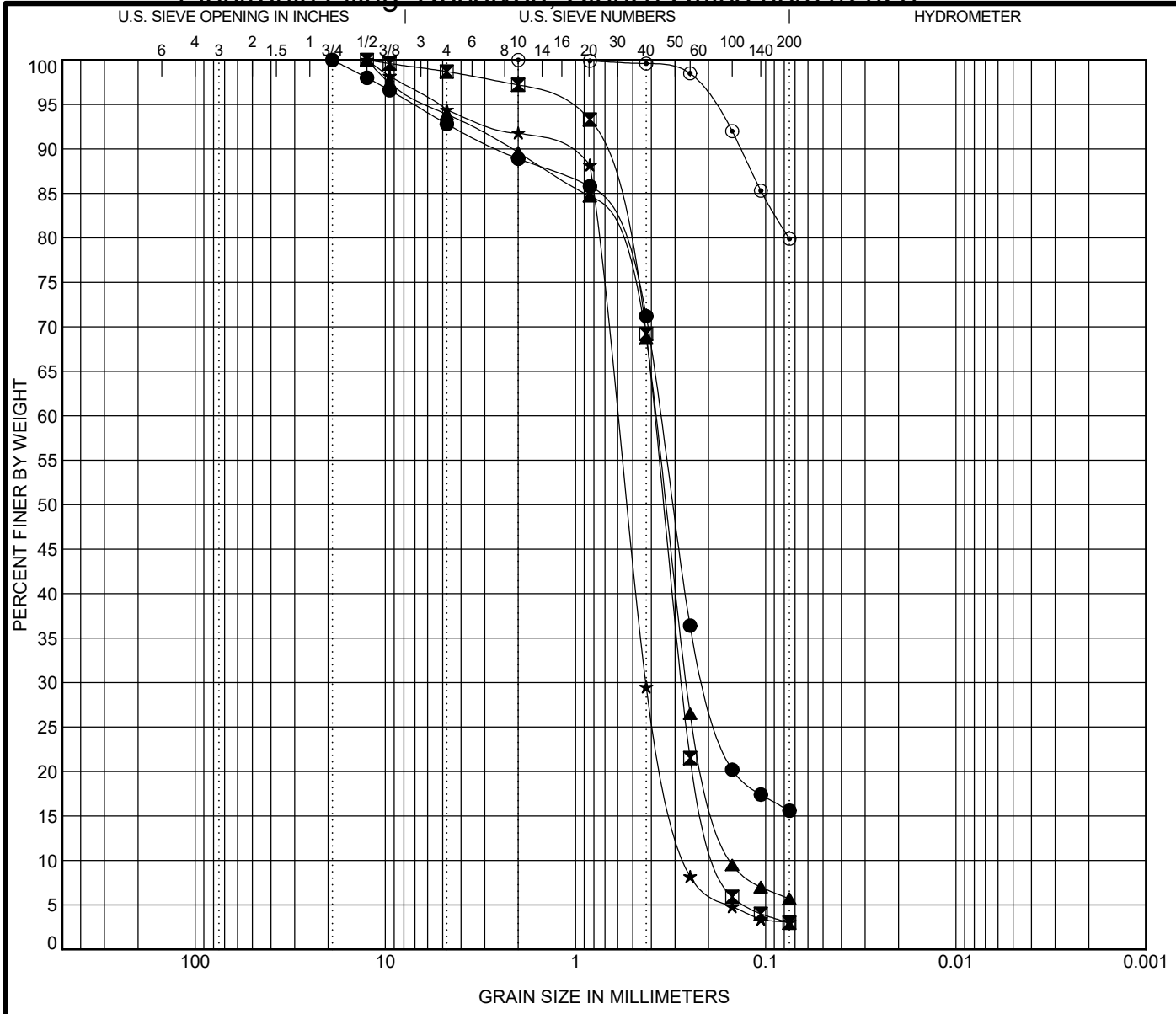
	Boring	Depth (ft.)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**Boring A**	**10.0**	**9.5**				**2.0**	**13.6**	**84.4**	
⊠	**Boring B**	**15.0**	**9.5**				**0.0**	**28.6**	**71.4**	
▲	**Boring C**	**2.0**	**2**				**0.0**	**7.7**	**92.3**	
★	**Boring D**	**5.0**	**2**				**0.0**	**2.0**	**98.0**	

GEOTECHNOLOGY
A Universal Engineering Sciences Company

GRAIN SIZE DISTRIBUTION

Meredosia Old Ash Pond
Meredosia, Illinois
J024917.07

GRAIN SIZE 2018 J024917.07 SIEVE DATA.GPJ 00 CLONE ME.GPJ 6/30/22



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring	Depth (ft.)	Sample Description	LL	PL	PI	Cc	Cu
●	Boring A	0.2						
⊠	Boring A Cap	0.5	POORLY GRADED SAND(SP)				1.15	2.24
▲	Boring B	0.2					1.18	2.50
★	Boring B Cap	0.5	POORLY GRADED SAND(SP)				1.15	2.32
⊙	Boring C	0.2						

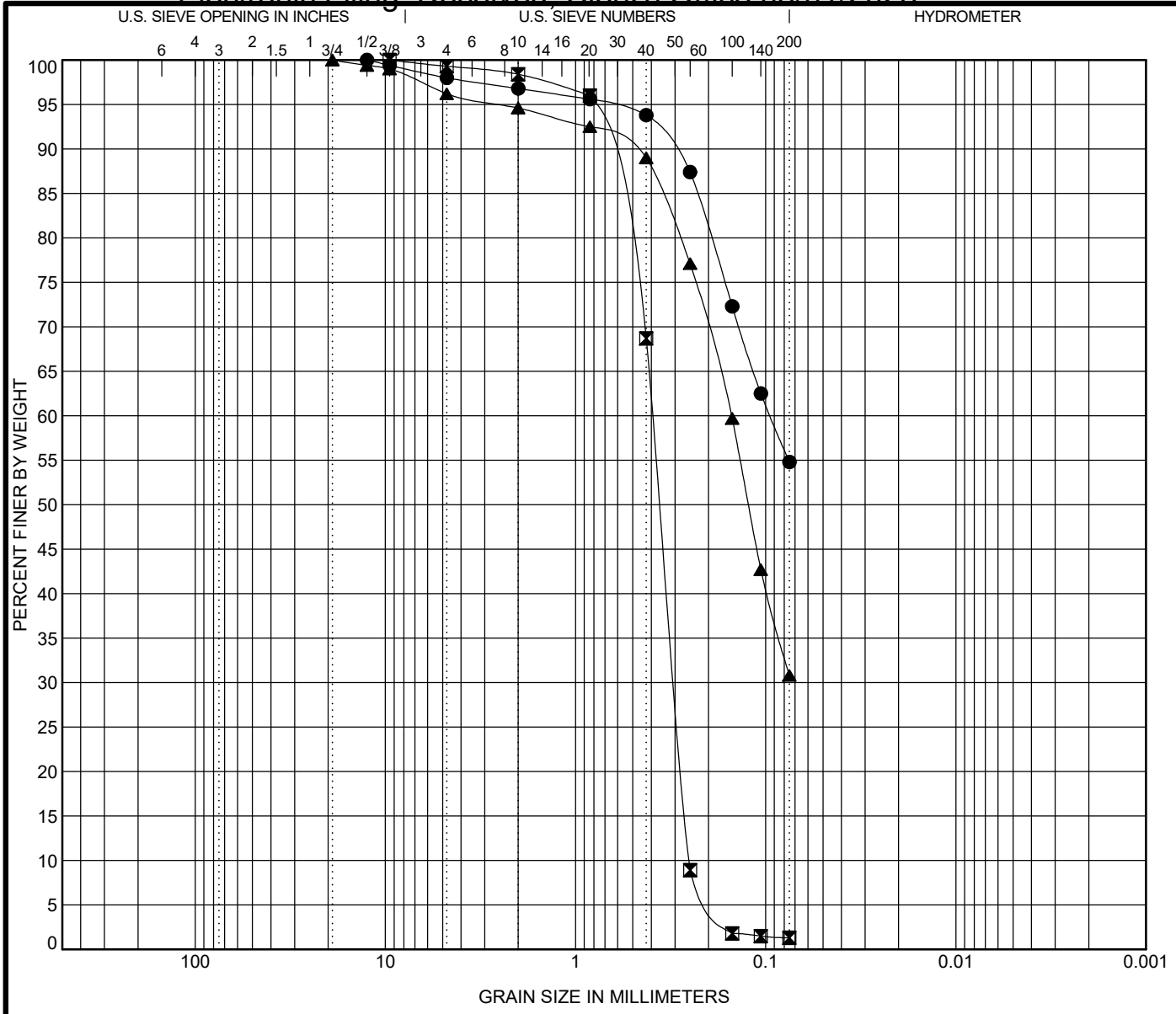
	Boring	Depth (ft.)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	Boring A	0.2	19	0.36	0.2		7.2	77.2	15.6	
⊠	Boring A Cap	0.5	12.5	0.38	0.27	0.172	1.3	95.7	3.0	
▲	Boring B	0.2	12.5	0.38	0.26	0.152	6.1	88.2	5.7	
★	Boring B Cap	0.5	12.5	0.61	0.43	0.261	5.6	91.3	3.1	
⊙	Boring C	0.2	2				0.0	20.1	79.9	

GEOTECHNOLOGY
A Universal Engineering Sciences Company

GRAIN SIZE DISTRIBUTION

Meredosia Old Ash Pond
Meredosia, Illinois
J024917.07

GRAIN SIZE 2018 J024917.07 SIEVE DATA.GPJ 00 CLONE ME.GPJ 6/13/22



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring	Depth (ft.)	Sample Description	LL	PL	PI	Cc	Cu
●	**Boring C Cap**	**0.5**						
⊠	**Boring D**	**35.0**	**POORLY GRADED SAND(SP)**				**0.92**	**1.56**
▲	**Boring D Cap**	**0.5**						

	Boring	Depth (ft.)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**Boring C Cap**	**0.5**	**12.5**	**0.09**			**2.0**	**43.2**	**54.8**	
⊠	**Boring D**	**35.0**	**9.5**	**0.39**	**0.3**	**0.252**	**0.7**	**98.0**	**1.3**	
▲	**Boring D Cap**	**0.5**	**19**	**0.15**			**3.8**	**65.4**	**30.8**	

GEOTECHNOLOGY
A Universal Engineering Sciences Company

GRAIN SIZE DISTRIBUTION

Meredosia Old Ash Pond
Meredosia, Illinois
J024917.07

GRAIN SIZE 2018 J024917.07 SIEVE DATA.GPJ 00 CLONE ME.GPJ 6/13/22

APPENDIX F

ILLINOIS RIVER AND GROUNDWATER ELEVATION SUMMARY

ILLINOIS RIVER AND GROUNDWATER ELEVATION SUMMARY
OLD ASH POND
MEREDOSIA POWER PLANT
MORGAN COUNTY, ILLINOIS

USGS Illinois River Gauge Data		
Closest USGS Gaging Station	Meredosia, IL Power Plant	
Datum of Gauge	417.64	ft NAVD88
Maximum Gauge Height	28.61	ft NAVD88
Maximum River Height	446.25	ft NAVD88

Flood Stages and Records	Gauge height (ft)	Elevation (ft NAVD88)
Record High	28.86	466.57
Record Low	-1.13	416.58
Major Flood Stage	24	441.64
Moderate Flood Stage	22	439.64
Flood Stage	17	434.64
Action Stage	14	431.64

Flood Events Over 25 ft Gauge Height		
Date	Gauge height (ft)	Elevation (ft NAVD88)
7/2/2015	28.86	446.50
5/26/1943	28.70	446.34
4/27/2013	28.69	446.33
6/4/2019	28.39	446.03
5/30/1995	28.30	445.94
1/5/2016	28.03	445.67
3/10/1985	27.62	445.26
5/19/2002	27.57	445.21
4/19/1979	27.28	444.92
7/28/1993	26.96	444.60
12/12/1982	26.40	444.04
5/23/2009	26.25	443.89
5/2/1973	26.25	443.89
06/06/2013	25.79	443.43
3/24/1982	25.56	443.20
5/23/1933	25.50	443.14
5/27/2020	25.39	443.03
4/20/1922	25.10	442.74

https://water.weather.gov/ahps2/crests.php?wfo=lsx&gage=mroi2&crest_type=historic

Boring Name	Boring Elevation (ft NAVD88)	Depth to Ash Bottom (ft bls)	Elevation of Ash Bottom (ft NAVD88)
Boring A	463.350	15.5	447.850
Boring B	463.422	17.5	445.922
Boring C	459.441	11	448.441
Boring D	458.333	11	447.333

ILLINOIS RIVER AND GROUNDWATER ELEVATION SUMMARY
OLD ASH POND
MEREDOSIA POWER PLANT
MORGAN COUNTY, ILLINOIS

Groundwater Elevations near the Old Ash Pond					
	Elevations (feet NAVD88)				
Gauging Date	APW-1	APW-5	APW-8	APW-10	APW-11
6/5/2018	429.56	426.86	426.03	not installed	not installed
9/20/2018	428.9	427.41	426.73	427.1	427.92
11/27/2018	426.57	427.49	426.54	426.71	427.96
1/29/2019	430.69	429.45	428.94	429.34	430.01
6/4/2019	441.12	442.67	442.82	442.98	442.19
8/26/2019	435.46	432.55	429.84	431.09	434.01
12/9/2019	432.34	430.75	429.94	430.4	431.97
2/17/2020	433.13	431.92	431.36	432.26	433.01
4/27/2020	434.26	432.55	431.49	432.71	433.86
7/29/2020	434.42	432.28	430.54	431.79	433.69
12/4/2020	428.41	426.29	424.82	425.59	427.32
1/26/2021	427.82	425.96	424.65	425.34	426.88
6/30/2021	431.64	430.08	429.31	429.75	431.04
9/17/2021	432.07	429.61	427.32	428.38	430.81
11/11/2021	431.48	430.52	430.58	431.06	431.22

APPENDIX G

SHRUB AND CANOPY VEGETATION SURVEY

SHRUB AND CANOPY VEGETATION SURVEY
OLD ASH POND
MEREDOSIA POWER PLANT
MORGAN COUNTY, ILLINOIS

Location	Layer	Common Name	Latin Name	Percent Absolute Cover	Comment
Boring A	Canopy	Black Locust	*Robinia pseudoacacia*	40%	
		Eastern Cottonwood	*Populus deltoiodes*	10%	
		Eastern Red Cedar	*Juniperus virginiana*	5%	
	Shrub	Black Locust	*Robinia pseudoacacia*	20%	
		Bush Honeysuckle	*Lonicera mackii*	5%	
		White Mulberry	*Morus alba*	2%	
		Common Persimmon	*Diospyros virginiana*	2%	
Boring B	Canopy	Black Locust	*Robinia pseudoacacia*	60%	
		Eastern Red Cedar	*Juniperus virginiana*	10%	
		Eastern Cottonwood	*Populus deltoiodes*	10%	
	Shrub	Bush Honeysuckle	*Lonicera mackii*	25%	
		Box Elder/Ash-leaf Maple	*Acer negundo*	5%	
		Eastern Red Cedar	*Juniperus virginiana*	5%	
Boring C	Canopy	Black Locust	*Robinia pseudoacacia*	40%	
		White Mulberry	*Morus alba*	20%	
		Box Elder/Ash-leaf Maple	*Acer negundo*	20%	
		Eastern Cottonwood	*Populus deltoiodes*	10%	
		Pecan	*Carya illinoinensis*	5%	
	Shrub	Bush Honeysuckle	*Lonicera mackii*	100%	
Boring D	Canopy	Eastern Cottonwood	*Populus deltoiodes*	50%	
		White Mulberry	*Morus alba*	50%	
		Black Locust	*Robinia pseudoacacia*	10%	
	Shrub	Bush Honeysuckle	*Lonicera mackii*	40%	
		Box Elder/Ash-leaf Maple	*Acer negundo*	5%	
SW Corner W Cell	Canopy	Eastern Red Cedar	*Juniperus virginiana*	30%	Low point of west cell
		Box Elder/Ash-leaf Maple	*Acer negundo*	20%	
		Eastern Cottonwood	*Populus deltoiodes*	20%	
	Shrub	Rough-leaf Dogwood	*Cornus drummondii*	70%	
SW Corner E Cell	Canopy	Black Locust	*Robinia pseudoacacia*	70%	Low point of east cell Stacked logs here from cutting, not from flooding
		White Mulberry	*Morus alba*	60%	
	Shrub	White Mulberry	*Morus alba*	40%	
		Bush Honeysuckle	*Lonicera mackii*	10%	

Canopy layer: 30 foot circle around low point or boring clearing
Shrub layer: 15 foot circle around low point or boring clearing

APPENDIX H

PRECIPITATION DATA SUMMARY

PRECIPITATION DATA SUMMARY
OLD ASH POND
MEREDOSIA POWER PLANT
MORGAN COUNTY, ILLINOIS

Normal Monthly Precipitation Jacksonville, IL - 1991-2020		
January	1.93	inches
February	1.72	inches
March	2.81	inches
April	4.27	inches
May	4.82	inches
June	4.89	inches
July	3.96	inches
August	3.39	inches
September	3.50	inches
October	2.97	inches
November	3.01	inches
December	1.98	inches
Annual Total	39.25	inches

Source: https://www.weather.gov/wrh/climate?wfo=ilx

NOAA Significant Storm Events Database		
Date	Precip (inches)	Event Duration
5/13/2009	2-4	2 hours
6/2/2011	3	2 hours
6/17/2011	5-10	5 hours
6/25/2011	2-5	5 hours
6/4/2014	2.5-4	2 hours
7/11/2015	2.5-4.5	6 hours
7/19/2015	3-6	5 hours
4/29/2017	4-5	3 hours

Source: https://www.ncdc.noaa.gov/stormevents

PRECIPITATION DATA SUMMARY
OLD ASH POND
MEREDOSIA POWER PLANT
MORGAN COUNTY, ILLINOIS

Daily Precip Records by Month - Springfield, IL		
Month	Precip (inches)	Year
January	2.41	1937
February	3.38	1882
March	4.60	1898
April	4.45	1979
May	4.20	1893
June	5.15	1917
July	4.33	1981
August	5.59	2016
September	5.44	1926
October	4.74	1941
November	2.70	1881
December	4.70	1982

Sources:
https://www.weather.gov/ilx/spi-pcpn-janfebmar
https://www.weather.gov/ilx/spi-pcpn-aprmayjun
https://www.weather.gov/ilx/spi-pcpn-julaugsep
https://www.weather.gov/ilx/spi-pcpn-octnovdec

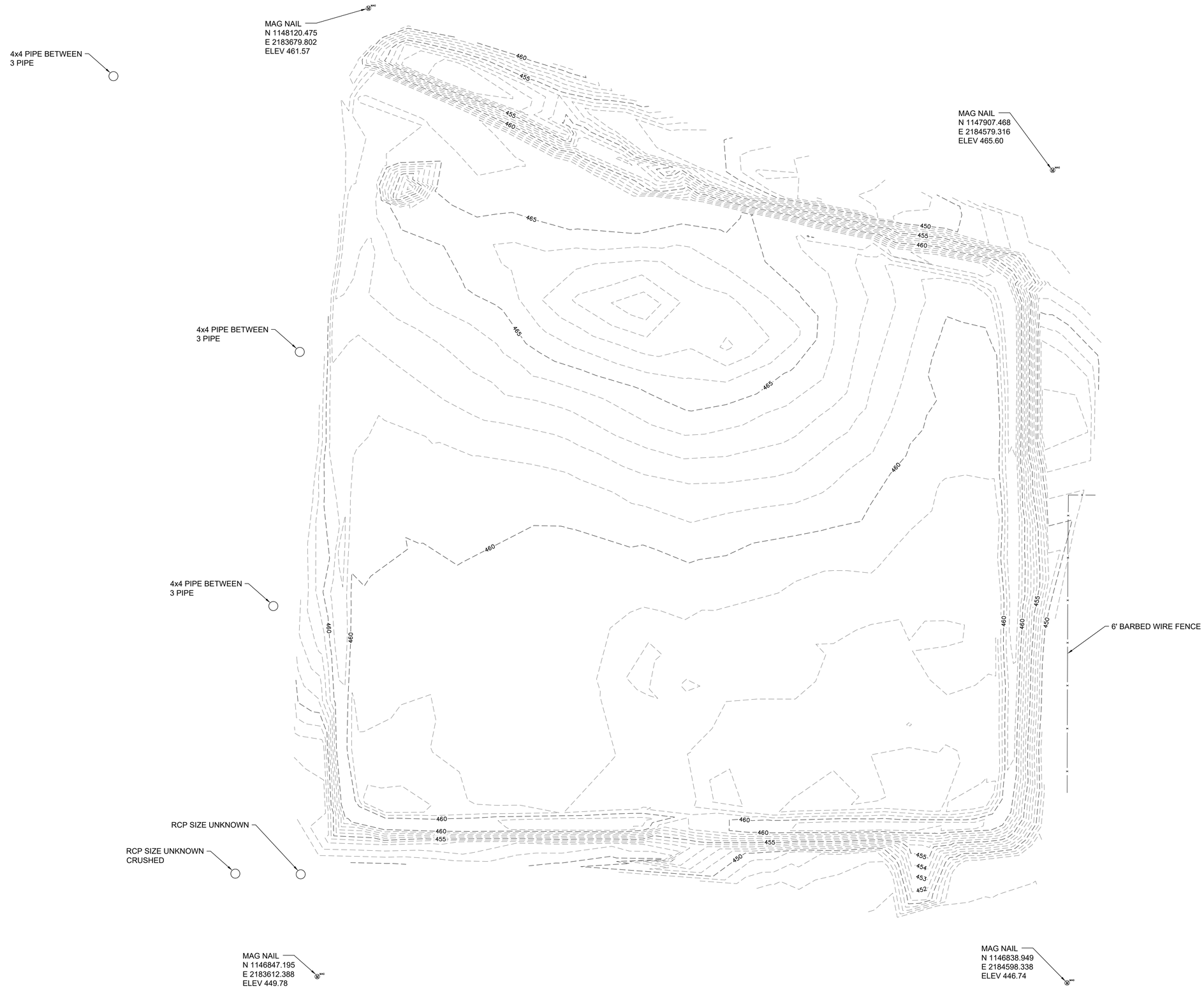
Record Events - Springfield, IL		
Record Precip (24-hour period)	6.12 inches	December 2-3, 1982
Record Precip (1 month)	15.16 inches	September 1926
Record Snowfall (24-hour period)	17.4 inches	March 25-25, 2013

Source: https://www.weather.gov/ilx/spi-alltime

APPENDIX I

(DIGITAL FORMAT ONLY)

SURVEY DATA



REVISIONS					
NO.	DATE	DESCRIPTION	NO.	DATE	DESCRIPTION

DESIGNED: ____
DRAWN: SMS
CHECKED: ABC
DATE: 5/5/2022

PROJECT NUMBER: 22.0302
FILE: 220302-survey3d.dwg
SCALE: 1"=60'

Hampton, Lenzini and Renwick, Inc.
Civil & Structural Engineers , Land Surveyors , Environmental Services
ELGIN . SPRINGFIELD . WOODRIDGE . MT CARMEL
www.hlrengineering.com
184.000959 ILLINOIS PROFESSIONAL DESIGN FIRM LS / PE / SE CORPORATION

AMEREN MISSOURI

AMEREN LEGACY POND MEREDOSIA

TOPOGRAPHIC MAP

TOTAL SHEETS	SHEET NUMBER
1	1

BENCHMARK INFORMATION

PROJECT BENCHMARK
POINT NUMBER 49:
N: 1150664.1865 E: 2185146.9920
ELEVATION: 447.42'
COORDINATE SYSTEM: ILLINOIS STATE PLANE WEST COORDINATE

DESCRIPTION:
BENCHMARK DISK SET IN TOP OF CONCRETE MONUMENT. THE BENCHMARK IS 80 FEET SOUTH OF THE CENTERLINE OF THE WABASH RAILWAY, 72.8 FEET SOUTHWEST OF A POWERPOLE, 51.5 FEET WEST OF A RAILROAD CROSSING SIGNAL, AND 30.2 FEET NORTHEAST OF A POWERPOLE WITH A TRANSFORMER.

SURVEY CONTROL:
HORIZONTAL AND VERTICAL CONTROL HAS BEEN ESTABLISHED BY GPS OBSERVATION USING TRIMBLE'S "VRS NOW" NETWORK, NAD1983 (2011) (CONUS) ILLINOIS WEST GEOID12B 1202, NAVD 88 ADJUSTMENTS. STATE PLANE COORDINATE VAULES ARE ON THE ILLINOIS WEST PROJECTION LABELED IN US FEET.

REVISIONS

NO.	DATE	DESCRIPTION	NO.	DATE	DESCRIPTION

DESIGNED: ____
DRAWN: SMS
CHECKED: ABC
DATE: 5/5/2022

PROJECT NUMBER: 22.0302
FILE: 220302-survey3d.dwg
SCALE: 1"=80'

Hampton, Lenzini and Renwick, Inc.
Civil & Structural Engineers . Land Surveyors . Environmental Services
ELGIN . SPRINGFIELD . WOODRIDGE . MT CARMEL
www.hlrengineering.com
184.000959 ILLINOIS PROFESSIONAL DESIGN FIRM LS / PE / SE CORPORATION

AMEREN MISSOURI

AMEREN LEGACY POND MEREDOSIA

TOPOGRAPHIC MAP

TOTAL SHEETS	SHEET NUMBER
1	1

APPENDIX J

LIMITATIONS OF REPORT

ENVIRONMENTAL SAMPLING AND TESTING LIMITATIONS

1. The Report has been prepared on behalf of and for the exclusive use of the addressee, solely for use in documenting specific sample results. This report and the findings contained herein shall not, in whole or in part, be disseminated or conveyed to any other party, nor used by any other party in whole or in part, without the prior written consent of Geotechnology. Unless other contractual agreements were made, the services described in the report were carried out in accordance with the Terms for Geotechnology's Services which accompanied the proposal.

2. The sampling was performed in accordance with generally accepted practices of other consultants undertaking similar projects at the same time and in the same geographical area, and Geotechnology endeavored to observe that degree of care and skill ordinarily exercised by other consultants under similar circumstances and conditions. The findings and conclusions stated herein must be considered not as scientific certainties, but rather as professional opinions concerning the significance of the limited data gathered during the course of the project. Geotechnology does not and cannot represent that the site contains no hazardous waste or material, oil (including petroleum products) or other latent condition beyond that observed by Geotechnology.

3. It is recommended that Geotechnology be retained to provide further services during construction and/or implementation of any remedial measures recommended in this report. This is to allow Geotechnology to observe compliance with the concepts and recommendations contained herein, and to allow the development of design changes in the event that subsurface conditions differ from those anticipated.

4. In the event that information is developed relative to environmental or hazardous waste or material issues at the site and not contained in this report, such information shall be brought to Geotechnology's attention. Geotechnology will evaluate such information and, based on this evaluation, may modify the conclusions stated in this Report.

5. The conclusions and recommendations contained in this Report are based in part upon the data obtained from a limited number of air, water, soil and/or groundwater samples obtained from widely spaced sampling. The identified presence of contaminated water, soil and/or groundwater is limited to the extent that they could be identified by color, smell, instrumentation and sampling and testing. There is a potential for contaminated water, soil and/or groundwater above the indicated concentrations to occur elsewhere on the site. The nature and extent of variations between these explorations may not become evident until further exploration. If variations or other latent conditions then appear evident, and/or if changes are made in regulations, it will be necessary to reevaluate the conclusions and recommendations of this report.

6. Quantitative laboratory testing was performed as part of the assessment by an outside laboratory, Geotechnology has relied upon the data provided, and has not conducted an independent evaluation of the reliability to these data.

7. Chemical analyses have been performed for specific parameters during the course of this sampling as described in the text. Do not assume that a given chemical is not present at the site simply because it was not present at the test locations. The chemical may exist on the site where tests were not performed. In addition, it should be noted that additional chemical constituents not tested for during the sampling could be present in water, soil and/or groundwater at the site.

ATTACHMENT C
Groundwater Flow Contour Maps

NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

- Monitoring Well Location
- (427.20) Groundwater Elevation at Well Location (November 17, 2010)
- —425— Groundwater Elevation Contour

N

0 300 600

SCALE IN FEET

Drawn By: WAH	Ck'd By: [illegible]	App'vd By: AMS
Date: 5-18-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

GROUNDWATER ELEVATION CONTOURS - NOVEMBER 2010

Project Number	
J024917.01	PLATE 8

NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

- Monitoring Well Location
- (427.20) Groundwater Elevation at Well Location (December 13, 2010)
- —425— Groundwater Elevation Contour

N

0 300 600

SCALE IN FEET

Drawn By: WAH	Ck'd By: [illegible]	App'vd By: AMS
Date: 5-18-16	Date: 7/20/16	Date: 7/16/20

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

GROUNDWATER ELEVATION CONTOURS - DECEMBER 2010

Project Number	
J024917.01	PLATE 9

NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

- Monitoring Well Location
- (427.20) Groundwater Elevation at Well Location (September 15, 2011)
- —425— Groundwater Elevation Contour

N

0 300 600

SCALE IN FEET

Drawn By: WAH	Ck'd By:	App'vd By: AMS
Date: 5-18-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

GROUNDWATER ELEVATION CONTOURS - SEPTEMBER 2011

Project Number	
J024917.01	PLATE 10

NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

- Monitoring Well Location
- (427.20) Groundwater Elevation at Well Location (October 28, 2011)
- —425— Groundwater Elevation Contour

N

0 300 600

SCALE IN FEET

Drawn By: WAH	Ck'd By:	App'vd By: AMS
Date: 5-18-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

GROUNDWATER ELEVATION CONTOURS - OCTOBER 2011

Project Number	
J024917.01	PLATE 11

NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

- Monitoring Well Location
- (427.20) Groundwater Elevation at Well Location (March 26, 2012)
- —425— Groundwater Elevation Contour

N

0 300 600

SCALE IN FEET

Drawn By: WAH	Ck'd By:	App'vd By: AMS
Date: 5-18-16	Date: 7/26/16	Date: 7/20/16

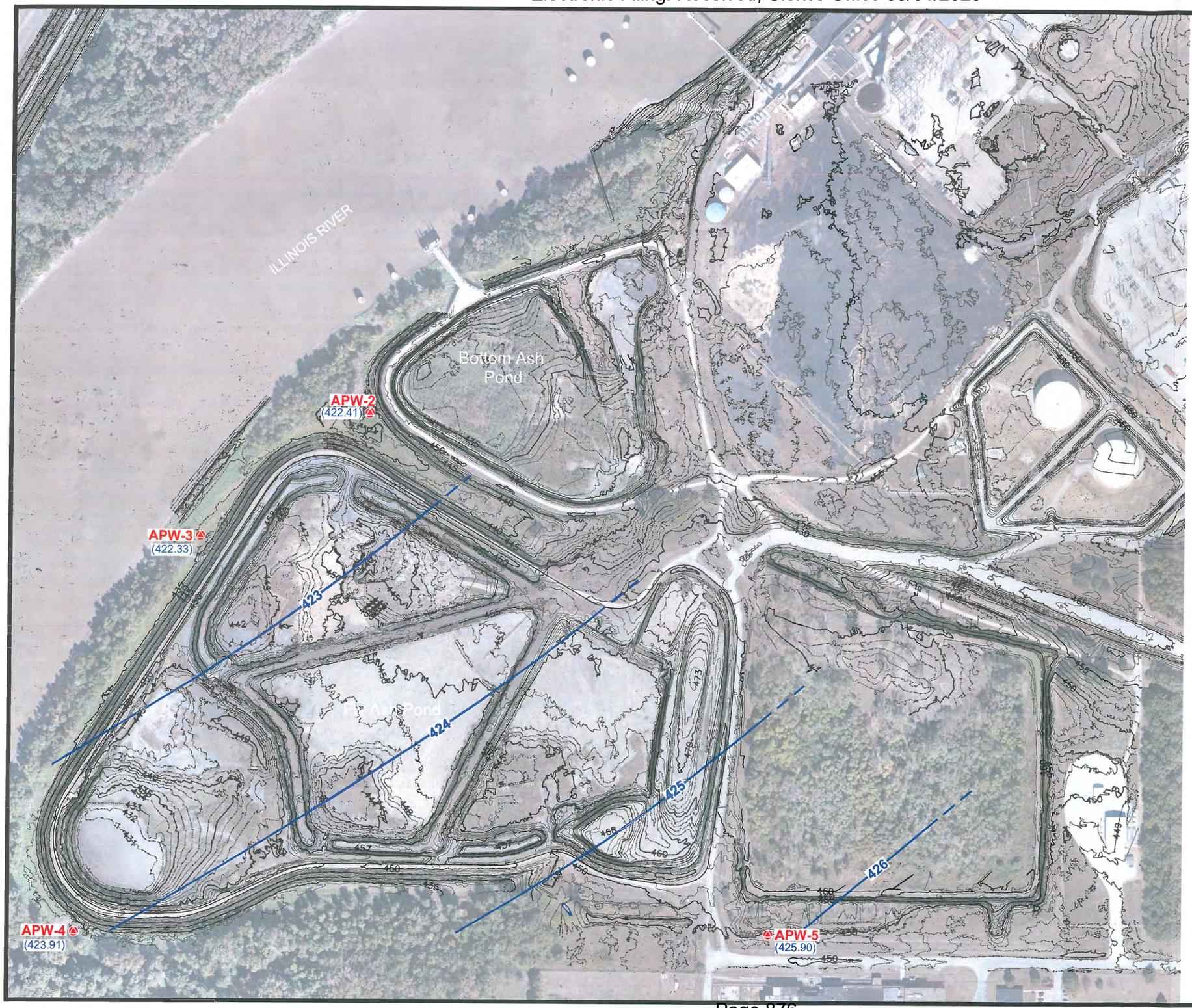
GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

GROUNDWATER ELEVATION CONTOURS - MARCH 2012

Project Number J024917.01

PLATE 12



NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

- Monitoring Well Location
- (427.20) Groundwater Elevation at Well Location (June 18, 2012)
- —425— Groundwater Elevation Contour

N

0 300 600

SCALE IN FEET

Drawn By: WAH	Ck'd By: [illegible]	App'vd By: AMS
Date: 5-18-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

GROUNDWATER ELEVATION CONTOURS - JUNE 2012

Project Number	
J024917.01	PLATE 13

NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

- Monitoring Well Location
- (427.20) Groundwater Elevation at Well Location (September 17, 2012)
- —425— Groundwater Elevation Contour

N

0 300 600

SCALE IN FEET

Drawn By: WAH	Ck'd By: VAE	App'vd By: AMS
Date: 5-18-16	Date: 7/20/16	Date: 7/20/16

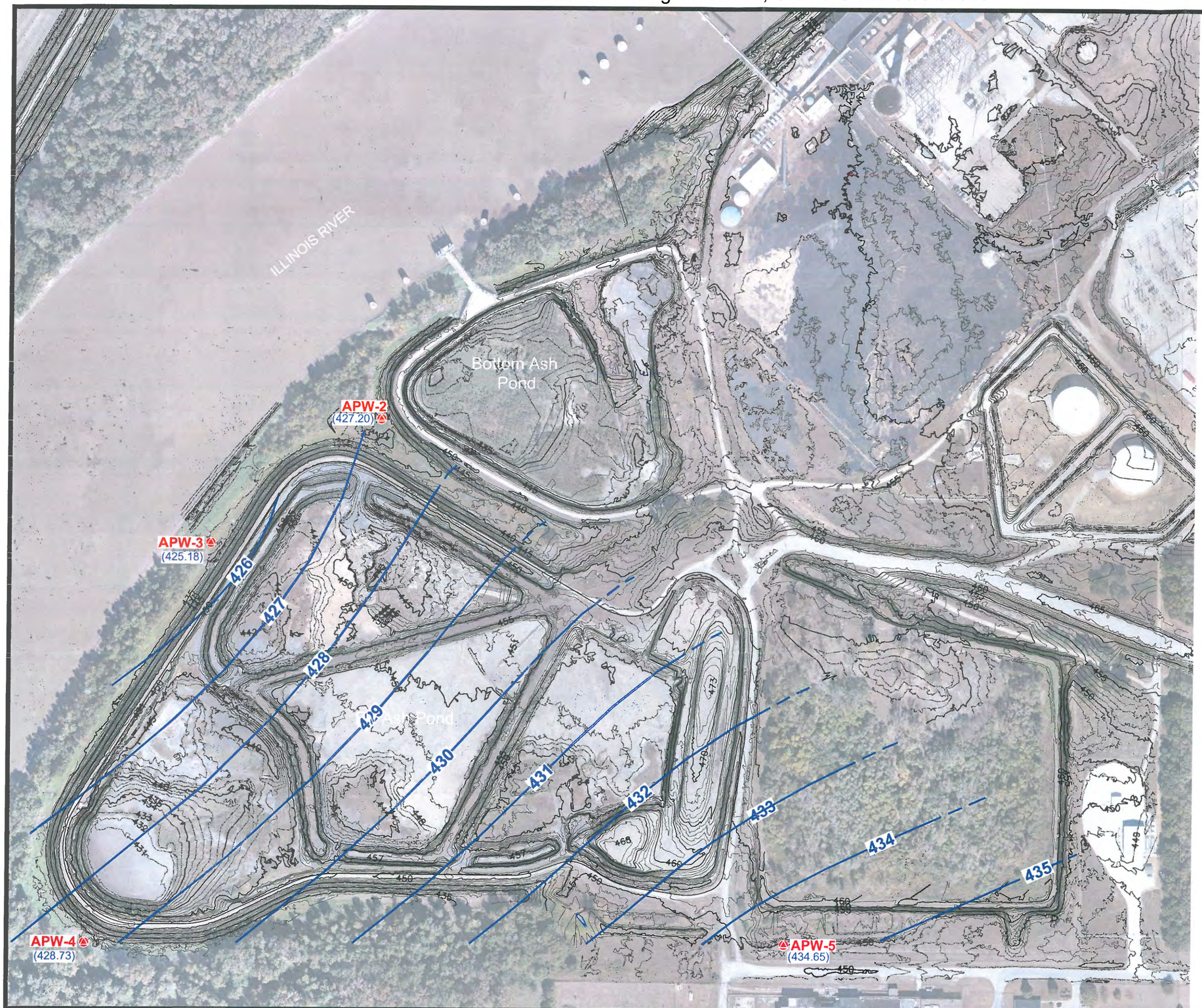
GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

GROUNDWATER ELEVATION CONTOURS - SEPTEMBER 2012

Project Number J024917.01

PLATE 14



NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

- Monitoring Well Location
- (427.20) Groundwater Elevation at Well Location (August 25, 2015)
- —425— Groundwater Elevation Contour

N

0 300 600

SCALE IN FEET

Drawn By: WAH	Ck'd By: JLC	App'vd By: AMS
Date: 5-18-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

GROUNDWATER ELEVATION CONTOURS - AUGUST 2015

Project Number	
J024917.01	PLATE 15

NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

- Monitoring Well Location
- (427.20) Groundwater Elevation at Well Location (December 21, 2015)
- —425— Groundwater Elevation Contour

N

0 300 600

SCALE IN FEET

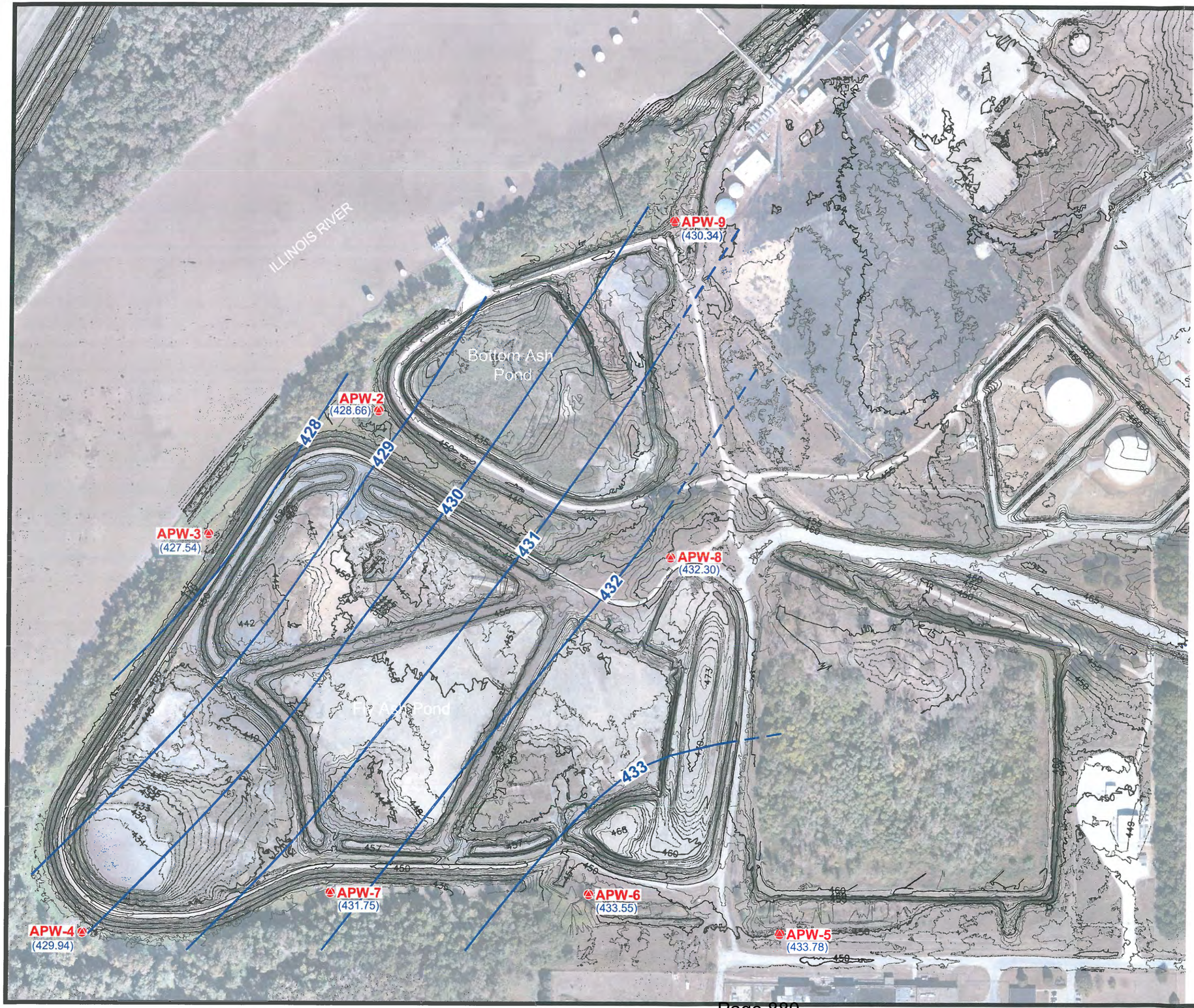
Drawn By: WAH	Ck'd By: the	App'vd By: AMS
Date: 3-9-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

GROUNDWATER ELEVATION CONTOURS - DECEMBER 2015

Project Number	
J024917.01	PLATE 16



NOTES

1. Plan adapted from drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. Monitoring Wells were located by the project surveyor.
3. Monitoring Well APW-1 is located beyond the limits of this map and is approximately 2000-feet east of Monitoring Well APW-5.

LEGEND

- Monitoring Well Location
- (427.20) Groundwater Elevation at Well Location (February 18, 2016)
- —425— Groundwater Elevation Contour

N

0 300 600

SCALE IN FEET

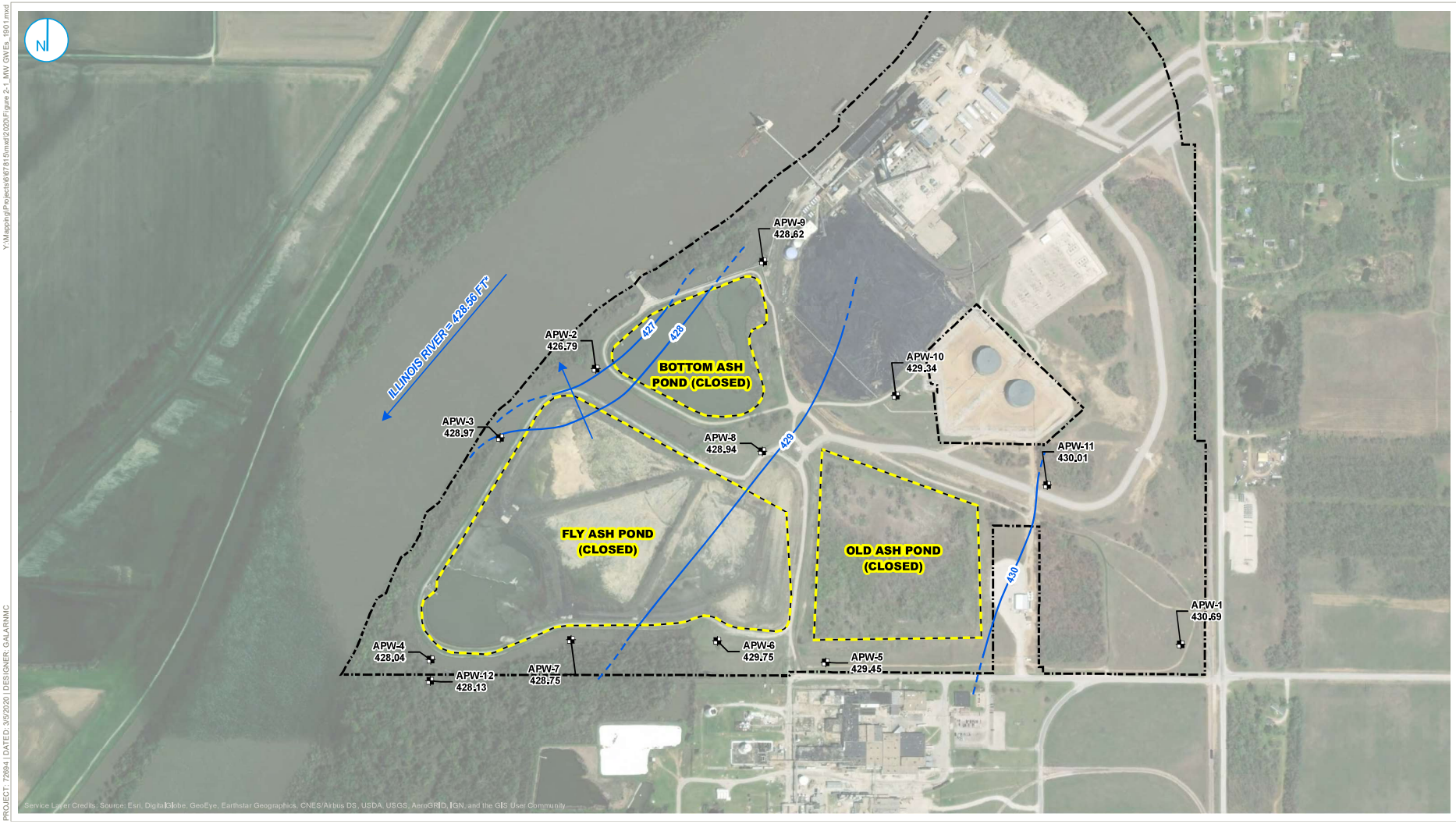
Drawn By: WAH	Ck'd By: VSE	App'vd By: AMS
Date: 5-18-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Power Station
Meredosia, Illinois

GROUNDWATER ELEVATION CONTOURS - FEBRUARY 2016

Project Number	PLATE 17
J024917.01	



MONITORING WELL LOCATION
GROUNDWATER ELEVATION CONTOUR (1-FT INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION
0 240 480 Feet

APPROXIMATE PROPERTY BOUNDARY
LIMITS OF CCP MANAGEMENT

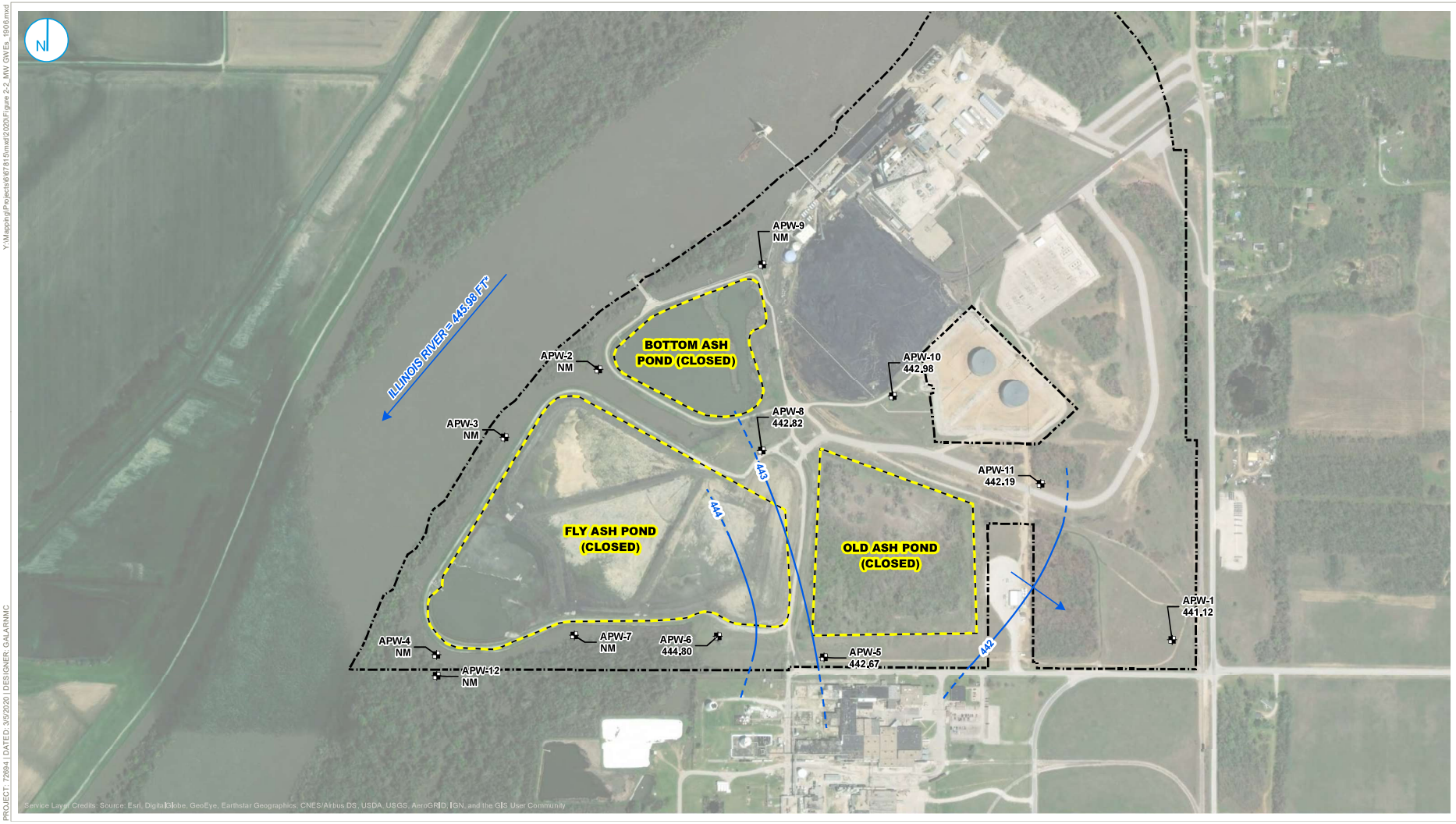
*River Elevation obtained from United States Geological Survey 05585500 Meredosia, IL gaging station. The elevation was reported in NGVD29 and then converted to NAVD88 at the time of this drawing.

GROUNDWATER ELEVATIONS - JANUARY 29, 2019

FIGURE 2-1

2019 ANNUAL REPORT
AMEREN ENERGY RESOURCES MEREDOSIA
POWER STATION
MORGAN COUNTY, ILLINOIS

RAMBOLL US CORPORATION
A RAMBOLL COMPANY



MONITORING WELL LOCATION
GROUNDWATER ELEVATION CONTOUR (1-FT INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION
0 240 480 Feet

APPROXIMATE PROPERTY BOUNDARY
LIMITS OF CCP MANAGEMENT

*River Elevation obtained from United States Geological Survey 05585500 Meredosia, IL gaging station. The elevation was reported in NGVD29 and then converted to NAVD88 at the time of this drawing.
NM = Not Measured, surrounding area flooded

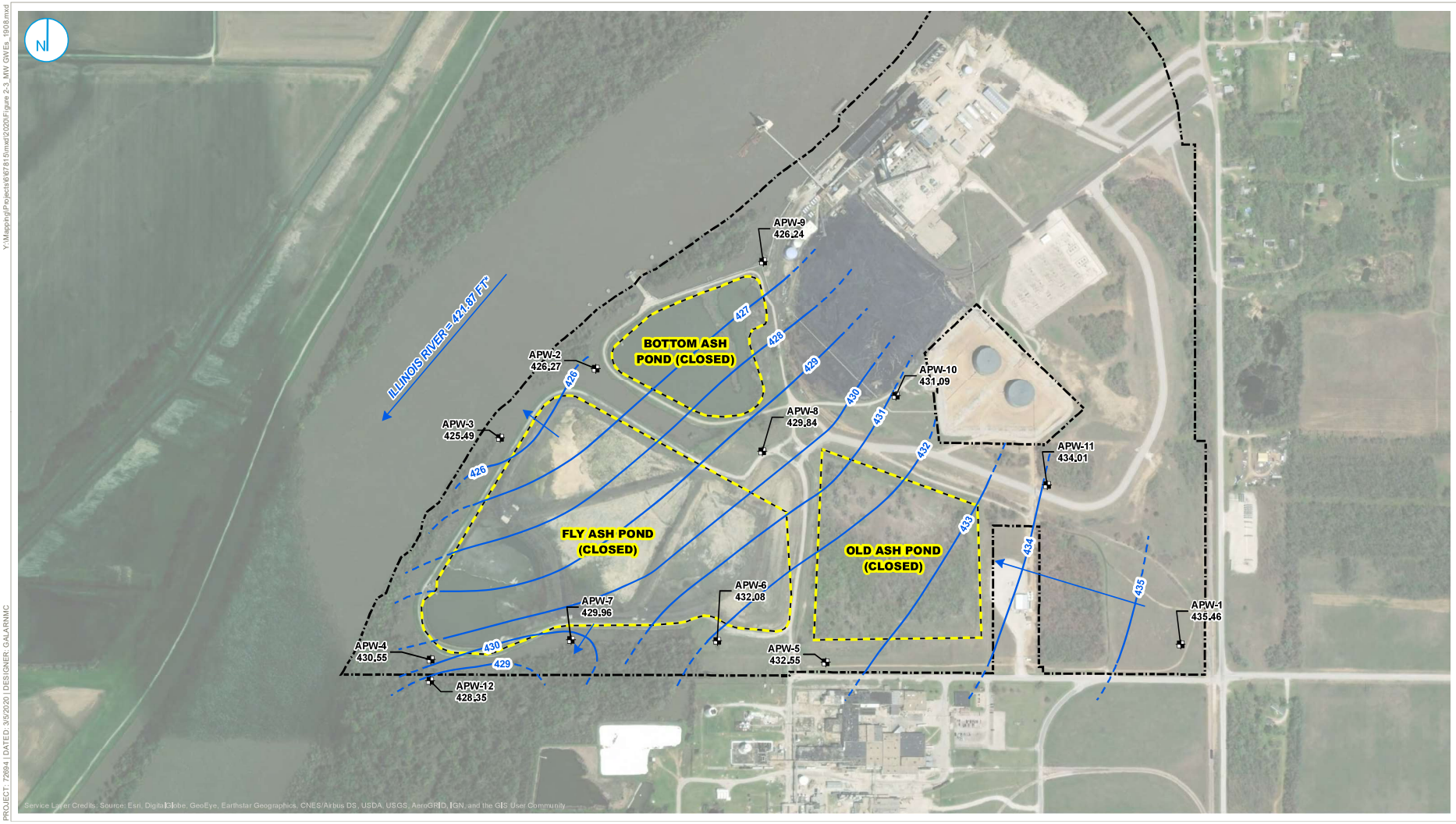
GROUNDWATER ELEVATIONS - JUNE 4, 2019

FIGURE 2-2

2019 ANNUAL REPORT
AMEREN ENERGY RESOURCES MEREDOSIA
POWER STATION
MORGAN COUNTY, ILLINOIS

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL



MONITORING WELL LOCATION
GROUNDWATER ELEVATION CONTOUR (1-FT INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION

0 240 480 Feet

APPROXIMATE PROPERTY BOUNDARY
LIMITS OF CCP MANAGEMENT

*River Elevation obtained from United States Geological Survey 05585500 Meredosia, IL gaging station. The elevation was reported in NGVD29 and then converted to NAVD88 at the time of this drawing.

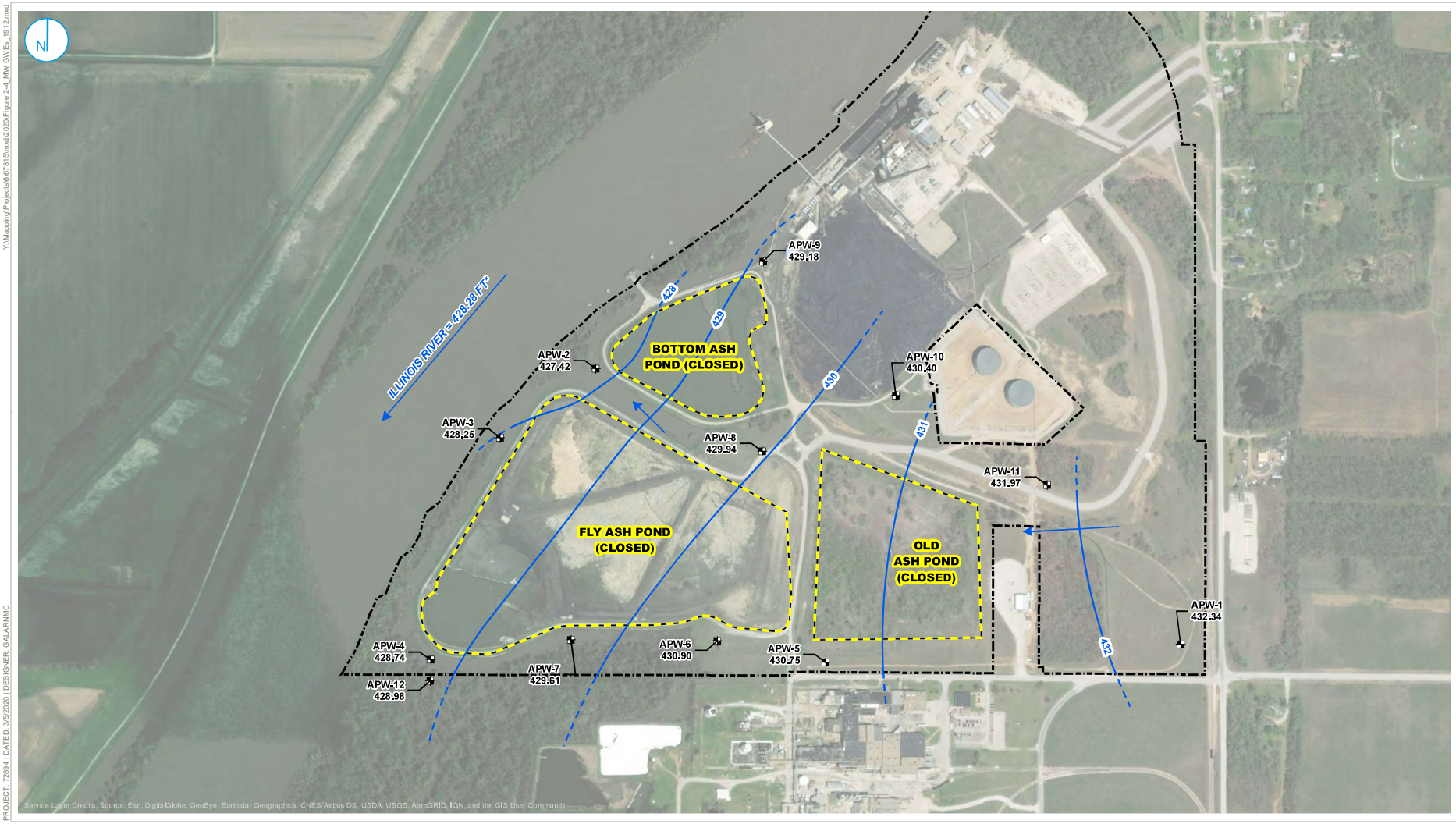
GROUNDWATER ELEVATIONS - AUGUST 26-27, 2019

FIGURE 2-3

2019 ANNUAL REPORT
AMEREN ENERGY RESOURCES MEREDOSIA
POWER STATION
MORGAN COUNTY, ILLINOIS

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL

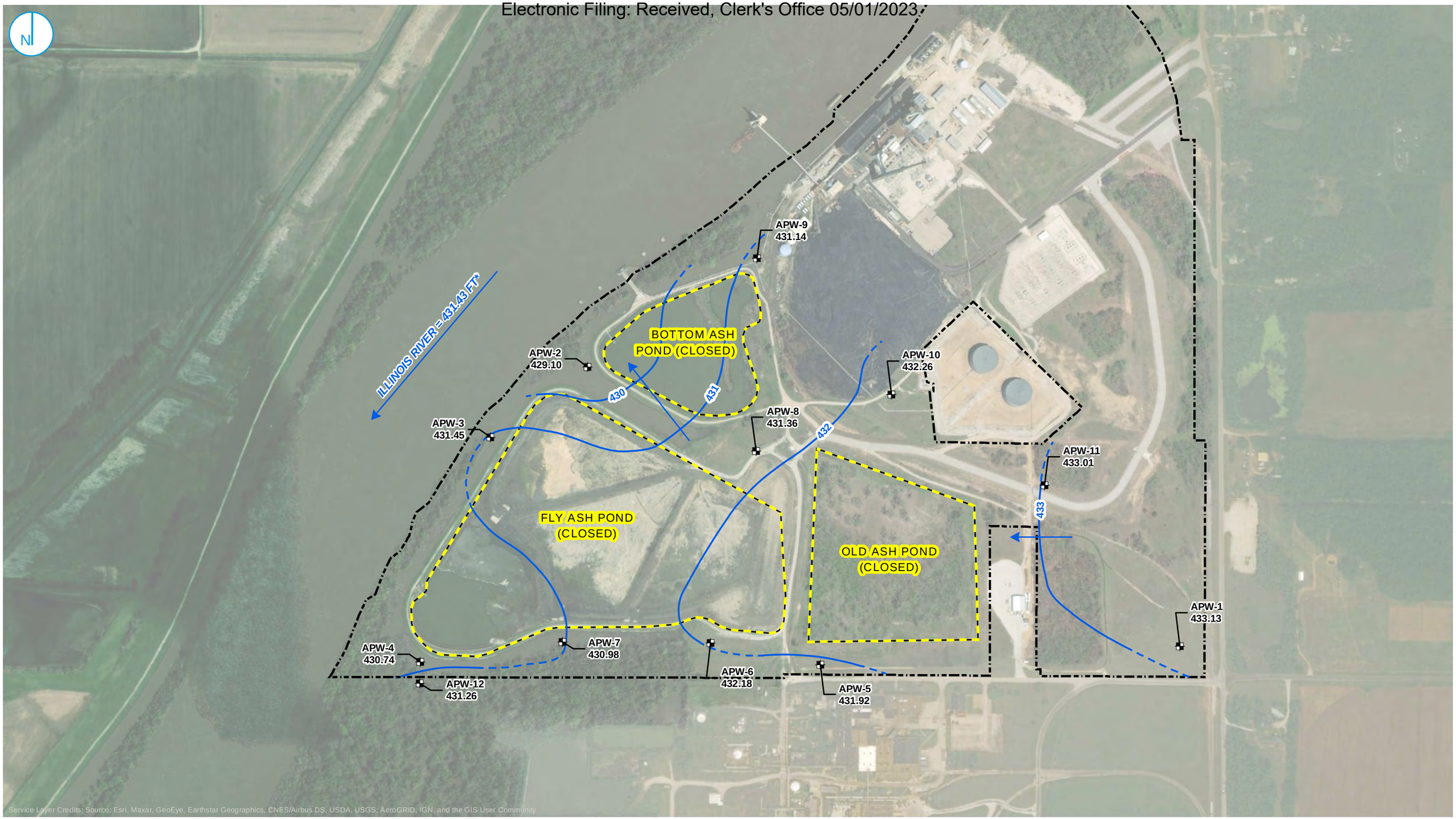

N
ILLINOIS RIVER = 428.28 FT*
APW-9
429.18
APW-2
427.42
BOTTOM ASH
POND (CLOSED)
APW-10
430.40
APW-3
428.25
APW-8
429.94
APW-11
431.97
FLY ASH POND
(CLOSED)
OLD
ASH POND
(CLOSED)
APW-1
432.34
APW-4
428.74
APW-6
430.90
APW-5
430.75
APW-7
429.61
APW-12
428.98
428
429
430
431
432
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
MONITORING WELL LOCATION
GROUNDWATER ELEVATION CONTOUR (1-FT INTERVAL, NAVD88)
INFERRED GROUNDWATER ELEVATION CONTOUR
GROUNDWATER FLOW DIRECTION
0 240 480 Feet
APPROXIMATE PROPERTY BOUNDARY
LIMITS OF CCP MANAGEMENT
*River Elevation obtained from United States Geological Survey 05585500 Meredosia, IL gaging station. The elevation was reported in NGVD29 and then converted to NAVD88 at the time of this drawing.
GROUNDWATER ELEVATIONS - DECEMBER 9, 2019
FIGURE 2-4
2019 ANNUAL REPORT
AMEREN ENERGY RESOURCES MEREDOSIA
POWER STATION
MORGAN COUNTY, ILLINOIS
RAMBOLL US CORPORATION
A RAMBOLL COMPANY
RAMBOLL
Y:\Mapping\Projects\667815\mxd\2020\Figure 2-4_MW GWEs_1912.mxd
PROJECT: 72694 | DATED: 3/5/2020 | DESIGNER: GALARNMC

641

Electronic Filing: Received, Clerk's Office 05/01/2023

Y:\Mapping\Projects\667815\mxd\2020\Figure 3-1_MW GWEs_2002.mxd

PROJECT: 72694 | DATED: 3/10/2021 | DESIGNER: MARRAMJ



MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (1-FT INTERVAL, NAVD88)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

0 240 480 Feet

APPROXIMATE PROPERTY BOUNDARY

LIMITS OF CCP MANAGEMENT

*River Elevation obtained from United States Geological Survey 05585500 Meredosia, IL gaging station. The elevation was reported in NGVD29 and then converted to NAVD88 at the time of this drawing.
NGVD29 = National Geodetic Vertical Datum of 1929
NAVD88 = North American Vertical Datum of 1988

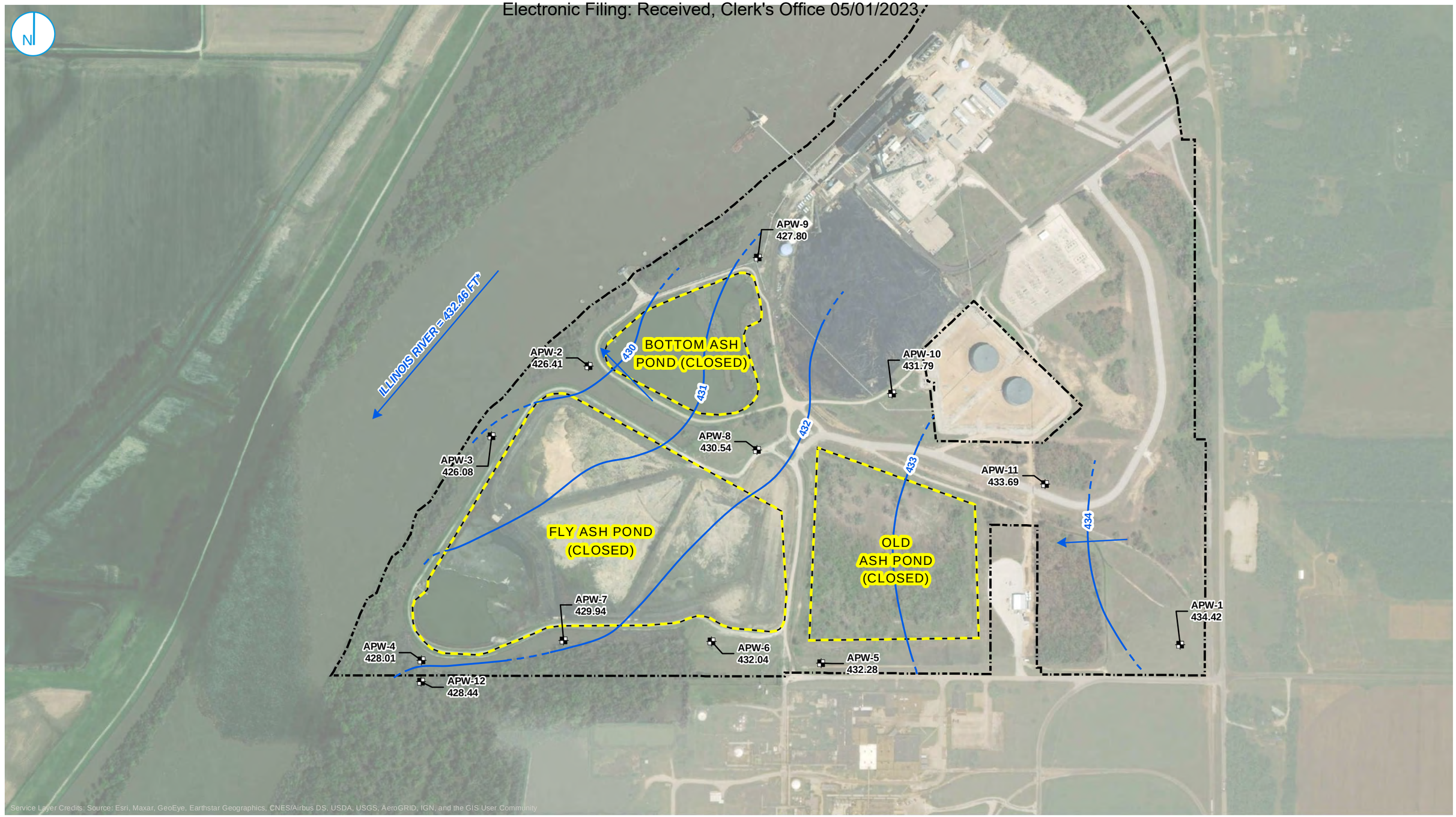
GROUNDWATER ELEVATIONS - FEBRUARY 17, 2020

FIGURE 3-1

2020 ANNUAL REPORT
AMEREN ENERGY RESOURCES
MEREDOSIA POWER STATION
MORGAN COUNTY, ILLINOIS

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

Electronic Filing: Received, Clerk's Office 05/01/2023



Y:\Mapping\Projects\667815\mxd\2020\Figure 3-2_MW GWEs_2004.mxd

PROJECT: 72694 | DATED: 3/10/2021 | DESIGNER: MARRAMJ

MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (1-FT INTERVAL, NAVD88)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

APPROXIMATE PROPERTY BOUNDARY

LIMITS OF CCP MANAGEMENT

0 240 480 Feet

*River Elevation obtained from United States Geological Survey 05585500 Meredosia, IL gaging station. The elevation was reported in NGVD29 and then converted to NAVD88 at the time of this drawing.
NGVD29 = National Geodetic Vertical Datum of 1929
NAVD88 = North American Vertical Datum of 1988

GROUNDWATER ELEVATIONS - APRIL 27, 2020

2020 ANNUAL REPORT
AMEREN ENERGY RESOURCES
MEREDOSIA POWER STATION
MORGAN COUNTY, ILLINOIS

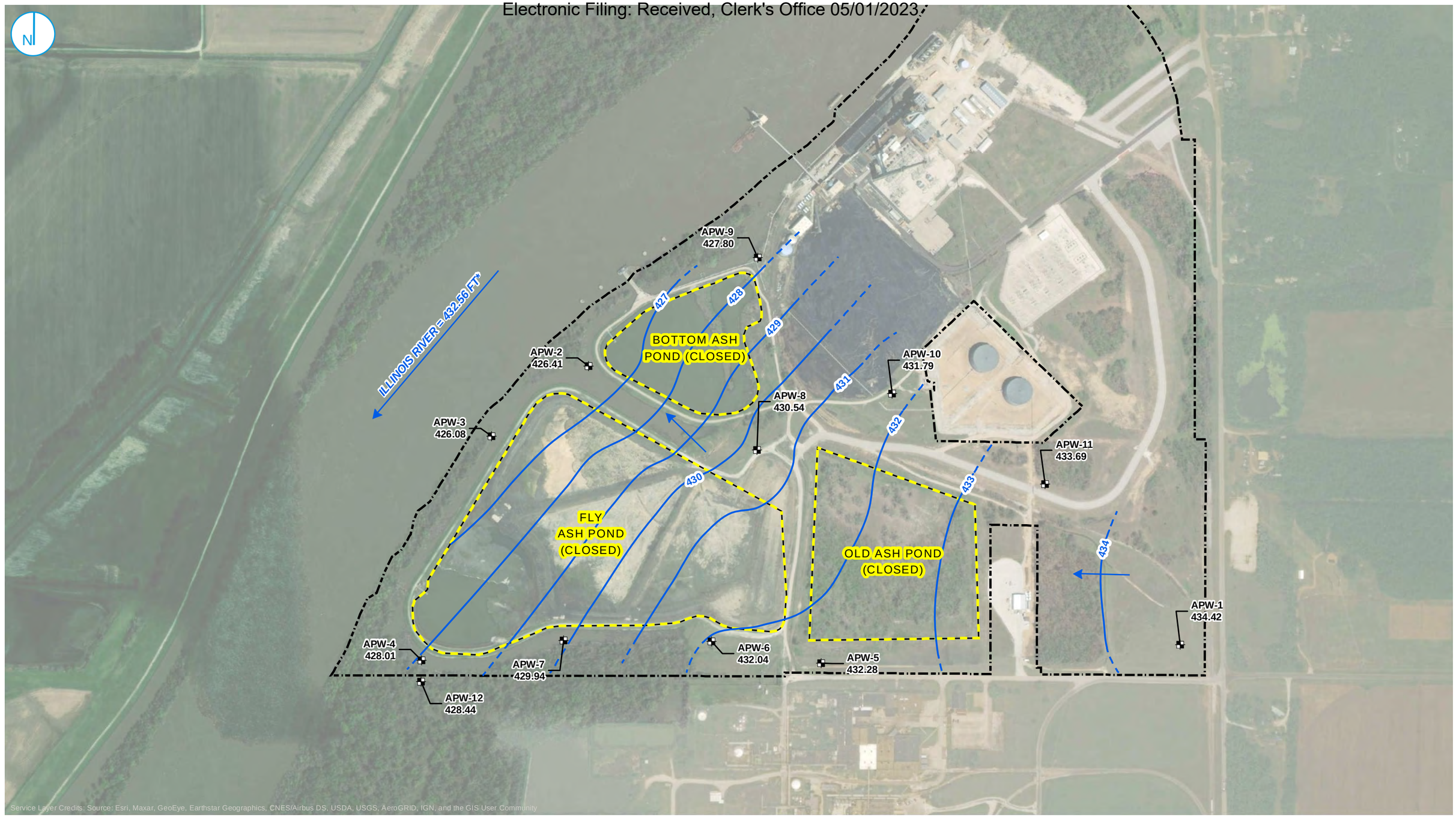
FIGURE 3-2

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

Electronic Filing: Received, Clerk's Office 05/01/2023

Y:\Mapping\Projects\667815\mxd\2020\Figure 3-3_MW GWEs_2007.mxd

PROJECT: 72694 | DATED: 3/10/2021 | DESIGNER: MARRAMJ



MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (1-FT INTERVAL, NAVD88)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

0 240 480 Feet

APPROXIMATE PROPERTY BOUNDARY

LIMITS OF CCP MANAGEMENT

*River Elevation obtained from United States Geological Survey 05585500 Meredosia, IL gaging station. The elevation was reported in NGVD29 and then converted to NAVD88 at the time of this drawing.
NGVD29 = National Geodetic Vertical Datum of 1929
NAVD88 = North American Vertical Datum of 1988

GROUNDWATER ELEVATIONS - JULY 29, 2020

2020 ANNUAL REPORT
AMEREN ENERGY RESOURCES
MEREDOSIA POWER STATION
MORGAN COUNTY, ILLINOIS

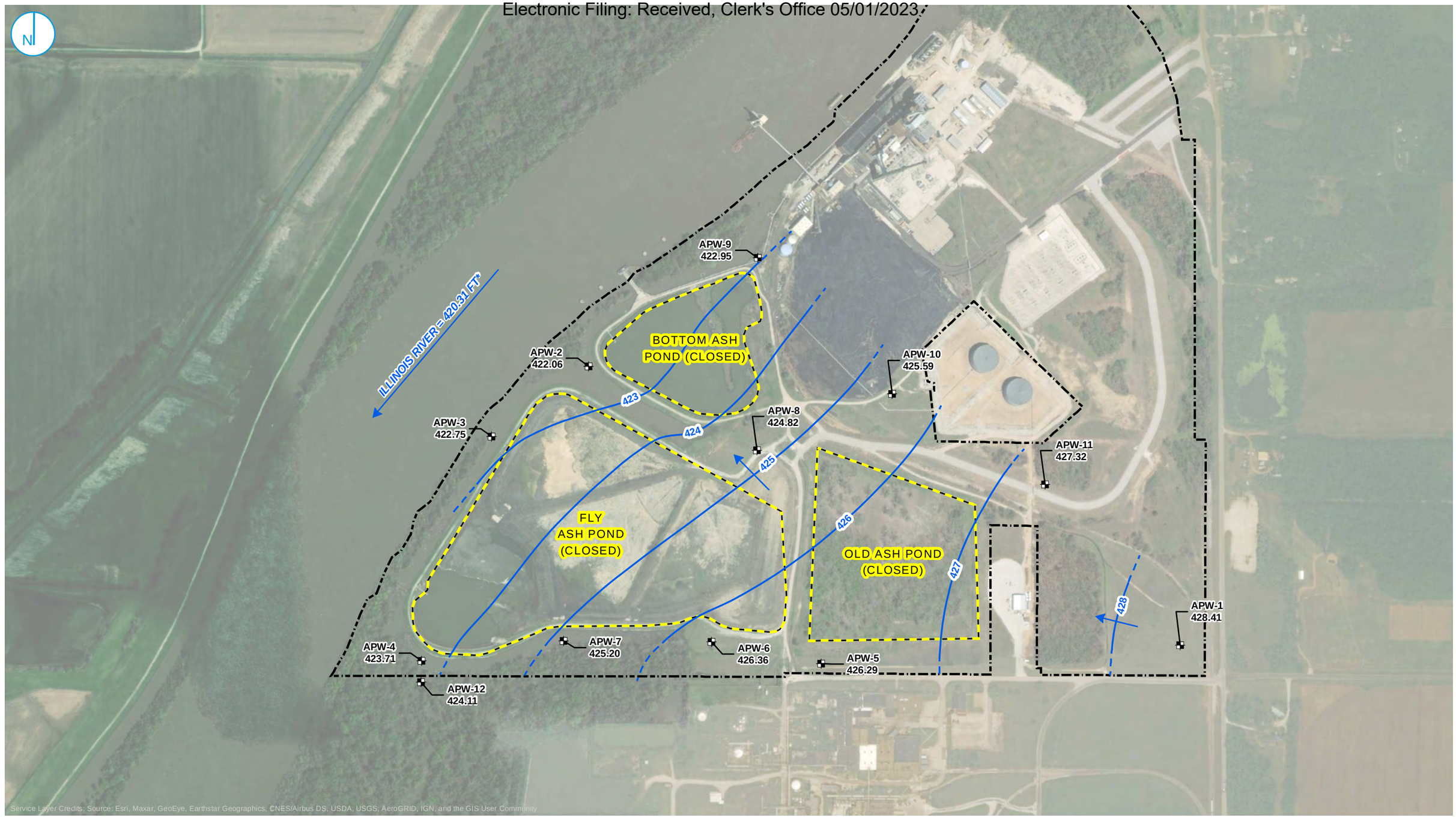
FIGURE 3-3

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

Electronic Filing: Received, Clerk's Office 05/01/2023

Y:\Mapping\Projects\667815\mxd\2020\Figure 3-4_MW GWEs_2012.mxd

PROJECT: 72694 | DATED: 3/10/2021 | DESIGNER: MARRAMJ



MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (1-FT INTERVAL, NAVD88)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

0 240 480 Feet

APPROXIMATE PROPERTY BOUNDARY

LIMITS OF CCP MANAGEMENT

*River Elevation obtained from United States Geological Survey 05585500 Meredosia, IL gaging station. The elevation was reported in NGVD29 and then converted to NAVD88 at the time of this drawing.
NGVD29 = National Geodetic Vertical Datum of 1929
NAVD88 = North American Vertical Datum of 1988

