HALEY ALDRICH

www.haleyaldrich.com

2019 ANNUAL GROUNDWATER MONITORING AND CORRECTIVE ACTION REPORT

FLY ASH LANDFILL
JEFFREY ENERGY CENTER
ST. MARYS, KANSAS

by Haley & Aldrich, Inc.
Cleveland, Ohio

for Evergy Kansas Central, Inc. (f/k/a Westar Energy, Inc.)
Topeka, Kansas

File No. 129778-030
January 2020

Table of Contents

Page

Revision No.	Date	Notes
0	1/31/2020	Original

List of Tables

List of Figures

List of Attachments

This Annual Groundwater Monitoring and Corrective Action Report documents the groundwater monitoring program for the Jeffrey Energy Center Fly Ash Landfill (FAL) consistent with applicable sections of § 257.90 through 257.98, and describes activities conducted in the prior calendar year (2019) and documents compliance with the United States Environmental Protection Agency Coal Combustion Residual Rule. I certify that the 2019 Annual Groundwater Monitoring and Corrective Action Report for the FAL is, to the best of my knowledge, accurate and complete.

Signed:_____
Professional Geologist

Print Name:	Mark Nicholls
Kansas License No.:	Professional Geologist No. 8
Title:	Technical Expert 2
Company:	Haley & Aldrich, Inc.

1. Introduction

This 2019 Annual Groundwater Monitoring and Corrective Action Report (Annual Report) addresses the Fly Ash Landfill (FAL) at the Jeffrey Energy Center (JEC), operated by Evergy Kansas Central, Inc. (Evergy; f/k/a Westar Energy, Inc.). This Annual Report was developed in accordance with the United States Environmental Protection Agency Coal Combustion Residual (CCR) Rule (Rule) effective 19 October 2015, including subsequent revisions, specifically Code of Federal Regulations Title 40 (40 CFR), subsection § 257.90(e). The Annual Report documents the groundwater monitoring system for the FAL consistent with applicable sections of § 257.90 through 257.98, and describes activities conducted in the prior calendar year (2019) and documents compliance with the Rule. The specific requirements for the Annual Report listed in § 257.90(e)(1)-(5) of the Rule are provided in Section 2 of this Annual Report and are in bold italic font, followed by a short narrative describing how each Rule requirement has been met.

2. 40 CFR § 257.90 Applicability

2.1 40 CFR § 257.90(a)

All CCR landfills, CCR surface impoundments, and lateral expansions of CCR units are subject to the groundwater monitoring and corrective action requirements under §257.90 through 257.99, except as provided in paragraph (g) [Suspension of groundwater monitoring requirements] of this section.

Evergy has installed and certified a groundwater monitoring system at the JEC FAL. The FAL is subject to the groundwater monitoring and corrective action requirements described under 40 CFR § 257.90 through 257.98. This document addresses the requirement for the Owner/Operator to prepare an Annual Report per § 257.90(e).

2.2 40 CFR § 257.90(e) – SUMMARY

Annual groundwater monitoring and corrective action report. For existing CCR landfills and existing CCR surface impoundments, no later than January 31, 2018, and annually thereafter, the owner or operator must prepare an annual groundwater monitoring and corrective action report. For new CCR landfills, new CCR surface impoundments, and all lateral expansions of CCR units, the owner or operator must prepare the initial annual groundwater monitoring and corrective action report no later than January 31 of the year following the calendar year a groundwater monitoring system has been established for such CCR unit as required by this subpart, and annually thereafter. For the preceding calendar year, the annual report must document the status of the groundwater monitoring and corrective action program for the CCR unit, summarize key actions completed, describe any problems encountered, discuss actions to resolve the problems, and project key activities for the upcoming year. For purposes of this section, the owner or operator has prepared the annual report when the report is placed in the facility's operating record as required by §257.105(h)(1).

This Annual Report describes monitoring completed and actions taken for the groundwater monitoring system at the JEC FAL as required by the Rule. Groundwater sampling and analysis was conducted per the requirements described in § 257.93, and the status of the groundwater monitoring program described in § 257.94 and § 257.95 is also provided in this report. This Annual Report documents the applicable groundwater-related activities completed in the calendar year 2019.

2.2.1 Status of the Groundwater Monitoring Program

The FAL remained in the assessment monitoring program during 2019.

2.2.2 Key Actions Completed

The 2018 Annual Groundwater Monitoring and Corrective Action Report was completed in January 2019. Statistical evaluation was completed in January 2019 on analytical data from the

September 2018 assessment monitoring sampling event. A successful alternate source demonstration (ASD) was completed and certified for the September 2018 sampling event.

A semi-annual assessment monitoring sampling event was completed in March 2019 for detected Appendix IV constituents identified from the June 2018 annual assessment monitoring sampling event. Statistical evaluation was completed in July 2019 on analytical data from the March 2019 assessment monitoring sampling event.

An annual assessment monitoring sampling event was completed in June 2019 to identify detected Appendix IV constituents for subsequent semi-annual sampling events in September 2019 and planned for March 2020. Groundwater protection standards for detected Appendix IV constituents were established or updated at that time. Semi-annual assessment monitoring sampling was completed in September 2019 for detected Appendix IV constituents identified during the June 2019 annual monitoring event. Statistical evaluation of the results from the September 2019 semi-annual assessment monitoring sampling event are due to be completed in January 2020 and will be reported in the next annual report.

2.2.3 Problems Encountered

No noteworthy problems (i.e., problems could include damaged wells, issues with sample collection or lack of sampling, and problems with analytical analysis) were encountered at the FAL in 2019.

2.2.4 Actions to Resolve Problems

No problems were encountered at the FAL in 2019, therefore, no actions to resolve problems were required.

2.2.5 Project Key Activities for Upcoming Year

Key activities planned for 2020 include the completion of the 2019 Annual Groundwater Monitoring and Corrective Action Report, statistical evaluation of semi-annual assessment monitoring analytical data collected in September 2019, semi-annual assessment monitoring and subsequent statistical evaluations, and annual assessment monitoring.

2.3 40 CFR § 257.90(e) – INFORMATION

At a minimum, the annual groundwater monitoring and corrective action report must contain the following information, to the extent available:

2.3.1 40 CFR § 257.90(e)(1)

A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;

As required by § 257.90(e)(1), a map showing the locations of the CCR unit and associated upgradient and downgradient monitoring wells for the FAL is included in this report as Figure 1.

2.3.2 40 CFR § 257.90(e)(2) – Monitoring System Changes

Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;

No monitoring wells were installed or decommissioned during 2019.

2.3.3 40 CFR § 257.90(e)(3) – Summary of Sampling Events

In addition to all the monitoring data obtained under §257.90 through §257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;

In accordance with § 257.95(b) and § 257.95(d)(1), three independent assessment monitoring samples from each background and downgradient monitoring well were collected in 2019. A summary including sample names, dates of sample collection, field parameters, and monitoring data obtained for the groundwater monitoring program for the FAL is presented in Table I of this report.

2.3.4 40 CFR § 257.90(e)(4) – Monitoring Transition Narrative

A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels); and

The assessment monitoring program was established in June 2018 to meet the requirements of 40 CFR § 257.95. The FAL remained in assessment monitoring during 2019.

2.3.5 40 CFR § 257.90(e)(5) – Other Requirements

Other information required to be included in the annual report as specified in §257.90 through §257.98.

This Annual Report documents activities conducted to comply with § 257.90 through 257.95 of the Rule. It is understood that there are supplemental references in § 257.90 through 257.98 that must be placed in the Annual Report. The following requirements include relevant and required information in the Annual Report for activities completed in calendar year 2019.

2.3.5.1 40 CFR § 257.94(d)(3) – Demonstration for Alternative Detection Monitoring Frequency

The owner or operator must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration for an alternative groundwater sampling and analysis frequency meets the requirements of this section. The owner or operator must include the demonstration providing the basis for the alternative monitoring frequency and

the certification by a qualified professional engineer or the approval from the Participating State Director or approval from EPA where EPA is the permitting authority in the annual groundwater monitoring and corrective action report required by § 257.90(e).

An alternative groundwater detection monitoring sampling and analysis frequency has not been established for this CCR unit; therefore, no demonstration or certification is applicable.

2.3.5.2 40 CFR § 257.94(e)(2) – Detection Monitoring Alternate Source Demonstration

The owner or operator may demonstrate that a source other than the CCR unit caused the statistically significant increase over background levels for a constituent or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The owner or operator must complete the written demonstration within 90 days of detecting a statistically significant increase over background levels to include obtaining a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority verifying the accuracy of the information in the report. If a successful demonstration is completed within the 90-day period, the owner or operator of the CCR unit may continue with a detection monitoring program under this section. If a successful demonstration is not completed within the 90-day period, the owner or operator of the CCR unit must initiate an assessment monitoring program as required under § 257.95. The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority.

This unit is in assessment monitoring; therefore, no detection monitoring alternative source demonstration or certification is applicable.

2.3.5.3 40 CFR § 257.95(c)(3) – Demonstration for Alternative Assessment Monitoring Frequency

The owner or operator must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration for an alternative groundwater sampling and analysis frequency meets the requirements of this section. The owner or operator must include the demonstration providing the basis for the alternative monitoring frequency and the certification by a qualified professional engineer or the approval from the Participating State Director or approval from EPA where EPA is the permitting authority in the annual groundwater monitoring and corrective action report required by § 257.90(e).

An alternative groundwater assessment monitoring sampling and analysis frequency has not been established for this CCR unit; therefore, no demonstration or certification is applicable.

2.3.5.4 40 CFR § 257.95(d)(3) – Assessment Monitoring Concentrations and Groundwater Protection Standards

Include the recorded concentrations required by paragraph (d)(1) of this section, identify the background concentrations established under § 257.94(b), and identify the groundwater

protection standards established under paragraph (d)(2) of this section in the annual groundwater monitoring and corrective action report required by § 257.90(e).

An assessment monitoring program has been implemented at the CCR unit since June 2018. Three rounds of assessment monitoring sampling were completed in 2019. Analytical results for both downgradient and upgradient wells are provided in Table I. The background concentrations (upper tolerance limits) and groundwater protection standards established for detected Appendix IV constituents for the FAL are included in Table II. The background concentrations and groundwater protection standards provided in Table II were utilized for the statistical evaluations completed in 2019 for September 2018 and March 2019 semi-annual assessment monitoring sampling events.

2.3.5.5 40 CFR § 257.95(g)(3)(ii) – Assessment Monitoring Alternate Source Demonstration

Demonstrate that a source other than the CCR unit caused the contamination, or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. Any such demonstration must be supported by a report that includes the factual or evidentiary basis for any conclusions and must be certified to be accurate by a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority. If a successful demonstration is made, the owner or operator must continue monitoring in accordance with the assessment monitoring program pursuant to this section, and may return to detection monitoring if the constituents in appendices III and IV to this part are at or below background as specified in paragraph (e) of this section. The owner or operator must also include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer or the approval from the Participating State Director or approval from EPA where EPA is the permitting authority.

A successful assessment monitoring ASD is included in this report as Attachment 1. The FAL remained in assessment monitoring during 2019.

2.3.5.6 40 CFR § 257.96(a) – Demonstration for Additional Time for Assessment of Corrective Measures

Within 90 days of finding that any constituent listed in appendix IV to this part has been detected at a statistically significant level exceeding the groundwater protection standard defined under § 257.95(h), or immediately upon detection of a release from a CCR unit, the owner or operator must initiate an assessment of corrective measures to prevent further releases, to remediate any releases and to restore affected area to original conditions. The assessment of corrective measures must be completed within 90 days, unless the owner or operator demonstrates the need for additional time to complete the assessment of corrective measures due to site-specific conditions or circumstances. The owner or operator must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority attesting that the demonstration is accurate. The 90-day deadline to complete the assessment of corrective measures may be extended for no longer than 60 days. The owner or operator must also

include the demonstration in the annual groundwater monitoring and corrective action report required by § 257.90(e), in addition to the certification by a qualified professional engineer or the approval from the Participating State Director or approval from EPA where EPA is the permitting authority.

No assessment of corrective measures was required to be initiated in 2019; therefore, no demonstration or certification is applicable for this unit.

TABLES

TABLE I
SUMMARY OF ANALYTICAL RESULTS - ASSESSMENT MONITORING
EVERGY KANSAS CENTRAL, INC.
JEFFREY ENERGY CENTER
FLY ASH LANDFILL
ST. MARYS, KANSAS

Location	Upgradient			Downgradient								
	MW-FAA-5			MW-FAA-3			MW-FAA-4			MW-FAA-6		
Measure Point (TOC)	1250.8			1165.66			1213.81			1162.76		
Sample Name	FAA-5-032619	FAA-5_062319	MW-FAA-5	FAA-3-032619	FAA-3_062319	MW-FAA-3	FAA-4-032619	FAA-4_062319	MW-FAA-4	FAA-6-032619	FAA-6_062319	MW-FAA-6
Sample Date	3/26/2019	6/23/2019	9/12/2019	3/26/2019	6/23/2019	9/12/209	3/26/2019	6/23/2019	9/12/2019	3/26/2019	6/23/2019	9/12/2019
Final Lab Report Date	4/8/2019	7/5/2019	9/23/2019	4/8/2019	7/5/2019	9/23/2019	4/8/2019	7/5/2019	9/23/2019	4/8/2019	7/5/2019	9/23/2019
Final Lab Report Revision Date	N/A	N/A	10/22/2019	N/A	N/A	10/22/2019	N/A	N/A	10/22/2019	N/A	N/A	10/22/2019
Final Radiation Lab Report Date	4/8/2019	7/16/2019	10/8/2019	4/8/2019	7/16/2019	10/8/2019	4/8/2019	7/16/2019	10/8/2019	4/8/2019	7/16/2019	10/8/2019
Final Radiation Lab Report Revision Date	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lab Data Reviewed and Accepted	4/15/2019	7/23/2019	10/22/2019	4/15/2019	7/23/2019	10/22/2019	4/15/2019	7/23/2019	10/22/2019	4/15/2019	7/23/2019	10/22/2019
Depth to Water (ft btoc)	86.78	85.66	85.96	12.79	10.95	11.58	55.32	53.39	53.96	14.70	12.70	13.66
Temperature (Deg C)	12.2	15.61	15.64	14.5	16.90	15.30	13.1	14.65	15.50	15.0	16.38	16.50
Conductivity (µS/cm)	2395	3500	2788	2488	1920	1551	1561	1430	1140	1593	3070	2641
Turbidity (NTU)	0.62	0.43	0.24	1.37	5.62	0.05	0.41	0.41	0.27	0.62	0.77	0.57
Boron, Total (mg/L)	**1.1**	--	**1.5**	**0.54**	--	**0.93**	**0.88**	--	**0.62**	**1.5**	--	**3.5**
Calcium, Total (mg/L)	**294**	--	**313**	**366**	--	**204**	**180**	--	**154**	**147**	--	**121**
Chloride (mg/L)	**127**	--	**105**	**176**	--	**79.3**	**68.5**	--	**75.7**	**80.4**	--	**73.2**
Fluoride (mg/L)	**0.53**	--	<0.20	**0.37**	--	<0.20	**0.33**	--	**0.32**	**0.62**	--	**0.97**
Sulfate (mg/L)	**900**	--	**1560**	**1090**	--	**809**	**479**	--	**414**	**972**	--	**1720**
pH (su)	**7.1**	--	**7.1**	**7.2**	--	**7.4**	**7.3**	--	**7.3**	**7.4**	--	**7.7**
TDS (mg/L)	**1770**	--	**2840**	**1990**	--	**1570**	**1110**	--	**1090**	**1560**	--	**3100**
Antimony, Total (mg/L)	<0.0010	<0.0010	--	<0.0010	<0.0010	--	<0.0010	<0.0010	--	<0.0010	<0.0010	--
Arsenic (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	**0.0037**	**0.0043**	**0.0073**
Barium, Total (mg/L)	<0.0050	**0.0072**	<0.0050	**0.036**	**0.033**	**0.032**	**0.051**	**0.052**	**0.051**	**0.033**	**0.026**	**0.024**
Beryllium, Total (mg/L)	<0.0010	<0.0010	--	<0.0010	<0.0010	--	<0.0010	<0.0010	--	<0.0010	<0.0010	--
Cadmium, Total (mg/L)	<0.00050	<0.00050	--	<0.00050	<0.00050	--	<0.00050	<0.00050	--	<0.00050	<0.00050	--
Chromium, Total (mg/L)	<0.0050	<0.0050	--	<0.0050	<0.0050	--	<0.0050	<0.0050	--	<0.0050	<0.0050	--
Cobalt, Total (mg/L)	**0.0022**	**0.0056**	**0.0040**	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	**0.0017**	**0.0012**	**0.0015**
Lead, Total (mg/L)	<0.010	<0.010	--	<0.010	<0.010	--	<0.010	<0.010	--	<0.010	<0.010	--
Lithium, Total (mg/L)	**0.082**	**0.11**	**0.11**	**0.014**	<0.010	**0.015**	**0.019**	**0.017**	**0.020**	**0.014**	<0.010	**0.012**
Molybdenum, Total (mg/L)	**0.024**	**0.053**	**0.034**	**0.0039**	**0.011**	**0.013**	**0.0072**	**0.0065**	**0.0054**	**0.22**	**0.34**	**0.58**
Selenium, Total (mg/L)	**0.0027**	**0.0011**	**0.0033**	<0.0010	<0.0010	<0.0010	**0.0013**	**0.0019**	**0.0016**	<0.0010	**0.014**	**0.0013**
Thallium, Total (mg/L)	<0.0010	<0.0010	--	<0.0010	<0.0010	--	<0.0010	<0.0010	--	<0.0010	<0.0010	--
Mercury, Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Fluoride (mg/L)	**0.53**	**1.6**	<0.20	**0.37**	**0.43**	<0.20	**0.33**	**0.44**	**0.32**	**0.62**	**1.2**	**0.97**
Radium-226 & 228 Combined (pCi/L)	1.00 +/- 0.975 (1.80)	**2.43 +/- 1.12 (1.34)**	0.794 +/- 0.854 (1.48)	0.352 +/- 0.782 (1.66)	0.453 +/- 0.790 (1.53)	0.857 +/- 0.932 (1.81)	1.40 +/ 1.18 (2.02)	**1.54 +/- 0.959 (1.46)**	0.335 +/- 0.858 (1.69)	1.43 +/- 1.12 (1.82)	1.43 +/- 0.932 (1.49)	0.136 +/- 0.750 (1.62)

Note:

The June 2019 sampling event was for Appendix IV constituents only. The September 2019 sampling event included Appendix IV constituents detected in the June 2019 sampling event, and all of the Appendix III constituents.

Radiological results are presented as activity plus or minus uncertainty with minimum detectable concentration (MDC).

Bold value: *Detection above laboratory reporting limit or MDC .*

µS/cm = micro Siemens per centimeter

ft btoc = feet below top of casing

Deg C = degrees Celsius

mg/L = milligrams per liter

NTU = Nephelometric Turbidity Unit

pCi/L = picoCuries per liter

su = standard unit

TDS = total dissolved solids

TOC = top of casing

TABLE II
ANNUAL ASSESSMENT GROUNDWATER MONITORING - DETECTED APPENDIX IV GWPS
JUNE 2019 SAMPLING EVENT
JEFFREY ENERGY CENTER
FLY ASH LANDFILL

Well #	Background Value*	GWPS
CCR Appendix-IV Arsenic, Total (mg/L)		
MW-FAA-5 (upgradient)	0.0037	NA
MW-FAA-3		0.010
MW-FAA-4		0.010
MW-FAA-6		0.010
CCR Appendix-IV Barium, Total (mg/L)		
MW-FAA-5 (upgradient)	0.0136	NA
MW-FAA-3		2
MW-FAA-4		2
MW-FAA-6		2
CCR Appendix-IV Cobalt, Total (mg/L)		
MW-FAA-5 (upgradient)	0.0036	NA
MW-FAA-3		0.006
MW-FAA-4		0.006
MW-FAA-6		0.006
CCR Appendix-IV Fluoride, Total (mg/L)		
MW-FAA-5 (upgradient)	1.261	NA
MW-FAA-3		4.0
MW-FAA-4		4.0
MW-FAA-6		4.0
CCR Appendix-IV Lithium, Total (mg/L)		
MW-FAA-5 (upgradient)	0.183	NA
MW-FAA-3		0.183
MW-FAA-4		0.183
MW-FAA-6		0.183
CCR Appendix-IV Molybdenum, Total (mg/L)		
MW-FAA-5 (upgradient)	0.0699	NA
MW-FAA-3		0.1
MW-FAA-4		0.1
MW-FAA-6		0.929**
CCR Appendix-IV Radium-226 & 228 Combined (pCi/L)		
MW-FAA-5 (upgradient)	1.3	NA
MW-FAA-3		5
MW-FAA-4		5
MW-FAA-6		5
CCR Appendix-IV Selenium, Total (mg/L)		
MW-FAA-5 (upgradient)	0.0037	NA
MW-FAA-3		0.050
MW-FAA-4		0.050
MW-FAA-6		0.050

Notes and Abbreviations:

** Background value for interwell evaluation based on data collected through June 2018.*

*** GWPS based on background value using intrawell evaluation based on data collected through June 2018.*

CCR = Coal Combustion Residuals

GWPS = Groundwater Protection Standard

MCL = Maximum Contaminant Level

mg/L = milligrams per Liter

NA = Not Applicable

pCi/L = picoCuries per Liter

RSL = Regional Screening Level

FIGURE

LEGEND

- MONITORING WELL
- PIEZOMETRIC OBSERVATION ONLY
- FLY ASH LANDFILL LIMITS OF DISPOSAL AREA

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

2. AERIAL IMAGERY SOURCE: ENVIRONMENTAL SYSTEMS RESEARCH INSTITUTE, 7 MAY 2018.

N

0 350 700

SCALE IN FEET

HALEY ALDRICH

EVERGY KANSAS CENTRAL, INC.
JEFFREY ENERGY CENTER
ST. MARYS, KANSAS

FLY ASH LANDFILL
MONITORING WELL LOCATION MAP

JANUARY 2020

FIGURE 1

ATTACHMENT 1

Appendix IV SSL Alternate Source Demonstration for Fly Ash Landfill Area I, September 2018 Sampling Event

HALEY ALDRICH

www.haleyaldrich.com

REPORT ON

APPENDIX IV STATISTICALLY SIGNIFICANT LEVEL ALTERNATE SOURCE DEMONSTRATION FOR THE FLY ASH LANDFILL AREA 1 SEPTEMBER 2018 SAMPLING EVENT JEFFREY ENERGY CENTER ST. MARYS, KANSAS

by Haley & Aldrich, Inc.
Cleveland, Ohio

for Westar Energy, Inc.
Topeka, Kansas

File No. 129778-023
Updated May 2019

Table of Contents

List of Tables

List of Figures

List of Appendices

1. Introduction

Haley & Aldrich, Inc. (Haley & Aldrich) was retained by Westar Energy Inc. (Westar) to perform an evaluation of groundwater quality at Area 1 of the Fly Ash Landfill (FAL; Site/Unit) at the Jeffrey Energy Center (JEC) located in St. Marys, Kansas. The evaluation was performed in support of the coal combustion residuals (CCR) Rule, specifically §257.95(g)(3)(ii), groundwater assessment monitoring program, to evaluate a statistically significant level (SSL) of molybdenum identified during the September 2018 assessment monitoring sampling event at monitoring well MW-FAA-6 which is installed down gradient of the FAL. This report provides an overview of the site conditions and investigation activities, the results of the investigation activities conducted as part of the evaluation, and an alternative source demonstration (ASD) for the Appendix IV constituent, molybdenum. This report does not address Area 2 of the FAL, which is under construction as of the date of this report.

Summary & Conclusions

Based on the finding and evaluation of available information discussed in this report, it has been concluded that the SSL for molybdenum identified at MW-FAA-6 is due to the presence of interbedded shale and limestone deposits within the Grenola limestone, and geochemical conditions (pH) promoting the localized mobilization of molybdenum from that formation. Consequently, the alternate source of molybdenum at the FAL monitoring well MW-FAA-6 is natural groundwater quality variability associated with the presence of interbedded shale and limestone deposits within the Grenola limestone, and localized mobilization of molybdenum from that formation into groundwater.

1.1 BACKGROUND

Consistent with Code of Federal Regulations Title 40 (40 CFR) §257.90 through §257.95, Westar has installed and certified a groundwater monitoring network at the FAL, has completed detection monitoring program activities including identifying statistically significant increases in Appendix III constituent concentrations, and established an assessment monitoring program. Westar conducted statistical analyses of the down gradient groundwater quality results from the September 2018 assessment monitoring sampling event to determine if any Appendix IV constituents are present at concentrations that exceed groundwater protection standards set for the Unit. The analysis of the Appendix IV constituents resulted in a calculated SSL above the groundwater protection standard of 0.1 milligrams per liter (mg/L) for molybdenum down gradient of the FAL at monitoring well MW-FAA-6. The analyses described in this report were conducted to determine if alternate sources existed for the SSL.

Pursuant to 40 CFR §257.95(g)(3)(ii), "…***the owner or operator must…demonstrate that a source other than the CCR unit*** [1] ***caused the contamination, or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality."*** The CCR Rule provides 90 days from determination of an SSL to complete an ASD for applicable Appendix IV constituents [2]. If a successful ASD is completed and certified by a qualified professional engineer, the CCR unit may continue in assessment monitoring. If, however, an alternate source of the

[1] Referred to in this document as an "alternate source," and the demonstration for such is referred to as an ASD.

[2] For simplicity, this report utilizes the term ASD to account for any of the three possible explanations (allowed for in the CCR Rule) for why a calculated SSL is not related to the CCR unit being evaluated. Those include: 1) The source for the SSL originates from something other than the CCR unit in question; 2) the SSL resulted from an error in sampling, analysis, or statistical evaluation; or 3) the SSL resulted from a natural variation in groundwater quality.

Appendix IV SSL is not identified, the owner or operator must initiate an assessment of corrective measures and nature and extent evaluation. This report documents the findings and conclusions of an investigation of the molybdenum SSL at MW-FAA-6.

1.2 PURPOSE AND SCOPE

The purpose of this ASD is to determine whether the concentrations of molybdenum detected in groundwater at MW-FAA-6 are from sources other than the Unit. The scope of the demonstration includes a review of the current regional geochemical and geologic conditions, a comparison of the groundwater quality at MW-FAA-6 and the other monitoring well locations, and analysis of the bedrock matrix for sources of molybdenum. This evaluation was completed using existing information describing the regional and site-specific geology and groundwater monitoring data collected during detection and assessment monitoring activities. This analysis included:

- Review of well installation logs for the presence of shale and limestone in the groundwater monitoring well screened intervals;
- Review of low flow groundwater sampling field forms including specific conductance, turbidity, and pH measurements; and
- Collection and analysis of representative bedrock samples obtained during the installation of groundwater monitoring wells up gradient and down gradient of the unit.

1.3 SITE SETTING

The JEC is located approximately 7 miles northwest of St. Marys in Pottawatomie County, Kansas. The location of the JEC is shown on Figure 1. The Site is located within the Central Lowland physiographic province which includes rolling hills with substantial topographic relief and the relatively horizontal orientation of the thin alternating shale and limestone beds. The FAL is a CCR landfill that encompasses approximately 55 acres and is located approximately 1 mile west of the JEC plant site. The JEC plant site and the FAL are relatively flat; however, the area between the JEC plant and the FAL consists of rolling hills and natural drainages with natural ground surface elevations varying between 1,100 and 1,300 feet above mean sea level (amsl).

1.4 SITE DESCRIPTION

The FAL CCR management unit was permitted as a combined Industrial Waste Landfill in 1980 under the Kansas Department of Health and Environment (KDHE) Solid Waste Disposal Area Operating Permit No. 359 (KDHE Permit No. 359). Fly ash is collected at the JEC power plant via an electrostatic precipitator and is conveyed by truck to the FAL where it is deposited behind an embankment in the FAL, graded, hydrated to support grading and dust suppression, and disposed in Area 1 of the FAL. The FAL and associated groundwater monitoring well network is shown on Figure 2.