GROUNDWATER ELEVATIONS - DECEMBER 4, 2020

2020 ANNUAL REPORT
AMEREN ENERGY RESOURCES
MEREDOSIA POWER STATION
MORGAN COUNTY, ILLINOIS

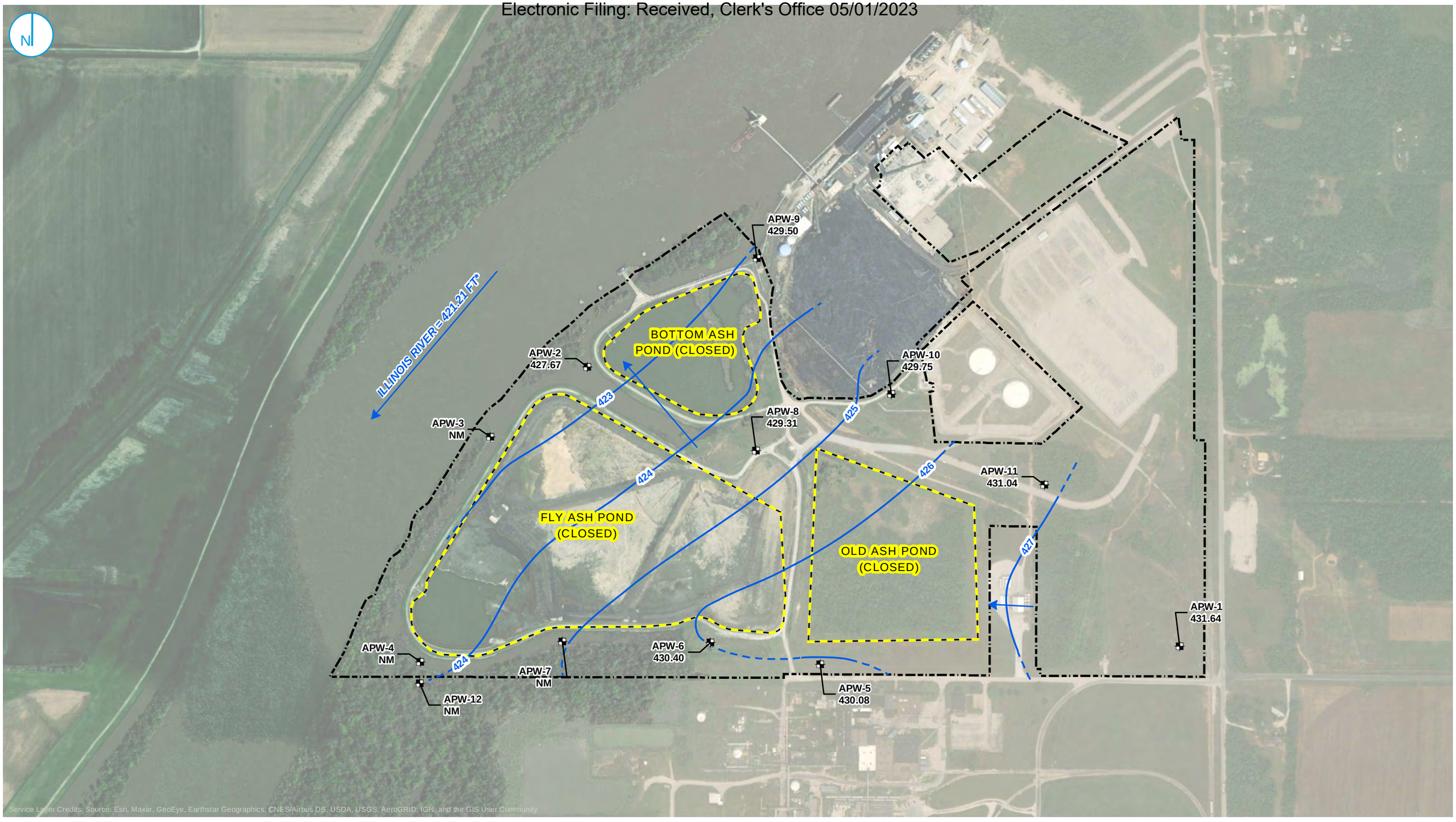
FIGURE 3-4

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

Electronic Filing: Received, Clerk's Office 05/01/2023

Y:\Mapping\Projects\667815\mxd\2021\Figure 3-1_MW GWEs_2101.mxd

PROJECT: 72694 | DATED: 2/25/2022 | DESIGNER: galammc



MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (1-FT INTERVAL, NAVD88)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

0 240 480 Feet

APPROXIMATE PROPERTY BOUNDARY

LIMITS OF CCP MANAGEMENT

*River Elevation obtained from United States Geological Survey 05585500 Meredosia, IL gaging station. The elevation was reported in NGVD29 and then converted to NAVD88 at the time of this drawing.
NGVD29 = National Geodetic Vertical Datum of 1929
NAVD88 = North American Vertical Datum of 1988

GROUNDWATER ELEVATIONS - JANUARY 26, 2021

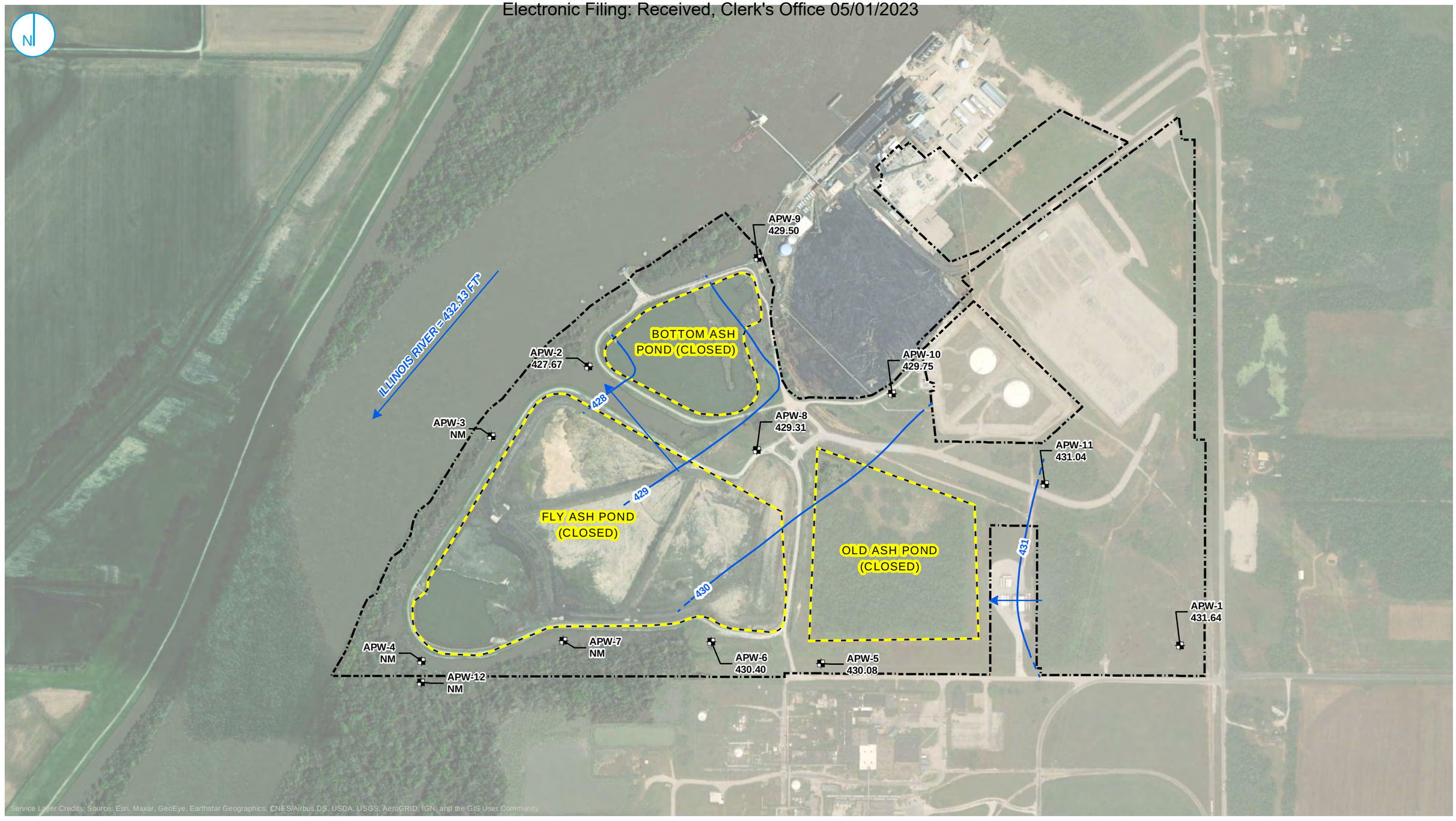
2021 ANNUAL REPORT
AMEREN ENERGY RESOURCES
MEREDOSIA POWER STATION
MORGAN COUNTY, ILLINOIS

FIGURE 3-1

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

Electronic Filing: Received, Clerk's Office 05/01/2023

Y:\Mapping\Projects\66781S\mxd\2021\Figure 3-2_MW GWEs_2106.mxd



PROJECT: 72694 | DATED: 2/25/2022 | DESIGNER: galarnmc

MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (1-FT INTERVAL, NAVD88)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

0 240 480 Feet

APPROXIMATE PROPERTY BOUNDARY

LIMITS OF CCP MANAGEMENT

*River Elevation obtained from United States Geological Survey 05585500 Meredosia, IL gaging station. The elevation was reported in NGVD29 and then converted to NAVD88 at the time of this drawing.
NM= Groundwater Elevation Not Measured
NGVD29 = National Geodetic Vertical Datum of 1929
NAVD88 = North American Vertical Datum of 1988

GROUNDWATER ELEVATIONS - JUNE 30, 2021

2021 ANNUAL REPORT
AMEREN ENERGY RESOURCES
MEREDOSIA POWER STATION
MORGAN COUNTY, ILLINOIS

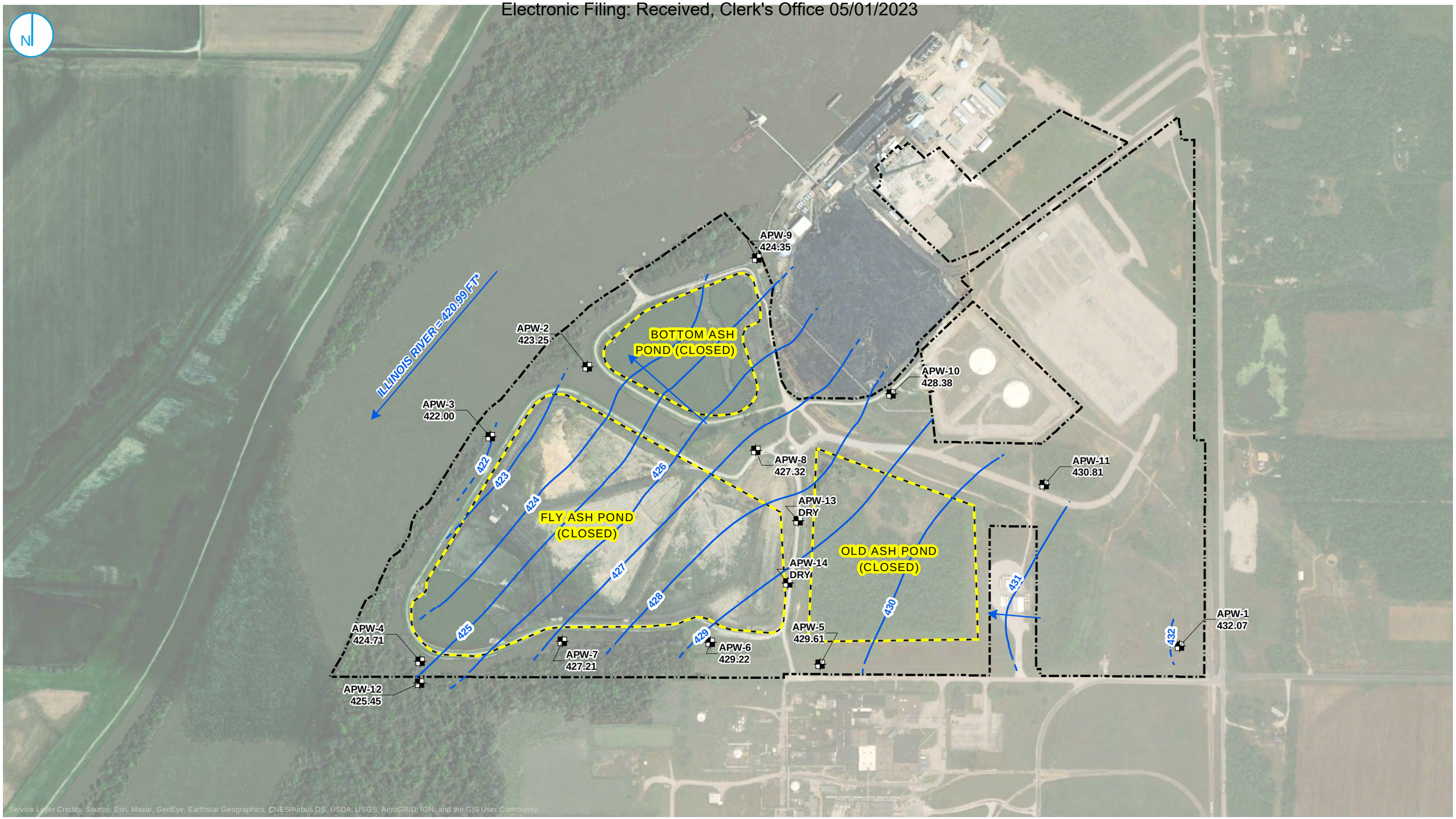
FIGURE 3-2

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

Electronic Filing: Received, Clerk's Office 05/01/2023

Y:\Mapping\Projects\66781S\mxd\2021Figure 3-3_MW GWEs_2109.mxd

PROJECT: 72694 | DATED: 2/25/2022 | DESIGNER: galarnmc



MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (1-FT INTERVAL, NAVD88)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

0 240 480 Feet

APPROXIMATE PROPERTY BOUNDARY

LIMITS OF CCP MANAGEMENT

*River Elevation obtained from United States Geological Survey 05585500 Meredosia, IL gaging station. The elevation was reported in NGVD29 and then converted to NAVD88 at the time of this drawing.
NM= Groundwater Elevation Not Measured
NGVD29 = National Geodetic Vertical Datum of 1929
NAVD88 = North American Vertical Datum of 1988

GROUNDWATER ELEVATIONS - SEPTEMBER 17, 2021

2021 ANNUAL REPORT
AMEREN ENERGY RESOURCES
MEREDOSIA POWER STATION
MORGAN COUNTY, ILLINOIS

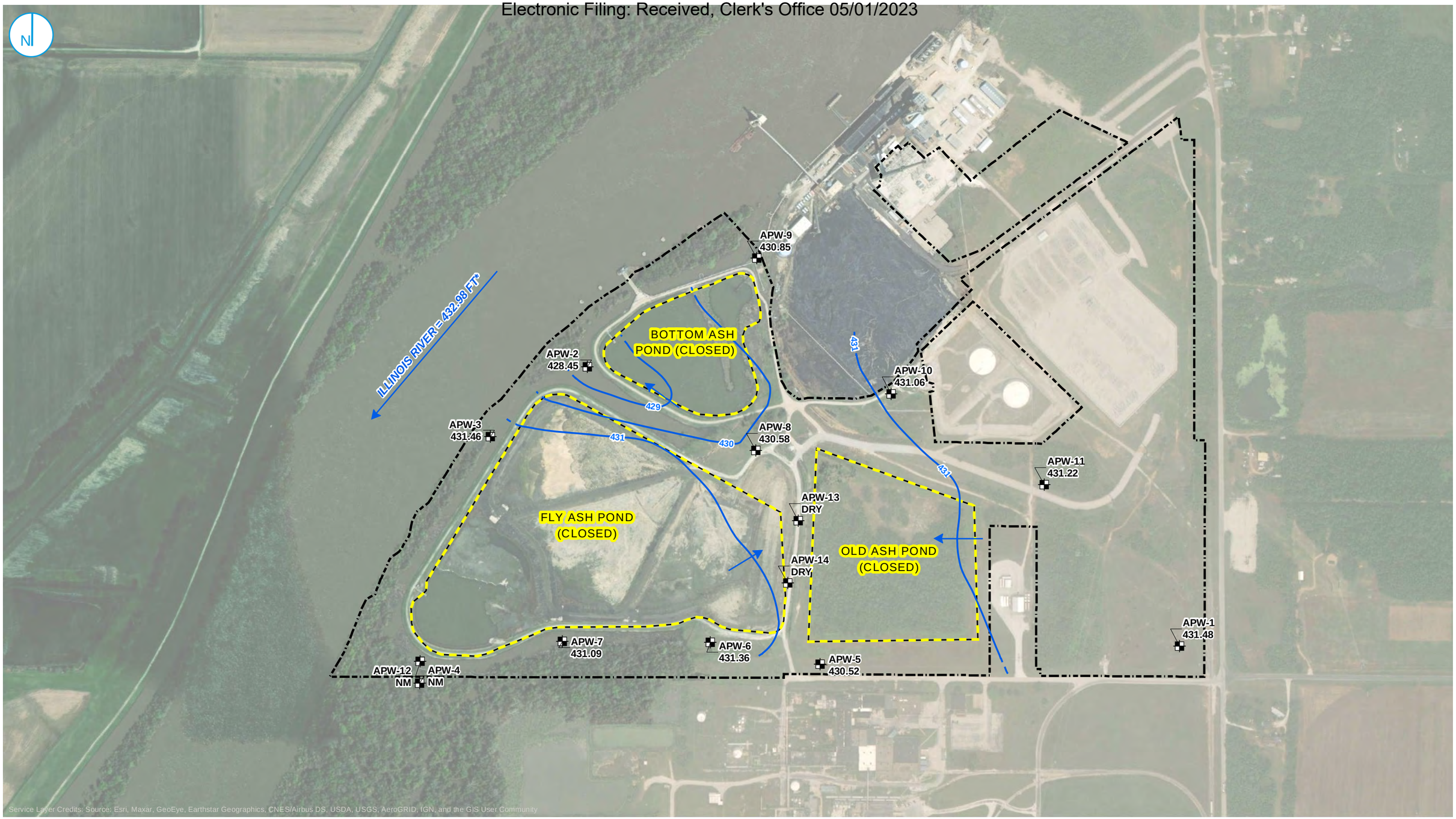
FIGURE 3-3

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

Electronic Filing: Received, Clerk's Office 05/01/2023

Y:\Mapping\Projects\66781S\mxd\2021\Figure 3-4_MW GWEs_2111.mxd

PROJECT: 72694 | DATED: 2/25/2022 | DESIGNER: galarnmc



MONITORING WELL LOCATION

GROUNDWATER ELEVATION CONTOUR (1-FT INTERVAL, NAVD88)

INFERRED GROUNDWATER ELEVATION CONTOUR

GROUNDWATER FLOW DIRECTION

0 240 480 Feet

APPROXIMATE PROPERTY BOUNDARY

LIMITS OF CCP MANAGEMENT

*River Elevation obtained from United States Geological Survey 05585500 Meredosia, IL gaging station. The elevation was reported in NGVD29 and then converted to NAVD88 at the time of this drawing.
NM= Groundwater Elevation Not Measured Due to Flooding
NGVD29 = National Geodetic Vertical Datum of 1929
NAVD88 = North American Vertical Datum of 1988

GROUNDWATER ELEVATIONS - NOVEMBER 11, 2021

2021 ANNUAL REPORT
AMEREN ENERGY RESOURCES
MEREDOSIA POWER STATION
MORGAN COUNTY, ILLINOIS

FIGURE 3-4

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

ATTACHMENT D
2017 Geotechnology Liquefaction Analysis

GEOTECHNOLOGY INC
FROM THE GROUND UP

GEOTECHNICAL EXPLORATION
MEREDOSIA FLY ASH POND AND CLOSED ASH POND
LIQUEFACTION ANALYSIS
MEREDOSIA, ILLINOIS

Prepared for:

AMEREN MISSOURI
St. Louis, Missouri

Prepared by:

GEOTECHNOLOGY, INC.
St. Louis, Missouri

Geotechnology Project No. J024917.03

September 20, 2017

St. Louis, MO
Fairview Heights, IL
Overland Park, KS
Memphis, TN
geotechnology.com

GEOTECHNOLOGY INC
FROM THE GROUND UP

September 20, 2017 J019896.07

Mr. Mike Wagstaff
Ameren Missouri
11149 Lindbergh Business Court
St. Louis, Missouri 63123

GEOTECHNICAL EXPLORATION
MEREDOSIA FLY AND CLOSED ASH PONDS
LIQUEFACTION ANALYSIS
HUTSONVILLE, ILLINOIS

Dear Mr. Wagstaff:

The report includes our understanding of the project, site conditions, conclusions and/or recommendations, and support data as listed in the Table of Contents.

It has been our pleasure to provide geotechnical services to you, and we would welcome the opportunity to provide other services during the course of the project. Please contact us if you need further information or clarification about this document.

Very truly yours,

GEOTECHNOLOGY, INC.

Brian J. Sanders, P.E.*
Senior Engineer

Craig K. Kaibel, P.E.
Geotechnical Manager

BJS/CKK/AMS:bjs/ccg

Copies submitted: (2) + pdf

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CRAIG K KAIBEL
062-061432
9/20/2017
STATE OF ILLINOIS

* Licensed in Missouri

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J024917.03

GEOTECHNICAL EXPLORATION
MEREDOSIA FLY ASH POND AND CLOSED ASH POND
LIQUEFACTION ANALYSIS
MEREDOSIA, ILLINOIS

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J024917.03

GEOTECHNICAL EXPLORATION
MEREDOSIA FLY ASH POND AND CLOSED ASH POND
LIQUEFACTION ANALYSIS
MEREDOSIA, ILLINOIS

SECTION I – PROJECT INFORMATION

AUTHORIZATION

Our services were authorized by the issuance of Ameren Energy PO 793018, dated June 6, 2017 to Geotechnology, Inc.

PURPOSE AND SCOPE OF SERVICES

The purpose of our services was to evaluate the liquefaction potential of the impounded material in the Fly Ash Pond and the Closed Ash Pond at the Meredosia Site. Briefly, services consisted of site reconnaissance, performing fourteen Cone Penetrometer Test (CPT) soundings, two direct push borings, engineering analyses, and preparation of this report. Important information prepared by The Geoprofessional Business Association (GBA) for studies of this type is presented in Appendix A for your review.

PROJECT AND SITE DESCRIPTION

The project site is at the decommissioned Meredosia Power Station in Meredosia, Illinois. Ameren is proposing to declassify the Fly Ash Pond and the Closed Ash Pond in accordance with guidelines issued by the Illinois Department of Natural Resources – Office of Water Resources (IDNR-OWR). We understand that the Closed Ash Pond does not have a bottom liner and has a soil cap of unknown thickness. The Fly Ash Pond does not have a bottom liner and is scheduled be graded and capped in 2018 construction seasons. The designed cap utilizes ClosureTurf, which is a geosynthetic system that meets the Subtitle D technical requirements and has been approved by the IEPA for installation.

SECTION II - FIELD EXPLORATION AND LABORATORY TESTING

Geotechnology performed fourteen seismic CPT soundings, designated as C-01 through C-08 (Fly Ash Pond) and O-01 through O-06 (Closed Ash Pond). The CPT sounding locations were selected and located in the field by a representative from Geotechnology. The CPT soundings were advanced by Geotechnology, using a 20-ton, track-mounted Vertek direct-push rig. The soundings were advanced to termination depths of approximately 25 feet below land surface (bls) in both the Fly Ash Pond and the Closed Ash Pond. Direct push samples from the impounded ash were collected to a depth of approximately 24 feet in each pond.

Geotechnology performed CPT testing in general accordance with ASTM D5778. The data were collected using a 15-square-centimeter end area, tri-axial geophone, seismic

piezometric cone with a saturated, porous filter ring at the u_2 pore pressure location (i.e., behind the tip). The cone was advanced to the predetermined termination depth or cone refusal at a rate of approximately 20 +/- 5 millimeters per second. The cone resistance, sleeve friction, pore pressure, shear strength, normalized soil behavior type (SBTn), and standard penetration test (SPT) N60 values are presented in Appendix B. Seismic cone penetration tests (SCPT) were performed in each sounding at approximately 3-foot depth intervals to collect shear wave velocity data. Shear wave velocity measurements versus depth at these locations are presented in Appendix C. The fines content was determined on select direct push samples using the percent passing the #200 sieve test and the results are included in Appendix D.

An engineer from Geotechnology observed the CPT data collection process. Unless noted on the CPT logs, the lines designating the changes between various strata represent approximate boundaries. The stratification given on the CPT logs, or described herein, is for use by Geotechnology in its analyses and should not be used as the basis of design or construction cost estimates without Geotechnology's written approval.

The CPT soundings and related information depict subsurface conditions only at the specific locations and times where the soundings were conducted. The passage of time could result in changes in conditions, interpreted to exist, at the locations where CPT was conducted.

SECTION III – SUBSURFACE CONDITIONS

STRATIGRAPHY

We understand the stratigraphy within the ash ponds consists of fly ash to depths of approximately 25 feet in the Fly Ash Pond and approximately 25 feet in the Closed Ash Pond. The CPT data indicates interbedded layers of material that respond to CPT advancement similar to clay, silty clay, silty sand, and sand in the Fly Ash Pond and interbedded layers of sand and silty sand in the Closed Ash Pond. The interbedded nature of the CPT data interpretation is to be expected in an uncontrolled waste product such as fly ash. The laboratory testing indicates the sampled material in the Fly Ash Pond was fine grained in nature having approximately 98 and 99 percent passing the #200 sieve. The sampled material in the Closed Ash Pond indicates the material is coarser in nature with approximately 4 percent passing the #200 sieve.

GROUNDWATER

We understand that the groundwater within the ash ponds is typically perched in nature. Based on the CPT data, groundwater (i.e.,hydrostatic pressure) in the Fly Ash Pond appears to range from depths of approximately 15 to 17 feet below the ground surface. In the Closed Ash Pond, the groundwater (i.e., hydrostatic pressure) appears to range from depths of approximately 26 to 29 feet below the ground surface. Groundwater levels might vary over time due to the effects of seasonal variation in precipitation, recharge, stage of the Illinois River, or other factors not evident at the time of exploration.

SECTION IV – LIQUEFACTION ANALYSIS

Geotechnology analyzed the CPT data for liquefaction potential and dynamic (post-liquefaction) settlement using the CLiq software. CLiq utilizes the analysis method published by Idriss and Boulanger in 2008 and updated in 2014. Based on ASCE 7-10, a design PGA of 0.08g and an earthquake magnitude of 7.5 where used in this analysis. The analysis incorporated the results of the laboratory tests to refine the fines content within the soundings. Based on the liquefaction analysis, it does not appear that the ash ponds have potentially liquefiable layers, i.e. where the calculated factor of safety (F.O.S) is less than 1.0, under the analyzed seismic loading. Liquefaction analysis results for each CPT sounding to the depths pushed are presented in Appendix E.

Geotechnology, Inc. performed seismic and static stability analysis of the embankments and impounded ash. This stability analysis was submitted to the Illinois Department of Natural Resources (IDNR) and approved in 2017. The Closed Ash Pond was reported closed with a soil cap in the 1970s.

Liquefaction Potential Index (LPI[1]) indices are all less than 0, which indicates a **very low risk of liquefaction**. LPI attempts to predict the potential of liquefaction to cause damage to surface features and provide a measure of the severity of liquefaction and has a scale of 0 to 20. *For reference an LPI of 0 indicates a very low liquefaction risk and a LPI of less than 5 indicates a low risk of liquefaction*.

The fluidity of the impounded material was also considered. The elevated or perched groundwater conditions suggest that some level of saturation of the impounded material is possible, especially if the Illinois River is at flood stage. The fines content determined from laboratory testing indicates the impounded material will behave similarly to silts and clays. As such, when saturated, the impounded material would potentially be less fluid than a similarly placed sand material.

SECTION V – CONCLUSIONS

Based on the results of the liquefaction analysis and the seismic and static stability analysis performed by Geotechnology, Inc., it is Geotechnology's opinion that there is a very low risk of surface manifestation of liquefaction or damage to the Fly Ash Pond and Closed Ash Pond embankments during a seismic event.

[1] David Kun Li, C Hsein Juang, Ronald D. Andrus, *Liquefaction Potential Index: A Critical Assessment Using Probability Concept* Journal of GeoEngineering, Vol.1, No.1, August 2006, pp. 11-24,

SECTION VI - LIMITATIONS OF REPORT

This report has been prepared on behalf of, and for the exclusive use of, the client for specific application to the named project as described herein. If this report is provided to other parties, it should be provided in its entirety with all supplementary information. In addition, the client should make it clear that the information is provided for factual data only, and not as a warranty of subsurface conditions presented in this report.

Geotechnology has attempted to conduct the services reported herein in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality and under similar conditions. The recommendations and conclusions contained in this report are professional opinions. The report is not a bidding document and should not be used for that purpose.

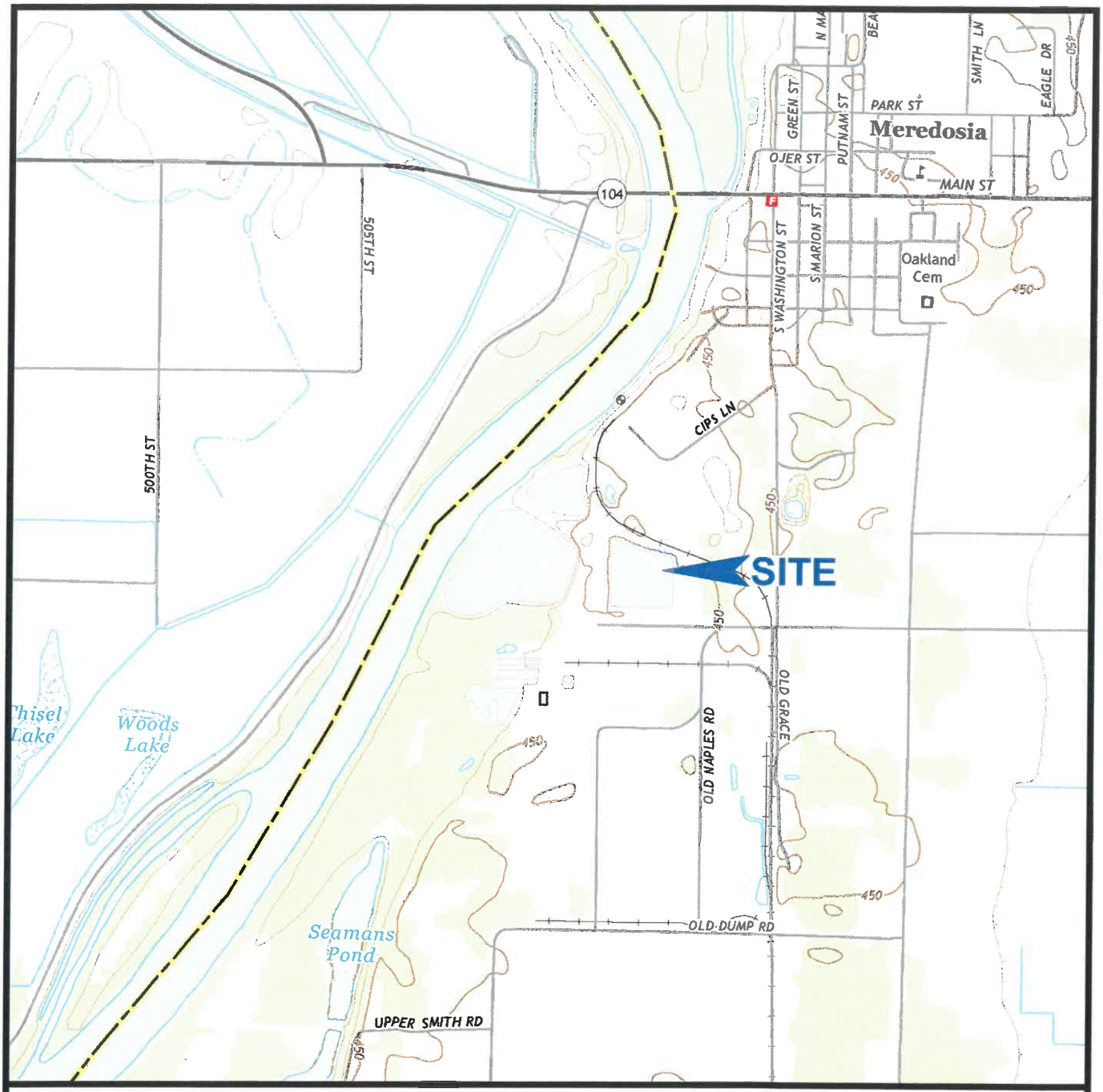
Our scope of service for this phase of the project did not include any environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors noted or unusual or suspicious items or conditions observed are strictly for the information of our client. Our scope of service did not include an assessment of the effects of flooding and erosion of creeks or rivers adjacent to or on the project site.

The analyses, conclusions, and recommendations contained in this report are based on the data obtained from the subsurface exploration. The field exploration methods used indicate subsurface conditions only at the specific locations where samples were obtained, only at the time they were obtained, and only to the depths penetrated. Consequently, subsurface conditions may vary gradually, abruptly, and/or nonlinearly between sample locations and/or intervals.

The conclusions or recommendations presented in this report should not be used without Geotechnology's review and assessment if the nature, design, or location of the facilities is changed, if there is a substantial lapse in time between the submittal of this report and the start of work at the site, or if there is a substantial interruption or delay during work at the site. If changes are contemplated or delays occur, Geotechnology must be allowed to review them to assess their impact on the findings, conclusions, and/or design recommendations given in this report. Geotechnology will not be responsible for any claims, damages, or liability associated with any other party's interpretations of the subsurface data or with reuse of the subsurface data or engineering analyses in this report.

The recommendations included in this report have been based in part on assumptions about variations in site stratigraphy that may be evaluated further during earthwork and foundation construction. Geotechnology should be retained to perform construction observation and continue its geotechnical engineering service using observational methods. Geotechnology cannot assume liability for the adequacy of its recommendations when they are used in the field without Geotechnology being retained to observe construction.

"Important Information about This Geotechnical-Engineering Report" published by the Geotechnical Business Council (GBC) of the Geoprofessional Business Association (GBA) is included as Appendix A. That document discusses some other limitations, as well as ways to manage risk associated with subsurface conditions.



NOTES

1. Plan adapted from a 7.5 minute U.S.G.S. map for Meredosia, Illinois quadrangle, last revised in 2015.

0 2,000 4,000

SCALE IN FEET

Drawn By: WAH	Ck'd By: BSS	App'vd By: CKK
Date: 6-27-17	Date: 9-26-17	Date: 9-20-17

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Ash Pond
Liquefaction Analysis
Meredosia, Illinois

SITE LOCATION AND TOPOGRAPHY

Project Number J024917.03	PLATE 1

NOTES

1. Plan adapted from an August 23, 2015 aerial photograph courtesy of Google Earth and drawings based on topography obtained by AeroView in October 2015 and supplied by the client.
2. CPT soundings were located in the field with reference to existing site features and are shown approximate only.

LEGEND

● CPT Sounding Location

N

0 300 600

SCALE IN FEET

Drawn By: WAH	Ck'd By: BJS	App'vd By: CKK
Date: 6-27-17	Date: 9-20-17	Date: 9-20-17

GEOTECHNOLOGY INC
FROM THE GROUND UP

Meredosia Ash Pond
Liquefaction Analysis
Meredosia, Illinois

AERIAL PHOTOGRAPH OF SITE AND CPT SOUNDING LOCATIONS

Project Number	PLATE 2
J024917.03	

APPENDIX A

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL-ENGINEERING REPORT

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org

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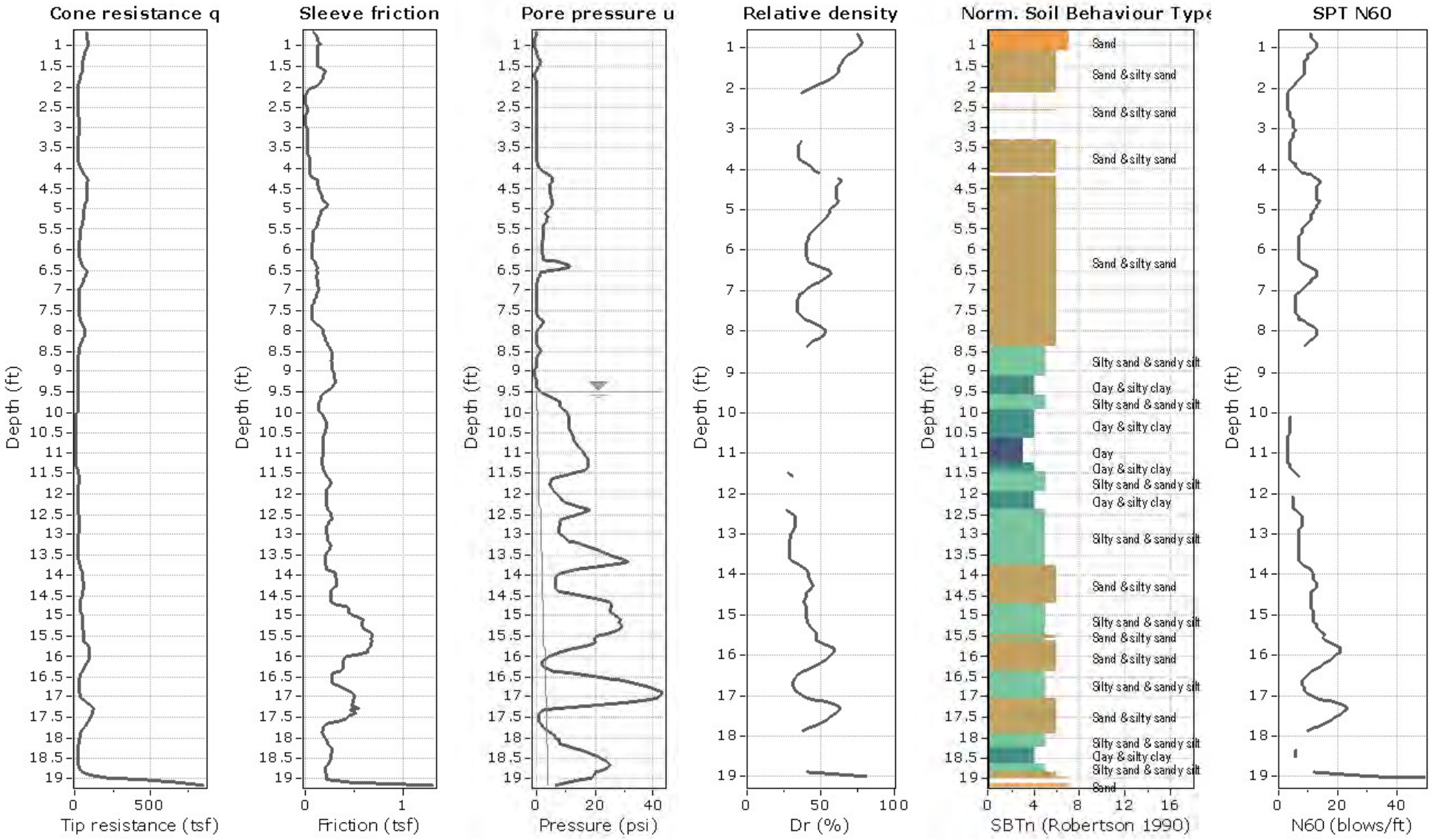
APPENDIX B

CPT SOUNDING LOGS, INTERPRETATIONS, AND ESTIMATIONS

Geotechnology, Inc
11816 Lackland Road
St. Louis, Missouri
http://www.geotechnology.com

Project: **Meridosia Ash Pond**
Location: **Meridosia, IL**

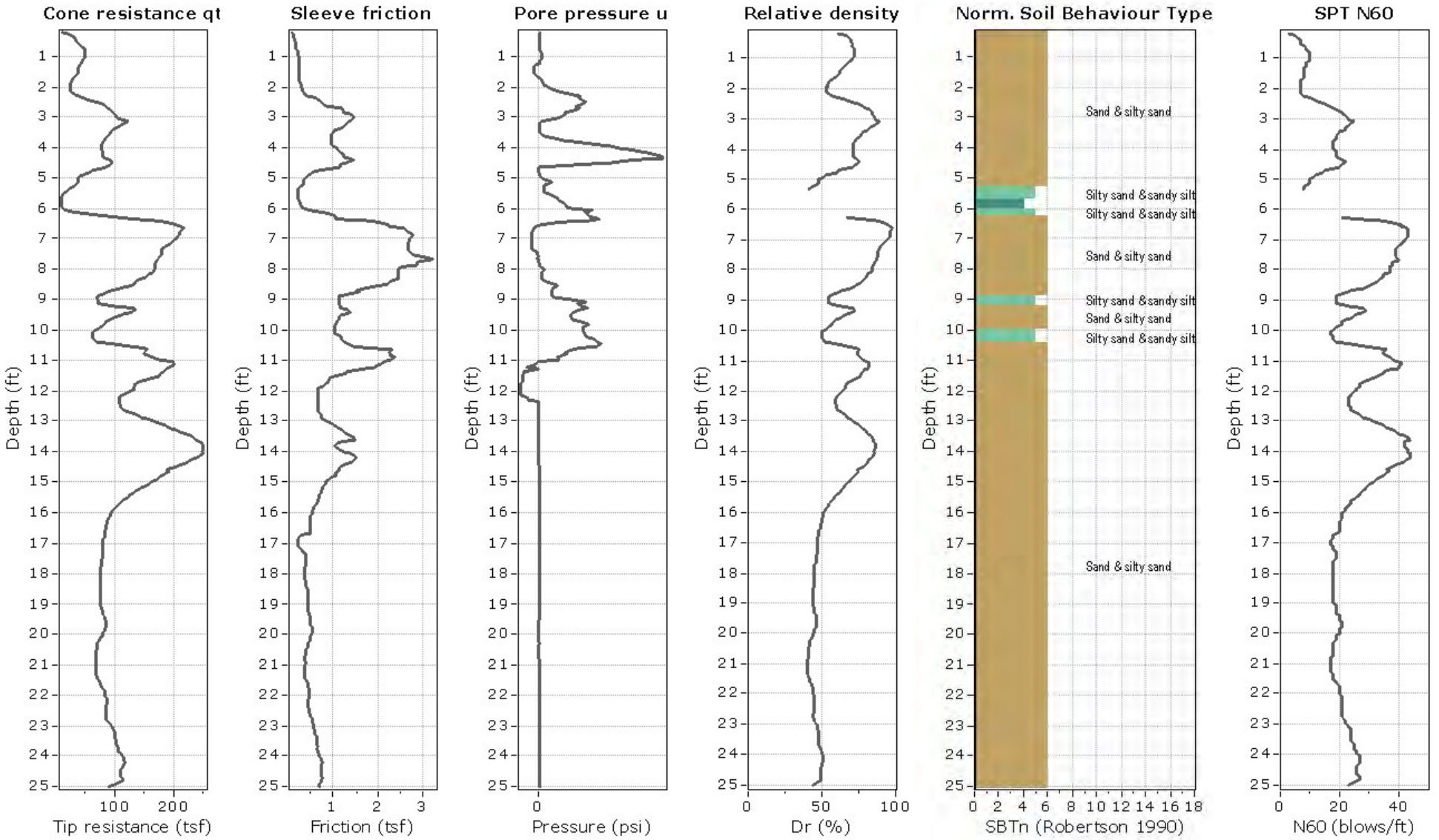
C01
Total depth: 19.17 ft, Date: 6/20/2017
Coords: lat 39.81785° lon -90.57078°
Cone Type: 15cm2
Cone Operator: DWJ



Geotechnology, Inc
11816 Lackland Road
St. Louis, Missouri
http://www.geotechnology.com

Project: **Meridosia Ash Pond**
Location: **Meridosia, IL**

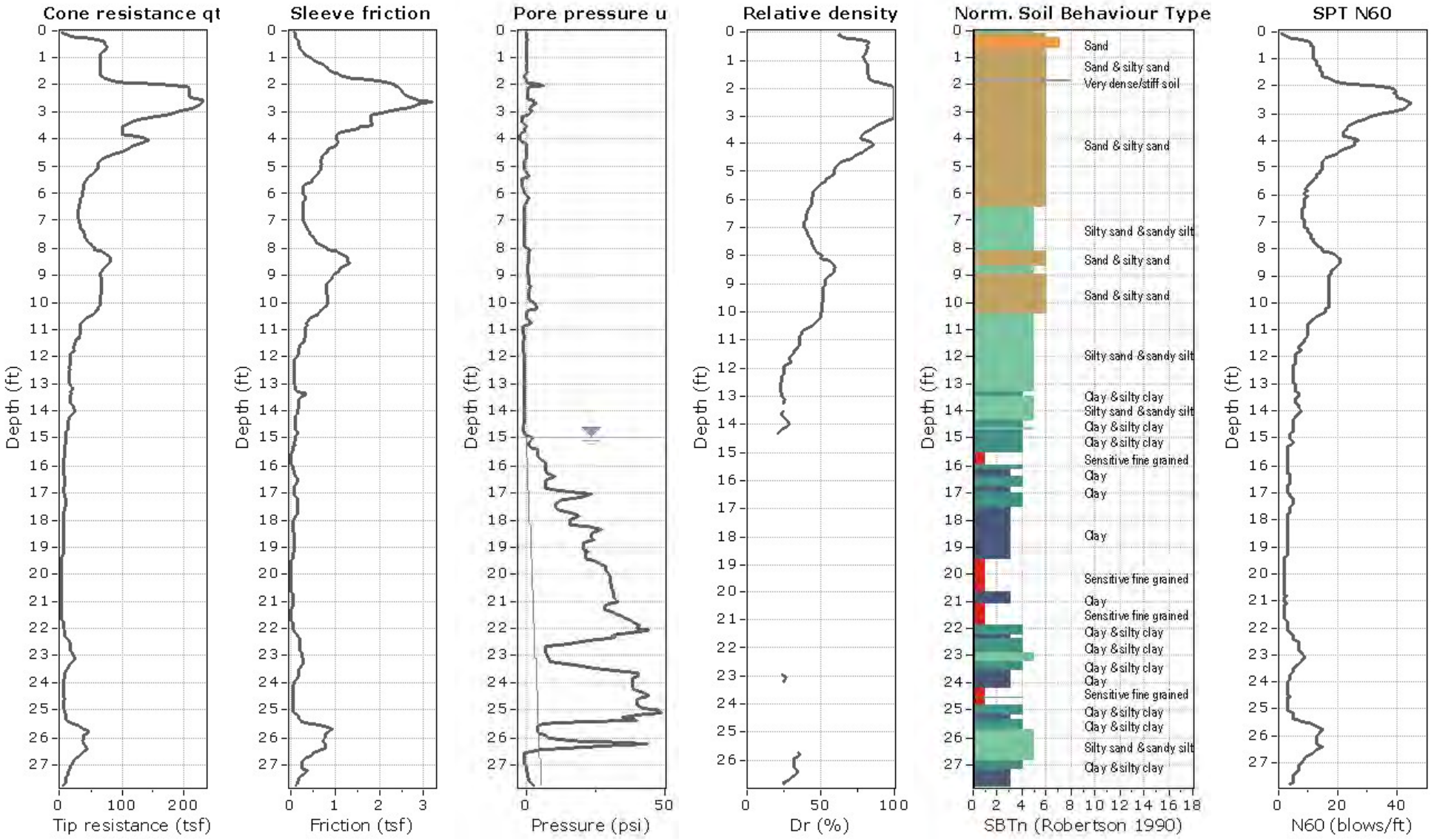
C02
Total depth: 25.02 ft, Date: 6/6/2017
Coords: lat 39.816763° lon -90.569358°
Cone Type: 15cm2
Cone Operator: DWJ



Geotechnology, Inc
11816 Lackland Road
St. Louis, Missouri
http://www.geotechnology.com

Project: **Meridosia Ash Pond**
Location: **Meridosia, IL**

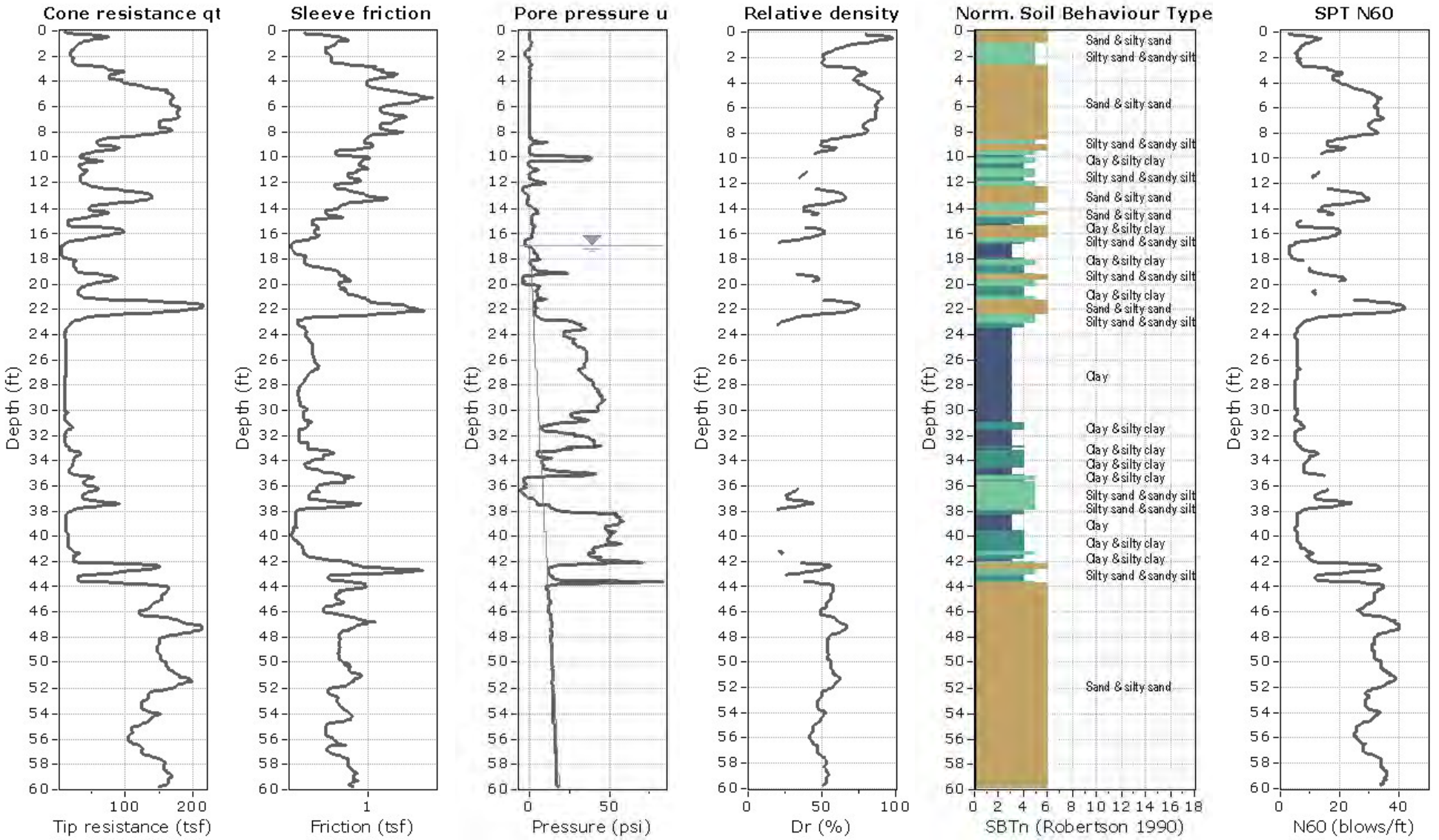
C03
Total depth: 27.76 ft, Date: 6/6/2017
Coords: lat 39.816228° lon -90.572783°
Cone Type: 15cm2
Cone Operator: DWJ



Geotechnology, Inc
11816 Lackland Road
St. Louis, Missouri
http://www.geotechnology.com

Project: **Meridosia Ash Pond**
Location: **Meridosia, IL**

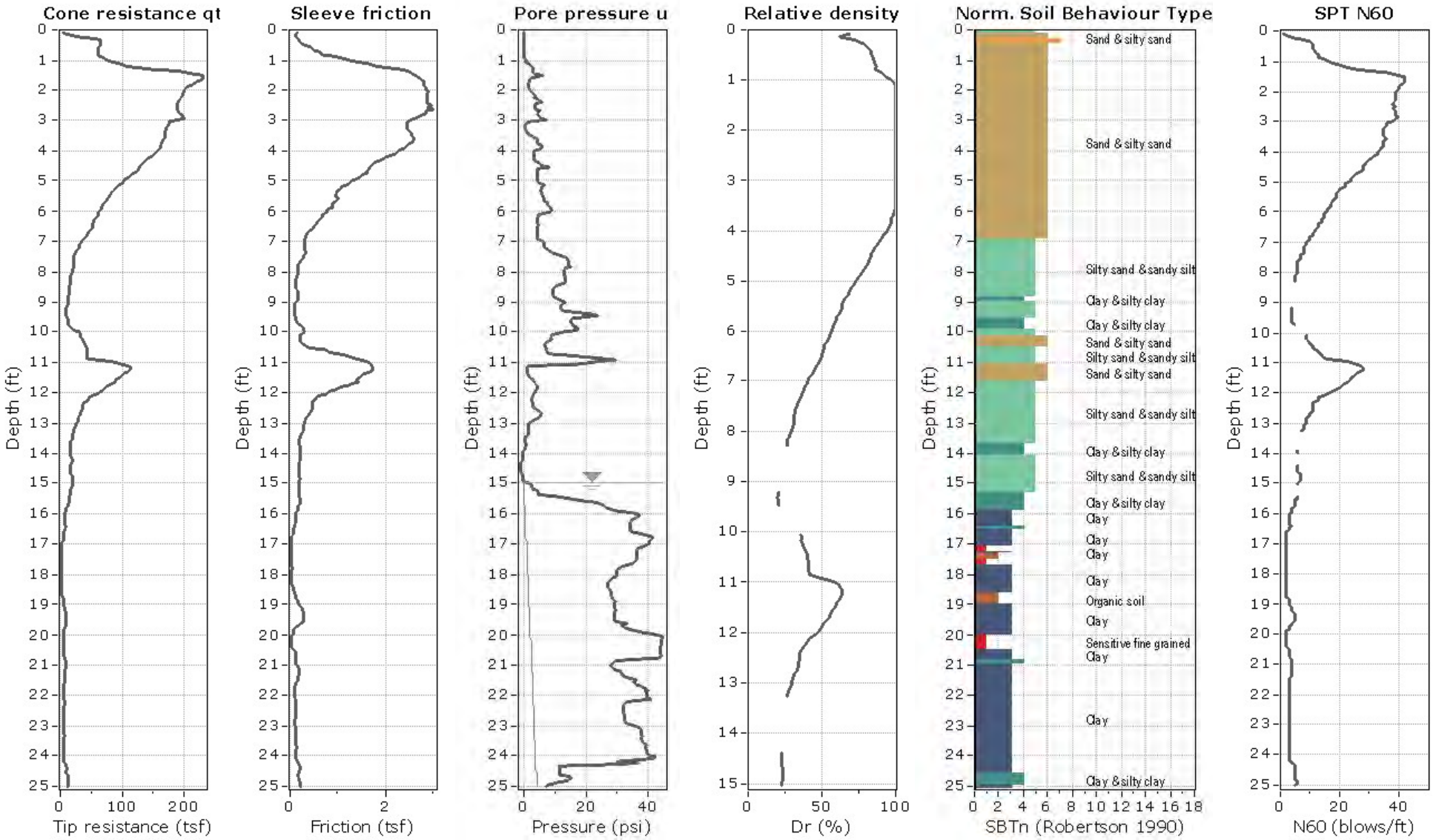
C04
Total depth: 59.80 ft, Date: 6/6/2017
Coords: lat 39.816732° lon -90.57602°
Cone Type: 15cm2
Cone Operator: DWJ



Geotechnology, Inc
11816 Lackland Road
St. Louis, Missouri
http://www.geotechnology.com

Project: **Meridosia Ash Pond**
Location: **Meridosia, IL**

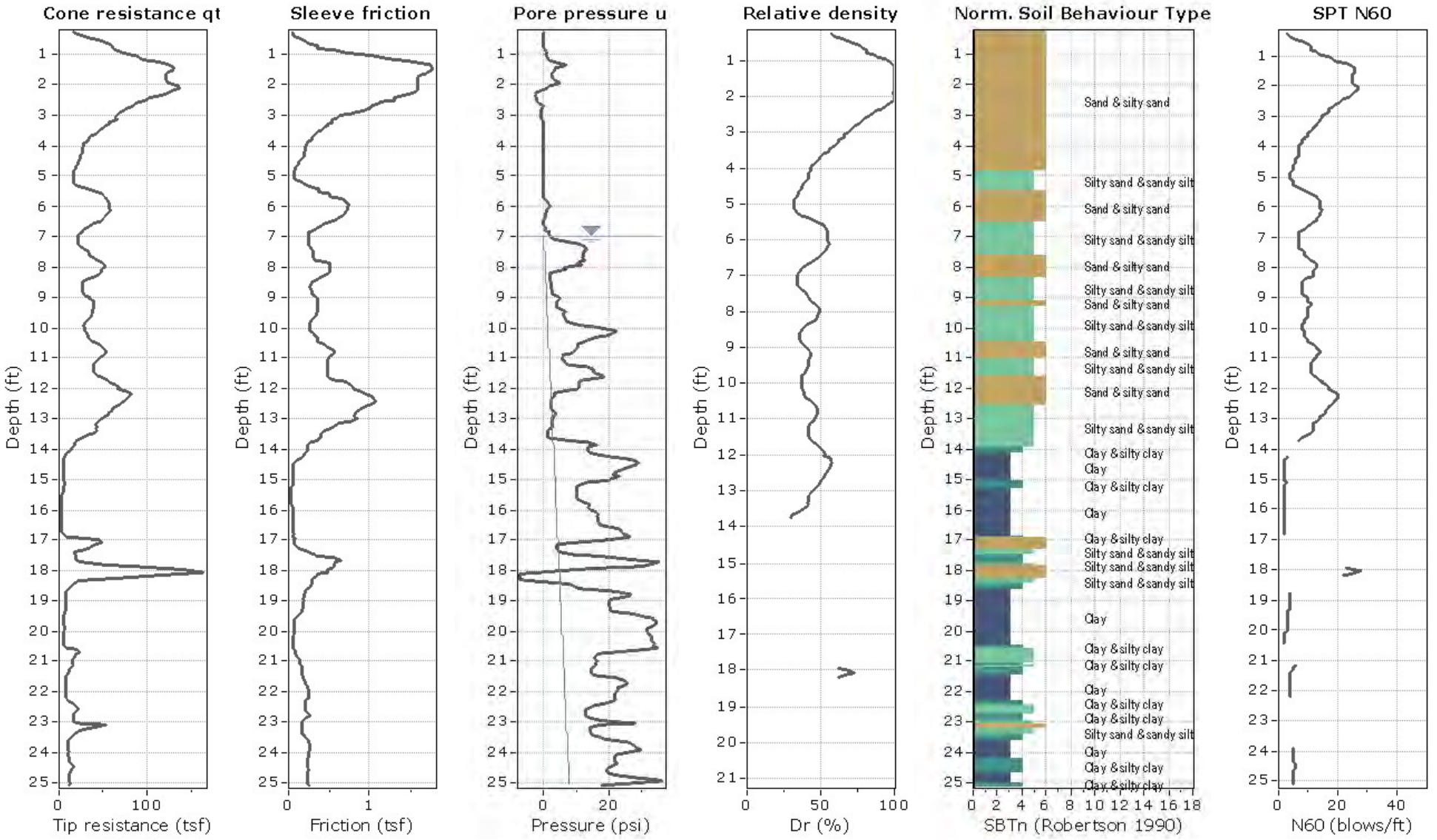
C05
Total depth: 25.02 ft, Date: 6/6/2017
Coords: lat 39.81905° lon -90.573843°
Cone Type: 15cm2
Cone Operator: DWJ



Geotechnology, Inc
11816 Lackland Road
St. Louis, Missouri
http://www.geotechnology.com

Project: **Meridosia Ash Pond**
Location: **Meridosia, IL**

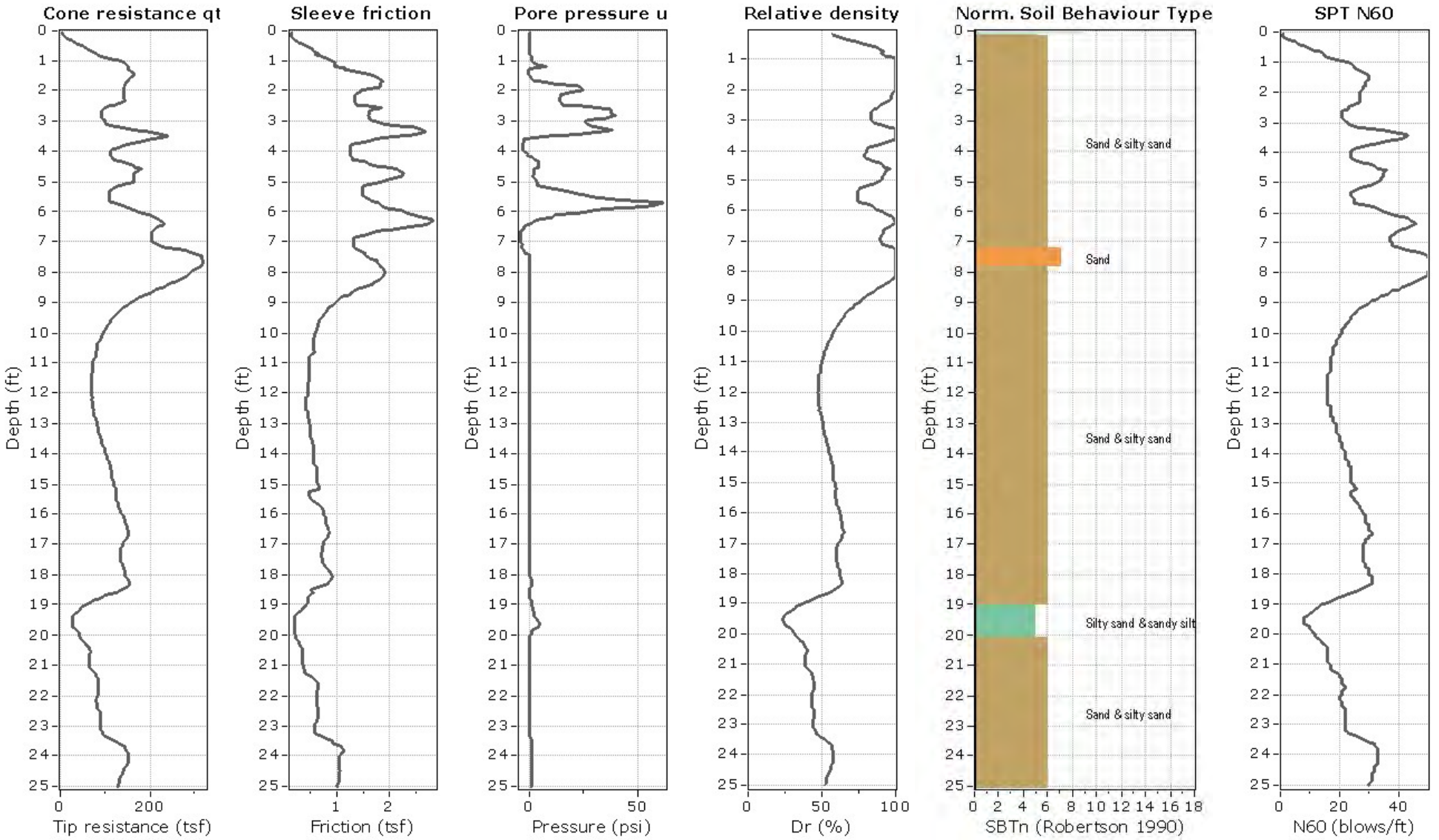
C06
Total depth: 25.08 ft, Date: 6/6/2017
Coords: lat 39.817665° lon -90.574332°
Cone Type: 15cm2
Cone Operator: DWJ



Geotechnology, Inc
11816 Lackland Road
St. Louis, Missouri
http://www.geotechnology.com

Project: **Meridosia Ash Pond**
Location: **Meridosia, IL**

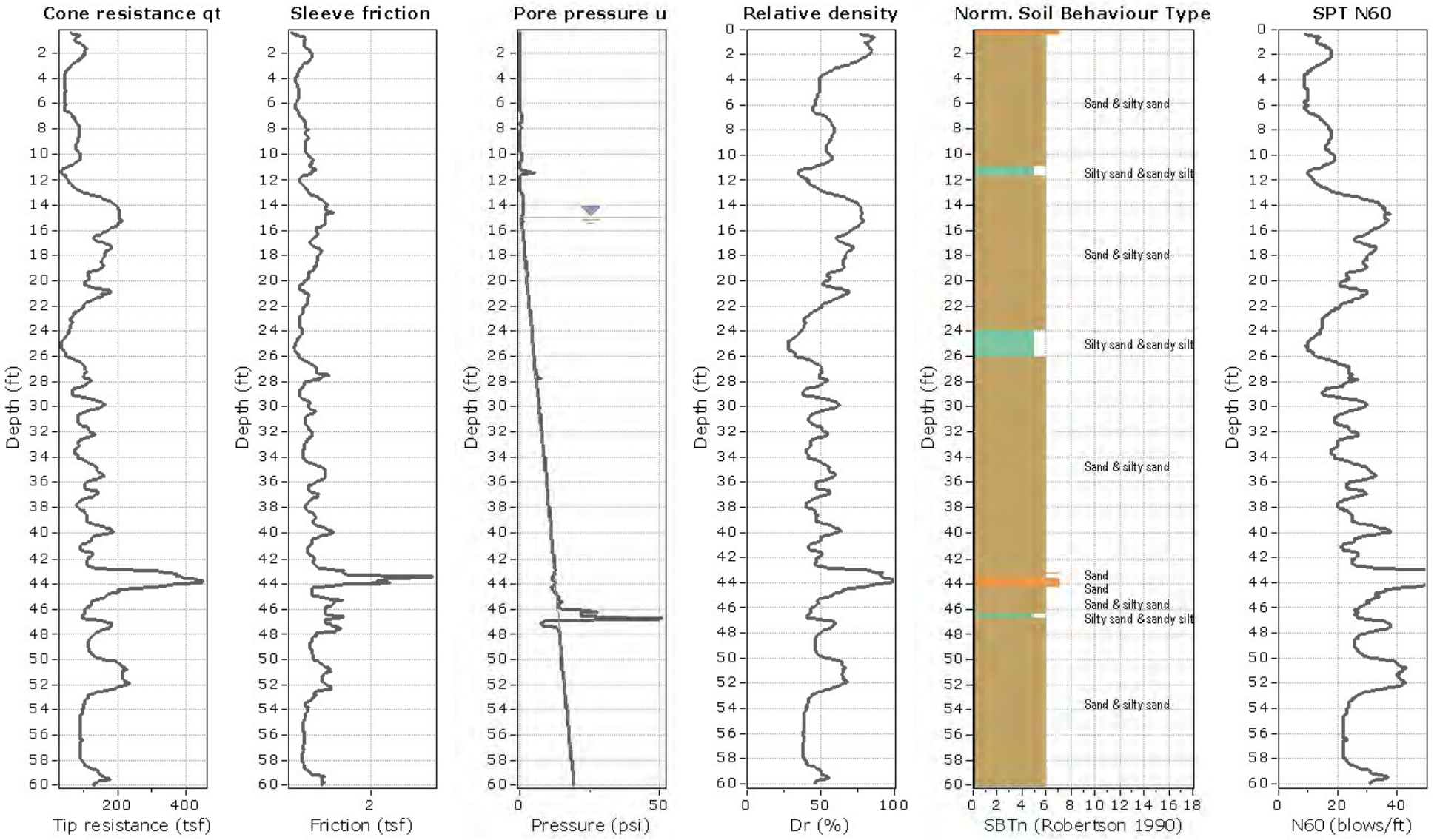
C07
Total depth: 25.01 ft, Date: 6/6/2017
Coords: lat 39.818095° lon -90.569087°
Cone Type: 15cm2
Cone Operator: DWJ



Geotechnology, Inc
11816 Lackland Road
St. Louis, Missouri
http://www.geotechnology.com

Project: **Meridosia Ash Pond**
Location: **Meridosia, IL**

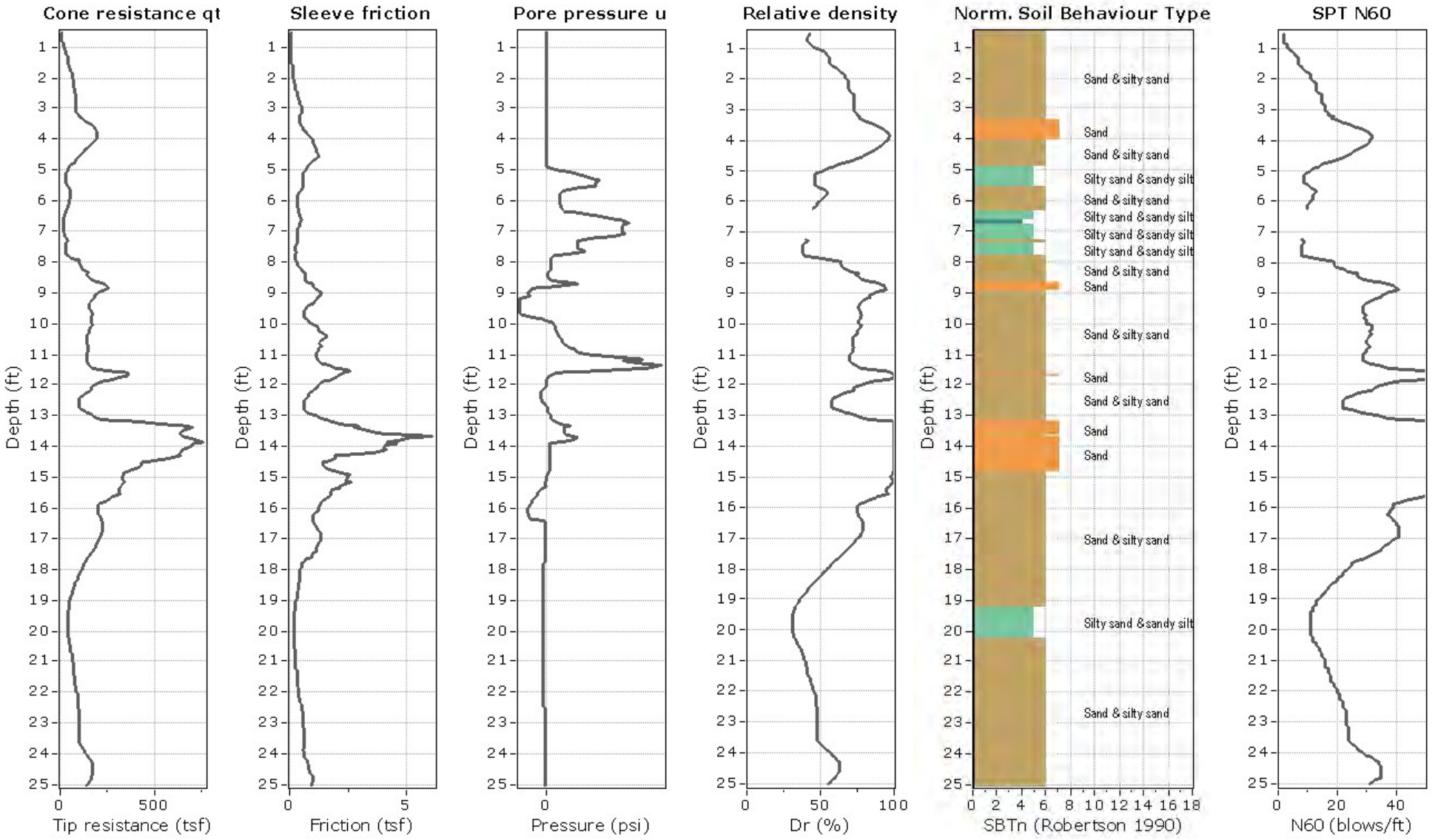
C08
Total depth: 59.99 ft, Date: 6/6/2017
Coords: lat 39.815977° lon -90.576365°
Cone Type: 15cm2
Cone Operator: DWJ



Geotechnology, Inc
11816 Lackland Road
St. Louis, Missouri
http://www.geotechnology.com

Project: **Meridosia Ash Pond**
Location: **Meridosia, IL**

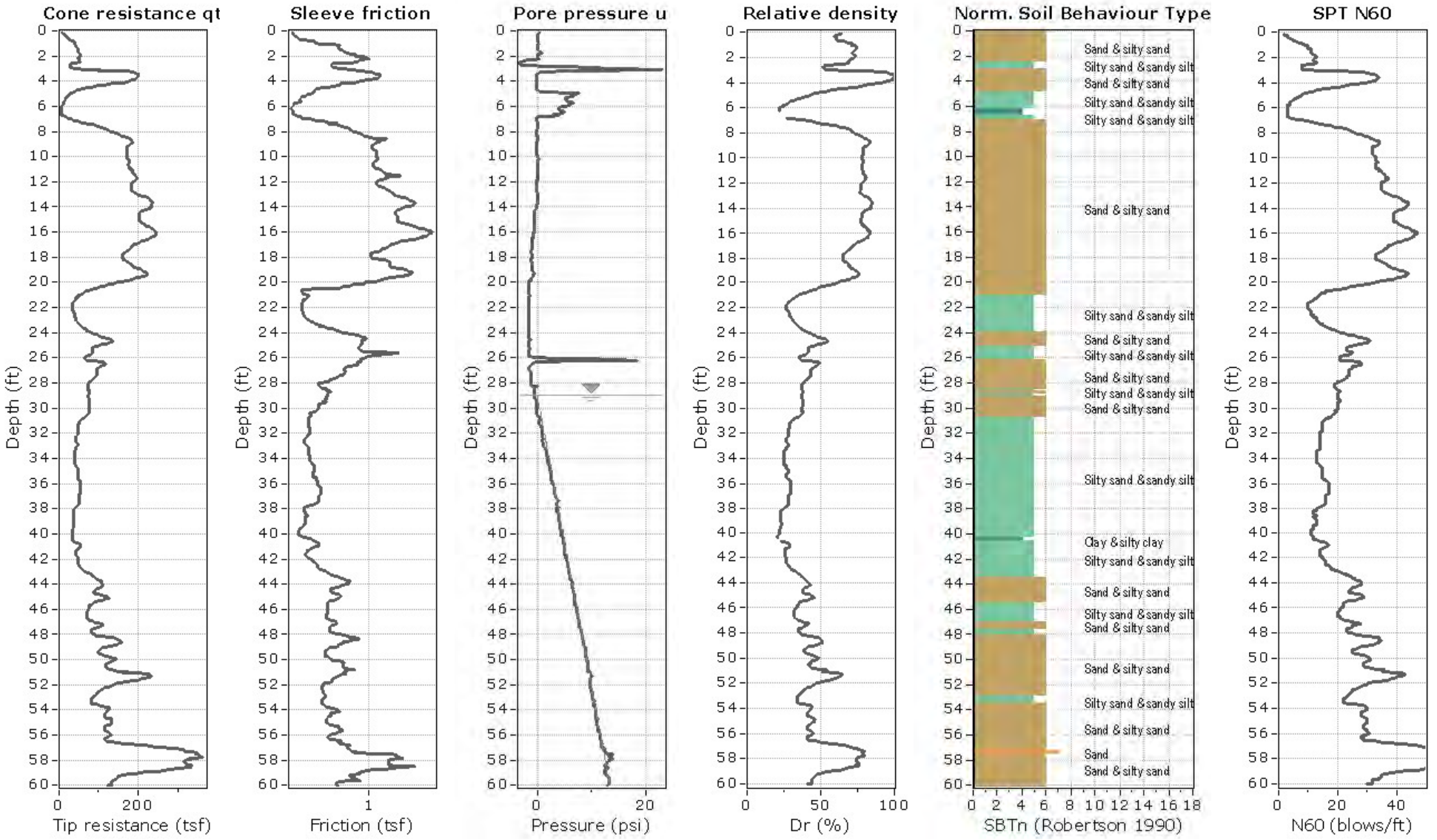
O01
Total depth: 25.02 ft, Date: 6/6/2017
Coords: lat 39.818205° lon -90.56809°
Cone Type: 15cm2
Cone Operator: DWJ



Geotechnology, Inc
11816 Lackland Road
St. Louis, Missouri
http://www.geotechnology.com

Project: **Meridosia Ash Pond**
Location: **Meridosia, IL**

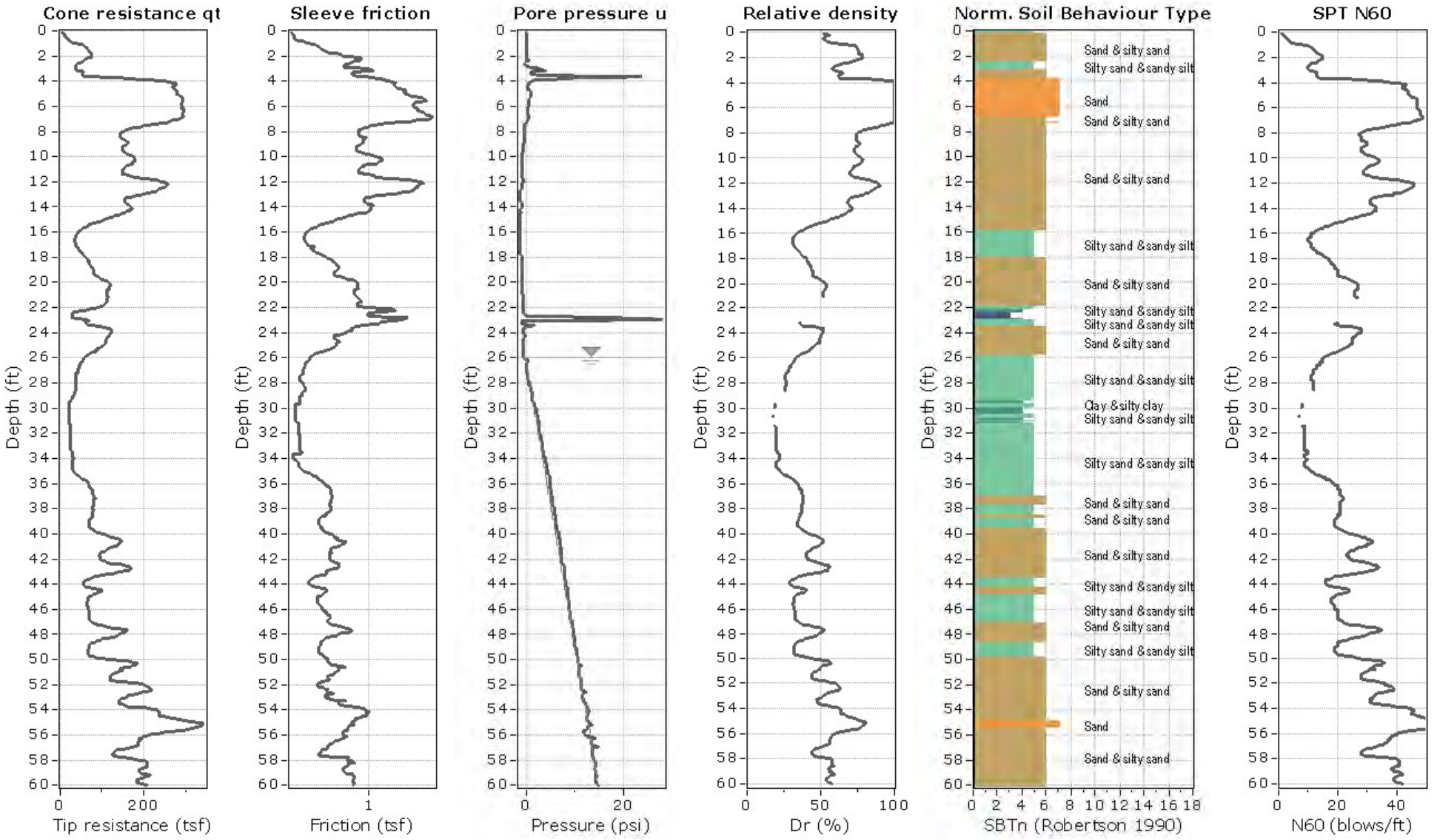
O02
Total depth: 60.05 ft, Date: 6/6/2017
Coords: lat 39.817595° lon -90.565527°
Cone Type: 15cm2
Cone Operator: DWJ



Geotechnology, Inc
11816 Lackland Road
St. Louis, Missouri
http://www.geotechnology.com

Project: **Meridosia Ash Pond**
Location: **Meridosia, IL**

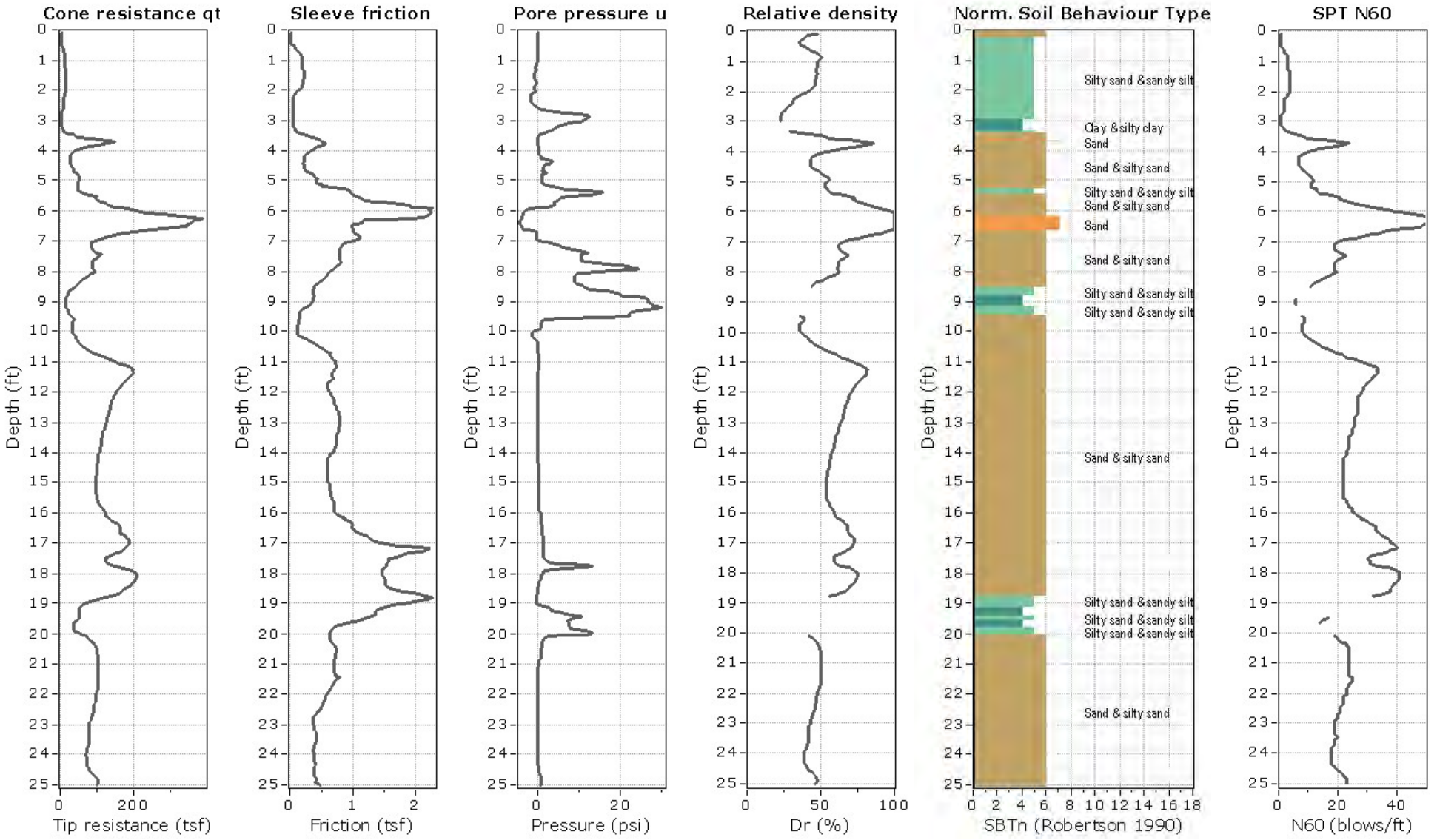
O03
Total depth: 59.99 ft, Date: 6/6/2017
Coords: lat 39.815937° lon -90566513°
Cone Type: 15cm2
Cone Operator: DWJ



Geotechnology, Inc
11816 Lackland Road
St. Louis, Missouri
http://www.geotechnology.com

Project: **Meridosia Ash Pond**
Location: **Meridosia, IL**

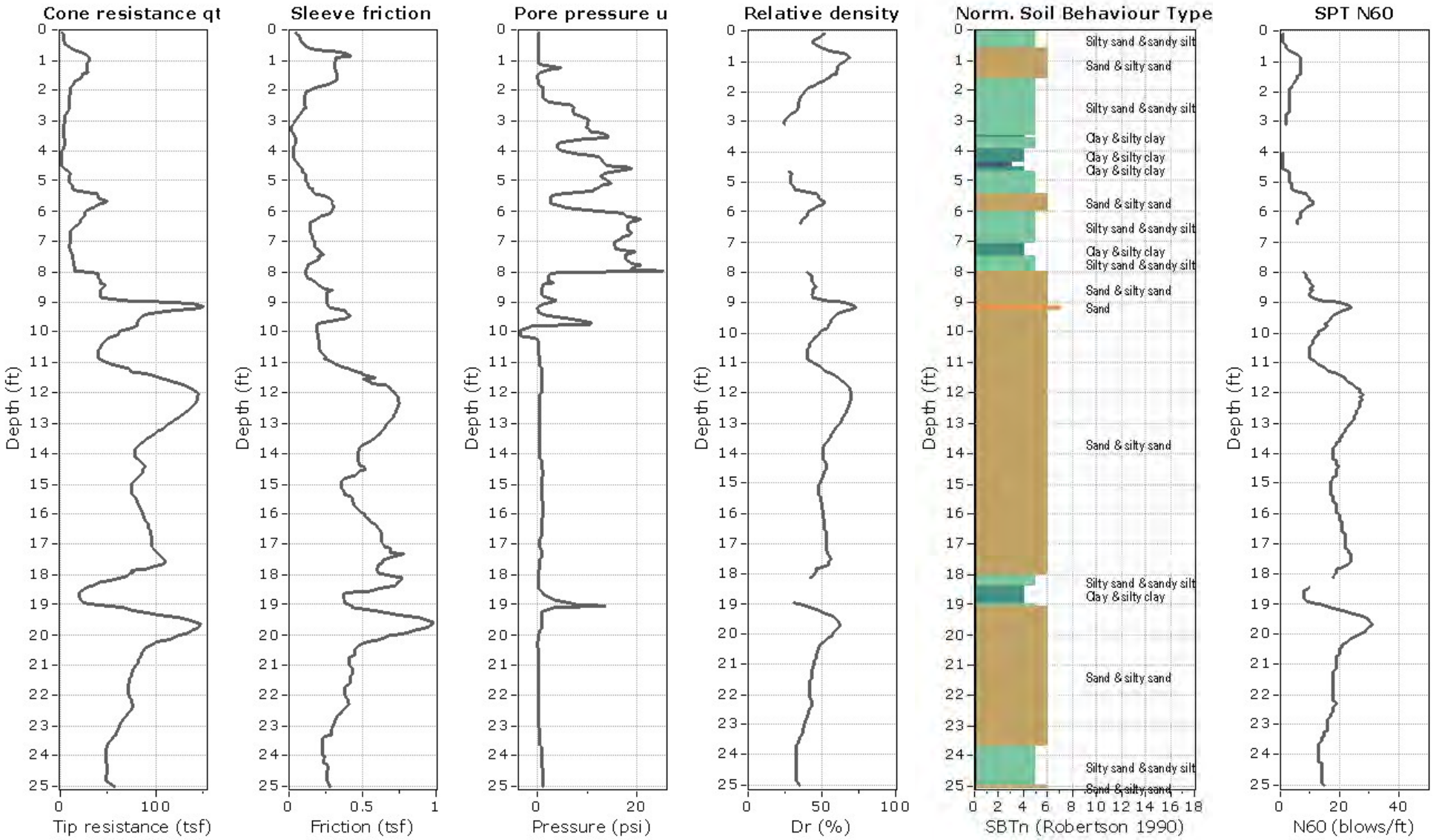
O04
Total depth: 25.02 ft, Date: 6/6/2017
Coords: lat 39.81632° lon -90.568385°
Cone Type: 15cm2
Cone Operator: DWJ



Geotechnology, Inc
11816 Lackland Road
St. Louis, Missouri
http://www.geotechnology.com

Project: **Meridosia Ash Pond**
Location: **Meridosia, IL**

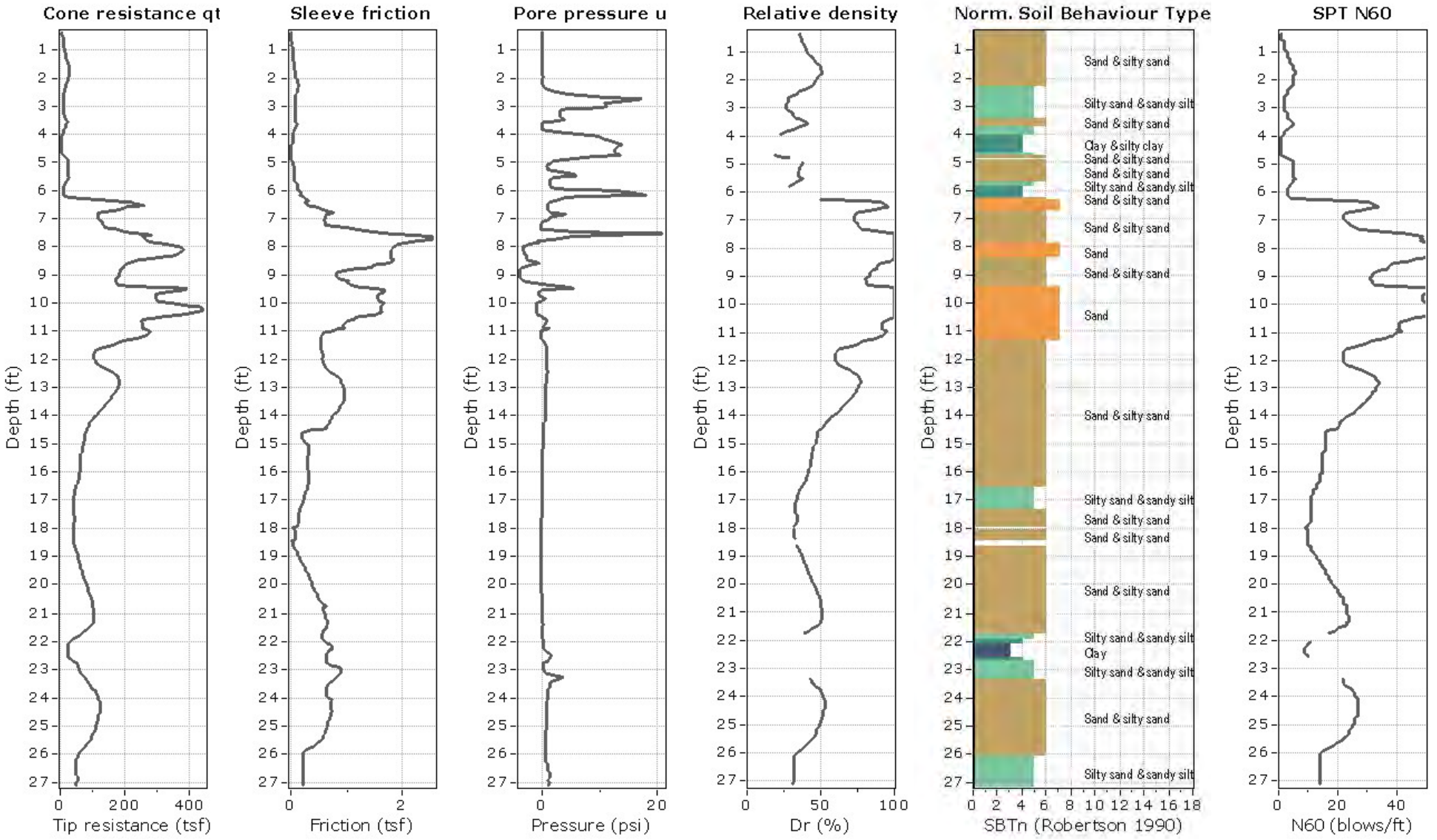
O05
Total depth: 25.02 ft, Date: 6/6/2017
Coords: lat 39.816532° lon -90.582468°
Cone Type: 15cm2
Cone Operator: DWJ



Geotechnology, Inc
11816 Lackland Road
St. Louis, Missouri
http://www.geotechnology.com

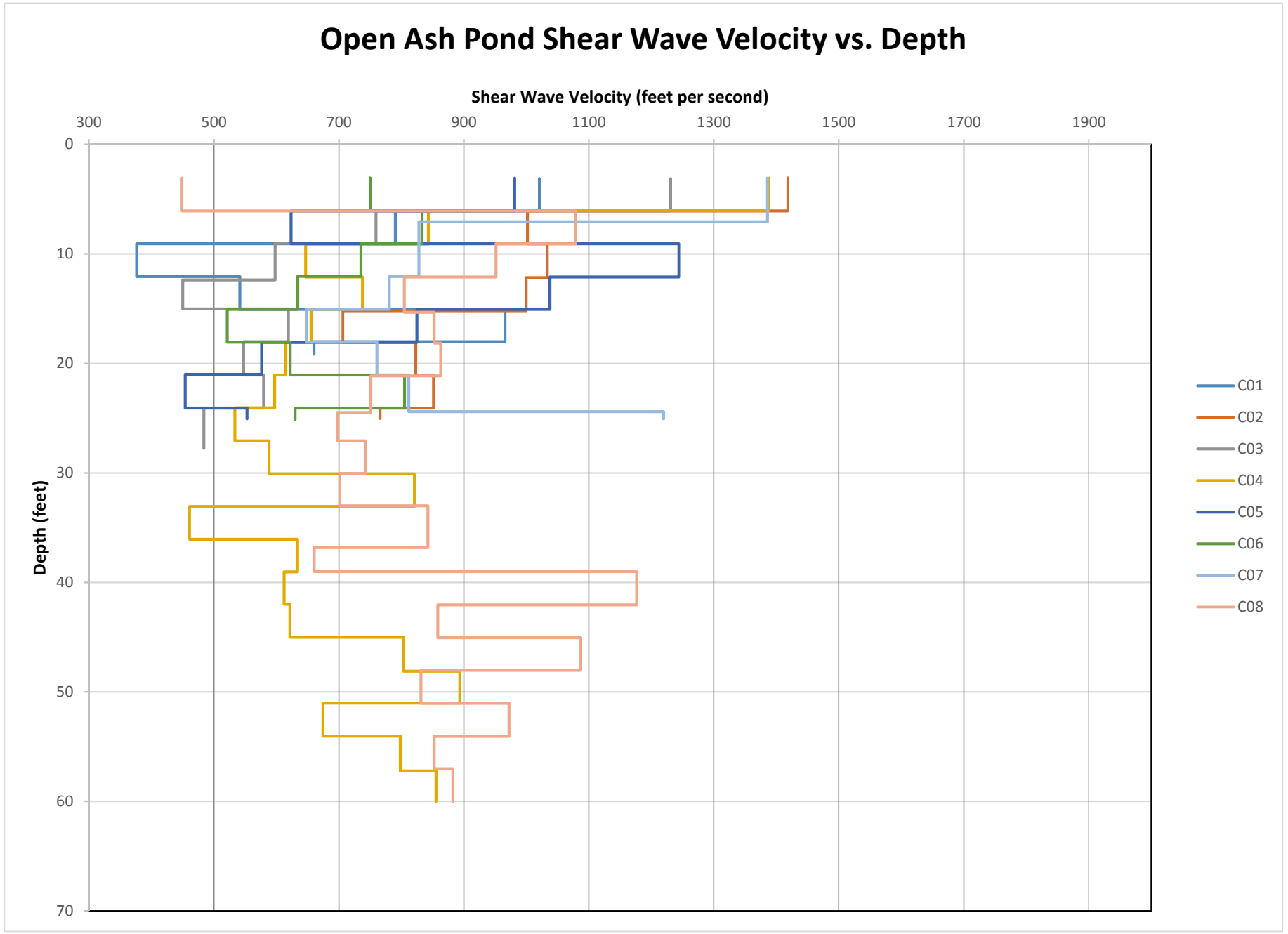
Project: **Meridosia Ash Pond**
Location: **Meridosia, IL**

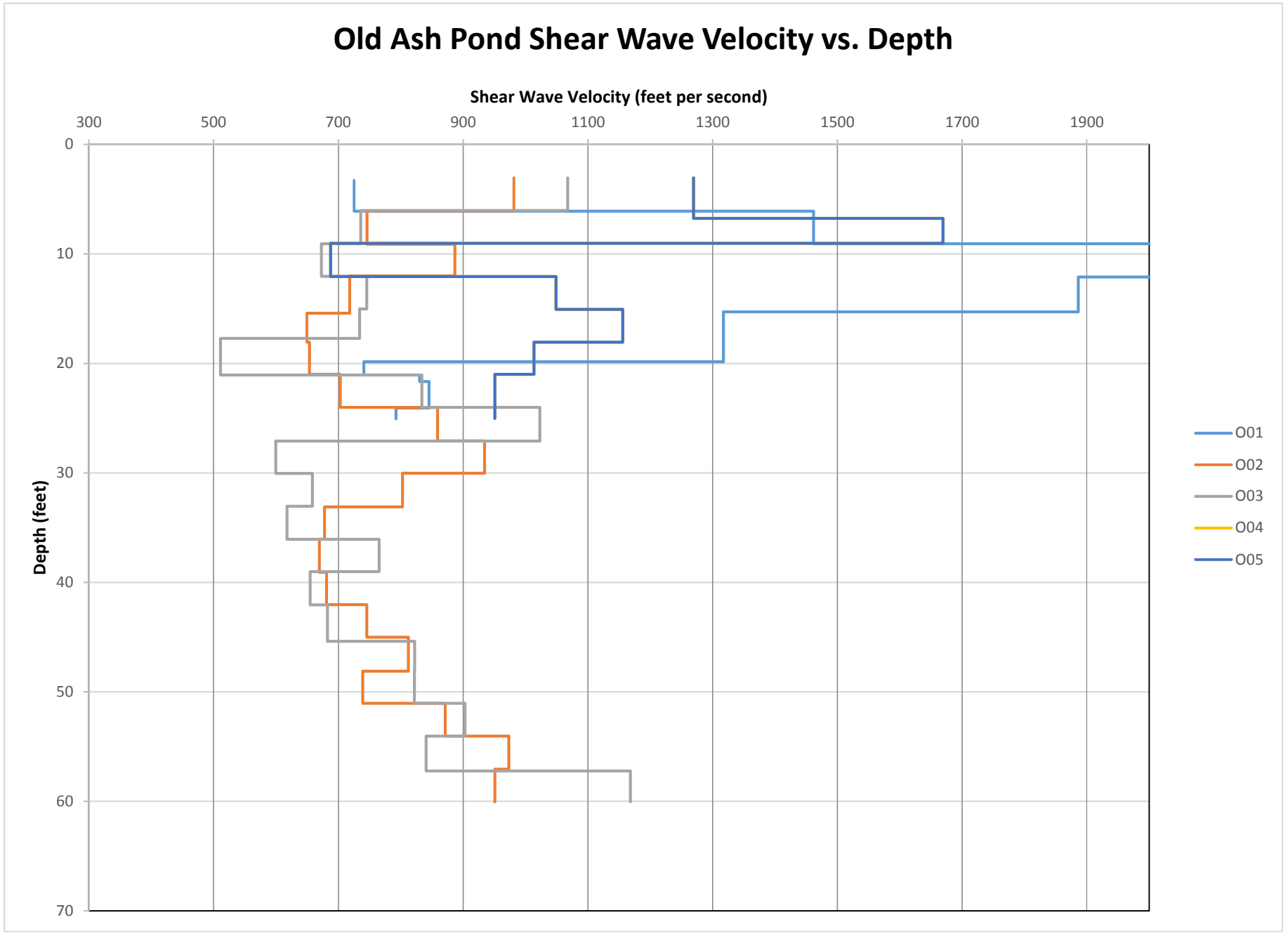
O06
Total depth: 27.13 ft, Date: 6/6/2017
Coords: lat 39.800462° lon -90.56739°
Cone Type: 15cm2
Cone Operator: DWJ



APPENDIX C

SHEAR WAVE VELOCITY RESULTS


Open Ash Pond Shear Wave Velocity vs. Depth
Shear Wave Velocity (feet per second)
300
500
700
900
1100
1300
1500
1700
1900
Depth (feet)
0
10
20
30
40
50
60
70
C01
C02
C03
C04
C05
C06
C07
C08


Old Ash Pond Shear Wave Velocity vs. Depth
Shear Wave Velocity (feet per second)
300
500
700
900
1100
1300
1500
1700
1900
Depth (feet)
0
10
20
30
40
50
60
70
O01
O02
O03
O04
O05

APPENDIX D

LABORATORY TEST RESULTS

PERCENT FINES (ASTM D 1140)

GEOTECHNOLOGY INC
FROM THE GROUND UP

DATE	PROJECT NAME	PROJECT NO.:
June 16, 2017	Meridosia Ash Pond Liquefaction Analysis	J024917.03

Balance Used: BA- 17 Oven Used: OV- 9

Test Method: [x] Method A [ ] Method B Soaking length (min.) ____ Dry Mass determined: [ ] Directly [ ] From water content of Spec.

Boring No.	Sample No.	Depth (ft)	Sieve No. Used SV-200-	Visual Identification (Color, Group Name & Symbol)	Tare Number / Tare Mass (g)	Initial Dry Mass of Soil (g)	Dry Mass of Soil after Washing & Shaking over 75 μm Sieve (g)	% Passing 75 μm Sieve (%)
005A		12-16			KS-9 / 110.74	118.19	113.78	3.7
005A		20-24			KS-13 / 110.92	123.57	118.68	4.0
C01A		8-12			KS-10 / 115.05	78.54	1.38	98.2
C01A		16-20			KS-12 / 110.89	107.75	0.85	99.2

REMARKS

Tested By: AT Date: 06/16/17

Calculated By: AB Date: 06/19/17

Checked By: EG Date: 06/19/17

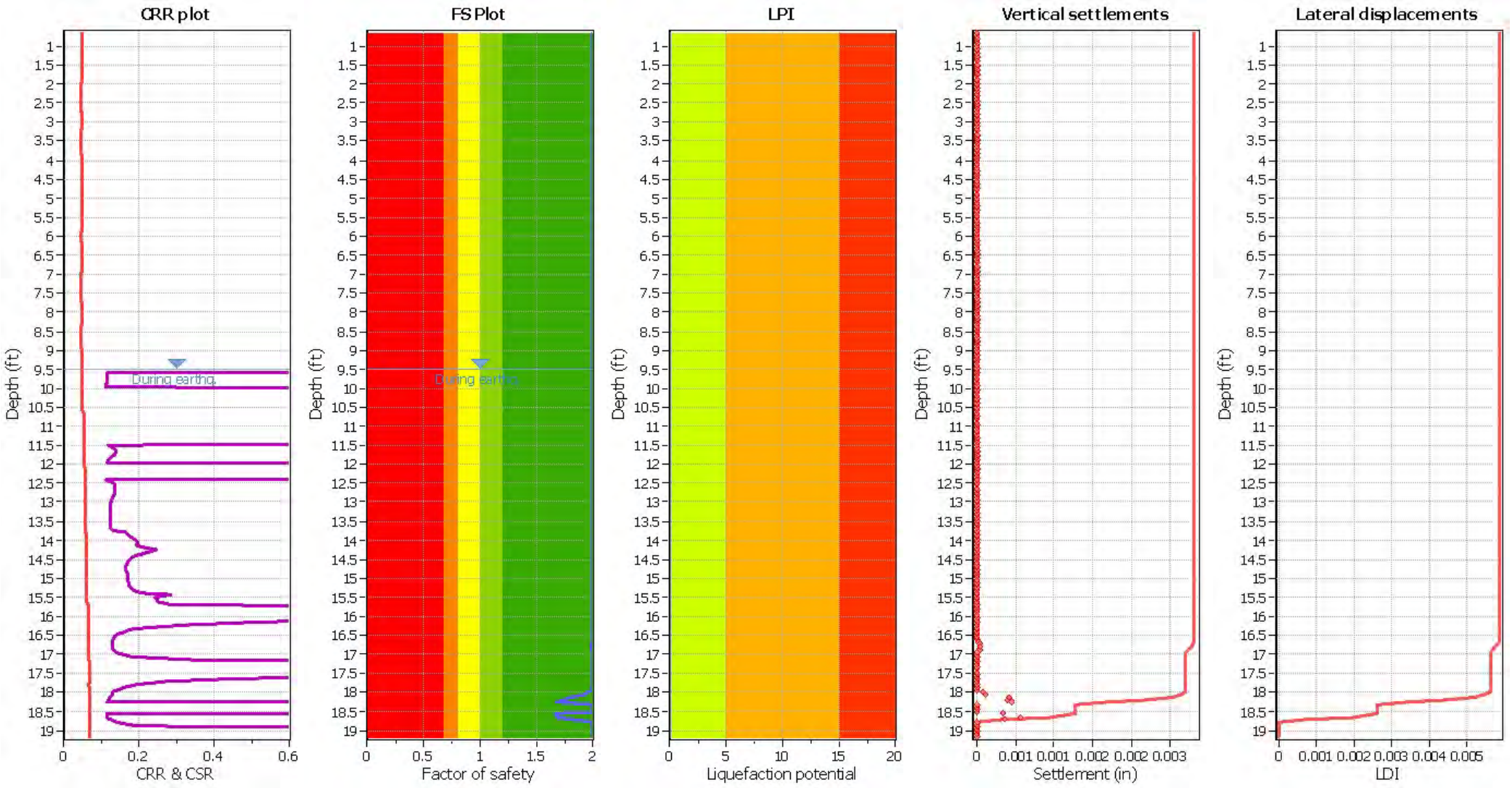
APPENDIX E

LIQUEFACTION ANALYSIS RESULTS

This software is licensed to: Geotechnology, Inc.

CPT name: C01

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	9.50 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.08	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	9.50 ft	Fill height:	N/A	Limit depth:	25.00 ft

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

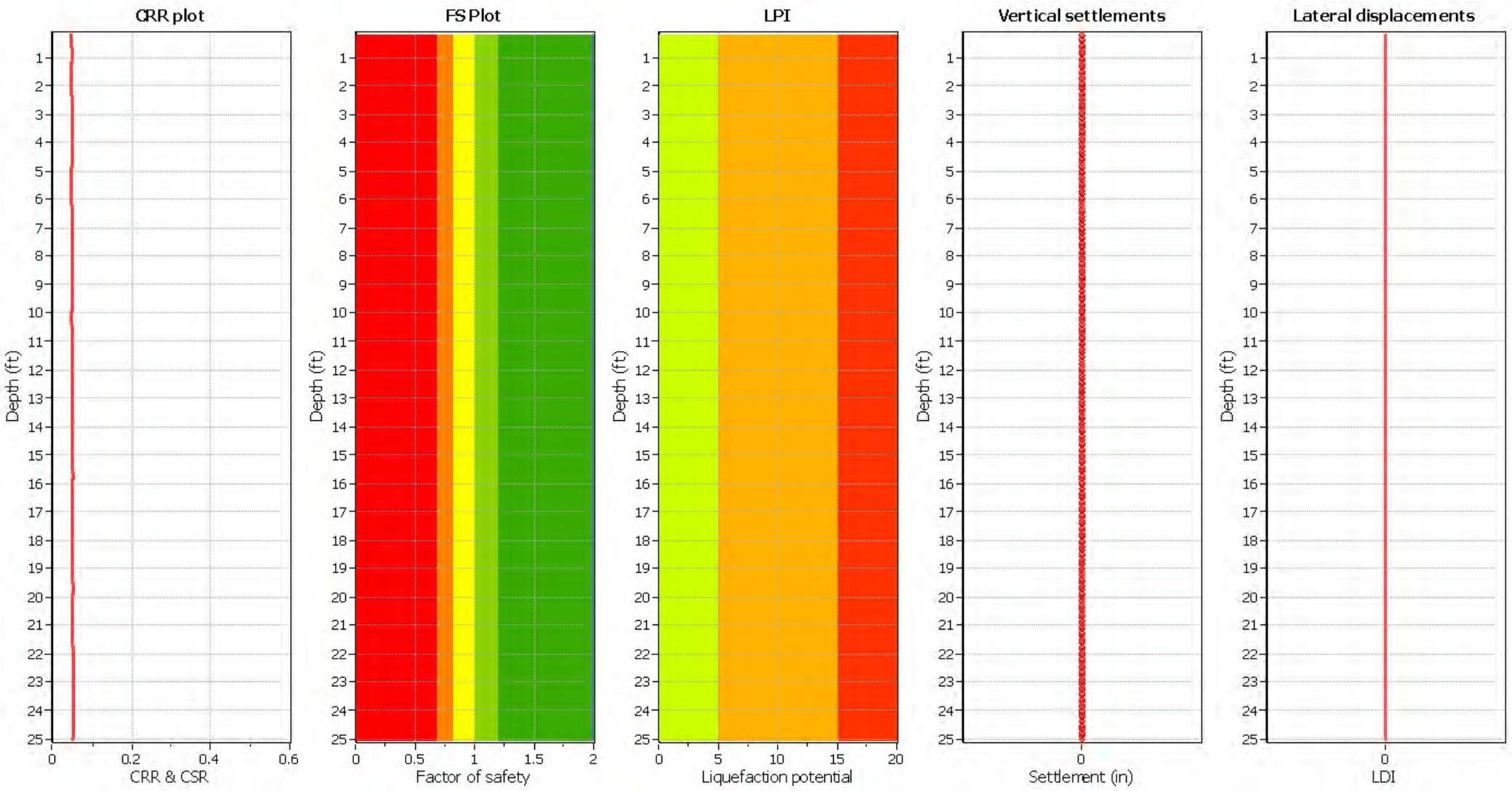
LPI color scheme

- Very high risk
- High risk
- Low risk

This software is licensed to: Geotechnology, Inc.

CPT name: C02

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.08	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	30.00 ft	Fill height:	N/A	Limit depth:	25.00 ft

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

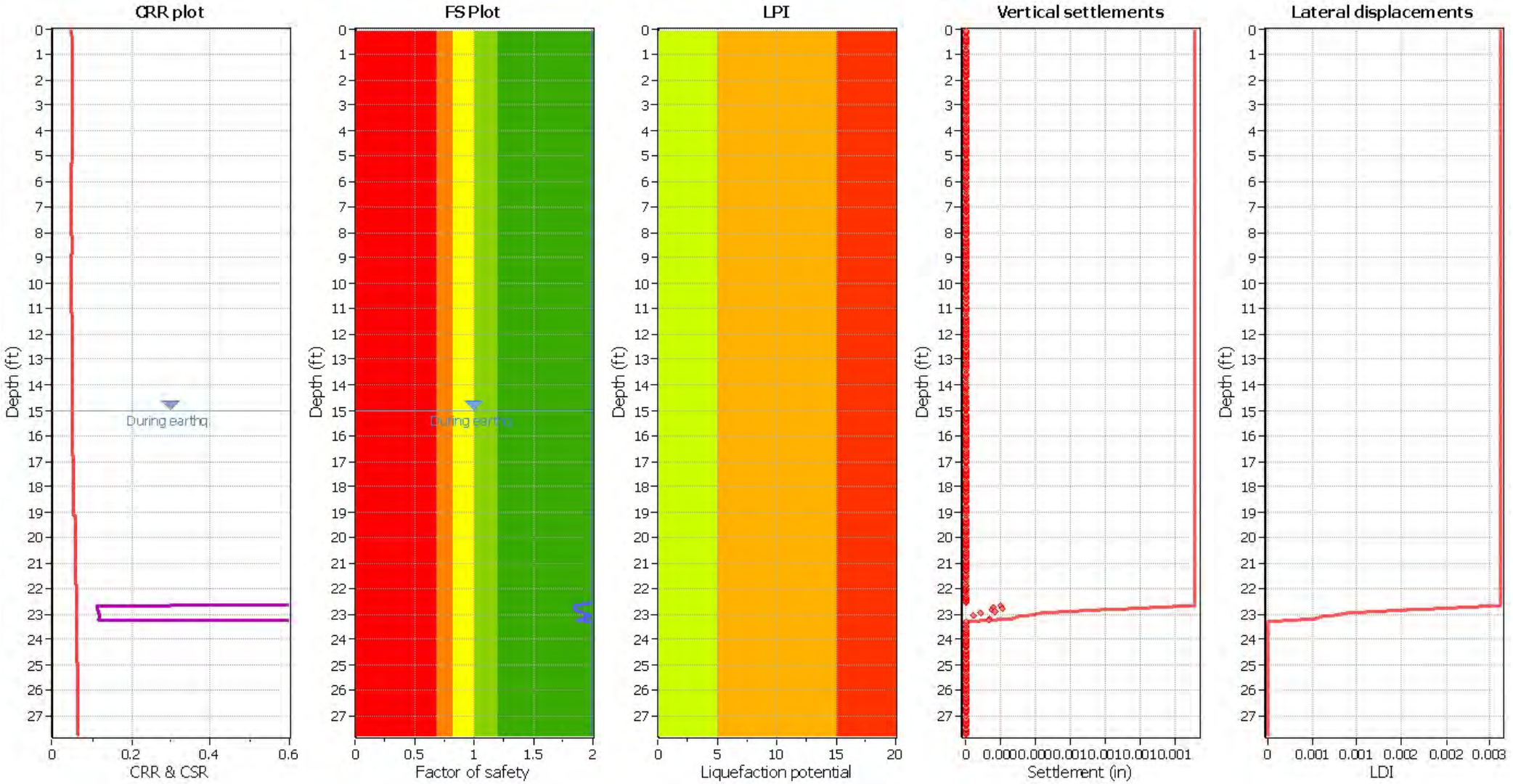
LPI color scheme

- Very high risk
- High risk
- Low risk

This software is licensed to: Geotechnology, Inc.

CPT name: C03

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	15.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.08	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	15.00 ft	Fill height:	N/A	Limit depth:	25.00 ft

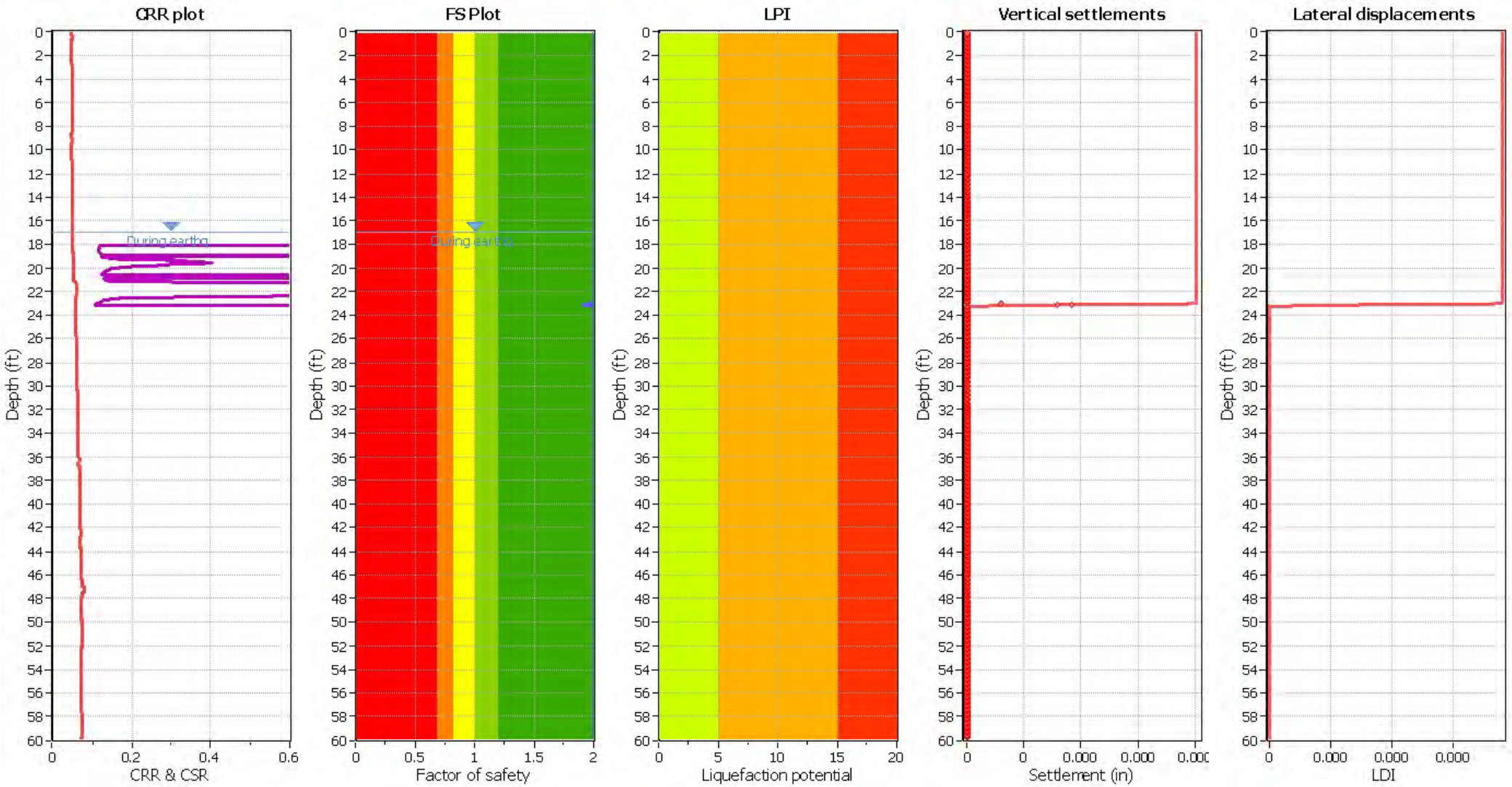
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plot



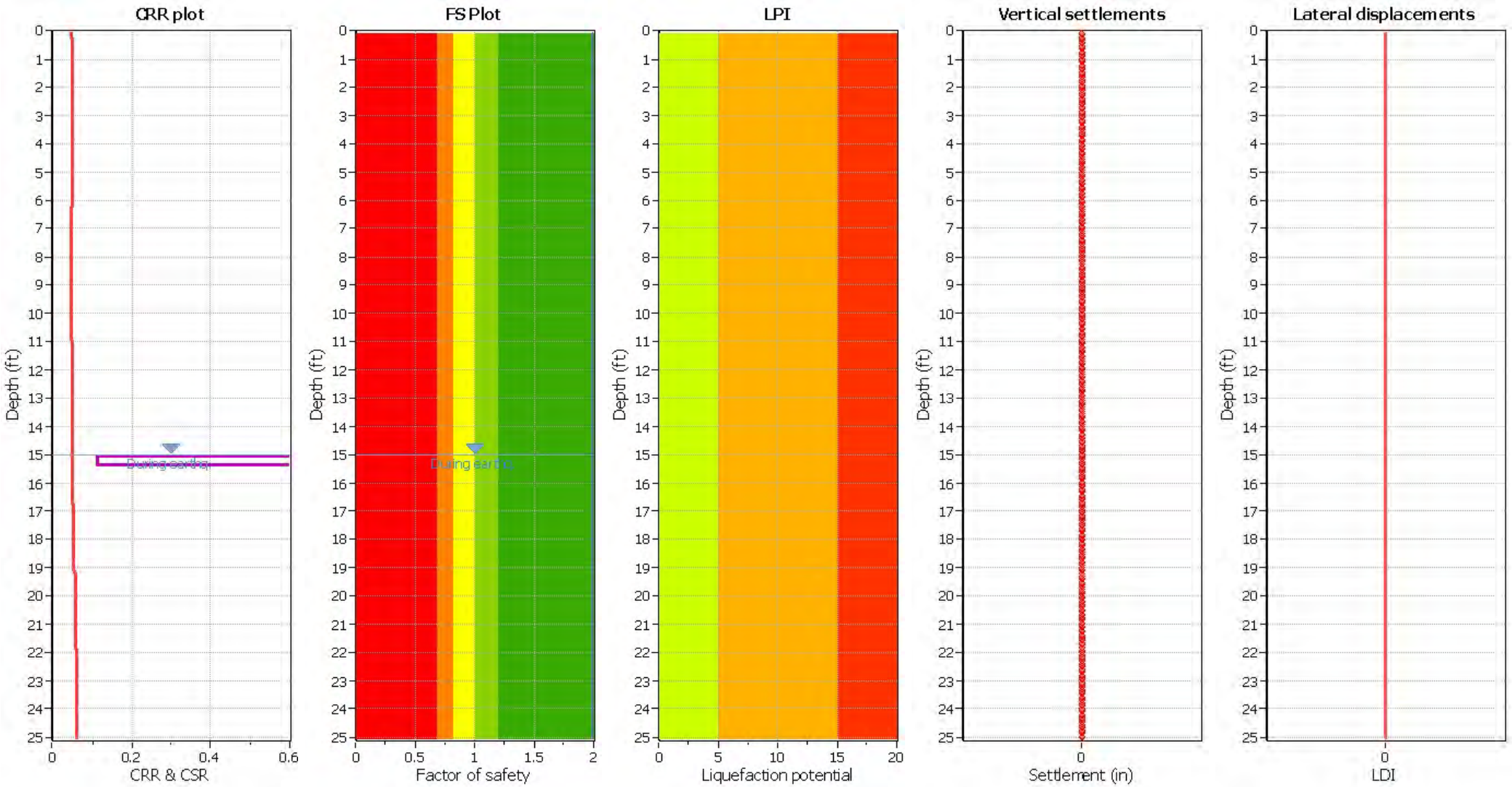
Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	17.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.08	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	17.00 ft	Fill height:	N/A	Limit depth:	25.00 ft

F.S. color scheme
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme
- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	15.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.08	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	15.00 ft	Fill height:	N/A	Limit depth:	25.00 ft

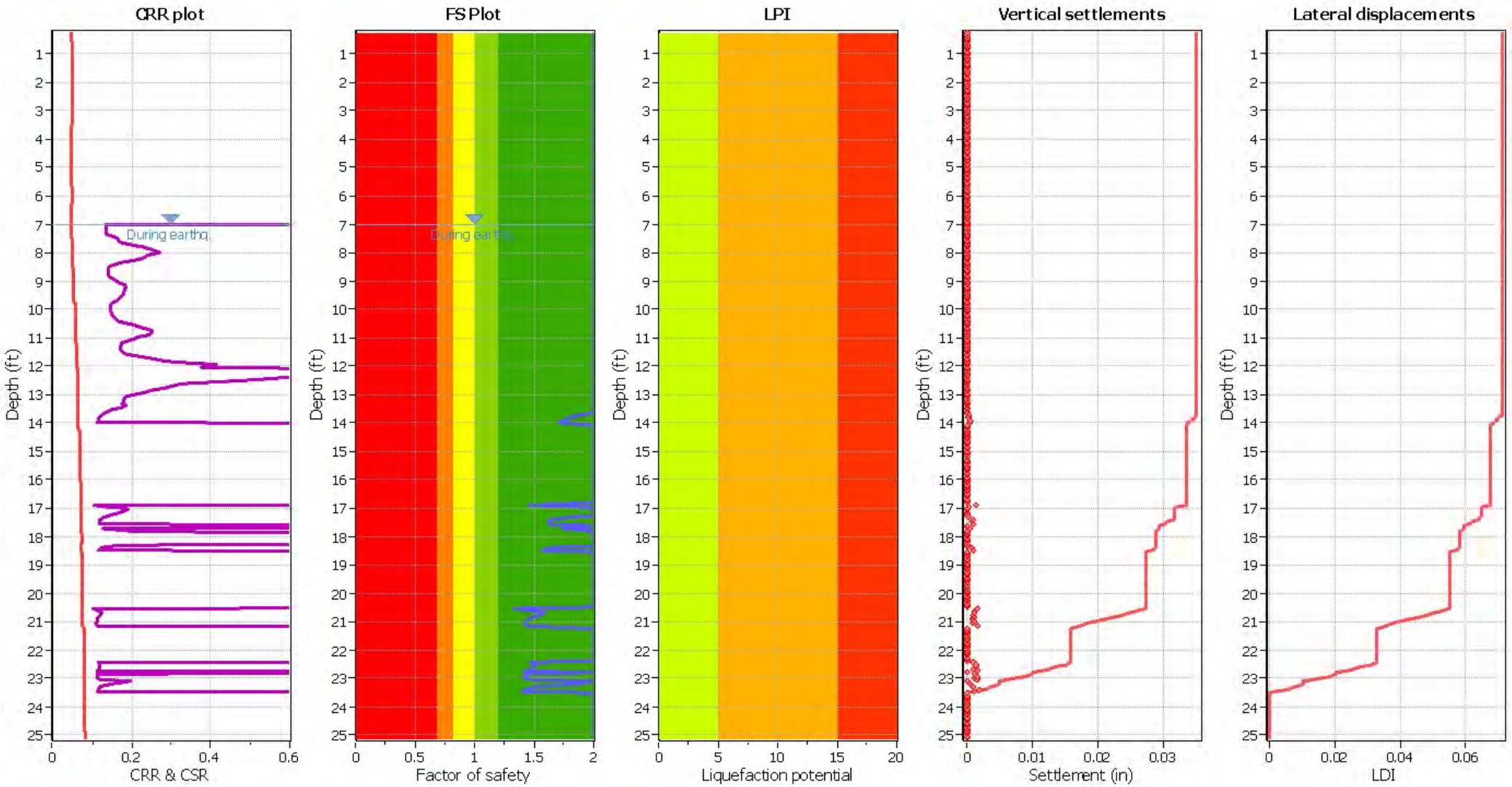
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	7.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.08	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	7.00 ft	Fill height:	N/A	Limit depth:	25.00 ft

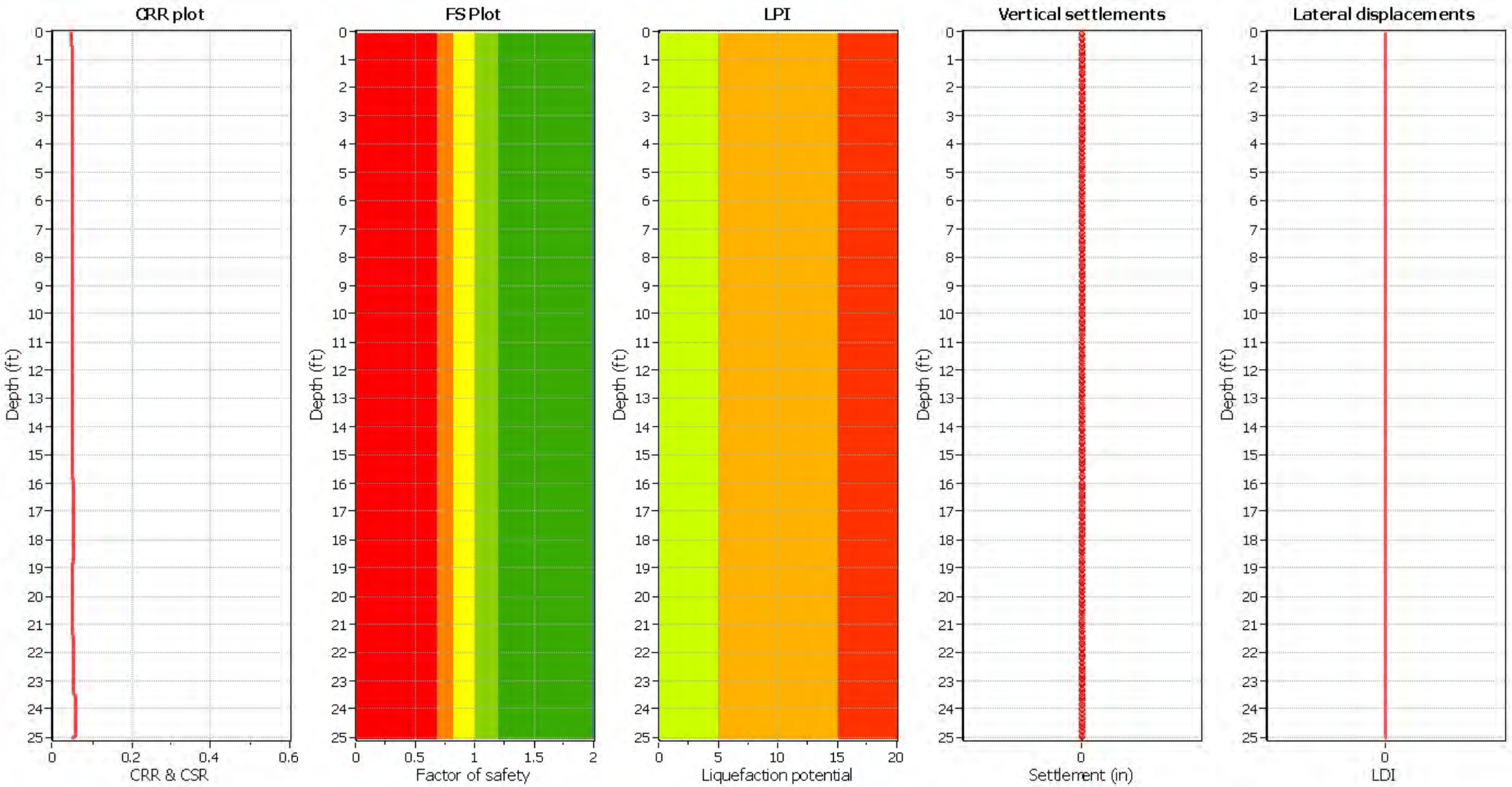
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	50.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.08	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	50.00 ft	Fill height:	N/A	Limit depth:	25.00 ft

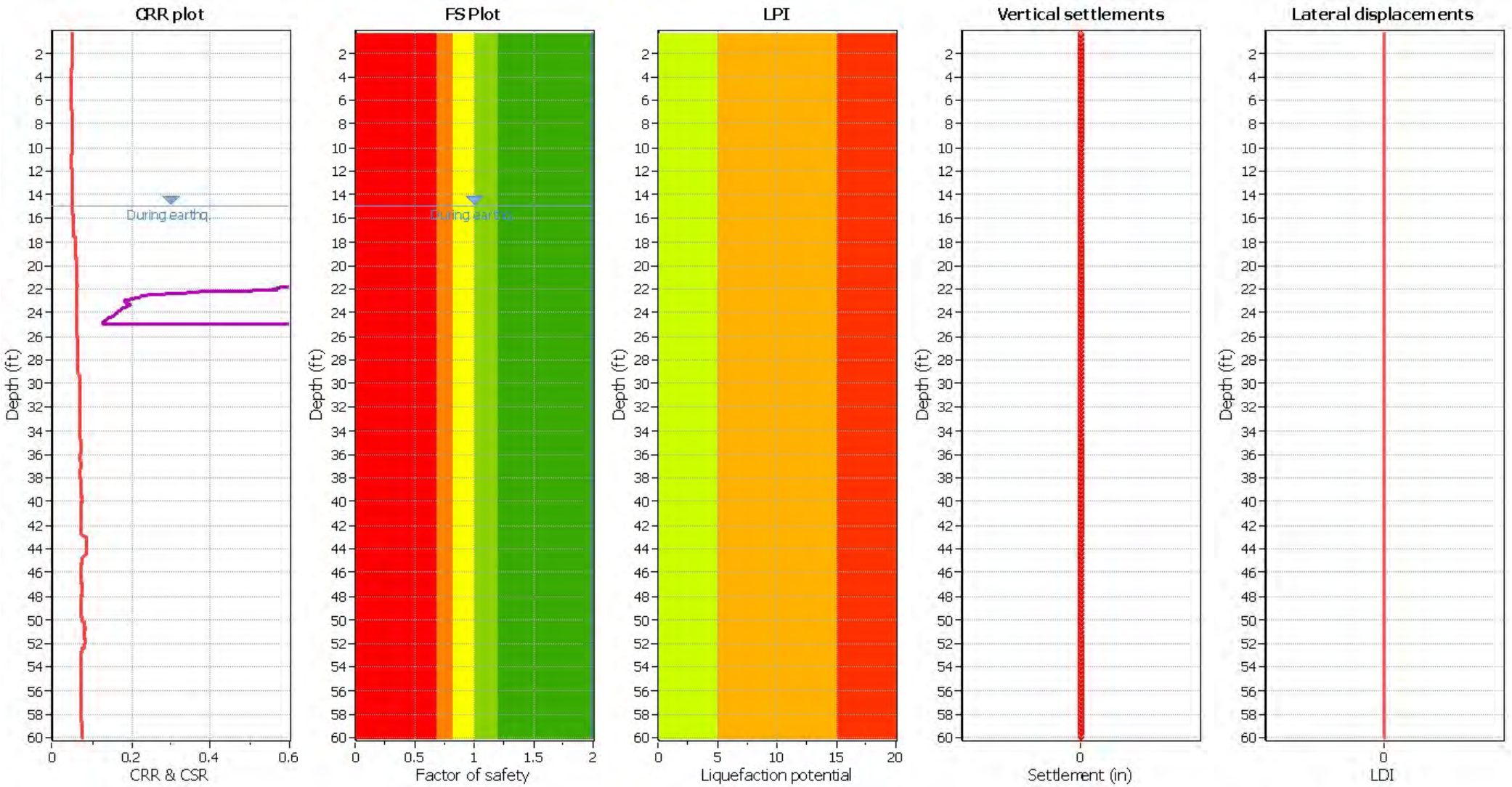
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	15.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.08	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	15.00 ft	Fill height:	N/A	Limit depth:	25.00 ft

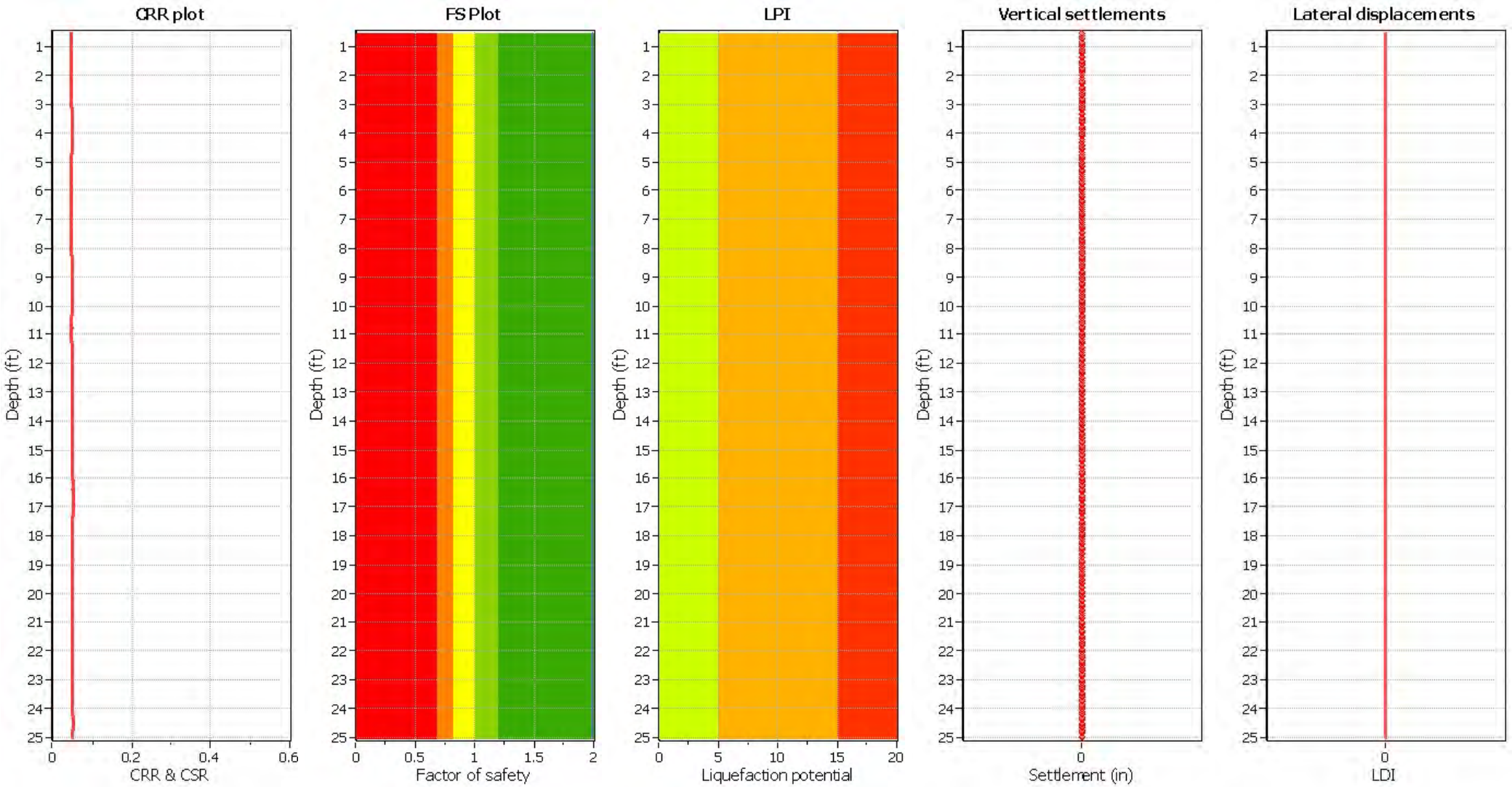
F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	50.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.08	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	50.00 ft	Fill height:	N/A	Limit depth:	25.00 ft

F.S. color scheme
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LPI color scheme
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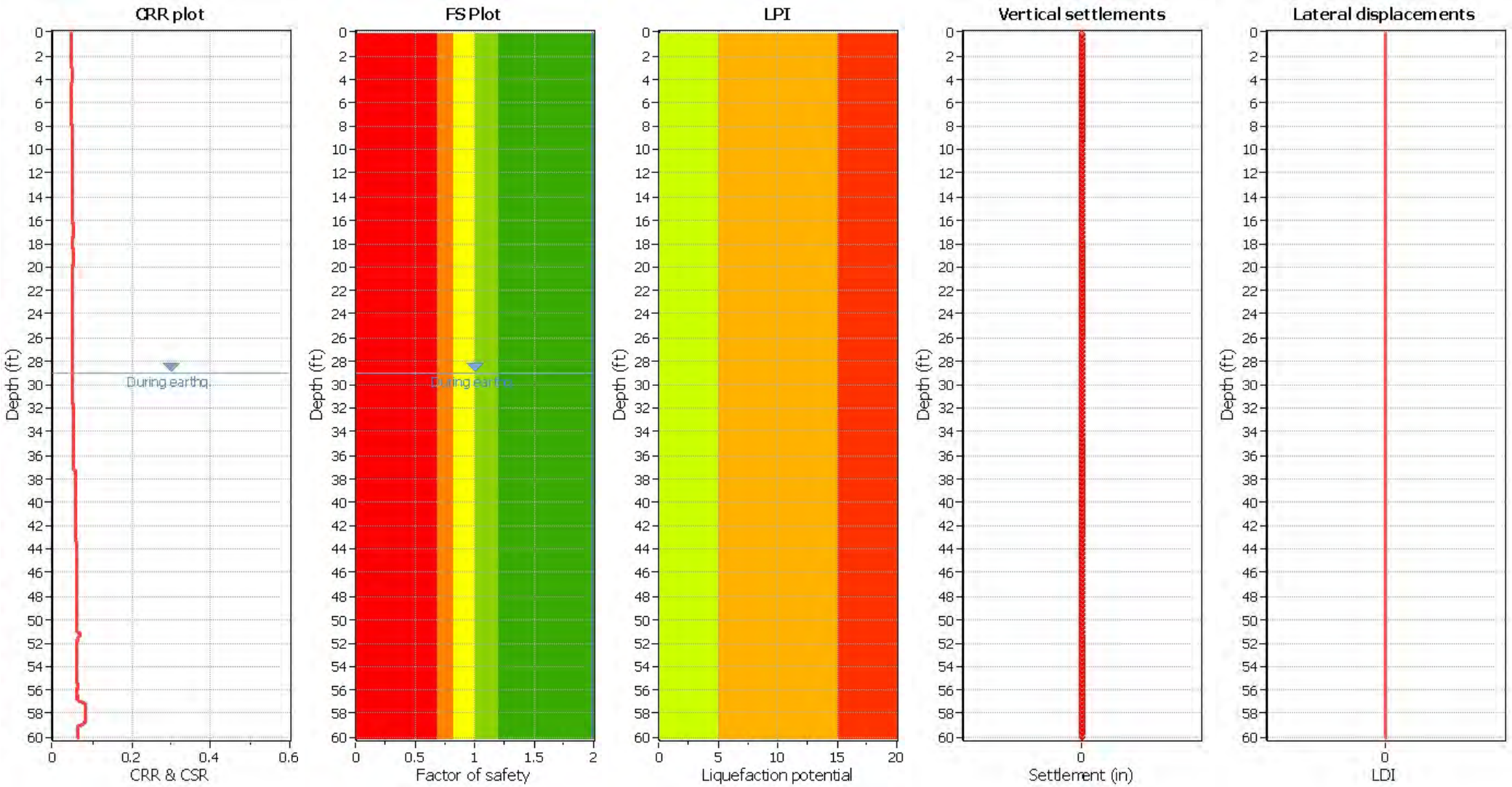
This software is licensed to: Geotechnology, Inc.

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	29.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.08	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	29.00 ft	Fill height:	N/A	Limit depth:	25.00 ft

F.S. color scheme

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LPI color scheme

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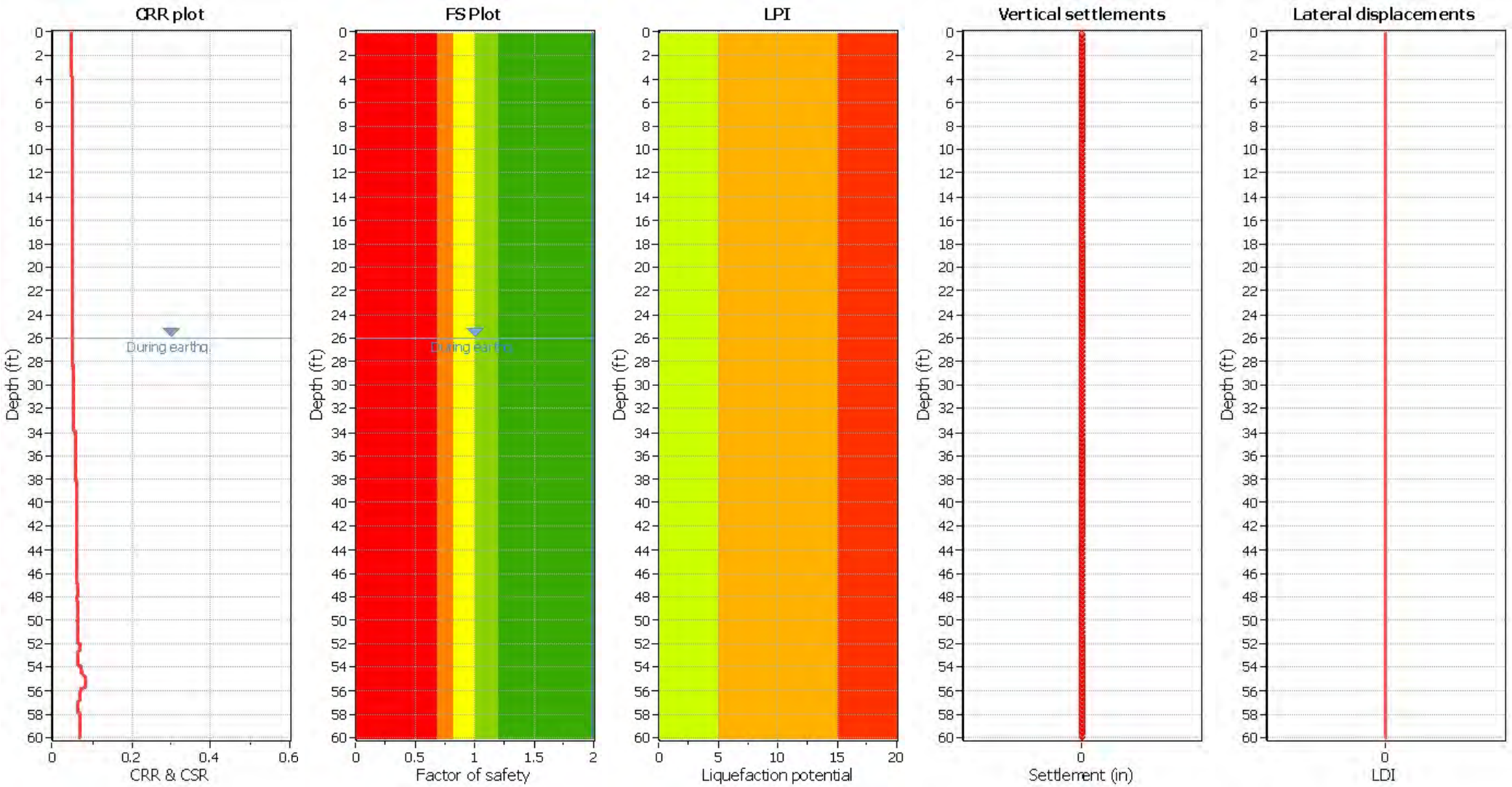
- Low risk

Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	26.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.08	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	26.00 ft	Fill height:	N/A	Limit depth:	25.00 ft

F.S. color scheme

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LPI color scheme

- Very high risk
- High risk
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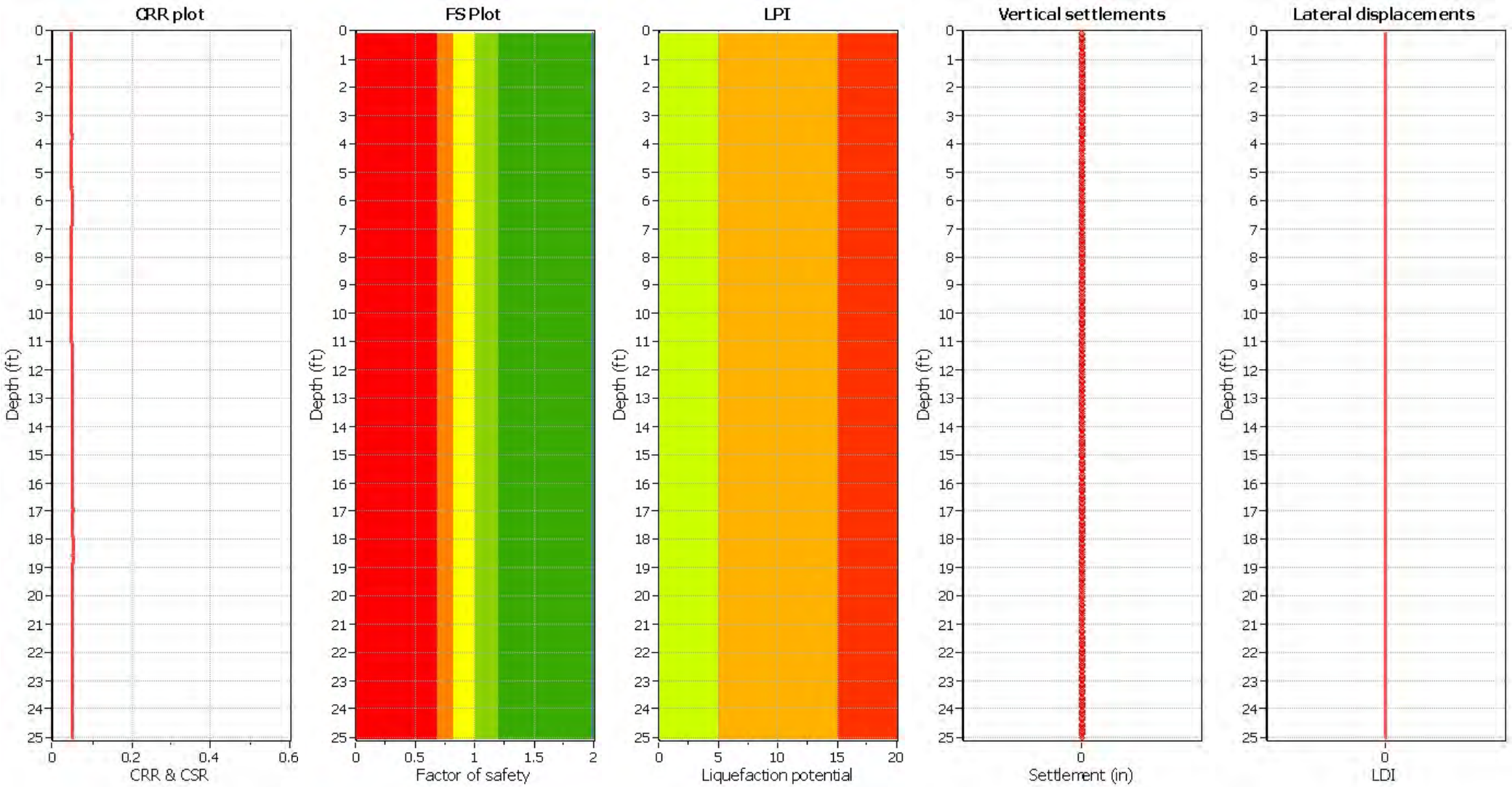
Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	50.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.08	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	50.00 ft	Fill height:	N/A	Limit depth:	25.00 ft

F.S. color scheme
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LPI color scheme
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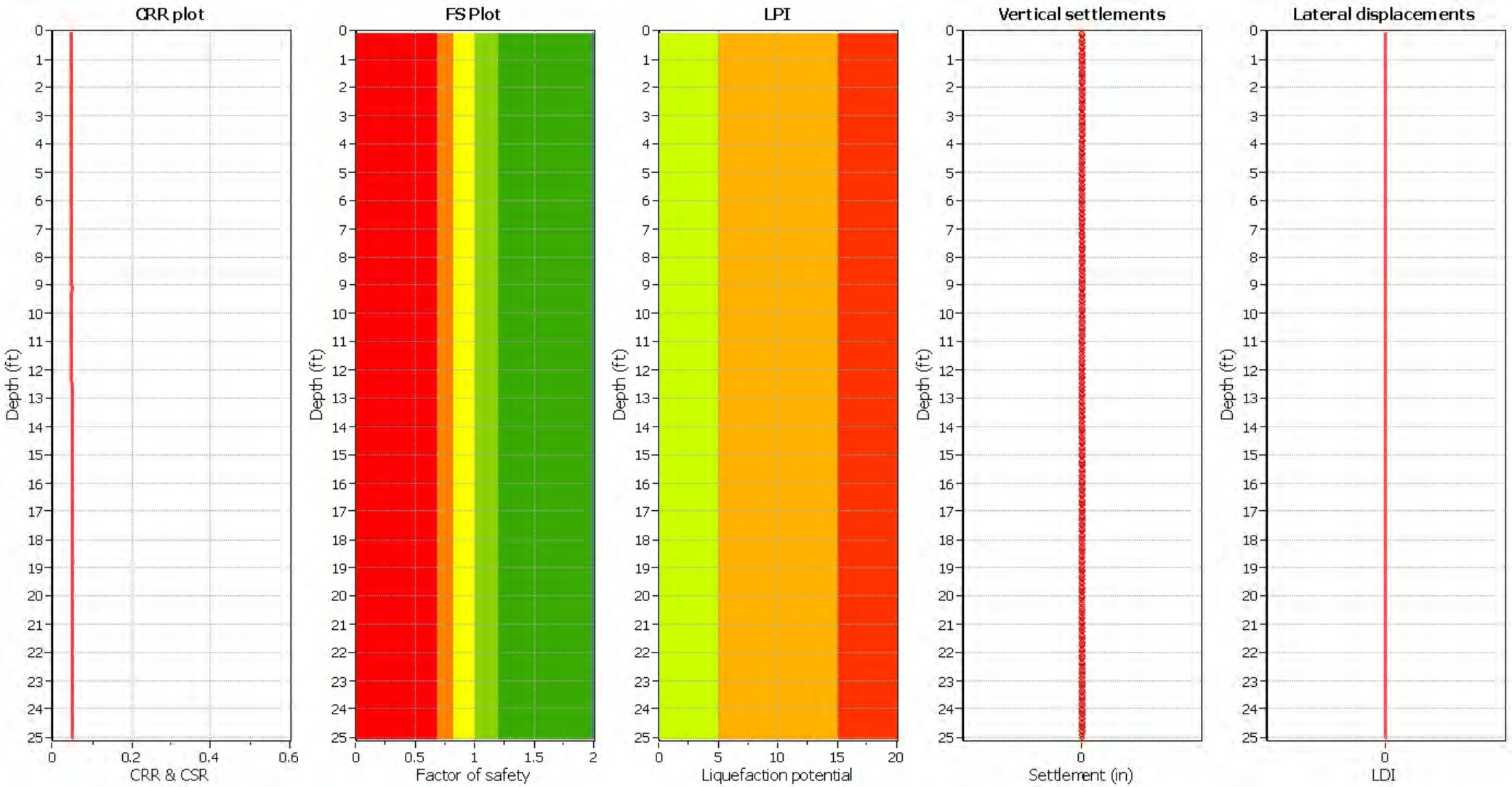
Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	50.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.08	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	50.00 ft	Fill height:	N/A	Limit depth:	25.00 ft

F.S. color scheme
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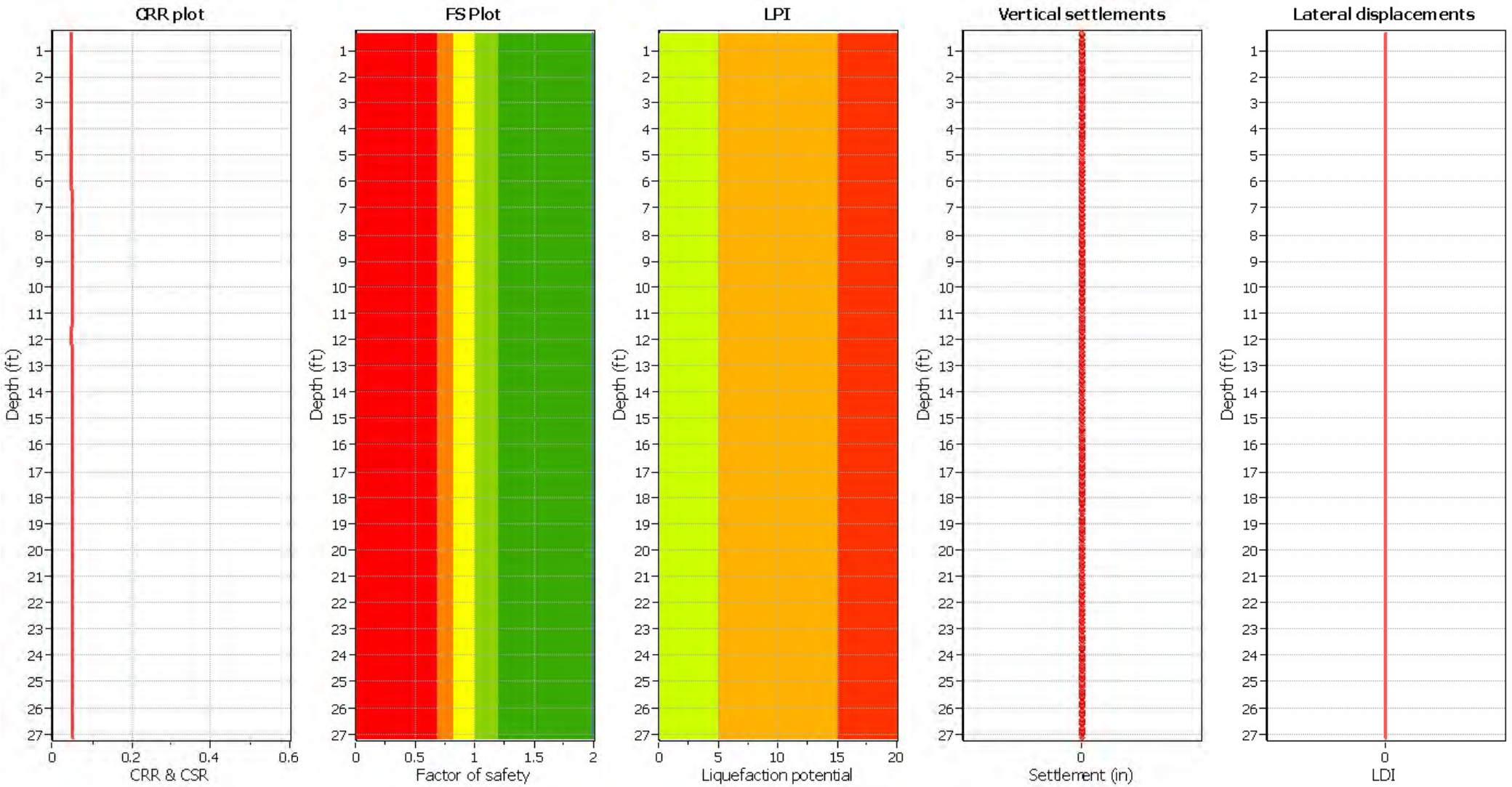
Liquefaction analysis overall plot



Input parameters and analysis data

Analysis method:	B&I (2014)	Depth to GWT (erthq.):	50.00 ft	Fill weight:	N/A
Fines correction method:	B&I (2014)	Average results interval:	3	Transition detect. applied:	No
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.70	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.08	Use fill:	No	Limit depth applied:	Yes
Depth to water table (insitu):	50.00 ft	Fill height:	N/A	Limit depth:	25.00 ft

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ATTACHMENT E
Ameren Meredosia Annual Dam Safety Inspection Reports

Inspection Form for Dams, Levees and Ponds at Ameren Facilities

Projcet Name:	2014 Annual Dam Safety Inspection	Inspection Date:	09/16/2014
		Temperature:	60s
Location:	Meredosia Power Plant	Weather:	sunny
System Description:	Bottom Ash Pond	Bottom Ash Pond Level:	Very Low
	Ash Pond (Active)	Ash Pond Level:	Very Low
	Ash Pond (Closed)		
Engineer/Inspectors:	Jeff Greer, Dam Safety Engineer		
Owner Representative:	Steve Potter		

Overall System Rating: **Acceptable**

System Rating Codes

Acceptable System: Nearly all items or components are rated as GC or NE.

Minimally Acceptable System: One or more items are rated as MM or one or more items are rated as IM or EC and an engineering determination concludes that the IM or EC items would not prevent the system from performing as intended.

Unacceptable System: One or more items are rated as IM or EC and would prevent the system from performing as intended, or a serious deficiency noted in past inspections (which had previously resulted in a minimally acceptable system rating) has not been corrected within the established timeframe, not to exceed two years.

Condition Codes

EC = Emergency Condition. A serious dam safety condition exists that needs immediate action. Emergency measures implemented as instructed by Supervising Engineer, Dam Safety; i.e. pool draw down, work stoppage, or plant stoppage.

IM = Item needing Immediate Maintenance to restore or ensure its safety or integrity. Remediation should be completed within an appropriate timeframe as determined by the Supervising Engineer, Dam Safety.

MM = Item needing Minor Maintenance and/or repairs within the year. The safety or integrity of the item is not yet imperiled.

OB = Condition requires regular Observation to ensure that the condition does not become worse.

GC = Good Condition.

NE = No Evidence of a problem.

NI = Not Inspected. Reason should be stated in comment

	Item	Condition Code *	Deficiencies	Recommended Remedial Measures and Implementation Schedule
Inlet and Outlet	Obstruction	NE		
	Inlet Piping Supports	GC		
	Leakage	GC	There was a bit of water on the inlet, but it is believed that this is from significant amount of rainfall in the past week.	
	Outfall Structure Condition	GC		
	Outfall Pipe	GC	River side under water. River is up 14.2'	
	Other			
Earth Embankment	Vertical & Horizontal Alignment of Crest	GC		
	Animal Damage	NE		
	Surface Cracks	NE		
	Pond Liner	na		
	Seepage	NE	Due to higher than normal river levels and low pond levels, seepage was not witnessed	
	Erosion	NE		
	Slope Stability	GC		
	Vegetation	OB	A lot of recent work has been done to remove debris and growth from the outer burm.	Please mow grass on crest and outer berms. Mowing scheduled for first part of October, as stated during inspection.
	Unusual Movement or Cracking At or Beyond Toe	NE	Toe was underwater	
	Other			

Meredosia Power Plant **Annual Engineering Inspection Checksheet**

Fly Ash Pond

Inspection Date: 09/16/2014

	Item	Condition Code *	Deficiencies	Recommended Remedial Measures and Implementation Schedule
Inlet and Outlet	Obstruction	NE		
	Inlet Piping Supports	NI	Did not witness, although areas leading up to and around discharge appear to be dry.	
	Leakage	NE		
	Outfall Structure Condition	GC	The outfall structure lists to the south, but this apparantley has been a attribute spanning back to its construction. Slide gate valve has been closed for a few years since maintenance was last done. There is some water in the pond, but believed to be from heavy rains in the recent days.	
	Outfall Pipe	GC	Discharge under water	
	Other			
Earth Embankment	Vertical & Horizontal Alignment of Crest	GC		
	Animal Damage	NE	Difficult to tell with high grass, but nothing of note was seen.	
	Surface Cracks	NE		
	Pond Liner	NA		
	Seepage	NE		
	Erosion	NE		
	Slope Stability	GC		
	Vegetation	OB	Outside berm cleaned of debris. Grass should be cut and small trees and woody sprouts should be spayed.	Please mow grass off of crest and berm. Please spray woody vegatation growing therein. Mowing scheduled for first part of October, as stated during inspection.
	Unusual Movement or Cracking At or Beyond Toe	NE		
	Other			

Meredosia Power Plant
Inactive Ash Pond

Annual Engineering Inspection Checksheet

Inspection Date: 09/16/2014

	Item	Condition Code *	Deficiencies	Recommended Remedial Measures and Implementation Schedule
Inlet and Outlet	Obstruction	n/a		
	Inlet Piping Supports	n/a		
	Leakage	n/a		
	Outfall Structure Condition	n/a		
	Outfall Pipe	n/a		
	Other			
Earth Embankment	Vertical & Horizontal Alignment of Crest	GC		
	Animal Damage	NE		
	Surface Cracks	NE		
	Pond Liner	NA		
	Seepage	NE		
	Erosion	NE		
	Slope Stability	GC		
	Vegetation	OB	Trees removed from south berm. While there are bare and depressions in the outer berm, it appears to be from the removal of larger trees.	Please mow grass on crest and outer berms. Mowing scheduled for first part of October, as stated during inspection.
	Unusual Movement or Cracking At or Beyond Toe	NE	Grass was high, but what was visible did not exhibit any issues.	
	Pond Cap (Soil)	GC		

Ameren Meredosia Annual Ash Pond Inspection

September 17, 2014

By Jeff Greer, Ameren Missouri Dam Safety

Meredosia Bottom Ash Pond
Meredosia Inactive Ash Pond
Meredosia Fly Ash Pond

Bottom Ash Pond Photos

Bottom Ash
Inlet
Structure

West
Embankment

Discharge
Pipe
submerged

Fly Ash Pond Photos

North side
relief of ash
build up above
crest, on fly
ash pond

West Embankment

North Embankment

Discharge
Pipe
submerged

West embankment
alignment

East side relief of ash build up
above crest, on fly ash pond

East side access road and
embankment

Inactive Ash Pond Photos

East embankment

West
embankment

Inspection Form for Dams, Levees and Ponds at Ameren Facilities

Projcet Name:	2016 Annual Dam Safety Inspection	Inspection Date:	11/01/2016
		Temperature:	75
Location:	Meredosia Power Plant	Weather:	sunny
System Description:	Bottom Ash Pond	Bottom Ash Pond Level:	Very Low
	Fly Ash Pond	Ash Pond Level:	Very Low
	Ash Pond (Closed)		
Engineer/Inspectors:	Jeff Greer, Dam Safety Engineer		
Owner Representative:	Steve Potter		

Overall System Rating: **Acceptable**

Vegetation is high and obsurs the toe in spots, however with colder weather coming the vegetation is dying and will likely not need to be mowed before the ponds are closed in early 2017.

System Rating Codes

Acceptable System: Nearly all items or components are rated as GC or NE.

Minimally Acceptable System: One or more items are rated as MM or one or more items are rated as IM or EC and an engineering determination concludes that the IM or EC items would not prevent the system from performing as intended.

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Condition Codes

EC = Emergency Condition. A serious dam safety condition exists that needs immediate action. Emergency measures implemented as instructed by Supervising Engineer, Dam Safety; i.e. pool draw down, work stoppage, or plant stoppage.

IM = Item needing Immediate Maintenance to restore or ensure its safety or integrity. Remediation should be completed within an appropriate timeframe as determined by the Supervising Engineer, Dam Safety.

MM = Item needing Minor Maintenance and/or repairs within the year. The safety or integrity of the item is not yet imperiled.

OB = Condition requires regular Observation to ensure that the condition does not become worse.

GC = Good Condition.

NE = No Evidence of a problem.