2. Site Geology, Hydrogeology, Geochemistry, and Regional Conditions

Geologic and hydrogeologic conditions beneath the FAL have been characterized based on information obtained during installation and sampling of the monitoring wells installed pursuant to the Solid Waste Disposal Area Operating Permit (KDHE Permit No. 359) and wells installed for the CCR groundwater monitoring network.

2.1 SITE GEOLOGY

The JEC site and the FAL are located within the southern extent of Pleistocene glacial activity in the Dissected till plains region of the Central Lowlands geomorphic province. The Site is underlain by multiple sequences of marine sedimentary rocks (interbedded shales and limestones) that are roughly horizontal. The principal hydrogeologic units that underlie the FAL, in order of increasing depth, include the Stearns shale, Beattie limestone, Eskridge shale, Grenola limestone, Roca shale, Red Eagle limestone, Johnson shale, and Foraker limestone formations. The fundamental properties of these formations are described below. Figure 3 shows the stratigraphic units located beneath the JEC site encountered during the installation of the FAL CCR monitoring well network.

Surficial geologic materials in the vicinity of and beneath the FAL include thin deposits of Pleistocene glacial till and Holocene alluvium. The natural surficial materials prior to construction of the FAL include the poorly sorted glacial deposits composed of Kansan and Nebraskan age clays, silts, and sands. Locally, the till may yield minor quantities of water, but occurrence of water is discontinuous, and the Unit does not constitute an aquifer.

The Pleistocene glacial deposits are underlain by strata representing transgressions and regressions of marine and near-shore depositional environments. The shale units represent deposition of fine grain silt and clay materials in an off-shore marine environment. The silt and clay were later buried at depth and compressed to form the relatively hard and impermeable shale observed underlying the FAL. The limestone units represent deposition of chemically precipitated calcium carbonate in an environment further from shore in comparison with the shale depositional environment. After deposition, the chemically precipitated calcium carbonate was also buried at depth and compressed to form the limestone units observed underlying the FAL. The alternating sequences of shale and limestone were created by sequential rising and falling of the relative sea level which caused the shale and limestone depositional environments to repeatedly transgress and regress over one another.

The alternating shale and limestone units range in thickness between approximately 8 and 42 feet. The limestone units are generally water-bearing and the shale units generally are not. The nearly horizontal shale units have formed barriers to vertical groundwater flow. The Stearns shale, the Beattie limestone, and the Eskridge shale are unsaturated beneath the FAL and overlie the principle hydrogeologic units consisting of the Grenola limestone and the Roca shale.

2.2 SITE HYDROGEOLOGY AND HYDROLOGY

Given the alternating sequences of shale and limestone, many of the water-bearing units are confined and preclude the vertical migration of groundwater. The limestone formations have variable permeability but are generally characterized as low permeability but have higher permeability than the shale units. Shale permeability decreases with depth and while the upper shale units beneath the CCR

management units have a low permeability, the deeper shale units are considered relatively impermeable.

The uppermost water-bearing geologic formation at the FAL is the Grenola limestone. Based on observations made by Haley & Aldrich during drilling conducted at the FAL in March 2016 and June 2017, the saturated thickness of the Grenola formation is approximately 12 to 42 feet below ground surface (bgs). The saturated Grenola limestone is underlain by the low permeability Roca shale which acts as an aquitard, inhibiting downward groundwater flow. The uppermost aquifer does not appear to be hydraulically interconnected with the underlying aquifers within the JEC facility boundary.

Based on groundwater elevation data collected as part of the detection and assessment monitoring programs, the groundwater flow direction has been consistently observed toward the south. Available groundwater elevation data indicate that seasonal groundwater elevation variation does not have a significant effect on groundwater flow direction at the JEC site.

Based on slug test results conducted by Haley & Aldrich and others, the hydraulic conductivity of the Grenola limestone at FAL was calculated to range between $3.97x10^{-3}$ and $2.33x10^{-3}$ centimeters per second (cm/sec). The Roca shale underlying the uppermost aquifer at FAL is between 7 to 34 feet thick, and results of packer tests conducted during previous studies indicate that the hydraulic conductivity is $3.55x10^{-5}$ cm/sec (Burns & McDonnell, 2009). Based on these observations, the Roca shale is characterized as an aquitard beneath the Grenola limestone at the FAL.

During installation of the groundwater monitoring well network at the FAL, discontinuous thin layers of black shale were observed interbedded with limestone within the bedrock formation. Black shale was observed interbedded within the water-bearing Grenola limestone in wells at the FAL.

2.3 NATURALLY-OCCURRING SOURCES OF MOLYBDENUM

Black shale deposits identified in the region have been documented to contain elevated molybdenum content and typically occur in thin layers generally less than 3 feet thick. The shale layers with elevated molybdenum are believed to have been formed near ancient deltaic shorelines enriched in terrestrial organic matter and can be associated with coal seams. These types of shale deposits have been identified from Indiana to Oklahoma and from Kentucky to Iowa. In general, the further from the boundary of the ancient shoreline, the lower the molybdenum concentration observed in the shale (Coveney and Glascock, 1989).

The dissolution and mobility of molybdenum is affected by the oxidation conditions in the water-bearing unit, the presence of adsorption sites within the soil and bedrock matrix, and groundwater pH conditions. Generally, molybdenum adsorption to soils and bedrock matrices is lower under anaerobic groundwater conditions (dissolved oxygen less than 0.5 mg/L) and at neutral to basic pH (6 to 8 standard units [S.U.]). These groundwater conditions induce the dissolution of molybdenum adsorbed to iron oxide minerals (Smedley and Kinniburgh, 2012) and inhibit the adsorption of molybdenum to the soil matrix due to competition with the elevated hydroxide concentrations (Barrow, 1977), thus, increasing dissolved phase concentrations in groundwater.

3. Alternative Source Demonstration

Haley & Aldrich conducted an evaluation of molybdenum concentration detected at MW-FAA-6 that included review of the three possible alternative sources (allowed for in the CCR Rule) for the apparent SSL determined by statistical analyses completed in January 2019 for the September 2018 assessment monitoring sampling event. The molybdenum concentration observed for the September 2018 assessment monitoring sampling event is 0.416 mg/L.

These possible alternative sources include:

1. The SSL resulted from an error in sampling, analysis, or statistical evaluation;
2. The source for the SSL originates from something other than the CCR unit in question; or
3. The SSL resulted from a natural variation in groundwater quality.

As part of that evaluation, Haley & Aldrich evaluated potential point and non-point sources of molybdenum in the vicinity of the FAL and evaluated natural geologic conditions and the effect of those conditions on native groundwater chemistry. Each of these analyses and the resulting findings are described below.

3.1 REVIEW OF FIELD SAMPLING, LABORATORY ANALYSIS, AND STATISTICAL PROCEDURES

3.1.1 Field Sampling Procedures

Westar conducted field sampling activities in accordance with the Groundwater Sampling and Analysis Plan (SAP; Haley & Aldrich, 2017) that was prepared in accordance with §257.93 of the CCR Rule. The SAP prescribes the site-specific activities and methods for groundwater sampling and included procedures for field data collection, sample collection, sample preservation and shipment, interpretation, laboratory analytical methods, and reporting for groundwater sampling for the FAL. The administrative procedures and frequency for collection of groundwater elevation measurements, determination of flow directions, and gradients were also provided in the SAP.

Haley & Aldrich reviewed the field sampling and equipment calibration logs and the field indicator parameters and did not identify any apparent deviations or errors in sampling that would result in a potential SSL down gradient of the FAL.

3.1.2 Laboratory Analysis and Quality Control Documentation

The groundwater samples collected down gradient of the FAL were analyzed by Pace Analytical Services (Pace) using promulgated U.S. Environmental Protection Agency (USEPA) analytical methods in accordance with the SAP (Haley & Aldrich, 2017) that was prepared in accordance with §257.93 of the CCR Rule. The data generated from these laboratory analyses are stored in a project database that incorporates hydrogeologic and groundwater quality data and was established to allow efficient management of chemical and physical data collected in the field and produced in the laboratory.

Haley & Aldrich conducted a quality assurance/quality control review of each groundwater quality dataset generated for the FAL and has not identified any apparent errors that would result in a potential SSL down gradient of the FAL.

3.1.3 Statistical Evaluation

Westar collected the initial assessment monitoring groundwater sample in June 2018, and a second assessment monitoring groundwater sample in September 2018, from each of the up gradient (MW-FAA-5) and down gradient (MW-FAA-3, MW-FAA-4, and MW-FAA-6) monitoring wells at the FAL. Baseline sampling was previously completed over a period spanning from August 2016 through June 2017, as required by the CCR Rule. Statistical analysis of the analytical results was completed and reported as documented in the 2018 Annual Groundwater Monitoring and Corrective Action Report (Haley & Aldrich, 2019).

Haley & Aldrich has reviewed the statistical analysis of groundwater quality data from monitoring wells at the FAL and has not identified any laboratory or statistical calculation errors that would result in the apparent molybdenum SSL at MW-FAA-6. The statistical test method used met the performance standard established in the CCR Rule, and the statistical procedure complies with the requirements of the CCR Rule.

3.2 POTENTIAL SOURCES OTHER THAN THE FAL

Haley & Aldrich conducted a review of potential sources (both point and non-point) of molybdenum in the vicinity of the FAL to determine if previous or adjacent site activities, land uses, or practices might have caused, or are currently causing, elevated concentrations of molybdenum in groundwater down gradient of the FAL. Potential point sources would include discharging activities or other activities occurring at a discrete location that may be a source of molybdenum. Non-point sources would include diffuse discharging activities or practices that may result in a low level but wide-spread increase in molybdenum concentrations detected at the down gradient side of the FAL.

3.2.1 Point Sources

Prior to construction of the FAL, the landfill site and surrounding vicinity was undeveloped land. Review of historical United States Geological Survey (USGS) topographic maps shows undeveloped land prior to the construction of the FAL. No known industrial, agricultural, mining, or other activities were conducted at the FAL site prior to construction of the landfill that would potentially constitute a point source for molybdenum. No point sources have been identified as a potential alternative source for molybdenum at the FAL.

3.2.2 Non-Point Sources

No mining, industrial, or other activities have been documented in the vicinity of the FAL that might constitute a non-point source of molybdenum in the vicinity of MW-FAA-6. Agricultural land use was observed approximately 0.8 mile to the southwest and down gradient of the FAL.

No agricultural activities have been identified up gradient of the FAL. Records reviewed included historical aerial photographs and historical topographic maps. No non-point sources have been identified as a potential alternative source for molybdenum at the FAL.

3.3 HISTORICAL LAND USE REVIEW

Haley & Aldrich assessed past usage of the Site and adjoining properties through a review of the following records:

- Environmental Risk Information Services (ERIS) – Aerial Photographs, dated 1950, 1954, 1977, 1981, 1991, 2002, 2003, 2004, 2005, 2006, 2008, 2010, 2012, 2014, 2015, and 2017 (Appendix A); and
- ERIS – Topographic Maps, dated 1964, 1978, and 2012 (Appendix B).

Unless otherwise noted below, sources were reviewed dating back to 1940 or first developed use, whichever is earlier, and at 5-year intervals if the use of the property had changed within the time period.

3.3.1 Historical Aerial Photographs

Haley & Aldrich reviewed aerial photographs depicting the development of the Site and vicinity as summarized in Table I. The historical aerial photograph search includes photographs from the Army Mapping Service, USGS, National High-Altitude Photography, and the National Agriculture Information Program (ERIS, 2018) and are included in Appendix A.

Photographs show that the Site was undeveloped up until at least 1977. By 1981, the FAL embankment was constructed and the landfill had begun accepting fly ash up gradient of the current location of MW-FAA-6. Aerial photos from 1981 through 2017 show the progression of fill at the FAL. An historical aerial photograph review summary is included as Table I. No activities constituting potential sources of molybdenum have been identified based on aerial photograph review.

3.3.2 Historical Topographic Maps

Haley & Aldrich reviewed historical topographic maps depicting the development of the site and vicinity, as summarized in Table II. The topographic maps were provided for review by ERIS. Copies of the topographic maps are included in Appendix B. No historical development of other features constituting potential sources of molybdenum have been identified based on topographic map review.

3.4 NATURAL VARIABILITY OF MOLYBDENUM OCCURENCE

Haley & Aldrich conducted an evaluation of the natural variability of molybdenum occurrence in formation material and groundwater at the FAL based on site-specific data; the analyses and observations are described in the following sections.

3.4.1 Natural Bedrock Variability

As described above, published information indicates that on a regional scale black shale is known to contain elevated levels of molybdenum. Based on this fact and the observed occurrence of black shales at the FAL, samples of shale deposits encountered during the installation of monitoring wells at the FAL lateral expansion were collected for laboratory analysis of molybdenum concentrations. Seven shale samples were submitted under a chain of custody (COC) to Pace laboratory in Lenexa, Kansas for the analysis of total molybdenum in accordance with USEPA Test Method 6020 and leachable molybdenum using USEPA Method 1312 Synthetic Precipitation Leaching Procedure (SPLP) extraction fluids and deionized (DI) water.

The results of total molybdenum analysis ranged from less than the laboratory reporting limit of 3.9 milligrams per kilogram (mg/kg) to 13.6 mg/kg. Concentrations of leachable molybdenum produced through SPLP ranged from 0.0024 to 0.25 mg/L. Concentrations of leachable molybdenum produced through DI leach ranged from 0.003 to 0.225 mg/L. These data confirm that the shale deposits at the JEC site exhibit a range of molybdenum concentrations that are leachable within the same concentration range as observed at MW-FAA-6. A summary of the shale deposit sample analyses and the SPLP and DI leachate are provided in Table III attached to this report, and a copy of the laboratory report with the completed COC are provided in Appendix C.