NI = Not Inspected. Reason should be stated in comment

Meredosia Power Plant
Bottom Ash Pond

Annual Engineering Inspection Checksheet

Inspection Date: 11/01/2016

	Item	Condition Code *	Deficiencies	Recommended Remedial Measures and Implementation Schedule
Inlet and Outlet	Obstruction	NE	Not a discharge line.	
	Inlet Piping Supports	GC		
	Leakage	OB	No leakage observed.	
	Outfall Structure Condition	OB	Structure's condition will be sufficient for the life of the plant.	
	Dischage	NA	Grouted shut in 2015.	
	Outfall Pipe	NA	Grouted shut in 2015.	
	Other			
Earth Embankment	Vertical & Horizontal Alignment of Crest	GC	No noticeable shifts or depressions.	
	Animal Damage	OB	Some minor activity.	
	Surface Cracks	NE	None identified.	
	Pond Liner	NA	Not lined.	
	Seepage	NE	In areas of where the toe was cleared, no seepage or ponding was noted.	
	Erosion	OB	Some errosion exists, but pond is empty and discharge grouted shut. Pond is due to be closed early in 2017.	
	Slope Stability	GC		
	Vegetation	MM	Some areas where growth is thick. Some of the toe could be viewed but some of the embankments were obscured.	Please continue to mow grass on crest and outer berms to facilitate monitoring. Pond due to close in 2017. Vegetation dying so will likely not need mowing before closure.
	Unusual Movement or Cracking At or Beyond Toe	NE		
	Other			

Meredosia Power Plant
Fly Ash Pond

Annual Engineering Inspection Checksheet

Inspection Date: 11/01/2016

	Item	Condition Code *	Deficiencies	Recommended Remedial Measures and Implementation Schedule
Inlet and Outlet	Obstruction	OB	Low water level area to be filled with clean fill.	
	Inlet Piping Supports	OB	Did not witness, although areas leading up to and around discharge appear to be dry.	
	Leakage	OB	No leakage was observed within the concrete outlet structure.	
	Outfall Structure Condition	GC	The outfall structure lists to the south, but this apparantley has been a attribute spanning back to its construction. Slide gate valve has been closed for a few years since maintenance was last done. There is some water in the pond, but believed to be from heavy rains in the recent days.	
	Outfall Pipe	GC	Intended to only be opened on special need.	
	Other			
Earth Embankment	Vertical & Horizontal Alignment of Crest	GC	No indication of any misalignment or change from last viewed.	
	Animal Damage	NE	Difficult to tell with high grass, but nothing of note was seen.	
	Surface Cracks	NE	Crest was clear, but embankments overgrown. No evidience of cracks in bare areas.	
	Pond Liner	NA		
	Seepage	NE	Most of the embankments and toe are overgrown. Bare spots were walked but no seepages was identified.	
	Erosion	NE		
	Slope Stability	OB	No evidence of instability where surface was visible.	
	Vegetation	OB	Heavily vegitated berms. Most of the toe is overgown.	Pond due to close in early 2017. Vegetation dying but embankments not visible.
	Unusual Movement or Cracking At or Beyond Toe	NE		
	Other			

Ameren Meredosia Annual Ash Pond Inspection

November 1, 2016

By Jeff Greer, Ameren Missouri Dam Safety

Meredosia Bottom Ash Pond
Meredosia Inactive Ash Pond
Meredosia Fly Ash Pond

Bottom Ash Pond Photos

West
Embankment

Fly Ash Pond Photos

North Embankment

West Embankment

Discharge

South Side embankment

East Embankment

East side access road and
embankment

Inactive Ash Pond Photos

South
embankment

Old Abandoned Line
Plant personnel
wants filled

Inspection Form for Dams, Levees and Ponds at Ameren Facilities

Project Name:	Annual Dam Safety Inspection	Inspection Date:	11/19/2020
		Temperature:	65° F
Location:	Meredosia Power Plant	Weather:	Sunny
System Description:	Capped Bottom Ash Pond	Bottom Ash Pond Level:	Closed
	Capped Fly Ash Pond	Ash Pond Level:	Closed
	First Ash Pond (Inactive)	Illinois River Level:	**3.2** ft
		Illinois River Elevation:	**421.2** ft
Engineer/Inspectors:	Marc Lueckenhoff, Dam Safety Engineer	**Toe is underwater at 12'*	

Overall System Rating:

Bottom Ash Pond	**Acceptable**
Fly Ash Pond	**Acceptable**
First Ash Pond	**Acceptable**

System Rating Codes

Acceptable System: Nearly all items or components are rated as GC or NE.

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Condition Codes

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MM = Item needing Minor Maintenance and/or repairs within the year. The safety or integrity of the item is not yet imperiled.

OB = Condition requires regular Observation to ensure that the condition does not become worse.

GC = Good Condition.

NE = No Evidence of a problem.

NI = Not Inspected. Reason should be stated in comment

Meredosia Power Plant
Fly Ash Pond

Date	11/19/2020
Inspector	Lueckenhoff
Temperature	65º F
Weather	Sunny

	Item	Condition Code *	Comments
Pond Cap	Drainage Channels (perimeter ditch)	GC	
	Vegetation	GC	
	Erosion on Cap	GC	
	Liner	GC	
	Seepage/Wetness/ Ponding Areas	GC	
	Other		
Embankment	Vegetation	GC	
	Erosion	GC	
	Drainage Channels (rip-rap, paved flumes, etc.)	MM	Erosion along toe starting to cut into a drainage channel.
	Seepage/Wetness/ Ponding Areas	GC	
	Vertical & Horizontal Alignment of Crest	GC	
	Other		

Condition Codes

IM = Item needing Immediate Maintenance. Remediation should be completed within 1 month.
MM = Item needing Minor Maintenance and/or repairs within the year.
OB = Condition requires regular observation to ensure that the condition does not become worse.
GC = Good Condition. Working properly.
NE = No Evidence of a problem.
NI = Not Inspected. Reason should be stated in comment

Meredosia Power Plant
Bottom Ash Pond

Date	11/19/2020
Inspector	Lueckenhoff
Temperature	65º F
Weather	Sunny

	Item	Condition Code *	Comments
Embankment	**Vegetation**	**GC**	
	Erosion	**GC**	
	Liner	**GC**	
	Drainage Channels (rip-rap, paved flumes, etc.)	**GC**	
	Seepage/Wetness/ Ponding Areas	**GC**	Ponding along toe
	Vertical & Horizontal Alignment of Crest	**GC**	
	Other		

Condition Codes

IM = Item needing Immediate Maintenance. Remediation should be completed within 1 month.
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Meredosia Power Plant
First Ash Pond

Date	11/19/2020
Inspector	Lueckenhoff
Temperature	65º F
Weather	Sunny

	Item	Condition Code *	Comments
Pond Cap	Vegetation	GC	
	Erosion on Cap	GC	
	Seepage/Wetness/ Ponding Areas	GC	
	Other		
Embankment	Vegetation	GC	
	Erosion	OB	Erosion on the N embankment. Appears to be old and not changing.
	Seepage/Wetness/ Ponding Areas	GC	
	Vertical & Horizontal Alignment of Crest	GC	
	Other	OB	Multiple animal burrows

Condition Codes

IM = Item needing Immediate Maintenance. Remediation should be completed within 1 month.
MM = Item needing Minor Maintenance and/or repairs within the year.
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Erosion
Animal Burrows

Erosion along toe

Fly Ash Pond

South Embankment Looking West

North embankment Looking East

Erosion

Bottom Ash Pond

Looking West

Water Along Toe

First Ash Pond

Erosion on North Embankment

Animal Burrow at SW Corner

Inspection Form for Dams, Levees and Ponds at Ameren Facilities

Project Name:	Annual Dam Safety Inspection	Inspection Date:	11/18/2021
		Temperature:	45° F
Location:	Meredosia Power Plant	Weather:	Sunny
System Description:	Capped Bottom Ash Pond	Bottom Ash Pond Level:	Closed
	Capped Fly Ash Pond	Ash Pond Level:	Closed
	First Ash Pond (Inactive)	Illinois River Level:	**11.4** ft
		Illinois River Elevation:	**429.4** ft
Engineer/Inspectors:	Marc Lueckenhoff, Dam Safety Engineer		**Toe is underwater at 12'*

Overall System Rating:

Bottom Ash Pond	**Acceptable**
Fly Ash Pond	**Acceptable**
First Ash Pond	**Acceptable**

System Rating Codes

Acceptable System: Nearly all items or components are rated as GC or NE.

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GC = Good Condition.

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NI = Not Inspected. Reason should be stated in comment

Meredosia Power Plant
Fly Ash Pond

Date	11/18/2021
Inspector	Lueckenhoff
Temperature	45º F
Weather	Sunny

	Item	Condition Code *	Comments
Pond Cap	Drainage Channels (perimeter ditch)	GC	
	Vegetation	GC	
	Erosion on Cap	GC	
	Liner	GC	
	Seepage/Wetness/ Ponding Areas	GC	
	Other		
Embankment	Vegetation	GC	
	Erosion	GC	
	Drainage Channels (rip-rap, paved flumes, etc.)	GC	Erosion along toe was repaired.
	Seepage/Wetness/ Ponding Areas	GC	Multiple wet areas along toe. The toe was underwater due to flooding since October 25, 2021.
	Vertical & Horizontal Alignment of Crest	GC	
	Other		

Condition Codes

IM = Item needing Immediate Maintenance. Remediation should be completed within 1 month.
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OB = Condition requires regular observation to ensure that the condition does not become worse.
GC = Good Condition. Working properly.
NE = No Evidence of a problem.
NI = Not Inspected. Reason should be stated in comment

Meredosia Power Plant
Bottom Ash Pond

Date	11/18/2021
Inspector	Lueckenhoff
Temperature	45º F
Weather	Sunny

	Item	Condition Code *	Comments
Embankment	**Vegetation**	**GC**	
	Erosion	**GC**	
	Liner	**GC**	
	Drainage Channels (rip-rap, paved flumes, etc.)	**GC**	
	Seepage/Wetness/ Ponding Areas	**GC**	Ponding along toe. The toe was underwater due to flooding since October 25, 2021.
	Vertical & Horizontal Alignment of Crest	**GC**	
	Other		

Condition Codes

IM = Item needing Immediate Maintenance. Remediation should be completed within 1 month.
MM = Item needing Minor Maintenance and/or repairs within the year.
OB = Condition requires regular observation to ensure that the condition does not become worse.
GC = Good Condition. Working properly.
NE = No Evidence of a problem.
NI = Not Inspected. Reason should be stated in comment

Meredosia Power Plant
First Ash Pond

Date	11/18/2021
Inspector	Lueckenhoff
Temperature	45º F
Weather	Sunny

	Item	Condition Code *	Comments
Pond Cap	Vegetation	GC	
	Erosion on Cap	GC	
	Seepage/Wetness/ Ponding Areas	GC	
	Other		
Embankment	Vegetation	GC	
	Erosion	OB	Erosion on the N embankment. Appears to be old and not changing.
	Seepage/Wetness/ Ponding Areas	GC	
	Vertical & Horizontal Alignment of Crest	GC	
	Other	OB	Multiple animal burrows.

Condition Codes

IM = Item needing Immediate Maintenance. Remediation should be completed within 1 month.
MM = Item needing Minor Maintenance and/or repairs within the year.
OB = Condition requires regular observation to ensure that the condition does not become worse.
GC = Good Condition. Working properly.
NE = No Evidence of a problem.
NI = Not Inspected. Reason should be stated in comment

Erosion
Animal Burrows

Fly Ash Pond

South Embankment Looking West

North embankment Looking East

Erosion

Bottom Ash Pond

Looking West

Water Along Toe

First Ash Pond

Erosion on North Embankment

Animal Burrow at SW Corner

Meredosia Energy Center
Bottom Ash Pond
Annual Inspection Checklist

Date	11/03/2022
River Level	3.08
Temperature	30's
Weather	Clear
Inspector	M. Lueckenhoff G. Campbell A. Nash

Date of Previous Annual Inspection: 11/18/2021

Date of Previous Periodic Inspection: N/A

Description of Emergency (EC) or Immediate Maintenance (IM) conditions observed since the last annual inspection:
None

Describe any action taken to restore or improve safety and integrity of impounding structure:
None

Describe any modifications to the geometry of the impounding structure since the previous annual inspection:
None

Describe any modifications to the operation of the impounding structure since the previous annual inspection:
None

Describe any changes to the downstream watershed:
None

Bottom Ash Pond
Annual Inspection Checklist

Date	11/03/2022
Inspector	M. Lueckenhoff G. Campbell A. Nash

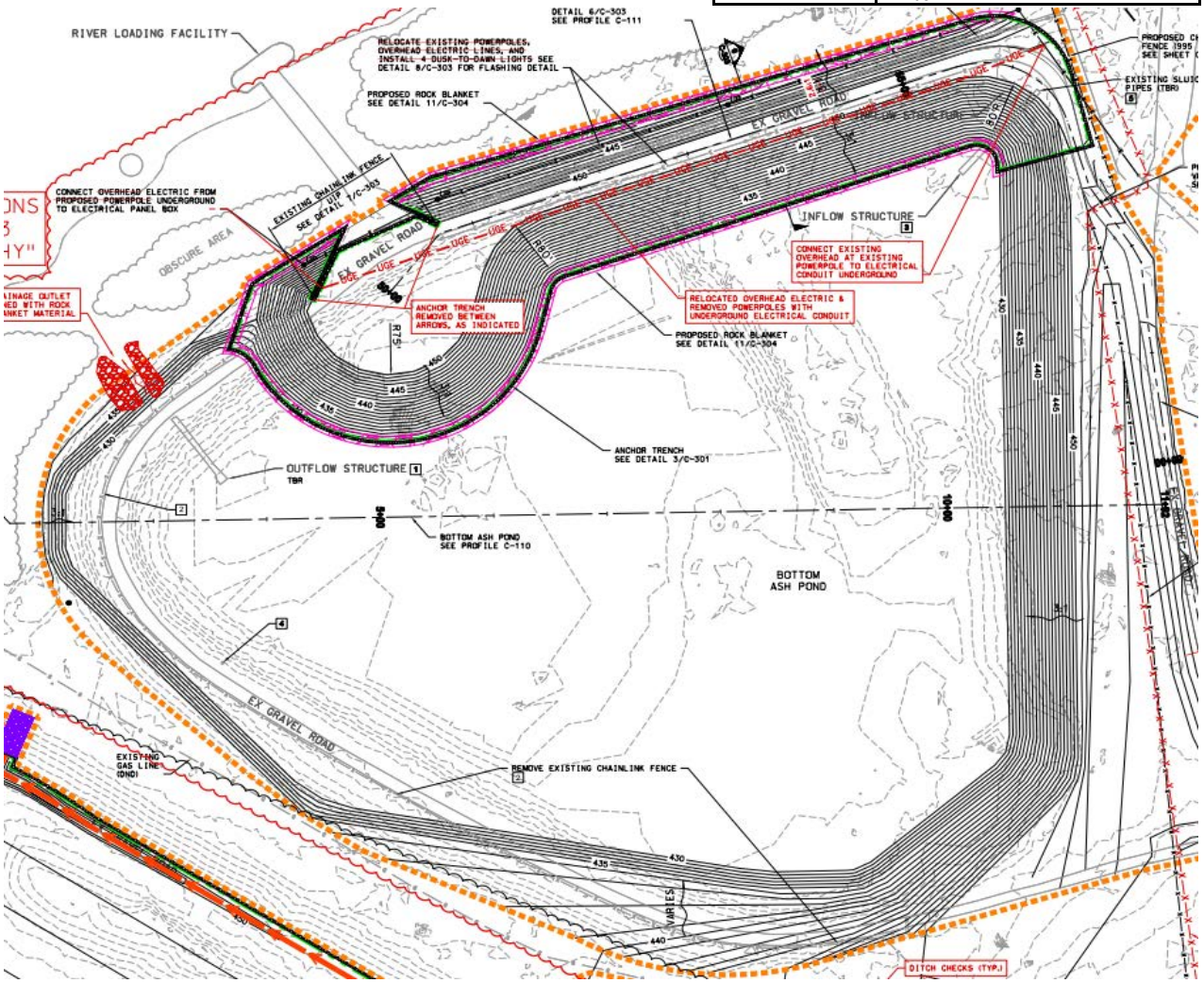
	Item	Condition Code*	Comments
Closure Cap	**Closure Turf**	GC	
	Armor Fill	GC	
	Riprap at Toe	GC	
	Riprap Outlet Flumes	GC	
	Vegetation	GC	
	Other		
Earth Embankment	**Vertical & Horizontal Alignment of Crest**	GC	
	Seepage/Wetness/ Ponding Areas	GC	
	Erosion/Rutting	GC	
	Debris/Logs	OB	Some debris/logs along embankment.
	Vegetation	MM	Remove woody vegetation growing in riprap.
	Sloughs/Slides/ Cracks	GC	
	Animal Control	GC	
	Riprap	GC	
	Roadway	GC	
	Other		
Remaining Basin	**Side Slopes**	GC	
	Bottom	GC	
	Outlet Riprap	GC	
	Toe Riprap	GC	
	Other		

Note location of observation on attached plan sheet.

Bottom Ash Pond

Annual Inspection Checklist

Date	11/03/2022
Inspector	M. Lueckenhoff G. Campbell A. Nash



*** Condition Codes**

EM	Emergency Condition. A serious dam safety condition exists that needs immediate action; Emergency measures implemented as instructed by Chief Dam Safety Engineer, pool drawdown, work stoppage, plant stoppage.
IM	Immediate Maintenance. Item needing immediate maintenance to restore or ensure its safety and integrity. Remediation should be completed within 1 month or as required.
MM	Minor Maintenance. Item needing minor maintenance and/or repairs within the year. The safety or integrity of the item is not yet imperiled.
OB	Condition requires regular observation and potential future minor maintenance.
GC	Good Condition.
NO	No observation possible.
NI	Not Inspected. State reason in comment column.

Meredosia Energy Center
Fly Ash Pond
Annual Inspection Checklist

Date	11/03/2022
River Level	3.08
Temperature	30's
Weather	Clear
Inspector	M. Lueckenhoff G. Campbell A. Nash

Date of Previous Annual Inspection: 11/18/2021

Date of Previous Periodic Inspection: N/A

Description of Emergency (EC) or Immediate Maintenance (IM) conditions observed since the last annual inspection:
None

Describe any action taken to restore or improve safety and integrity of impounding structure:
None

Describe any modifications to the geometry of the impounding structure since the previous annual inspection:
None

Describe any modifications to the operation of the impounding structure since the previous annual inspection:
None

Describe any changes to the downstream watershed:
None

Meredosia Energy Center

Fly Ash Pond

Annual Inspection Checklist

Date	11/03/2022
Inspector	M. Lueckenhoff G. Campbell A. Nash

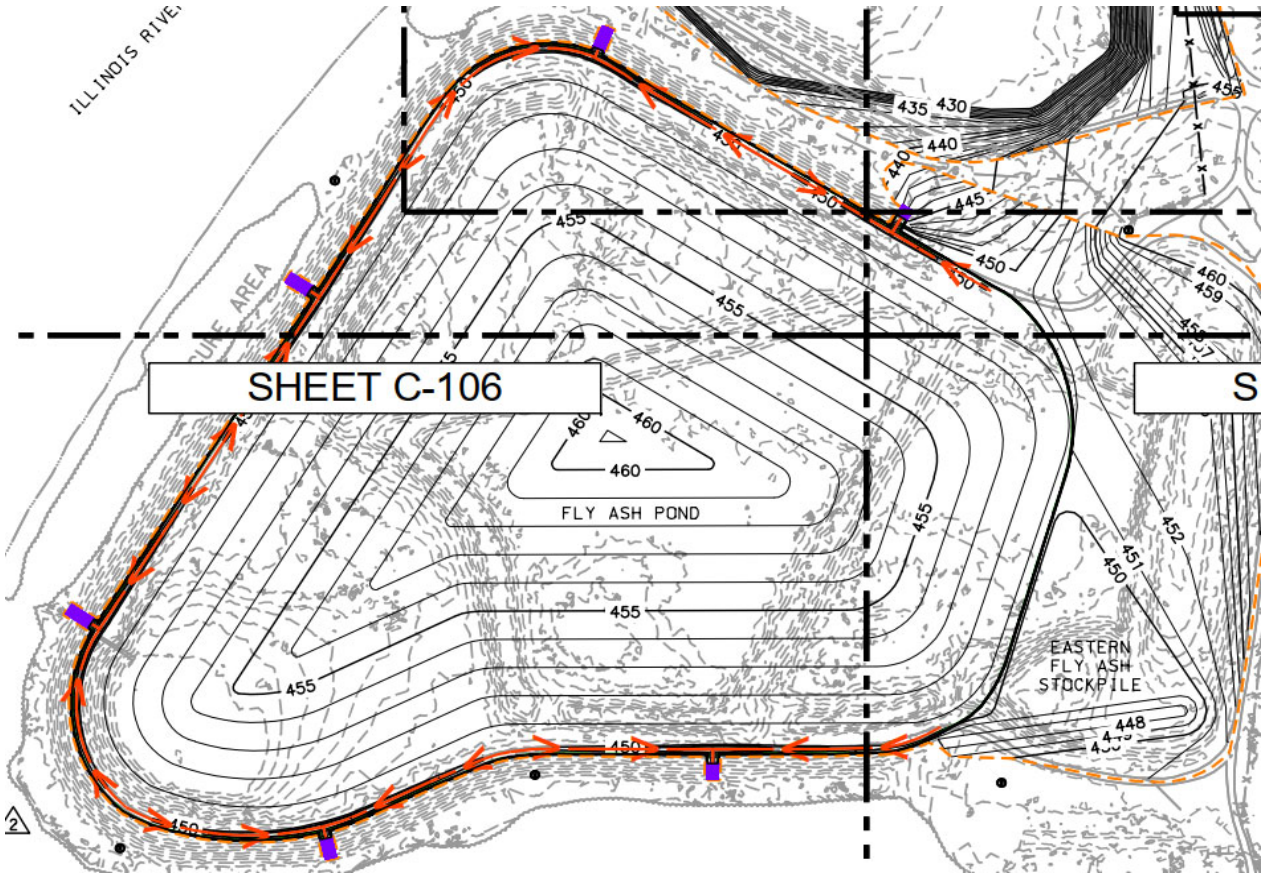
	Item	Condition Code*	Comments
Closure Cap	**Closure Turf**	GC	
	Drainage Ditch/Armor Fill	GC	
	Cap Infill	GC	
	Anchor Trench Rock Blanket	GC	
	Letdowns and Energy Dissipators	GC	
	Other		
Earth Embankment	**Vertical & Horizontal Alignment of Crest**	GC	
	Seepage/Wetness/ Ponding Areas	GC	
	Erosion/Rutting	GC	
	Debris/Logs	GC	
	Vegetation	MM	Remove woody vegetation in riprap.
	Sloughs/Slides/ Cracks	GC	
	Animal Control	GC	
	Riprap	GC	
	Other		

Note location of observation on attached plan sheet.

Fly Ash Pond

Annual Inspection Checklist

Date	11/03/2022
Inspector	M. Lueckenhoff G. Campbell A. Nash



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MM	Minor Maintenance. Item needing minor maintenance and/or repairs within the year. The safety or integrity of the item is not yet imperiled.
OB	Condition requires regular observation and potential future minor maintenance.
GC	Good Condition.
NO	No observation possible.
NI	Not Inspected. State reason in comment column.

Meredosia Energy Center
Original Ash Pond
Annual Inspection Checklist

Date	11/03/2022
River Level	3.08
Temperature	30's
Weather	Clear
Inspector	M. Lueckenhoff G. Campbell A. Nash

Date of Previous Annual Inspection: 11/18/2021

Date of Previous Periodic Inspection: N/A

Description of Emergency (EC) or Immediate Maintenance (IM) conditions observed since the last annual inspection:
None

Describe any action taken to restore or improve safety and integrity of impounding structure:
None

Describe any modifications to the geometry of the impounding structure since the previous annual inspection:
None

Describe any modifications to the operation of the impounding structure since the previous annual inspection:
None

Describe any changes to the downstream watershed:
None

Fly Ash Pond
Annual Inspection Checklist

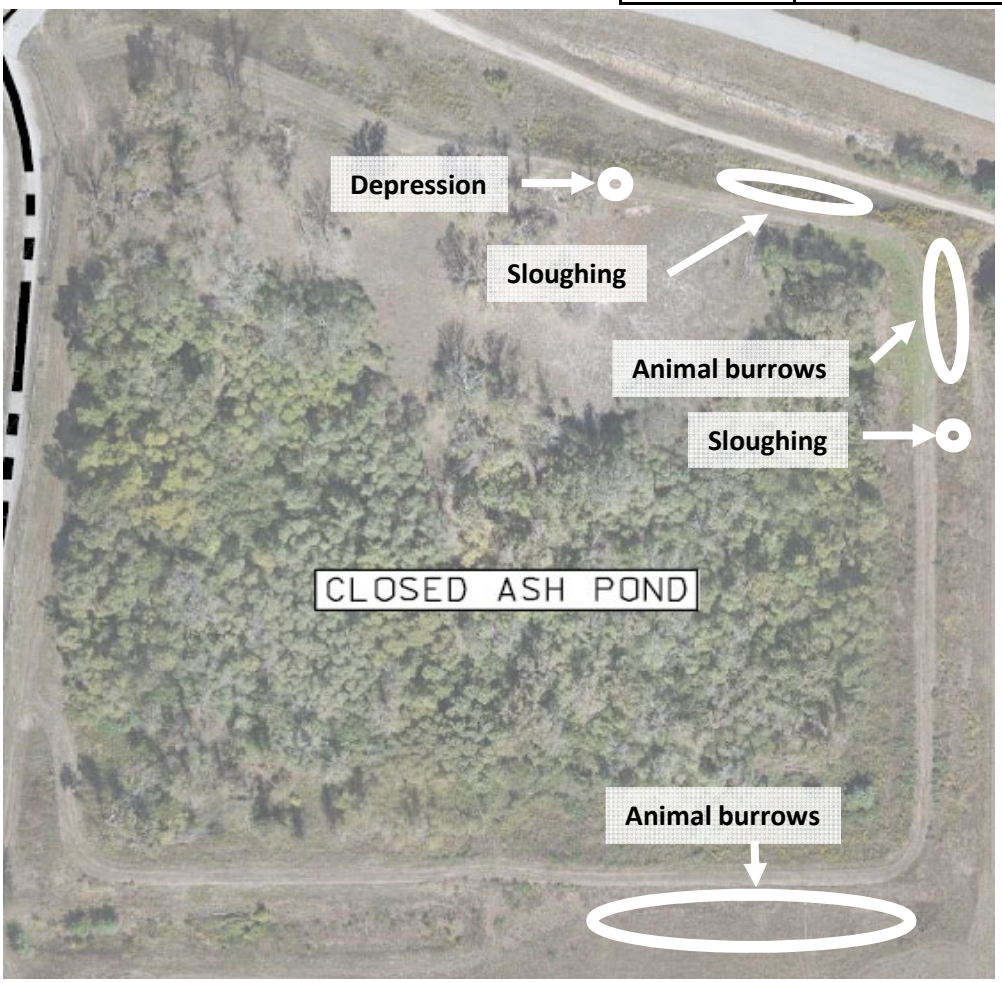
Date	11/03/2022
Inspector	M. Lueckenhoff G. Campbell A. Nash

	Item	Condition Code*	Comments
Earth Embankment	**Vertical & Horizontal Alignment of Crest**	OB	Minor depression on the north embankment crest. Monitor and repair if condition continues to worsen.
	Seepage/Wetness/ Ponding Areas	GC	
	Erosion/Rutting	OB	Minor erosion and rutting due to steep slopes. Monitor and repair if condition continues to worsen.
	Debris/Logs	GC	
	Vegetation	GC	
	Sloughs/Slides/ Cracks	OB	Minor sloughing on north and east side of pond. Monitor and repair if condition continues to worsen.
	Animal Control	MM	Multiple animal burrows along the embankment. Excavate and fill with compacted soil.
	Other		

Note location of observation on attached plan sheet.

Fly Ash Pond
Annual Inspection Checklist

Date	11/03/2022
Inspector	M. Lueckenhoff G. Campbell A. Nash



*** Condition Codes**

EM	Emergency Condition. A serious dam safety condition exists that needs immediate action; Emergency measures implemented as instructed by Chief Dam Safety Engineer, pool drawdown, work stoppage, plant stoppage.
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GC	Good Condition.
NO	No observation possible.
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2022 Embankment repair photographs provided by Ameren

ATTACHMENT F
EDR Historic Aerial Photographs

800 Washington Street

800 Washington Street

Meredosia, IL 62665

Inquiry Number: 7187119.3

November 28, 2022

The EDR Aerial Photo Decade Package

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

EDR Aerial Photo Decade Package

11/28/22

Site Name:

800 Washington Street
800 Washington Street
Meredosia, IL 62665
EDR Inquiry # 7187119.3

Client Name:

Haley & Aldrich, Inc.
6500 Rockside Road
Independence, OH 44131-0000
Contact: Brian Boddecker

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Search Results:

Year	Scale	Details	Source
2017	1"=750'	Flight Year: 2017	USDA/NAIP
2014	1"=750'	Flight Year: 2014	USDA/NAIP
2011	1"=750'	Flight Year: 2011	USDA/NAIP
2005	1"=750'	Acquisition Date: January 01, 2005	USGS/DOQQ
1998	1"=750'	Acquisition Date: January 01, 1998	USGS/DOQQ
1995	1"=750'	Flight Date: March 16, 1995	USGS
1988	1"=750'	Flight Date: April 08, 1988	USGS
1986	1"=750'	Flight Date: April 08, 1986	USGS
1975	1"=750'	Flight Date: March 20, 1975	USGS
1956	1"=750'	Flight Date: June 11, 1956	USGS
1941	1"=750'	Flight Date: July 15, 1941	USDA

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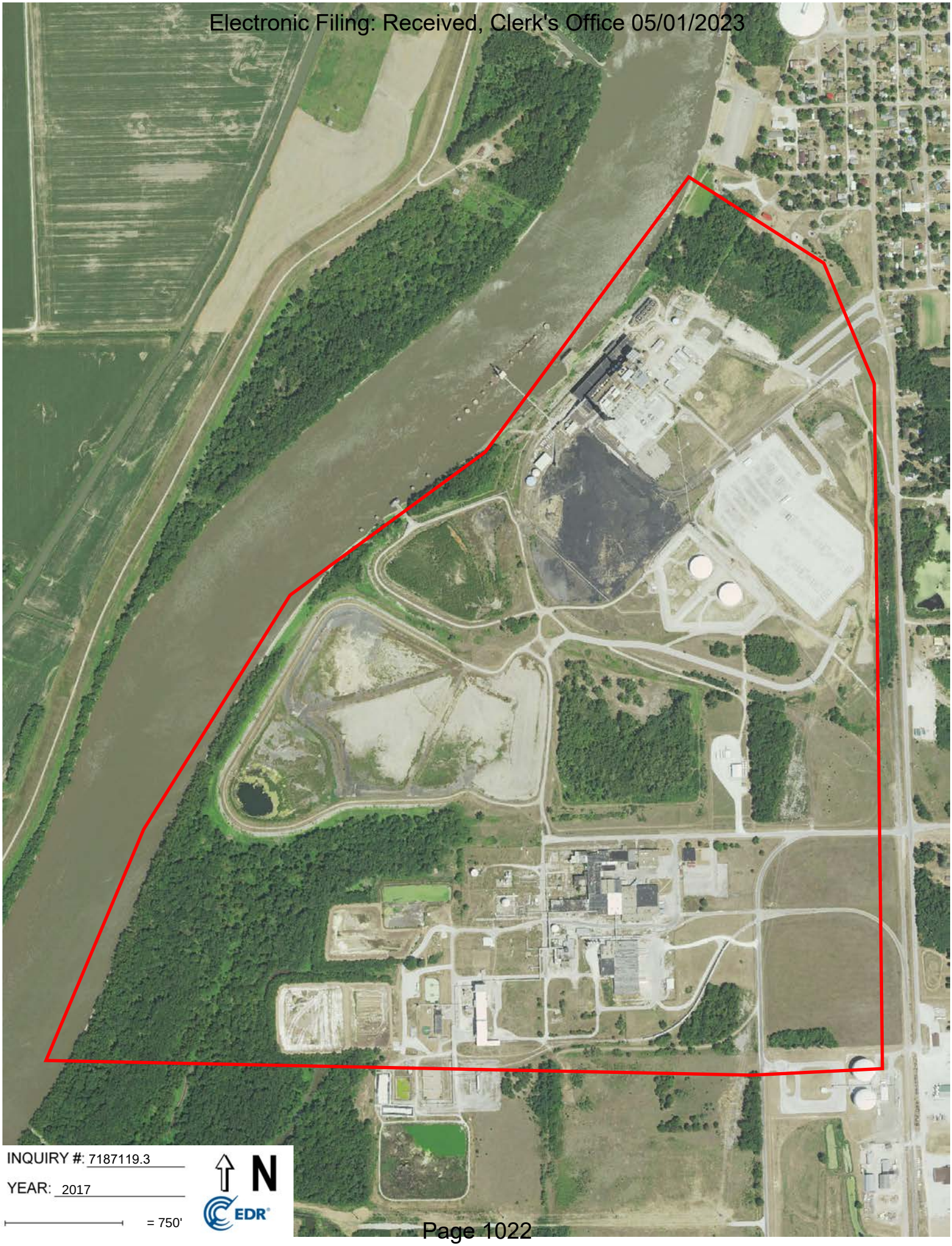
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EDR

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YEAR: 2014

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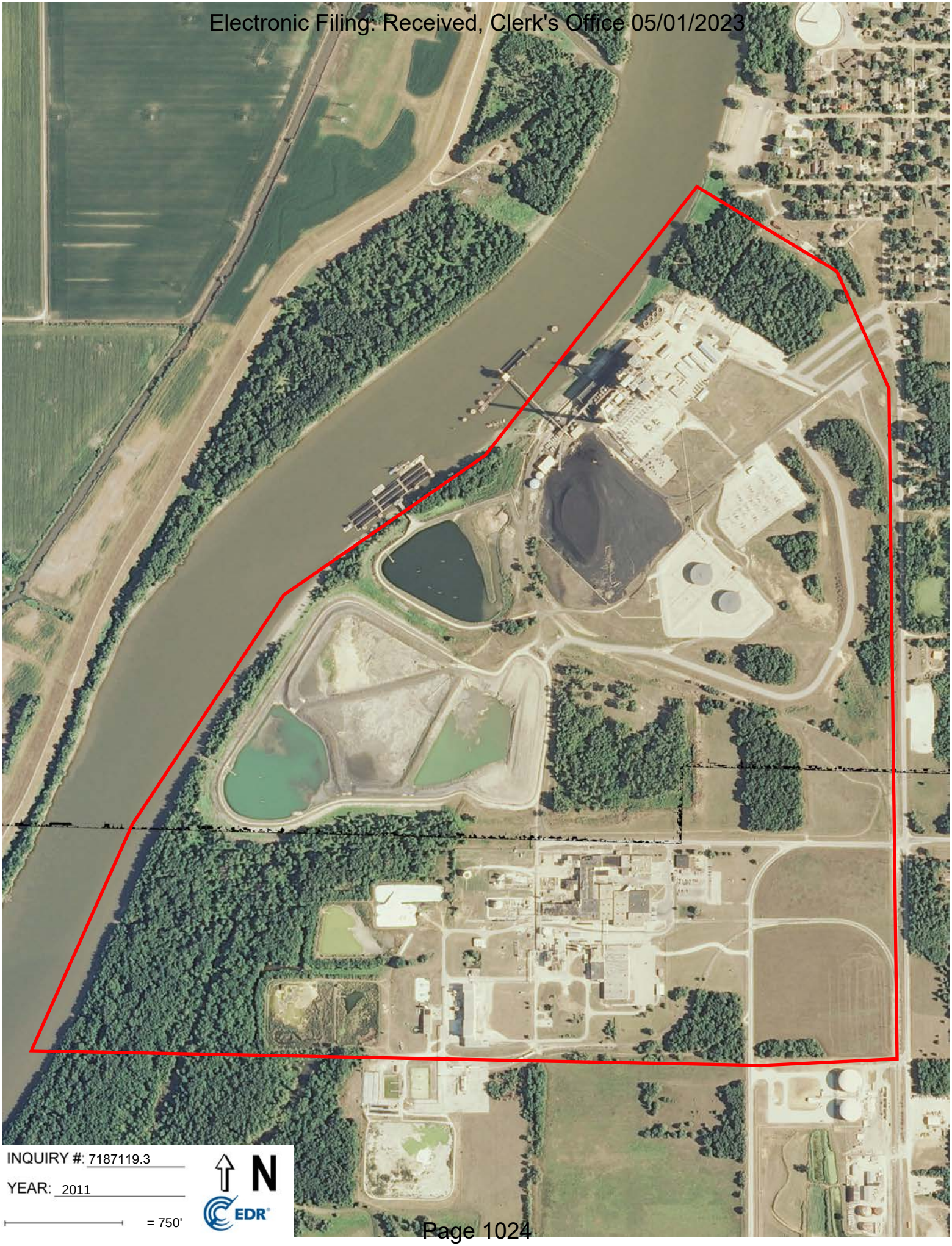
EDR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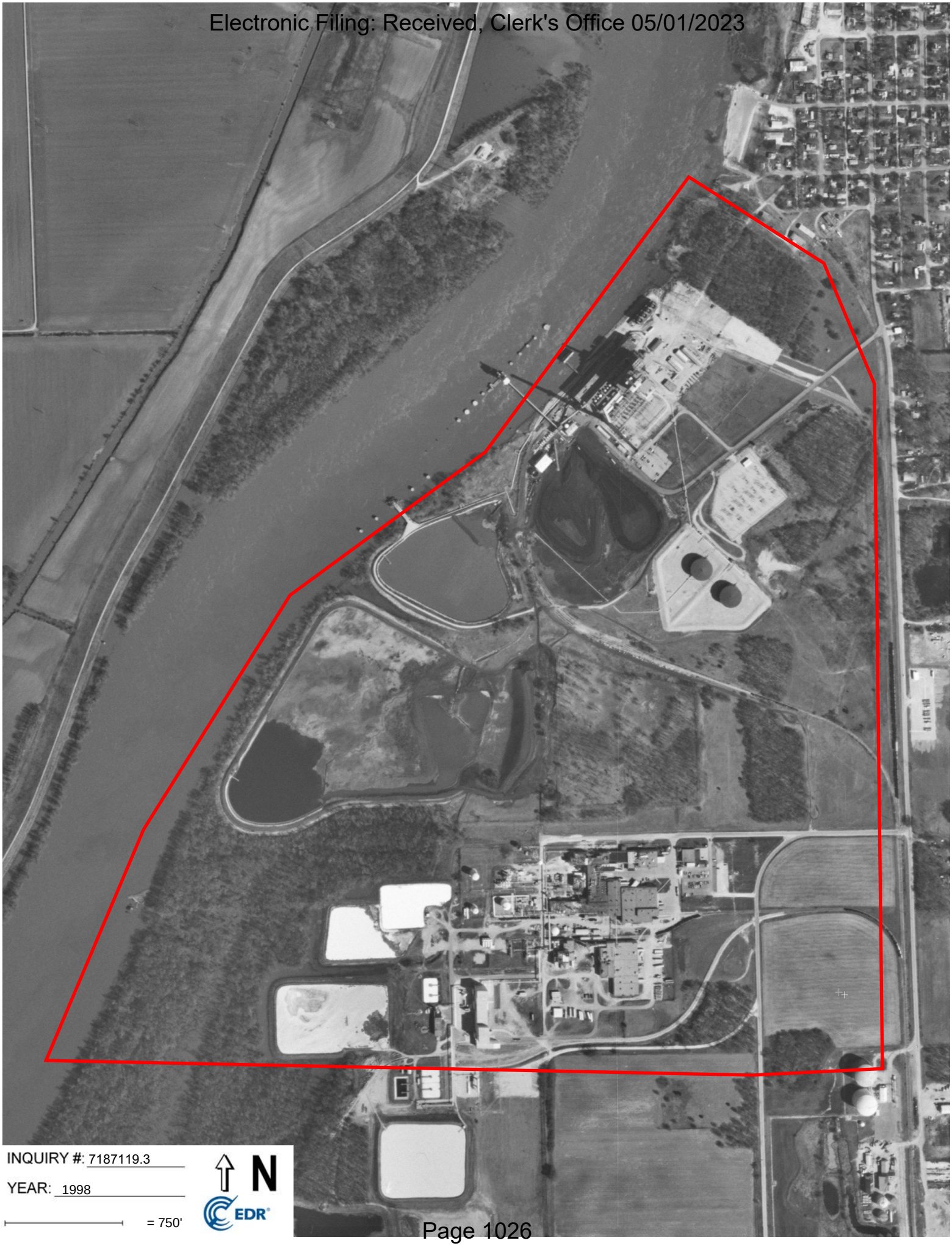
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YEAR: 1995

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EDR

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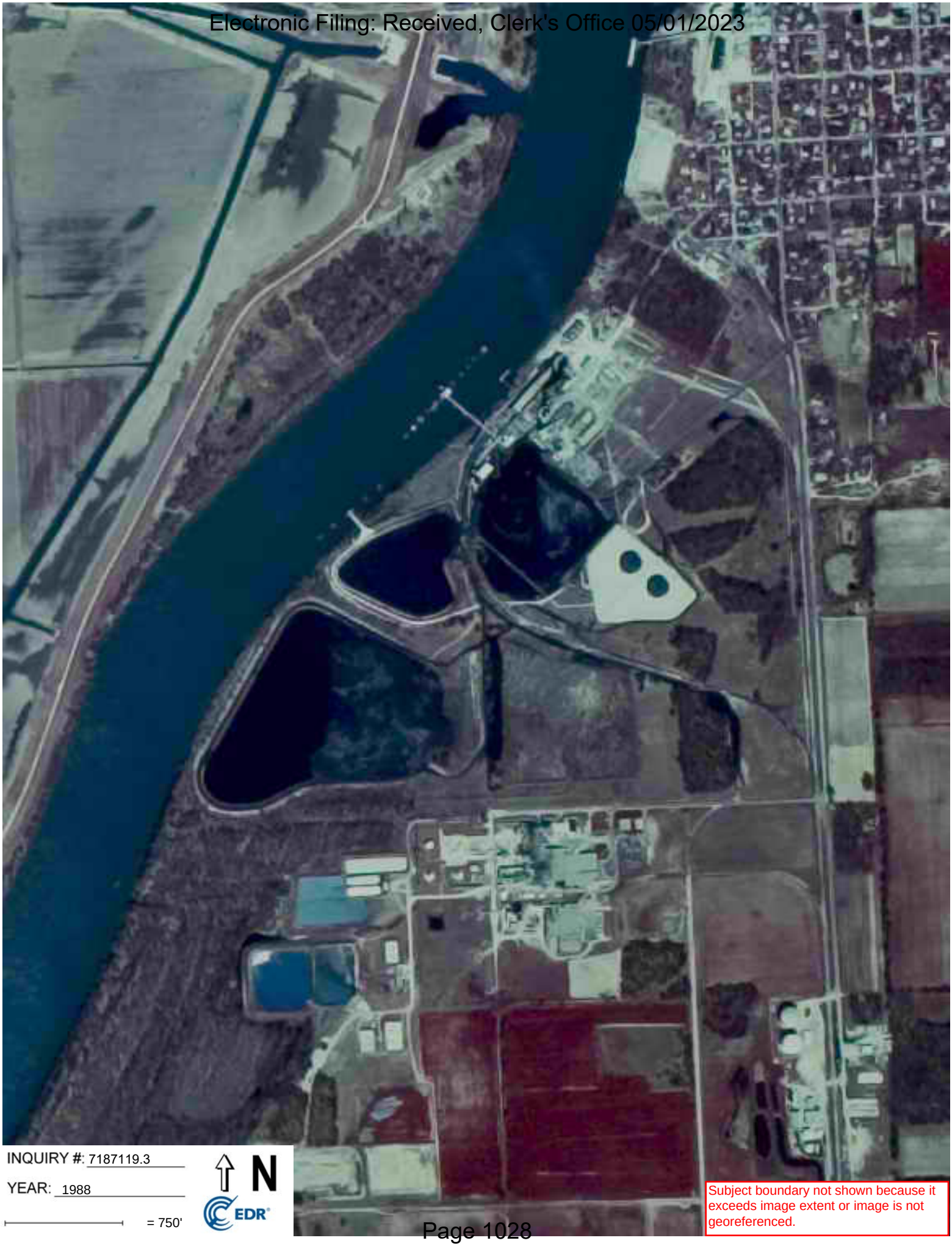

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YEAR: 1988

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EDR

Subject boundary not shown because it exceeds image extent or image is not georeferenced.

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YEAR: 1986

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N

EDR

Subject boundary not shown because it exceeds image extent or image is not georeferenced.

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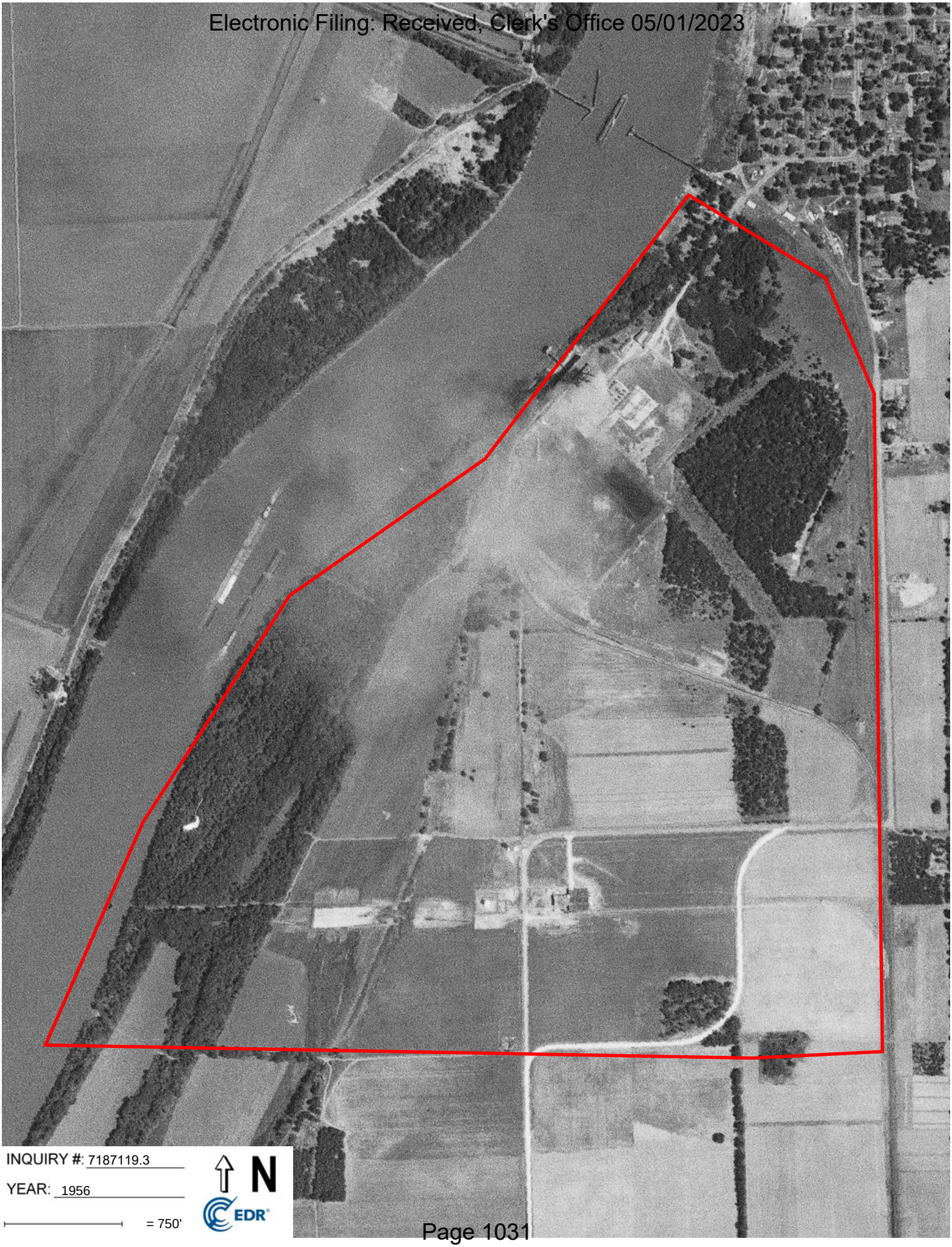
EDR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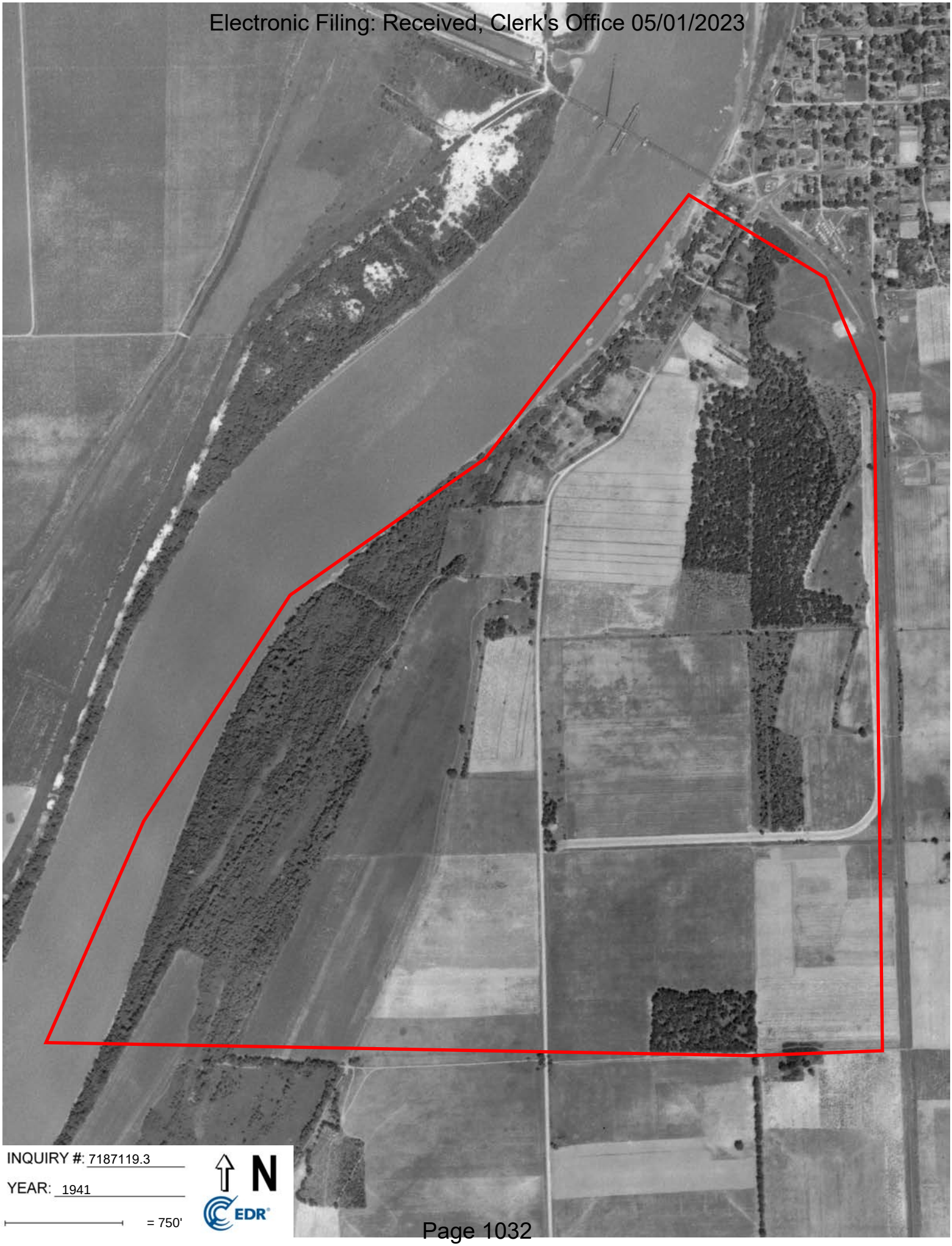
EDR


INQUIRY #: 7187119.3
YEAR: 1941
= 750'
N
EDR

REPORT ON

OLD MEREDOSIA RISK EVALUATION
MEREDOSIA, ILLINOIS

by
Haley & Aldrich, Inc.
Boston, Massachusetts

for
Brown, Hay & Stephens, LLP
Springfield, Illinois

File No. 0206891-000-02
April 2023

SIGNATURE PAGE FOR

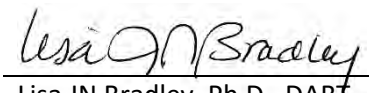
REPORT ON

OLD MEREDOSIA RISK EVALUATION
MEREDOSIA, ILLINOIS

PREPARED FOR

BROWN, HAY & STEPHENS, LLP
SPRINGFIELD, ILLINOIS

PREPARED BY:



Lisa JN Bradley, Ph.D., DABT
Principal Toxicologist
Haley & Aldrich, Inc.

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List of Abbreviations

Abbreviation	Definition
CCR	Coal Combustion Residuals
CSM	Conceptual Site Model
DAF	Dilution and Attenuation Factor
GMZ	Groundwater Management Zone
IDNR	Illinois Department of Natural Resources
IEPA	Illinois Environmental Protection Agency
RCRA	Resource Conservation and Recovery Act
SW-DAF	Surface Water Dilution and Attenuation Factor
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey

1. Introduction

Haley and Aldrich, Inc. (Haley & Aldrich) has been engaged to consult with Ameren Corporation, Ameren Legal, and its outside counsel, Brown, Hayes & Stephens, LLP to evaluate the potential risk the Meredosia Old Ash Pond (Old Meredosia) may pose to human health and the environment. This report is a component of the Petition for Adjusted Standard for Old Meredosia, Illinois Pollution Control Board Docket AS 2021-008. This report provides the approach and methods used, and the results of the evaluation.

Based on the information I have reviewed, and the evaluation I have conducted, it is my opinion is that Old Meredosia in its current setting does not pose a risk to human health or the environment.

1.1 LOCATION

Old Meredosia is located at the inactive Meredosia Power Station, 800 S. Washington Street, along the east bank of the Illinois River, just south of the Village of Meredosia. Old Meredosia is a closed coal ash impoundment constructed to support the Meredosia Power Station to manage coal combustion residuals (CCR) through the early 1970s. Old Meredosia is situated south of the former power block and facility infrastructure and is separated from the Illinois River to the west by the Bottom Ash and Fly Ash Ponds (**Figure 1**).

Old Meredosia was operated to manage the plant's CCR through 1971, at which time it was closed-in-place using native materials from the Illinois River.[1] Upon closure, native vegetation was established and allowed to mature naturally over the closed cover area for the past approximately 50 years.

The Meredosia Power Station was decommissioned in 2011. The former Fly Ash Pond and Bottom Ash Pond were closed pursuant to the Closure Plan dated August 15, 2016 (Geotechnology, 2016a).

1.2 SETTING

The Old Meredosia footprint is trapezoidal in shape with an approximate plan area of 17 acres. It is presently covered by a soil cap, mature vegetative growth, and a complementary wildlife habitat.

According to an ecological review performed by WSP USA Environment and Infrastructure, Inc. (WSP, 2023) titled "Old Meredosia Ash Pond – Ecological Review," the vegetation and tree growth established on the footprint of Old Meredosia includes "10.2 acres of deciduous forest, 2.3 acres of shrub-scrub, 3.5 acres of undeveloped herbaceous/grassland cover, and 1.3 acres of developed, low intensity land." This well-established and mature vegetative growth provides moderate wildlife support for a range of flora and fauna including common wildlife and more notable high-profile residents, e.g., nesting bald eagles and the Illinois chorus frog, which is a state imperiled species. According to the WSP Report, the deciduous forest may also provide suitable roosting and foraging habitat for various species of bats.

[1] Old Meredosia ceased operation and closed prior to the effective dates of both the Resource Conservation and Recovery Act (RCRA), October 21, 1976 [https://www.epa.gov/rcra/history-resource-conservation-and-recovery-act-rcra], the federal CCR Rule, October 19, 2015, and the Illinois Coal Combustion Residual Act, July 30, 2019.

1.3 GROUNDWATER MANAGEMENT ZONE

A Groundwater Management Zone (GMZ) plan for the now closed Bottom Ash and Fly Ash Ponds was submitted to the Illinois Environmental Protection Agency (IEPA) on December 22, 2016 (Geotechnology, 2016b), and approved by the agency in a letter dated March 30, 2017 (IEPA, 2017). The GMZ is shown on **Figure 2**.

The GMZ encompasses Old Meredosia, which is the area to the east of the "Exception" area, as shown on **Figure 2**. As noted in Geotechnology, 2016b, "the vertical component of the proposed GMZ will extend to 60 feet below the ground surface within the horizontal boundaries of the GMZ."

1.4 DEPTH TO GROUNDWATER

As summarized by the Engineering Evaluation for Old Meredosia (Haley & Aldrich, 2023), there is an approximately 14 to 22-foot separation between the bottom of the coal ash in Old Meredosia and the top of the water table. Even during an extreme flood event on June 4, 2019, the highest measured groundwater levels in the vicinity of Old Meredosia were recorded on June 4, 2019, and a minimum 2.9-foot separation existed between the base of the unit and this maximum measured seasonal high-water table. Therefore, the seasonally high groundwater table is not expected to rise to the point where it would intersect the CCR in Old Meredosia.

1.5 GROUNDWATER MONITORING

The latest groundwater monitoring results for the Meredosia Power Station are presented in an annual report for 2021 (Ramboll, 2022). As indicated in that report, the current groundwater monitoring network is comprised of 14 monitoring wells shown on **Figure 3**, including five installed in October 2010 (APW-1 through APW-5), four installed in October 2015 (APW-6 through APW-9), three installed in August 2018 (APW-10 through APW-12) and two installed in July 2021 (APW-13 and APW-14).

Two temporary monitoring wells, shown on **Figure 4**, were installed within the footprint of Old Meredosia in September 2022 (TMW-B and TMW-C) (Geotechnology, 2023).

As noted in Ramboll (2022), groundwater flow direction is generally from the east to the west/ northwest, towards the Illinois River.

The evaluation of the groundwater data is discussed in Section 2.1.

1.6 PUBLIC AND PRIVATE WATER SUPPLY WELLS

A review of the location of water supply wells within a one-mile radius of Old Meredosia and the Meredosia Power Station was conducted by Geotechnology (2016c). **Figure 6** shows the results of the survey.

The survey indicated that 20 private water supply wells are located within the one-mile radius of the station; five of these are located on the west side of the Illinois River. The wells closest to the station are approximately 340 feet to the south and southeast of Old Meredosia (i.e., upgradient of Old Meredosia).

1.7 EVALUATION APPROACH

The analysis presented in this report was conducted by evaluating the environmental setting of Old Meredosia. Information on where groundwater is located in relation to Old Meredosia, the direction(s) of groundwater flow, and where waterbodies may intercept groundwater flow was considered.

A conceptual site model was developed based on this physical setting information, and the model was used to identify what human populations could contact ash at Old Meredosia, and groundwater and/or surface water in the area of the facility. This information was also used to identify where ecological populations could come into contact with surface water. Groundwater and surface water data are evaluated on a human health risk basis and an ecological risk basis.

Constituent concentrations in groundwater are compared to risk-based screening levels for potential exposure by human and ecological receptors, using a site-specific dilution and attenuation factor (DAF) that assumes groundwater movement into the Illinois River.

1.8 REPORT ORGANIZATION

This report is organized as follows:

- Section 2 presents the environmental data evaluated in this report;
- Section 3 presents the conceptual site model;
- Section 4 presents the risk-based screening levels used in the data evaluation;
- Section 5 presents the risk-based screening results; and
- Section 6 provides the summary and conclusions.

2. Environmental Data

Two sources of environmental data were used for this evaluation. Analytical data are available for groundwater collected from monitoring wells installed as part of the closure of the Fly Ash and Bottom Ash Ponds, as well as from additional wells installed at the request of IEPA. Surface water data for the Illinois River were obtained from the U.S. Geological Survey (USGS) on-line databases.

2.1 GROUNDWATER

Groundwater data from 2017 to 2022 were used for this evaluation. Based on the location of Old Meredosia, the location of the monitoring wells shown on **Figure 3**, and the direction of groundwater flow, the following wells are considered appropriate for the evaluation of groundwater for Old Meredosia:

Upgradient Wells:

- APW-1 and APW-5

Immediately Downgradient Wells:

- APW-13 and APW-14

Downgradient Wells:

- APW-10, APW-8, and APW-6

In addition to these wells, a grab sample of groundwater was collected from each of two borings placed within the area of Old Meredosia (September 14, 2022; Geotechnology, 2023) (see **Figure 4**):

- TMW-B and TMW-C

Table 1 shows the summary of groundwater sampling events, and therefore, data available for these wells.

Appendix A provides the analytical data.

2.2 SURFACE WATER

Surface water data for the Illinois River was obtained from USGS sources. **Figure 5** shows the location of the Meredosia Power Station, the nearest upstream gauging station with available analytical data (USGS-05570520 – 46 miles upstream), the nearest downstream gauging station with available analytical data (USGS-05586100 – 10 miles downstream), and the confluence of the Illinois River with the Mississippi River (68 miles downstream).

Records indicate that there are no public water supplies that use the Illinois River as a source of drinking water downstream of the Meredosia Power Station between the station and the Mississippi River.

3. Conceptual Site Model

Human health and ecological conceptual site models (CSMs) are developed to guide identification of potential exposure pathways and potential receptors for risk evaluation. The CSM describes the sources and potential migration pathways through which soil, surface water, sediment, and groundwater may transport CCR-derived constituents to other environmental media (receiving media) and, in turn, to potential human and ecological receptors. The linkage between a source, the receiving medium, and potential exposure is called an exposure pathway. For an exposure pathway to be complete, the following conditions must exist, as defined by the U.S. Environmental Protection Agency (USEPA) (USEPA, 1989):

1. A source and mechanism of constituent release to the environment;
2. An environmental transport medium (e.g., air, water, soil);
3. A point of potential contact with the receiving medium by a receptor; and
4. A receptor exposure route at the contact point (e.g., inhalation, ingestion, dermal contact).

The CSM has been developed based on the knowledge of the site setting, as discussed in the Introduction, and past environmental investigations, referenced herein.

3.1 LAND USE

Old Meredosia is located within a former industrial facility, the Meredosia Power Station. It is located within a GMZ. Groundwater within the GMZ is not designated for drinking water purposes, and the groundwater on the facility is not used for drinking water (Geotechnology, 2016c). The Illinois River is adjacent to other closed CCR units at the facility; it is not used as a source of drinking water downstream of the facility, but could be used for recreational purposes (swimming, boating, fishing).

IEPA and the Illinois Department of Natural Resources (IDNR) say this about the Illinois River:[2]

> "This river is divided into navigation reaches by a series of locks and dams. The river banks contain many lakes and backwaters. Natural sedimentation processes have been altered and accelerated by human activities such as agriculture, levee building and urbanization. Sediments amounting to 13.8 million tons are delivered to the Illinois River annually. The average annual outflow of sediment from the Illinois River at Valley City is 5.6 million tons. On average, 8.2 million tons of sediment are delivered from streams and deposited in the Illinois River valley."

The Illinois River, like all rivers in Illinois, has a fish advisory based on PCBs and methyl mercury.[3] The Illinois River is also on the state list of impaired waters per the requirements of Section 303(d) of the federal Clean Water Act and the Water Quality Planning and Management regulation at 40 CFR Part 130,[4] for fish consumption for mercury, PCBs, and several pesticides/herbicides.

[2] https://dnr.illinois.gov/content/dam/soi/en/web/dnr/education/documents/aquaticillinoisrivlakefactshts.pdf
[3] https://dph.illinois.gov/topics-services/environmental-health-protection/toxicology/fish-advisories/map.html; and https://dph.illinois.gov/topics-services/environmental-health-protection/toxicology/fish-advisories/map/advisory.html?bodyofwater=41
[4] https://www2.illinois.gov/epa/topics/water-quality/watershed-management/tmdls/Pages/303d-list.aspx; Appendix C-2.

3.2 POTENTIAL SOURCES

The CCR within Old Meredosia is a potential source of CCR-derived constituents to groundwater in the immediate vicinity, and potentially to the Illinois River.

3.3 MIGRATION PATHWAYS AND RECEIVING MEDIA

Primary release mechanisms refer to how CCR-derived constituents may be transported from the original sources, while secondary sources are environmental media that receive direct or indirect constituent inputs from the primary source via transport and fate mechanisms.

CCR-derived constituents could potentially migrate from Old Meredosia to underlying soil and from there to groundwater, and then to surface water. Principal migration pathways could include: 1) the potential infiltration and percolation of rainwater through Old Meredosia that might, in turn, result in leaching of CCR-derived constituents into the underlying soil and subsequently to the groundwater; and 2) potential advective transport of constituents in the groundwater and potential subsequent inflow of groundwater to surface water of the Illinois River. CCR-derived constituents present in surface water could be available for exposure by human recreators in the river and by aquatic flora and fauna.

3.4 POTENTIAL RECEPTORS AND EXPOSURE PATHWAYS

The Meredosia Power Station is a closed facility. Old Meredosia is a closed unit that has been covered by materials from the Illinois River, thus the CCR within Old Meredosia is not available for direct contact by an on-site worker, nor is it available to generate wind blow dust. The only way for CCR to become available for direct contact is if the soil cover is removed or if excavation were to occur within the footprint of Old Meredosia and the CCR then placed on the land surface. There are no on-going excavation activities at Old Meredosia, and none are planned. Therefore, there are no complete direct pathways for contact with CCR by workers that may be at the site.

CCR constituents may be present in groundwater, as described above, however, groundwater at the site is not used as a source of drinking water, and the location of Old Meredosia within the GMZ for the facility precludes the use of groundwater as drinking water. The private well survey described in Section 1.6 above indicated that potential drinking water wells are located upgradient of Old Meredosia and of the facility. Thus, this potential exposure pathway is incomplete.

CCR-derived constituents could move from groundwater to the Illinois River. Human recreators in the river (boaters, swimmers, anglers) could contact CCR-derived constituents, thus, these are potentially complete exposure pathways.

As noted in Section 2.2 above, the Illinois River does not serve as a source of drinking water downstream of the Meredosia Power Station, so the use of surface water as drinking water is an incomplete exposure pathway.

Ecological receptors do not come into contact with groundwater. However, aquatic life in the Illinois River could come into contact with CCR-derived constituents that may originate from Old Meredosia, therefore, exposure pathways via surface water for these receptors are potentially complete.

3.5 PRELIMINARY CONCEPTUAL SITE MODEL

Figure 7 shows the preliminary CSM for Old Meredosia. As indicated, potentially complete exposure pathways for CCR-derived constituents are for human incidental ingestion and dermal contact with surface water during recreational activities, and consumption of fish/organisms from the river. Aquatic receptors could contact CCR-derived constituents in surface water by ingestion and direct contact. Therefore, these pathways are evaluated quantitatively in this report.

4. Risk-Based Screening Levels

The CSM was used to guide the identification and selection of risk-based screening levels. The relevant media are groundwater, to the extent that it may serve as a source of CCR-derived constituents to surface water, and surface water.

4.1 GENERIC SCREENING LEVELS

Illinois standards and criteria are given priority, and USEPA sources are used when Illinois values are not available.

Risk-based screening levels for groundwater and surface water are shown in **Table 2**. The groundwater screening levels are not appropriate for this evaluation because the use of groundwater as drinking water is not a complete exposure pathway. However, they are presented here for informational purposes. **Appendix B** presents the comparison of the groundwater analytical results to the groundwater screening levels for informational purposes.

Screening levels for surface water include Illinois Derived Aquatic Life Criteria and Human Health Criteria, and National Recommended Water Quality Criteria for Human Health for the Consumption of Organisms, and National Recommended Aquatic Life Criteria. Specific references are provided in **Table 2**. The list of constituents is based on the available groundwater data.

4.2 SITE-SPECIFIC SCREENING LEVELS

As noted in the CSM, there are no direct exposure pathways for groundwater. Analytical data are not available for surface water in the immediate vicinity of the Meredosia Power Station. Therefore, it is of interest to understand what constituent levels in groundwater are protective of potential exposures to CCR-derived constituents in the Illinois River under the assumption that groundwater containing CCR-derived constituents may move to river water.

Therefore, for this evaluation, it is assumed that groundwater can flow to surface water. The purpose of this step of the evaluation is to develop site-specific target screening levels for CCR-derived constituents for groundwater that are protective of potential contact in surface water. The two scenarios that are potentially complete based on the CSM are: human recreational use of the river, and ecological receptor exposure to surface water.

A surface water dilution and attenuation factor (SW-DAF) was derived for groundwater that may flow to the Illinois River. The SW-DAF describes the effect of mixing on constituent concentrations expected for the surface water body potentially receiving the impacted groundwater. The modeling used to develop the SW-DAF is conservative in that the effects of groundwater on surface water quality likely are over-estimated; the conservatively calculated SW-DAF is 20,556 (a unitless value). The SW-DAF derivation is provided in **Appendix C**.

Table 3 presents the derivation of site-specific target groundwater screening levels that are protective of surface water using the application of the SW-DAF. This was conducted in using a step-wise process.

First, the lowest of the surface water screening levels, for both human and aquatic receptors is identified. The Target Surface Water Screening Level is identified using the following hierarchy:

1. The lower of the acute and chronic Illinois Derived Aquatic Life Criteria, and the threshold and non-threshold Illinois Derived Human Health Criteria is selected; if no value is available,
2. The lower of the acute and chronic National Recommended Aquatic Life Criteria is selected; if no value is available,
3. The National Recommended Water Quality Criteria - Human Health for the Consumption of Organism Only is selected.

The SW-DAF is then applied to the lowest human health and ecological risk-based screening level for surface water to develop the target groundwater concentrations protective of people who use the Illinois River for recreational purposes, and for ecological receptors that live in or use the Illinois River.

Target Groundwater Screening Level = Target Surface Water Screening Level x SW-DAF

The target groundwater concentrations are shown in the last column of **Table 3**.

Note that the lowest human health and ecological risk-based screening level for surface water, as identified above, is also used to evaluate the available surface water data for the Illinois River obtained from the USGS (see Section 2.2).

5. Risk-Based Screening Results

This section presents the analytical data and screening results for groundwater and Illinois River surface water.

5.1 GROUNDWATER

The analytical data for the seven monitoring wells and two groundwater grab samples are presented in **Appendix A**. Data are available quarterly between 2017 and 2022 (as shown on **Table 1**). To streamline the screening process, the maximum detected concentration of each constituent in each well was identified and is shown on **Table 4**. These concentrations are compared to the "Target Groundwater Screening Level Protective of Surface Water" in the Illinois River, shown in the second column of **Table 4** (as derived in **Table 3**). As shown, all of the maximum detected groundwater concentrations are below the "Target Groundwater Screening Level Protective of Surface Water" in the Illinois River.

The results of this groundwater evaluation indicate that there are no adverse impacts to people who may use the Illinois River for recreational purposes, or for aquatic receptors that live in or use the Illinois River, from constituents present in groundwater at Old Meredosia.

5.2 SURFACE WATER

The analytical data for inorganic constituents for the Illinois River are presented in **Table 5**. Analytical data for the nearest upstream station were only available for the time period 1990 – 1997. Data from the nearest downstream station were also available for this time frame. Both sets of data are shown in **Table 5**. Additional data are available for the downstream station for the time period 1998 – 2018; these are presented on **Table 6**, though there are fewer constituents for which there are analytical data in this time period.

The data in both tables are compared to the lowest human health and ecological risk-based screening level for surface water identified in **Table 3**.

As shown on **Table 5**, constituent concentrations in the river are similar upstream and downstream. Where constituent concentrations are above the screening level at the downstream location, they are also above at the upstream station (note that there are no upstream data for cadmium or lead to compare with the downstream data).

The more recent downstream data are shown on **Table 6**. All results are below the surface water screening levels.

These results, while limited in time and location, indicate that the facility does not have a demonstrated impact on the Illinois River.

6. Summary and Conclusions

Old Meredosia ceased operation and closed prior to the effective dates of both the Resource Conservation and Recovery Act (RCRA), October 21, 1976, and the CCR Rule, October 19, 2015. Hydrogeologic investigations have demonstrated that the CCR within Old Meredosia is above the water table, even under high water conditions.

In the presence of the GMZ, groundwater is not used as a source of drinking water, and the Illinois River downstream of the facility (for the 63 river miles to the Mississippi River) is not used as a source of drinking water.

The preliminary CSM shown on **Figure 7** identifies that the only potentially complete exposure pathways for CCR-derived constituents from Old Meredosia are to surface water in the Illinois River.

Therefore, site-specific risk-based screening levels were developed for groundwater to be protective of surface water. A site-specific SW-DAF was applied to the lowest of the surface water screening levels for both human recreational and aquatic receptors to develop groundwater screening levels protective of surface water of the Illinois River.

Comparison of the site-specific screening levels to the maximum detected concentration of each constituent in each well indicates that all groundwater maximum concentrations are below the screening levels.

Evaluation of the USGS data for the Illinois River upstream and downstream of the facility indicates no adverse impact on the river.

These results have been used to finalize the CSM, in **Figure 8**, showing that there are no complete or significant exposure pathways to CCR-derived constituents in groundwater or surface water.

Thus, in its current setting Old Meredosia does not pose a risk to human health or the environment.

References

1. Geotechnology. 2016a. Closure Plan – Fly Ash Pond and Bottom Ash Pond, Meredosia Power Station, Meredosia, Illinois. Geotechnology, Inc. August 15, 2016.

2. Geotechnology. 2016b. Groundwater Management Zone Plan – Fly Ash and Bottom Ash Pond, Meredosia Power Station, Meredosia, Illinois. Geotechnology, Inc. December 22, 2016.

3. Geotechnology. 2016c. Hydrogeologic Assessment Report – Fly Ash and Bottom Ash Pond – Meredosia Power Station, Meredosia, IL. Geotechnology, Inc. December 13, 2016.

4. Geotechnology. 2023. Sampling and Testing Report – Old Ash Pond – Meredosia Power Plant.

5. Haley & Aldrich. 2023. Technical Memorandum – Engineering Review/Expert Witness Support, Petition for Adjusted Standard for Old Meredosia, Illinois Pollution Control Board Docket AS 2021-008. Haley & Aldrich, Inc.

6. IEPA. 2017. Letter from WE Buscher, Bureau of Water to K Kersting, Ameren Service. Approval of the Groundwater Management Zone application. Illinois Environmental Protection Agency. March 30, 2017.

7. Illinois State Water Survey. 1988. 7-Day 10-Year Low Flow Maps. Available at: https://www.isws.illinois.edu/watershed-science/surface-water-resources/7-day-10-year-low-flow-maps

8. Ramboll. 2022 Annual Report & 2021 Annual Report - Meredosia Power Station. Ramboll. Available at: https://www.ameren.com/company/environment-and-sustainability/managing-coal-combustion/inactive-basins/meredosia

9. USEPA. 1989. Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part A. EPA/540/1-89/002. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. December. Available at: https://www.epa.gov/sites/production/files/2015-09/documents/rags_a.pdf

10. WSP. 2023. Old Meredosia Ash Pond – Ecological Review. WSP USA Environment and Infrastructure, Inc.

TABLES

TABLE 1
SUMMARY OF GROUNDWATER SAMPLING EVENTS
OLD MEREDOSIA
AMEREN MEREDOSIA POWER STATION, IL

	2017			2018				2019				2020				2021				2022			
Locations	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
APW-1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
APW-5	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
APW-6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
APW-8	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
APW-10						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
APW-13																		X		X	X		
APW-14																		X					
TMW-B																						X	
TMW-C																						X	

Dry/or insufficient water to sample
Not Sampled

TABLE 2
SCREENING LEVELS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

	GROUNDWATER			SURFACE WATER						
	Illinois 620.420 Groundwater Quality Standards		Illinois 845.600 Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments	Illinois Derived Aquatic Life Criteria		Illinois Derived Human Health Criteria		National Recommended Water Quality Criteria - Human Health	National Recommended Aquatic Life Criteria	
Constituent	Class I: Potable Resource Groundwater (a)	Class II: General Resource Groundwater (b)	Groundwater Protection Standards (c)	Acute (d)	Chronic (d)	Human Threshold Criterion (d)	Human Nonthreshold Criteria (d)	Human Health for the Consumption of Organism Only (e)	Acute (g)	Chronic (g)
Inorganic Compounds (mg/L)										
Antimony, Dissolved	0.006	0.024	0.006	1.2	0.32	12	NA	0.64	NA	NA
Arsenic, Dissolved	0.01	0.2	0.01	NA	NA	NA	NA	0.00014	0.34	0.15
Barium, Dissolved	2	2	2	NA	NA	NA	NA	1 (f)	NA	NA
Beryllium, Dissolved	0.004	0.5	0.004	NA	NA	NA	NA	NA	NA	NA
Boron, Dissolved	2	2	2	NA	NA	NA	NA	NA	NA	NA
Cadmium, Dissolved	0.005	0.05	0.005	NA	NA	NA	NA	NA	0.0018 (h)	0.00072 (h)
Chromium, Dissolved	0.1	1	0.1	NA	NA	NA	NA	NA	0.57 (h)	0.074 (h)
Cobalt, Dissolved	1	1	0.006	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	0.65	0.65	NA	NA	NA	NA	NA	1.3 (f)	NA	NA
Iron, Dissolved	5	5	NA	NA	NA	NA	NA	NA	NA	1
Lead, Dissolved	0.0075	0.1	0.0075	NA	NA	NA	NA	NA	0.065 (h)	0.0025 (h)
Manganese, Dissolved	0.15	10	NA	NA	NA	NA	NA	0.1	NA	NA
Mercury, Dissolved	0.002	0.01	0.002	NA	NA	NA	NA	NA	0.0012	0.00065
Nickel, Dissolved	0.1	2	NA	NA	NA	NA	NA	4.6	0.47 (h)	0.052 (h)
Selenium, Dissolved	0.05	0.05	0.05	NA	NA	NA	NA	4.2	NA	NA
Silver, Dissolved	0.05	NA	NA	NA	NA	NA	NA	NA	0.0032 (h)	NA
Thallium, Dissolved	0.002	0.02	0.002	0.086	0.011	0.003	NA	0.00047	NA	NA
Vanadium, Dissolved	0.049	0.1	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	5	10	NA	NA	NA	NA	NA	26	0.12 (h)	0.12 (h)
Antimony, Total	0.006	0.024	0.006	1.2	0.32	12	NA	0.64	NA	NA
Arsenic, Total	0.01	0.2	0.01	NA	NA	NA	NA	0.00014	0.34	0.15
Barium, Total	2	2	2	NA	NA	NA	NA	1 (f)	NA	NA
Beryllium, Total	0.004	0.5	0.004	NA	NA	NA	NA	NA	NA	NA
Boron, Total	2	2	2	NA	NA	NA	NA	NA	NA	NA
Cadmium, Total	0.005	0.05	0.005	NA	NA	NA	NA	NA	0.0019 (h)	0.00079 (h)
Chromium, Total	0.1	1	0.1	NA	NA	NA	NA	NA	1.8 (h)	0.086 (h)
Cobalt, Total	1	1	0.006	NA	NA	NA	NA	NA	NA	NA
Copper, Total	0.65	0.65	NA	NA	NA	NA	NA	1.3 (f)	NA	NA
Iron, Total	5	5	NA	NA	NA	NA	NA	NA	NA	1
Lead, Total	0.0075	0.1	0.0075	NA	NA	NA	NA	NA	0.082 (h)	0.0032 (h)
Manganese, Total	0.15	10	NA	NA	NA	NA	NA	0.1	NA	NA
Mercury, Total	0.002	0.01	0.002	NA	NA	NA	NA	NA	0.0014	0.00077
Nickel, Total	0.1	2	NA	NA	NA	NA	NA	4.6	0.47 (h)	0.052 (h)
Selenium, Total	0.05	0.05	0.05	NA	NA	NA	NA	4.2	NA	NA
Silver, Total	0.05	NA	NA	NA	NA	NA	NA	NA	0.0038 (h)	NA
Thallium, Total	0.002	0.02	0.002	0.086	0.011	0.003	NA	0.00047	NA	NA
Vanadium, Total	0.049	0.1	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Total	5	10	NA	NA	NA	NA	NA	26	0.12 (h)	0.12 (h)

TABLE 2
SCREENING LEVELS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

	GROUNDWATER			SURFACE WATER						
	Illinois 620.420 Groundwater Quality Standards		Illinois 845.600 Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments	Illinois Derived Aquatic Life Criteria		Illinois Derived Human Health Criteria		National Recommended Water Quality Criteria - Human Health	National Recommended Aquatic Life Criteria	
Constituent	Class I: Potable Resource Groundwater (a)	Class II: General Resource Groundwater (b)	Groundwater Protection Standards (c)	Acute (d)	Chronic (d)	Human Threshold Criterion (d)	Human Nonthreshold Criteria (d)	Human Health for the Consumption of Organism Only (e)	Acute (g)	Chronic (g)
Other (mg/L)										
Chloride, Dissolved	200	200	200	NA	NA	NA	NA	NA	860	230
Cyanide, Dissolved	0.2	0.6	NA	NA	NA	NA	NA	0.4	0.022	0.0052
Fluoride, Dissolved	4	4	4	NA	NA	NA	NA	NA	NA	NA
Nitrate (as N), Dissolved	10	100	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite (as N), Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate, Dissolved	400	400	400	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids (TDS)	1200	1200	1200	NA	NA	NA	NA	NA	NA	NA
Chloride	200	200	200	NA	NA	NA	NA	NA	860	230
Cyanide	0.2	0.6	NA	NA	NA	NA	NA	0.4	0.022	0.0052
Fluoride	4	4	4	NA	NA	NA	NA	NA	NA	NA
Nitrate (as N)	10	100	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite (as N)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	400	400	400	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids (TDS)	1200	1200	1200	NA	NA	NA	NA	NA	NA	NA

Notes:

mg/L - milligram per liter.
NA - Not Available.

(a) Illinois Administrative Code. October 2012. Title 35: Environmental Protection. Subtitle F: Public Water Supplies. Chapter I: Pollution Control Board. Part 620: Groundwater Quality. Subpart D: Groundwater Quality Standards. Section 620.410 Groundwater Quality Standards for Class I: Potable Resource Groundwater.
The Class I Groundwater Standards are not applicable within the Groundwater Management Zone; however are provided here for informational purposes.
https://pcb.illinois.gov/documents/dsweb/Get/Document-33425/

(b) Illinois Administrative Code. October 2013. Title 35: Environmental Protection. Subtitle F: Public Water Supplies. Chapter I: Pollution Control Board. Part 620: Groundwater Quality. Subpart D: Groundwater Quality Standards. Section 620.420 Groundwater Quality Standards for Class II: General Resource Groundwater.
The Class II Groundwater Standards are not applicable within the Groundwater Management Zone; however are provided here for informational purposes.
https://pcb.illinois.gov/documents/dsweb/Get/Document-33425/

(c) Illinois Administrative Code. April 2021. Title 35: Environmental Protection. Subtitle G: Waste Disposal. Chapter I: Pollution Control Board. Part 845: Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments. Subpart A: General Provisions.
The Part 845.600 Standards are not applicable to Old Meredosia; however are provided here for informational purposes.
https://pcb.illinois.gov/documents/dsweb/Get/Document-103997/

(d) Illinois Environmental Protection Agency. November 2019. Derived Water Quality Criteria List.
https://www2.illinois.gov/epa/topics/water-quality/standards/Documents/MasterDWQC_Nov19.pdf

(e) United States Environmental Protection Agency. September 2022. National Recommended Water Quality Criteria - Human Health Criteria Table.
https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table
Values are based on the Human Health for the Consumption of Organisms Only because the Illinois River is not used as a source of drinking water downstream of the facility (see text).

(f) Barium and Copper values are based on Human Health for the Consumption of Water + Organism as no value is available for Consumption of Organism Only.

(g) United States Environmental Protection Agency. September 2022. National Recommended Water Quality Criteria - Aquatic Life Criteria Table.
https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table

(h) Hardness-specific criteria based on a default dissolved hardness of 100 mg/L.

TABLE 3
DERIVATION OF TARGET GROUNDWATER SCREENING LEVELS PROTECTIVE OF SURFACE WATER
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

					Dilution Attenuation Factor - Illinois River (a)			**20,556**	
	SURFACE WATER								**GROUNDWATER**
	Illinois Derived Aquatic Life Criteria		**Illinois Derived Human Health Criteria**		**National Recommended Water Quality Criteria - Human Health**	**National Recommended Aquatic Life Criteria**		**Target Surface Water Screening Level - River (g)**	**Target Groundwater Screening Level Protective of Surface Water - River (h)**
Constituent	**Acute (b)**	**Chronic (b)**	**Human Threshold Criterion (b)**	**Human Nonthreshold Criteria (b)**	**Human Health for the Consumption of Organism Only (c)**	**Acute (e)**	**Chronic (e)**		
Other (mg/L)									
Chloride, Dissolved	NA	NA	NA	NA	NA	860	230	230	4,727,880
Cyanide, Dissolved	NA	NA	NA	NA	0.4	0.022	0.0052	0.0052	107
Fluoride, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate (as N), Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite (as N), Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate, Dissolved	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids (TDS)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	NA	NA	NA	NA	NA	860	230	230	4,727,880
Cyanide	NA	NA	NA	NA	0.4	0.022	0.0052	0.0052	107
Fluoride	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate (as N)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite (as N)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Dissolved Solids (TDS)	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

mg/L - milligram per liter.
NA - Not Available.

(a) Estimated value, see text for derivation.
(b) Illinois Environmental Protection Agency. November 2019. Derived Water Quality Criteria List.
https://www2.illinois.gov/epa/topics/water-quality/standards/Documents/MasterDWQC_Nov19.pdf
(c) United States Environmental Protection Agency. September 2022. National Recommended Water Quality Criteria - Human Health Criteria Table.
https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table
Values are based on the Human Health for the Consumption of Organisms Only because the Illinois River is not used as a source of drinking water downstream of the facility (see text).
(d) Barium and Copper values are based on Human Health for the Consumption of Water + Organism as no value is available for Consumption of Organism Only.
(e) United States Environmental Protection Agency. September 2022. National Recommended Water Quality Criteria - Aquatic Life Criteria Table.
https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table
(f) Hardness-specific criteria based on a default dissolved hardness of 100 mg/L.
(g) The Target Surface Water Screening Level is obtained using the following hierarchy:
1) Lower of the acute and chronic Illinois Derived Aquatic Life Criteria and the threshold and non-threshold Illinois derived Human Health Criteria; if no value available,
2) Lower of the acute and chronic National Recommended Aquatic Life Criteria; if no value available,
3) National Recommended Water Quality Criteria - Human health for the Consumption of Organism only.
(h) The Target Groundwater Screening Level = Target Surface Water Screening Level x Dilution Attenuation Factor.

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TABLE 4
MAXIMUM DETECTED CONCENTRATION (a) AT WELLS COMPARED WITH TARGET GROUNDWATER SCREENING LEVELS PROTECTIVE OF SURFACE WATER
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Target Groundwater Screening Level Protective of Surface Water - River (b)	Old Meredosia Maximum Detected Concentration		Upgradient Maximum Detected Concentration		Immediately Downgradient Maximum Detected Concentration		Downgradient Maximum Detected Concentration		
Location Name		TMW-B	TMW-C	APW-1	APW-5	APW-13	APW-14	APW-10	APW-8	APW-6
Sample Name		TMW-B-20220914	TMW-C-20220914							
Sample Date		09/14/2022	09/14/2022							
Inorganic Compounds (mg/L)										
Antimony, Dissolved	8000	0.05 U	0.05 U	**0.0005 J**	**0.0009 J**	**0.0003**	0.0002 U	**0.001**	**0.001 J**	**0.0007 J**
Arsenic, Dissolved	3750	0.025 U	0.025 U	**0.0003 J**	**0.0005 J**	**0.0005 J**	**0.0001 J**	**0.0019**	**0.0016**	**0.0007 J**
Barium, Dissolved	25000	**0.0314**	**0.0163**	**0.0232**	**0.0108**	**0.056**	**0.0444**	**0.0231**	**0.0754**	**0.0198**
Beryllium, Dissolved	NA	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0017	**0.0004 J**
Boron, Dissolved	NA	**7.45**	**2.83**	**0.108**	**0.116**	**7.13**	**3.28**	**2.3**	**8.88**	**1.81**
Cadmium, Dissolved	18	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Dissolved	1853	0.0123	0.005 U	0.005 U	0.005 U	**0.0083**	0.005 U	**0.004 J**	**0.0256**	0.005 U
Cobalt, Dissolved	NA	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Copper, Dissolved	32500	0.005 U	0.005 U	**0.0068**	0.005 U	0.005 U	0.005 U	**0.0018 J**	0.005 U	0.005 U
Iron, Dissolved	25000	0.04 U	0.04 U	**0.023 J**	0.02 U	0.04 U	0.04 U	**0.535**	0.02 U	**0.038 J**
Lead, Dissolved	63	0.015 U	0.015 U	0.001 U	**0.0017**	0.001 U	0.0002 U	**0.0009 J**	0.001 U	0.001 U
Manganese, Dissolved	2500	**0.0066 J**	**0.0054 J**	**0.0014 J**	**0.0044 J**	**0.0177**	**0.0084**	**0.0452**	0.003 U	**0.0224**
Mercury, Dissolved	16	0.0002 U	0.0002 U	**0.00008 J**	0.0002 U	0.0002 U	0.0002 U	**0.00009 J**	**0.0001 J**	**0.00008 J**
Nickel, Dissolved	1300	0.005 U	0.005 U	**0.0035 J**	0.005 U	**0.0051**	0.005 U	0.005 U	0.005 U	0.005 U
Selenium, Dissolved	105000	**0.105**	**0.025 J**	0.04 U	0.04 U	**0.0873**	**0.034 J**	**0.018 J**	**0.0963**	**0.024 J**
Silver, Dissolved	80	0.007 U	0.007 U	0.005 U	0.005 U	0.007 U	0.007 U	0.007 U	0.005 U	0.005 U
Thallium, Dissolved	75	0.05 U	0.05 U	0.001 U	0.001 U	0.002 U	0.0004 U	**0.0013 J**	0.001 U	0.001 U
Vanadium, Dissolved	NA	**0.0023 J**	**0.0027 J**	**0.0014 J**	**0.0018 J**	**0.0013 J**	0.01 U	**0.003 J**	**0.0032 J**	**0.0021 J**
Zinc, Dissolved	2930	0.01 U	0.01 U	**0.0162**	0.01 U	0.01 U	0.01 U	**0.0066 J**	**0.0076 J**	0.01 U
Antimony, Total	8000	**0.01 J**	0.05 U	**0.0009 J**	**0.0012**	0.001 U	**0.0006 J**	**0.0018**	**0.0057**	**0.0009 J**
Arsenic, Total	3750	0.025 U	0.025 U	**0.0089**	**0.0039**	**0.0017**	**0.0079**	**0.0364**	**0.0301**	**0.0027**
Barium, Total	25000	**0.0406**	**0.0313**	**0.065**	**0.0304**	**0.072**	**0.092**	**0.143**	**0.185**	**0.027**
Beryllium, Total	NA	0.0005 U	0.0005 U	**0.0006**	0.0005 U	0.0005 U	**0.0003 J**	**0.0013**	**0.0019**	**0.0006**
Boron, Total	NA	**8.49**	**3.13**	**0.126**	**0.154**	**7.98**	**3.8**	**2.39**	**9.4**	**1.91**
Cadmium, Total	20	0.002 U	0.002 U	**0.0005 J**	**0.0005 J**	0.002 U	0.002 U	**0.0012 J**	**0.001 J**	0.002 U
Chromium, Total	2154	**0.0158**	**0.0029 J**	**0.0111**	**0.0061**	**0.0143**	**0.0131**	**0.0431**	**0.0438**	**0.0049 J**
Cobalt, Total	NA	0.005 U	**0.003 J**	**0.0352**	**0.0265**	**0.0028 J**	**0.0277**	**0.111**	**0.0771**	**0.0077**
Copper, Total	32500	0.005 U	**0.003 J**	**0.0226**	**0.013**	**0.0024 J**	**0.0273**	**0.0913**	**0.0815**	**0.0086**
Iron, Total	25000	**0.146**	**1.04**	**17.4**	**5.8 S**	**2.57**	**12.6**	**44.5**	**41.7**	**3.82**
Lead, Total	80	0.015 U	0.015 U	**0.0179**	**0.0078**	**0.0024**	**0.0143**	**0.0469**	**0.0484**	**0.004**
Manganese, Total	2500	**0.0418**	**0.218**	**1.79**	**1.15**	**0.156**	**1.13**	**3.43**	**2.71**	**0.233**
Mercury, Total	19	0.0002 U	0.0002 U	**0.00008 J**	**0.00008 J**	0.0002 U	0.0002 U	**0.00008 J**	**0.00014 J**	**0.00008 J**
Nickel, Total	1304	0.005 U	**0.0046 J**	**0.0583**	**0.0332**	**0.0097**	**0.0437**	**0.16**	**0.12**	**0.0103**
Selenium, Total	105000	**0.116**	**0.026 J**	0.04 U	0.04 U	**0.0892**	**0.033 J**	**0.018 J**	**0.111**	**0.021 J**
Silver, Total	95	0.007 U	0.007 U	0.005 U	0.005 U	0.007 U	0.007 U	0.007 U	0.005 U	0.005 U
Thallium, Total	75	0.05 U	0.05 U	**0.0016 J**	0.001 U	0.002 U	0.002 U	0.002 U	**0.001 J**	0.001 U
Vanadium, Total	NA	**0.0023 J**	**0.0044 J**	**0.0205**	**0.0093 J**	**0.005 J**	**0.0157**	**0.0622**	**0.0522**	**0.0065 J**
Zinc, Total	2995	0.01 U	**0.0074 J**	**0.051**	**0.0173**	0.01 U	**0.0417**	**0.168**	**0.145**	**0.0133**
Other (mg/L)										
Chloride, Dissolved	1000000	**4**	**17**	**159**	**22**	**20**	-	**7**	**18**	**27**
Cyanide, Dissolved	130	0.005 U	0.005 U	-	-	-	-	-	-	-
Fluoride, Dissolved	NA	**0.13**	**0.12**	**0.35**	**0.19**	**0.06 J**	-	**0.06 J**	**0.24**	**0.25**
Nitrate (as N), Dissolved	NA	**5.35**	**3.06 H**	**8.24**	**4.29**	**4.62**	-	**4.53**	**5.77**	**2.13**
Nitrite (as N), Dissolved	NA	0.05 UH	0.05 UH	**0.01 J**	**0.01 J**	0.05 U	-	0.05 U	**0.01 J**	**0.01 J**
Sulfate, Dissolved	NA	**387**	**59**	**22**	**83**	**205**	-	**126**	**421**	**38**
Total Dissolved Solids (TDS)	NA	**740 H**	**300 H**	-	-	-	-	-	-	-
Chloride	1000000	**4**	**17**	-	-	**21**	**7**	-	-	-
Cyanide	130	0.005 U	0.005 U	0.007 U	**0.001 J**	0.005 U	0.005 U	0.005 U	**0.002 J**	0.007 U
Fluoride	NA	**0.13**	**0.12**	-	-	**0.08 J**	**0.08 J**	-	-	-
Nitrate (as N)	NA	**5.48**	**3.06 H**	-	-	**4.45**	**4.46**	-	-	-
Nitrite (as N)	NA	0.05 UH	0.05 UH	-	-	0.05 U	0.05 U	-	-	-
Sulfate	NA	**401**	**59**	-	-	**175**	**217**	-	-	-
Total Dissolved Solids (TDS)	NA	**714 H**	**314 H**	**420**	**382**	**624**	**646**	**408**	**832**	**398**

TABLE 4
MAXIMUM DETECTED CONCENTRATION (a) AT WELLS COMPARED WITH TARGET GROUNDWATER SCREENING LEVELS PROTECTIVE OF SURFACE WATER
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Notes:

H - Holding times exceeded.
J - Analyte detected below quantitation limits.
mg/L - milligram per liter.
NA - Not Available.
S - Spike Recovery outside recovery limits.
U - Not detected above the indicated reporting limit.

(a) Maximum detected concentration at each well identified from data obtained from Ameren Corporation, for the period: June 2017 to September 2022.
(b) The Target Groundwater Screening Level = Target Surface Water Screening Level x Dilution Attenuation Factor.

Bold indicates a detect concentration above the method detection limit.
Greater than the Target Groundwater Screening Level.

TABLE 5
ANALYTICAL DATA FROM ILLINOIS RIVER - UPSTREAM AND DOWNSTREAM FROM THE SITE COMPARED WITH TARGET SURFACE WATER SCREENING LEVELS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location	Target	Upstream								Downstream							
Station	Surface	Station ID: USGS-05570520 (c)								Station ID: USGS-05586100 (b)							
Approximate Distance (miles):	Water	46								10							
Sample Collection Date:	Screening	1990	1991	1992	1993	1994	1995	1996	1997	1990	1991	1992	1993	1994	1995	1996	1997
Constituent	Level - River (a)																
Metals, Total (mg/L)																	
Antimony	0.32	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aluminum	NA	2.7	1.3	2.1	0.8	1.6	1.5	1.4	0.9	1.5	7.2	1.4	0.4	2.6	2.4	2.7	1.5
Arsenic	0.15	NA	NA	NA	NA	NA	NA	NA	NA	0.002	0.003	0.001	0.01	0.002	0.001	0.002	0.002
Barium	1	0.049	0.045	0.044	0.049	0.044	0.046	0.046	0.043	0.2	0.1	NA	NA	0.1	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0005	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Boron	NA	0.1	0.14	0.11	0.06	0.11	0.16	0.14	0.1	0.19	0.03	0.1	0.04	0.07	0.09	0.12	0.07
Cadmium	0.0007	NA	NA	NA	NA	NA	NA	NA	NA	0.003	0.005	0.02	0.005	0.003	0.003	0.003	0.003
Chromium	0.074	0.01	0.005	0.009	0.005	0.008	0.007	0.008	NA	0.007	0.014	0.005	0.005	0.008	0.006	0.005	0.005
Cobalt	NA	NA	NA	0.01	NA	NA	NA	NA	NA	0.005	0.005	0.005	0.005	0.005	0.01	0.01	0.01
Copper	1.3	0.01	0.01	0.02	NA	NA	NA	NA	NA	0.005	0.005	0.01	0.005	0.005	0.005	0.01	0.01
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.005	0.005	0.005	0.01	0.01	0.01	0.01	0.01
Iron	1	4.27	1.8	1.64	1.2	2.2	2.3	2.8	1.5	2.55	7.48	2.4	0.74	2.6	3.2	3.3	2.5
Lead	0.003	NA	NA	NA	NA	NA	NA	NA	NA	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Manganese	0.1	0.15	0.08	0.1	0.1	0.11	0.16	0.15	0.09	0.12	0.24	0.11	0.04	0.23	0.1	0.14	0.11
Mercury	0.001	0.0001	NA	NA	NA	NA	NA	NA	NA	0.00001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Nickel	0.052	NA	NA	NA	NA	NA	NA	NA	NA	0.005	0.015	0.015	0.015	0.015	0.015	0.025	0.025
Phosphorus	NA	0.33	0.29	0.28	0.18	0.22	0.45	0.34	0.36	0.5	0.3	0.27	0.13	0.295	0.37	0.377	0.31
Silver	0.003	NA	NA	NA	0.004	0.004	0.004	NA	NA	0.003	0.005	0.005	0.005	0.003	0.003	0.003	0.003
Selenium	4.2	NA	NA	NA	NA	NA	NA	NA	NA	0.001	NA	NA	0.001	0.001	0.001	0.002	0.002
Thallium	0.003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	0.02	0.01	0.02	NA	NA	NA	NA	NA	0.005	0.005	0.005	0.005	0.005	0.005	0.01	NA
Zinc	0.117	NA	0.07	0.06	NA	0.11	0.17	NA	NA	0.05	0.05	0.05	0.05	0.1	0.1	0.1	0.1
Water Parameters (dissolved)																	
Hardness, Ca, Mg (mg/L)	NA	330	320	260	320	260	260	350	300	350	330	350	240	300	280	320	310
pH (SU)	NA	7.4	8.2	8.2	7.6	8.1	7.5	8.3	7.4	7.2	8.7	8	8.8	9.3	8.1	7.7	7.5
Sulfate (mg/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	126	65	75	61	34	53	87.2	77.6
Total Dissolved Solids (mg/L)	NA	NA	NA	NA	NA	NA	NA	NA	NA	393	327	444	358	451	447	495	407
Chloride	230	NA	NA	NA	NA	NA	NA	NA	NA	99	46	59	57	110	77.4	99.2	61.5
Fluoride	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5	0.2	0.3	0.2	0.3	0.3	0.4	0.3
Nitrate (as N)	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.34	4.84	6.7	3.89	NA	NA	4.52	5.75
Nitrite (as N)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.06	0.06	0.1	0.11	NA	NA	0.08	0.05
Inorganic nitrogen (nitrate and nitrite)	NA	5.1	4.5	6.2	3.4	2.6	2.3	4.4	4.3	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

mg/L - miligrams per liter.
SU - standard unit.
N - Nitrogen.
NA - Not Available.

(a) The Target Surface Water Screening Level is obtained using the following hierarchy:
1) Lower of the acute and chronic Illinois Derived Aquatic Life Criteria and the threshold and non-threshold Illinois derived Human Health Criteria; if no value available,
2) Lower the acute and chronic National Recommended Aquatic Life Criteria; if no value available,
3) National Recommended Water Quality Criteria - Human health for the Consumption of Organism only.

(b) United States Geological Survey (USGS). National Water Information System: Web Interface. USGS 05586100 Illinois River at Valley City, IL. Available online at :
https://waterdata.usgs.gov/nwis/inventory?site_no=05586100&agency_cd=USGS

(c) USGS. Illinois River at Power Company at Havana, IL. Available online at :
https://waterdata.usgs.gov/monitoring-location/05570520/#period=P1Y

Greater than the Target Surface Water Screening Level.
Upstream Constituent Data Not Available.

TABLE 6
ANALYTICAL DATA FROM ILLINOIS RIVER - DOWNSTREAM FROM THE SITE COMPARED WITH TARGET SURFACE WATER SCREENING LEVELS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location	Target Surface Water Screening Level - River (a)	Downstream																				
Station		Station ID: USGS-05586100 (b)																				
Approximate Distance (miles):		10																				
Sample Collection Date:		1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Constituent																						
Metals, Total (mg/L)																						
Antimony	0.32	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	0.15	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0024	0.0011	0.001	0.00095	0.0011	0.0014	0.0012	0.0014	0.00088	0.001	0.0012	0.00098
Barium	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.135	0.047	0.052	0.072	0.079	0.083	0.084	0.069	0.093	0.071	0.087	0.043
Cadmium	0.0007	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	0.074	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	0.003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	0.052	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus	NA	0.44	0.43	0.66	0.32	1.32	0.53	0.5	0.24	0.64	0.5	0.51	0.47	0.48	0.69	0.45	0.34	0.34	0.83	0.25	0.34	0.24
Silver	0.003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	4.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00054	0.00066	0.00073	0.00067	0.00075	0.00085	1.2	0.00054	0.00069	0.00062	0.00054	0.00072
Thallium	0.003	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0014	0.001	0.0011	0.00081	0.0012	0.0012	0.00095	0.0021	0.0012	0.00098	0.00099	0.00086
Zinc	0.117	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Water Parameters (dissolved)																						
Hardness, Ca, Mg (mg/L)	NA	290	261	331	277	NA	NA	NA	NA	NA	302	179	288	262	252	340	248	245	236	315	318	222
pH (SU)	NA	7.7	7.9	8	7.7	8.2	8.3	8.1	7.8	8.1	8.4	7.7	7.5	8.2	8.1	8.4	8.2	8.1	7.4	8.4	8.3	7.8
Sulfate (mg/L)	NA	57.9	51	95.7	37.7	90.6	76.2	78.2	53.6	71.5	74.7	32.6	45.8	48.9	50.7	63.1	78.4	53.2	66.9	62.1	56.2	33.5
Total Dissolved Solids (mg/L)	NA	420	365	525	315	NA	NA	NA	NA	NA	469	317	378	400	397	433	536	420	552	452	448	342
Chloride	230	75.2	46.6	112	57.6	97.1	85	88.4	77.3	86	83.8	78.5	50.2	77.8	75.9	59	125	120	133	76	80.3	68.6
Fluoride	NA	0.3	0.29	0.65	0.21	NA	NA	NA	NA	NA	0.42	0.21	0.22	0.24	0.29	0.3	0.25	0.24	0.27	0.22	0.21	0.18
Nitrate (as N)	NA	7.11	7.78	3.1	5.83	3.29	1.76	1.56	6.83	2.27	3.16	3.39	4.94	3.67	4.88	4.31	5.7	2.41	4.27	3.68	3.76	5.2
Nitrite (as N)	NA	0.064	0.083	0.038	0.041	0.022	0.025	0.006	0.038	0.174	0.012	0.038	0.033	0.1	0.055	0.022	0.049	0.059	0.046	0.023	0.025	0.034
Inorganic nitrogen (nitrate and nitrite)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

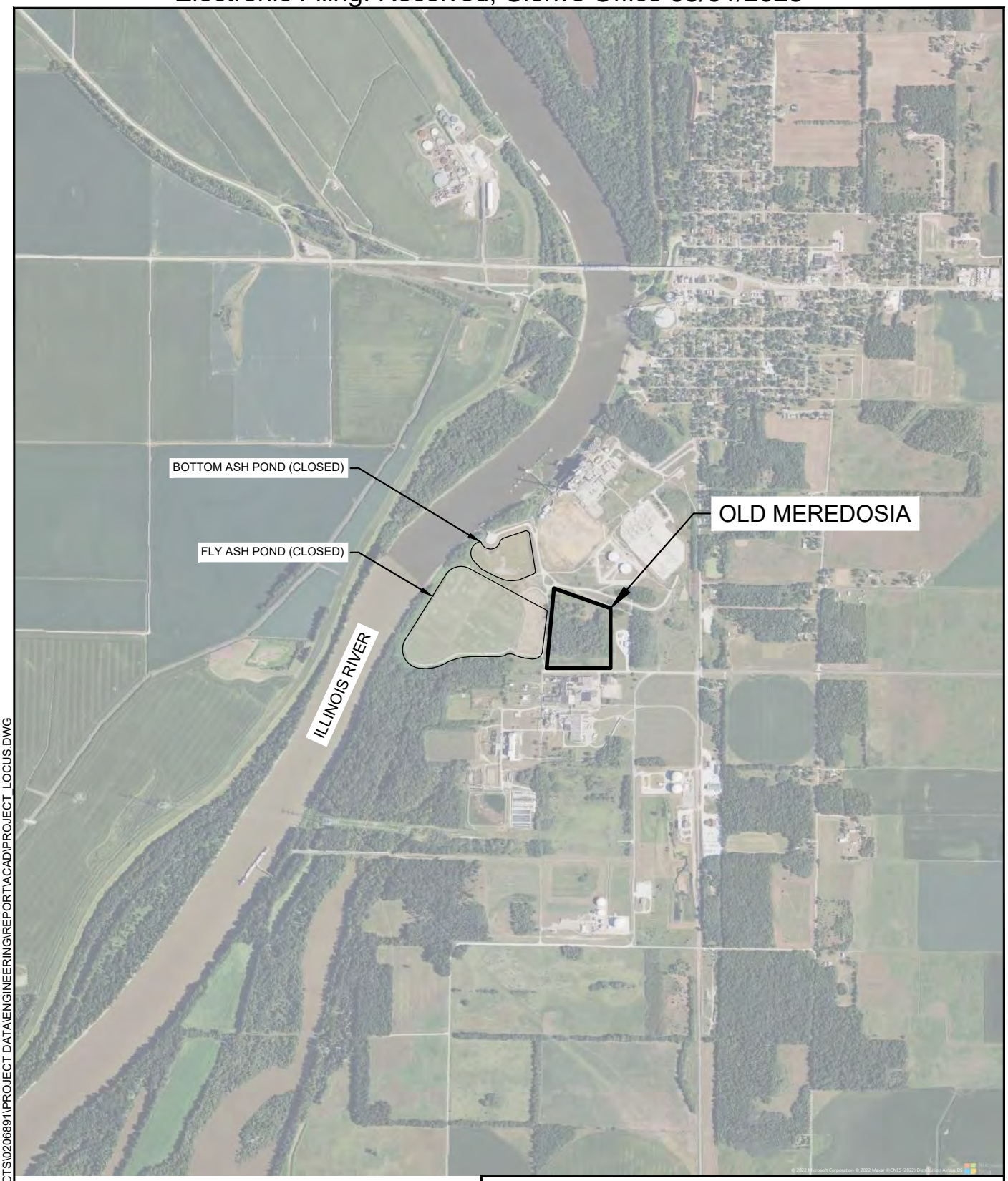
mg/L - miligrams per liter.
SU - standard unit.
N - Nitrogen.
NA - Not Available.

(a) The Target Surface Water Screening Level is obtained using the following hierarchy:
1) Lower of the acute and chronic Illinois Derived Aquatic Life Criteria and the threshold and non-threshold Illinois derived Human Health Criteria; if no value available,
2) Lower the acute and chronic National Recommended Aquatic Life Criteria; if no value available,
3) National Recommended Water Quality Criteria - Human health for the Consumption of Organism only.

(b) United States Geological Survey (USGS). National Water Information System: Web Interface. USGS 05586100 Illinois River at Valley City, IL. Available online at :
https://waterdata.usgs.gov/nwis/inventory?site_no=05586100&agency_cd=USGS

Greater than the Target Surface Water Screening Level.

FIGURES



SITE LOCATION

NOTE:

BASE MAP TAKEN FROM BING IMAGES

N

0 2000 4000

SCALE IN FEET

HALEY ALDRICH

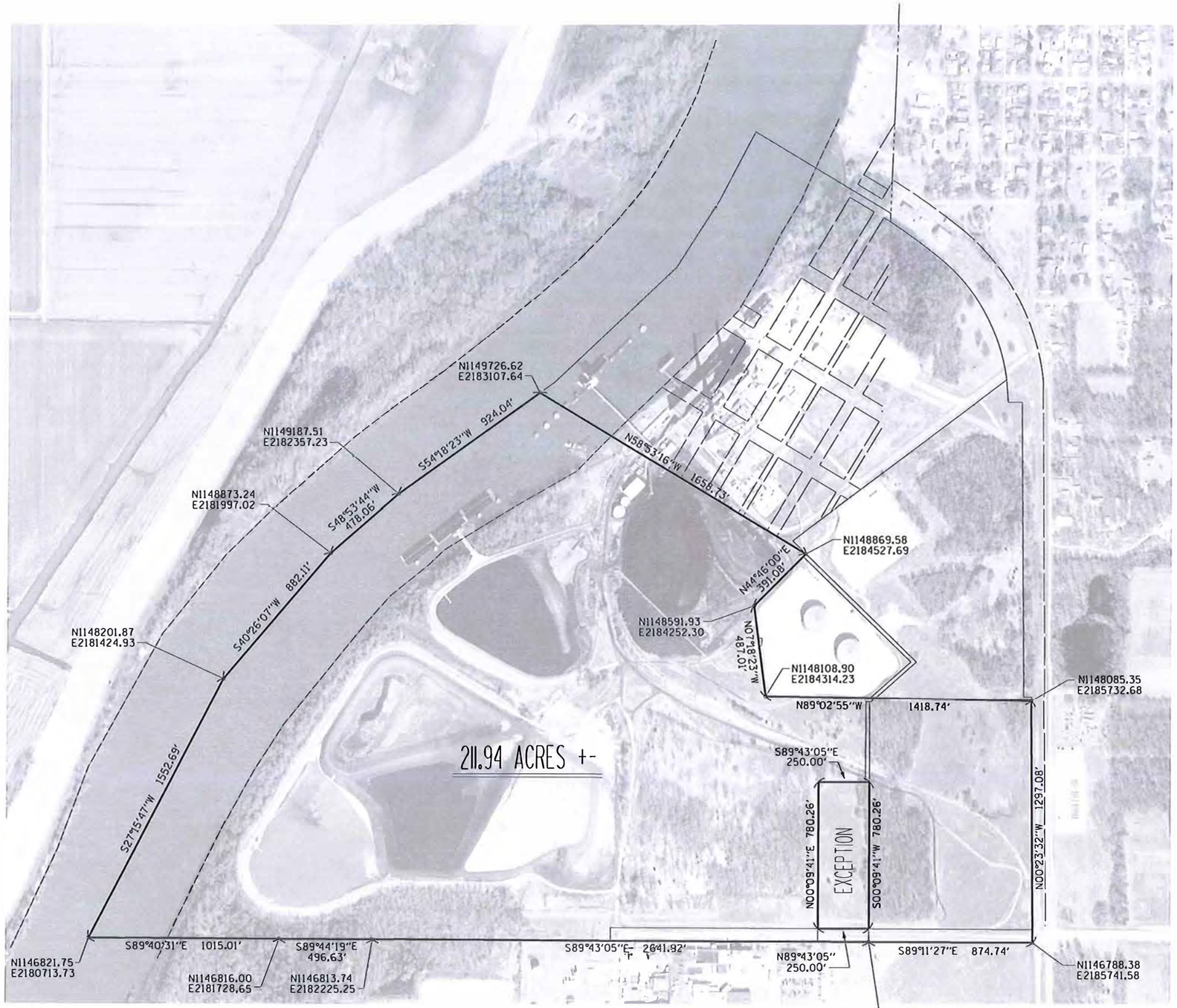
AMEREN ENERGY RSOURCES
MEREDOSIA POWER STATION
MORGAN COUNTY, ILLINOIS

SITE LOCATION MAP

SCALE: AS SHOWN
DECEMBER 2022

FIGURE-1

Saved by: GRUENDLING, SETH Printed: 12/9/2022 8:30 AM Sheet: HA-FIG-A-P
\\HALEYALDRICH\SHARE\CF\PROJECTS\0206891\PROJECT DATA\ENGINEERING\REPORT\ACAD\PROJECT LOCUS.DWG



NOTE:
ALL BEARINGS AND COORDINATES ARE REFERENCED TO THE ILLINOIS STATE PLANE COORDINATE SYSTEM, NAD83, ILLINOIS WEST ZONE.
ALL DISTANCES ARE GROUND

N

0 300 600
GRAPHIC SCALE

LEGAL DESCRIPTION

Part of the Northwest Quarter (NW 1/4) of Section Twenty-seven (27), part of the Northeast Quarter (NE 1/4) of Section Twenty-eight (28), and part of the Southeast Quarter (SE 1/4) of Section Twenty-One (21), all in Township Sixteen (16) North, Range Thirteen (13) of the Third Principal Meridian, Morgan County, Illinois, being more particularly described as follows: Beginning at the Southeast corner of the North Half (N 1/2) of the Northeast Quarter (NE 1/4) of said Section Twenty-eight (28); thence South 89°11'27" East (all bearings referenced to the Illinois State Plane Coordinate System, NAD 83, Illinois West Zone), 874.74 feet; thence North 00°23'32" West 1297.08 feet; thence North 89°02'55" West 1418.74 feet; thence North 07°18'23" West, 487.01 feet; thence North 44°46'00" East, 391.08 feet; thence North 58°53'16" West, 1658.73 feet; thence South 54°18'23" West 924.04 feet; thence South 48°53'44" West, 478.06 feet; thence South 40°26'07" West, 882.11 feet; thence South 27°15'47" West 1552.69 feet; thence South 89°40'31" East, 1015.01 feet; thence South 89°44'19" East, 496.63 feet; thence South 89°43'05" East 2641.92 feet to the point of beginning, except the following described parcel:

Part of the Northeast Quarter of Section 28, Township 16 North, Range 13 West of the Third Principal Meridian, Morgan County, Illinois, being more particularly described as follows:

Commencing at the Northeast corner of Section 28 (Southwest corner Section 22), Township 16 North, Range 13 West of the Third Principal Meridian, Morgan County, Illinois; thence South 89° 02' 55" East (basis of bearing is the Illinois State Plane Coordinate System, NAD 83, Illinois West Zone) along the South line of said Section 22, a distance of 19.06 feet; thence South 48° 18' 27" West a distance of 29.52 feet; thence North 89° 02' 55" West a distance of 19.76 feet; thence South 00° 09' 41" West a distance of 449.00 feet to the true point of beginning;

Thence continuing South 00° 09' 41" West a distance of 780.26 feet to a point on the now vacated North R.O.W. line of T.R. 59; thence North 89° 43' 05" West a distance of 250.00 feet; thence North 00° 09' 41" East a distance of 780.26 feet; thence South 89° 43' 05" East a distance of 250.00 feet to the true point of beginning.

Excepted parcel containing 4.478 acres, more or less.

Said Groundwater Management Zone tract containing 211.94 acres, more or less.

PROFESSIONAL LAND SURVEYOR
KENNETH E. STURGEON
035-003518
JACKSONVILLE, ILLINOIS
STATE OF ILLINOIS

SURVEYORS STATEMENT

I, KENNETH E. STURGEON, A PROFESSIONAL LAND SURVEYOR IN THE STATE OF ILLINOIS DO HEREBY STATE THAT THE PLAT AND DESCRIPTION SHOWN HEREON IS A TRUE AND CORRECT REPRESENTATION OF THE SURVEY MADE UNDER MY SUPERVISION.

Kenneth E. Sturgeon 8/12/16

KENNETH E. STURGEON
ILLINOIS PROFESSIONAL LAND SURVEYOR #3518
LICENSE EXPIRES 11/30/16

THIS PROFESSIONAL SERVICE CONFORMS TO THE CURRENT ILLINOIS MINIMUM STANDARDS FOR A BOUNDARY SURVEY.

BENTON & ASSOCIATES INC
Illinois Design Firm Registration No. 184-000352

No.	Description	Date	Appr.

GROUND WATER MANAGEMENT ZONE
PLAT OF SURVEY
FOR
AMEREN, MEREDOSIA, ILLINOIS

BENTON & ASSOCIATES, INC.
1970 W. Lafayette Ave., Jacksonville IL 62650
(217) 245-4146 (217) 245-4149 Fax

Kirksville Missouri
Macomb Illinois
Macon Missouri

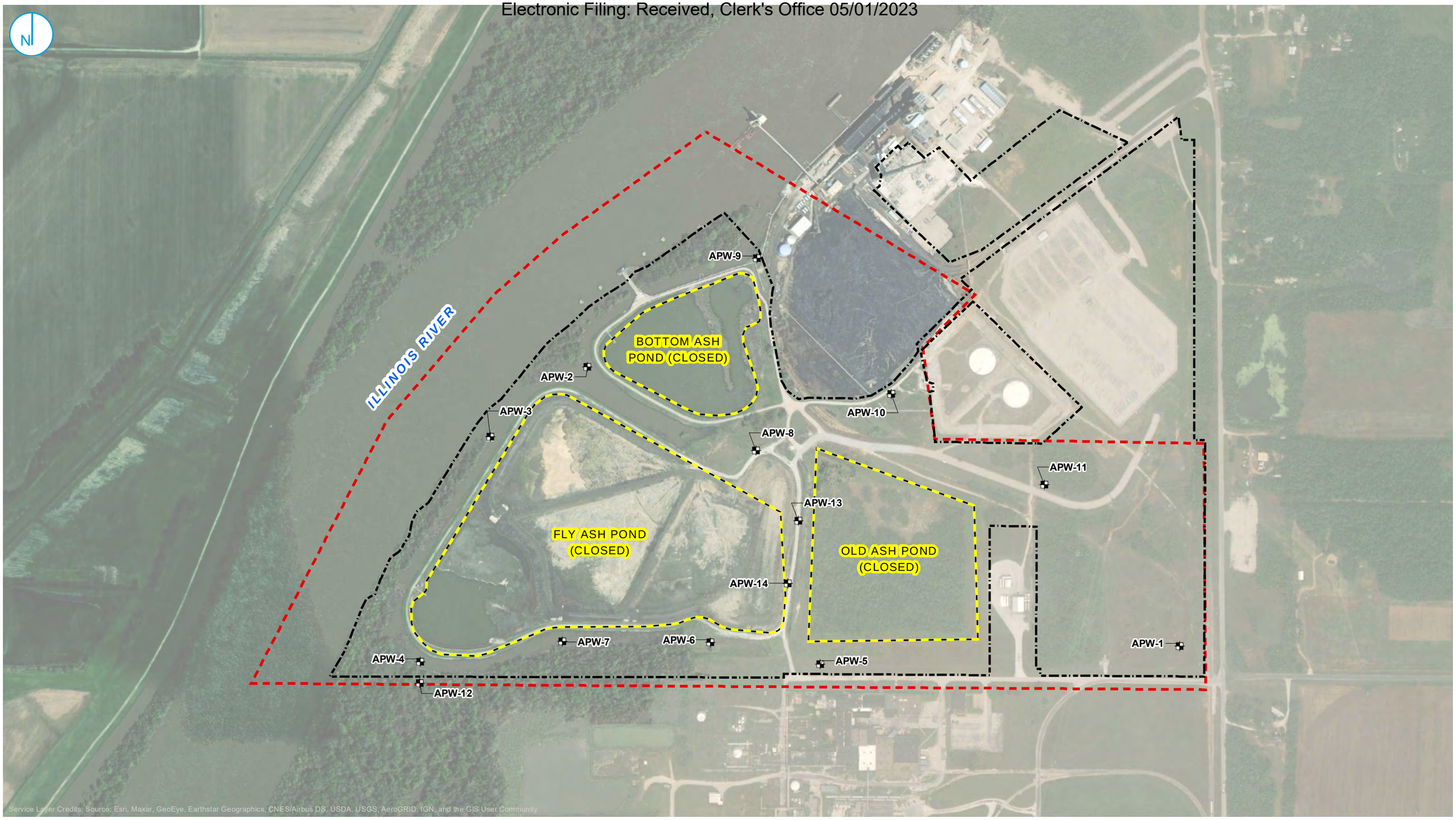
Date: August 2016
Designed by: K Sturgeon
Drawn by: S Weber
Reviewed by: K Sturgeon
Approved by: K Sturgeon

Job No. 12s3250

Figure 2

P:\12S3250\Design\Plats\3250_south property plat.dgn SWEBER-WIN10 600.0000 ' / in. sweber 9:41:06 AM 8/12/2016

Figure from Geotechnology, 2016b.



Y:\Mapping\Projects\6\67815\mxd\2021\Figure 1-2_Site_Base_Map.mxd

PROJECT: 72694 | DATED: 2/25/2022 | DESIGNER: galammc

MONITORING WELL LOCATION
APPROXIMATE PROPERTY BOUNDARY
LIMITS OF CCP MANAGEMENT
APPROXIMATE GROUNDWATER MONITORING ZONE

0 240 480 Feet

Figure 3 - Groundwater Monitoring Wells; from:

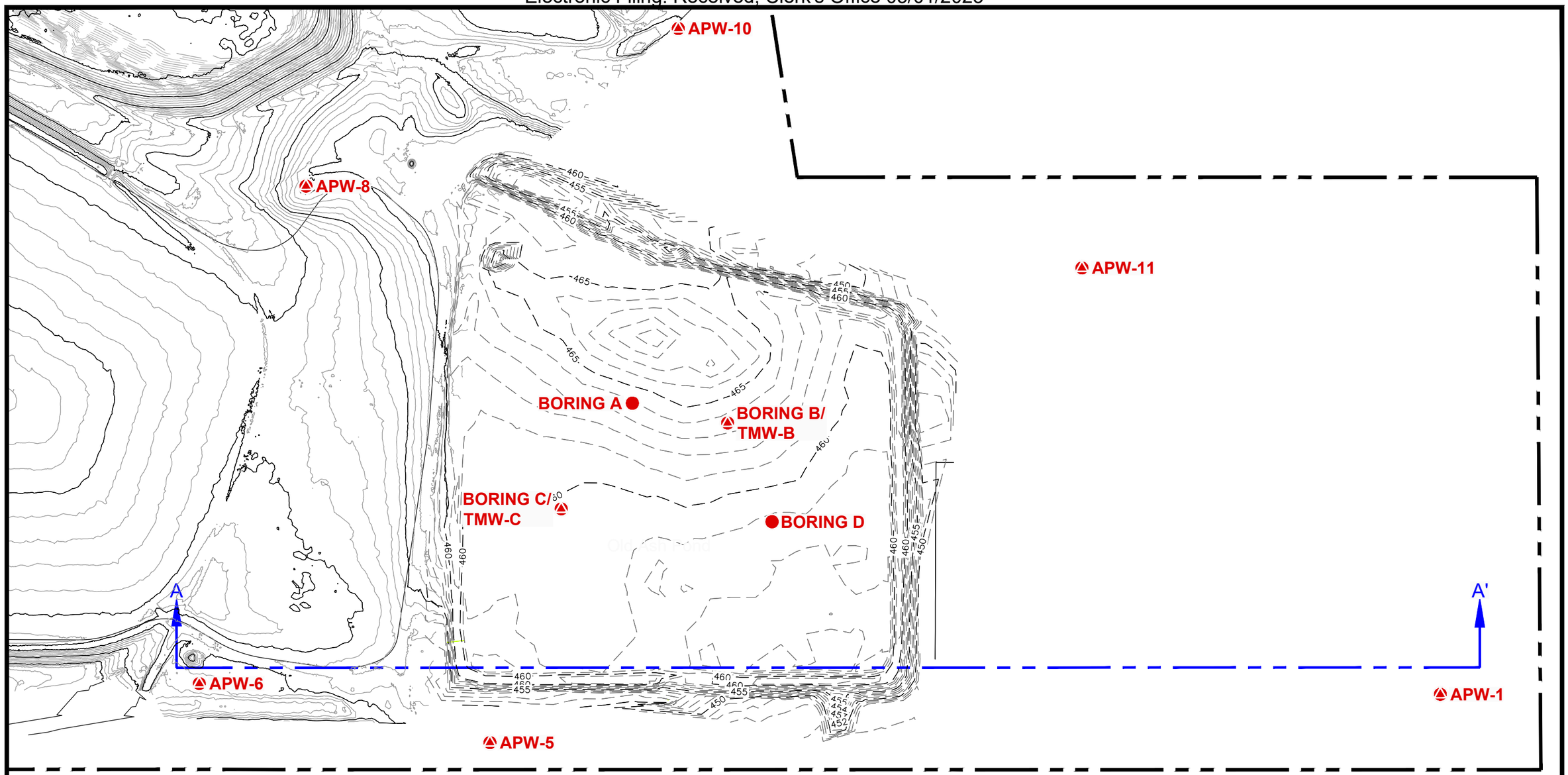
SITE BASE MAP

2021 ANNUAL REPORT
AMEREN ENERGY RESOURCES
MEREDOSIA POWER STATION
MORGAN COUNTY, ILLINOIS

FIGURE 1-2

RAMBOLL US CORPORATION
A RAMBOLL COMPANY

RAMBOLL



NOTES

1. Plan adapted from a May 11, 2022 aerial surey supplied by the client.
2. Borings and monitoring wells were located in the field by Geotechnology and subsequently surveyed in May 2022 by the project surveyor.

LEGEND

- Boring Location
- Monitoring Well Location
- Subsurface Profile - Cross-Section A-A' (See Figure 3)

0 200 400
SCALE IN FEET

N

Drawn By: WAH	Ck'd By: JYG	App'vd By: AMS
Date: 8-11-22	Date: 8-25-22	Date: 8-25-22

GEOTECHNOLOGY
A Universal Engineering Sciences Company

Meredosia Old Ash Pond
Meredosia, Illinois

BORING LOCATIONS

Project Number
J024917.07

FIGURE 4

NOTES

1. Plan adapted from a July 22, 2012 aerial photograph courtesy of Google Earth.
2. Water well locations from Illinois State Geological Survey Prairie Research Institute.
3. See Appendix A for water well records.
4. Abandoned on-site water supply wells are not shown.

LEGEND

- Water Supply Wells
- On-Site Water Supply Wells to be Abandoned

N

0 600 1200 2400

SCALE IN FEET

Drawn By: WAH	Ck'd By: ube	App'vd By: AMS
Date: 4-21-16	Date: 7/20/16	Date: 7/20/16

GEOTECHNOLOGY INC
FROM THE GROUND UP

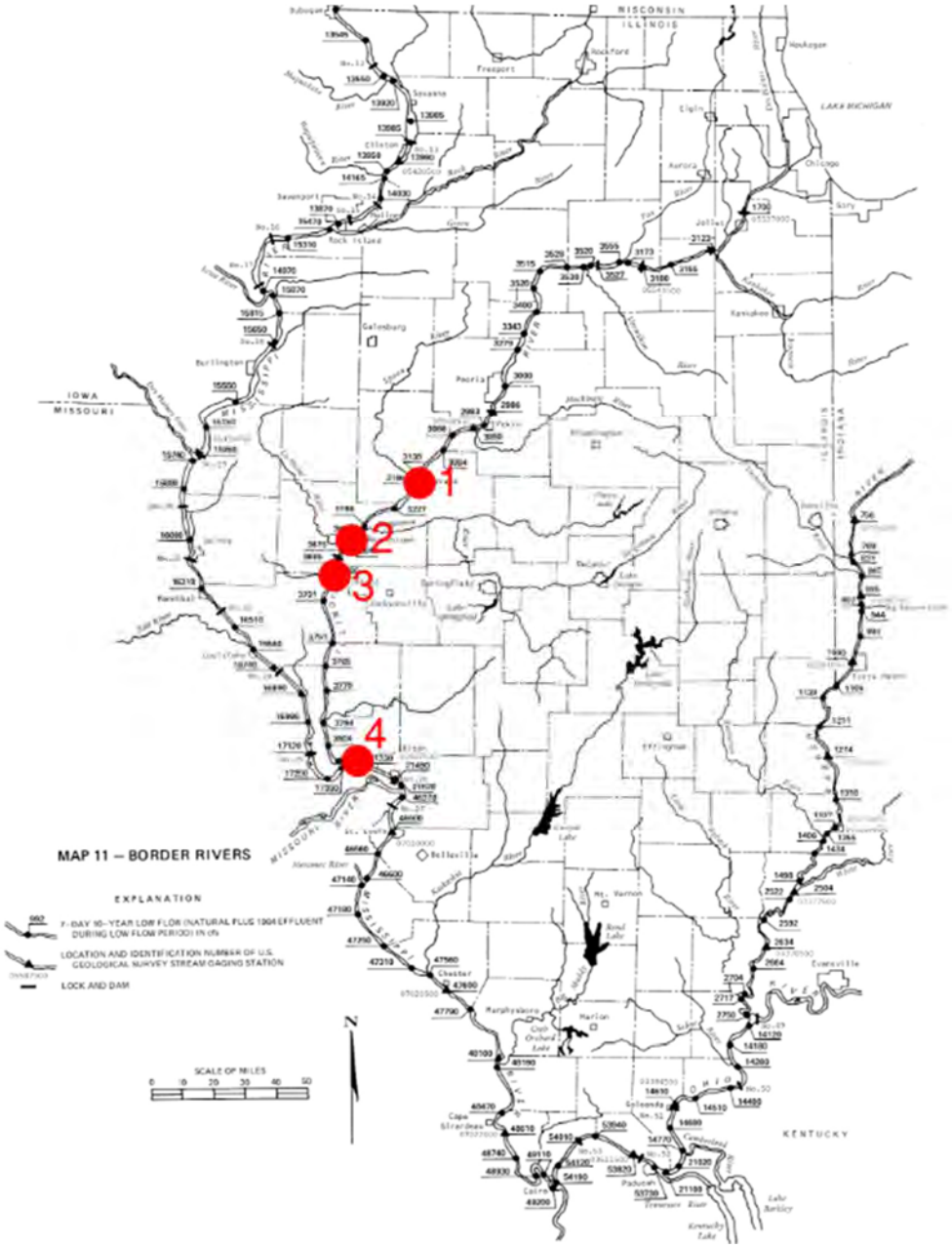
Meredosia Power Station
Meredosia, Illinois

POTABLE WATER WELL SEARCH RADIUS

Project Number J024917.01	PLATE 4

Figure 5

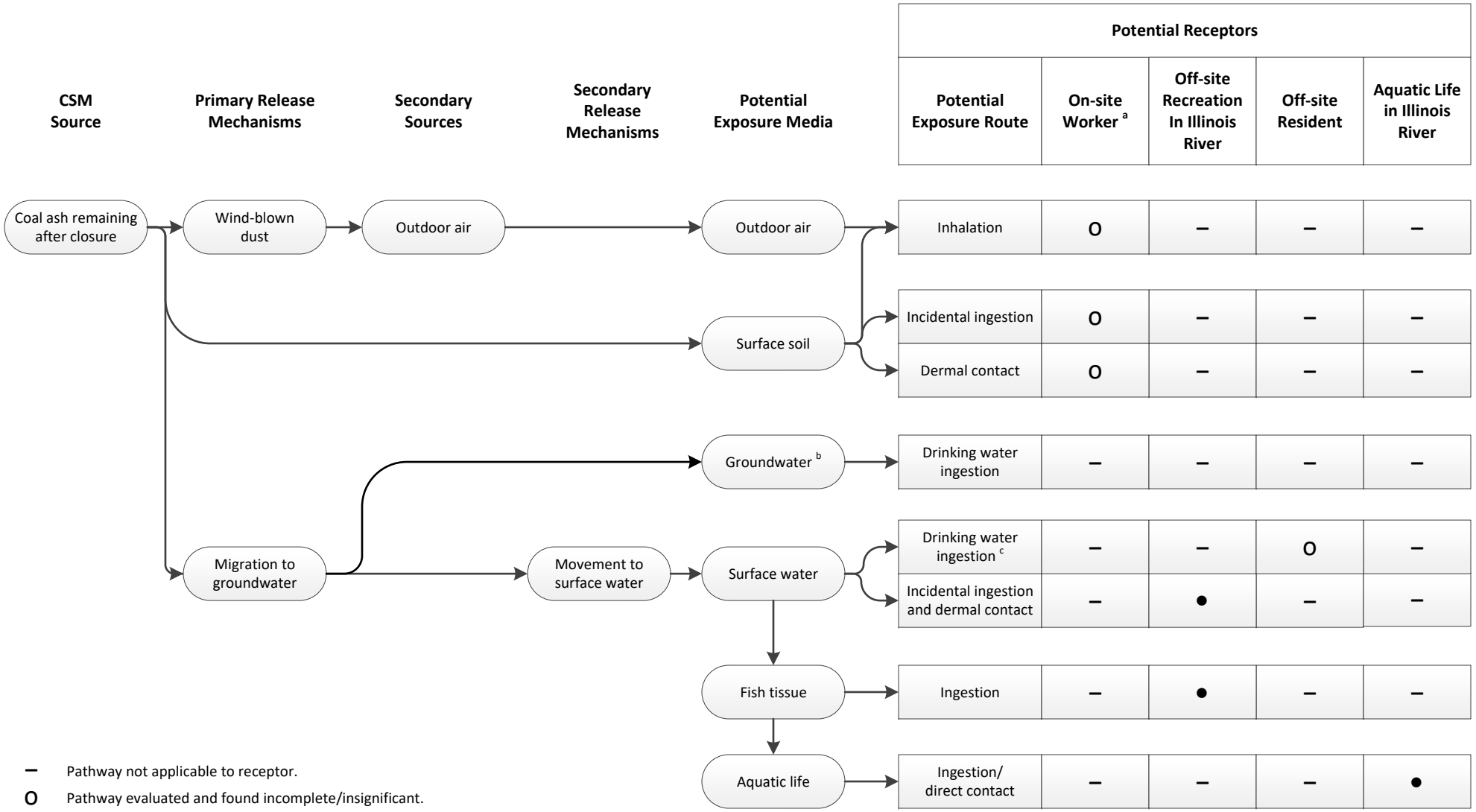
FIGURE 5
ILLINOIS RIVER GAUGING STATIONS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL



1 – Station USGS-05586100 – 46 miles upstream (b).
2 – Location of Meredosia Power Station.
3 – Station USGS-05570520 – 10 miles downstream (c).
4 – Confluence of Illinois River and the Mississippi River – 68 miles downstream.

(a) Illinois State Water Survey (1988).
(b) United States Geological Survey (USGS). National Water Information System: Web Interface. USGS 05586100 Illinois River at Valley City, IL. Available online at: https://waterdata.usgs.gov/nwis/inventory?site_no=05586100&agency_cd=USGS
(c) USGS. Illinois River at Power Company at Havana, IL. Available online at: https://waterdata.usgs.gov/monitoring-location/05570520/#period=P1Y

Figure 7
Preliminary Conceptual Site Model
Old Meredosia Risk Evaluation
Ameren Meredosia Power Station, Illinois



– Pathway not applicable to receptor.

O Pathway evaluated and found incomplete/insignificant.

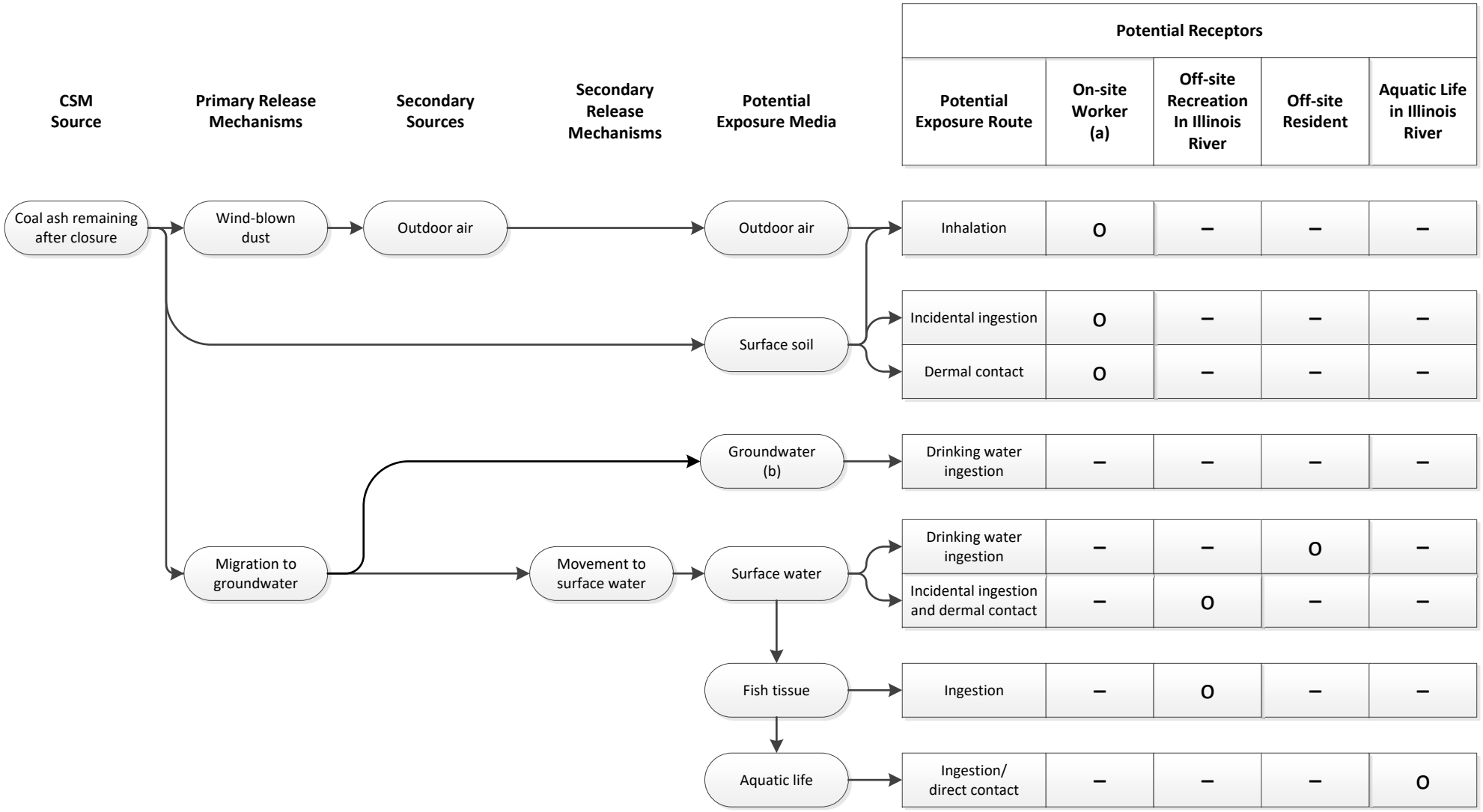
● Pathway potentially complete and evaluated here.

a Old Meredosia is covered and coal ash is not available for contact at the surface.

b Old Meredosia is within the foot print of a groundwater management zone (GMZ) for the facility, thus, groundwater is not used as a source of drinking water.

c The Illinois River is not a source of drinking water downstream of the Meredosia Power Station.

Figure 8
Final Conceptual Site Model Old
Meredosia Risk Evaluation Ameren
Meredosia Power Station, IL



– Pathway not applicable to receptor.

O Pathway evaluated and found incomplete/insignificant.

● Pathway potentially complete and evaluated here.

(a) Old Meredosia is covered and coal ash is not available for contact at the surface.

(b) Old Meredosia is within the foot print of a groundwater management zone (GMZ) for the facility, thus, groundwater is not used as a source of drinking water.

APPENDIX A
Groundwater Analytical Data

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Upgradient Wells								
Location Name	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1
Sample Name	APW-1-20170628	APW-1-20170919	APW-1-20171221	APW-1-20180321	APW-1 DUP-20180321	APW-1-20180605	APW-1 DUP-20180605	APW-1-20180920	APW-1 DUP-20180920
Sample Date	06/28/2017	09/19/2017	12/21/2017	03/21/2018	03/21/2018	06/05/2018	06/05/2018	09/20/2018	09/20/2018
Lab Sample ID	17060316-001	17081244-001	17111760-001	18030562-001	18030562-010	18051259-001	18051259-010	18090767-001	18090767-010
Inorganic Compounds (mg/L)									
Antimony, Dissolved	0.001 U	**0.0005 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 UB	0.001 UB
Arsenic, Dissolved	0.001 U	**0.0003 J**	**0.0003 J**	**0.0003 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Barium, Dissolved	**0.0156**	**0.0134**	**0.0098**	**0.0122**	**0.0124**	**0.0117**	**0.0115**	**0.0138**	**0.014**
Beryllium, Dissolved	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Dissolved	**0.0758**	**0.0763**	**0.0986**	**0.0611**	**0.0618**	**0.0751**	**0.0737**	**0.0745**	**0.0778**
Cadmium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Cobalt, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Copper, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Iron, Dissolved	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.04 U	0.04 U	0.04 U	0.04 U
Lead, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Manganese, Dissolved	0.003 U	0.003 U	**0.0014 J**	0.003 U	0.003 U	0.007 U	0.007 U	0.007 U	0.007 U
Mercury, Dissolved	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**0.0021 J**	**0.0018 J**
Selenium, Dissolved	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Silver, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.002 U	0.002 U	0.002 U	0.002 U
Vanadium, Dissolved	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Zinc, Dissolved	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Antimony, Total	**0.0003 J**	**0.0003 J**	**0.0004 J**	**0.0009 J**	**0.0006 J**	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic, Total	**0.0019**	**0.002**	**0.0022**	**0.0089**	**0.0073**	**0.001**	**0.001 J**	**0.0016**	**0.0016**
Barium, Total	**0.0262**	**0.0263**	**0.0209**	**0.065**	**0.0565**	**0.0167**	**0.0161**	**0.0191**	**0.0173**
Beryllium, Total	0.0005 U	0.0005 U	0.0005 U	**0.0006**	**0.0005**	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Total	**0.0799**	**0.0855**	**0.11**	**0.0664**	**0.0665**	**0.0752**	**0.0771**	**0.0841**	**0.109**
Cadmium, Total	0.002 U	0.002 U	0.002 U	**0.0005 J**	**0.0005 J**	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Total	**0.0027 J**	**0.0029 J**	**0.003 J**	**0.0111**	**0.0099**	**0.002 J**	**0.0015 J**	**0.0019 J**	**0.0016 J**
Cobalt, Total	**0.0061**	**0.006**	**0.0072**	**0.0352**	**0.0292**	**0.0031 J**	**0.0027 J**	**0.003 J**	**0.0021 J**
Copper, Total	**0.0042 J**	**0.0044 J**	**0.0044 J**	**0.0226**	**0.0186**	**0.0016 J**	**0.0015 J**	**0.0025 J**	**0.0015 J**
Iron, Total	**3.13**	**3.43**	**3.55**	**17.4**	**15**	**1.21**	**1.12**	**1.48**	**1.14**
Lead, Total	**0.0038**	**0.0041**	**0.0041**	**0.0179**	**0.0148**	**0.0016**	**0.0014**	**0.0021**	**0.002**
Manganese, Total	**0.304**	**0.32**	**0.327**	**1.79**	**1.46**	**0.107**	**0.1**	**0.162**	**0.123**
Mercury, Total	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Total	**0.0127**	**0.0129**	**0.0124**	**0.0583**	**0.048**	**0.0046 J**	**0.0042 J**	**0.0077**	**0.0053**
Selenium, Total	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Silver, Total	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Total	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.002 U	0.002 U	0.002 U	0.002 U
Vanadium, Total	**0.0047 J**	**0.0053 J**	**0.004 J**	**0.0205**	**0.0178**	**0.002 J**	**0.0019 J**	**0.0031 J**	**0.0023 J**
Zinc, Total	**0.0118**	**0.0128**	**0.0114**	**0.051**	**0.0416**	0.01 U	0.01 U	**0.0069 J**	0.01 U
Other									
Chloride, Dissolved (mg/L)	**38**	**28**	**18**	**23**	**22**	**22**	**22**	**45**	**45**
Cyanide, Dissolved (mg/L)	-	-	-	-	-	-	-	-	-
Fluoride, Dissolved (mg/L)	**0.12**	**0.11**	**0.17**	**0.35**	**0.34**	**0.13**	**0.13**	**0.14**	**0.13**
Nitrate (as N), Dissolved (mg/L)	**2.62**	**3.41**	**2.79**	**5.22**	**5.73**	**8.24**	**8.03**	**4.7**	**4.94**
Nitrite (as N), Dissolved (mg/L)	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Sulfate, Dissolved (mg/L)	**14**	**14 S**	**18**	**14 S**	**15**	**14**	**14**	**16**	**14**
Total Dissolved Solids (TDS) (mg/L)	-	-	-	-	-	-	-	-	-

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Upgradient Wells								
Location Name	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1
Sample Name	APW-1-20170628	APW-1-20170919	APW-1-20171221	APW-1-20180321	APW-1 DUP-20180321	APW-1-20180605	APW-1 DUP-20180605	APW-1-20180920	APW-1 DUP-20180920
Sample Date	06/28/2017	09/19/2017	12/21/2017	03/21/2018	03/21/2018	06/05/2018	06/05/2018	09/20/2018	09/20/2018
Lab Sample ID	17060316-001	17081244-001	17111760-001	18030562-001	18030562-010	18051259-001	18051259-010	18090767-001	18090767-010
Chloride (mg/L)	-	-	-	-	-	-	-	-	-
Cyanide (mg/L)	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.005 U	0.005 U	0.005 U	0.005 U
Fluoride (mg/L)	-	-	-	-	-	-	-	-	-
Nitrate (as N) (mg/L)	-	-	-	-	-	-	-	-	-
Nitrite (as N) (mg/L)	-	-	-	-	-	-	-	-	-
Sulfate (mg/L)	-	-	-	-	-	-	-	-	-
Total Dissolved Solids (TDS) (mg/L)	**242**	**166**	**154**	**206**	**220**	**200**	**206**	**246**	**242**
Field Parameters									
Temperature, Field (Deg C)	-	-	-	-	-	**15**	**15**	**16.6**	**16.6**
Temperature, Field (Deg F)	**58.5**	**61.3**	**59.9**	**54.9**	**54.9**	-	-	-	-
Dissolved Oxygen, Field (mg/L)	-	-	-	-	-	-	-	-	-
Oxidation Reduction Potential (ORP), Field (mv)	-	-	-	-	-	-	-	-	-
Turbidity, Field (NTU)	-	-	-	-	-	-	-	-	-
pH, Field (pH units)	**6.68**	**6.77**	**7.11**	**7.34**	**7.34**	**7.03**	**7.03**	**6.99**	**6.99**
Specific Conductance, Field (umhos/cm)	**421**	-	**357**	**426**	**426**	**380**	**380**	**446**	**446**
Bottom of Well (ft)	-	-	-	-	-	-	-	-	-
Depth to Groundwater (ft)	-	-	-	-	-	-	-	-	-
Depth to Groundwater from Measuring Point (ft)	**15.05**	**19.3**	**24.8**	**20.59**	**20.59**	**19.7**	**19.7**	**20.36**	**20.36**
Ground Water Elevation (ft)	-	-	-	-	-	-	-	-	-
MEASURING POINT ELEVATION (ft)	-	-	-	-	-	-	-	-	-

Notes:
- - Not tested.
B - analyte detected in the sample and the associated blank.
ft - feet.
H - holding time exceeded.
J - value is estimated.
mg/L - miligrams per liter.
mv - millivolts.
N - Nitrogen.
S - Spike Recovery outside recovery limits.
U - not detected, value is the reporting limit.
umhos/cm - micromhos per centimeter.

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Upgradient Wells								
Location Name	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1
Sample Name	APW-1-20181127	APW-1 DUP-20181127	APW-1-20190129	APW-1 DUP-20190129	APW-1-20190604	APW-1 DUP-20190604	APW-1-20190826	APW-1 DUP-20190826	APW-1-20191209
Sample Date	11/27/2018	11/27/2018	01/29/2019	01/29/2019	06/04/2019	06/04/2019	08/26/2019	08/26/2019	12/09/2019
Lab Sample ID	18110867-001	18110867-010	19010743-001	19010743-010	19041781-001	19041781-010	19080444-001	19080444-010	19110682-001
Inorganic Compounds (mg/L)									
Antimony, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Barium, Dissolved	**0.0136**	**0.0136**	**0.012**	**0.0125**	**0.0142**	**0.0143**	**0.0122**	**0.0122**	**0.0075**
Beryllium, Dissolved	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Dissolved	**0.085**	**0.0835**	**0.073**	**0.0737**	**0.0486**	**0.0465**	**0.0559**	**0.0568**	**0.0679**
Cadmium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Cobalt, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Copper, Dissolved	0.005 UB	0.005 UB	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Iron, Dissolved	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Lead, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Manganese, Dissolved	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Mercury, Dissolved	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Dissolved	**0.0017 J**	**0.0023 J**	0.005 U	0.005 U	**0.0018 J**	**0.0019 J**	**0.0016 J**	**0.0021 J**	0.005 U
Selenium, Dissolved	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Silver, Dissolved	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Vanadium, Dissolved	**0.001 J**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Zinc, Dissolved	0.01 UB	0.01 UB	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.0162**
Antimony, Total	0.001 U	**0.0006 J**	**0.0006 J**	0.001 U	0.001 U	0.001 U	**0.0007 J**	0.001 U	0.001 U
Arsenic, Total	**0.0021**	**0.003**	**0.0019**	**0.0012**	**0.0008 J**	**0.0007 J**	**0.0011**	**0.0008 J**	**0.001**
Barium, Total	**0.0231**	**0.026**	**0.0221**	**0.0186**	**0.0171**	**0.0167**	**0.0181**	**0.0169**	**0.0125**
Beryllium, Total	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Total	**0.0788**	**0.0834**	**0.0787**	**0.0833**	**0.0644**	**0.126**	**0.0629**	**0.063**	**0.0692**
Cadmium, Total	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Total	**0.0032 J**	**0.0044 J**	**0.0026 J**	**0.0018 J**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Cobalt, Total	**0.005**	**0.0078**	**0.0045 J**	**0.0034 J**	0.005 U	0.005 U	**0.0026 J**	**0.002 J**	0.005 U
Copper, Total	**0.0038 J**	**0.0053**	**0.0033 J**	**0.0017 J**	0.005 U	0.005 U	**0.0019 J**	0.005 U	**0.0014 J**
Iron, Total	**3.31**	**4.2**	**2.36**	**1.41**	**0.882**	**0.654**	**1.3**	**1.12**	**1.3**
Lead, Total	**0.0038**	**0.0058**	**0.003**	**0.0017**	**0.0011**	**0.0009 J**	**0.0015**	**0.0013**	**0.0015**
Manganese, Total	**0.313**	**0.402**	**0.201**	**0.118**	**0.0884**	**0.0673**	**0.105**	**0.089**	**0.0947**
Mercury, Total	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Total	**0.0119**	**0.015**	**0.0081**	**0.0046 J**	**0.0044 J**	**0.0033 J**	**0.0058**	**0.0058**	**0.0042 J**
Selenium, Total	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Silver, Total	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Total	0.002 U	0.002 U	0.002 UB	0.002 UB	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Vanadium, Total	**0.0052 J**	**0.0064 J**	**0.0036 J**	**0.0025 J**	**0.0019 J**	**0.0016 J**	**0.0026 J**	**0.0023 J**	**0.0025 J**
Zinc, Total	**0.0132**	**0.0178**	**0.01**	**0.0071 J**	**0.0072 J**	**0.0067 J**	**0.0073 J**	**0.0077 J**	**0.0056 J**
Other									
Chloride, Dissolved (mg/L)	**29**	**28**	**28**	**28**	**26**	**26**	**27**	**28**	**11**
Cyanide, Dissolved (mg/L)	-	-	-	-	-	-	-	-	-
Fluoride, Dissolved (mg/L)	**0.15**	**0.14**	**0.15**	**0.15**	**0.16**	**0.16**	**0.14**	**0.14**	**0.18**
Nitrate (as N), Dissolved (mg/L)	**4.19**	**4.4**	**4.06**	**4.06**	**4.15**	**4.59**	**3.34**	**3.31**	**3.89**
Nitrite (as N), Dissolved (mg/L)	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	**0.01 J**
Sulfate, Dissolved (mg/L)	**16**	**16**	**13**	**13**	**17**	**15**	**11**	**12**	**15**
Total Dissolved Solids (TDS) (mg/L)	-	-	-	-	-	-	-	-	-

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Upgradient Wells								
Location Name	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1
Sample Name	APW-1-20181127	APW-1 DUP-20181127	APW-1-20190129	APW-1 DUP-20190129	APW-1-20190604	APW-1 DUP-20190604	APW-1-20190826	APW-1 DUP-20190826	APW-1-20191209
Sample Date	11/27/2018	11/27/2018	01/29/2019	01/29/2019	06/04/2019	06/04/2019	08/26/2019	08/26/2019	12/09/2019
Lab Sample ID	18110867-001	18110867-010	19010743-001	19010743-010	19041781-001	19041781-010	19080444-001	19080444-010	19110682-001
Chloride (mg/L)	-	-	-	-	-	-	-	-	-
Cyanide (mg/L)	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Fluoride (mg/L)	-	-	-	-	-	-	-	-	-
Nitrate (as N) (mg/L)	-	-	-	-	-	-	-	-	-
Nitrite (as N) (mg/L)	-	-	-	-	-	-	-	-	-
Sulfate (mg/L)	-	-	-	-	-	-	-	-	-
Total Dissolved Solids (TDS) (mg/L)	**204**	**182**	**202**	**202**	**200**	**196**	**168**	**174**	**116 H**
Field Parameters									
Temperature, Field (Deg C)	**15**	**15**	**12.9**	**12.9**	**13.6**	**13.6**	**15.4**	**14.8**	**14.9**
Temperature, Field (Deg F)	-	-	-	-	-	-	-	-	-
Dissolved Oxygen, Field (mg/L)	-	-	-	-	-	-	-	-	-
Oxidation Reduction Potential (ORP), Field (mv)	-	-	-	-	-	-	-	-	-
Turbidity, Field (NTU)	-	-	-	-	-	-	-	-	-
pH, Field (pH units)	**7.07**	**7.07**	**6.86**	**6.86**	**6.87**	**6.87**	**6.63**	**6.63**	**7.04**
Specific Conductance, Field (umhos/cm)	**357**	**357**	**326**	**326**	**378**	**378**	**326**	**326**	**248**
Bottom of Well (ft)	-	-	-	-	-	-	-	-	-
Depth to Groundwater (ft)	-	-	-	-	-	-	-	-	-
Depth to Groundwater from Measuring Point (ft)	**22.69**	**22.69**	**18.57**	**18.57**	**8.14**	**8.14**	**13.8**	**13.8**	**16.92**
Ground Water Elevation (ft)	-	-	-	-	-	-	-	-	-
MEASURING POINT ELEVATION (ft)	-	-	-	-	-	-	-	-	-

Notes:
- - Not tested.
B - analyte detected in the sample and the associated blank.
ft - feet.
H - holding time exceeded.
J - value is estimated.
mg/L - miligrams per liter.
mv - millivolts.
N - Nitrogen.
S - Spike Recovery outside recovery limits.
U - not detected, value is the reporting limit.
umhos/cm - micromhos per centimeter.

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Upgradient Wells								
Location Name	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1
Sample Name	APW-1 DUP-20191209	APW-1-20200217	APW-1 DUP-20200217	APW-1-20200427	APW-1 DUP-20200427	APW-1-20200729	APW-1 DUP-20200729	APW-1-20201204	APW-1 DUP-20201204
Sample Date	12/09/2019	02/17/2020	02/17/2020	04/27/2020	04/27/2020	07/29/2020	07/29/2020	12/04/2020	12/04/2020
Lab Sample ID	19110682-010	20020491-001	20020491-010	20041232-001	20041232-010	20070966-001	20070966-010	20120358-001	20120358-010
Inorganic Compounds (mg/L)									
Antimony, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Barium, Dissolved	**0.0074**	**0.0089**	**0.0088**	**0.0114**	**0.0115**	**0.0122**	**0.0118**	**0.0103**	**0.0105**
Beryllium, Dissolved	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Dissolved	**0.0647**	**0.0691**	**0.0867**	**0.0746**	**0.0848**	**0.0809**	**0.108**	**0.097**	**0.0988**
Cadmium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Cobalt, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Copper, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Iron, Dissolved	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	**0.023 J**	0.04 U
Lead, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Manganese, Dissolved	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Mercury, Dissolved	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**0.0023 J**	**0.0021 J**	0.005 U	0.005 U
Selenium, Dissolved	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Silver, Dissolved	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Vanadium, Dissolved	0.01 U	**0.0014 J**	**0.001 J**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Zinc, Dissolved	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Antimony, Total	0.001 U	**0.0005 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	**0.0005 J**	0.001 U
Arsenic, Total	**0.0006 J**	**0.0011**	**0.0008 J**	**0.0007 J**	**0.0008 J**	**0.0021**	**0.0015**	**0.0015**	**0.001**
Barium, Total	**0.0103**	**0.0163**	**0.0161**	**0.0161**	**0.0169**	**0.0234**	**0.0182**	**0.0158**	**0.0154**
Beryllium, Total	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Total	**0.0702**	**0.0816**	**0.0794**	**0.083**	**0.0823**	**0.0852**	**0.0814**	**0.103**	**0.12**
Cadmium, Total	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Total	0.005 U	**0.0033 J**	**0.003 J**	0.005 U	0.005 U	**0.0033 J**	0.005 U	0.005 U	0.005 U
Cobalt, Total	0.005 U	**0.0026 J**	**0.0023 J**	0.005 U	**0.0025 J**	**0.0059**	**0.0038 J**	**0.0023 J**	0.005 U
Copper, Total	0.005 U	**0.0021 J**	**0.0017 J**	0.005 U	0.005 U	**0.004 J**	**0.0024 J**	**0.0022 J**	**0.0017 J**
Iron, Total	**0.613**	**1.91**	**1.63**	**1.02**	**1.17**	**3.11**	**2**	**1.46**	**1.08**
Lead, Total	**0.0007 J**	**0.0022**	**0.0014**	**0.0011**	**0.0015**	**0.0039**	**0.0024**	**0.0051**	**0.0027**
Manganese, Total	**0.0418**	**0.128**	**0.1**	**0.0828**	**0.0938**	**0.275**	**0.181**	**0.125**	**0.0813**
Mercury, Total	0.0002 U	0.0002 U	**0.00008 J**	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Total	**0.0027 J**	**0.0057**	**0.0051**	**0.0048 J**	**0.0058**	**0.0116**	**0.0088**	**0.0066**	**0.0047 J**
Selenium, Total	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Silver, Total	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Total	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Vanadium, Total	**0.0015 J**	**0.0035 J**	**0.0035 J**	**0.0024 J**	**0.0028 J**	**0.0041 J**	**0.003 J**	**0.0021 J**	**0.0019 J**
Zinc, Total	0.01 U	**0.0087 J**	**0.0079 J**	0.01 U	**0.0055 J**	**0.0126**	**0.0089 J**	**0.0052 J**	**0.0117**
Other									
Chloride, Dissolved (mg/L)	**12**	**15**	**15**	**16**	**16**	**17**	**17**	**59**	**61**
Cyanide, Dissolved (mg/L)	-	-	-	-	-	-	-	-	-
Fluoride, Dissolved (mg/L)	**0.18**	**0.18**	**0.17**	**0.13**	**0.13**	**0.12**	**0.12**	**0.18**	**0.16**
Nitrate (as N), Dissolved (mg/L)	**3.95**	**4.63**	**4.5**	**6.61**	**6.52**	**4.84**	**4.86**	**2.36**	**2.29**
Nitrite (as N), Dissolved (mg/L)	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Sulfate, Dissolved (mg/L)	**15**	**13**	**13**	**15**	**16**	**16**	**17**	**21**	**22**
Total Dissolved Solids (TDS) (mg/L)	-	-	-	-	-	-	-	-	-

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Upgradient Wells								
Location Name	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1
Sample Name	APW-1 DUP-20191209	APW-1-20200217	APW-1 DUP-20200217	APW-1-20200427	APW-1 DUP-20200427	APW-1-20200729	APW-1 DUP-20200729	APW-1-20201204	APW-1 DUP-20201204
Sample Date	12/09/2019	02/17/2020	02/17/2020	04/27/2020	04/27/2020	07/29/2020	07/29/2020	12/04/2020	12/04/2020
Lab Sample ID	19110682-010	20020491-001	20020491-010	20041232-001	20041232-010	20070966-001	20070966-010	20120358-001	20120358-010
Chloride (mg/L)	-	-	-	-	-	-	-	-	-
Cyanide (mg/L)	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Fluoride (mg/L)	-	-	-	-	-	-	-	-	-
Nitrate (as N) (mg/L)	-	-	-	-	-	-	-	-	-
Nitrite (as N) (mg/L)	-	-	-	-	-	-	-	-	-
Sulfate (mg/L)	-	-	-	-	-	-	-	-	-
Total Dissolved Solids (TDS) (mg/L)	**82 H**	**162**	**168**	**160**	**160**	**178**	**168**	**238**	**248**
Field Parameters									
Temperature, Field (Deg C)	**14.9**	**13.7**	**13.7**	**13.5**	**13.5**	**15**	**15**	**14.5**	**14.5**
Temperature, Field (Deg F)	-	-	-	-	-	-	-	-	-
Dissolved Oxygen, Field (mg/L)	-	-	-	-	-	-	-	-	-
Oxidation Reduction Potential (ORP), Field (mv)	-	-	-	-	-	-	-	-	-
Turbidity, Field (NTU)	-	-	-	-	-	-	-	-	-
pH, Field (pH units)	**7.04**	**7.1**	**7.1**	**7.05**	**7.05**	**6.85**	**6.85**	**6.98**	**6.98**
Specific Conductance, Field (umhos/cm)	**248**	**266**	**266**	**320**	**320**	**266**	**266**	**462**	**462**
Bottom of Well (ft)	-	-	-	-	-	-	-	-	-
Depth to Groundwater (ft)	-	-	-	-	-	-	-	-	-
Depth to Groundwater from Measuring Point (ft)	**16.92**	**16.13**	**16.13**	**15**	**15**	**14.84**	**14.84**	**20.85**	**20.85**
Ground Water Elevation (ft)	-	-	-	-	-	-	-	-	-
MEASURING POINT ELEVATION (ft)	-	-	-	-	-	-	-	-	-

Notes:
- - Not tested.
B - analyte detected in the sample and the associated blank.
ft - feet.
H - holding time exceeded.
J - value is estimated.
mg/L - miligrams per liter.
mv - millivolts.
N - Nitrogen.
S - Spike Recovery outside recovery limits.
U - not detected, value is the reporting limit.
umhos/cm - micromhos per centimeter.