3.4.2 Natural Groundwater Quality Variability

Field parameter values collected during the collection of representative assessment monitoring groundwater samples using low-flow, low stress techniques in June and September 2018 indicate that the current groundwater conditions at MW-FAA-6 are basic with pH ranging from 7.98 to 8.59 S.U. Field pH measurements at the other monitoring wells during the assessment monitoring program generally range from 1 to 2 pH S.U. lower than MW-FAA-6. All of the FAL monitoring wells have been constructed with screened intervals in the Grenola limestone, which include alternating layers of limestone and shale. The higher pH observed at MW-FAA-6 is consistent with a well screened in limestone. The difference in pH between the FAL monitoring wells illustrates a degree of geochemical variability within that formation. The lithologic log for MW-FAA-6 indicates thin alternating layers of shale and limestone. The elevated pH conditions observed at MW-FAA-6 would induce a higher dissolution of molybdenum from the shale deposits within the groundwater monitoring interval. Groundwater parameters collected at the FAL groundwater monitoring network during the June and September 2018 assessment monitoring sampling events are provided in Table IV.

Molybdenum has also been detected in an up gradient monitoring well (MW-FGD-6) completed in the Grenola limestone at a separate JEC CCR unit at a concentration similar to that observed at MW-FAA-6. The molybdenum concentration at MW-FGD-6 is 0.52 mg/L, which is higher than the molybdenum concentrations of 0.33 and 0.416 mg/L observed in MW-FAA-6 during both the June and September 2018 assessment monitoring events, respectively. Monitoring well FGD-6 is constructed in the Grenola limestone in an area that is unimpacted by CCR material and where no recorded historical development has taken place.

These data indicate that sufficient natural geochemical variability exists within the Grenola limestone to locally mobilize molybdenum where present in the formation. This variability has resulted in concentrations of molybdenum in areas unimpacted by CCR material that range higher than those concentrations observed at MW-FAA-6.

Well construction details for the FAL monitoring wells (MW-FAA-3, MW-FAA-4, MW-FAA-5, and MW-FAA-6) are provided in Appendix D.

4. Findings and Conclusions

Haley & Aldrich conducted a geochemical evaluation of groundwater quality information and site geology to identify potential alternative sources of the elevated molybdenum concentrations detected down gradient of the FAL in groundwater samples collected from MW-FAA-6. The geochemical evaluation included review of oxidation conditions in the uppermost aquifer, groundwater quality observed at the FAL and elsewhere, and geochemical composition of formation materials. These data were evaluated in conjunction with published information regarding the occurrence of molybdenum in black shales on a regional scale to identify naturally occurring sources of molybdenum that might affect groundwater at MW-FAA-6.

The evaluation included review of sampling procedures, laboratory procedures, and statistical analyses to determine if potential errors may have been made that would have resulted in the false identification of an SSL for molybdenum at this monitoring well location. The evaluation also included consideration of historical site activities based on aerial photograph and historical topographic map review, and consideration of potential point and non-point sources of molybdenum based on those activities.

4.1 FINDINGS

Haley & Aldrich found no apparent errors in sampling, laboratory analysis, data management, or statistical analysis that would result in the apparent SSL for molybdenum at MW-FAA-6. Haley & Aldrich also found no evidence of historical point or non-point sources of molybdenum, or historical activities that might have concentrated molybdenum in the vicinity of the FAL.

Haley & Aldrich evaluated field data and information to better understand the potential for natural variability of groundwater quality in the uppermost aquifer beneath the FAL. Key findings regarding the depositional characteristics of the bedrock formation and the associated natural variability of groundwater quality in the uppermost aquifer include:

- The uppermost water-bearing unit beneath the FAL is located within an interbedded sequence of shale and limestone bedrock.
- The monitoring well screen installed at down gradient well location MW-FAA-6 transects layers of shale and limestone deposits within the Grenola limestone formation.
- The pH measured during the assessment monitoring program indicates that the groundwater conditions at MW-FAA-6 could promote the dissolution of molybdenum from the bedrock formation.
- Samples of shale deposits collected during the installation of new monitoring wells located up gradient from the FAL exhibited elevated concentrations of total and leachable molybdenum.
- Leachate created from the shale samples collected up and down gradient from the FAL and analyzed using USEPA Test Method 1312 SPLP and laboratory pure DI exhibited similar concentrations of dissolved molybdenum as identified at MW-FAA-6.
- Another monitoring well (FGD-6) located up gradient of another CCR unit at the JEC in an area known to be unimpacted by CCR material has exhibited molybdenum concentrations higher than molybdenum concentrations observed in MW-FAA-6.

4.2 CONCLUSIONS

Based on these findings, the SSL for molybdenum identified at MW-FAA-6 is due to the presence of interbedded shale and limestone deposits within the Grenola limestone, and geochemical conditions (pH) promoting the localized mobilization of molybdenum from that formation. Consequently, the alternate source of molybdenum at the FAL monitoring well MW-FAA-6 is natural groundwater quality variability associated with the presence of interbedded shale and limestone deposits within the Grenola limestone, and localized mobilization of molybdenum from that formation into groundwater.

5. Certification

This statement certifies that the demonstration that a source other than the CCR unit caused the contamination, or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality is complete in accordance with 40 CFR 257.95(g)(3)(ii). The certification submitted is, to the best of my knowledge, accurate and complete.

Signed: _____

Print Name:	Steven F. Putrich, P.E.
Kansas PE License No.:	24363
Title:	Principal Consultant
Company:	Haley & Aldrich, Inc.

Steve Putrich Digitally signed by Steve Putrich Date: 2019.05.22 08:26:41 -07'00'

Signed: _____

Print Name:	Mark D. Nicholls, P.G.
Kansas PG License No.:	881
Title:	Lead Hydrogeologist
Company:	Haley & Aldrich, Inc.

Mark Nicholls Digitally signed by Mark Nicholls Date: 2019.05.22 08:27:23 -07'00'

HALEY ALDRICH

6. References

1. Coveney, Raymond and Glascock M., 1989. A review of the origins of metal-rich Pennsylvania black shales, central U.S.A., with an inferred role for basinal brines, Journal of Applied Geochemistry, Vol. 4, pp 347-367.

2. Barrow, N.J., 1977. Factors Affecting Molybdenum Status in Soils, Volume 2. The Geochemistry, Cycling and Industrial Uses of Molybdenum, proceedings from the International Symposium on Molybdenum in the Environment, Denver, CO.

3. Burns & McDonnell, 2009. *Final Phase II Hydrogeologic Investigation and Bottom Ash Pond Characterization*. January 2008 (Revised August 2009).

4. Environmental Risk Information Services, 2018. Database Report, March.

5. Haley & Aldrich, 2017. *Groundwater Sampling and Analysis Plan, Jeffrey Energy Center*. October.

6. Haley & Aldrich, 2019. *2018 Annual Groundwater Monitoring and Corrective Action Report, Fly Ash Landfill, Jeffrey Energy Center*. January.

7. Smedley, Pauline and Kinniburgh, D., 2012. *Molybdenum in natural waters: A review of occurrence, distributions and controls,* Journal of Applied Geochemistry, January 2017, pp 389-425.

8. United States Geological Survey (USGS), 1964. Topographic Map, Laclede, 7.5-minute series.

9. USGS, 1978. Topographic Map, Laclede, 7.5-minute series.

10. USGS, 2012. Topographic Map, Laclede, 7.5-minute series.

TABLES

TABLE I
HISTORICAL AERIAL PHOTOGRAPH REVIEW SUMMARY
WESTAR ENERGY, INC.
FLY ASH LANDFILL, JEFFREY ENERGY CENTER
ST. MARYS, KANSAS

Dates	Description of Site and Adjacent Properties	Sources
1950 – 1954	Undeveloped; some road use in the vicinity of the Site. Agricultural land use southwest of the Fly Ash Landfill.	Aerial photos – AMS
1977	Development of the plant site and road development south of the Fly Ash Area 1 Landfill. Agricultural land use southwest of the Fly Ash Landfill.	Aerial photos – USGS
1981	First appearance of Tower Hill Lake and Fly Ash Landfill. Agricultural land use southwest of the Fly Ash Landfill.	Aerial photos – NHAP
1991 – 2017	Growth of Fly Ash Landfill. Agricultural land use southwest of the Fly Ash Landfill.	Aerial photos – USGS; NAIP

Notes:

AMS = American Meteorological Society

NAIP = National Agriculture Imagery Program

NHAP = National High Altitude Photography

USGS = U.S. Geological Survey

TABLE II
HISTORICAL TOPOGRAPHIC MAP REVIEW SUMMARY
WESTAR ENERGY, INC.
FLY ASH LANDFILL, JEFFREY ENERGY CENTER
ST. MARYS, KANSAS

Dates	Description of Site and Adjacent Properties	Map Name
1964	The map shows undeveloped rolling hills incised by natural drainages. One road and one trail are shown within the Site vicinity.	7.5-Minute Series, Laclede, Kansas Quadrangle
1978	Several roads leading to areas depicted as "Dam Under Construction" are shown on the map. The plant site is depicted as Power Plant and Substation. However, the Fly Ash Landfill does not appear on this map.	7.5-Minute Series, Laclede, Kansas Quadrangle
2012	Tower Hill Road and other un-named roads lead to the two reservoirs. The plant site and Fly Ash Landfill are not depicted on the map.	7.5-Minute Series, Laclede, Kansas Quadrangle

TABLE III
SUMMARY OF SHALE SAMPLE ANALYSIS FOR TOTAL METALS AND SPLP RESULTS
WESTAR ENERGY, INC.
FLY ASH LANDFILL, JEFFREY ENERGY CENTER
ST. MARYS, KANSAS

Field Sample Name	MW-FAA-7 117.5-120	MW-FAA-7 102-104	MW-FAA-8 31.5-34	MW-FAA-9 24-25	MW-FAA-10 28-29.5	MW-FAA-11 78.5-79	MW-FAA-11 61-61.5
Location	MW-B-1		MW-FAA-7	MW-FAA-8	MW-FAA-9	MW-FAA-10	
Total Molybdenum[1] (mg/kg)	<3.9	9.4	8.3	13.6	11.0	<3.9	8.8
SPLP Molybdenum (mg/L)	0.0024	0.24	0.061	0.067	0.038	0.016	0.25
DI Leach Molybdenum (mg/L)	0.003	0.15	0.0547	0.0583	0.0309	0.0119	0.225

Notes:

All samples analyzed by Pace Analytical Services, Lenexa KS

Total Metals determined using U.S. Environmental Protection Agency (USEPA) Method 200.8

DI = Deionized Water

mg/kg = milligrams per kilogram dry weight;

mg/L = milligrams per liter

TABLE IV
SUMMARY OF FIELD PARAMETER MONITORING FROM THE INITIAL ASSESSMENT MONITORING SAMPLING EVENT
WESTAR ENERGY, INC.
FLY ASH LANDFILL, JEFFREY ENERGY CENTER
ST. MARYS, KANSAS

Location	Sample Name	Sample Date	Event	Depth to Water (btoc)	Groundwater Elevation (ft amsl)	Field Parameters			
						Temperature (Deg C)	Conductivity (µS/cm)	Turbidity (NTU)	pH (su)
MW-FAA-5	FAA-5-0650518	6/5/2018	**June 2018**	87.15	1163.65	**17.8**	**3340**	**0.21**	**6.91**
MW-FAA-3	FAA-3-060518	6/6/2018	**June 2018**	14.38	1151.28	**16.9**	**1630**	**2.24**	**7.17**
MW-FAA-4	FAA-4-060518	6/5/2018	**June 2018**	58.71	1155.10	**16.9**	**1360**	**0.05**	**7.23**
MW-FAA-6	FAA-6-060518	6/6/2018	**June 2018**	14.90	1147.86	**17.7**	**2780**	**1.51**	**8.57**
	FAA-6-091318	9/13/2018	**Sept 2018**	14.94	1147.82	**18.5**	**3170**	**0.44**	**8.27**

Notes:

USEPA, 2016. Final Rule: Disposal of Coal Combustion Residuals from Electric Utilities. July 26. 40 CFR Part 257. https://www.epa.gov/coalash/coal-ash-rule