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Upgradient Wells								
Location Name	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1
Sample Name	APW-1-20210126	APW-1 DUP-20210126	APW-1-20210630	APW-1 DUP-20210630	APW-1-20210917	APW-1 DUP-20210917	APW-1-20211111	APW-1 DUP-20211111	APW-1-20220317
Sample Date	01/26/2021	01/26/2021	06/30/2021	06/30/2021	09/17/2021	09/17/2021	11/11/2021	11/11/2021	03/17/2022
Lab Sample ID	21011338-001	21011338-010	21070002-001	21070002-007	21080633-001	21080633-010	21110002-001	21110002-010	22020001-001
Inorganic Compounds (mg/L)									
Antimony, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Barium, Dissolved	**0.014**	**0.014**	**0.0232**	**0.0223**	**0.0179**	**0.0179**	**0.011**	**0.0114**	**0.0094**
Beryllium, Dissolved	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Dissolved	**0.0739**	**0.0758**	**0.0559**	**0.0524**	**0.0427**	**0.0421**	**0.0483**	**0.0561**	**0.0619**
Cadmium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Cobalt, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Copper, Dissolved	0.005 UB	0.005 UB	**0.0068**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Iron, Dissolved	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Lead, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Manganese, Dissolved	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Mercury, Dissolved	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Dissolved	**0.002 J**	0.005 U	**0.0035 J**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Selenium, Dissolved	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Silver, Dissolved	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Vanadium, Dissolved	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Zinc, Dissolved	0.01 U	0.01 U	**0.0061 J**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Antimony, Total	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	**0.0005 J**	0.001 U	0.001 U
Arsenic, Total	**0.0026**	**0.002**	**0.0005 J**	0.001 U	**0.0013**	**0.0009 J**	**0.0053**	**0.0043**	**0.0013**
Barium, Total	**0.0251**	**0.0229**	**0.025**	**0.0251**	**0.0242**	**0.0229**	**0.0378**	**0.0334**	**0.0159**
Beryllium, Total	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	**0.0003 J**	**0.0002 J**	0.0005 U
Boron, Total	**0.0839**	**0.0934**	**0.0572**	**0.0565**	**0.0492**	**0.0468**	**0.0563**	**0.0623**	**0.0604**
Cadmium, Total	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Total	**0.0033 J**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**0.0067**	**0.0059**	**0.0042 J**
Cobalt, Total	**0.0076**	**0.006**	0.005 U	0.005 U	**0.0029 J**	**0.0026 J**	**0.0182**	**0.015**	**0.003 J**
Copper, Total	**0.0061**	**0.0046 J**	**0.002 J**	**0.0017 J**	**0.003 J**	**0.0023 J**	**0.0115**	**0.0092**	**0.0029 J**
Iron, Total	**3.52**	**2.79**	**0.496**	**0.481**	**1.4**	**1**	**8.31**	**6.96**	**1.64**
Lead, Total	**0.0047**	**0.0038**	**0.0007 J**	**0.0007 J**	**0.0028**	**0.0021**	**0.0095**	**0.0079**	**0.0018**
Manganese, Total	**0.329**	**0.259**	**0.0442**	**0.0379**	**0.145**	**0.122**	**0.887**	**0.735**	**0.111**
Mercury, Total	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Total	**0.0127**	**0.0108**	0.005 U	0.005 U	**0.0066**	**0.0063**	**0.0315**	**0.0266**	**0.0069**
Selenium, Total	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Silver, Total	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Total	0.002 U	0.002 U	**0.0016 J**	0.002 U	0.002 U	**0.0011 J**	0.002 U	0.002 U	0.002 U
Vanadium, Total	**0.0047 J**	**0.0038 J**	**0.0012 J**	**0.0012 J**	**0.0029 J**	**0.002 J**	**0.0104**	**0.0086 J**	**0.0033 J**
Zinc, Total	**0.0148**	**0.0114**	0.01 U	**0.0064 J**	0.01 U	0.01 U	**0.0276**	**0.023**	**0.0098 J**
Other									
Chloride, Dissolved (mg/L)	**39**	**38**	**100**	**93**	**111**	**115**	**91**	**91**	**46**
Cyanide, Dissolved (mg/L)	-	-	-	-	-	-	-	-	-
Fluoride, Dissolved (mg/L)	**0.14**	**0.14**	**0.13**	**0.13**	**0.21**	**0.2**	**0.29**	**0.29**	**0.23**
Nitrate (as N), Dissolved (mg/L)	**4.81**	**4.73**	**4.28**	**4.39**	**3.71**	**4.01**	**3.6**	**3.35**	**4.35**
Nitrite (as N), Dissolved (mg/L)	0.05 U	0.05 U	-	-	0.05 U	0.05 U	-	-	0.05 U
Sulfate, Dissolved (mg/L)	**18**	**18**	**11**	**11**	**13**	**16**	**16**	**17**	**11**
Total Dissolved Solids (TDS) (mg/L)	-	-	-	-	-	-	-	-	-

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Upgradient Wells								
Location Name	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1	APW-1
Sample Name	APW-1-20210126	APW-1 DUP-20210126	APW-1-20210630	APW-1 DUP-20210630	APW-1-20210917	APW-1 DUP-20210917	APW-1-20211111	APW-1 DUP-20211111	APW-1-20220317
Sample Date	01/26/2021	01/26/2021	06/30/2021	06/30/2021	09/17/2021	09/17/2021	11/11/2021	11/11/2021	03/17/2022
Lab Sample ID	21011338-001	21011338-010	21070002-001	21070002-007	21080633-001	21080633-010	21110002-001	21110002-010	22020001-001
Chloride (mg/L)	-	-	-	-	-	-	**91**	**91**	-
Cyanide (mg/L)	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Fluoride (mg/L)	-	-	-	-	-	-	**0.29**	**0.29**	-
Nitrate (as N) (mg/L)	-	-	-	-	-	-	**3.6**	**3.35**	-
Nitrite (as N) (mg/L)	-	-	-	-	-	-	-	-	-
Sulfate (mg/L)	-	-	-	-	-	-	**16**	**17**	-
Total Dissolved Solids (TDS) (mg/L)	**252**	**240**	**298**	**316**	**374**	**386**	**348**	**346**	**208**
Field Parameters									
Temperature, Field (Deg C)	**14.2**	**14.2**	**14.2**	**14.2**	**15.9**	**15.9**	**15.5**	**15.5**	**14.5**
Temperature, Field (Deg F)	-	-	-	-	-	-	-	-	-
Dissolved Oxygen, Field (mg/L)	-	-	-	-	-	-	-	-	**7.99**
Oxidation Reduction Potential (ORP), Field (mv)	-	-	-	-	-	-	-	-	**36**
Turbidity, Field (NTU)	-	-	-	-	-	-	-	-	**29**
pH, Field (pH units)	**6.98**	**6.98**	**6.36**	**6.36**	**7.02**	**7.02**	**7.04**	**7.04**	**6.93**
Specific Conductance, Field (umhos/cm)	**441**	**441**	**629**	**629**	**1030**	**1030**	**555**	**555**	**491**
Bottom of Well (ft)	-	-	-	-	-	-	-	-	**421.23**
Depth to Groundwater (ft)	-	-	-	-	-	-	-	-	**14.53**
Depth to Groundwater from Measuring Point (ft)	**21.44**	**21.44**	**17.8**	**17.8**	**17.19**	**17.19**	**17.78**	**17.78**	**17.69**
Ground Water Elevation (ft)	-	-	-	-	-	-	-	-	**431.57**
MEASURING POINT ELEVATION (ft)	-	-	-	-	-	-	-	-	**449.26**

Notes:
- - Not tested.
B - analyte detected in the sample and the associated blank.
ft - feet.
H - holding time exceeded.
J - value is estimated.
mg/L - miligrams per liter.
mv - millivolts.
N - Nitrogen.
S - Spike Recovery outside recovery limits.
U - not detected, value is the reporting limit.
umhos/cm - micromhos per centimeter.

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Upgradient Wells				Upgradient Wells				
Location Name	APW-1	APW-1	APW-1	APW-1	APW-5	APW-5	APW-5	APW-5	APW-5
Sample Name	APW-1 DUP-20220317	APW-1-20220622	APW-1-20220818	APW-1 DUP-20220818	APW-5-20170628	APW-5-20170919	APW-5-20171221	APW-5-20180321	APW-5-20180605
Sample Date	03/17/2022	06/22/2022	08/18/2022	08/18/2022	06/28/2017	09/19/2017	12/21/2017	03/21/2018	06/05/2018
Lab Sample ID	22020001-010	22050078-001	22080103-001	22080103-010	17060316-005	17081244-005	17111760-005	18030562-005	18051259-005
Inorganic Compounds (mg/L)									
Antimony, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	**0.0004 J**	**0.0003 J**	0.001 U	0.001 U
Arsenic, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	**0.0004 J**	**0.0003 J**	**0.0004 J**	**0.0003 J**	0.001 U
Barium, Dissolved	**0.0093**	**0.0193**	**0.0131**	**0.0131**	**0.0102**	**0.0069**	**0.0086**	**0.0096**	**0.0081**
Beryllium, Dissolved	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Dissolved	**0.0541**	**0.0553**	**0.0402**	**0.0362**	**0.116**	**0.104**	**0.0813**	**0.0947**	**0.089**
Cadmium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Cobalt, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Copper, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Iron, Dissolved	0.04 U	0.04 U	0.04 U	0.04 U	0.02 U	0.02 U	0.02 U	0.02 U	0.04 U
Lead, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	**0.0017**	0.001 U
Manganese, Dissolved	0.007 U	0.007 U	0.007 U	0.007 U	0.003 U	**0.0017 J**	**0.0012 J**	**0.0007 J**	0.007 U
Mercury, Dissolved	0.0002 U	**0.00008 J**	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Selenium, Dissolved	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Silver, Dissolved	0.007 U	0.007 U	0.007 U	0.007 U	0.005 U	0.005 U	0.005 U	0.005 U	0.007 U
Thallium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.002 U
Vanadium, Dissolved	0.01 U	0.01 U	0.01 U	0.01 U	**0.0018 J**	0.01 U	**0.0018 J**	0.01 U	0.01 U
Zinc, Dissolved	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Antimony, Total	0.001 U	0.001 U	0.001 U	0.001 U	**0.0004 J**	**0.0005 J**	**0.0004 J**	**0.0007 J**	0.001 U
Arsenic, Total	**0.001 J**	**0.0007 J**	**0.0009 J**	**0.0011**	**0.001**	**0.0026**	**0.0012**	**0.0039**	**0.0007 J**
Barium, Total	**0.0151**	**0.0238**	**0.0165**	**0.0164**	**0.0124**	**0.0161**	**0.0123**	**0.0304**	**0.0099**
Beryllium, Total	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Total	**0.0601**	**0.0577**	**0.041**	**0.0438**	**0.116**	**0.101**	**0.105**	**0.104**	**0.0953**
Cadmium, Total	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	**0.0005 J**	0.002 U
Chromium, Total	**0.0043 J**	0.005 U	0.005 U	0.005 U	0.005 U	**0.0028 J**	0.005 U	**0.0061**	0.005 U
Cobalt, Total	**0.003 J**	**0.0027 J**	0.005 U	0.005 U	**0.003 J**	**0.0112**	**0.0065**	**0.0265**	**0.0028 J**
Copper, Total	**0.0021 J**	**0.002 J**	**0.0021 J**	**0.0024 J**	**0.002 J**	**0.0062**	**0.0027 J**	**0.013**	0.005 U
Iron, Total	**1.5**	**0.933 B**	**0.624**	**0.86**	**0.71**	**2.81**	**1.15**	**5.8 S**	**0.364**
Lead, Total	**0.0013**	**0.0016**	**0.0009 J**	**0.0014**	**0.001 J**	**0.0052**	**0.002**	**0.0078**	**0.0007 J**
Manganese, Total	**0.0993**	**0.119**	**0.0687**	**0.1**	**0.0911**	**0.485**	**0.241**	**1.15**	**0.067**
Mercury, Total	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Total	**0.0064**	**0.0053**	**0.0035 J**	**0.0042 J**	**0.0045 J**	**0.016**	**0.0079**	**0.0332**	**0.0018 J**
Selenium, Total	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Silver, Total	0.007 U	0.007 U	0.007 U	0.007 U	0.005 U	0.005 U	0.005 U	0.005 U	0.007 U
Thallium, Total	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.002 U
Vanadium, Total	**0.0027 J**	**0.0016 J**	**0.0017 J**	**0.002 J**	**0.002 J**	**0.006 J**	0.01 U	**0.0093 J**	**0.0012 J**
Zinc, Total	**0.0081 J**	**0.0052 J**	0.01 U	0.01 U	**0.0034 J**	**0.0111**	**0.0037 J**	**0.0173**	0.01 U
Other									
Chloride, Dissolved (mg/L)	**47**	**159**	**84**	**83**	**10**	**3 J**	**4 J**	**5**	**4 J**
Cyanide, Dissolved (mg/L)	-	-	-	-	-	-	-	-	-
Fluoride, Dissolved (mg/L)	**0.22**	**0.23**	**0.33**	**0.33**	**0.08 J**	**0.09 J**	**0.1 J**	**0.06 J**	**0.09 J**
Nitrate (as N), Dissolved (mg/L)	**4.35**	**2.29**	**6.11**	**6.19**	**1.54**	**1.48**	**2.26**	**1.66**	**1.51**
Nitrite (as N), Dissolved (mg/L)	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Sulfate, Dissolved (mg/L)	**11**	**15**	**12**	**12**	**25**	**14**	**51**	**36**	**20**
Total Dissolved Solids (TDS) (mg/L)	-	-	-	-	-	-	-	-	-

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Upgradient Wells				Upgradient Wells				
Location Name	APW-1	APW-1	APW-1	APW-1	APW-5	APW-5	APW-5	APW-5	APW-5
Sample Name	APW-1 DUP-20220317	APW-1-20220622	APW-1-20220818	APW-1 DUP-20220818	APW-5-20170628	APW-5-20170919	APW-5-20171221	APW-5-20180321	APW-5-20180605
Sample Date	03/17/2022	06/22/2022	08/18/2022	08/18/2022	06/28/2017	09/19/2017	12/21/2017	03/21/2018	06/05/2018
Lab Sample ID	22020001-010	22050078-001	22080103-001	22080103-010	17060316-005	17081244-005	17111760-005	18030562-005	18051259-005
Chloride (mg/L)	-	-	-	-	-	-	-	-	-
Cyanide (mg/L)	0.005 U	0.005 U	0.005 U	0.005 U	0.007 U	0.007 U	0.007 U	0.007 U	0.005 U
Fluoride (mg/L)	-	-	-	-	-	-	-	-	-
Nitrate (as N) (mg/L)	-	-	-	-	-	-	-	-	-
Nitrite (as N) (mg/L)	-	-	-	-	-	-	-	-	-
Sulfate (mg/L)	-	-	-	-	-	-	-	-	-
Total Dissolved Solids (TDS) (mg/L)	**204**	**420**	**392**	**390**	**338**	**244**	**300**	**318**	**298**
Field Parameters									
Temperature, Field (Deg C)	**14.5**	**14.5**	**13.6**	**13.6**	-	-	-	-	**15.5**
Temperature, Field (Deg F)	-	-	-	-	**61**	**61.9**	**61.9**	**59**	-
Dissolved Oxygen, Field (mg/L)	**7.99**	**8.82**	**7.32**	**7.32**	-	-	-	-	-
Oxidation Reduction Potential (ORP), Field (mv)	**36**	**134**	**155**	**155**	-	-	-	-	-
Turbidity, Field (NTU)	**29**	**22**	**8.4**	**8.4**	-	-	-	-	-
pH, Field (pH units)	**6.93**	**6.93**	**6.84**	**6.84**	**7.27**	**7.36**	**7.38**	**7.36**	**7.37**
Specific Conductance, Field (umhos/cm)	**491**	**685**	**711**	**711**	**572**	**430**	**547**	**562**	**574**
Bottom of Well (ft)	**421.23**	**421.22**	**421.25**	**421.25**	-	-	-	-	-
Depth to Groundwater (ft)	**17.69**	-	-	-	-	-	-	-	-
Depth to Groundwater from Measuring Point (ft)	**17.69**	**15.12**	**17.54**	**17.54**	**20.53**	**25.6**	**26.96**	**23.52**	**25.34**
Ground Water Elevation (ft)	**431.57**	**434.14**	**431.72**	**431.72**	-	-	-	-	-
MEASURING POINT ELEVATION (ft)	**449.26**	**449.26**	**449.26**	**449.26**	-	-	-	-	-

Notes:
- - Not tested.
B - analyte detected in the sample and the associated blank.
ft - feet.
H - holding time exceeded.
J - value is estimated.
mg/L - miligrams per liter.
mv - millivolts.
N - Nitrogen.
S - Spike Recovery outside recovery limits.
U - not detected, value is the reporting limit.
umhos/cm - micromhos per centimeter.

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Upgradient Wells									
Location Name	APW-5	APW-5	APW-5	APW-5	APW-5	APW-5	APW-5	APW-5	APW-5	APW-5
Sample Name	APW-5-20180920	APW-5-20181127	APW-5-20190129	APW-5-20190604	APW-5-20190827	APW-5-20191209	APW-5-20200217	APW-5-20200427	APW-5-20200729	APW-5-20201204
Sample Date	09/20/2018	11/27/2018	01/29/2019	06/04/2019	08/27/2019	12/09/2019	02/17/2020	04/27/2020	07/29/2020	12/04/2020
Lab Sample ID	18090767-005	18110867-005	19010743-005	19041781-005	19080444-005	19110682-005	20020491-005	20041232-005	20070966-005	20120358-005
Inorganic Compounds (mg/L)										
Antimony, Dissolved	0.001 UB	0.001 U	0.001 U	0.001 U	**0.0009 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic, Dissolved	**0.0005 J**	0.001 U	**0.0004 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Barium, Dissolved	**0.009**	**0.0093**	**0.0091**	**0.0108**	**0.0066**	**0.0079**	**0.0085**	**0.0088**	**0.0069**	**0.006**
Beryllium, Dissolved	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Dissolved	**0.0879**	**0.0903**	**0.106**	**0.0912**	**0.0897**	**0.0856**	**0.105**	**0.0748**	**0.0865**	**0.0788**
Cadmium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Cobalt, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Copper, Dissolved	0.005 U	0.005 UB	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Iron, Dissolved	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Lead, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Manganese, Dissolved	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	**0.0044 J**	0.007 U	0.007 U	0.007 U
Mercury, Dissolved	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Selenium, Dissolved	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Silver, Dissolved	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Vanadium, Dissolved	0.01 U	**0.0011 J**	0.01 U	**0.001 J**	**0.001 J**	0.01 U	**0.0013 J**	0.01 U	0.01 U	0.01 U
Zinc, Dissolved	0.01 U	0.01 UB	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Antimony, Total	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	**0.0005 J**	0.001 U	**0.0006 J**	0.001 U
Arsenic, Total	**0.0006 J**	**0.002**	**0.0008 J**	0.001 U	**0.0005 J**	**0.0006 J**	**0.0005 J**	**0.0007 J**	**0.001 J**	**0.0005 J**
Barium, Total	**0.0099**	**0.0151**	**0.0109**	**0.0118**	**0.0075**	**0.009**	**0.011**	**0.0107**	**0.0089**	**0.0067**
Beryllium, Total	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Total	**0.154**	**0.089**	**0.119**	**0.107**	**0.095**	**0.0893**	**0.0856**	**0.0814**	**0.079**	**0.0937**
Cadmium, Total	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Total	0.005 U	**0.0022 J**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Cobalt, Total	0.005 U	**0.0062**	**0.0021 J**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**0.0027 J**	0.005 U
Copper, Total	0.005 U	**0.0033 J**	**0.0014 J**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**0.0015 J**	0.005 U
Iron, Total	**0.211**	**1.86**	**0.273**	**0.214**	**0.16**	**0.261**	**0.599**	**0.472**	**0.951**	**0.0583**
Lead, Total	**0.0004 J**	**0.0033**	**0.0004 J**	0.001 U	0.001 U	0.001 U	**0.0007 J**	**0.0007 J**	**0.0013**	0.001 U
Manganese, Total	**0.0378**	**0.322**	**0.0336**	**0.0312**	**0.0202**	**0.0259**	**0.0703**	**0.0577**	**0.119**	**0.0074**
Mercury, Total	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	**0.00008 J**	0.0002 U	0.0002 U	0.0002 U
Nickel, Total	0.005 U	**0.0096**	0.005 U	0.005 U	0.005 U	0.005 U	**0.0028 J**	**0.003 J**	**0.0054**	0.005 U
Selenium, Total	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Silver, Total	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Total	0.002 U	0.002 U	0.002 UB	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Vanadium, Total	**0.002 J**	**0.0045 J**	**0.0014 J**	**0.002 J**	**0.0011 J**	**0.0013 J**	**0.0019 J**	**0.0016 J**	**0.0019 J**	0.01 U
Zinc, Total	0.01 U	**0.0086 J**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Other										
Chloride, Dissolved (mg/L)	**3 J**	**5**	**8**	**22**	**5**	**4 J**	**16**	**9**	**10**	**16**
Cyanide, Dissolved (mg/L)	-	-	-	-	-	-	-	-	-	-
Fluoride, Dissolved (mg/L)	**0.09 J**	**0.08 J**	**0.1 J**	**0.12**	**0.1**	**0.11**	**0.11**	**0.1**	**0.13**	**0.14**
Nitrate (as N), Dissolved (mg/L)	**2.07**	**2.09**	**2.29**	**1.07**	**1.58**	**1.87**	**2.09**	**2.66**	**2.13**	**3.35**
Nitrite (as N), Dissolved (mg/L)	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Sulfate, Dissolved (mg/L)	**73**	**83**	**70**	**25**	**19**	**48**	**47**	**51**	**37**	**26**
Total Dissolved Solids (TDS) (mg/L)	-	-	-	-	-	-	-	-	-	-

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Upgradient Wells									
Location Name	APW-5	APW-5	APW-5	APW-5	APW-5	APW-5	APW-5	APW-5	APW-5	APW-5
Sample Name	APW-5-20180920	APW-5-20181127	APW-5-20190129	APW-5-20190604	APW-5-20190827	APW-5-20191209	APW-5-20200217	APW-5-20200427	APW-5-20200729	APW-5-20201204
Sample Date	09/20/2018	11/27/2018	01/29/2019	06/04/2019	08/27/2019	12/09/2019	02/17/2020	04/27/2020	07/29/2020	12/04/2020
Lab Sample ID	18090767-005	18110867-005	19010743-005	19041781-005	19080444-005	19110682-005	20020491-005	20041232-005	20070966-005	20120358-005
Chloride (mg/L)	-	-	-	-	-	-	-	-	-	-
Cyanide (mg/L)	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Fluoride (mg/L)	-	-	-	-	-	-	-	-	-	-
Nitrate (as N) (mg/L)	-	-	-	-	-	-	-	-	-	-
Nitrite (as N) (mg/L)	-	-	-	-	-	-	-	-	-	-
Sulfate (mg/L)	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids (TDS) (mg/L)	**342**	**336**	**330**	**382**	**224**	**254 H**	**342**	**316**	**280**	**268**
Field Parameters										
Temperature, Field (Deg C)	**17.4**	**15.3**	**15**	**14.7**	**14.4**	**16.2**	**15.7**	**15.2**	**15.6**	**15.9**
Temperature, Field (Deg F)	-	-	-	-	-	-	-	-	-	-
Dissolved Oxygen, Field (mg/L)	-	-	-	-	-	-	-	-	-	-
Oxidation Reduction Potential (ORP), Field (mv)	-	-	-	-	-	-	-	-	-	-
Turbidity, Field (NTU)	-	-	-	-	-	-	-	-	-	-
pH, Field (pH units)	**7.37**	**7.34**	**7.2**	**7.19**	**7.17**	**7.41**	**7.35**	**7.45**	**7.59**	**7.32**
Specific Conductance, Field (umhos/cm)	**568**	**578**	**535**	**707**	**454**	**513**	**536**	**560**	**472**	**465**
Bottom of Well (ft)	-	-	-	-	-	-	-	-	-	-
Depth to Groundwater (ft)	-	-	-	-	-	-	-	-	-	-
Depth to Groundwater from Measuring Point (ft)	**25.79**	**25.71**	**23.75**	**10.53**	**20.65**	**22.45**	**21.28**	**20.65**	**20.92**	**26.91**
Ground Water Elevation (ft)	-	-	-	-	-	-	-	-	-	-
MEASURING POINT ELEVATION (ft)	-	-	-	-	-	-	-	-	-	-

Notes:
- - Not tested.
B - analyte detected in the sample and the associated blank.
ft - feet.
H - holding time exceeded.
J - value is estimated.
mg/L - miligrams per liter.
mv - millivolts.
N - Nitrogen.
S - Spike Recovery outside recovery limits.
U - not detected, value is the reporting limit.
umhos/cm - micromhos per centimeter.

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Upgradient Wells							Immediately Downgradient Wells	
Location Name	APW-5	APW-5	APW-5	APW-5	APW-5	APW-5	APW-5	APW-13	APW-13
Sample Name	APW-5-20210126	APW-5-20210630	APW-5-20210917	APW-5-20211111	APW-5-20220317	APW-5-20220622	APW-5-20220818	APW-13-20210723	APW-13-20220317
Sample Date	01/26/2021	06/30/2021	09/17/2021	11/11/2021	03/17/2022	06/22/2022	08/18/2022	07/23/2021	03/17/2022
Lab Sample ID	21011338-005	21070002-003	21080633-005	21110002-005	22020001-005	22050078-005	22080103-005	21071466-001	22020001-015
Inorganic Compounds (mg/L)									
Antimony, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	**0.0003**	0.001 U
Arsenic, Dissolved	**0.0004 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	**0.0001 J**	**0.0004 J**
Barium, Dissolved	**0.0071**	**0.0071**	**0.0055**	**0.0077**	**0.0063**	**0.0085**	**0.0069**	**0.056**	**0.0553**
Beryllium, Dissolved	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Dissolved	**0.0752**	**0.0824**	**0.0785**	**0.0752**	**0.0693**	**0.073**	**0.0806**	**6.95**	**7.13**
Cadmium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**0.0083**	**0.0083**
Cobalt, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Copper, Dissolved	0.005 UB	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Iron, Dissolved	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Lead, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	**0.0013**	0.0002 U	0.001 U
Manganese, Dissolved	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	**0.0177**	0.007 U
Mercury, Dissolved	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**0.0051**	0.005 U
Selenium, Dissolved	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	**0.0718**	**0.0873**
Silver, Dissolved	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.0004 U	0.002 U
Vanadium, Dissolved	**0.001 J**	0.01 U	0.01 U	0.01 U	**0.0013 J**	0.01 U	0.01 U	**0.001 J**	0.01 U
Zinc, Dissolved	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Antimony, Total	0.001 U	**0.0012**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic, Total	**0.0004 J**	0.001 U	**0.0006 J**	**0.0007 J**	**0.0008 J**	0.001 U	**0.0007 J**	**0.0017**	**0.0012**
Barium, Total	**0.0078**	**0.0072**	**0.0078**	**0.0105**	**0.0085**	**0.0095**	**0.0085**	**0.072**	**0.0599**
Beryllium, Total	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Total	**0.119**	**0.0866**	**0.11**	**0.0831**	**0.0826**	**0.0982**	**0.0884**	**7.98**	**7.46**
Cadmium, Total	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Total	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**0.0127**	**0.0143**
Cobalt, Total	0.005 U	0.005 U	**0.0025 J**	**0.0046 J**	**0.003 J**	0.005 U	0.005 U	**0.0026 J**	**0.0028 J**
Copper, Total	0.005 U	**0.0044 J**	0.005 U	0.005 U	**0.0017 J**	0.005 U	**0.0024 J**	**0.0024 J**	**0.0022 J**
Iron, Total	**0.064**	**0.039 J**	**0.467**	**0.42**	**0.499**	**0.108**	**0.388**	**2.57**	**1.06**
Lead, Total	0.001 U	0.001 U	**0.0009 J**	**0.0008 J**	**0.0008 J**	0.001 U	0.001 U	**0.0024**	**0.0011**
Manganese, Total	**0.0089**	**0.0117**	**0.0922**	**0.109**	**0.0653**	**0.019**	**0.0688**	**0.156**	**0.0683**
Mercury, Total	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Total	0.005 U	0.005 U	**0.0033 J**	**0.0046 J**	0.005 U	0.005 U	0.005 U	**0.0097**	**0.0056**
Selenium, Total	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	**0.0765**	**0.0892**
Silver, Total	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Total	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Vanadium, Total	**0.001 J**	0.01 U	**0.0013 J**	**0.0014 J**	**0.0017 J**	0.01 U	**0.0012 J**	**0.005 J**	**0.0031 J**
Zinc, Total	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Other									
Chloride, Dissolved (mg/L)	**7**	**6**	**6**	**5**	**3**	**2**	**2**	-	**20**
Cyanide, Dissolved (mg/L)	-	-	-	-	-	-	-	-	-
Fluoride, Dissolved (mg/L)	**0.13**	**0.15**	**0.17**	**0.18**	**0.17**	**0.19**	**0.18**	-	**0.06 J**
Nitrate (as N), Dissolved (mg/L)	**2.78**	**1.74**	**2.57 H**	**4.29**	**2.22**	**2.6**	**2.31**	-	**4.62**
Nitrite (as N), Dissolved (mg/L)	0.05 U	-	**0.01 J**	-	0.05 U	0.05 U	0.05 U	-	0.05 U
Sulfate, Dissolved (mg/L)	**34**	**35**	**25**	**29**	**24**	**37**	**20**	-	**205**
Total Dissolved Solids (TDS) (mg/L)	-	-	-	-	-	-	-	-	-

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Upgradient Wells							Immediately Downgradient Wells	
Location Name	APW-5	APW-5	APW-5	APW-5	APW-5	APW-5	APW-5	APW-13	APW-13
Sample Name	APW-5-20210126	APW-5-20210630	APW-5-20210917	APW-5-20211111	APW-5-20220317	APW-5-20220622	APW-5-20220818	APW-13-20210723	APW-13-20220317
Sample Date	01/26/2021	06/30/2021	09/17/2021	11/11/2021	03/17/2022	06/22/2022	08/18/2022	07/23/2021	03/17/2022
Lab Sample ID	21011338-005	21070002-003	21080633-005	21110002-005	22020001-005	22050078-005	22080103-005	21071466-001	22020001-015
Chloride (mg/L)	-	-	-	**5**	-	-	-	**21**	-
Cyanide (mg/L)	**0.001 J**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Fluoride (mg/L)	-	-	-	**0.18**	-	-	-	**0.08 J**	-
Nitrate (as N) (mg/L)	-	-	-	**4.29**	-	-	-	**4.45**	-
Nitrite (as N) (mg/L)	-	-	-	-	-	-	-	0.05 U	-
Sulfate (mg/L)	-	-	-	**29**	-	-	-	**175**	-
Total Dissolved Solids (TDS) (mg/L)	**260**	**258**	**216**	**320**	**238**	**330**	**272**	**592**	**572**
Field Parameters									
Temperature, Field (Deg C)	**15.4**	**14.1**	**15.5**	**15.8**	**15.5**	**15.3**	**16.1**	**13.9**	**14.8**
Temperature, Field (Deg F)	-	-	-	-	-	-	-	-	-
Dissolved Oxygen, Field (mg/L)	-	-	-	-	**5.52**	**2.27**	**6.77**	-	**8.48**
Oxidation Reduction Potential (ORP), Field (mv)	-	-	-	-	**-3**	**116**	**162**	-	**31**
Turbidity, Field (NTU)	-	-	-	-	**12**	**1.3**	**6**	-	**16**
pH, Field (pH units)	**7.33**	**6.87**	**7.3**	**7.19**	**7.42**	**7.27**	**7.38**	-	**7.03**
Specific Conductance, Field (umhos/cm)	**453**	**523**	**518**	**513**	**580**	**476**	**445**	-	**1120**
Bottom of Well (ft)	-	-	-	-	**420.23**	**420.28**	**420.27**	-	**429.26**
Depth to Groundwater (ft)	-	-	-	-	**20.04**	-	-	-	**27.69**
Depth to Groundwater from Measuring Point (ft)	**27.24**	**23.3**	**23.59**	**22.68**	**22.74**	**21.15**	**23.84**	**28.44**	**31.4**
Ground Water Elevation (ft)	-	-	-	-	**430.46**	**432.05**	**429.36**	-	**430.51**
MEASURING POINT ELEVATION (ft)	-	-	-	-	**453.2**	**453.2**	**453.2**	-	**461.91**

Notes:
- - Not tested.
B - analyte detected in the sample and the associated blank.
ft - feet.
H - holding time exceeded.
J - value is estimated.
mg/L - miligrams per liter.
mv - millivolts.
N - Nitrogen.
S - Spike Recovery outside recovery limits.
U - not detected, value is the reporting limit.
umhos/cm - micromhos per centimeter.

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Immediately Downgradient Wells		Downgradient						
Location Name	APW-13	APW-14	APW-10	APW-10	APW-10	APW-10	APW-10	APW-10	APW-10
Sample Name	APW-13-20220621	APW-14-20210723	APW-10-20180920	APW-10-20181127	APW-10-20190129	APW-10-20190604	APW-10-20190826	APW-10-20191209	APW-10-20200217
Sample Date	06/21/2022	07/23/2021	09/20/2018	11/27/2018	01/29/2019	06/04/2019	08/26/2019	12/09/2019	02/17/2020
Lab Sample ID	22050078-015	21071466-002	18091184-001	18110867-012	19010743-012	19041781-012	19080444-012	19110682-012	20020491-012
Inorganic Compounds (mg/L)									
Antimony, Dissolved	0.001 U	0.0002 U	0.001 UB	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic, Dissolved	**0.0005 J**	**0.0001 J**	**0.0012**	**0.0014**	**0.0019**	**0.0014**	**0.0015**	**0.0016**	**0.0013**
Barium, Dissolved	**0.0405**	**0.0444**	**0.0193**	**0.02**	**0.0217**	**0.0189**	**0.0158**	**0.0156**	**0.016**
Beryllium, Dissolved	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Dissolved	**5.27**	**3.28**	**1.12**	**1.27**	**1.1**	**1.02**	**0.821**	**0.819**	**0.924**
Cadmium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Dissolved	0.005 U	0.005 U	**0.0017 J**	**0.0021 J**	**0.0025 J**	0.005 U	0.005 U	0.005 U	0.005 U
Cobalt, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Copper, Dissolved	0.005 U	0.005 U	0.005 U	0.005 UB	**0.0018 J**	0.005 U	0.005 U	0.005 U	0.005 U
Iron, Dissolved	0.04 U	0.04 U	0.04 U	0.04 U	**0.535**	0.04 U	0.04 U	0.04 U	0.04 U
Lead, Dissolved	0.001 U	0.0002 U	0.001 U	0.001 U	**0.0009 J**	0.001 U	0.001 U	0.001 U	0.001 U
Manganese, Dissolved	0.007 U	**0.0084**	0.007 U	0.007 U	**0.0452**	0.007 U	0.007 U	0.007 U	0.007 U
Mercury, Dissolved	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	**0.00006 J**	0.0002 U	0.0002 U	**0.00009 J**
Nickel, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Selenium, Dissolved	**0.027 J**	**0.034 J**	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Silver, Dissolved	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Dissolved	0.002 U	0.0004 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Vanadium, Dissolved	**0.0013 J**	0.01 U	**0.0013 J**	**0.0019 J**	**0.003 J**	**0.0014 J**	**0.0013 J**	**0.0017 J**	**0.0019 J**
Zinc, Dissolved	0.01 U	0.01 U	0.01 U	0.01 UB	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Antimony, Total	0.001 U	**0.0006 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic, Total	**0.0006 J**	**0.0079**	**0.003**	**0.005**	**0.0036**	**0.0023**	**0.0025**	**0.0025**	**0.0019**
Barium, Total	**0.0438**	**0.092**	**0.0247**	**0.0327**	**0.0261**	**0.0221**	**0.0199**	**0.02**	**0.0211**
Beryllium, Total	0.0005 U	**0.0003 J**	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Total	**5.52**	**3.8**	**1.14**	**1.34**	**1.2**	**1.04**	**0.889**	**0.879**	**1.02**
Cadmium, Total	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Total	**0.0032 J**	**0.0131**	**0.0037 J**	**0.0074**	**0.0041 J**	0.005 U	0.005 U	**0.003 J**	0.005 U
Cobalt, Total	0.005 U	**0.0277**	**0.0037 J**	**0.0115**	**0.0063**	0.005 U	**0.0025 J**	**0.0026 J**	**0.0022 J**
Copper, Total	0.005 U	**0.0273**	**0.0031 J**	**0.0092**	**0.0044 J**	**0.0023 J**	**0.0018 J**	**0.0013 J**	**0.0013 J**
Iron, Total	**0.603**	**12.6**	**1.82**	**4.66**	**2.15**	**1.06**	**1.04**	**1.07**	**0.903**
Lead, Total	0.001 U	**0.0143**	**0.0024**	**0.0053**	**0.0028**	**0.0018**	**0.0013**	**0.0013**	**0.001**
Manganese, Total	**0.0266**	**1.13**	**0.141**	**0.387**	**0.164**	**0.0985**	**0.0773**	**0.0722**	**0.0685**
Mercury, Total	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Total	0.005 U	**0.0437**	**0.0064**	**0.0164**	**0.0067**	**0.0034 J**	**0.0046 J**	**0.0037 J**	**0.0036 J**
Selenium, Total	**0.02 J**	**0.033 J**	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Silver, Total	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Total	0.002 U	0.002 U	0.002 U	0.002 U	0.002 UB	0.002 U	0.002 U	0.002 U	0.002 U
Vanadium, Total	**0.0017 J**	**0.0157**	**0.0047 J**	**0.0093 J**	**0.005 J**	**0.0036 J**	**0.0031 J**	**0.0037 J**	**0.0034 J**
Zinc, Total	0.01 U	**0.0417**	**0.0081 J**	**0.0225**	**0.0084 J**	**0.0088 J**	**0.0066 J**	**0.0053 J**	0.01 U
Other									
Chloride, Dissolved (mg/L)	**6**	-	**3 J**	**3 J**	**3 J**	**4 J**	**3 J**	**2 J**	**3 J**
Cyanide, Dissolved (mg/L)	-	-	-	-	-	-	-	-	-
Fluoride, Dissolved (mg/L)	**0.06 J**	-	**0.04 J**	**0.04 J**	**0.05 J**	**0.06 J**	**0.05 J**	**0.04 J**	**0.04 J**
Nitrate (as N), Dissolved (mg/L)	**3.04**	-	**4.53**	**4.34**	**4.3**	**3.03**	**2.5**	**3.8**	**3.2**
Nitrite (as N), Dissolved (mg/L)	0.05 U	-	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Sulfate, Dissolved (mg/L)	**193**	-	**90 S**	**89**	**63**	**58**	**46**	**49**	**47**
Total Dissolved Solids (TDS) (mg/L)	-	-	-	-	-	-	-	-	-

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Immediately Downgradient Wells		Downgradient						
Location Name	APW-13	APW-14	APW-10	APW-10	APW-10	APW-10	APW-10	APW-10	APW-10
Sample Name	APW-13-20220621	APW-14-20210723	APW-10-20180920	APW-10-20181127	APW-10-20190129	APW-10-20190604	APW-10-20190826	APW-10-20191209	APW-10-20200217
Sample Date	06/21/2022	07/23/2021	09/20/2018	11/27/2018	01/29/2019	06/04/2019	08/26/2019	12/09/2019	02/17/2020
Lab Sample ID	22050078-015	21071466-002	18091184-001	18110867-012	19010743-012	19041781-012	19080444-012	19110682-012	20020491-012
Chloride (mg/L)	-	**7**	-	-	-	-	-	-	-
Cyanide (mg/L)	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Fluoride (mg/L)	-	**0.08 J**	-	-	-	-	-	-	-
Nitrate (as N) (mg/L)	-	**4.46**	-	-	-	-	-	-	-
Nitrite (as N) (mg/L)	-	0.05 U	-	-	-	-	-	-	-
Sulfate (mg/L)	-	**217**	-	-	-	-	-	-	-
Total Dissolved Solids (TDS) (mg/L)	**624**	**646**	**346**	**326**	**336**	**304**	**256**	**226 H**	**288**
Field Parameters									
Temperature, Field (Deg C)	**15.3**	**14.8**	**16.2**	**12.7**	**13.7**	**14.2**	**14.7**	**14.2**	**14.4**
Temperature, Field (Deg F)	-	-	-	-	-	-	-	-	-
Dissolved Oxygen, Field (mg/L)	**9.84**	-	-	-	-	-	-	-	-
Oxidation Reduction Potential (ORP), Field (mv)	**136**	-	-	-	-	-	-	-	-
Turbidity, Field (NTU)	**14**	-	-	-	-	-	-	-	-
pH, Field (pH units)	**7.06**	**7.01**	**7.63**	**7.56**	**7.44**	**7.55**	**7.61**	**7.74**	**7.66**
Specific Conductance, Field (umhos/cm)	**710**	**954**	**551**	**561**	**482**	**539**	**479**	**445**	**444**
Bottom of Well (ft)	**428.83**	-	-	-	-	-	-	-	-
Depth to Groundwater (ft)	-	-	-	-	-	-	-	-	-
Depth to Groundwater from Measuring Point (ft)	**30.2**	**25.98**	**30.35**	**30.74**	**28.11**	**14.92**	**26.81**	**27.5**	**25.64**
Ground Water Elevation (ft)	**431.35**	-	-	-	-	-	-	-	-
MEASURING POINT ELEVATION (ft)	**461.55**	-	-	-	-	-	-	-	-

Notes:
- - Not tested.
B - analyte detected in the sample and the associated blank.
ft - feet.
H - holding time exceeded.
J - value is estimated.
mg/L - miligrams per liter.
mv - millivolts.
N - Nitrogen.
S - Spike Recovery outside recovery limits.
U - not detected, value is the reporting limit.
umhos/cm - micromhos per centimeter.

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Downgradient								
Location Name	APW-10	APW-10	APW-10	APW-10	APW-10	APW-10	APW-10	APW-10	APW-10
Sample Name	APW-10-20200427	APW-10-20200729	APW-10-20201204	APW-10-20210126	APW-10-20210630	APW-10-20210917	APW-10-20211111	APW-10-20220317	APW-10-20220622
Sample Date	04/27/2020	07/29/2020	12/04/2020	01/26/2021	06/30/2021	09/17/2021	11/11/2021	03/17/2022	06/22/2022
Lab Sample ID	20041232-012	20070966-012	20120358-012	21011338-012	21070002-009	21080633-012	21110002-012	22020001-012	22050078-012
Inorganic Compounds (mg/L)									
Antimony, Dissolved	0.001 U	0.001 U	0.001 U	**0.0007 J**	**0.001**	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic, Dissolved	**0.0014**	**0.0015**	**0.0015**	**0.0018**	**0.0018**	**0.0014**	**0.0015**	**0.0012**	**0.0016**
Barium, Dissolved	**0.0166**	**0.0171**	**0.0179**	**0.0218**	**0.0189**	**0.0196**	**0.019**	**0.0222**	**0.0219**
Beryllium, Dissolved	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Dissolved	**0.702**	**0.68**	**1.53**	**2.05**	**1.7**	**1.92**	**2.08**	**2.12**	**2.3**
Cadmium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Dissolved	0.005 U	0.005 U	**0.004 J**	**0.0032 J**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Cobalt, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Copper, Dissolved	0.005 U	0.005 U	0.005 U	0.005 UB	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Iron, Dissolved	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Lead, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Manganese, Dissolved	0.007 U	0.007 U	0.007 U	**0.0073**	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Mercury, Dissolved	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Selenium, Dissolved	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	**0.018 J**	0.04 U
Silver, Dissolved	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	**0.0013 J**	0.002 U	0.002 U
Vanadium, Dissolved	**0.0014 J**	**0.0014 J**	0.01 U	**0.0016 J**	**0.0011 J**	**0.0012 J**	**0.0013 J**	**0.0017 J**	**0.0011 J**
Zinc, Dissolved	0.01 U	0.01 U	0.01 U	**0.0066 J**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Antimony, Total	0.001 U	0.001 U	0.001 U	**0.001 J**	0.001 U	0.001 U	**0.0018**	0.001 U	0.001 U
Arsenic, Total	**0.0029**	**0.0032**	**0.0023**	**0.0031**	**0.0024**	**0.0022**	**0.0364**	**0.0022**	**0.0025**
Barium, Total	**0.0242**	**0.0241**	**0.0223**	**0.0264**	**0.0202**	**0.0243**	**0.143**	**0.0265**	**0.0277**
Beryllium, Total	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	**0.0013**	0.0005 U	0.0005 U
Boron, Total	**0.73**	**0.695**	**1.8**	**2.13**	**1.79**	**2.06**	**2.38**	**2.29**	**2.39**
Cadmium, Total	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	**0.0012 J**	0.002 U	0.002 U
Chromium, Total	**0.0035 J**	**0.0033 J**	**0.0051**	**0.0047 J**	0.005 U	0.005 U	**0.0431**	**0.0044 J**	**0.0037 J**
Cobalt, Total	**0.0044 J**	**0.005**	**0.002 J**	**0.0048 J**	0.005 U	**0.0027 J**	**0.111**	**0.0032 J**	**0.0048 J**
Copper, Total	**0.0025 J**	**0.0037 J**	0.005 U	**0.0049 J**	0.005 U	**0.0021 J**	**0.0913**	**0.0026 J**	**0.0027 J**
Iron, Total	**1.63**	**1.66**	**0.653**	**1.41**	**0.341**	**0.748**	**44.5**	**0.924**	**1.22 B**
Lead, Total	**0.0021**	**0.0021**	**0.0012**	**0.0021**	0.001 U	**0.0013**	**0.0469**	**0.0012**	**0.0019**
Manganese, Total	**0.143**	**0.144**	**0.0606**	**0.135**	**0.0419**	**0.0718**	**3.43**	**0.0701**	**0.142**
Mercury, Total	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	**0.00008 J**	0.0002 U	0.0002 U
Nickel, Total	**0.0066**	**0.0075**	**0.0037 J**	**0.0065**	0.005 U	**0.0035 J**	**0.16**	**0.004 J**	**0.0057**
Selenium, Total	0.04 U	0.04 U	0.04 U	**0.017 J**	**0.017 J**	0.04 U	0.04 U	0.04 U	0.04 U
Silver, Total	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Total	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Vanadium, Total	**0.0051 J**	**0.0039 J**	**0.0024 J**	**0.004 J**	**0.002 J**	**0.0028 J**	**0.0622**	**0.0032 J**	**0.0033 J**
Zinc, Total	**0.007 J**	**0.0077 J**	0.01 U	**0.0074 J**	0.01 U	0.01 U	**0.168**	0.01 U	**0.0057 J**
Other									
Chloride, Dissolved (mg/L)	**3 J**	**2**	**3 J**	**5**	**5**	**7**	**7**	**6**	**5**
Cyanide, Dissolved (mg/L)	-	-	-	-	-	-	-	-	-
Fluoride, Dissolved (mg/L)	**0.04 J**	**0.05 J**	**0.04 J**	**0.03 J**	**0.05 J**	**0.05 J**	**0.06 J**	**0.05 J**	**0.06 J**
Nitrate (as N), Dissolved (mg/L)	**3.24**	**3.34**	**2.49**	**2.4**	**2.4**	**2.48**	**2.48**	**2.39**	**3.07**
Nitrite (as N), Dissolved (mg/L)	0.05 U	0.05 U	0.05 U	0.05 U	-	0.05 U	-	0.05 U	0.05 U
Sulfate, Dissolved (mg/L)	**51**	**58**	**93**	**91**	**82**	**95**	**97**	**126**	**117**
Total Dissolved Solids (TDS) (mg/L)	-	-	-	-	-	-	-	-	-

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Downgradient								
Location Name	APW-10	APW-10	APW-10	APW-10	APW-10	APW-10	APW-10	APW-10	APW-10
Sample Name	APW-10-20200427	APW-10-20200729	APW-10-20201204	APW-10-20210126	APW-10-20210630	APW-10-20210917	APW-10-20211111	APW-10-20220317	APW-10-20220622
Sample Date	04/27/2020	07/29/2020	12/04/2020	01/26/2021	06/30/2021	09/17/2021	11/11/2021	03/17/2022	06/22/2022
Lab Sample ID	20041232-012	20070966-012	20120358-012	21011338-012	21070002-009	21080633-012	21110002-012	22020001-012	22050078-012
Chloride (mg/L)	-	-	-	-	-	-	**7**	-	-
Cyanide (mg/L)	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Fluoride (mg/L)	-	-	-	-	-	-	**0.06 J**	-	-
Nitrate (as N) (mg/L)	-	-	-	-	-	-	**2.48**	-	-
Nitrite (as N) (mg/L)	-	-	-	-	-	-	-	-	-
Sulfate (mg/L)	-	-	-	-	-	-	**97**	-	-
Total Dissolved Solids (TDS) (mg/L)	**264**	**274**	**336**	**330**	**312**	**332**	**350**	**386**	**382**
Field Parameters									
Temperature, Field (Deg C)	**14.2**	**14.1**	**14.2**	**14**	**13.7**	**14.1**	**13.9**	**14.7**	**15.2**
Temperature, Field (Deg F)	-	-	-	-	-	-	-	-	-
Dissolved Oxygen, Field (mg/L)	-	-	-	-	-	-	-	**5.07**	**7.77**
Oxidation Reduction Potential (ORP), Field (mv)	-	-	-	-	-	-	-	**16**	**119**
Turbidity, Field (NTU)	-	-	-	-	-	-	-	**21**	**44**
pH, Field (pH units)	**7.68**	**7.75**	**7.52**	**7.48**	**7.11**	**7.41**	**7.54**	**7.39**	**7.54**
Specific Conductance, Field (umhos/cm)	**470**	**491**	**520**	**524**	**597**	**741**	**525**	**809**	**515**
Bottom of Well (ft)	-	-	-	-	-	-	-	**415.3**	**414.82**
Depth to Groundwater (ft)	-	-	-	-	-	-	-	**23.25**	-
Depth to Groundwater from Measuring Point (ft)	**25.19**	**26.11**	**32.31**	**32.56**	**28.31**	**29.52**	**26.84**	**27.05**	**25.97**
Ground Water Elevation (ft)	-	-	-	-	-	-	-	**430.85**	**431.48**
MEASURING POINT ELEVATION (ft)	-	-	-	-	-	-	-	**457.9**	**457.45**

Notes:
- - Not tested.
B - analyte detected in the sample and the associated blank.
ft - feet.
H - holding time exceeded.
J - value is estimated.
mg/L - miligrams per liter.
mv - millivolts.
N - Nitrogen.
S - Spike Recovery outside recovery limits.
U - not detected, value is the reporting limit.
umhos/cm - micromhos per centimeter.

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Downgradient									
Location Name	APW-10	APW-8	APW-8	APW-8	APW-8	APW-8	APW-8	APW-8	APW-8	APW-8
Sample Name	APW-10-20220818	APW-8-20170628	APW-8-20170919	APW-8-20171221	APW-8-20180321	APW-8-20180605	APW-8-20180920	APW-8-20181127	APW-8-20190129	APW-8-20190604
Sample Date	08/18/2022	06/28/2017	09/19/2017	12/21/2017	03/21/2018	06/05/2018	09/20/2018	11/27/2018	01/29/2019	06/04/2019
Lab Sample ID	22080103-012	17060316-008	17081244-008	17111760-008	18030562-008	18051259-008	18090767-008	18110867-008	19010743-008	19041781-008
Inorganic Compounds (mg/L)										
Antimony, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 UB	0.001 U	**0.0008 J**	0.001 U
Arsenic, Dissolved	**0.0016**	**0.0012**	**0.0011**	**0.0012**	**0.0012**	**0.0011**	**0.0015**	**0.0015**	**0.0013**	**0.0012**
Barium, Dissolved	**0.0231**	**0.0504**	**0.0666**	**0.0754**	**0.0748**	**0.0548**	**0.0658**	**0.0708**	**0.0692**	**0.0662**
Beryllium, Dissolved	0.0005 U	0.0005 U	0.0005 U	0.0005 U	**0.0017**	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Dissolved	**2.11**	**6.93**	**7.58**	**8.88**	**8.01**	**7.34**	**8.4**	**8.38**	**7.94**	**7.53**
Cadmium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Dissolved	0.005 U	**0.0076**	**0.0082**	**0.0091**	**0.0079**	**0.0089**	**0.0136**	**0.0132**	**0.0126**	**0.0117**
Cobalt, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Copper, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 UB	0.005 U	0.005 U
Iron, Dissolved	0.04 U	0.02 U	0.02 U	0.02 U	0.02 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Lead, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Manganese, Dissolved	0.007 U	0.003 U	0.003 U	0.003 U	0.003 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Mercury, Dissolved	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Selenium, Dissolved	0.04 U	**0.0551**	**0.0954**	**0.0963**	**0.091**	**0.0651**	**0.0811**	**0.0831**	**0.0809**	**0.0524**
Silver, Dissolved	0.007 U	0.005 U	0.005 U	0.005 U	0.005 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Dissolved	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Vanadium, Dissolved	0.01 U	0.01 U	**0.0017 J**	**0.0022 J**	0.01 U	**0.0017 J**	**0.0011 J**	**0.0014 J**	**0.0012 J**	**0.0032 J**
Zinc, Dissolved	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 UB	0.01 U	0.01 U
Antimony, Total	0.001 U	0.001 U	0.001 U	**0.0003 J**	0.001 U	0.001 U	0.001 U	**0.0006 J**	0.001 U	0.001 U
Arsenic, Total	**0.0059**	**0.0012**	**0.0024**	**0.0013**	**0.0017**	**0.0016**	**0.0023**	**0.0034**	**0.0015**	**0.0015**
Barium, Total	**0.0345**	**0.048**	**0.0845**	**0.0809**	**0.0828**	**0.058**	**0.0707**	**0.0802**	**0.0753**	**0.068**
Beryllium, Total	0.0005 U	0.0005 U	0.0005 U	0.0005 U	**0.0019**	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Total	**2.37**	**6.64**	**8.34**	**9.4**	**8.55**	**7.7**	**8.49**	**8.71**	**8.61**	**7.72**
Cadmium, Total	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Total	**0.006**	**0.0071**	**0.0112**	**0.0099**	**0.0089**	**0.0094**	**0.0144**	**0.0164**	**0.0142**	**0.0124**
Cobalt, Total	**0.0082**	0.005 U	**0.008**	**0.0024 J**	**0.0032 J**	0.005 U	0.005 U	**0.0057**	0.005 U	0.005 U
Copper, Total	**0.0084**	0.005 U	**0.0055**	0.005 U	**0.0019 J**	0.005 U	0.005 U	**0.0051**	0.005 U	0.005 U
Iron, Total	**3.97**	**0.106**	**1.87**	**0.241**	**0.698**	**0.132**	**0.667**	**1.96**	**0.142**	**0.135**
Lead, Total	**0.0056**	0.001 U	**0.0025**	**0.0004 J**	**0.0007 J**	**0.0003 J**	**0.0012**	**0.003**	**0.0003 J**	0.001 U
Manganese, Total	**0.288**	**0.0103**	**0.286**	**0.0369**	**0.0717**	**0.0175**	**0.0951**	**0.248**	**0.0151**	**0.014**
Mercury, Total	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Total	**0.0122**	0.005 U	**0.0107**	**0.0022 J**	**0.0027 J**	0.005 U	**0.0041 J**	**0.0084**	0.005 U	0.005 U
Selenium, Total	**0.018 J**	**0.0613**	**0.0903**	**0.111**	**0.0904**	**0.0747**	**0.0859**	**0.0755**	**0.0822**	**0.0517**
Silver, Total	0.007 U	0.005 U	0.005 U	0.005 U	0.005 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Total	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.002 U	0.002 U	0.002 U	0.002 UB	0.002 U
Vanadium, Total	**0.0069 J**	**0.0029 J**	**0.0056 J**	0.01 U	0.01 U	**0.0011 J**	**0.0034 J**	**0.0054 J**	**0.0015 J**	**0.0032 J**
Zinc, Total	**0.0137**	0.01 U	**0.0101**	0.01 U	0.01 U	0.01 U	0.01 U	**0.0109**	0.01 U	0.01 U
Other										
Chloride, Dissolved (mg/L)	**4**	**8**	**16**	**16**	**13**	**6**	**6**	**6**	**4 J**	**5**
Cyanide, Dissolved (mg/L)	-	-	-	-	-	-	-	-	-	-
Fluoride, Dissolved (mg/L)	**0.05 J**	**0.15**	**0.12**	**0.1**	**0.11**	**0.08 J**	**0.1 J**	**0.08 J**	**0.11**	**0.15**
Nitrate (as N), Dissolved (mg/L)	**3.19**	**3.48**	**4.7**	**5.59**	**5.18**	**4.49**	**3.87**	**3.95**	**3.86**	**3.89**
Nitrite (as N), Dissolved (mg/L)	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Sulfate, Dissolved (mg/L)	**116**	**214**	**421**	**403**	**353**	**245**	**351**	**338**	**304**	**249**
Total Dissolved Solids (TDS) (mg/L)	-	-	-	-	-	-	-	-	-	-

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Downgradient									
Location Name	APW-10	APW-8	APW-8	APW-8	APW-8	APW-8	APW-8	APW-8	APW-8	APW-8
Sample Name	APW-10-20220818	APW-8-20170628	APW-8-20170919	APW-8-20171221	APW-8-20180321	APW-8-20180605	APW-8-20180920	APW-8-20181127	APW-8-20190129	APW-8-20190604
Sample Date	08/18/2022	06/28/2017	09/19/2017	12/21/2017	03/21/2018	06/05/2018	09/20/2018	11/27/2018	01/29/2019	06/04/2019
Lab Sample ID	22080103-012	17060316-008	17081244-008	17111760-008	18030562-008	18051259-008	18090767-008	18110867-008	19010743-008	19041781-008
Chloride (mg/L)	-	-	-	-	-	-	-	-	-	-
Cyanide (mg/L)	0.005 U	0.007 U	0.007 U	0.007 U	0.007 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Fluoride (mg/L)	-	-	-	-	-	-	-	-	-	-
Nitrate (as N) (mg/L)	-	-	-	-	-	-	-	-	-	-
Nitrite (as N) (mg/L)	-	-	-	-	-	-	-	-	-	-
Sulfate (mg/L)	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids (TDS) (mg/L)	**408**	**554**	**832**	**806**	**780**	**600**	**696**	**704**	**678**	**600**
Field Parameters										
Temperature, Field (Deg C)	**15.5**	-	-	-	-	**14.7**	**16.1**	**12.8**	**13.1**	**13.9**
Temperature, Field (Deg F)	-	**57.9**	**57.7**	**56.8**	**56.3**	-	-	-	-	-
Dissolved Oxygen, Field (mg/L)	**8.15**	-	-	-	-	-	-	-	-	-
Oxidation Reduction Potential (ORP), Field (mv)	**180**	-	-	-	-	-	-	-	-	-
Turbidity, Field (NTU)	**84**	-	-	-	-	-	-	-	-	-
pH, Field (pH units)	**7.47**	**7.36**	**7.36**	**7.42**	**7.29**	**7.43**	**7.31**	**7.35**	**7.23**	**7.36**
Specific Conductance, Field (umhos/cm)	**588**	**790**	**1130**	**1157**	**1074**	**995**	**984**	**1021**	**888**	**891**
Bottom of Well (ft)	**414.85**	-	-	-	-	-	-	-	-	-
Depth to Groundwater (ft)	-	-	-	-	-	-	-	-	-	-
Depth to Groundwater from Measuring Point (ft)	**29.49**	**32.44**	**38.24**	**39**	**34.32**	**37.87**	**37.17**	**37.36**	**34.96**	**21.08**
Ground Water Elevation (ft)	**427.96**	-	-	-	-	-	-	-	-	-
MEASURING POINT ELEVATION (ft)	**457.45**	-	-	-	-	-	-	-	-	-

Notes:
- - Not tested.
B - analyte detected in the sample and the associated blank.
ft - feet.
H - holding time exceeded.
J - value is estimated.
mg/L - miligrams per liter.
mv - millivolts.
N - Nitrogen.
S - Spike Recovery outside recovery limits.
U - not detected, value is the reporting limit.
umhos/cm - micromhos per centimeter.

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Downgradient									
Location Name	APW-8	APW-8	APW-8	APW-8	APW-8	APW-8	APW-8	APW-8	APW-8	APW-8
Sample Name	APW-8-20190826	APW-8-20191209	APW-8-20200217	APW-8-20200427	APW-8-20200729	APW-8-20201204	APW-8-20210126	APW-8-20210630	APW-8-20210917	APW-8-20211111
Sample Date	08/26/2019	12/09/2019	02/17/2020	04/27/2020	07/29/2020	12/04/2020	01/26/2021	06/30/2021	09/17/2021	11/11/2021
Lab Sample ID	19080444-008	19110682-008	20020491-008	20041232-008	20070966-008	20120358-008	21011338-008	21070002-005	21080633-008	21110002-008
Inorganic Compounds (mg/L)										
Antimony, Dissolved	0.001 U	**0.001 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic, Dissolved	**0.0012**	**0.0013**	**0.0011**	**0.0014**	**0.0016**	**0.0013**	**0.0015**	**0.0013**	**0.0011**	**0.0011**
Barium, Dissolved	**0.0696**	**0.0629**	**0.0586**	**0.0662**	**0.0573**	**0.0684**	**0.0644**	**0.0676**	**0.0526**	**0.0749**
Beryllium, Dissolved	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Dissolved	**6.76**	**7.63**	**5.59**	**7.58**	**7.03**	**6.98**	**7.09**	**6.26**	**6.06**	**6.91**
Cadmium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Dissolved	**0.0085**	**0.0117**	**0.0067**	**0.0079**	**0.008**	**0.0105**	**0.0087**	**0.008**	**0.0071**	**0.0147**
Cobalt, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Copper, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 UB	0.005 U	0.005 U	0.005 U
Iron, Dissolved	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Lead, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Manganese, Dissolved	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Mercury, Dissolved	**0.0001 J**	0.0002 U	**0.00008 J**	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Selenium, Dissolved	**0.0616**	**0.0839**	**0.0582**	**0.0753**	**0.0677**	**0.093**	**0.0885**	**0.0774**	**0.0573**	**0.0834**
Silver, Dissolved	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Vanadium, Dissolved	**0.0027 J**	**0.0022 J**	**0.003 J**	**0.0024 J**	**0.0017 J**	**0.0013 J**	**0.0015 J**	0.01 U	0.01 U	0.01 U
Zinc, Dissolved	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.0076 J**	0.01 U	0.01 U
Antimony, Total	**0.0011**	**0.0057**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	**0.0005 J**
Arsenic, Total	**0.0018**	**0.0301**	**0.0013**	**0.0016**	**0.0022**	**0.0015**	**0.0017**	**0.0016**	**0.0013**	**0.0024**
Barium, Total	**0.0784**	**0.185**	**0.0645**	**0.0723**	**0.0639**	**0.074**	**0.0671**	**0.0742**	**0.0558**	**0.0917**
Beryllium, Total	0.0005 U	**0.0009**	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Total	**7.12**	**8.02**	**6.08**	**7.85**	**7.34**	**8.1**	**7.37**	**6.99**	**6.31**	**7.7**
Cadmium, Total	0.002 U	**0.001 J**	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Total	**0.0102**	**0.0438**	**0.008**	**0.0092**	**0.0097**	**0.0112**	**0.0088**	**0.0079**	**0.0074**	**0.0185**
Cobalt, Total	**0.0022 J**	**0.0771**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**0.0043 J**
Copper, Total	**0.0021 J**	**0.0815**	0.005 U	0.005 U	**0.0013 J**	0.005 U	0.005 U	**0.0015 J**	0.005 U	**0.003 J**
Iron, Total	**0.901**	**41.7**	**0.112**	**0.164**	**0.598**	**0.106**	**0.0746**	**0.0992**	**0.0725**	**1.79**
Lead, Total	**0.0016**	**0.0484**	0.001 U	0.001 U	**0.0008 J**	0.001 U	0.001 U	0.001 U	0.001 U	**0.0021**
Manganese, Total	**0.0556**	**2.71**	**0.0124**	**0.0197**	**0.0608**	**0.0175**	**0.0102**	**0.0132**	**0.0166**	**0.149**
Mercury, Total	0.0002 U	**0.00014 J**	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Total	**0.0037 J**	**0.12**	0.005 U	**0.0016 J**	**0.0034 J**	**0.0021 J**	0.005 U	**0.004 J**	0.005 U	**0.0072**
Selenium, Total	**0.0672**	**0.0815**	**0.0643**	**0.0717**	**0.0689**	**0.101**	**0.0867**	**0.085**	**0.0722**	**0.0943**
Silver, Total	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Total	0.002 U	**0.001 J**	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Vanadium, Total	**0.0037 J**	**0.0522**	**0.0021 J**	**0.0026 J**	**0.0026 J**	**0.0019 J**	**0.0015 J**	**0.0013 J**	0.01 U	**0.0035 J**
Zinc, Total	**0.0085 J**	**0.145**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	**0.0058 J**
Other										
Chloride, Dissolved (mg/L)	**10**	**18**	**10**	**9**	**8**	**13**	**10**	**8**	**9**	**13**
Cyanide, Dissolved (mg/L)	-	-	-	-	-	-	-	-	-	-
Fluoride, Dissolved (mg/L)	**0.15**	**0.19**	**0.14**	**0.16**	**0.24**	**0.09 J**	**0.1 J**	**0.1 J**	**0.1**	**0.08 J**
Nitrate (as N), Dissolved (mg/L)	**4.07**	**5.39**	**3.78**	**3.9**	**3.73**	**4.91**	**5.77**	**4.45**	**3.98**	**5.27**
Nitrite (as N), Dissolved (mg/L)	0.05 U	**0.01 J**	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	-	0.05 U	-
Sulfate, Dissolved (mg/L)	**367**	**389**	**281**	**363**	**334**	**297**	**258**	**229**	**230**	**327**
Total Dissolved Solids (TDS) (mg/L)	-	-	-	-	-	-	-	-	-	-

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Downgradient									
Location Name	APW-8	APW-8	APW-8	APW-8	APW-8	APW-8	APW-8	APW-8	APW-8	APW-8
Sample Name	APW-8-20190826	APW-8-20191209	APW-8-20200217	APW-8-20200427	APW-8-20200729	APW-8-20201204	APW-8-20210126	APW-8-20210630	APW-8-20210917	APW-8-20211111
Sample Date	08/26/2019	12/09/2019	02/17/2020	04/27/2020	07/29/2020	12/04/2020	01/26/2021	06/30/2021	09/17/2021	11/11/2021
Lab Sample ID	19080444-008	19110682-008	20020491-008	20041232-008	20070966-008	20120358-008	21011338-008	21070002-005	21080633-008	21110002-008
Chloride (mg/L)	-	-	-	-	-	-	-	-	-	**13**
Cyanide (mg/L)	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Fluoride (mg/L)	-	-	-	-	-	-	-	-	-	**0.08 J**
Nitrate (as N) (mg/L)	-	-	-	-	-	-	-	-	-	**5.27**
Nitrite (as N) (mg/L)	-	-	-	-	-	-	-	-	-	-
Sulfate (mg/L)	-	-	-	-	-	-	-	-	-	**327**
Total Dissolved Solids (TDS) (mg/L)	**766**	**756 H**	**622**	**736**	**624**	**724**	**634**	**578**	**508**	**696**
Field Parameters										
Temperature, Field (Deg C)	**14.8**	**13.8**	**14.3**	**14**	**14.1**	**14.1**	**13.6**	**13.6**	**14.1**	**14.2**
Temperature, Field (Deg F)	-	-	-	-	-	-	-	-	-	-
Dissolved Oxygen, Field (mg/L)	-	-	-	-	-	-	-	-	-	-
Oxidation Reduction Potential (ORP), Field (mv)	-	-	-	-	-	-	-	-	-	-
Turbidity, Field (NTU)	-	-	-	-	-	-	-	-	-	-
pH, Field (pH units)	**7.36**	**7.56**	**7.46**	**7.39**	**7.5**	**7.38**	**7.33**	**6.99**	**7.36**	**7.09**
Specific Conductance, Field (umhos/cm)	**1110**	**1140**	**848**	**1040**	**964**	**971**	**881**	**946**	**999**	**944**
Bottom of Well (ft)	-	-	-	-	-	-	-	-	-	-
Depth to Groundwater (ft)	-	-	-	-	-	-	-	-	-	-
Depth to Groundwater from Measuring Point (ft)	**34.06**	**33.96**	**32.54**	**32.41**	**33.36**	**39.08**	**39.25**	**34.72**	**36.58**	**33.32**
Ground Water Elevation (ft)	-	-	-	-	-	-	-	-	-	-
MEASURING POINT ELEVATION (ft)	-	-	-	-	-	-	-	-	-	-

Notes:
- - Not tested.
B - analyte detected in the sample and the associated blank.
ft - feet.
H - holding time exceeded.
J - value is estimated.
mg/L - miligrams per liter.
mv - millivolts.
N - Nitrogen.
S - Spike Recovery outside recovery limits.
U - not detected, value is the reporting limit.
umhos/cm - micromhos per centimeter.

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Downgradient									
Location Name	APW-8	APW-8	APW-8	APW-6	APW-6	APW-6	APW-6	APW-6	APW-6	APW-6
Sample Name	APW-8-20220317	APW-8-20220622	APW-8-20220818	APW-6-20170628	APW-6-20170919	APW-6-20171221	APW-6-20180321	APW-6-20180605	APW-6-20180920	APW-6-20181127
Sample Date	03/17/2022	06/22/2022	08/18/2022	06/28/2017	09/19/2017	12/21/2017	03/21/2018	06/05/2018	09/20/2018	11/27/2018
Lab Sample ID	22020001-008	22050078-008	22080103-008	17060316-006	17081244-006	17111760-006	18030562-006	18051259-006	18090767-006	18110867-006
Inorganic Compounds (mg/L)										
Antimony, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	**0.0003 J**	0.001 U	0.001 U	0.001 U	0.001 UB	0.001 U
Arsenic, Dissolved	**0.0012**	**0.0012**	**0.0013**	**0.0006 J**	**0.0006 J**	**0.0007 J**	**0.0006 J**	**0.0005 J**	**0.0007 J**	**0.0006 J**
Barium, Dissolved	**0.0538**	**0.0706**	**0.0676**	**0.0164**	**0.0128**	**0.013**	**0.015**	**0.0132**	**0.0132**	**0.0151**
Beryllium, Dissolved	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	**0.0004 J**	0.0005 U	0.0005 U	0.0005 U
Boron, Dissolved	**7.02**	**6.05**	**6.96**	**0.378**	**1.69**	**0.471**	**1.81**	**0.48**	**0.216**	**0.194**
Cadmium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Dissolved	**0.0256**	**0.0072**	**0.0108**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Cobalt, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Copper, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 UB
Iron, Dissolved	0.04 U	0.04 U	0.04 U	0.02 U	0.02 U	0.02 U	0.02 U	0.04 U	0.04 U	**0.022 J**
Lead, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Manganese, Dissolved	0.007 U	0.007 U	0.007 U	0.003 U	**0.0016 J**	**0.0026 J**	**0.0028 J**	0.007 U	0.007 U	**0.0026 J**
Mercury, Dissolved	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Selenium, Dissolved	**0.0583**	**0.0698**	**0.0614**	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Silver, Dissolved	0.007 U	0.007 U	0.007 U	0.005 U	0.005 U	0.005 U	0.005 U	0.007 U	0.007 U	0.007 U
Thallium, Dissolved	0.002 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.002 U	0.002 U	0.002 U
Vanadium, Dissolved	**0.0015 J**	**0.0011 J**	**0.001 J**	**0.0021 J**	0.01 U	**0.0017 J**	0.01 U	**0.0016 J**	**0.0011 J**	**0.0013 J**
Zinc, Dissolved	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 UB
Antimony, Total	0.001 U	0.001 U	0.001 U	**0.0004 J**	**0.0004 J**	**0.0004 J**	**0.0005 J**	0.001 U	0.001 U	0.001 U
Arsenic, Total	**0.0016**	**0.0014**	**0.0022**	**0.0019**	**0.0015**	**0.0015**	**0.0027**	**0.0007 J**	**0.0015**	**0.0013**
Barium, Total	**0.0583**	**0.0748**	**0.0781**	**0.0193**	**0.0174**	**0.016**	**0.027**	**0.0146**	**0.0161**	**0.018**
Beryllium, Total	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	**0.0006**	0.0005 U	0.0005 U	0.0005 U
Boron, Total	**7.38**	**6.2**	**7.91**	**0.424**	**1.82**	**0.55**	**1.91**	**0.482**	**0.252**	**0.17**
Cadmium, Total	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Total	**0.0278**	**0.0078**	**0.0138**	0.005 U	**0.0026 J**	0.005 U	**0.0049 J**	0.005 U	**0.0015 J**	**0.0019 J**
Cobalt, Total	**0.002 J**	0.005 U	**0.002 J**	**0.0025 J**	**0.0023 J**	**0.004 J**	**0.0077**	0.005 U	**0.0026 J**	0.005 U
Copper, Total	0.005 U	0.005 U	**0.0041 J**	**0.0022 J**	**0.0026 J**	**0.0023 J**	**0.0086**	0.005 U	**0.0028 J**	**0.0027 J**
Iron, Total	**0.13**	**0.124**	**0.926**	**0.962**	**1.49**	**1.28**	**3.82**	**0.164**	**1.34**	**1.16**
Lead, Total	0.001 U	0.001 U	**0.0013**	**0.0011**	**0.0019**	**0.0018**	**0.004**	**0.0003 J**	**0.0019**	**0.0016**
Manganese, Total	**0.0156**	**0.0158**	**0.101**	**0.0604**	**0.102**	**0.0981**	**0.233**	**0.0158**	**0.108**	**0.0861**
Mercury, Total	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Total	0.005 U	0.005 U	**0.0049 J**	**0.0046 J**	**0.0054**	**0.0054**	**0.0103**	0.005 U	**0.0059**	**0.0033 J**
Selenium, Total	**0.0627**	**0.072**	**0.0819**	0.04 U	**0.021 J**	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Silver, Total	0.007 U	0.007 U	0.007 U	0.005 U	0.005 U	0.005 U	0.005 U	0.007 U	0.007 U	0.007 U
Thallium, Total	0.002 U	0.002 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.002 U	0.002 U	0.002 U
Vanadium, Total	**0.0017 J**	**0.001 J**	**0.0028 J**	**0.0032 J**	**0.0039 J**	0.01 U	**0.0065 J**	**0.0011 J**	**0.0042 J**	**0.0042 J**
Zinc, Total	0.01 U	0.01 U	0.01 U	**0.0052 J**	**0.0068 J**	**0.0063 J**	**0.0133**	0.01 U	**0.0058 J**	**0.007 J**
Other										
Chloride, Dissolved (mg/L)	**12**	**11**	**11**	**8**	**5**	**6**	**5 J**	**9**	**9**	**11**
Cyanide, Dissolved (mg/L)	-	-	-	-	-	-	-	-	-	-
Fluoride, Dissolved (mg/L)	**0.13**	**0.1**	**0.12**	**0.17**	**0.17**	**0.13**	**0.23**	**0.14**	**0.11**	**0.11**
Nitrate (as N), Dissolved (mg/L)	**4.73**	**4.28**	**3.9**	**0.459**	**0.215**	**0.125**	**0.506**	**0.144**	**0.392**	**0.744**
Nitrite (as N), Dissolved (mg/L)	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Sulfate, Dissolved (mg/L)	**276**	**249**	**306**	**14**	**38**	**26**	**26**	**15**	**18**	**22**
Total Dissolved Solids (TDS) (mg/L)	-	-	-	-	-	-	-	-	-	-

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Downgradient									
Location Name	APW-8	APW-8	APW-8	APW-6	APW-6	APW-6	APW-6	APW-6	APW-6	APW-6
Sample Name	APW-8-20220317	APW-8-20220622	APW-8-20220818	APW-6-20170628	APW-6-20170919	APW-6-20171221	APW-6-20180321	APW-6-20180605	APW-6-20180920	APW-6-20181127
Sample Date	03/17/2022	06/22/2022	08/18/2022	06/28/2017	09/19/2017	12/21/2017	03/21/2018	06/05/2018	09/20/2018	11/27/2018
Lab Sample ID	22020001-008	22050078-008	22080103-008	17060316-006	17081244-006	17111760-006	18030562-006	18051259-006	18090767-006	18110867-006
Chloride (mg/L)	-	-	-	-	-	-	-	-	-	-
Cyanide (mg/L)	**0.002 J**	0.005 U	0.005 U	0.007 U	0.007 U	0.007 U	0.007 U	0.005 U	0.005 U	0.005 U
Fluoride (mg/L)	-	-	-	-	-	-	-	-	-	-
Nitrate (as N) (mg/L)	-	-	-	-	-	-	-	-	-	-
Nitrite (as N) (mg/L)	-	-	-	-	-	-	-	-	-	-
Sulfate (mg/L)	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids (TDS) (mg/L)	**658**	**600**	**652**	**356**	**332**	**312**	**318**	**366**	**352**	**358**
Field Parameters										
Temperature, Field (Deg C)	**14.7**	**14.9**	**14.9**	-	-	-	-	**14**	**17.2**	**14.7**
Temperature, Field (Deg F)	-	-	-	**57.9**	**60.8**	**59.7**	**55.8**	-	-	-
Dissolved Oxygen, Field (mg/L)	**8.34**	**6.35**	**8.67**	-	-	-	-	-	-	-
Oxidation Reduction Potential (ORP), Field (mv)	**19**	**119**	**164**	-	-	-	-	-	-	-
Turbidity, Field (NTU)	**4.7**	**2.4**	**27**	-	-	-	-	-	-	-
pH, Field (pH units)	**7.34**	**7.29**	**7.41**	**7.16**	**7.19**	**7.21**	**7.29**	**7.19**	**7.19**	**7.12**
Specific Conductance, Field (umhos/cm)	**1240**	**747**	**881**	**584**	**595**	**627**	**564**	**698**	**641**	**665**
Bottom of Well (ft)	**420**	**420.92**	**421.05**	-	-	-	-	-	-	-
Depth to Groundwater (ft)	**31.44**	-	-	-	-	-	-	-	-	-
Depth to Groundwater from Measuring Point (ft)	**34.84**	**33.14**	**36.51**	**19.35**	**24.45**	**25.6**	**21.1**	**23.99**	**24.25**	**24.1**
Ground Water Elevation (ft)	**429.06**	**430.76**	**427.39**	-	-	-	-	-	-	-
MEASURING POINT ELEVATION (ft)	**463.9**	**463.9**	**463.9**	-	-	-	-	-	-	-

Notes:
- - Not tested.
B - analyte detected in the sample and the associated blank.
ft - feet.
H - holding time exceeded.
J - value is estimated.
mg/L - miligrams per liter.
mv - millivolts.
N - Nitrogen.
S - Spike Recovery outside recovery limits.
U - not detected, value is the reporting limit.
umhos/cm - micromhos per centimeter.

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Downgradient									
Location Name	APW-6	APW-6	APW-6	APW-6	APW-6	APW-6	APW-6	APW-6	APW-6	APW-6
Sample Name	APW-6-20190129	APW-6-20190604	APW-6-20190826	APW-6-20191209	APW-6-20200217	APW-6-20200427	APW-6-20200729	APW-6-20201204	APW-6-20210126	APW-6-20210630
Sample Date	01/29/2019	06/04/2019	08/26/2019	12/09/2019	02/17/2020	04/27/2020	07/29/2020	12/04/2020	01/26/2021	06/30/2021
Lab Sample ID	19010743-006	19041781-006	19080444-006	19110682-006	20020491-006	20041232-006	20070966-006	20120358-006	21011338-006	21070002-004
Inorganic Compounds (mg/L)										
Antimony, Dissolved	0.001 U	0.001 U	**0.0007 J**	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Arsenic, Dissolved	**0.0007 J**	**0.0006 J**	**0.0006 J**	**0.0006 J**	**0.0005 J**	**0.0007 J**	**0.0007 J**	**0.0005 J**	**0.0005 J**	**0.0005 J**
Barium, Dissolved	**0.0157**	**0.0198**	**0.0188**	**0.0152**	**0.011**	**0.0124**	**0.0156**	**0.0092**	**0.0108**	**0.0187**
Beryllium, Dissolved	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Dissolved	**0.528**	**0.55**	**1.06**	**1.4**	**0.586**	**0.357**	**1.54**	**0.241**	**0.161**	**0.312**
Cadmium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Cobalt, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Copper, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 UB	0.005 U
Iron, Dissolved	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	**0.037 J**	0.04 U	**0.026 J**	0.04 U	0.04 U
Lead, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Manganese, Dissolved	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	**0.0043 J**	**0.0048 J**	0.007 U
Mercury, Dissolved	0.0002 U	**0.00007 J**	0.0002 U	0.0002 U	**0.00008 J**	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Selenium, Dissolved	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Silver, Dissolved	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Vanadium, Dissolved	0.01 U	**0.0012 J**	**0.0013 J**	**0.001 J**	**0.0017 J**	**0.0013 J**	**0.001 J**	0.01 U	0.01 U	0.01 U
Zinc, Dissolved	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Antimony, Total	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	**0.0009 J**
Arsenic, Total	**0.0008 J**	**0.0009 J**	**0.0007 J**	**0.0007 J**	**0.001**	**0.0012**	**0.0015**	**0.001 J**	**0.0006 J**	**0.0007 J**
Barium, Total	**0.0179**	**0.0211**	**0.0214**	**0.0162**	**0.0138**	**0.0157**	**0.0174**	**0.0102**	**0.0116**	**0.0197**
Beryllium, Total	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Total	**0.568**	**0.551**	**1.11**	**1.43**	**0.581**	**0.369**	**1.52**	**0.26**	**0.195**	**0.35**
Cadmium, Total	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Total	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Cobalt, Total	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**0.002 J**	0.005 U	0.005 U	0.005 U
Copper, Total	0.005 U	0.005 U	0.005 U	0.005 U	**0.0015 J**	0.005 U	**0.0024 J**	0.005 U	0.005 U	0.005 U
Iron, Total	**0.0735**	**0.31**	**0.0744**	**0.152**	**0.765**	**0.731**	**1.06**	**0.102**	**0.0939**	**0.107**
Lead, Total	0.001 U	0.001 U	0.001 U	0.001 U	**0.0008 J**	**0.0008 J**	**0.0015**	0.001 U	0.001 U	0.001 U
Manganese, Total	**0.005 J**	**0.022**	**0.0047 J**	**0.0071**	**0.0382**	**0.0413**	**0.0622**	**0.0083**	**0.0088**	**0.0135**
Mercury, Total	0.0002 U	**0.00007 J**	0.0002 U	0.0002 U	**0.00008 J**	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Total	0.005 U	0.005 U	**0.0018 J**	0.005 U	**0.0023 J**	**0.003 J**	**0.0035 J**	0.005 U	0.005 U	0.005 U
Selenium, Total	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Silver, Total	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Total	0.002 UB	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Vanadium, Total	**0.0014 J**	**0.003 J**	**0.0013 J**	**0.0014 J**	**0.0029 J**	**0.0028 J**	**0.0028 J**	0.01 U	**0.0013 J**	**0.0009 J**
Zinc, Total	0.01 U	0.01 U	0.01 U	0.01 U	**0.005 J**	0.01 U	**0.0056 J**	0.01 U	0.01 U	0.01 U
Other										
Chloride, Dissolved (mg/L)	**8**	**25**	**8**	**8**	**3 J**	**5 J**	**2 J**	**4 J**	**6**	**27**
Cyanide, Dissolved (mg/L)	-	-	-	-	-	-	-	-	-	-
Fluoride, Dissolved (mg/L)	**0.15**	**0.17**	**0.13**	**0.15**	**0.19**	**0.18**	**0.25**	**0.15**	**0.11**	**0.12**
Nitrate (as N), Dissolved (mg/L)	**0.442**	**0.824**	**0.184**	**2.13**	**0.358**	**0.149**	**0.175**	**0.212**	**0.374**	**0.33**
Nitrite (as N), Dissolved (mg/L)	0.05 U	0.05 U	0.05 U	**0.01 J**	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	-
Sulfate, Dissolved (mg/L)	**23**	**15**	**24**	**15**	**11**	**12**	**37**	**13**	**20**	**35**
Total Dissolved Solids (TDS) (mg/L)	-	-	-	-	-	-	-	-	-	-

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Downgradient									
Location Name	APW-6	APW-6	APW-6	APW-6	APW-6	APW-6	APW-6	APW-6	APW-6	APW-6
Sample Name	APW-6-20190129	APW-6-20190604	APW-6-20190826	APW-6-20191209	APW-6-20200217	APW-6-20200427	APW-6-20200729	APW-6-20201204	APW-6-20210126	APW-6-20210630
Sample Date	01/29/2019	06/04/2019	08/26/2019	12/09/2019	02/17/2020	04/27/2020	07/29/2020	12/04/2020	01/26/2021	06/30/2021
Lab Sample ID	19010743-006	19041781-006	19080444-006	19110682-006	20020491-006	20041232-006	20070966-006	20120358-006	21011338-006	21070002-004
Chloride (mg/L)	-	-	-	-	-	-	-	-	-	-
Cyanide (mg/L)	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Fluoride (mg/L)	-	-	-	-	-	-	-	-	-	-
Nitrate (as N) (mg/L)	-	-	-	-	-	-	-	-	-	-
Nitrite (as N) (mg/L)	-	-	-	-	-	-	-	-	-	-
Sulfate (mg/L)	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids (TDS) (mg/L)	**356**	**398**	**354**	**262 H**	**282**	**252**	**304**	**268**	**284**	**384**
Field Parameters										
Temperature, Field (Deg C)	**12.7**	**13.1**	**14.4**	**15.4**	**14.1**	**13.3**	**14.6**	**15.1**	**14.3**	**13.4**
Temperature, Field (Deg F)	-	-	-	-	-	-	-	-	-	-
Dissolved Oxygen, Field (mg/L)	-	-	-	-	-	-	-	-	-	-
Oxidation Reduction Potential (ORP), Field (mv)	-	-	-	-	-	-	-	-	-	-
Turbidity, Field (NTU)	-	-	-	-	-	-	-	-	-	-
pH, Field (pH units)	**7.09**	**7.13**	**7.05**	**7.27**	**7.31**	**7.45**	**7.53**	**7.2**	**6.98**	**6.72**
Specific Conductance, Field (umhos/cm)	**568**	**729**	**650**	**557**	**433**	**474**	**510**	**461**	**496**	**749**
Bottom of Well (ft)	-	-	-	-	-	-	-	-	-	-
Depth to Groundwater (ft)	-	-	-	-	-	-	-	-	-	-
Depth to Groundwater from Measuring Point (ft)	**22.15**	**7.1**	**19.82**	**21**	**19.72**	**19.19**	**19.86**	**25.54**	**25.89**	**21.6**
Ground Water Elevation (ft)	-	-	-	-	-	-	-	-	-	-
MEASURING POINT ELEVATION (ft)	-	-	-	-	-	-	-	-	-	-

Notes:
- - Not tested.
B - analyte detected in the sample and the associated blank.
ft - feet.
H - holding time exceeded.
J - value is estimated.
mg/L - miligrams per liter.
mv - millivolts.
N - Nitrogen.
S - Spike Recovery outside recovery limits.
U - not detected, value is the reporting limit.
umhos/cm - micromhos per centimeter.

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Downgradient					Old Meredosia	
Location Name	APW-6	APW-6	APW-6	APW-6	APW-6	TMW-B	TMW-C
Sample Name	APW-6-20210917	APW-6-20211111	APW-6-20220317	APW-6-20220621	APW-6-20220818	TMW-B-20220914	TMW-C-20220914
Sample Date	09/17/2021	11/11/2021	03/17/2022	06/21/2022	08/18/2022	09/14/2022	09/14/2022
Lab Sample ID	21080633-006	21110002-006	22020001-006	22050078-006	22080103-006	22091023-002	22091023-001
Inorganic Compounds (mg/L)							
Antimony, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.05 U	0.05 U
Arsenic, Dissolved	**0.0004 J**	**0.0006 J**	**0.0005 J**	**0.0005 J**	**0.0006 J**	0.025 U	0.025 U
Barium, Dissolved	**0.0168**	**0.0165**	**0.0124**	**0.0136**	**0.0113**	**0.0314**	**0.0163**
Beryllium, Dissolved	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Dissolved	**0.523**	**1.1**	**0.737**	**0.423**	**0.585**	**7.45**	**2.83**
Cadmium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**0.0123**	0.005 U
Cobalt, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Copper, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Iron, Dissolved	0.04 U	**0.038 J**	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Lead, Dissolved	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.015 U	0.015 U
Manganese, Dissolved	0.007 U	**0.0224**	0.007 U	0.007 U	0.007 U	**0.0066 J**	**0.0054 J**
Mercury, Dissolved	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Dissolved	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Selenium, Dissolved	**0.024 J**	0.04 U	0.04 U	0.04 U	0.04 U	**0.105**	**0.025 J**
Silver, Dissolved	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Dissolved	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.05 U	0.05 U
Vanadium, Dissolved	0.01 U	0.01 U	**0.0012 J**	0.01 U	0.01 U	**0.0023 J**	**0.0027 J**
Zinc, Dissolved	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Antimony, Total	0.001 U	**0.0005 J**	0.001 U	0.001 U	0.001 U	**0.01 J**	0.05 U
Arsenic, Total	**0.001**	**0.0014**	**0.0009 J**	**0.0006 J**	**0.0013**	0.025 U	0.025 U
Barium, Total	**0.0206**	**0.0226**	**0.0145**	**0.0148**	**0.014**	**0.0406**	**0.0313**
Beryllium, Total	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Boron, Total	**0.58**	**1.29**	**0.78**	**0.498**	**0.668**	**8.49**	**3.13**
Cadmium, Total	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Total	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**0.0158**	**0.0029 J**
Cobalt, Total	**0.002 J**	**0.0027 J**	0.005 U	0.005 U	0.005 U	0.005 U	**0.003 J**
Copper, Total	**0.0015 J**	**0.0015 J**	0.005 U	0.005 U	**0.0034 J**	0.005 U	**0.003 J**
Iron, Total	**0.62**	**1.24**	**0.486**	**0.242**	**0.966**	**0.146**	**1.04**
Lead, Total	**0.0011**	**0.0016**	**0.0006 J**	0.001 U	**0.0013**	0.015 U	0.015 U
Manganese, Total	**0.0642**	**0.0917**	**0.0279**	**0.0144**	**0.0609**	**0.0418**	**0.218**
Mercury, Total	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel, Total	**0.0034 J**	**0.0047 J**	0.005 U	0.005 U	**0.0045 J**	0.005 U	**0.0046 J**
Selenium, Total	**0.02 J**	0.04 U	0.04 U	0.04 U	0.04 U	**0.116**	**0.026 J**
Silver, Total	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Thallium, Total	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.05 U	0.05 U
Vanadium, Total	**0.0019 J**	**0.0028 J**	**0.002 J**	**0.001 J**	**0.0023 J**	**0.0023 J**	**0.0044 J**
Zinc, Total	0.01 U	0.01 U	0.01 U	0.01 U	**0.0051 J**	0.01 U	**0.0074 J**
Other							
Chloride, Dissolved (mg/L)	**6**	**3**	**1**	**3**	**1**	**4**	**17**
Cyanide, Dissolved (mg/L)	-	-	-	-	-	0.005 U	0.005 U
Fluoride, Dissolved (mg/L)	**0.16**	**0.11**	**0.14**	**0.15**	**0.16**	**0.13**	**0.12**
Nitrate (as N), Dissolved (mg/L)	**0.148**	**0.33**	**0.205**	**0.175**	**0.253**	**5.35**	**3.06 H**
Nitrite (as N), Dissolved (mg/L)	0.05 U	-	0.05 U	0.05 U	0.05 U	0.05 UH	0.05 UH
Sulfate, Dissolved (mg/L)	**34**	**28**	**10 J**	**18**	**14**	**387**	**59**
Total Dissolved Solids (TDS) (mg/L)	-	-	-	-	-	**740 H**	**300 H**

TABLE A-1
SUMMARY OF GROUNDWATER RESULTS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Downgradient					Old Meredosia	
Location Name	APW-6	APW-6	APW-6	APW-6	APW-6	TMW-B	TMW-C
Sample Name	APW-6-20210917	APW-6-20211111	APW-6-20220317	APW-6-20220621	APW-6-20220818	TMW-B-20220914	TMW-C-20220914
Sample Date	09/17/2021	11/11/2021	03/17/2022	06/21/2022	08/18/2022	09/14/2022	09/14/2022
Lab Sample ID	21080633-006	21110002-006	22020001-006	22050078-006	22080103-006	22091023-002	22091023-001
Chloride (mg/L)	-	**3**	-	-	-	**4**	**17**
Cyanide (mg/L)	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Fluoride (mg/L)	-	**0.11**	-	-	-	**0.13**	**0.12**
Nitrate (as N) (mg/L)	-	**0.33**	-	-	-	**5.48**	**3.06 H**
Nitrite (as N) (mg/L)	-	-	-	-	-	0.05 UH	0.05 UH
Sulfate (mg/L)	-	**28**	-	-	-	**401**	**59**
Total Dissolved Solids (TDS) (mg/L)	**338**	**336**	**252**	**272**	**242**	**714 H**	**314 H**
Field Parameters							
Temperature, Field (Deg C)	**15.1**	**15.6**	**14.4**	**14.8**	**14.7**	-	-
Temperature, Field (Deg F)	-	-	-	-	-	-	-
Dissolved Oxygen, Field (mg/L)	-	-	**4.68**	**3.51**	**6.02**	-	-
Oxidation Reduction Potential (ORP), Field (mv)	-	-	**13**	**116**	**151**	-	-
Turbidity, Field (NTU)	-	-	**13**	**9**	**13**	-	-
pH, Field (pH units)	**6.98**	**6.91**	**7.15**	**7.17**	**7.27**	-	-
Specific Conductance, Field (umhos/cm)	**793**	**554**	**606**	**391**	**408**	-	-
Bottom of Well (ft)	-	-	**421.06**	**421.04**	**421.08**	-	-
Depth to Groundwater (ft)	-	-	**17.7**	-	-	-	-
Depth to Groundwater from Measuring Point (ft)	**22.68**	**20.54**	**21**	**19.96**	**22.83**	-	-
Ground Water Elevation (ft)	-	-	**430.9**	**431.94**	**429.07**	-	-
MEASURING POINT ELEVATION (ft)	-	-	**451.9**	**451.9**	**451.9**	-	-

Notes:
- - Not tested.
B - analyte detected in the sample and the associated blank.
ft - feet.
H - holding time exceeded.
J - value is estimated.
mg/L - miligrams per liter.
mv - millivolts.
N - Nitrogen.
S - Spike Recovery outside recovery limits.
U - not detected, value is the reporting limit.
umhos/cm - micromhos per centimeter.

APPENDIX B
Groundwater Comparison to Drinking Water-Based Screening Levels

TABLE B-1
MAXIMUM DETECTED CONCENTRATION (a) AT WELLS COMPARED WITH ILLINOIS GROUNDWATER QUALITY STANDARDS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Illinois 620.420 Groundwater Quality Standards		Old Meredosia Maximum Detected Concentration		Upgradient Maximum Detected Concentration		Immediately Downgradient Maximum Detected Concentration		Downgradient Maximum Detected Concentration		
Location Name	Class I: Potable Resource Groundwater (b)	Class II: General Resource Groundwater (c)	TMW-B	TMW-C	APW-1	APW-5	APW-13	APW-14	APW-10	APW-8	APW-6
Sample Name			TMW-B-20220914	TMW-C-20220914							
Sample Date			09/14/2022	09/14/2022							
Inorganic Compounds (mg/L)											
Antimony, Dissolved	0.006	0.024	0.05 U	0.05 U	**0.0005 J**	**0.0009 J**	**0.0003**	0.0002 U	**0.001**	**0.001 J**	**0.0007 J**
Arsenic, Dissolved	0.01	0.2	0.025 U	0.025 U	**0.0003 J**	**0.0005 J**	**0.0005 J**	**0.0001 J**	**0.0019**	**0.0016**	**0.0007 J**
Barium, Dissolved	2	2	**0.0314**	**0.0163**	**0.0232**	**0.0108**	**0.056**	**0.0444**	**0.0231**	**0.0754**	**0.0198**
Beryllium, Dissolved	0.004	0.5	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0017	**0.0004 J**
Boron, Dissolved	2	2	**7.45**	**2.83**	**0.108**	**0.116**	**7.13**	**3.28**	**2.3**	**8.88**	**1.81**
Cadmium, Dissolved	0.005	0.05	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Dissolved	0.1	1	0.0123	0.005 U	0.005 U	0.005 U	**0.0083**	0.005 U	**0.004 J**	**0.0256**	0.005 U
Cobalt, Dissolved	1	1	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Copper, Dissolved	0.65	0.65	0.005 U	0.005 U	**0.0068**	0.005 U	0.005 U	0.005 U	**0.0018 J**	0.005 U	0.005 U
Iron, Dissolved	5	5	0.04 U	0.04 U	**0.023 J**	0.02 U	0.04 U	0.04 U	**0.535**	0.02 U	**0.038 J**
Lead, Dissolved	0.0075	0.1	0.015 U	0.015 U	0.001 U	**0.0017**	0.001 U	0.0002 U	**0.0009 J**	0.001 U	0.001 U
Manganese, Dissolved	0.15	10	**0.0066 J**	**0.0054 J**	**0.0014 J**	**0.0044 J**	**0.0177**	**0.0084**	**0.0452**	0.003 U	**0.0224**
Mercury, Dissolved	0.002	0.01	0.0002 U	0.0002 U	**0.00008 J**	0.0002 U	0.0002 U	0.0002 U	**0.00009 J**	**0.0001 J**	**0.00008 J**
Nickel, Dissolved	0.1	2	0.005 U	0.005 U	**0.0035 J**	0.005 U	**0.0051**	0.005 U	0.005 U	0.005 U	0.005 U
Selenium, Dissolved	0.05	0.05	**0.105**	**0.025 J**	0.04 U	0.04 U	**0.0873**	**0.034 J**	**0.018 J**	**0.0963**	**0.024 J**
Silver, Dissolved	0.05	NA	0.007 U	0.007 U	0.005 U	0.005 U	0.007 U	0.007 U	0.007 U	0.005 U	0.005 U
Thallium, Dissolved	0.002	0.02	0.05 U	0.05 U	0.001 U	0.001 U	0.002 U	0.0004 U	**0.0013 J**	0.001 U	0.001 U
Vanadium, Dissolved	0.049	0.1	**0.0023 J**	**0.0027 J**	**0.0014 J**	**0.0018 J**	**0.0013 J**	0.01 U	**0.003 J**	**0.0032 J**	**0.0021 J**
Zinc, Dissolved	5	10	0.01 U	0.01 U	**0.0162**	0.01 U	0.01 U	0.01 U	**0.0066 J**	**0.0076 J**	0.01 U
Antimony, Total	0.006	0.024	**0.01 J**	0.05 U	**0.0009 J**	**0.0012**	0.001 U	**0.0006 J**	**0.0018**	**0.0057**	**0.0009 J**
Arsenic, Total	0.01	0.2	0.025 U	0.025 U	**0.0089**	**0.0039**	**0.0017**	**0.0079**	**0.0364**	**0.0301**	**0.0027**
Barium, Total	2	2	**0.0406**	**0.0313**	**0.065**	**0.0304**	**0.072**	**0.092**	**0.143**	**0.185**	**0.027**
Beryllium, Total	0.004	0.5	0.0005 U	0.0005 U	**0.0006**	0.0005 U	0.0005 U	**0.0003 J**	**0.0013**	**0.0019**	**0.0006**
Boron, Total	2	2	**8.49**	**3.13**	**0.126**	**0.154**	**7.98**	**3.8**	**2.39**	**9.4**	**1.91**
Cadmium, Total	0.005	0.05	0.002 U	0.002 U	**0.0005 J**	**0.0005 J**	0.002 U	0.002 U	**0.0012 J**	**0.001 J**	0.002 U
Chromium, Total	0.1	1	**0.0158**	**0.0029 J**	**0.0111**	**0.0061**	**0.0143**	**0.0131**	**0.0431**	**0.0438**	**0.0049 J**
Cobalt, Total	1	1	0.005 U	**0.003 J**	**0.0352**	**0.0265**	**0.0028 J**	**0.0277**	**0.111**	**0.0771**	**0.0077**
Copper, Total	0.65	0.65	0.005 U	**0.003 J**	**0.0226**	**0.013**	**0.0024 J**	**0.0273**	**0.0913**	**0.0815**	**0.0086**
Iron, Total	5	5	**0.146**	**1.04**	**17.4**	**5.8 S**	**2.57**	**12.6**	**44.5**	**41.7**	**3.82**
Lead, Total	0.0075	0.1	0.015 U	0.015 U	**0.0179**	**0.0078**	**0.0024**	**0.0143**	**0.0469**	**0.0484**	**0.004**
Manganese, Total	0.15	10	**0.0418**	**0.218**	**1.79**	**1.15**	**0.156**	**1.13**	**3.43**	**2.71**	**0.233**
Mercury, Total	0.002	0.01	0.0002 U	0.0002 U	**0.00008 J**	**0.00008 J**	0.0002 U	0.0002 U	**0.00008 J**	**0.00014 J**	**0.00008 J**
Nickel, Total	0.1	2	0.005 U	**0.0046 J**	**0.0583**	**0.0332**	**0.0097**	**0.0437**	**0.16**	**0.12**	**0.0103**
Selenium, Total	0.05	0.05	**0.116**	**0.026 J**	0.04 U	0.04 U	**0.0892**	**0.033 J**	**0.018 J**	**0.111**	**0.021 J**
Silver, Total	0.05	NA	0.007 U	0.007 U	0.005 U	0.005 U	0.007 U	0.007 U	0.007 U	0.005 U	0.005 U
Thallium, Total	0.002	0.02	0.05 U	0.05 U	**0.0016 J**	0.001 U	0.002 U	0.002 U	0.002 U	**0.001 J**	0.001 U
Vanadium, Total	0.049	0.1	**0.0023 J**	**0.0044 J**	**0.0205**	**0.0093 J**	**0.005 J**	**0.0157**	**0.0622**	**0.0522**	**0.0065 J**
Zinc, Total	5	10	0.01 U	**0.0074 J**	**0.051**	**0.0173**	0.01 U	**0.0417**	**0.168**	**0.145**	**0.0133**
Other (mg/L)											
Chloride, Dissolved	200	200	**4**	**17**	**159**	**22**	**20**	-	**7**	**18**	**27**
Cyanide, Dissolved	0.2	0.6	0.005 U	0.005 U	-	-	-	-	-	-	-
Fluoride, Dissolved	4	4	**0.13**	**0.12**	**0.35**	**0.19**	**0.06 J**	-	**0.06 J**	**0.24**	**0.25**
Nitrate (as N), Dissolved	10	100	**5.35**	**3.06 H**	**8.24**	**4.29**	**4.62**	-	**4.53**	**5.77**	**2.13**
Nitrite (as N), Dissolved	NA	NA	0.05 UH	0.05 UH	**0.01 J**	**0.01 J**	0.05 U	-	0.05 U	**0.01 J**	**0.01 J**
Sulfate, Dissolved	400	400	**387**	**59**	**22**	**83**	**205**	-	**126**	**421**	**38**
Total Dissolved Solids (TDS)	1200	1200	**740 H**	**300 H**	-	-	-	-	-	-	-
Chloride	200	200	**4**	**17**	-	-	**21**	**7**	-	-	-
Cyanide	0.2	0.6	0.005 U	0.005 U	0.007 U	**0.001 J**	0.005 U	0.005 U	0.005 U	**0.002 J**	0.007 U
Fluoride	4	4	**0.13**	**0.12**	-	-	**0.08 J**	**0.08 J**	-	-	-
Nitrate (as N)	10	100	**5.48**	**3.06 H**	-	-	**4.45**	**4.46**	-	-	-
Nitrite (as N)	NA	NA	0.05 UH	0.05 UH	-	-	0.05 U	0.05 U	-	-	-
Sulfate	400	400	**401**	**59**	-	-	**175**	**217**	-	-	-
Total Dissolved Solids (TDS)	1200	1200	**714 H**	**314 H**	**420**	**382**	**624**	**646**	**408**	**832**	**398**

TABLE B-1
MAXIMUM DETECTED CONCENTRATION (a) AT WELLS COMPARED WITH ILLINOIS GROUNDWATER QUALITY STANDARDS
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Notes:

H - Holding times exceeded.
J - Analyte detected below quantitation limits.
mg/L - milligram per liter.
NA - Not Available.
S - Spike Recovery outside recovery limits.
U - Not detected above the indicated reporting limit.

(a) Maximum detected concentration at each well identified from data obtained from Ameren Corporation, for the period: June 2017 to September 2022
(b) Illinois Administrative Code. October 2012. Title 35: Environmental Protection. Subtitle F: Public Water Supplies. Chapter I: Pollution Control Board. Part 620: Groundwater Quality. Subpart D: Groundwater Quality Standards. Section 620.410 Groundwater Quality Standards for Class I: Potable Resource Groundwater.
The Class I Groundwater Standards are not applicable within the Groundwater Management Zone; however are provided here for informational purposes.
https://pcb.illinois.gov/documents/dsweb/Get/Document-33425/
(c) Illinois Administrative Code. October 2013. Title 35: Environmental Protection. Subtitle F: Public Water Supplies. Chapter I: Pollution Control Board. Part 620: Groundwater Quality. Subpart D: Groundwater Quality Standards. Section 620.420 Groundwater Quality Standards for Class II: General Resource Groundwater.
The Class II Groundwater Standards are not applicable within the Groundwater Management Zone; however are provided here for informational purposes.
https://pcb.illinois.gov/documents/dsweb/Get/Document-33425/

Bold indicates a detect concentration above the method detection limit.
Greater than the Groundwater Quality Class I Potable Resource Groundwater Standards.
Greater than both the Groundwater Quality Class I Potable Resource Groundwater and Groundwater Quality Class II General Resource Groundwater Standards.

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TABLE B-2
MAXIMUM DETECTED CONCENTRATION (a) AT WELLS COMPARED WITH ILLINOIS PART 845.600 STANDARDS FOR GROUNDWATER
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Location Group	Illinois 845.600 Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments	Old Meredosia Maximum Detected Concentration		Upgradient Maximum Detected Concentration		Immediately Downgradient Maximum Detected Concentration		Downgradient Maximum Detected Concentration		
Location Name		TMW-B	TMW-C	APW-1	APW-5	APW-13	APW-14	APW-10	APW-8	APW-6
Sample Name		TMW-B-20220914	TMW-C-20220914							
Sample Date	Groundwater Protection Standards (b) (c)	09/14/2022	09/14/2022							
Inorganic Compounds (mg/L)										
Antimony, Dissolved	0.006	0.05 U	0.05 U	**0.0005 J**	**0.0009 J**	**0.0003**	0.0002 U	**0.001**	**0.001 J**	**0.0007 J**
Arsenic, Dissolved	0.01	0.025 U	0.025 U	**0.0003 J**	**0.0005 J**	**0.0005 J**	**0.0001 J**	**0.0019**	**0.0016**	**0.0007 J**
Barium, Dissolved	2	**0.0314**	**0.0163**	**0.0232**	**0.0108**	**0.056**	**0.0444**	**0.0231**	**0.0754**	**0.0198**
Beryllium, Dissolved	0.004	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0017	**0.0004 J**
Boron, Dissolved	2	**7.45**	**2.83**	**0.108**	**0.116**	**7.13**	**3.28**	**2.3**	**8.88**	**1.81**
Cadmium, Dissolved	0.005	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Chromium, Dissolved	0.1	0.0123	0.005 U	0.005 U	0.005 U	**0.0083**	0.005 U	**0.004 J**	**0.0256**	0.005 U
Cobalt, Dissolved	0.006	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Copper, Dissolved	NA	0.005 U	0.005 U	**0.0068**	0.005 U	0.005 U	0.005 U	**0.0018 J**	0.005 U	0.005 U
Iron, Dissolved	NA	0.04 U	0.04 U	**0.023 J**	0.02 U	0.04 U	0.04 U	**0.535**	0.02 U	**0.038 J**
Lead, Dissolved	0.0075	0.015 U	0.015 U	0.001 U	**0.0017**	0.001 U	0.0002 U	**0.0009 J**	0.001 U	0.001 U
Manganese, Dissolved	NA	**0.0066 J**	**0.0054 J**	**0.0014 J**	**0.0044 J**	**0.0177**	**0.0084**	**0.0452**	0.003 U	**0.0224**
Mercury, Dissolved	0.002	0.0002 U	0.0002 U	**0.00008 J**	0.0002 U	0.0002 U	0.0002 U	**0.00009 J**	**0.0001 J**	**0.00008 J**
Nickel, Dissolved	NA	0.005 U	0.005 U	**0.0035 J**	0.005 U	**0.0051**	0.005 U	0.005 U	0.005 U	0.005 U
Selenium, Dissolved	0.05	**0.105**	**0.025 J**	0.04 U	0.04 U	**0.0873**	**0.034 J**	**0.018 J**	**0.0963**	**0.024 J**
Silver, Dissolved	NA	0.007 U	0.007 U	0.005 U	0.005 U	0.007 U	0.007 U	0.007 U	0.005 U	0.005 U
Thallium, Dissolved	0.002	0.05 U	0.05 U	0.001 U	0.001 U	0.002 U	0.0004 U	**0.0013 J**	0.001 U	0.001 U
Vanadium, Dissolved	NA	**0.0023 J**	**0.0027 J**	**0.0014 J**	**0.0018 J**	**0.0013 J**	0.01 U	**0.003 J**	**0.0032 J**	**0.0021 J**
Zinc, Dissolved	NA	0.01 U	0.01 U	**0.0162**	0.01 U	0.01 U	0.01 U	**0.0066 J**	**0.0076 J**	0.01 U
Antimony, Total	0.006	**0.01 J**	0.05 U	**0.0009 J**	**0.0012**	0.001 U	**0.0006 J**	**0.0018**	**0.0057**	**0.0009 J**
Arsenic, Total	0.01	0.025 U	0.025 U	**0.0089**	**0.0039**	**0.0017**	**0.0079**	**0.0364**	**0.0301**	**0.0027**
Barium, Total	2	**0.0406**	**0.0313**	**0.065**	**0.0304**	**0.072**	**0.092**	**0.143**	**0.185**	**0.027**
Beryllium, Total	0.004	0.0005 U	0.0005 U	**0.0006**	0.0005 U	0.0005 U	**0.0003 J**	**0.0013**	**0.0019**	**0.0006**
Boron, Total	2	**8.49**	**3.13**	**0.126**	**0.154**	**7.98**	**3.8**	**2.39**	**9.4**	**1.91**
Cadmium, Total	0.005	0.002 U	0.002 U	**0.0005 J**	**0.0005 J**	0.002 U	0.002 U	**0.0012 J**	**0.001 J**	0.002 U
Chromium, Total	0.1	**0.0158**	**0.0029 J**	**0.0111**	**0.0061**	**0.0143**	**0.0131**	**0.0431**	**0.0438**	**0.0049 J**
Cobalt, Total	0.006	0.005 U	**0.003 J**	**0.0352**	**0.0265**	**0.0028 J**	**0.0277**	**0.111**	**0.0771**	**0.0077**
Copper, Total	NA	0.005 U	**0.003 J**	**0.0226**	**0.013**	**0.0024 J**	**0.0273**	**0.0913**	**0.0815**	**0.0086**
Iron, Total	NA	**0.146**	**1.04**	**17.4**	**5.8 S**	**2.57**	**12.6**	**44.5**	**41.7**	**3.82**
Lead, Total	0.0075	0.015 U	0.015 U	**0.0179**	**0.0078**	**0.0024**	**0.0143**	**0.0469**	**0.0484**	**0.004**
Manganese, Total	NA	**0.0418**	**0.218**	**1.79**	**1.15**	**0.156**	**1.13**	**3.43**	**2.71**	**0.233**
Mercury, Total	0.002	0.0002 U	0.0002 U	**0.00008 J**	**0.00008 J**	0.0002 U	0.0002 U	**0.00008 J**	**0.00014 J**	**0.00008 J**
Nickel, Total	NA	0.005 U	**0.0046 J**	**0.0583**	**0.0332**	**0.0097**	**0.0437**	**0.16**	**0.12**	**0.0103**
Selenium, Total	0.05	**0.116**	**0.026 J**	0.04 U	0.04 U	**0.0892**	**0.033 J**	**0.018 J**	**0.111**	**0.021 J**
Silver, Total	NA	0.007 U	0.007 U	0.005 U	0.005 U	0.007 U	0.007 U	0.007 U	0.005 U	0.005 U
Thallium, Total	0.002	0.05 U	0.05 U	**0.0016 J**	0.001 U	0.002 U	0.002 U	0.002 U	**0.001 J**	0.001 U
Vanadium, Total	NA	**0.0023 J**	**0.0044 J**	**0.0205**	**0.0093 J**	**0.005 J**	**0.0157**	**0.0622**	**0.0522**	**0.0065 J**
Zinc, Total	NA	0.01 U	**0.0074 J**	**0.051**	**0.0173**	0.01 U	**0.0417**	**0.168**	**0.145**	**0.0133**
Other (mg/L)										
Chloride, Dissolved	200	**4**	**17**	**159**	**22**	**20**	-	**7**	**18**	**27**
Cyanide, Dissolved	NA	0.005 U	0.005 U	-	-	-	-	-	-	-
Fluoride, Dissolved	4	**0.13**	**0.12**	**0.35**	**0.19**	**0.06 J**	-	**0.06 J**	**0.24**	**0.25**
Nitrate (as N), Dissolved	NA	**5.35**	**3.06 H**	**8.24**	**4.29**	**4.62**	-	**4.53**	**5.77**	**2.13**
Nitrite (as N), Dissolved	NA	0.05 UH	0.05 UH	**0.01 J**	**0.01 J**	0.05 U	-	0.05 U	**0.01 J**	**0.01 J**
Sulfate, Dissolved	400	**387**	**59**	**22**	**83**	**205**	-	**126**	**421**	**38**
Total Dissolved Solids (TDS)	1200	**740 H**	**300 H**	-	-	-	-	-	-	-
Chloride	200	**4**	**17**	-	-	**21**	**7**	-	-	-
Cyanide	NA	0.005 U	0.005 U	0.007 U	**0.001 J**	0.005 U	0.005 U	0.005 U	**0.002 J**	0.007 U
Fluoride	4	**0.13**	**0.12**	-	-	**0.08 J**	**0.08 J**	-	-	-
Nitrate (as N)	NA	**5.48**	**3.06 H**	-	-	**4.45**	**4.46**	-	-	-
Nitrite (as N)	NA	0.05 UH	0.05 UH	-	-	0.05 U	0.05 U	-	-	-
Sulfate	400	**401**	**59**	-	-	**175**	**217**	-	-	-
Total Dissolved Solids (TDS)	1200	**714 H**	**314 H**	**420**	**382**	**624**	**646**	**408**	**832**	**398**

TABLE B-2
MAXIMUM DETECTED CONCENTRATION (a) AT WELLS COMPARED WITH ILLINOIS PART 845.600 STANDARDS FOR GROUNDWATER
OLD MEREDOSIA RISK EVALUATION
AMEREN MEREDOSIA POWER STATION, IL

Notes:

H - Holding times exceeded.
J - Analyte detected below quantitation limits.
mg/L - milligram per liter.
NA - Not Available.
S - Spike Recovery outside recovery limits.
U - Not detected above the indicated reporting limit.

(a) Maximum detected concentration at each well identified from data obtained from Ameren Corporation, for the period: June 2017 to September 2022

(b) Illinois Administrative Code. April 2021. Title 35: Environmental Protection. Subtitle G: Waste Disposal. Chapter I: Pollution Control Board.
Part 845: Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments. Subpart A: General Provisions.
https://pcb.illinois.gov/documents/dsweb/Get/Document-103997/
Bold indicates a detect concentration above the method detection limit.
Greater than Illinois 845.600 Groundwater Protection Standards.

(c) Groundwater Standards are not applicable within the Groundwater Management Zone; however are provided here for informational purposes.

APPENDIX C
SW-DAF Derivation

APPENDIX C

SURFACE WATER DILUTION ATTENUATION FACTOR

This appendix describes the evaluation of the magnitude of dilution effects resulting from the mixing of groundwater that may flow from beneath the closed Meredosia Old Ash Pond (Old Meredosia) to surface water in the Illinois River (**Figure C-1**), and describes the development of a dilution attenuation factor (DAF) between groundwater and surface water. In addition to Old Meredosia, there are two additional closed ash ponds that make up the Ameren Energy Resources Meredosia Power Station, the Bottom Ash Pond and the Fly Ash Pond.

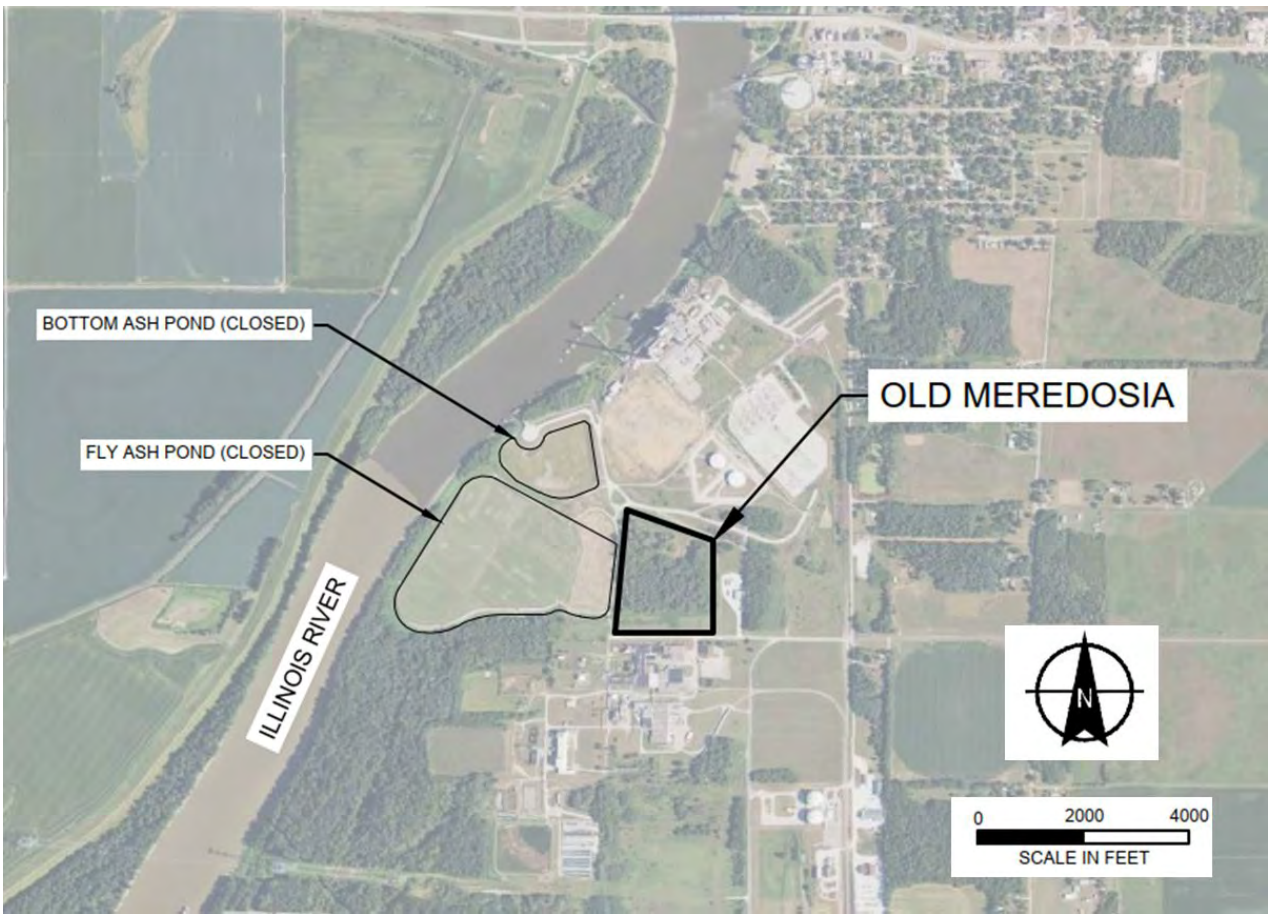


***Figure C-1**: Location of Old Meredosia relative to the Illinois River. The figure is adapted from Haley & Aldrich (2023).*

Four borings were completed within Old Meredosia between May 16 and 18, 2022 (**Figure C-2**). Borings A, B, and D were advanced to a depth of 60 feet below land surface (bls) while Boring C was advanced to

a depth of 30 feet bls. A cross section of Old Meredosia and the four borings are shown below (**Figure C-3)**. Cover material consisted of sand in the northern half of Old Meredosia while sand and lean clay were found in the southern half. Bottom ash thicknesses were found to be between 9 and 11.5 feet. At Boring D it was found that material underlying Old Meredosia was a poorly graded sand with 98.0 percent sand-sized particles. This was assessed at 35 feet bls.

The Old Meredosia bottom elevation is located at approximately 445.92 to 448.44 feet above mean sea level (AMLS) while the groundwater table ranges between 424.65 and 442.98 feet AMSL. The May 1943 and June 2019 flooding events were the only two in the past century to have river stage elevations exceed the lowest bottom ash elevation of Old Meredosia. The maximum observed groundwater elevation in monitoring wells near Old Meredosia was 442.98 feet during the June 2019 flooding event. This is approximately 3 feet below the lowest observed bottom ash elevation (445.92 feet). The bottom ash in the Old Ash Pond has not been inundated from surface waters nor a rising groundwater table under normal or flood conditions. Groundwater flow is generally to the west and northwest, towards the Illinois River (**Figure C-4**). During sampling events in November 2018 and June 2019, groundwater flow temporarily reversed direction (**Figure C-5)**. This reversal subsided as surface water levels dropped (Geotechnology, 2023).

Figure C-2: *Locations of borings completed May 16-18, 2022 by Geotechnology within Old Meredosia (Geotechnology 2023).*

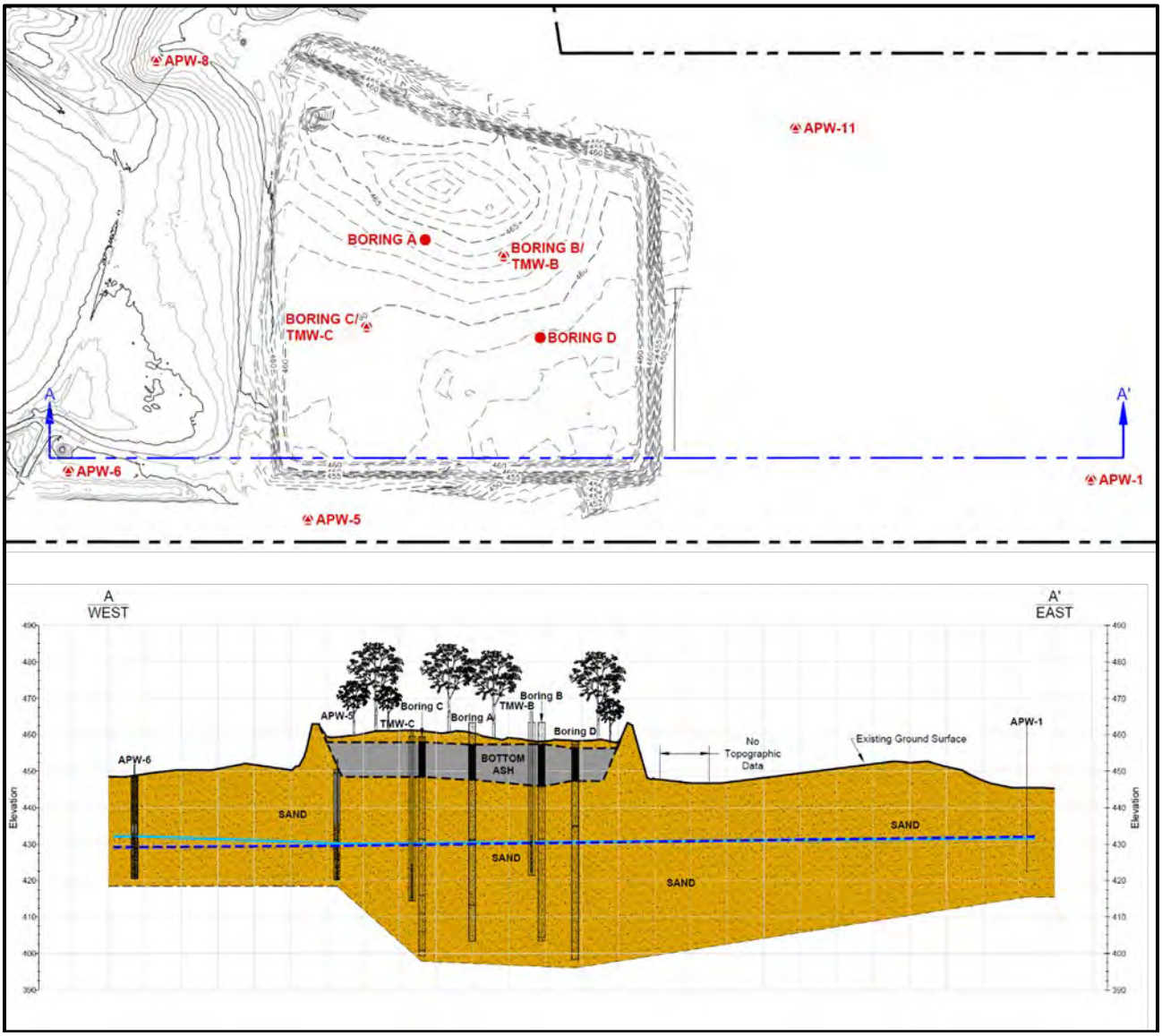


***Figure C-3**: Cross section showing the borings and surrounding subsurface beneath Old Meredosia. The figure is adapted from Geotechnology (2023).*

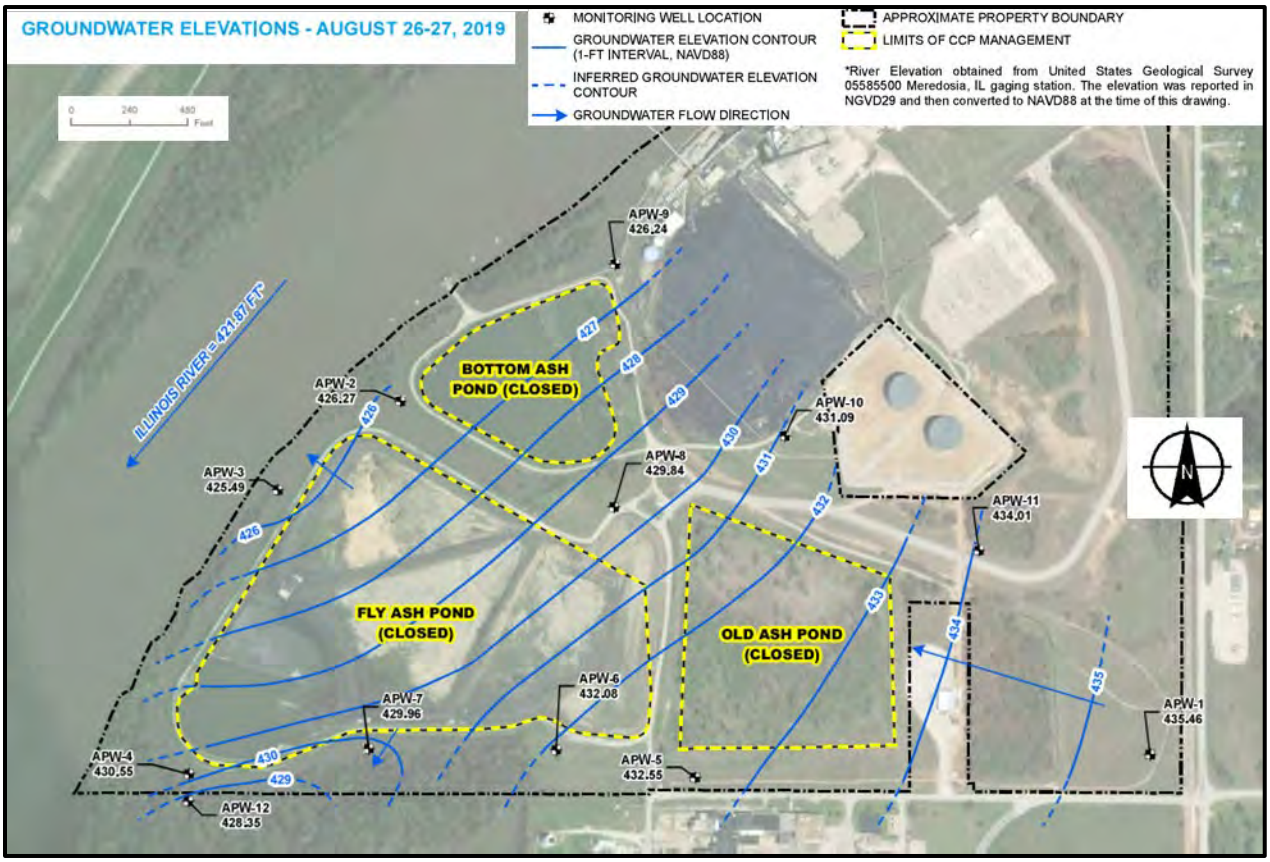


Figure C-4: *Groundwater elevation contours from August 26-27, 2019 showing groundwater flowing towards the Illinois River during normal conditions. The figure is adapted from Ramboll (2020).*

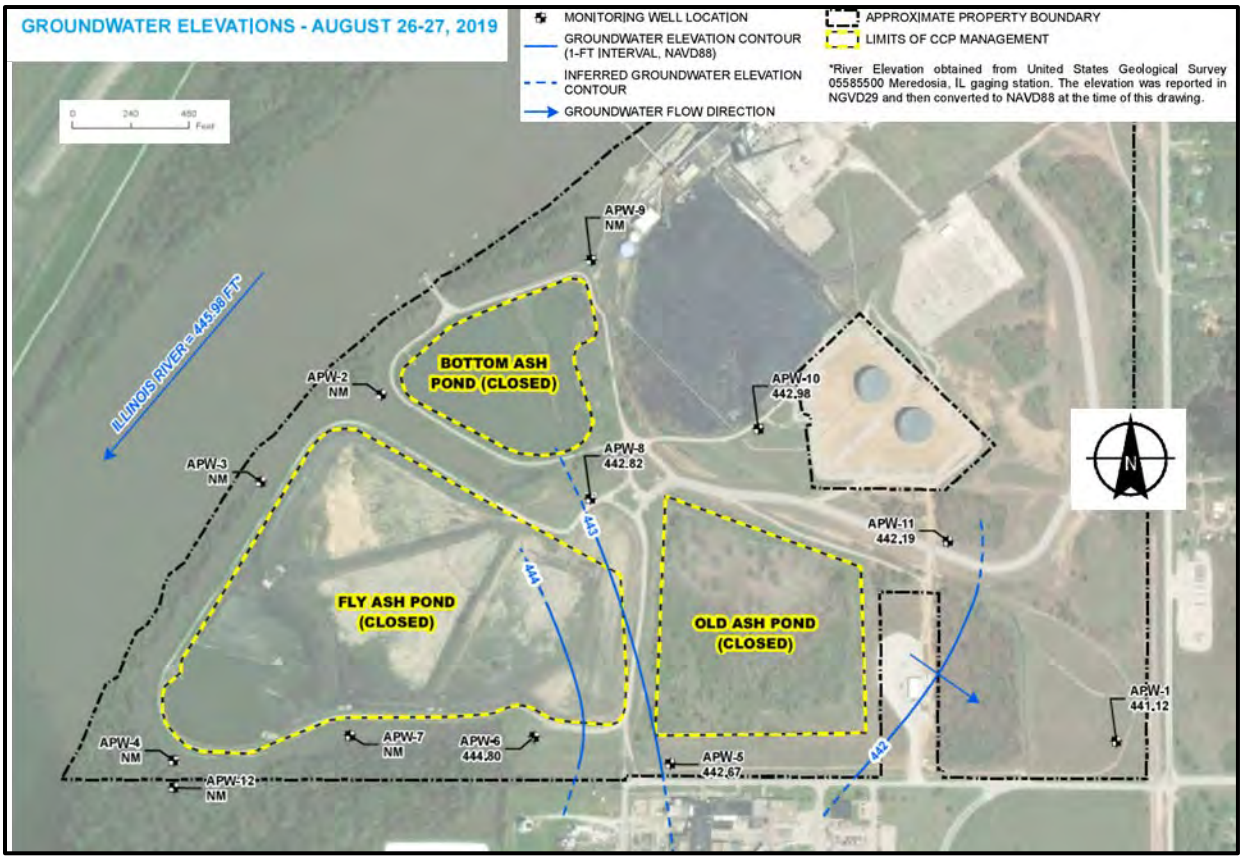


Figure C-5: *Groundwater elevation contours from June 4, 2019 showing groundwater flowing away from the Illinois River during historic flood conditions. The figure is adapted from Ramboll (2020).*

Old Meredosia was operated as the plants' CCR pond through 1971, at which time it was closed-in-place using native materials from the Illinois River. Upon closure, native vegetation was established and allowed to mature naturally over the closed cover area for the past approximately 50 years. The Meredosia Power Station was decommissioned in 2011. The former fly ash pond and bottom ash pond were closed pursuant to the Closure Plan dated August 15, 2016 (Geotechnology, 2016).

Therefore, Old Meredosia has not received inflow since 1971. Instead, water inputs, such as precipitation directly into Old Meredosia and potential runoff from areas adjacent to Old Meredosia have become the major contributors of water. Precipitation that falls within Old Meredosia does not have a topographic outlet to leave the pond as surface water and indicators of concentrated flow or ponding were not observed, indicating that precipitation percolates into the subsurface. The vegetation observed at Old Meredosia will uptake pore water in subsurface material, including leached boron. This reduces, but is not expected to eliminate, the water that infiltrates to groundwater through Old Meredosia (Geotechnology, 2023).

The current monitoring network has two monitoring wells immediately located downgradient of Old Meredosia (APW-13 and APW-14), as shown in **Figure C-6**. Monitoring wells APW-6, APW-8, and APW-10 are located further downgradient from Old Meredosia, and upgradient to the closed fly ash and bottom ash ponds. Monitoring wells APW-1, APW-5, and APW-11 are upgradient to Old Meredosia, as shown on **Figure C-6**.

Figure C-6: *Map of the current monitoring well locations across Meredosia Power Station.*

Dilution and Attenuation Effects of the Illinois River

The surface water dilution/attenuation factor (SW-DAF) is a factor that describes the mixing effects on constituent concentration anticipated in a surface water body that receives constituents from groundwater. Assuming the Illinois River is considered the ultimate end point for groundwater near the Meredosia Power Station, the site-specific SW-DAF for Old Meredosia at the Illinois River can be estimated using the following formula:

$$SW\text{-}DAF = Q_R \div Q_{IA} \quad (1)$$

where Q_R is the estimated representative river flow rate under low flow conditions and Q_{IA} is the estimated net infiltration (or groundwater recharge) rate over the area of Old Meredosia.

1. Q_R – Flow of the Illinois River at Meredosia Power Station

The low flow of the Illinois River near the Meredosia Power Station is based on the 7-day 10-year (7Q10) low flow map for Illinois, as shown in **Figure C-7**. The closest measured 7Q10 flow rate near the Meredosia Power Station is 3,700 cubic feet per second (cfs). According to the Illinois Administrative Code (Title 35, Subtitle C, Chapter I, Part 203.102(b)(8)), the area and volume in which mixing occurs, alone or in combination with other areas and volumes of mixing must not contain more than 25% of the cross-sectional area or volume of flow of a stream except for those streams for which the dilution ratio is less than 3:1. Therefore, Q_R is 925 cfs (=3700÷4).

2. Q_{IA} – Infiltration into Old Meredosia

Infiltration into Old Meredosia is primarily controlled by precipitation and evapotranspiration. Precipitation data was obtained from the National Weather Service for Jacksonville, Illinois (**Table C-1**). The average annual precipitation is 39.25 inches. The surface area of Old Meredosia is approximately 15.7 acres. Based on these values, the average annual input of precipitation that could infiltrate through Old Meredosia is 51.35 acre-feet, or 16.7 million gallons. This value would be further reduced by evaporation and transpiration of a portion of the precipitation by the trees and vegetation present on Old Meredosia.

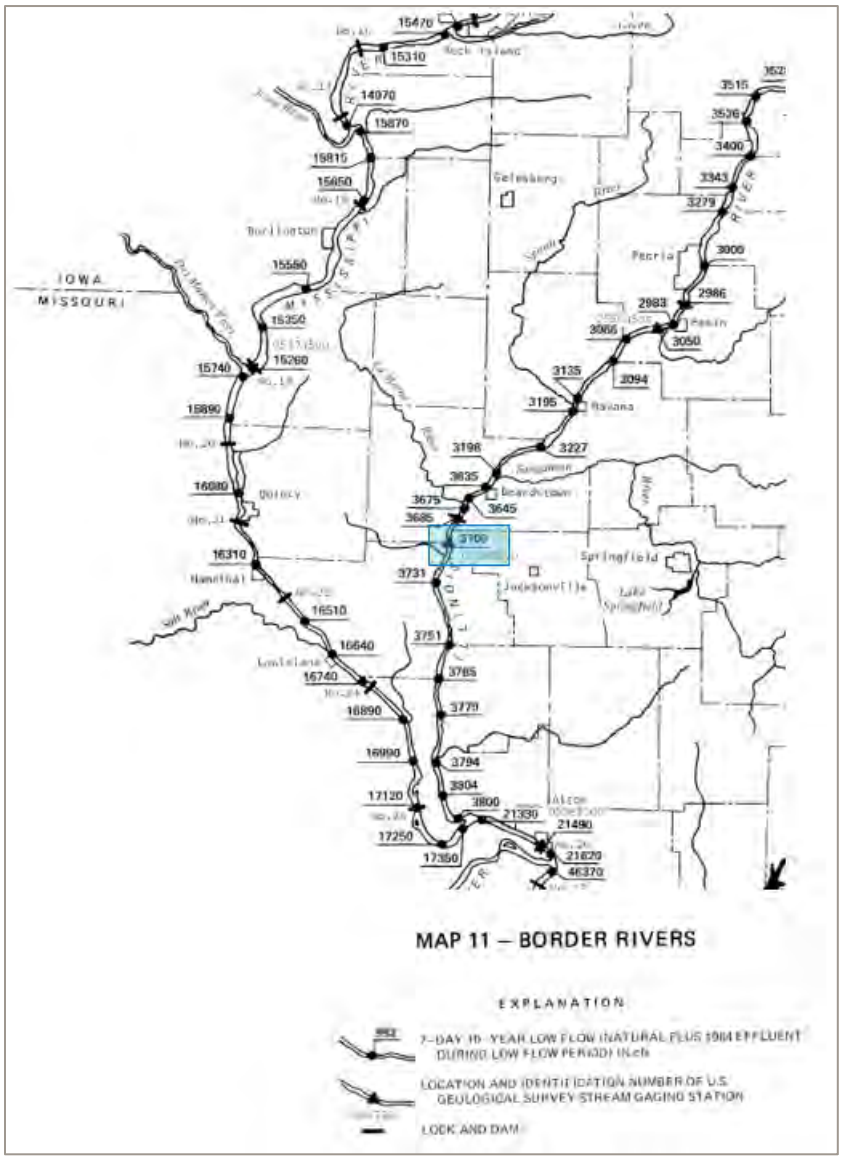


Figure C-7: *Map of 7-day 10-year low (7Q10) flow rates across Illinois with the rate nearest Meredosia Power Station and Old Meredosia highlighted. The location of the 7Q10 value of 3700 cubic feet per second (cfs) in the blue shaded area is in the vicinity of the project site (Illinois State Water Survey 1988). The QR value used is 925 cfs, which is 25% of 3,700 cfs (Illinois Administrative Code).*

PRECIPITATION DATA SUMMARY
OLD ASH POND
MEREDOSIA POWER PLANT
MORGAN COUNTY, ILLINOIS

Normal Monthly Precipitation Jacksonville, IL - 1991-2020		
January	1.93	inches
February	1.72	inches
March	2.81	inches
April	4.27	inches
May	4.82	inches
June	4.89	inches
July	3.96	inches
August	3.39	inches
September	3.50	inches
October	2.97	inches
November	3.01	inches
December	1.98	inches
Annual Total	39.25	inches

Source: https://www.weather.gov/wrh/climate?wfo=ilx

Table C-1: *Average monthly precipitation estimates for Old Meredosia from 1991-2020 (National Weather Service for Central Illinois). The table is adapted from Geotechnology (2023).*

Evapotranspiration data was obtained from the Illinois State Water Survey Circular 89 titled "Variability of Evapotranspiration in Illinois" by Jones (1966) (**Figure C-8**). The average annual potential evapotranspiration is estimated at 31.5 inches.

The surface water balance equation below (Faybishenko, 2007) is used to conservatively estimate the annual infiltration rate for Old Meredosia:

Net Infiltration = Precipitation – Runoff – Actual Evapotranspiration + Run-on (2)

Since Old Meredosia is at a topographically high location, there is little to no run-on contribution to the area (Figure C-3). To not overestimate the magnitude of the net infiltration, we also further assume no runoff. Thus, the equation above can be simplified as follows:

Net Infiltration = Precipitation – Actual Evapotranspiration (3)

To estimate the magnitude of actual evapotranspiration based on site-specific precipitation and potential evapotranspiration data, the method and data from various climate conditions published

by Zhang et al. (2001) were used (**Figure C-9**). The x-axis in **Figure C-9** is defined by the parameter "aridity index," which is the ratio of the site-specific annual evapotranspiration potential (= 31.5 inches) to site-specific annual precipitation (= 39.25 inches). The aridity index for the project site is 0.8. The y-axis is the ratio of actual evapotranspiration to precipitation. Based on the lower bound evapotranspiration curve (in order to not underestimate the infiltration), the estimated site-specific ratio of actual evapotranspiration to precipitation is approximately 0.5 (**Figure C-9**). Therefore, the lower bound actual annual evapotranspiration at the site is estimated to be 19.6 inches (= 39.25 inches x 0.5). The estimated annual infiltration rate is thus equal to 19.7 inches per year (= 39.25 inches – 19.6 inches). To calculate the overall annual net infiltration rate over the estimated surface area of Old Meredosia, this total infiltration rate is multiplied by the surface area of Old Meredosia (conservatively assumed to be 16 acres), which results in a total estimated flow rate of 0.037 cubic feet per second (19.7 inches per year x 16 acres).

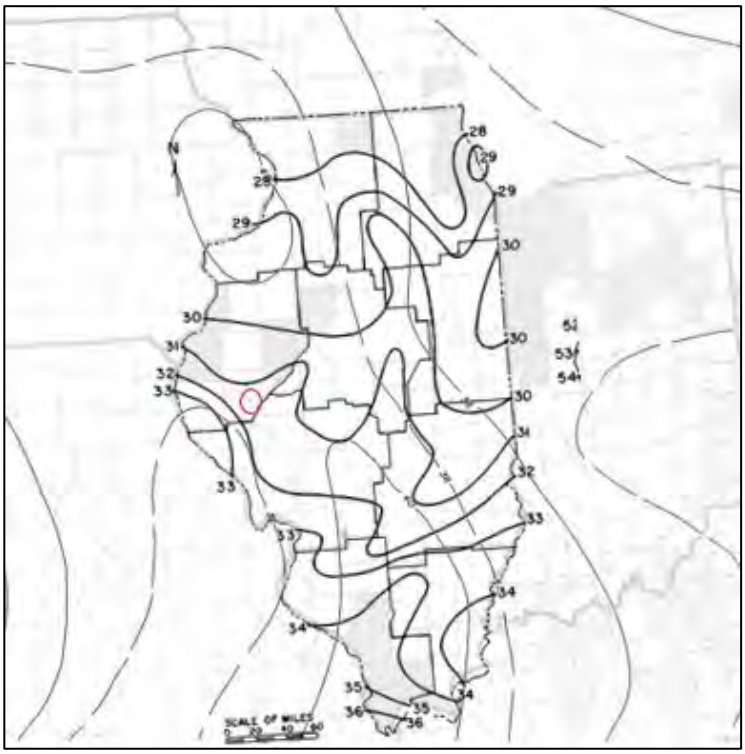
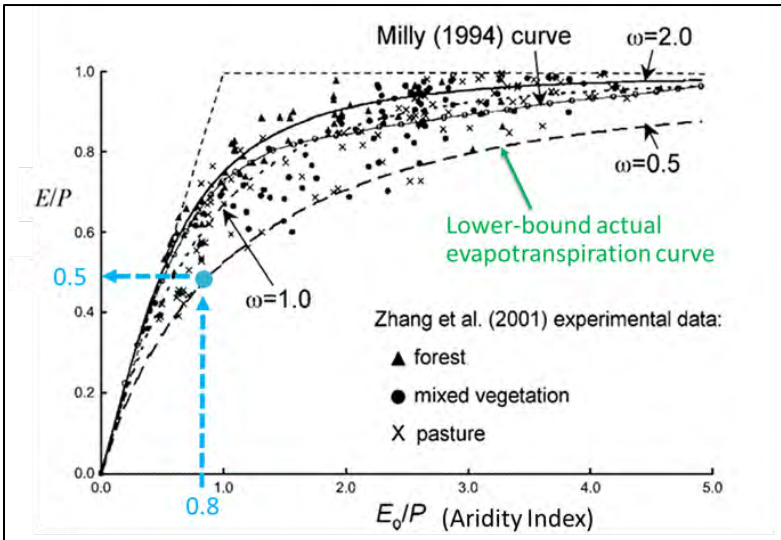


Figure C-8: *Map of potential evapotranspiration rates across Illinois. The red circle shows the approximate project site location. At the project site, the annual evapotranspiration potential is approximately 31.5 inches per year. The figure is adapted from Jones (1966).*



Notes:
(1) Site-specific annual precipitation (P) = 39.25 inches
(2) Site-specific annual potential evapotranspiration (Eo) = 31.5 inches
(3) Estimated Site-specific aridity index (Eo/P) = 0.8
(4) Estimated lower bound ratio of actual evapotranspiration to precipitation (E/P) = 0.5

Figure C-9: *The aridity index curve and calculations for the annual net infiltration and annual infiltration volume specific to Old Meredosia (Zhang et al., 2001).*

Estimated SW-DAF Value

Based on the estimated Q_R, Q_{IA}, and Equation 1 above, the Surface Water Dilution Attenuation Factor for the Illinois River due to assumed infiltration from Old Meredosia is:

$$SW - DAF = \frac{Q_R}{Q_{IA}} = \frac{925 \text{ cfs}}{0.037 \text{ cfs}} = \mathbf{25,000} \text{ (infiltration based)}$$

Based on the result above, we recommend using the SW-DAF factor of 25,000 for the effects of dilution.

REFERENCES

1. Faybishenko, B. 2007. Climatic Forecasting of Net Infiltration at Yucca Mountain Using Analogue Meteorological Data. Vadose Zone Journal 6(1), 77-92.

2. Geotechnology. 2016. Closure Plan – Fly Ash Pond and Bottom Ash Pond, Meredosia Power Station, Meredosia, Illinois. August 15, 2016.

3. Geotechnology. 2023. Sampling and Testing Report – Old Ash Pond – Meredosia Power Plant. Prepared for Ameren Corporation, St. Louis, Missouri.

4. Illinois Administrative Code, Title 35, Subtitle C, Chapter I, Part 203.102(b)(8).

5. Illinois State Water Survey, 1988. 7-Day 10-Year Low Flow Maps (https://www.isws.illinois.edu/watershed-science/surface-water-resources/7-day-10-year-low-flow-maps)

6. Haley & Aldrich. 2023. Technical Memorandum – Engineering Review/Expert Witness Support, Petition for Adjusted Standard for Old Meredosia, Illinois Pollution Control Board Docket AS 2021-008. Haly & Aldrich, Inc.

7. Jones, D.M.A. 1966. Variability of Evapotranspiration in Illinois. State of Illinois Department of Registration and Education. Circular 89.

8. National Weather Service for Central Illinois (https://www.weather.gov/wrh/climate?wfo=ilx)

9. Ramboll. 2020. 2019 Annual Report, Meredosia Power Station.

10. Zhang, L., Dawes, W.R. and Walker, G.R. 2001. Response of mean annual evapotranspiration to vegetation changes at catchment scale. Water resources research, 37(3), pp.701-708.

Electronic Filing: Received, Clerk's Office 05/01/2023

RICHARD B. OGILVIE
Governor

WILLIAM L. BLASER
DIRECTOR

STATE OF ILLINOIS

ENVIRONMENTAL PROTECTION AGENCY

July 9, 1971
Log ~~[illegible]~~-71
163A

CENTRAL ILLINOIS PUBLIC SERVICE COMPANY - Meredosia Generating Station
Bottom Ash & Fly Ash Ponds
PERMIT #1971-EA-430

Central Illinois Public Service Company
607 East Adams Street
Springfield, Illinois 62702

Gentlemen:

Permit is hereby granted to Central Illinois Public Service Company, Springfield, Sangamon County, Illinois to install and Central Illinois Public Service Company, Meredosia, Morgan County, Illinois, to operate a bottom ash storage basin and a fly ash storage basin to serve Meredosia Generating Station with discharge to the Illinois River, all in accordance with plans and specifications submitted by Sargent & Lundy, Registered Professional Engineers, acting as your agent, said plans consisting of three (3) sheets and entitled "Fly-Ash storage area, Meredosia power station General Illinois Public Service Company, Meredosia, Illinois," dated May 3, 1971, and received May 17, 1971 being made a part hereof.

This permit is issued subject to the standard conditions set forth on Page 2, attached hereto and incorporated herein by reference.

Condition #9: This permit is being issued on the condition that the effluent discharged from these ash storage basins must be within the limits on effluent quality as established in the present applicable water quality standards, and as may be revised or adopted by the Illinois Pollution Control Board. If the effluent proposed from the facilities does not meet the present and/or future effluent quality requirements, additional or alternate treatment facilities will be required. The present applicable water quality standards (S[illegible]-6) limits suspended solids in the effluent to 30 mg/l.

Ward L. Akers, Acting Manager
Permit Section, Division of
Water Pollution Control

DC[illegible]

cc: [illegible]EPA-PC
- Sargent & Lundy Engineers
Attn: R. T. Hargstrom
- Bureau of Legal Services
- Division of Waterways

IEPA - DIVISION OF RECORDS MANAGEMENT
RELEASABLE

JUN 03 2021

REVIEWER: MED

2200 CHURCHILL ROAD
AT 2400 WEST JEFFERSON
SPRINGFIELD, ILLINOIS 62706
AREA CODE 217-525-3397

Page 1116

Electronic Filing: Received, Clerk's Office 05/01/2023

This permit is granted in accordance with the provisions of the "Environmental Protection Act", approved June 29, 1970, and is subject to the following conditions:

1. If any statement or representation in the application is found to be incorrect, this permit may be revoked and the permittee thereupon waives all rights thereunder.

2. There shall be no deviations from the approved plans and specifications unless revised plans and specifications shall first have been submitted to the Environmental Protection Agency and a supplemental written permit issued therefor.

3. During or after the construction or the installation of the sewage works, any agent duly authorized by the Environmental Protection Agency shall have the right and authority to inspect such work and its operation.

4. This authority: (a) shall not be considered as in any manner affecting the title to the premises upon which the sewage works are to be located, (b) does not release the permittee from any liability for damage to person or property caused by or resulting from the installation, maintenance or operation of the proposed sewage works, (c) does not take into consideration the structural stability of any units or parts of the project, and (d) does not release the permittee from compliance with stream channel requirements of the State Division of Waterways, with other applicable statutes of the State Division of Waterways, with other applicable statutes of the State of Illinois, or with applicable local laws, regulations or ordinances.

5. This permit is void one year from date of issue unless installation of this project has started on or prior to date of expiration.

6. Rain water from roofs, streets and other areas, and ground water from foundation drains shall be excluded from the sewer system.

7. The installation shall be made under the supervision of an inspector provided by or approved by the operating agency.

8. Treatment works will be operated or supervised by a duly qualified sewage works operator Certified under the Regulations of the Environmental Protection Agency.

P. O. to Surveillance: Project consists of a fly ash storage basin of 1,000,000 cubic yards and a bottom ash storage basin of 300,000 cubic yards. All to serve Meredosia Generating Station.

Electronic Filing: Received, Clerk's Office 05/01/2023

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY

Subject Central Illinois Public Service Company
Data Bottom Ash & Fly Ash Ponds
Reviewed by E.J. Frampic Date

Log # 1634-71

Plans & specifications, and application for permit

Forms Received May 17, 1971

permit to install Central Illinois public service Company
607 E. Adams Street
Springfield Illinois

permit to operate. Central Illinois public Service Company
607 E. Adams Street
Springfield Illinois

Engineer - R. N. Bergstrom, Sargent & Lundy Engineers
140 South Dearborn Street
Chicago Illinois 60603.

Proposal - construct separate Fly Ash and Bottom Ash pond to serve Meredosia Generating Station Morgan County, Meredosia, Illinois

Receiving stream - Illinois River
Tributary to Mississippi River

IEPA - DIVISION OF RECORDS MANAGEMENT
RELEASABLE

JUN 03 2021

REVIEWER: MED

Design - As given by the Engineer
(See attached Meredosia Fly Ash pond Permit Progress) dated May 14, 1971

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STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY

Subject
Data
Reviewed by Date

(2)

	Fly Ash	Bottom Ash
Capacity	1,000,000 Cu. yds	300,000 cu. yds
Est. 1972 Tonnage Unit 1 & 2,	15,600 Cu. yds	3900 cu. yds
Unit 3	39,800 Cu. yds	9,950 cu. yds
Est. 1973 Tonnage Unit 1 & 2,	12,500 Cu. yds	3,100 Cu. yds
Unit 3	39,000 Cu. yds	9,800 Cu. yds
Est. 1974 Tonnage Unit 1 & 2,	10,000 Cu. yds	2,500 Cu. yds
Unit 3	38,000 Cu. yds	9,500 cu. yds
Est 1975 Tonnage Unit 1 & 2,	8,000 Cu. yds	2,000 Cu. yds
Unit 3	37,000 cu. yds	9,200 cu. yds
Est. 1976 Tonnage Unit 1 & 2	6,400 cu. yds	1,600 cu. yds
Unit 3	36,000 cu. yds	9,000 cu. yds
Total =	242,300 cu. yds	= 61450 cu. yds

The estimation 1 ton of Fly Ash would have a volume of 1 cu. yard.
which is 74 #/ cu. ft. (a)
The estimation 1 ton of Bottom Ash would have a volume of 1.1 cu. yards
which is 68 #/ cu. ft. (b)

It is estimated the life of the Ash pond based on reduction of Unit 1 and 2 by 20 % per year over the next 5 years and Unit 3 about 14% per year.

If is given from the projected reduction in fly ash input the pond we would estimate the life of the pond to be 20 to 25 years

but my calculations are done without any reduction

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STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY

Subject
Data
Reviewed by Date

(3)

will be for Fly Ash.
1,000,000 ÷ 242,300 = 4.13 years (OK)
for bottom Ash 300,000 ÷ 61,450 = 4.9 years (OK)

when the pond is 75% full the settling area is approximately 10 x 15 acres.

the Engineer gave the rate of bottom Ash inlet pipe & projected life of the pond after the 25 years (OK)

note but suspended solids ave. 38.8 Fly Ash & 40.0 ave bottom ash not acceptable

By Pass no by pass shown on the plans. (OK)

Projected Analysis of discharge from Fly Ash and bottom Ash (See Exhibit A May 10, 1971)

Operating Equipment None provided but should be available at the power plant.

Emergency power None needed.

Water supply None provided

Laboratory None provided in this contract.

Flow measurement none provided Weir Box (OK)

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STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY

Subject
Data
Reviewed by Date

(4)

multi Facing name provided

Two ponds are provided the layout pond of 1,000,000 gallons is designed for fly ash storage and the smaller of 300,000 is designed for bottom ash.

Depth of the pond 452 - 428 = 24 ft with the top embankment for section "BB" on the plan and 450 - 426 = 24 on section "AA" on the plans. The weir Box at maximum elevation of 450' is provided and regulate the light of the flow in the ponds.

the dikes forming the ponds are above existing grade.

Embankment Top Width 8'
interior slope 2:1
outer slope 2:1
freeboard - this elevation of operation.
Seeding as specified (Ok)

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STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY

Subject

Data

Reviewed by Date

(5)

Pond Bottom - Plot. Organic loading would be buried as the area requires fill.

note Inflow line not seen on the plans.

Effluent structure. Weir Box Det "B" w/12" Ø clay pipe see B-332 invert 426" (Fly Ash Pond)

& Weir Box "A" w/12" Ø clay pipe see B-332 invert 426 (Bottom Ash Pond)

Ended w/ concrete spill pad 6'-0" LG and centered on 12" Ø pipe (Spill pad shall be built with lean concrete) for both ponds.

Capacity - for Fly Ash pond = 1,000,000 cu. yds.

- for bottom Ashpond = 300,000 cu. yds.

(0±)

Electronic Filing: Received, Clerk's Office 05/01/2023

Subject CIPS - Morgan Co. - Design Sewage
Data Emergency Conference
Reviewed by Akers Date 11/6/70

~~DCM~~

100 People - 4 slu/p
60 " - 8 HRS -

Present 20 x 20 = 1200 GPD

Future: 120 x 20 = 2400 GPD

Pop Cap for 8 day = 5 gal/ft²/day
Filter Rate

In Office today - Agreed to 5 gpm Rate based on future design

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STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
BUREAU OF WATER POLLUTION CONTROL
SPRINGFIELD, ILLINOIS 62706

163A-71

APPLICATION FOR AN EPA-WPC PERMIT TO INSTALL OR MODIFY, AND TO OPERATE A WASTE TREATMENT FACILITY, AND/OR TO RELEASE PROCESS WASTE WATERS FROM AN INDUSTRY DIRECTLY INTO A LAKE, RIVER, STREAM, DRAINAGE DITCH, OR OTHER WATERS OF THE STATE IN COMPLIANCE WITH THE ENVIRONMENTAL PROTECTION AGENCY AND THE RULES, REGULATIONS AND REQUIREMENTS OF THE EPA FOR DISPOSAL OF INDUSTRIAL WASTES.

Central Illinois Public Service Company
(Name of Industry)

607 E. Adams Street - Illinois Building
Springfield
(Address)
Sangamon
(County)
, ILLINOIS

HEREBY MAKES APPLICATION TO THE EPA-WPC FOR THE ISSUANCE OF A PERMIT TO INSTALL AND OPERATE two ash storage basins complete with weir boxes.

WITH DISCHARGE TO Illinois River
(Name And/Or Location of Watercourse)

TRIBUTARY TO Mississippi River
(Name of Watercourse)

ATTACHED ARE THE FOLLOWING BASIC ENGINEERING PLANS AND SPECIFICATIONS, INFORMATION AND DATA: *(Include such items as daily volumes, average and maximum flow rates of wastes; types and concentrations of wastes; specifications, details and flow diagrams of treatment units and operation schedule; specifications of monitoring systems and/or laboratory analytical test procedures, etc.)*

1. Specification G-2457
2. Drawings B-331, B-332 and B-333
3.
4.
5.

RECEIVED
MAY 17 1971
ENVIRONMENTAL PROTECTION AGENCY
STATE OF ILLINOIS

ENGINEERING PLAN DOCUMENTS HAVE BEEN PREPARED BY

R. N. Bergstrom, Sargent & Lundy Engineers (Name of Engineer) Chicago 1925 (Illinois Registration No.)

AND ARE HEREWITH SUBMITTED FOR REVIEW AND APPROVAL, SAID PLANS, ETC. CONSISTING OF

1 (No.) SHEETS AND ENTITLED, "Plan - Ash Storage Pond"

R. N. Bergstrom, Sargent & Lundy Engineers

Signature of ~~Responsible Officer~~ R N Bergstrom

DATE May 14, 1971

Title (Owner, President, Etc.)

D. G. Raymer, Vice President
Central Illinois Public Service Company

EPA-WPC-7

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SEND TO:
STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
BUREAU OF WATER POLLUTION CONTROL
SPRINGFIELD, ILLINOIS 62706

EPA-WPC USE ONLY
ENGINEERS NOTE: This is your EPA-WPC Plan Submission Receipt Log Number. In future correspondence on this project refer to Log Number 163A-71
Date Received: _____

PLEASE SUBMIT TRIPLICATE COPIES OF THIS FORM WITH THE ORIGINAL PLAN SUBMISSION TO SPRINGFIELD. THEREAFTER, SUBMIT ONE (1) COPY WITH ANY ADDITIONAL PLANS OR INFORMATION.

SUBMISSION OF PLAN DOCUMENTS

ENGINEERING FIRM: Sargent & Lundy Engineers
ENGINEERING FILE NUMBER: _____
ADDRESS 140 South Dearborn
Chicago, Illinois 60603
PREVIOUS LOG NUMBER: _____
PREVIOUS PERMIT NUMBER: _____
(IF APPLICABLE, SEE CONDITION NUMBER 7 OF PERMIT AND RULE 1.04 OF R & R).
LOCATION OF PROJECT: Meredosia, Illinois
PROJECT DESCRIPTION: Ash Ponds

PLAN SUBMISSION ITEMS *

FOR SANITARY SEWERS & LIFT STATIONS (USE SEWER APPLICATION EPA-WPC-18)				FOR SEWAGE TREATMENT WORKS (USE TREATMENT APPLICATION EPA-WPC-26)			
ITEM	COPIES NEEDED	RULE,* PARA.	ENG. INITIAL	ITEM	COPIES NEEDED	RULE,* PARA.	ENG. INITIAL
BASIS OF DESIGN	1	11.2, 11.3		COMPREHENSIVE RPT.	1	11.1–11.5	
PLANS (SEWERS)	2	12.1, 12.2	RMB	PLANS	1	12.4	
PLANS (LIFT STATION)	2	12.3		OPERATION & MAINTENANCE MANUAL	1	FED. APP 11.44	
SPECIFICATIONS	2	13	RMB	SPECIFICATIONS	1	13	
ENGINEER SEAL	2	17	RMB	ENGINEER SEAL	1	17	
APPLICATION FOR PERMIT EPA-WPC-18	1	EPA	RMB	APPLICATION FOR PERMIT EPA-WPC-26	1	EPA	RMB
COST INFORMATION (SEE REVERSE SIDE)	1	11.54		COST (SEE REVERSE SIDE)	1	11.54	

RECEIVED
MAY 17 1971
ENVIRONMENTAL PROTECTION AGENCY
STATE OF ILLINOIS

* REFERENCE: "RULES AND REGULATIONS GOVERNING THE SUBMISSION OF PLAN DOCUMENTS AND DESIGN OF SEWAGE WORKS" DATED DECEMBER 19, 1951, AS AMENDED JANUARY 22, 1962.

THIS SUBMISSION IS (COMPLETE) (INCOMPLETE). IF INCOMPLETE, SUBMIT THE ITEMS WHICH HAVE BEEN CIRCLED. UPON RECEIPT OF THE ADDITIONAL MATERIAL WE WILL PROCEED WITH THE PLAN REVIEW ON THIS PROJECT.