µS/cm = microSiemen per centimeter

btoc - below top of casing

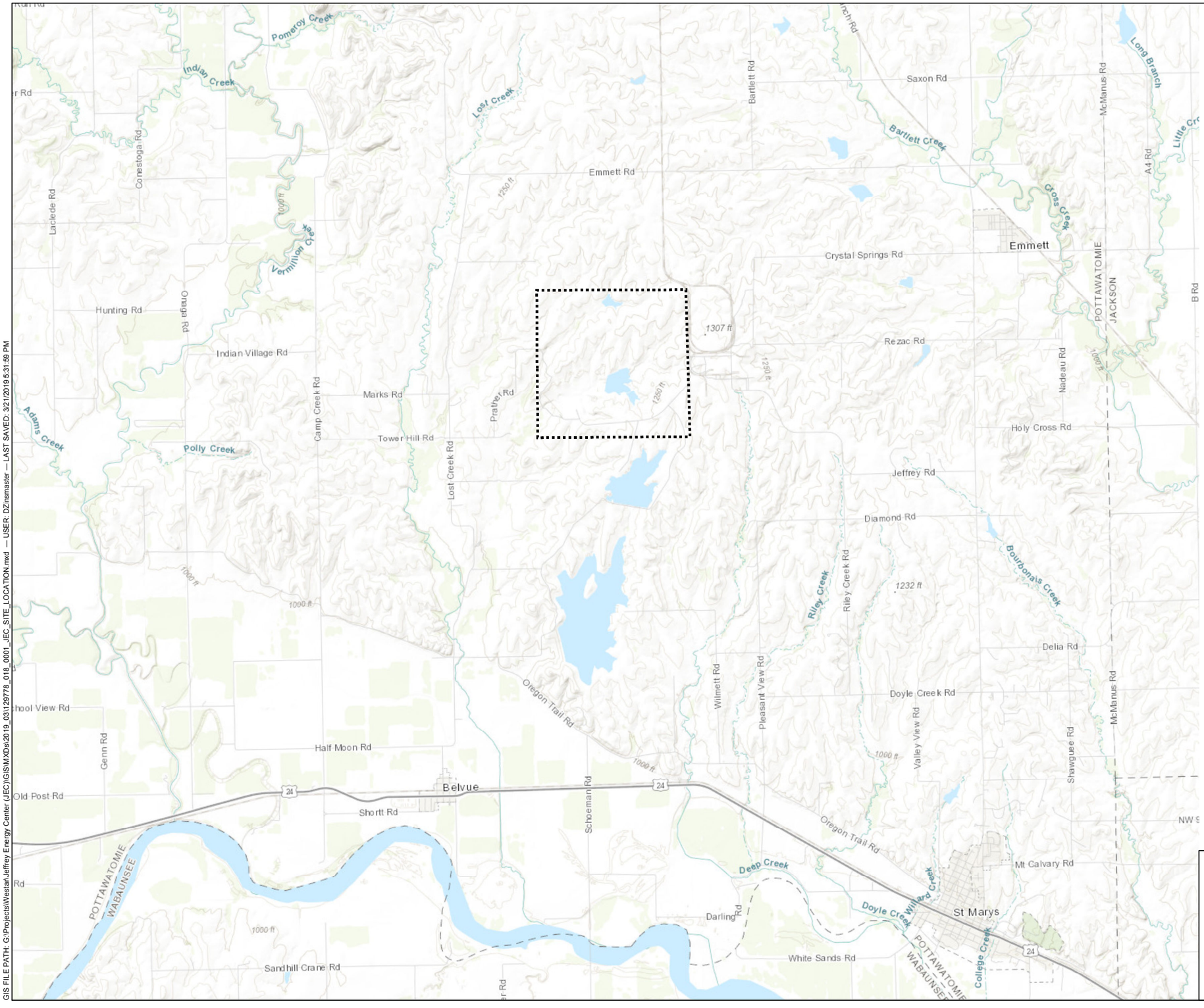
Deg C = degrees Celsius

ft amsl = feet above mean sea level

NTU = Nephelometric Turbidity Units

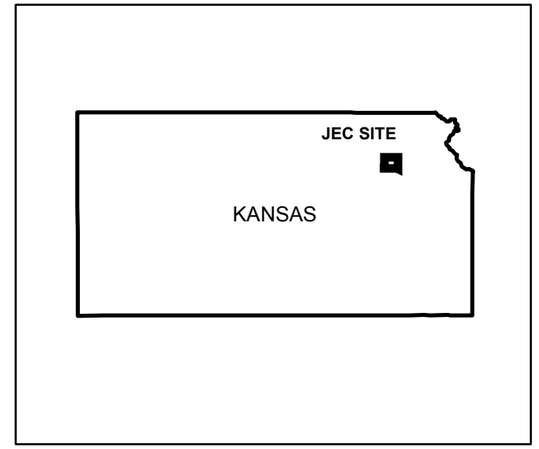
su = standard units

FIGURES



LEGEND

FACILITY



NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. SITE COORDINATES: 39°17'06"N, 96°08'19"W
3. TOPOGRAPHIC IMAGERY SOURCE: ESRI

N

0 1 2
Miles

HALEY ALDRICH

WESTAR ENERGY
JEFFREY ENERGY CENTER
ST. MARYS, KANSAS

SITE LOCATION

MARCH 2019
SCALE: AS SHOWN

FIGURE 1

GIS FILE PATH: G:\Projects\Westar\Jeffrey Energy Center (JEC)\GIS\MXDs\2019_03\129778_018_0001_JEC_SITE_LOCATION.mxd — USER: DZ — LAST SAVED: 3/21/2019 5:31:59 PM

DRAFT

LEGEND

- MONITORING WELL
- PIEZOMETRIC OBSERVATION ONLY
- FLY ASH LANDFILL LIMITS OF DISPOSAL AREA
- CROSS-SECTION

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.
2. AERIAL IMAGERY SOURCE: ESRI

N

0 400 800

SCALE IN FEET

HALEY ALDRICH

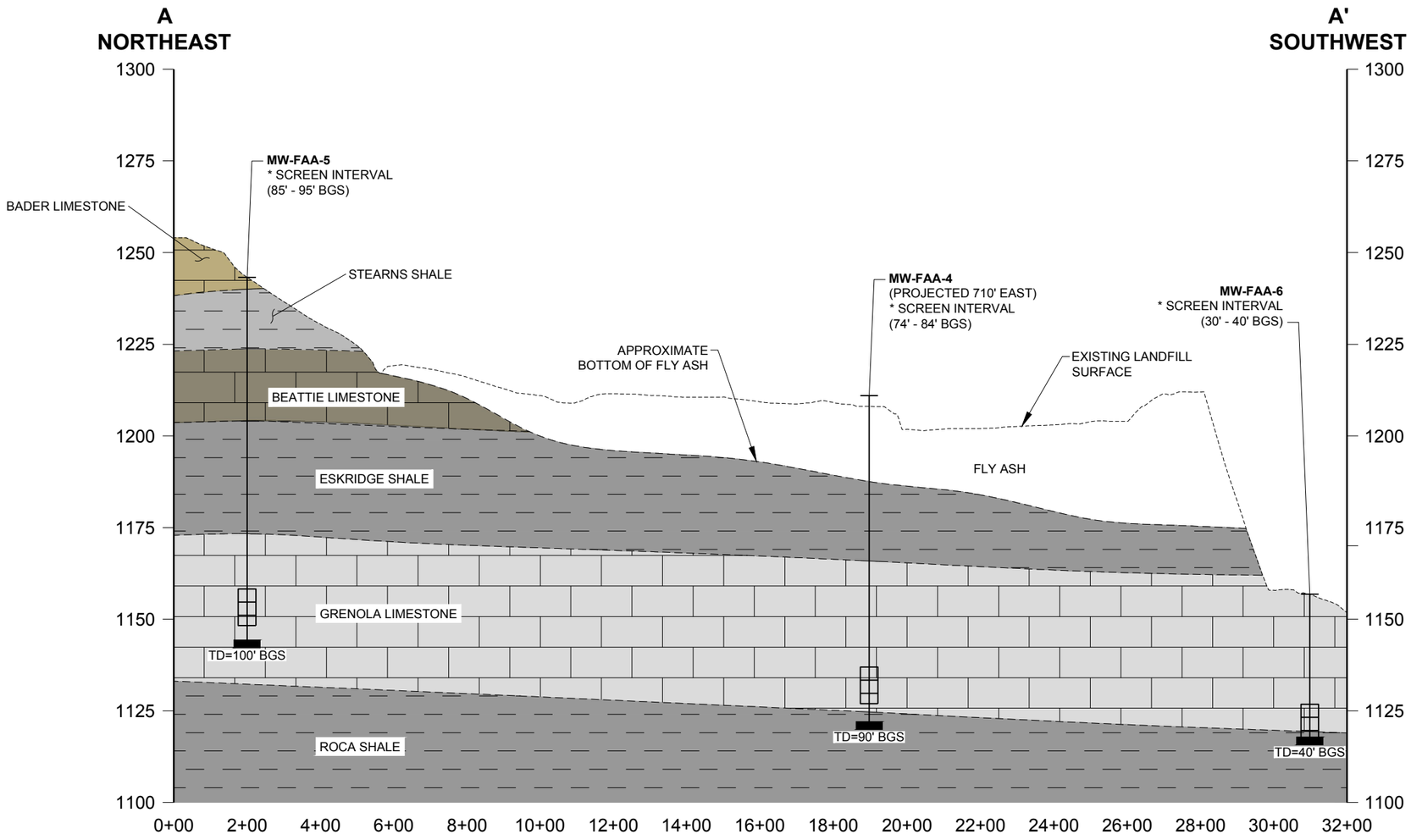
WESTAR ENERGY
JEFFREY ENERGY CENTER
ST. MARYS, KANSAS

FLY ASH LANDFILL
MONITORING WELL LOCATION MAP

JANUARY 2019

FIGURE 2

GIS FILE PATH: \\haleyaldrich.com\share\phx_common\Projects\Westar\Jeffrey Energy Center (JEC)\GIS\MXDs\2019_03\JEC_FLYASH_AREA1_MW_LOCATION_MAP_REV2.mxd — USER: anichols — LAST SAVED: 3/21/2019 4:58:53 PM



LEGEND:

- OVERBURDEN
- BADER LIMESTONE
- STEARNS SHALE
- BEATTIE LIMESTONE
- ESKRIDGE SHALE
- GRENOLA LIMESTONE
- ROCA SHALE
- APPROXIMATE WATER LEVEL
- xx-x WELL IDENTIFICATION
- GROUND SURFACE
- WATER LEVEL
- WELL SCREEN
- TOTAL DEPTH OF BOREHOLE (TD=4X' BGS)

NOTES

1. ALL LOCATIONS AND DIMENSIONS ARE APPROXIMATE.

HORIZ. 0 350 700
VERT. 0 35 70
SCALE IN FEET

WESTAR ENERGY
JEFFREY ENERGY CENTER
ST. MARYS, KANSAS

FLY ASH LANDFILL
GENERALIZED CROSS-SECTION A-A'

SCALE: AS SHOWN
MARCH 2019

FIGURE 3

APPENDIX A

Aerial Photographs

ENVIRONMENTAL RISK INFORMATION SERVICES

HISTORICAL AERIAL REPORT

for the site:
JEC
25905 Jeffrey Road
St. Marys, KS 66536
PO #:

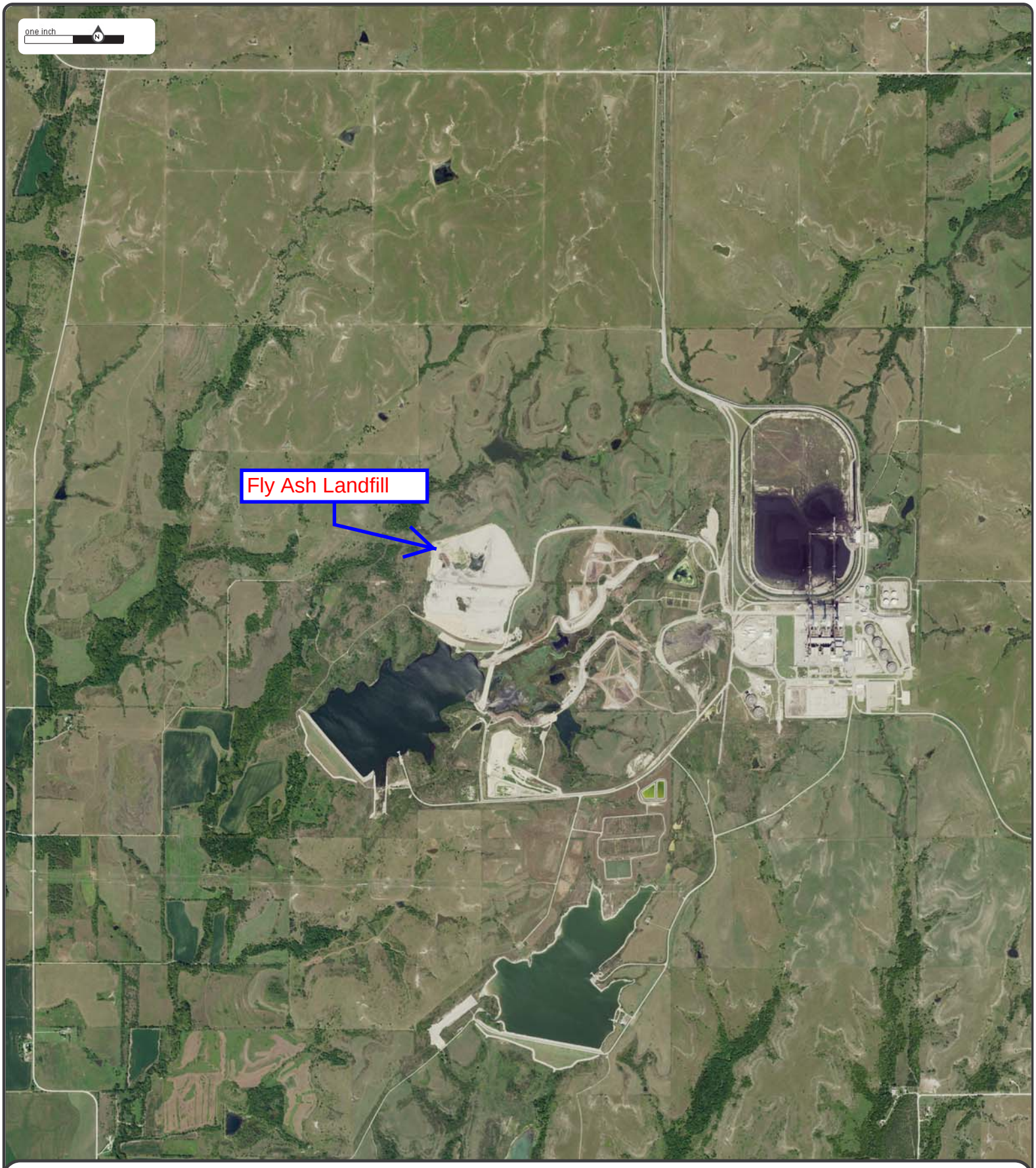
Report ID: 20180302344
Completed: 3/13/2018

ERIS Information Inc.
Environmental Risk Information Services (ERIS)
A division of Glacier Media Inc.
T: 1.866.517.5204
E: info@erisinfo.com

www.erisinfo.com

Search Results Summary

Date	Source	Scale	Comment
2017	**NAIP** - National Agriculture Information Program	1"=2500'	
2015	**NAIP** - National Agriculture Information Program	1"=2500'	
2014	**NAIP** - National Agriculture Information Program	1"=2500'	
2012	**NAIP** - National Agriculture Information Program	1"=2500'	
2010	**NAIP** - National Agriculture Information Program	1"=2500'	
2008	**NAIP** - National Agriculture Information Program	1"=2500'	
2006	**NAIP** - National Agriculture Information Program	1"=2500'	
2005	**NAIP** - National Agriculture Information Program	1"=2500'	
2004	**NAIP** - National Agriculture Information Program	1"=2500'	
2003	**NAIP** - National Agriculture Information Program	1"=2500'	
2002	**USGS** - US Geological Survey	1"=2500'	
1991	**USGS** - US Geological Survey	1"=2500'	
1981	**NHAP** - National High Altitude Photography	1"=2500'	
1977	**USGS** - US Geological Survey	1"=2500'	
1954	**AMS** - Army Mapping Service	1"=2500'	
1950	**AMS** - Army Mapping Service	1"=2500'	