FOR PROPOSALS IN LAKE, COOK, DU PAGE, WILL AND KANKAKEE COUNTIES, SEND ONE (1) SET OF COMPLETE PLAN SUBMISSION TO THE: *ENVIRONMENTAL PROTECTION AGENCY, 1919 WEST TAYLOR STREET, CHICAGO, ILLINOIS 60612. TELEPHONE: (312) 341-7290.*

FOR PROPOSALS IN MCHENRY, KENDALL AND KANE COUNTIES, SEND ONE (1) SET OF COMPLETE PLAN SUBMISSION TO THE: *ENVIRONMENTAL PROTECTION AGENCY, NORTHEAST REGIONAL OFFICE, REGIONAL ENGINEER, 48 WEST GALENA BLVD., AURORA, ILLINOIS 60504. TELEPHONE (312) 892-4272.*

EPA-WPC-17

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I. ESTIMATED PROJECT COST DATA–ENGINEERING, LEGAL, AND OTHER

PROJECT COSTS ENTERED BELOW PERTAIN ONLY TO MATERIAL, LABOR, AND DIRECT CONSTRUCTION COSTS. ENTER OTHER FEES AND SERVICE COSTS ESTIMATED FOR THIS PROJECT IN SECTION I.

ENGINEERING $ _____ LEGAL $ _____ ALL OTHER $ _____ **

II. ESTIMATED PROJECT COST DATA–SEWAGE TREATMENT FACILITIES

ITEM (LIST UNITS AS ON APPLICATION)	NUMBER OF UNITS	ESTIMATED TOTAL MATERIAL COST	ESTIMATED TOTAL CONSTRUCTION (LABOR) COST*	ESTIMATED TOTAL PROJECT COST
Earth dikes for bottom ash	1	$ 5,000	$150,000	$ 155,000
Earth dikes for fly ash	1	5,000	450,000	455,000
Weir Boxes	2	10,000	30,000	40,000
TOTAL				$650,000

III. ESTIMATED PROJECT COST DATA–SANITARY SEWERS AND APPURTENANCES

ITEM	QUANTITY OR # FEET	ESTIMATED TOTAL MATERIAL COST	ESTIMATED TOTAL LABOR COST*	ESTIMATED TOTAL PROJECT COST
8" Sewer (Sanitary)		$	$	$
10" Sewer (Sanitary)				
12" Sewer (Sanitary)				
Other (enter size)				
Other (enter size)				
Other (enter size)				
Other (enter size)				
TOTAL				
	INCLUDED IN SECTION II			
4" Force Main				
6" Force Main				
Other FM (give size)				
Other FM (give size)				
TOTAL				
Man Holes				
Lift Stations				
Pumps				
Siphons				
Junction Chambers				
Other (list)				
TOTAL				

GRAND TOTAL–COSTS, THIS PROJECT (TOTAL OF SECTIONS I, II, AND III): $ 650,000.00

*LABOR COSTS INCLUDE VALUE OF SERVICES WHEN LABOR IS BY OWN FORCES.

**OTHER COSTS INCLUDE LAND PURCHASE OR LAND VALUE COSTS FOR SEWAGE TREATMENT SITE.

EPA-WPC USE ONLY PERMIT# _____ PERMIT DATE _____

ON ISSUANCE OF PERMIT, ONE COPY TO BE FILED WITH CONSTRUCTION REPORT FORMS.

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CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
GENERAL OFFICES / 607 EAST ADAMS / SPRINGFIELD, ILLINOIS 62701

163B-71

June 11, 1971

RECEIVED
JUN 14 1971
ENVIRONMENTAL PROTECTION AGENCY
STATE OF ILLINOIS

Mr. W. L. Blaser, Director
State of Illinois
Environmental Protection Agency
Bureau of Water Pollution Control
Permits Section
2200 Churchill Road
Springfield, Illinois 62706

Mr. W. Akers Attention: Mr. E. Frangie

Dear Mr. Frangie:

We are submitting three copies of Sargent & Lundy Drawing B-331. They have been revised to show the location of the inlet pipes as requested in your telephone conversation with Mr. C. M. Kennedy May 21, 1971.

If there are any further questions please advise.

Very truly yours,

Robert A. Wierschem

R. A. Wierschem
Co-ordinator of
Environmental Protection

RAW:ll
Attachments
cc: C. M. Kennedy, Chemical Engineer

Electronic Filing: Received, Clerk's Office 05/01/2023

WILLIAM L. BLASER
XXXXXXXXXXXXXXXXX

June 1, 1971

CENTRAL ILLINOIS PUBLIC SERVICE CO. - Proposed Sewage Treatment
(Meredosia) EPA Log #163-71

Mr. C. M. Kennedy
Central Illinois Public Service Company
607 East Adams
Springfield, Illinois 62701

Dear Mr. Kennedy:

This Agency has reviewed the Application for Permit and plan documents for the proposed sewage treatment plant to serve C.I.P.S., Meredosia power plant. Please be advised that before a permit can be issued, the following items must be resolved:

1. The initial design data appears ambiguous; average flow 6 gpm, design flow 18 gpm, BOD loading 12 lbs/day and 12 lbs BOD/1000 ft^3 of aeration tank. The plant is set for 4 gpm design flow. Please indicate the basis for using 4 gpm as the plant design flow.

2. The surge tank is needed due to the lift station surges. The surge tank must be aerated.

3. The aeration compartment is required to have a 24 hour detention time based on the design average daily flow.

4. The rules and regulations of this Agency requires that the wet and dry wells including their superstructure shall be completely separated.

5. Plans and specifications for the rerouting of existing sewers are to be submitted containing elevations of manholes, slopes of sewers, and specifications of machole design.

This office is unable to issue a permit based on our review of documents submitted to date. Upon receipt of revised plans resolving the above-noted items, we will continue our review of the subject project for issuance of a permit.

Very truly yours,

Roger K. Fitting

Roger K. Fitting
Environmental Protection Engineer
Permit Section, Bureau of Water
Pollution Control

RKF:ob

Electronic Filing: Received, Clerk's Office 05/01/2023

L T F

CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
GENERAL OFFICES / 607 EAST ADAMS / SPRINGFIELD, ILLINOIS 62701

May 20, 1971

RECEIVED
MAY 21 1971
ENVIRONMENTAL PROTECTION AGENCY
STATE OF ILLINOIS

State of Illinois
Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois

Attention: Mr. W. Akers

Dear Mr. Akers:

Reference is made to our conversation on May 17, 1971 concerning the request for permit to construct and operate a Fly Ash Pond at our Meredosia Power Station. Attached is an estimate of the Fly Ash input and the estimated projected life of the storage pond.

I would appreciate very much your assistance in obtaining the permit so that construction could begin while the Illinois River is low.

Very truly yours,

C. M. Kennedy

C. M. Kennedy
Chemical Engineer
Reg. P.E. No. 9885

CMK:ll
Attachment

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CENTRAL ILLINOIS PUBLIC SERVICE COMPANY

To be attached to Meredosia Fly Ash Pond Permit Request dated May 14, 1971

		Fly Ash	Bottom Ash
Capacity of Pond		1,000,000 cu. yds.	300,000 cu. yds.
Est. 1972 Tonnage	Unit 1 & 2	15,600 cu. yds.	3,900 cu. yds.
	Unit 3	39,800 cu. yds.	9,950 cu. yds.
Est. 1973 Tonnage	Unit 1 & 2	12,500 cu. yds.	3,100 cu. yds.
	Unit 3	39,000 cu. yds.	9,800 cu. yds.
Est. 1974 Tonnage	Unit 1 & 2	10,000 cu. yds.	2,500 cu. yds.
	Unit 3	38,000 cu. yds.	9,500 cu. yds.
Est. 1975 Tonnage	Unit 1 & 2	8,000 cu. yds.	2,000 cu. yds.
	Unit 3	37,000 cu. yds.	9,200 cu. yds.
Est. 1976 Tonnage	Unit 1 & 2	6,400 cu. yds.	1,600 cu. yds.
	Unit 3	36,000 cu. yds.	9,900 cu. yds.

We have estimated 1 ton of Fly Ash would have a volume of 1 cu. yd.
We have estimated 1 ton of Bottom Ash to have a volume of 1.1 cu. yds.

It is estimated the life of the Ash Pond based on reduction of Unit 1 and 2 to be 20% per year over the next 5 years and Unit 3 about 17% per year.

From the projected reduction in Ash input to pond we would estimate the life of the pond to be 20 to 25 years.

When the pond is 75% full the settling area is approximately 10×10^6 cu. ft.

The rate of Bottom Ash inlet gives a projected life of the pond at 22 to 25 years.

C. M. Kennedy, Chemical Engineer
Central Illinois Public Service Co.
Reg. P.E. No. 9885

CMK:ll

A-2158-6-68

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State of Illinois, Environmental Protection Agency

CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
GENERAL OFFICES / 607 EAST ADAMS / SPRINGFIELD, ILLINOIS 62701

May 14, 1971

SUBJECT: Proposed Ash Storage Basins
Meredosia Power Station

District Engineer
U. S. Army Engineer District, St. Louis
906 Olive Street
St. Louis, Missouri 63101

Attention: Col. Carroll N. LeTellier

Dear Sir:

Central Illinois Public Service Company requests a Permit for the construction of two earth dike enclosures at our Meredosia Generating Station as shown on drawings entitled:

MEREDOSIA STATION
Proposed Ash Storage Pond
Adjacent to Illinois River
To Accompany Application
For Permit
Dated May 4, 1971
Central Illinois Public Service Company
Meredosia, Illinois

Central Illinois Public Service Company
Plat of Property
At Meredosia, Illinois
Morgan County
T 16N, R 13W, 3rd PM
Sections 21, 22, 27, 28

The "Proposed Ash Storage Pond" drawing was prepared for us by Sargent & Lundy Engineers, 140 South Dearborn Street, Chicago, Illinois 60603.

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We are enclosing three copies of our Application for Permit to the State of Illinois, Department of Public Works and Buildings, Division of Waterways and three prints each of the above drawings. The project for which this construction permit is requested is part of facilities being installed at the Meredosia Power Station for the control of air and water pollution. The Plant is located near milepost 70.5 on the Illinois River.

Attached is a copy of our transmittal letter dated May 14, 1971 to the State of Illinois, Department of Public Works and Buildings, Division of Waterways requesting their approval for a construction permit for this facility.

Also attached is a copy of our May 14, 1971 transmittal letter to the State of Illinois, Environmental Protection Agency, requesting a permit to construct and operate this facility. Upon approval by the Environmental Protection Agency, we will make application to your office to operate this facility in accordance with the 1899 Refuse Act as applies to discharges in navigable waters and tributaries.

Very truly yours,

W. J. Holhut
Construction Engineer

WJH:JTS
Attachments
cc: State of Illinois,
Department of Public Works and Buildings
Division of Waterways
cc: State of Illinois, Environmental Protection Agency
cc: Sargent & Lundy Engineers w/attachments
cc: F. A. Carlet, Jr., Superintendent
Meredosia Power Station

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State of Illinois, Environmental Protection Agency

CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
GENERAL OFFICES / 607 EAST ADAMS / SPRINGFIELD, ILLINOIS 62701

May 14, 1971

State of Illinois
Department of Public Works and Buildings
Division of Waterways
201 West Monroe
Springfield, Illinois 62701

Attention: Mr. Robert Dial, Permit Engineer

Dear Mr. Dial:

We are submitting herewith an Application For Permit along with plans (in triplicate) for construction of two earth dike enclosures to contain fly ash and bottom ash at our Meredosia Generating Station situated near milepost 70.5 on the Illinois River.

The two earth dike enclosures are shown and located on the following drawings entitled:

MEREDOSIA STATION
Proposed Ash Storage Pond
Adjacent to Illinois River
To Accompany Application
For Permit
Dated May 4, 1971
Central Illinois Public Service Company
Meredosia, Illinois

RECEIVED
MAY 17 1971
ENVIRONMENTAL PROTECTION AGENCY
STATE OF ILLINOIS

Central Illinois Public Service Company
Plat of Property
At Meredosia, Illinois
Morgan County
T 16N, R 13W, 3rd PM
Sections 21, 22, 27, 28

The "Proposed Ash Storage Pond" drawing was prepared for us by Sargent & Lundy Engineers, 140 South Dearborn Street, Chicago, Illinois 60603.

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Attached is a copy of our transmittal letter dated May 14, 1971 to the attention of Col. C. N. LeTellier, Corps of Engineers, St. Louis, Missouri requesting their approval for a construction permit.

Also attached is a copy of our May 14, 1971 transmittal letter to the State of Illinois, Environmental Protection Agency, requesting a permit to construct and operate this facility.

We are most anxious to begin construction of this facility during the month of June 1971 and respectfully request your immediate review of our application. If there are any questions concerning the attached application, forms, drawings or transmittal letters, please contact the writer.

Very truly yours,

W. J. Holhut
Construction Engineer

WJH:JTS
Attachments
cc: State of Illinois,
Environmental Protection Agency
cc: Corps of Engineers
U. S. Army District
St. Louis, Missouri
cc: Sargent & Lundy Engineers w/attachment
cc: F. A. Carlet, Jr., Superintendent
Meredosia Power Station

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MAY 17 1971
ENVIRONMENTAL PROTECTION AGENCY
STATE OF ILLINOIS

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ETF for review 5/18/71

CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
GENERAL OFFICES / 607 EAST ADAMS / SPRINGFIELD, ILLINOIS 62701

163A-71

May 14, 1971

Rec'd 5/17/71 Hand Delivered

Mr. W. L. Blaser, Director
State of Illinois
Environmental Protection Agency
Bureau of Water Pollution Control
Permits Section
2200 Churchill Road
Springfield, Illinois 62706

RECEIVED
MAY 17 1971
ENVIRONMENTAL PROTECTION AGENCY
STATE OF ILLINOIS

Mr. W. Akers Attention: Mr. D. Melton

Dear Mr. Melton:

We are submitting herewith application forms in triplicate, EPA-WPC-7 and form EPA-WPC-17 to construct and operate two earth dike enclosures forming bottom ash and fly ash ponds at our Meredosia Generating Station, Morgan County, Meredosia, Illinois. We have also included three copies each of Specification G-2457, Ash Storage Pond Work, revised April 1, 1971 and Sargent & Lundy Drawings B-331, B-332 and B-333.

As indicated on form EPA-WPC-7, engineering plan documents were prepared by Sargent & Lundy Engineers, 140 South Dearborn Street, Chicago, Illinois 60603. These documents have the State of Illinois Engineering Seal of Mr. R. N. Bergstrom, (Ill. Reg. No. 1925) affixed to the above mentioned Environmental Protection Agency forms and Sargent & Lundy Drawings. Form EPA-WPC-7 is signed by Mr. D. G. Raymer, Vice President, Central Illinois Public Service Company.

In addition, we have attached our "Exhibit A" dated May 14, 1971 in compliance with your verbal request to me for information on the expected quality of the effluent discharge from each of these ponds. This data has been assembled by our Mr. C. M. Kennedy, Chemical Engineer.

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For your reference, I am attaching our May 14, 1971 letter to the Corps of Engineers, U. S. Army District, St. Louis, requesting a permit to construct this facility. Also attached is our May 14, 1971 transmittal letter to the State of Illinois, Department of Public Works and Buildings, Division of Waterways, requesting a permit to construct this facility.

If there are any questions concerning the attached application forms, Specification, drawings or transmittal letters, please advise. We are most anxious to begin construction of this facility during the month of June, 1971 and respectfully request your immediate review of our application.

Very truly yours,

W. J. Holhut
Construction Engineer

WJH:JTS
Attachments
cc: State of Illinois,
Department of Public Works and Buildings
Division of Waterways
cc: Sargent & Lundy Engineers w/attachments
cc: Corps of Engineers,
U. S. Army District
St. Louis, Missouri
cc: F. A. Carlet, Jr., Superintendent
Meredosia Power Station

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CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
GENERAL OFFICES / 607 EAST ADAMS / SPRINGFIELD, ILLINOIS 62701

163-71

February 25, 1971

RECEIVED

MAR 1 1971

ENVIRONMENTAL PROTECTION AGENCY
STATE OF ILLINOIS

State of Illinois
Environmental Protection Agency
Bureau of Water Pollution Control
2200 Churchill Road
Springfield, Illinois

Attention: Permit Application Section

Attached you will find the necessary forms completed and signed as requested by your Department for installation of a Sewage Treatment Plant at our Meredosia Power Station.

Included in the forms for the permit you will find the following:

Form EPA-WPC-7 - Request for Permit to Install and Operate a Sewage Plant

Form EPA-WPC-18 - Application for Permit to Reroute Sewer to Flow to Lift Station

Form EPA-WPC-26 - Application for Permit to Install Sewage Treatment Plant at the Meredosia Power Station

Form EPA-WPC-17 - Which covers forms for the Submission of Plan Documents

Also attached you will find Specification G-2448 - Equipment for Lift Station and Sewage Treatment Plant. Also, attached are 3 copies of Drawing A-350 which covers Sewage Treatment Plant Plans and Sections at the Meredosia Power Station.

It is requested that you notify this office as to receipt of the above permits, specifications and drawings.

Very truly yours,

C. M. Kennedy

C. M. Kennedy
Chemical Engineer
Production Department

CMK:ll
Encls.

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File

RICHARD B. OGILVIE
Governor

WILLIAM L. BLASER
DIRECTOR

STATE OF ILLINOIS

ENVIRONMENTAL PROTECTION AGENCY

August 27, 1971
Log #163 - 71

CENTRAL ILLINOIS PUBLIC SERVICE COMPANY - Sewage Treatment Facilities
(MEREDOSIA) - PERMIT #1971-PA-660

Central Illinois Public Service Company
Illinois Building - 607 East Adams
Springfield, Illinois 62701

Permit is hereby granted to Central Illinois Public Service Company of Springfield, Sangamon County, Illinois, to install and operate at Meredosia, Morgan County, a lift station and extended aeration 9600 gallon-per-day sewage treatment plant with surge tank followed by: dosing tank, intermittent sand filters and effluent gas chlorination with discharge to the Illinois River all in accordance with plans and specifications submitted by Sargent & Lundy Engineers, Registered Professional Engineers, acting as your agent, said plans consisting of one (1) sheet and entitled "Sewage Treatment Plant - Plans and Sections - Meredosia Power Station - Central Illinois Public Service Company - Meredosia, Illinois," dated February 6, 1971 and revised plans received June 25, 1971.

This permit is issued subject to the standard conditions set forth on Page 2, attached hereto and incorporated herein by reference.

See Page LA for additional conditions.

Very truly yours,

DIVISION OF WATER POLLUTION CONTROL

Ward L. Akers, P.E.
Acting Manager
Permit Section

DCM:RRF:dgs

CC: - Division of Legal Services
- EPA - PO
- Sargent & Lundy Engineers
- Robert A. Wierschem of C.I.P.S.
- Division of Waterways

In the New Illinois, we accommodate!
2200 CHURCHILL ROAD
AT 2400 WEST JEFFERSON
SPRINGFIELD, ILLINOIS 62706
AREA CODE 217-525-3397

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SPECIAL PARAGRAPH: The average daily dry weather flow shall not exceed 4000 gpd, the average daily effluent BOD shall not exceed 30 mg/l, and the average daily effluent suspended solids shall not exceed 35 mg/l, without a permit or permit renewal from this Agency.

Condition #9: This permit is being issued on the condition that plans for sludge disposal facilities be submitted and approved by this Agency before operation of the sewage treatment facilities begins.

Condition #10: This permit is being issued on the condition that the inlet lift station shall be provided with the following: each pump shall be provided with a gate valve and check valve on the discharge line and the wet well shall be provided with a separate forced air ventilation system.

Condition #11: This permit is being issued on the condition that two (2) complete sets of final plans and specifications shall be submitted to this Agency.

P.S. to Surveillance: Project consists of a 100 gpm lift station, 1000 gallon surge tank, 4000 gpd extended aeration treatment plant, dosing tank with alternating siphons, intermittent sand filter, and effluent chlorination to serve 100 P.E. @ 40 gped.

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This permit is granted in accordance with the provisions of the "Environmental Protection Act", approved June 29, 1970, and is subject to the following conditions:

1. If any statement or representation in the application is found to be incorrect, this permit may be revoked and the permittee thereupon waives all rights thereunder.

2. There shall be no deviations from the approved plans and specifications unless revised plans and specifications shall first have been submitted to the Environmental Protection Agency and a supplemental written permit issued therefor.

3. During or after the construction or the installation of the sewage works, any agent duly authorized by the Environmental Protection Agency shall have the right and authority to inspect such work and its operation.

4. This authority: (a) shall not be considered as in any manner affecting the title to the premises upon which the sewage works are to be located, (b) does not release the permittee from any liability for damage to person or property caused by or resulting from the installation, maintenance or operation of the proposed sewage works, (c) does not take into consideration the structural stability of any units or parts of the project, and (d) does not release the permittee from compliance with stream channel requirements of the State Division of Waterways, with other applicable statutes of the State Division of Waterways, with other applicable statutes of the State of Illinois, or with applicable local laws, regulations or ordinances.

5. This permit is void one year from date of issue unless installation of this project has started on or prior to date of expiration.

6. Rain water from roofs, streets and other areas, and ground water from foundation drains shall be excluded from the sewer system.

7. The installation shall be made under the supervision of an inspector provided by or approved by the operating agency.

8. Treatment works will be operated or supervised by a duly qualified sewage works operator Certified under the Regulations of the Environmental Protection Agency.

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STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY

Subject Meredosia - Central Illinois Public Service Co.
Data Specs & Prints
Reviewed by RKF Date 2/25/71

Log 163/71

Meredosia Power Station
Documents Rec'd: March 4, 1971
Review letter Sent: June 1, 1971
Revised Plans Submitted: June 25, 1971

Engineer: R. N. Bergstrom

Sewage Treatment Plant

Propose Extended Aeration
Aer-O-Flo model S-50-33-2

Design flow information

Present pop. in power plant 100
charge to 40 ~~50~~ gpcd @ 0.07 #BOD/pe
(1 shift)

55 PE/hr x 50 gpcd ÷ 60 min/hr = 5.75 gpm ≈ 6 gpm

Since the other shifts are smaller than the 6 gpm shift, a surge tank is provided to pump the flow to the rest of the plant at 4 gpm

Note: 5000 gpd → 3.47 gpm (Pump shall be)
100 PE @ 0.07 #BOD/pe = 7 #BOD/day

For expansion purposes

55 PE @ 0.07 #BOD/pe x 3 = 11.5 #BOD/day ≈ 12 #

12 # ÷ 0.17 #BOD/pe = 70 PE

Propose 12 #BOD ÷ (5000 gal ÷ 7.5 gal/ft³) = 18 ft³

→ Actual (7 #BOD ÷ (4000 gal ÷ 7.5 gal/ft³)) = 13.1 #BOD

Aeration 4000 gal ~~5~~ 4000 gal of which is the surge tank which is aerated + 4000 gal regular aeration)

Detention Time 24 hrs.

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STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY

Subject Meredosia - Central Illinois Power Supply
Data Plans & Specs
Reviewed by RPE Date 3/26/71

Scum returned to aeration OK

Settling Tank
5' x 8' x 10' ~~ANAEROBIC~~ 4.65 = 960 gal 960 gallons
detention time ~~4.65~~ hrs
surface settling rate 125 gallons/ft2
5' weir = 1000 gal/ft/day

Sludge Storage
5' dia x 10' = ~~960~~ 196 ft3
OK Note: shall be aerated

SEP

Flow enters surge tank, an air lift pump delivers at a constant rate to a comminutor. A by-pass bar screen is provided.
Note: what happens when comminutor goes out

Aeration - diffused aeration
12# BOD x 2000 ft3 air/BOD# = 24,000 ft3 air/hr OK
Air provided by the station air
One blower provided for standby power

Sludge compartment - aerobic digester
aeration provided
supernatant line to aeration tank OK
sludge line from the clarifier
decanting equipment provided

Dosing Tank
2' x 8'-6" x 2'-6" = 170 ft3 = 1275 gallons

Sand beds
500 ft2
1.7 ÷ 5 = 0.34 ft = 4.08"
3.92 doses/day @ 6.12 hrs
splash pad provided
under drains every 5' OK

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STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY

Subject Meredosia - Central Illinois Power Supply
Data Plans & Specs
Reviewed by XXF Date 3/26/71

Chlorination
8' x 4'-8" x 2'-6" = 94.3 ft³ ≈ 700 gallons
Proposed delivery rate of 41 gpm
17.5 min. detention time OK
baffled outlet

Out fall
12" line to existing discharge flume to the Illinois River OK

Lift Station (discharging to treatment plant)
100 gpm pumps @ 16 ft TDH OK
Duplex pumps
counter & recorder provided
inlet elev. 445'
outlet elev. 459'
14' OK
2' left for friction head OK
alarms provided for lift station & treatment plant
OK Note: forced air ventilation shall be provided (what are specs.)
forget Note: Dehumidifier shall be provided

Chlorination equipment
gas chlorine with water added
vacuum valves provided
923 cfm vent fan provided
6.5' x 6.5' x 8' = 338 ft³ OK
OK Note: Intake shall be within 6" of floor and shall open in with door open

Sludge disposal by wet haul
Note: Withdraw To
OK Note: Alternate power supply
power plant provides own power supply

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STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY

Subject

Data

Reviewed by Date

340 NPE 80

CIPS must submit a letter to us which will have to represent a committment to a program for sludge disposal. It must contain an estimate of when the holding tank will be full and a statement that a scavenger service will haul the sludge away. The letter should state that they will submit a proposal to us at least 6 months before the sludge is to be disposed of, and that this proposal will include information on who will haul the sludge and where it will be disposed of. A METHOD The letter must state that they will not haul any sludge until they have approval from the Agency.

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Submit in Duplicate
Fill In All Blanks

Use Form S
Permit App
Sewage Treat

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
BUREAU OF WATER POLLUTION CONTROL
SPRINGFIELD, ILLINOIS 62706

SEWER SYSTEM
PERMIT APPLICATION

APPLICATION FOR PERMIT FOR CONSTRUCTION, INSTALLATION, MODIFICATION OR OPERATION OF SEWAGE WORKS OR ANY EXTENSION OR ADDITION

LOCATION OF PROJECT Morgan (County) Meredosia (Municipality, etc.) Illinois Building

THE Central Illinois Public Service Co. Springfield, Illinois 62701
(Legal Name of Applicant) (Address)

HEREBY MAKES APPLICATION TO THE SANITARY WATER BOARD OF THE STATE OF ILLINOIS FOR THE ISSUANCE OF A PERMIT TO INSTALL SEWER SYSTEM APPURTENANCES AS FOLLOWS: Rerouting of sewer to flow into lift station then to sewage treating plant.
(Describe briefly the sewer works for which application is made)

RECEIVED
MAR 1 1971
ENVIRONMENTAL PROTECTION AGENCY
STATE OF ILLINOIS

AND Central Illinois Public Service Company (Municipality, Corporation, Address) TO OPERATE

WITH OUTLET TO Illinois River (Identify point of connection or discharge)

AS MORE FULLY SHOWN ON ACCOMPANYING PLANS AND SPECIFICATIONS PREPARED BY
R. N. Bergstrom - Sargent & Lundy Engineers, Chicago 1925
(Name of Engineer) (Illinois Registration Number)

ACTING AS MY AGENT (Delete if not applicable)

SAID PLANS CONSISTING OF 1 SHEETS AND ENTITLED A-350 Sewage Treatment Plant Plans and Sections BEING MADE A PART HEREOF.

PROJECT APPROVAL

Sewer Lines: By indicating their approval hereon the signers hereby attest that they have ascertained that the proposed installation will be adequate for all sewage flow from sanitary sewer lines to be made tributary to the proposed installation; that the existing sewer lines and the sewage treatment works have adequate capacity for the additional sewage flow from the proposed installation; and furthermore, that the installation shall be made under the supervision of an inspector provided by or approved by the consulting engineer.

The application shall be signed as follows:

a. For construction and operation approval within the limits of a municipality, the application shall be signed by the installer and by a municipal official, and attested by the clerk. If municipally owned, the municipal official will sign as the owner regardless of location.
b. If the proposed facilities are privately owned and located outside a municipality, the owner or responsible officer of the organization shall sign the application and obtain signature of a proper official of the agency responsible for the continued maintenance and operation of the sewer system.

FOR CONSTRUCTION APPROVAL DATE February 5, 1971

R.N. Bergstrom (Signature of Applicant or Agent) Partner - Sargent & Lundy Engineers (Title: Owner Installer or Agent)

FOR OPERATION APPROVAL DATE February 23, 1971

(Signature of Mayor, President, etc.) Vice President (Title)

ATTESTED February 24, 1971 (Date) (Signature) ASSISTANT SECRETARY (Clerk)

FOR SPECIAL CONCURRENCE OR APPROVAL (Sanitary Districts where required locally, etc.) DATE

(Signature of President, etc.) (Title)

ATTESTED (Date) (Signature) (Clerk)

NOTE:

1. Sewer system means pipe lines or conduits, pumping stations, force mains, constructed drainage ditches, surface water intercepting ditches, and all other constructions, devices, and appliances appurtenant thereto, used for collecting or conducting sewage, industrial waste or other wastes to a point of ultimate disposal.
2. "Municipality" means Sanitary District and/or similar governing agencies.

(ENTER SKETCH OF SYSTEM ON REVERSE SIDE)

EPA-WPC-18

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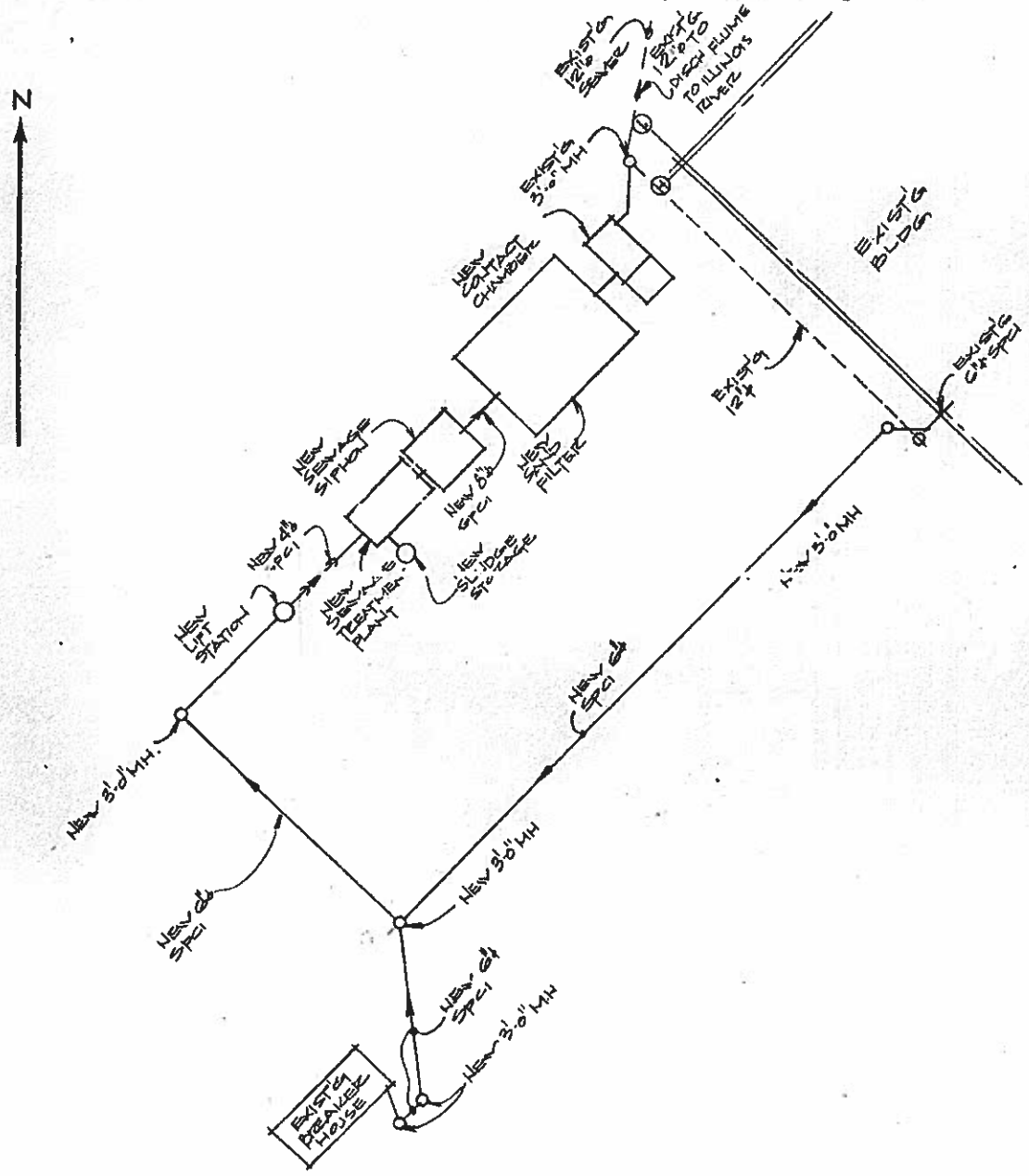
(CONSULTING ENGINEER)

SKETCH – Sewer System or Extension. Location Sketch. The project for which application is made should be specifically located as being in the NE, SE, NW, or SW parts of the sewer system. Indicate streets, location of Sewage Treatment Works with respect to this project, size and present load on intermediate sewers to the Treatment Works, and size and present load on any lift station(s) between this project and the Treatment Works. The specific point of connection to the present sewer system must be given. Bypasses or overflows on the proposed system should be located on the sketch and justified in the design notes.



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(Use Form EPA-WPC-18 for Sewer Permit Applications. Submit EPA-WPC-26 in Duplicate)

STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
BUREAU OF WATER POLLUTION CONTROL
SPRINGFIELD, ILLINOIS 62706

163-21

SEWAGE TREATMENT WORKS PERMIT APPLICATION

APPLICATION FOR PERMIT FOR CONSTRUCTION, INSTALLATION, MODIFICATION OR OPERATION OF SEWAGE TREATMENT WORKS OR ANY EXTENSION OR ADDITION

Location of project Morgan (county) Meredosia (municipality, etc.)

The Central Illinois Public Service Co. (legal name of applicant) Springfield, Illinois 62701 Illinois Building (address)

Hereby makes application to the EPA-WPC of the State of Illinois for the issuance of a permit TO INSTALL An aeration type sewage treating plant complete with intermittent sand filter and chlorinator. (describe briefly the sewage works for which application is made)

RECEIVED

And Central Illinois Public Service Company - Springfield (municipality, corporation, address) TO OPERATE

MAR 1 1971

With outlet to Illinois River (identify point of connection or discharge)

ENVIRONMENTAL PROTECTION AGENCY STATE OF ILLINOIS

As more fully shown on accompanying plans and specifications prepared by R. N. Bergstrom - Sargent & Lundy Engineers, Chica 29 (name of engineer) (Illinois Registration Number)

Acting as my agent (delete if not applicable)

Said plans consisting of 1 sheets and entitled A-350 Sewage Treatment Plant Plans & Sections being made a part hereof.

PROJECT APPROVAL

Sewage Treatment Works: By indicating their approval hereon the signers hereby attest that the proposed treatment works or proposed treatment works additions will be operated or supervised by a duly qualified sewage works operator as Certified under Regulations of the Environmental Protection Agency.

The application shall be signed as follows:

a. For construction and operation approval within the limits of a municipality, the application shall be signed by the installer and by a municipal official, and attested by the clerk. If municipally owned, the municipal official will sign as the owner regardless of location.
b. If the proposed facilities are privately owned and located outside a municipality, the owner or responsible officer of the organization shall sign the application and obtain signature of a proper official of the agency responsible for the continuous maintenance and operation of the sewage works.

FOR CONSTRUCTION APPROVAL Date February 5, 1971

R. N. Bergstrom (signature of applicant or agent) Partner - Sargent & Lundy Engineers (Title: Owner, Installer, or Agent)

FOR OPERATION APPROVAL Date February 23, 1971

(signature of Mayor, President, etc.) Vice President (Title)

Attested February 24, 1971 (Date) (Signature) ASSISTANT SECRETARY (Clerk)

For special concurrence or approval (Sanitary Districts where required locally, etc.) Date

(Signature of President, etc.) (Title)

Attested (Date) (Signature) (Clerk)

NOTE:

1. "Treatment Works" means any method, construction, device or appliance appurtenant thereto, installed for the purpose of treating, neutralizing, stabilizing, disinfecting, or disposing of sewage, industrial waste or other wastes, or for the recovery of by-products from such sewage, industrial waste or other wastes.
2. "Municipality" means Sanitary District and/or similar governing agencies.

EPA-WPC-26

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TO BE COMPLETED BY ENGINEER

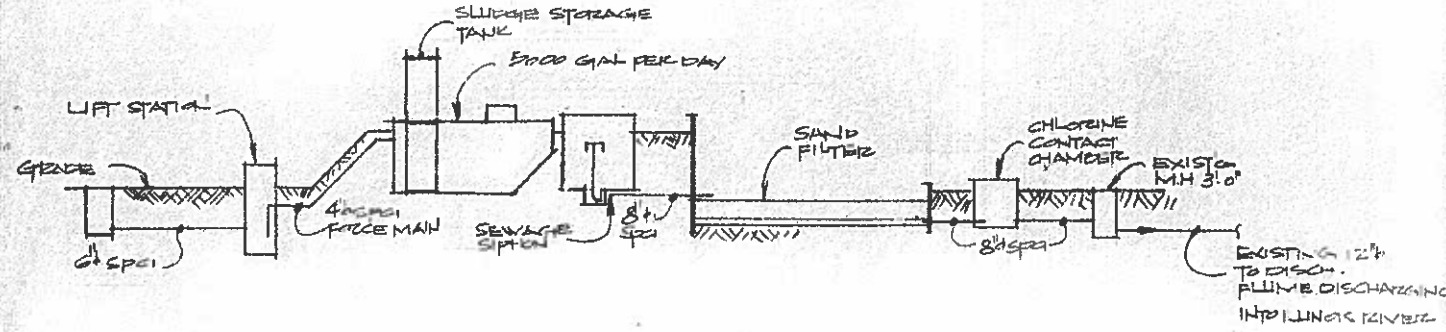
LOCATION SKETCH. Indicate area served, plant site, receiving watercourse, point(s) of discharge, access roads, closest habitations; quarter section, township and range.

Sewage works will be located in southeast 1/4 of Section 21, Township 35, and Range 13W.

See plan on drawing A-350 for location of sewage treating plant on existing power plant site and point of discharge to river.

N

PROCESS SKETCH. Indicate units and pump facilities with piping.



(FACILITY NAME)

(PERMIT DATE & NO.) (SWB use)

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TO BE COMPLETED BY ENGINEER

PLANT PROCESS – (D) (Identify with units on Process Sketch)

UNIT TYPE & DESCRIPTION	MFR NAME	DESIGN FLOW RATE	VOLUME & DIMENSIONS
Duplex Package Lift Station		100 GPM Each	5'-0" Diameter x 15'-0" Long
Extended Aeration Sewage Treatment Plant		4 GPM	14'-9" Lg x 8'-0" Wide x 10'-0" Deep
Surge Chamber		100 GPM	1000 Gal. 2'-0" x 8'-0" x 10'-0" Deep
Aeration Compartment		4 GPM	4000 Gal. 8'-3" Lg x 8'-0" Wide x 10'-0"Dp
Settling Compartment		4 GPM	960 Gal. 5'-0" x 8'-0" x 10'-0" Deep
Sludge Storage		---	5'-0" Dia x 10'-0" Deep - 200 Cu. Ft.
Sand Filter		---	500 Sq. Ft.
Contact Chamber		40 GPM	8'-0" x 4'-8" x 2'-6" 600 Gal.

ENTER DESIGN DATA

DESIGN (G) Aeration – Aeration period, hours and minutes; lbs BOD/1000 Cu. Ft. tank Volume. Sludge Beds – Sq. ft. per capita at design PE. Settling Tanks (primary), (secondary) – Settling rate, gallons/day/sq. ft; detention, hours and minutes. Digesters (first stage), (second stage) – Total capacity, cu. ft/capita at design PE. Filters – (total capacity) – MGAD at design avg. flow; lbs BOD/1000 cu. ft. filter volume/day. Stabilization Ponds – lbs BOD/Acre/day; size in acres. Reaeration – Reaeration period, hours and minutes; aeration: reaeration ratio.

Aeration Period - 24 Hours 12#/1000 Cu. Ft. Tank

Volume

(H) Stream Sewers.

H-31 Circle stream usage type for area immediately downstream of treatment works outlet.

1–Domestic water supply
2–Bathing
3–Recreation
(4)–Fishing
5–Industrial Water Supply
6–Livestock
7–Wildlife & Game
8–Irrigation
9–Navigation
10–Waste transport

H-35 Stream flow–(10 yr., 7 consecutive day minimum) cfs rate at the plant effluent outlet 2290 cfs

H-39 Stream flow–minimum observed or recorded cfs rate at the outlet 1740 cfs

*H-69 State the year the sewer system was originally installed _____ (municipal type systems)

*H-71 State the per cent mileage of the sewer system in Combined Sewers _____ % (municipal type systems)

*H-72 Give the total length of all the Public Sewers, Mains, etc. in the Sanitary Sewer system _____ miles. (municipal type systems)

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TO BE COMPLETED BY ENGINEER

(Asterisked items may be omitted by Industrial or Commercial applicants)

A-11 Name of the Owner of the Sewage Works: Central Illinois Public Service Co.

A-29 Address of the Owner: 607 E. Adams Street - Illinois Building, Springfield, Illinois ZIP 62701

B-75 Treatment Works is of (one) (two) of the following types. Circle one or two types below.

1 – Imhoff
2 – Primary
3 – Oxidation Pond
4 – Chemical Treatment
5 – Trickling Filter
6 – Activated Sludge
(7) – Sand Filtration
8 – Industrial Waste Process
9 – Special Process (Advanced)
10 – Other Extended Aeration

B-77 Sludge Treatment Process utilized in this proposal. Circle one or two types below.

A – None
B – Aerobic Digestion
C – Digester, unheated
D – Digester, heated
E – Vacuum Filtration
F – Sludge lagooning
(G) – Wet Oxidation
H – Flotation
I – Settling
J – Elutriation
(K) – Holding Tanks
L – Chemical Conditioning
M – Incineration
N – Drying Beds
O – Centrifuge
P – Heat Drying
Q – Other _____

B-79 Circle method of final, off-site sludge disposal.

1 – In water
2 – On land as fertilizer
3 – On land as ash
4 – Lagooning
5 – Burial
6 – Land fill
7 – Other Contractor to Remove Sludge

B-80 Circle sewerage quality control tests necessary to control operations of the proposed plant.

0 – None
1 – pH, Chlorine comparator
(2) – Settleable Solids
3 – Relative stability
(4) – Dissolved Oxygen
(5) – Biochemical Oxygen Demand
6 – Sludge Solids
7 – Volatile Acids
(8) – Suspended Solids
9 – Radioactives, COD
10 – Other Chlorine Residual

*C-16 Present human population in the area to be served by the treatment works: 100 Employees

*C-28 Design Population Equivalent of treatment works (BOD basis): 70 P.E.

C-34 Design Maximum Daily Flow Rate of the ultimate treatment works, including this and any future proposals utilizing both the hydraulic capacity: 5000 Gallons per Day MGD

C-40 Design Average Daily Flow Rate of the proposed plant, to nearest 1,000 gal. 5000 Gallons per Day MGD

C-46 Design Minimum Flow Rate of the proposed plant (Minimum required to prevent deposition of solids and to continue treatment) _____ MGD

C-52 Present loading on the existing treatment works (if applicable). BOD Basis _____ (PE)

C-58 Present average Daily Flow Rate at the existing plant (if applicable) _____ MGD

C-64 Present average Minimum Daily Flow Rate (if applicable) _____ MGD

*C-66 Projected Hourly Maximum Storm Flow Rate at the proposed Treatment Works _____ MGD

C-79 Circle Ownership type for this treatment works:

0 = Municipality
(1) = Industry
2 = State or Federal
3 = School
4 = Sanitary District
5 = Commercial
6 = Other
7 = Subdivision
8 = County

C-80 Circle type of waste treated by the proposed plant:

(Domestic) (over 75% by Flow to treatment works)
Industrial (over 75% by Flow to treatment works)
Both Domestic and Industrial

Circle the type treatment the waste receives:

(Primary) (Chemical) (Secondary) (Tertiary)

R. N. Bergman
Engineer Signature

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STATE OF ILLINOIS
ENVIRONMENTAL PROTECTION AGENCY
BUREAU OF WATER POLLUTION CONTROL
SPRINGFIELD, ILLINOIS 62706

163-71

APPLICATION FOR AN EPA-WPC PERMIT TO INSTALL OR MODIFY, AND TO OPERATE A WASTE TREATMENT FACILITY, AND/OR TO RELEASE PROCESS WASTE WATERS FROM AN INDUSTRY DIRECTLY INTO A LAKE, RIVER, STREAM, DRAINAGE DITCH, OR OTHER WATERS OF THE STATE IN COMPLIANCE WITH THE ENVIRONMENTAL PROTECTION AGENCY AND THE RULES, REGULATIONS AND REQUIREMENTS OF THE EPA FOR DISPOSAL OF INDUSTRIAL WASTES.

Central Illinois Public Service Company
(Name of Industry)

Illinois Building, Springfield (Address) Sangamon (County), ILLINOIS

HEREBY MAKES APPLICATION TO THE EPA-WPC FOR THE ISSUANCE OF A PERMIT TO INSTALL AND OPERATE an aeration type sewage treating plant complete with intermittent sand filter and chlorinator at the Meredosia Power Station at Meredosia, Ill.

RECEIVED
MAR 1 1971
ENVIRONMENTAL PROTECTION AGENCY
STATE OF ILLINOIS

WITH DISCHARGE TO Illinois River
(Name And/Or Location of Watercourse)

TRIBUTARY TO Mississippi River
(Name of Watercourse)

ATTACHED ARE THE FOLLOWING BASIC ENGINEERING PLANS AND SPECIFICATIONS, INFORMATION AND DATA: (Include such items as daily volumes, average and maximum flow rates of wastes; types and concentrations of wastes; specifications, details and flow diagrams of treatment units and operation schedule; specifications of monitoring systems and/or laboratory analytical test procedures, etc.)

1. Specification G-2448
2. Drawing A-350
3.
4.
5.

ENGINEERING PLAN DOCUMENTS HAVE BEEN PREPARED BY

R. N. Bergstrom, Sargent & Lundy Engineers, Chicago 1925
(Name of Engineer) (Illinois Registration No.)

AND ARE HEREWITH SUBMITTED FOR REVIEW AND APPROVAL, SAID PLANS, ETC. CONSISTING OF

1 (no.) SHEETS AND ENTITLED, " Sewage Treatment Plant, Plans & Sections

Signature of Responsible Officer

DATE February 23, 1971

Title Vice President
(Owner, President, Etc.)

EPA-WPC-7

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SARGENT & LUNDY
ENGINEERS
CHICAGO

SPECIFICATION REVISION 1

TO

SPECIFICATION G-2448

FOR

EQUIPMENT FOR LIFT STATION
AND SEWAGE TREATMENT PLANT

MEREDOSIA POWER STATION

CENTRAL ILLINOIS PUBLIC SERVICE COMPANY

RECEIVED
JUN 25 1971
ENVIRONMENTAL PROTECTION AGENCY
STATE OF ILLINOIS

With reference to the above Specification, the following revisions shall apply:

1. Page 2-1-2, Article 2-1.3.3 shall be deleted as written and revised as follows:

   2-1.3.3 ESTIMATED FLOW

   Average Flow $\frac{55 \times 50}{8 \text{ hrs.} \times 60 \text{ min.}} = 5.75$ GPM (6GPM)

   Use 4 GPM air lift pump for flow equalization. See Article 2-1.3.5b of Specification.

   2-1.3.4 BOD LOADING

   55 x .07 lbs. x 3 = 11.5 lbs.
   (12 lbs.) BOD

   $\frac{12 \text{ lbs.}}{.17} = 70$ population equivalent

   18 lbs/1000 cu. ft. or
   12 lbs./667 cf

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August 6, 1971

CENTRAL ILLINOIS PUBLIC COMPANY (Meredosia) - Sewage Treatment
- Facilities
- Log #163-71

Mr. Robert A. Weirschum
Central Illinois Public Service Company
General Offices
607 East Adams Street
Springfield, Illinois 62701

Dear Mr. Weirschum:

As was noted to you by a telephone conversation in the latter part of July, this Agency is unable to issue a permit until the following item has been satisfied:

1. The sewage pump station shall be of a wet and dry well type. The wet and dry wells including their superstructure shall be completely separated.

This Agency will await the revised plans satisfying the above items. Upon the receipt of the revised plans satisfying the above item, this Agency will reconsider the subject project for permit.

If you should have any questions, please feel free to contact this Agency.

Very truly yours,

RRF

Roger R. Fitting
Environmental Protection Engineer
Permit Section
Division of Water Pollution Control

RRF:em

Electronic Filing: Received, Clerk's Office 05/01/2023

CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
GENERAL OFFICES / 607 EAST ADAMS / SPRINGFIELD, ILLINOIS 62701

July 28, 1971

SUBJECT: Meredosia Power Station
Proposed Sewage Treatment Plant
EPA Log #163-71

Mr. W. L. Blaser, Director
State of Illinois
Environmental Protection Agency
Bureau of Water Pollution Control
2200 Churchill Road
Springfield, Illinois

Attention: Mr. Roger R. Fitting

Dear Mr. Fitting:

This letter will confirm our telephone conversation July 27, 1971 relative to points affecting the proposed sewage treatment plant at the Meredosia Power Station.

1. The 24 hour retention time for the aeration chamber, exclusive of the surge tank, was calculated using 40 gallons per person per day as the individual daily loading. This times 100 persons will equal 4,000 gallons per day or the capacity of the aeration chamber.

2. The lift station has a ventilating fan which operates at 2870 RPM at zero static pressure and produces a flow of 100 CFM.

3. It was decided that a dehumidifier would not be required for this installation.

4. An inlet vent pipe is to be installed on the suction of the chlorine house vent fan with its inlet six inches above the floor.

5. The Company hopes to locate an acceptable sanitation disposal service who will remove accumulated sludge and dispose of it in a manner acceptable to the State. Should none be found, suitable facilities will be constructed on the plant property which conform to Technical Release 2024.

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6. The primary source of air for aeration is a line from the main plant air supply. Standby air will be supplied from a blower located at the sewage treatment system.

7. The 40 gpm design flow rate for the contact chamber was arrived at by taking the capacity of the aeration chamber, 5,000 gallons, and dividing it by 4 chlorine doses per day for 1250 gallons/dose. It would take this gallonage an average 30 minutes to filter through the sand. This amounts to a flow rate of 40 gpm which will produce a retention time of at least 15 minutes in the contact chamber.

Very truly yours,

Robert A Wierschem

R. A. Wierschem
Co-ordinator of
Environmental Protection

RAW:ll
cc: E.P.Shires - S&L Chicago

A-2158-6-66

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CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
GENERAL OFFICES / 607 EAST ADAMS / SPRINGFIELD, ILLINOIS 62701

June 23, 1971

163C-71

SUBJECT: Meredosia Power Station
Proposed Sewage Treatment
EPA Log #163-71

RECEIVED
JUN 25 1971
ENVIRONMENTAL PROTECTION AGENCY
STATE OF ILLINOIS

Mr. William L. Blaser
State of Illinois
Environmental Protection Agency
Bureau of Water Pollution Control
2200 Churchill Road
Springfield, Illinois

Attention: Mr. Roger R. Fitting

Dear Mr. Fitting:

In reply to your letter of June 1, 1971, I am enclosing the following information pertaining to the Meredosia Power Station Sewage Treatment Equipment:

Sargent & Lundy Drawing A-350 Sewage Treatment Plant - Plans and Sections

Specification revisions number 1 to Specification G-2448

Manufacturer's specifications including his drawings --
S-5-SP
71-34
ALS-1
FP-5
from Pollution Control Inc., suppliers of the lift station and sewage treatment plant

Sargent & Lundy Specification G-2448

I will comment on the five items listed in your letter to assist in resolving the difficulties.

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Item No. 1 - Sargent & Lundy revisions 1 to Specification G-2448 eliminates any reference to a design flow of 18 GPM. BOD loading calculations have also been revised to indicate a BOD loading of 18 lbs./1000 FT. CV. or 12 lbs./667 FT. CV. Clarifier tank capacity is 960 gallons; this divided by a retention time of 240 minutes gives a 4 GPM basis for plant design flow.

Item No. 2 - Sargent & Lundy drawing A-350 and Pollution Control Inc. drawing S-5-SP indicate the method of aerating the surge tank.

Item No. 3 - The aeration chamber exclusive of the surge tank has a capacity of 4,000 gallons. Using 40 gallons per person times 100 persons, retention time equals 24 hours.

Item No. 4 - Omitted per Mr. Fitting's telephone conversation of June 2, 1971 to Mr. C. M. Kennedy.

Item No. 5 - Sargent & Lundy drawing A-350 indicates the plans and specifications for rerouting of existing sewers, etc.

If additional information is required, please advise.

Yours very truly,

Robert A Wierschem

R. A. Wierschem, Co-ordinator
of Environmental Protection

RAW:JTS
Encl.
cc: CMKennedy
FACarlet
EPShires (S&L)

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WILLIAM L. BLASE
[illegible]

523-3601
EXT 383

June 1, 1971

CENTRAL ILLINOIS PUBLIC SERVICE CO. - Proposed Sewage Treatment
(Meredosia) EPA Log #163-71

Mr. C. M. Kennedy
Central Illinois Public Service Company
607 East Adams
Springfield, Illinois 62701

Dear Mr. Kennedy:

This Agency has reviewed the Application for Permit and plan documents for the proposed sewage treatment plant to serve C.I.P.S., Meredosia power plant. Please be advised that before a permit can be issued, the following items must be resolved:

1. The initial design data appears ambiguous; average flow 6 gpm, design flow 18 gpm, BOD loading 12 lbs/day and 12 lbs BOD/1000 ft³ of aeration tank. The plant is set for 4 gpm design flow. Please indicate the basis for using 4 gpm as the plant design flow.

2. The surge tank is needed due to the lift station surges. The surge tank must be aerated.

3. The aeration compartment is required to have a 24 hour detention time based on the design average daily flow.

4. The rules and regulations of this Agency requires that the wet and dry wells including their superstructure shall be completely separated.

5. Plans and specifications for the rerouting of existing sewers are to be submitted containing elevations of manholes, slopes of sewers, and specifications of manhole design.

This office is unable to issue a permit based on our review of documents submitted to date. Upon receipt of revised plans resolving the above-noted items, we will continue our review of the subject project for issuance of a permit.

Very truly yours,

Roger R. Fitting
Environmental Protection Engineer
Permit Section, Bureau of Water
Pollution Control

RRF:ff

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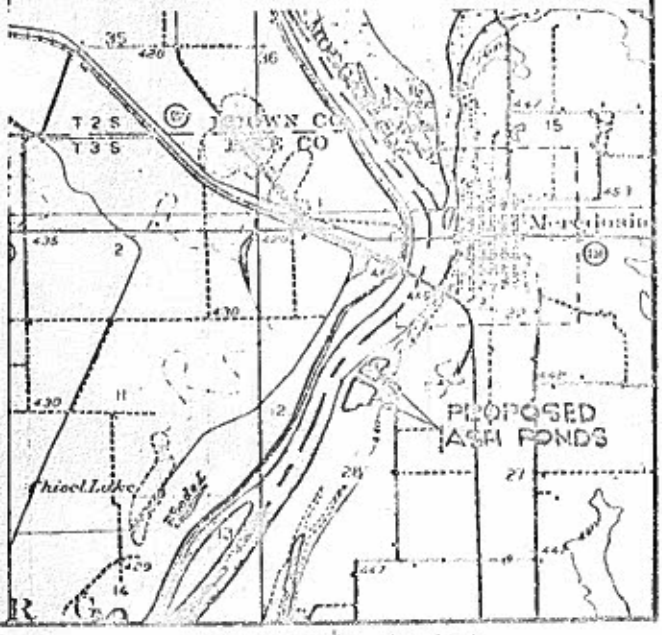
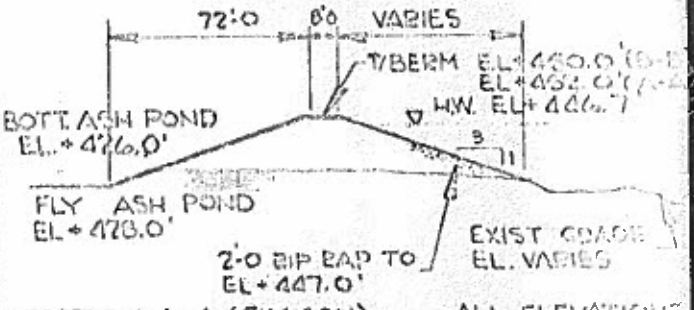


LOCATION PLAN

0 3000

SCALE IN FEET

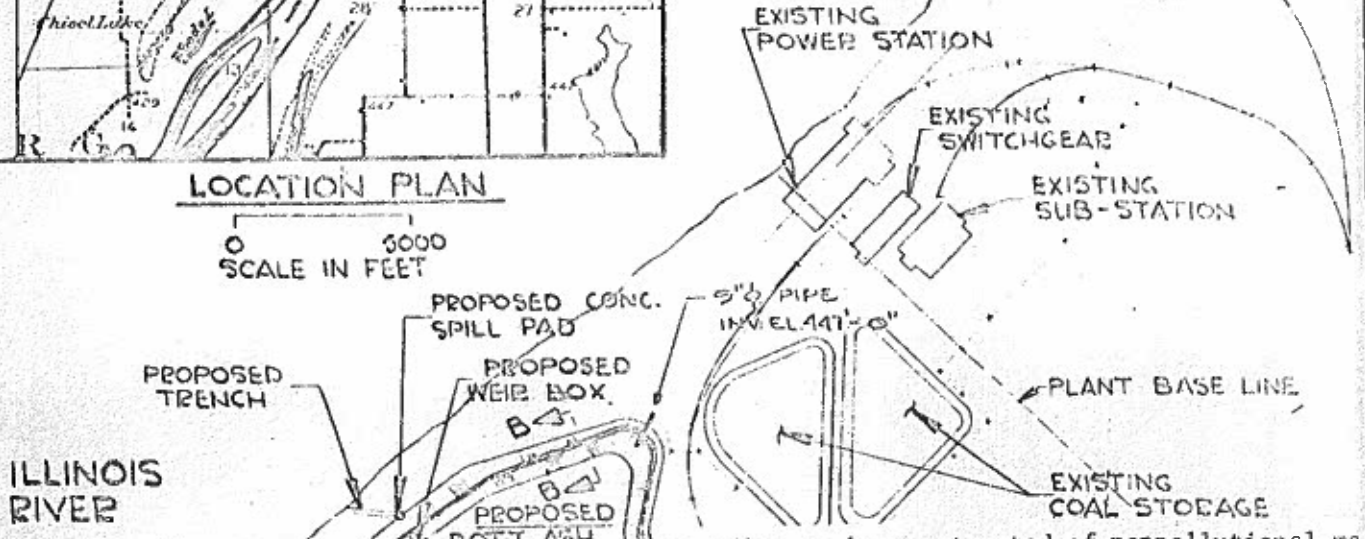


SECTION A-A (FLY ASH)
SECTION B-B (BOTT. ASH)

0 60

SCALE IN FEET

ALL ELEVATIONS ARE IN FEET AND TENTHS AND REFER TO ZERO DATUM AT BILOXI M.S.L.



SITUATION PLAN

0 600

SCALE IN FEET

1. Dikes to be constructed of nonpollutional materials & will include an impervious layer or core
2. Riprap will be nonpollutional materials well graded to prevent leaching of fines
3. Pond outlets - standard 12" vitrified pipe
4. Vegetation cover will be established & maintained in a manner satisfactory to the district engineer.

ATLANTIC

LOCATION PLAN COPIED FROM U.S. DEPT. OF INTERIOR GEOLOGICAL SURVEY MEREDOSIA QUADRANGLE 1953

MEREDOSIA STATION

PROPOSED ASH STORAGE POND ADJACENT TO ILLINOIS RIVER TO ACCOMPANY APPLICATION FOR THE PERMIT DATED

CENTRAL ILLINOIS PUBLIC SERVICE CO.

MEREDOSIA, ILLINOIS

SCALE AS NOTED

DRAWN W.V.K.

CHECKED E.C.S.

ENGINEER

APPROVED

DEVISED

SARGENT & LUNDY ENGINEERS CHICAGO

JOB NO. 4124 SHEET 1

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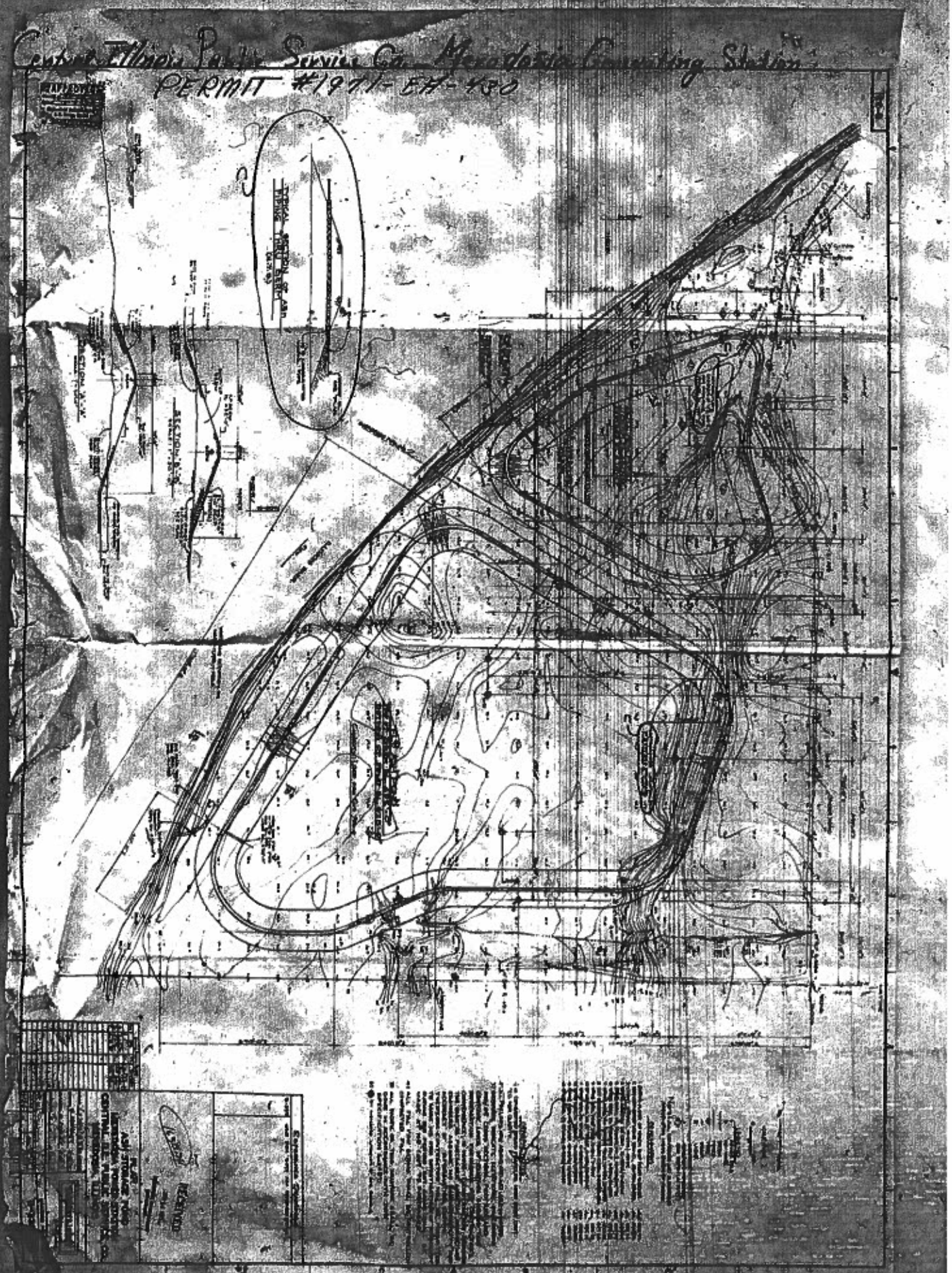
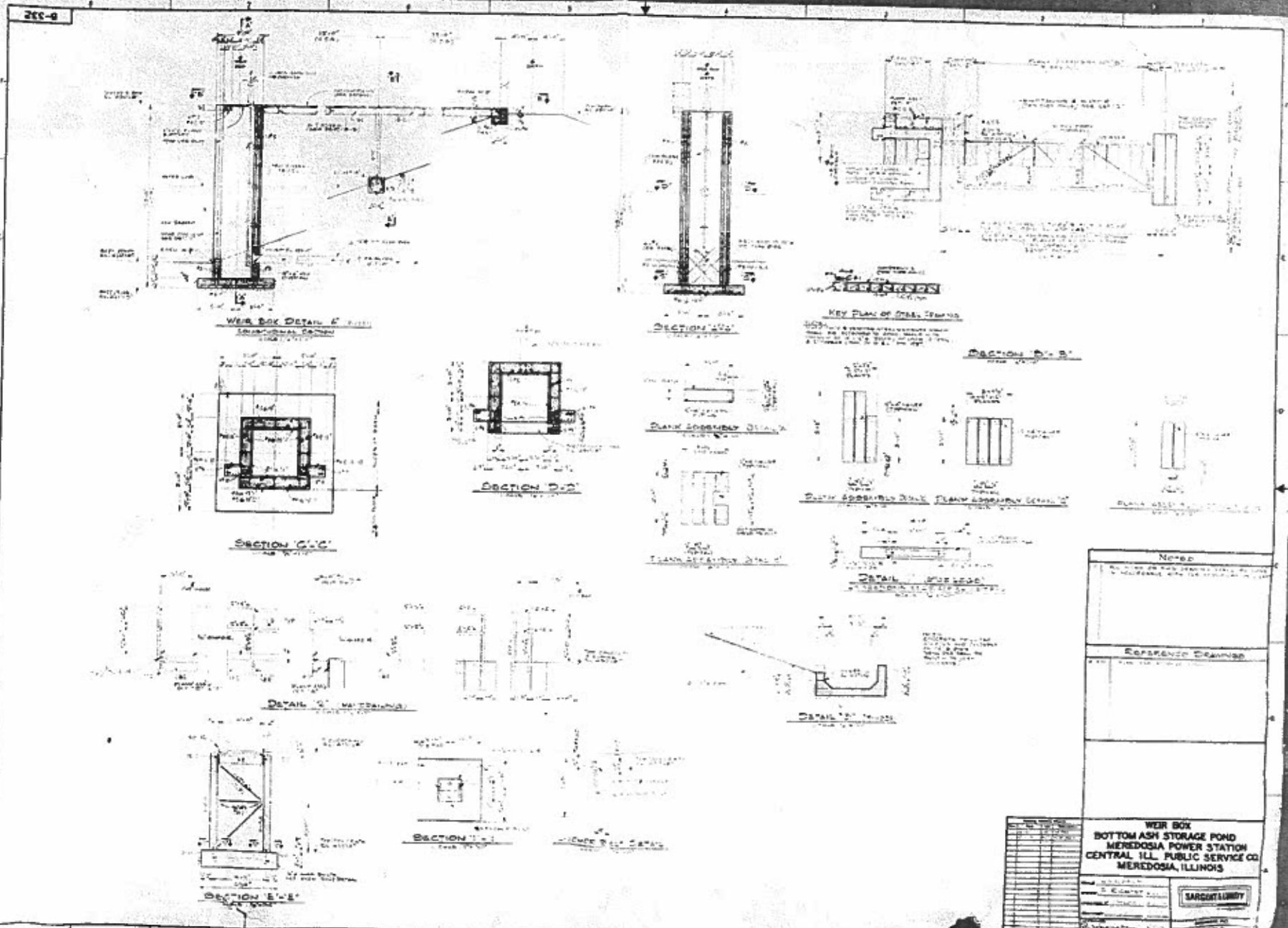
Central Illinois Public Service Co. Meredosia Generating Station

PERMIT #1971-EH-450





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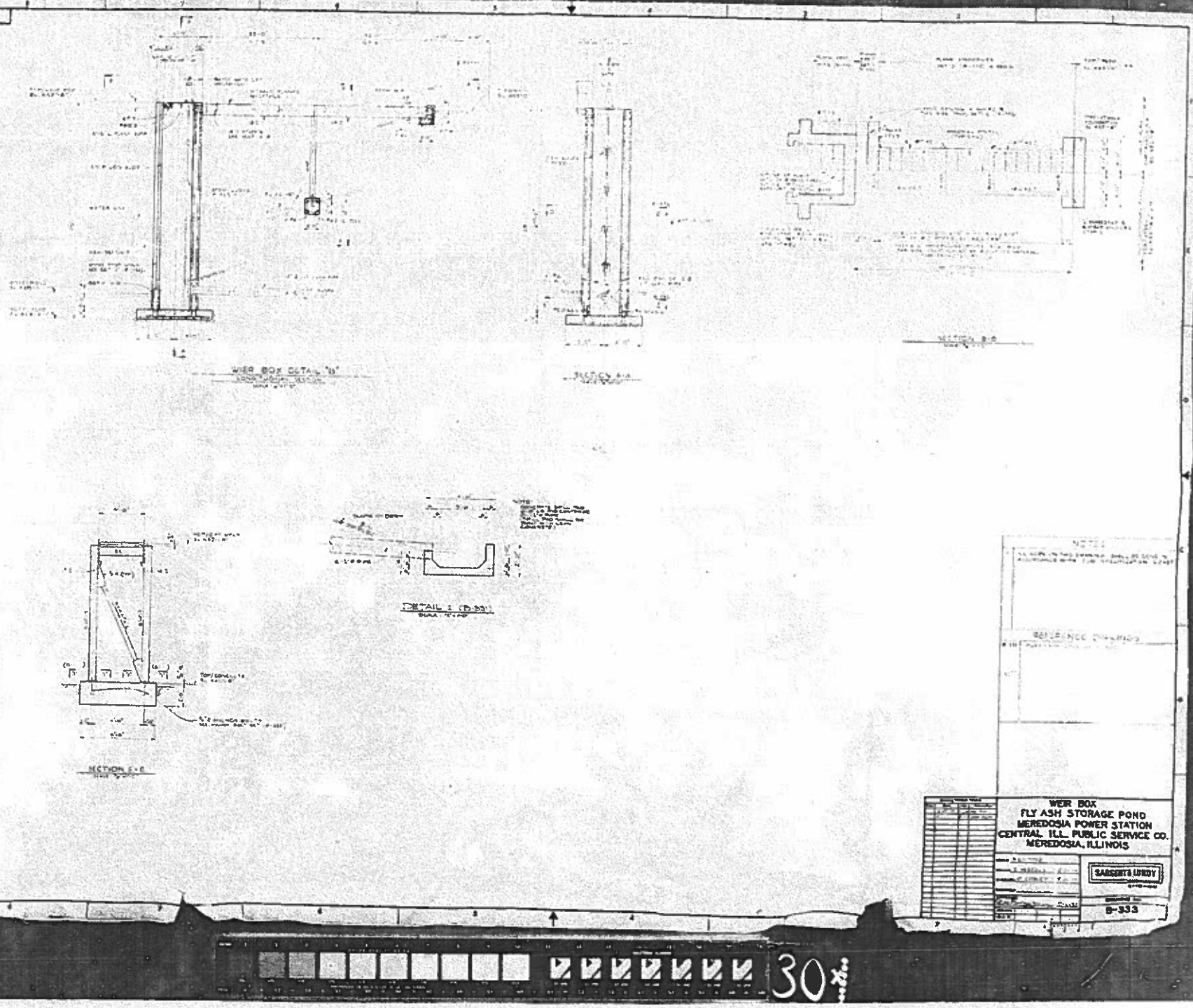
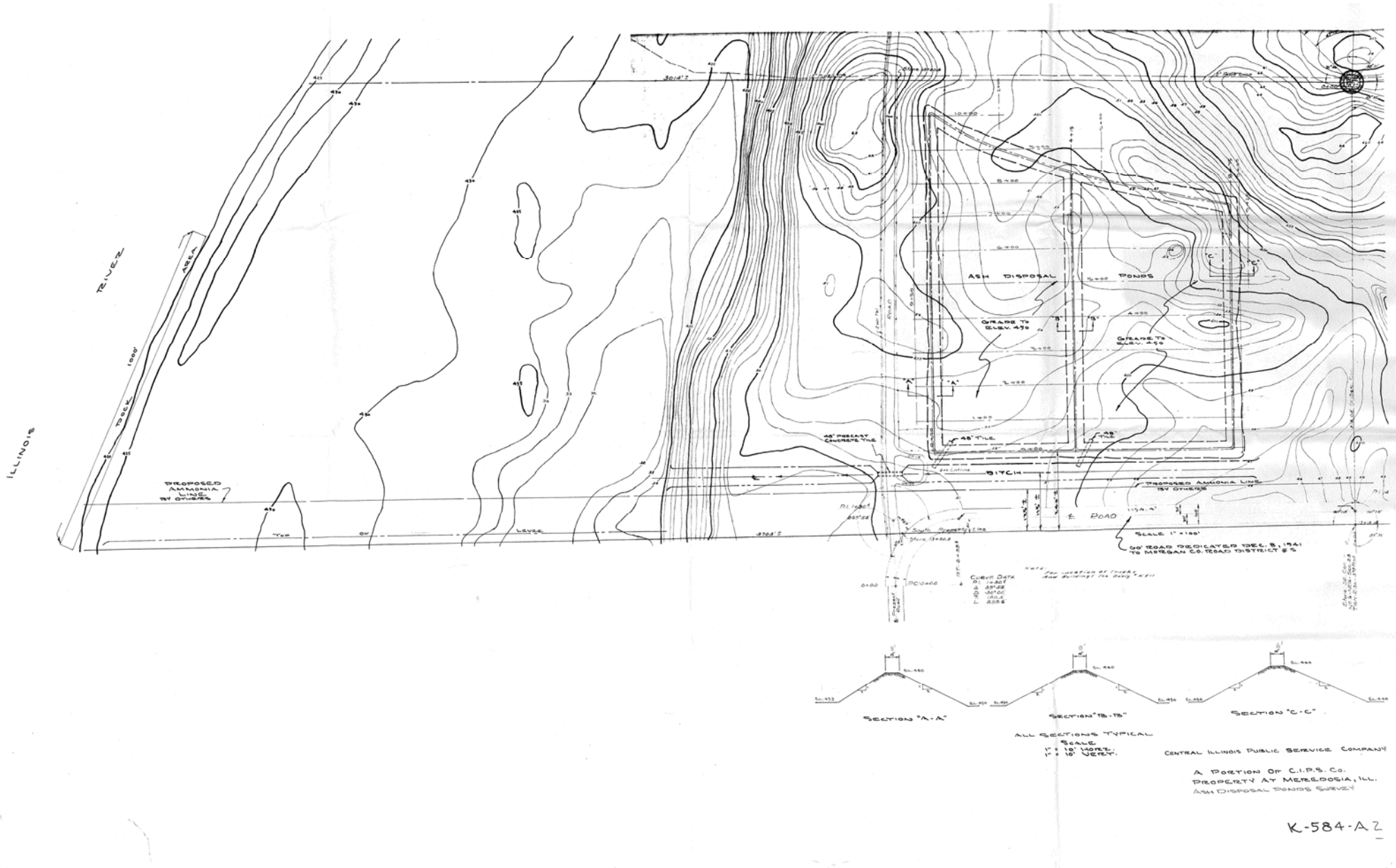


Page 1.162


ILLINOIS
RIVER
DOCK
1000'
PROPOSED AMMONIA LINE BY OTHERS
ASH DISPOSAL PONDS
GRADE TO ELEV. 459
GRADE TO ELEV. 455
48" PRECAST CONCRETE TILE
48" TILE
DITCH
PROPOSED AMMONIA LINE BY OTHERS
℄ ROAD
SCALE 1" = 100'
60' ROAD DEDICATED DEC. 8, 1941 TO MORGAN CO. TOAD DISTRICT #5
CURVE DATA
SECTION "A-A"
SECTION "B-B"
SECTION "C-C"
ALL SECTIONS TYPICAL
SCALE
1" = 10' HORIZ.
1" = 10' VERT.
CENTRAL ILLINOIS PUBLIC SERVICE COMPANY
A PORTION OF C.I.P.S. CO. PROPERTY AT MERIDOSIA, ILL.
ASH DISPOSAL PONDS SURVEY
K-584-A2

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

In the Matter of:	)	
	)	R 2020-019
STANDARDS FOR THE DISPOSAL OF COAL	)	
COMBUSTION RESIDUALS IN SURFACE	)	(Rulemaking – Land)
IMPOUNDMENTS: PROPOSED NEW 35 ILL.	)	
CODE 845	)	

RESPONSES BY GARY KING TO PREFILED QUESTIONS OF ELPC, PRAIRIE RIVERS NETWORK, AND SIERRA CLUB

1. On Page 7, you state: "I am an attorney licensed to practice law in Illinois. I received a Juris Doctor degree from Valparaiso University and a Bachelor of Sciences degree in Civil Engineering, also from Valparaiso University."

   a. What year did you obtain your Bachelor of Sciences?
   Response: 1974

   b. What year did you obtain your Juris Doctor degree?
   Response: 1977

   c. Have you ever been employed in any engineering capacity?
   Response: No, I am not a Licensed Professional Engineer.

   d. Have you even been employed as a hydrogeologist?
   Response: No, I am not a Licensed Professional Geologist.

   e. Since obtaining your B.S., have you worked in any capacity other than as a licensed attorney?
   Response: Yes. From 1990 through 2011 I was the Division Manager for the Division of Remediation Management within the Illinois Environmental Protection Agency ("IEPA" or the "Agency")'s Bureau of Land. In that position I supervised engineers, geologists and specialists with other scientific disciplines in the development and implementation of regulatory programs relating to environmental remediation and closure of sites, including but not limited to landfills, underground storage tank remediation, and Illinois' voluntary site remediation program. I also worked with Agency attorneys in the Division of Legal Counsel in addressing legal issues involved in the development and presentation of Agency regulatory proposals to the Board and also as to legal issues related to the implementation of Board regulations, such as enforcement, compliance and permitting issues. Since 2012 I have developed regulatory strategy for environmental closure of sites for Arcadis U.S. *See* https://www.arcadis.com/en/united-states

i. If so, was the CCR mixed with water in order to pump it to the CCR impoundment?
Response: Yes.

ii. In order to contain the mixture of CCR and water, was the Old Ash Pond at Meredosia designed to "hold an accumulation of water and liquids"?
Response: Since the Old Ash Pond was closed several decades ago, Ameren does not have records detailing the history of the pond, but it is likely that water was held in the basin to allow time for the ash to settle out of the water prior to discharge. Further, it does not hold water now and, as IDNR concluded, it is not an impoundment. *See* Answer 4(g) below.

d. For the period of time that the Old Ash Pond at Meredosia was receiving CCR would there have been head on the bottom of the impoundment?
Response: Since the Old Ash Pond was closed several decades ago, Ameren does not have records detailing the history of the pond. Ameren records do not have information as to whether there was head on the bottom of the Old Ash Pond.

e. Is there potential for the Old Ash Pond at Meredosia to have leaked when it stored CCR?
Response: Since the Old Ash Pond was closed several decades ago, Ameren does not have records detailing the history of the pond. As a result, Ameren records do not provide information on whether there was head on the bottom of the Old Ash Pond, or if any transport water was simply decanted directly after placement. As to current impacts, see responses to questions 4(a) and 4(i).

f. Is the Old Ash Pond at Meredosia currently used to dispose of CCR?
Response: **No. The last time CCR was placed in the Old Ash Pond was in the early 1970's.**

g. Has Ameren obtained site specific data on what the water level is with in the footprint of the Old Ash Pond at Meredosia?
Response: **Yes. Geotechnology Inc performed a liquefaction analysis study on the Meredosia facility that was submitted to the Illinois Department of Natural Resources (IDNR) on September 20, 2017. This study was prepared to support a request by Ameren to change the dam classification status for the berms at the Meredosia facility. In summary, six – approximately 25 feet deep cone penetration test (CPT) soundings were performed in the Closed Ash Pond and eight- approximately 25 feet CPT soundings were performed in the Fly Ash Pond. Direct push samples from the impounded ash were collected to a depth of approximately 24 feet in the Closed Ash Pond and approximately 24 feet in the Fly Ash Pond.**

Geotechnology analyzed the CPT data for liquefaction potential and dynamic (post liquefaction) settlement utilizing a design PGA of 0.08g and an earthquake magnitude of 7.5. The analysis incorporated the results of the laboratory tests to refine the fines content within the soundings. Based on the liquefaction results there were not potentially liquefiable layers identified within the impounded ash. Ameren records show the design of the old pond, with a top of berm elevation of 460 and bottom at 450, well above the groundwater elevation as indicated by CPT O002 (-29' to water table, i.e. 441'+/-) and CPT O003 (-26' to water table, i.e. 444'+/-) in the liquefaction study, as well as out of the record flood elevation of 446.86'. In responding to the study and Ameren's request, on April 12, 2019, IDNR concluded there are no structures at the Meredosia Power Station which are jurisdictional under the Part 3702 rules stating as follows:

> **Bottom Ash Pond - A portion of the embankment has been removed. The structure is no longer capable of impoundment and does not meet the definition of a dam under the Part 3702 rules.**
>
> **Fly Ash Pond - The investigation shows that the material within the structure is no longer capable of acting as a fluid. By definition, the structure is no longer intended to provide impoundment and is not considered to be a dam.**
>
> **Old Ash Pond - The investigation shows that the material within the structure is no longer capable of acting as a fluid. By definition, the structure is no longer intended to provide impoundment and is not considered to be a dam.**

h. Is any of the ash in the impoundment saturated?
Response: No. See prior response.

i. If so, what is the range of saturated thickness within the foot print of the Old Ash Pond at Meredosia?
Response: See prior response.

ii. Referring to pages 7 and 8 of Andrew Rehn's testimony for ELPC, Mr. Rehn testifies that the USEPA Risk Assessment identified the Old Ash Pond as a surface impoundment? Do you agree with this statement?
Response: **No. The USEPA's risk assessment of Ameren's Meredosia facility assesses two surface impoundments—the Fly Ash Pond and the Bottom Ash Pond. *See* Rehn Att. 12, § 4, pp. 15–19. The Risk Assessment acknowledges the Old Ash Pond as having existed, but also notes that the pond has been closed. *See Id.* at p. 9.**