Date: **2017**
Source: **NAIP**
Scale: **1" to 2500'**
Comments:

Subject: 25905 Jeffrey Road St. Marys KS
Approx Center: 39.28431 / -96.13949

N

ERIS
ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204

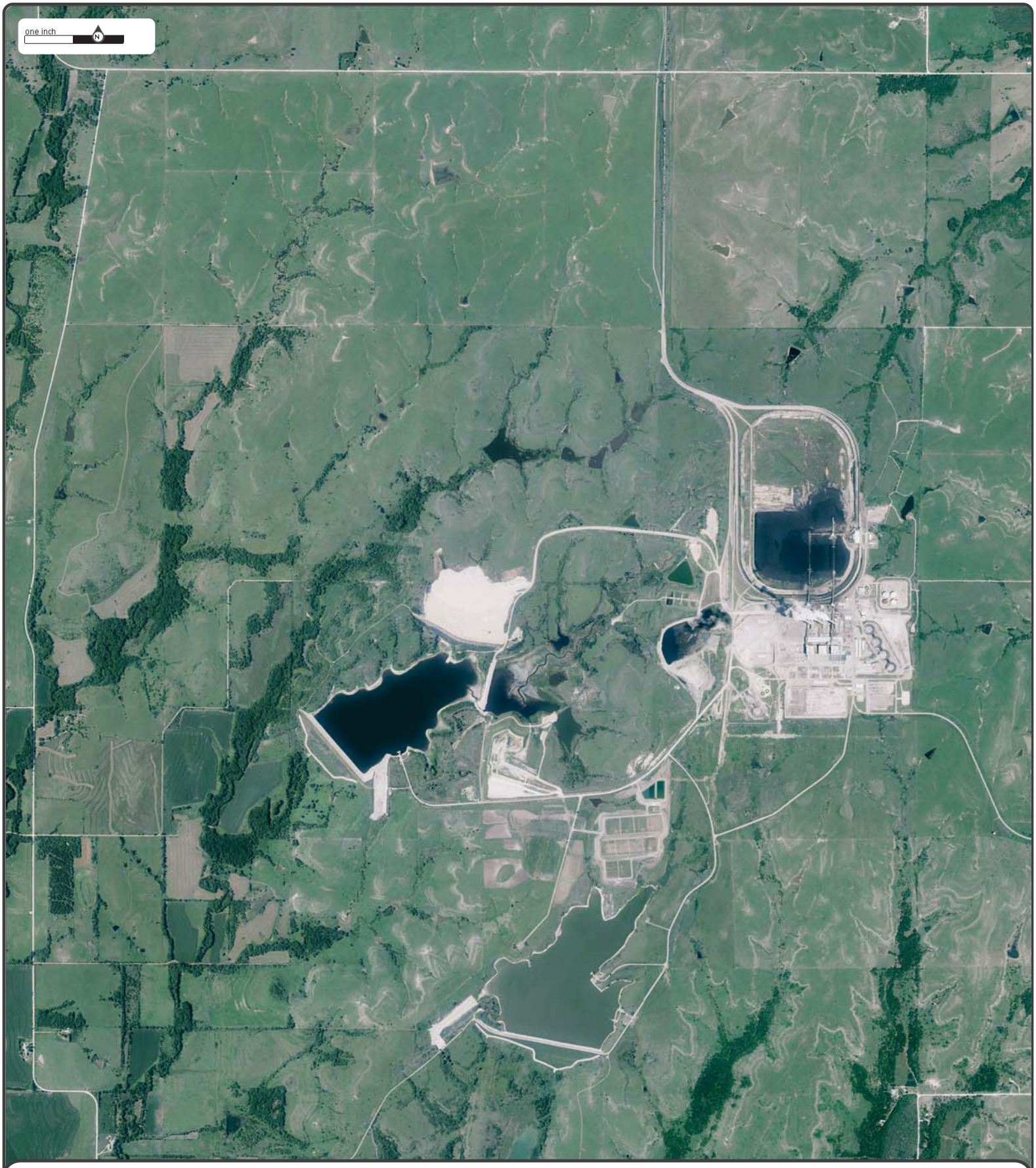
Date: **2015**
Source: **NAIP**
Scale: **1" to 2500'**
Comments:

Subject: 25905 Jeffrey Road St. Marys KS
Approx Center: 39.28431 / -96.13949

N

ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204



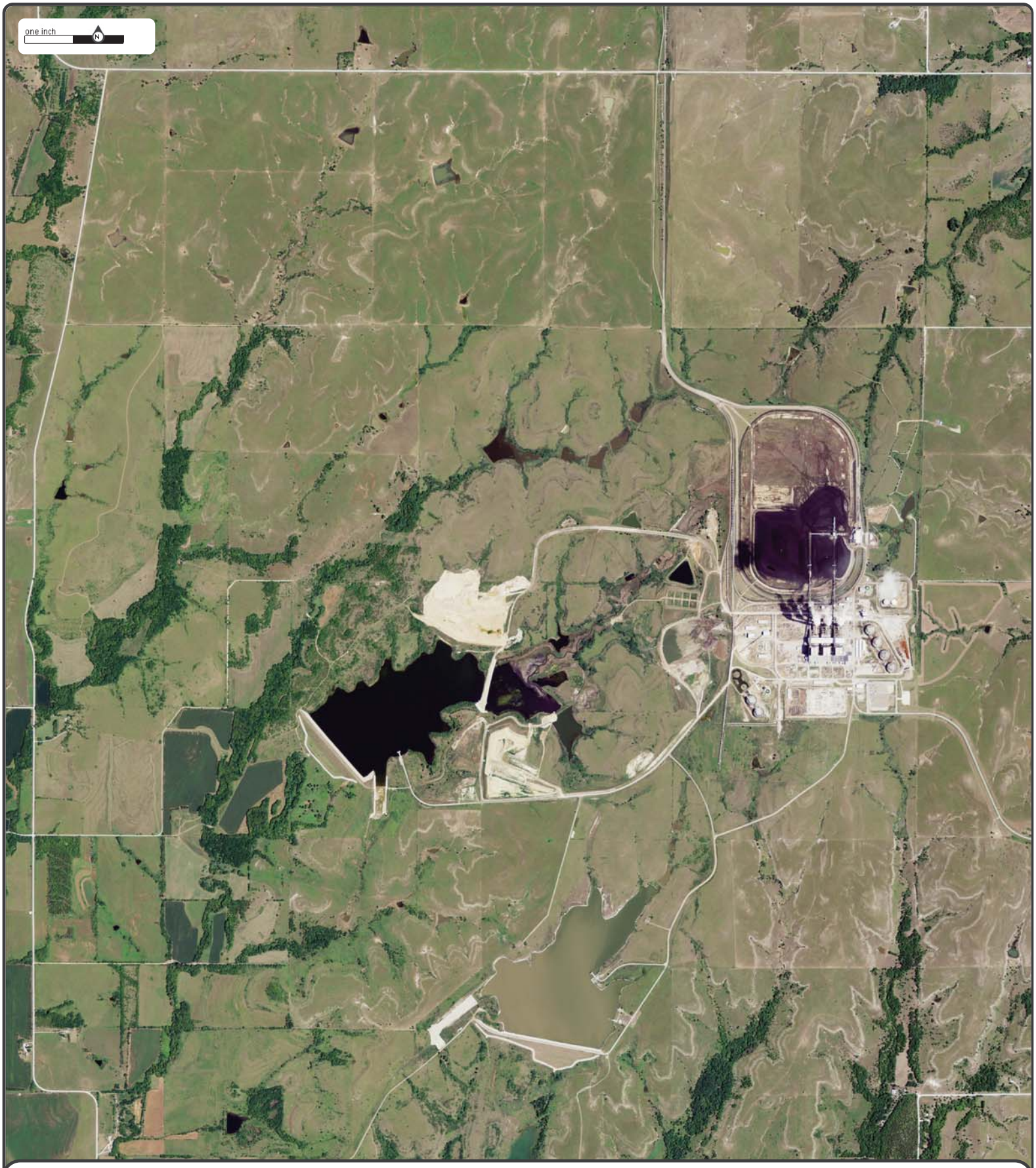
Date: **2014**
Source: **NAIP**
Scale: **1" to 2500'**
Comments:

Subject: 25905 Jeffrey Road St. Marys KS
Approx Center: 39.28431 / -96.13949

N

ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204



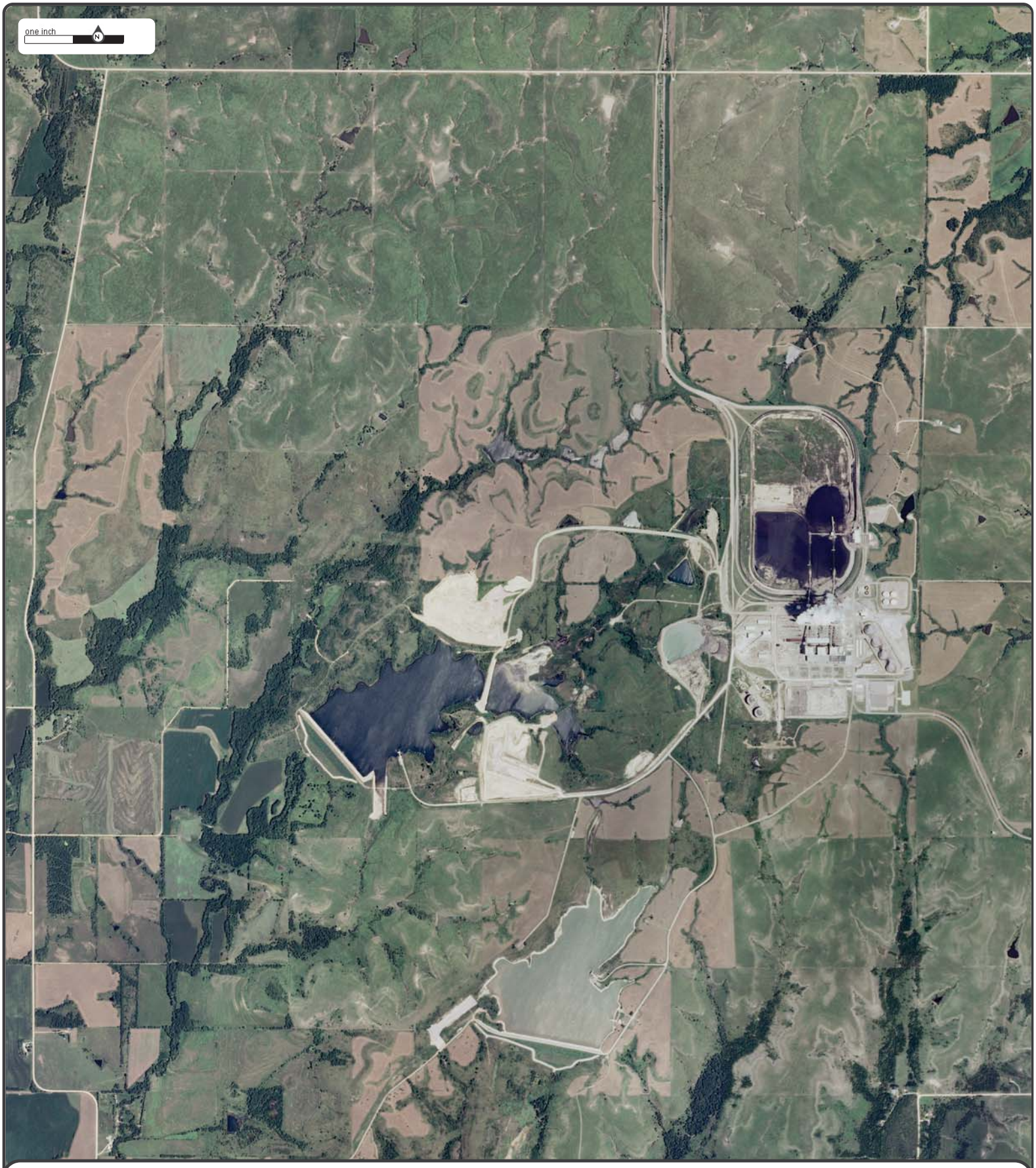
Date: **2012**
Source: **NAIP**
Scale: **1" to 2500'**
Comments:

Subject: 25905 Jeffrey Road St. Marys KS
Approx Center: 39.28431 / -96.13949

N

ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204



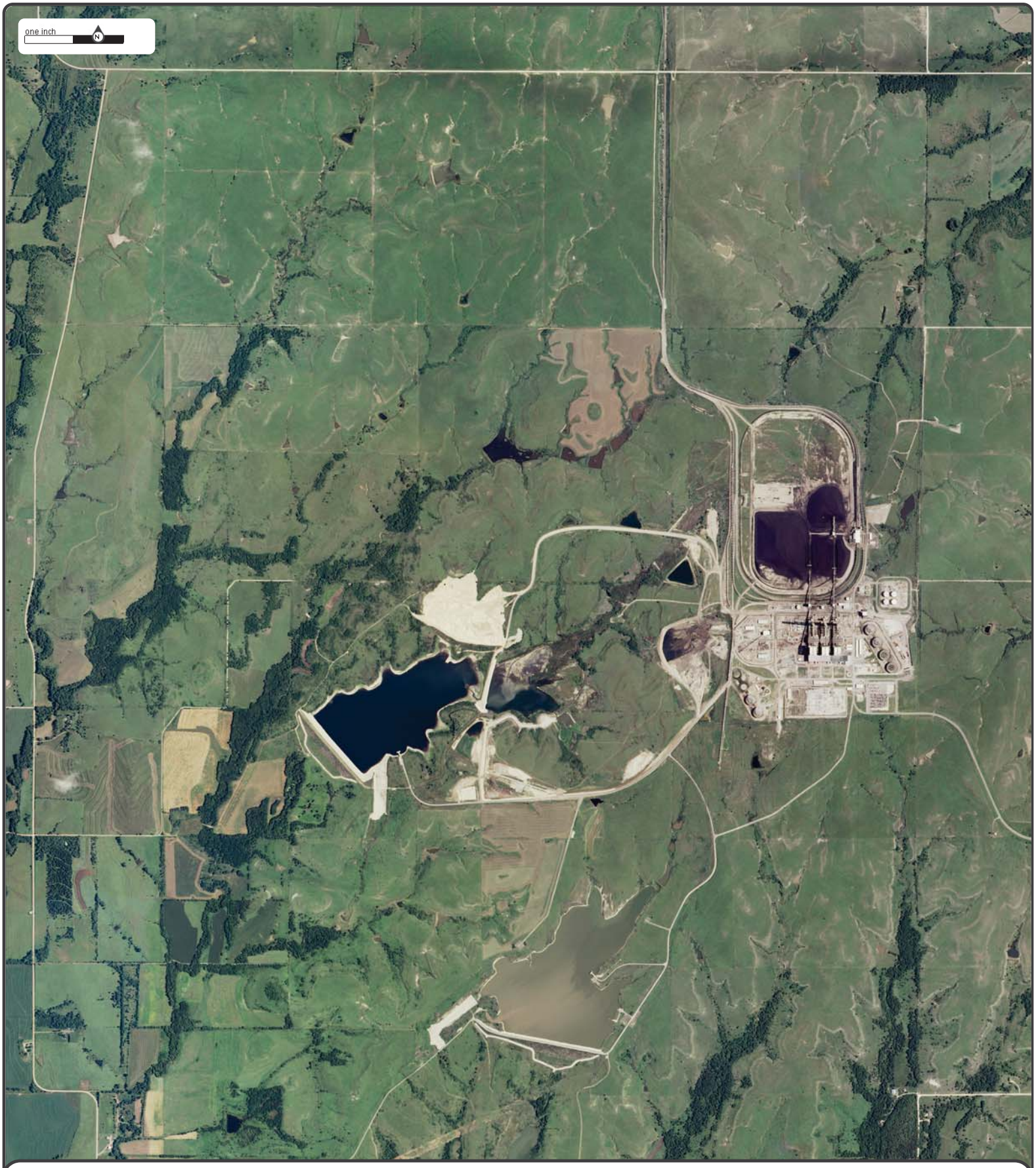
Date: **2010**
Source: **NAIP**
Scale: **1" to 2500'**
Comments:

Subject: 25905 Jeffrey Road St. Marys KS
Approx Center: 39.28431 / -96.13949

N

ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204



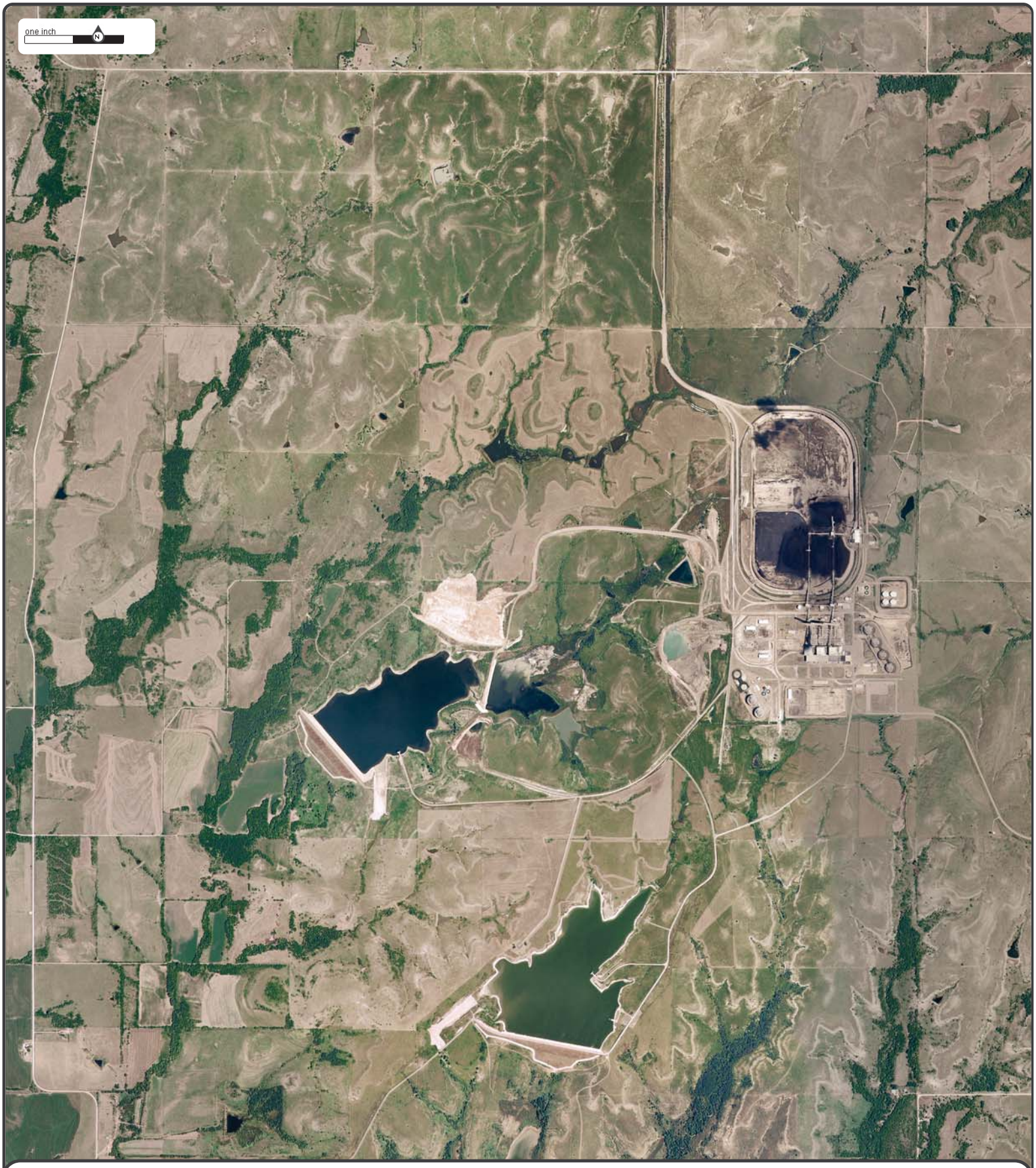
Date: **2008**
Source: **NAIP**
Scale: **1" to 2500'**
Comments:

Subject: 25905 Jeffrey Road St. Marys KS
Approx Center: 39.28431 / -96.13949

N

ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204



Date: **2006**
Source: **NAIP**
Scale: **1" to 2500'**
Comments:

Subject: 25905 Jeffrey Road St. Marys KS
Approx Center: 39.28431 / -96.13949

N

ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204

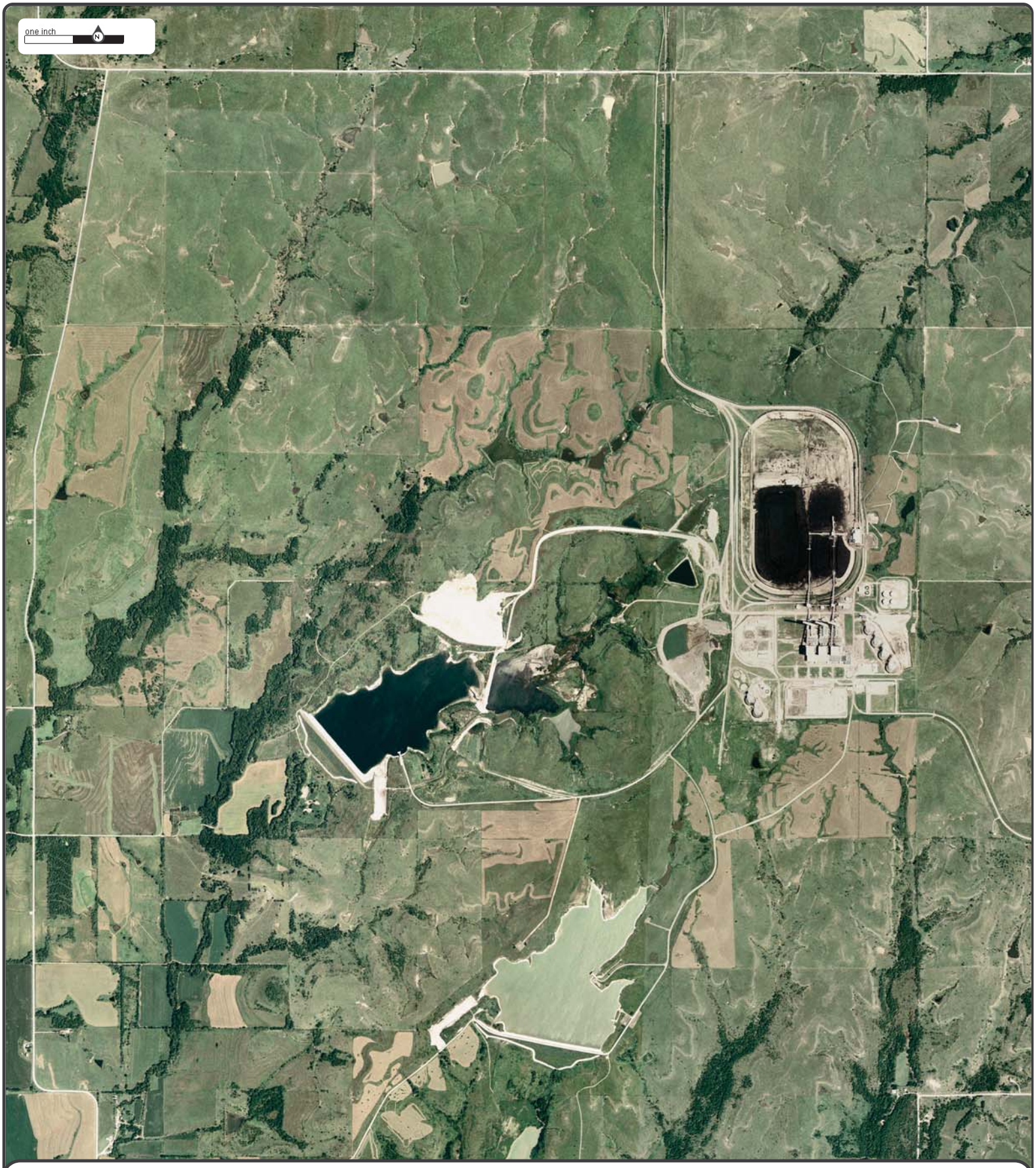
Date: **2005**
Source: **NAIP**
Scale: **1" to 2500'**
Comments:

Subject: 25905 Jeffrey Road St. Marys KS
Approx Center: 39.28431 / -96.13949

N

ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204



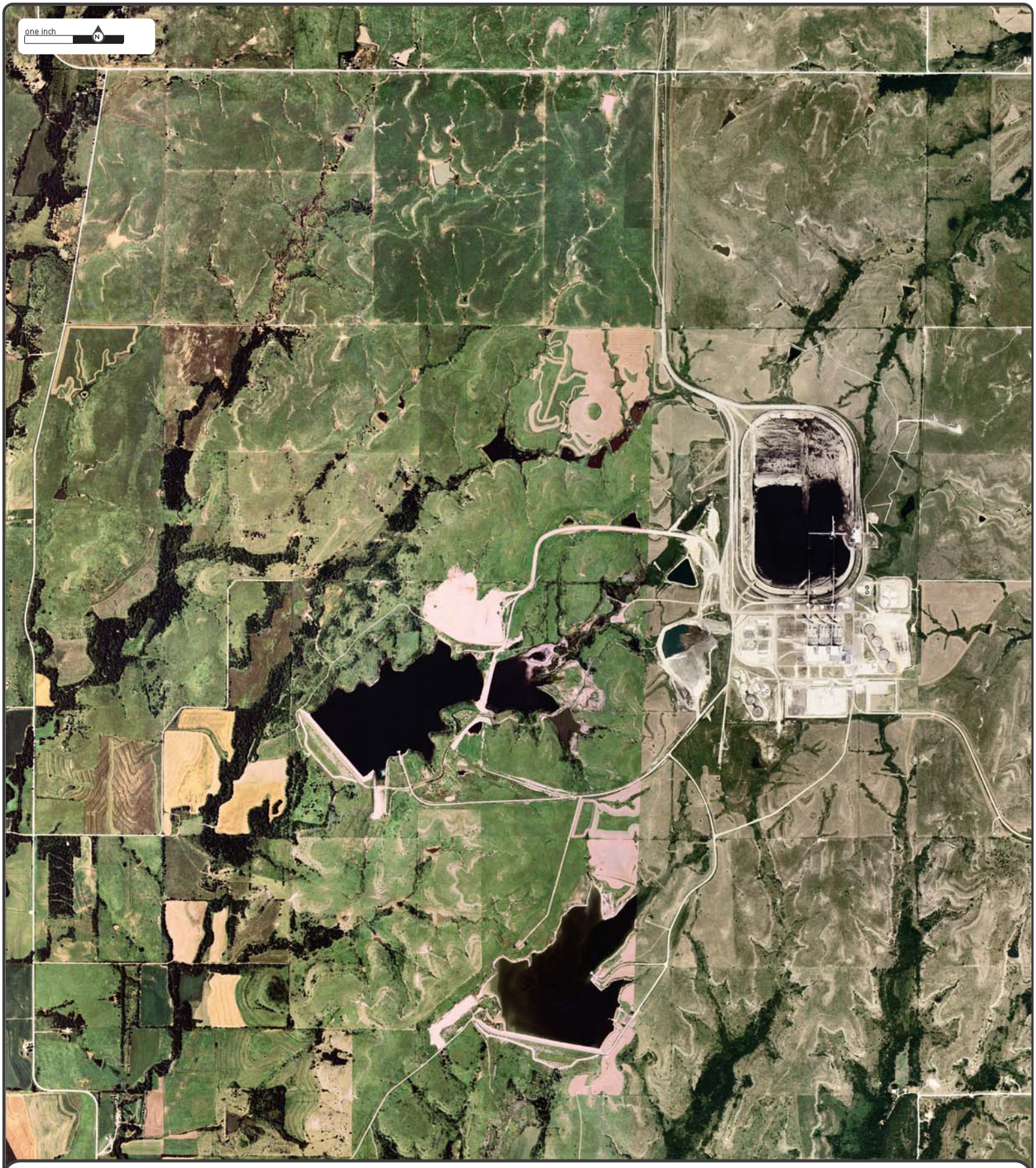
Date: **2004**
Source: **NAIP**
Scale: **1" to 2500'**
Comments:

Subject: 25905 Jeffrey Road St. Marys KS
Approx Center: 39.28431 / -96.13949

N

ERIS
ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204



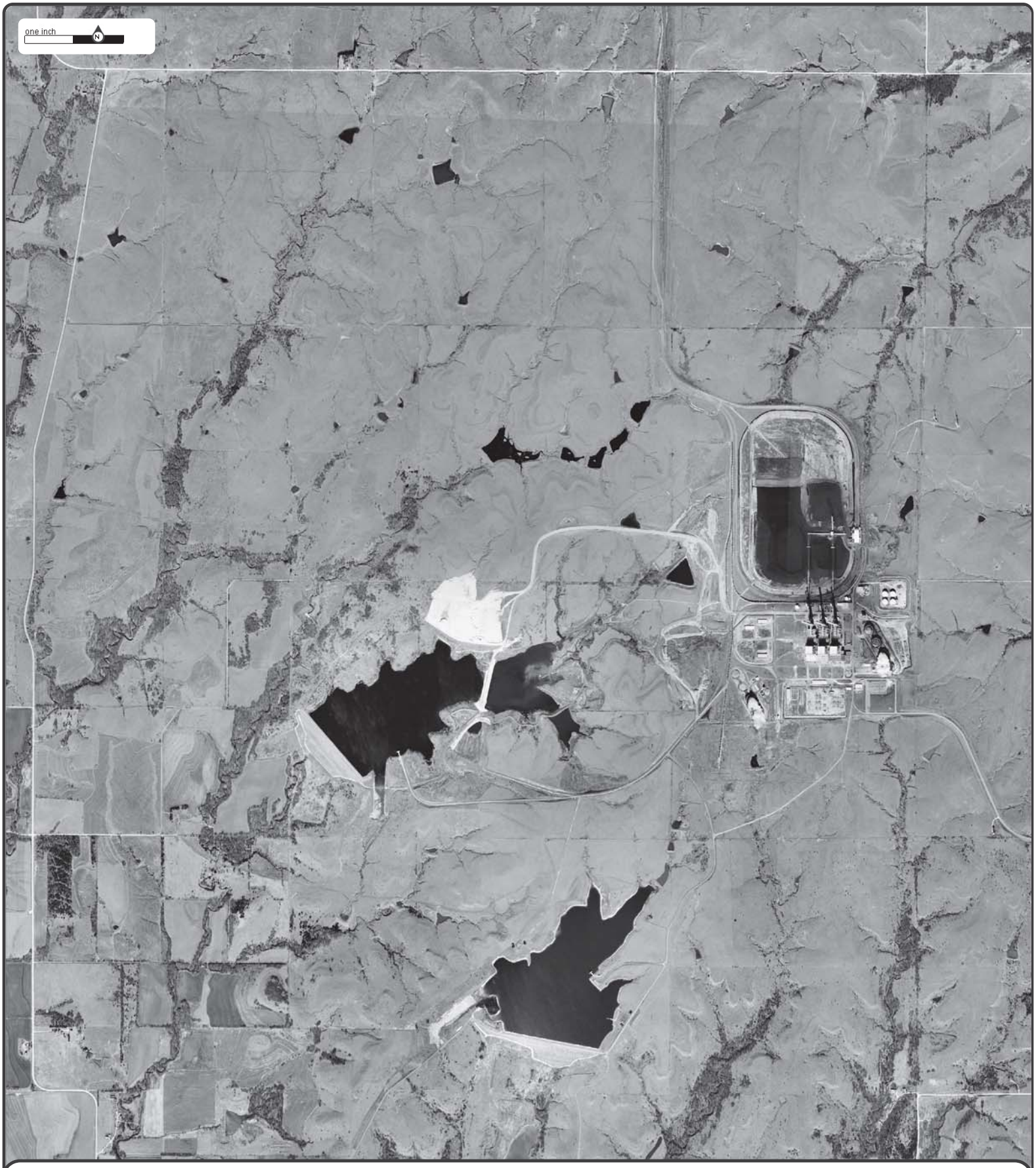
Date: **2003**
Source: **NAIP**
Scale: **1" to 2500'**
Comments:

Subject: 25905 Jeffrey Road St. Marys KS
Approx Center: 39.28431 / -96.13949

N

ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204



Date: **2002**
Source: **USGS**
Scale: **1" to 2500'**
Comments:

Subject: 25905 Jeffrey Road St. Marys KS
Approx Center: 39.28431 / -96.13949

N

ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204

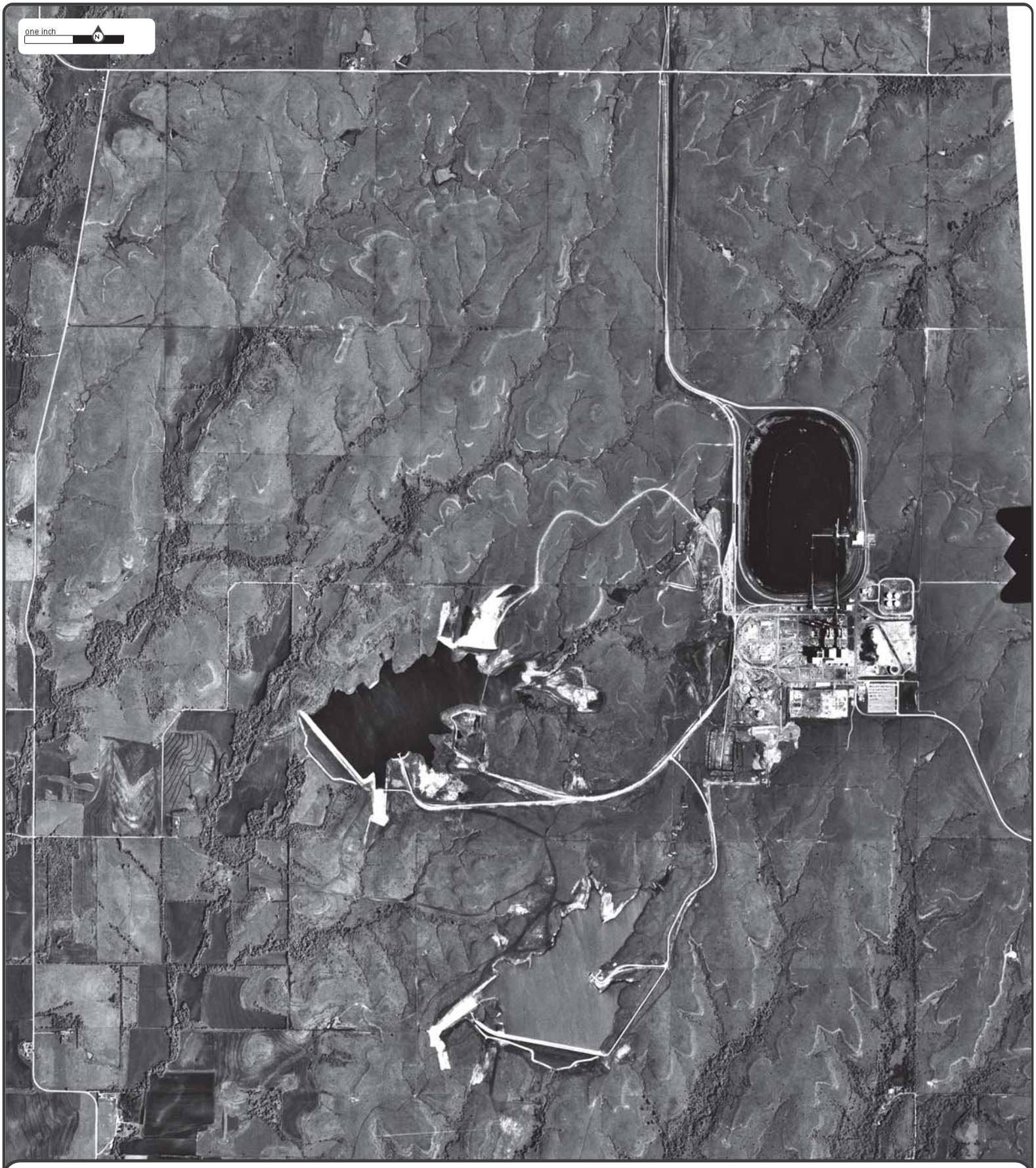
Date: **1991**
Source: **USGS**
Scale: **1" to 2500'**
Comments:

Subject: 25905 Jeffrey Road St. Marys KS
Approx Center: 39.28431 / -96.13949

N

ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204



Date: **1981**
Source: **NHAP**
Scale: **1" to 2500'**
Comments:

Subject: 25905 Jeffrey Road St. Marys KS
Approx Center: 39.28431 / -96.13949

N

ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204

Date: **1977**
Source: **USGS**
Scale: **1" to 2500'**
Comments:

Subject: 25905 Jeffrey Road St. Marys KS
Approx Center: 39.28431 / -96.13949

N

ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204

Date: **1954**
Source: **AMS**
Scale: **1" to 2500'**
Comments:

Subject: 25905 Jeffrey Road St. Marys KS
Approx Center: 39.28431 / -96.13949

N

ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204

Date: **1950**
Source: **AMS**
Scale: **1" to 2500'**
Comments:

Subject: 25905 Jeffrey Road St. Marys KS
Approx Center: 39.28431 / -96.13949

N

ENVIRONMENTAL RISK INFORMATION SERVICES

www.erisinfo.com | 1.866.517.5204

APPENDIX B

Topographic Maps

TOPOGRAPHIC MAP RESEARCH RESULTS

Date: 2018-03-02

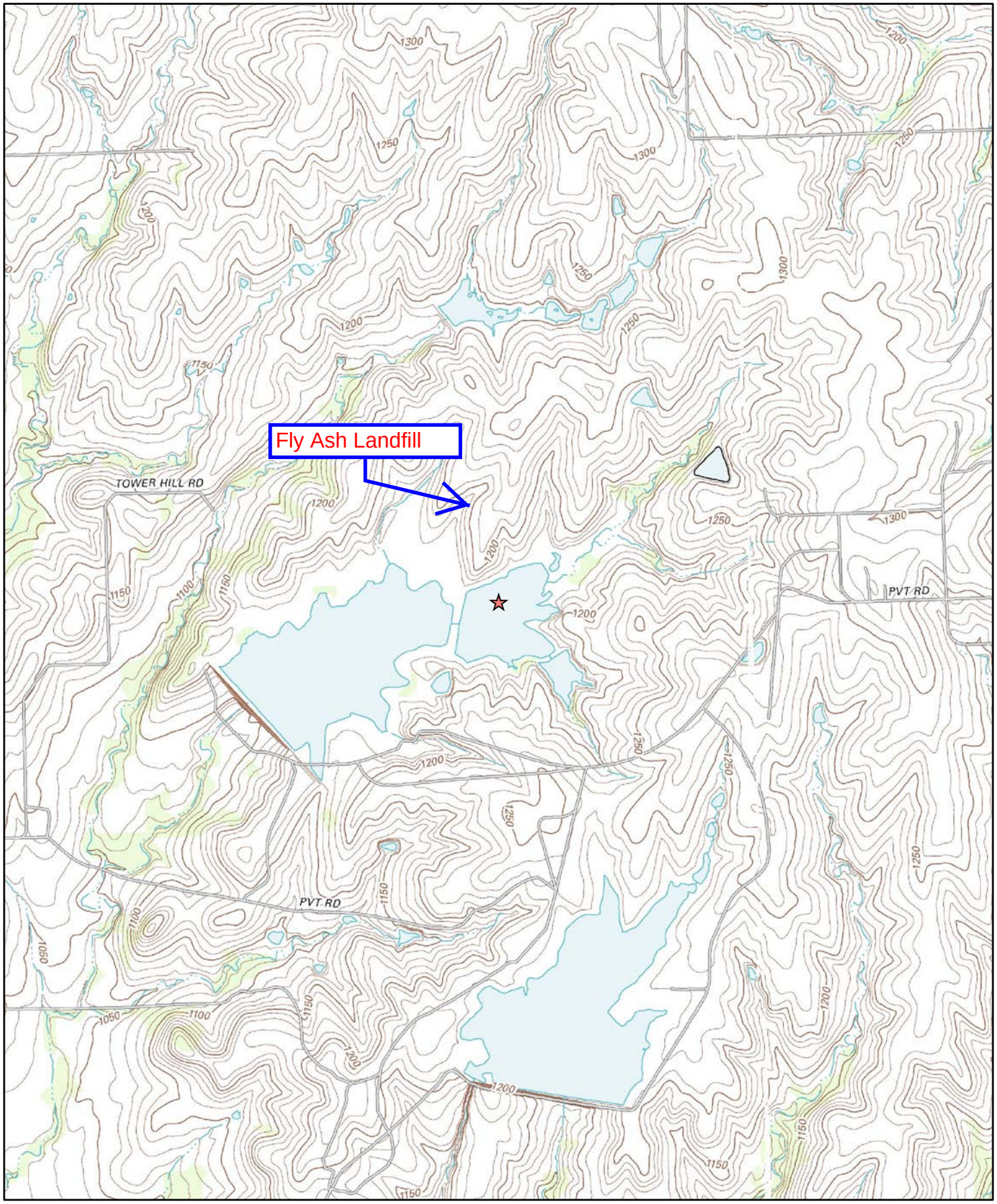
Project Property: 25905 Jeffrey Road, St. Marys, KS

ERIS Order Number: 20180302344

We have searched USGS collections of current topographic maps and historical topographic maps for the project property. Below is a list of maps found for the project property and adjacent area. Maps are from 7.5 and 15 minute topographic map series, if available.

Year	Map Series
2012	7.5
1978	7.5
1964	7.5

Address: 38 Lesmill Road Unit 2, Toronto, ON M3B 2T5
Phone: 1-866-517-5204 Fax: 416-447-7658
info@erisinfo.com www.erisinfo.com



2012

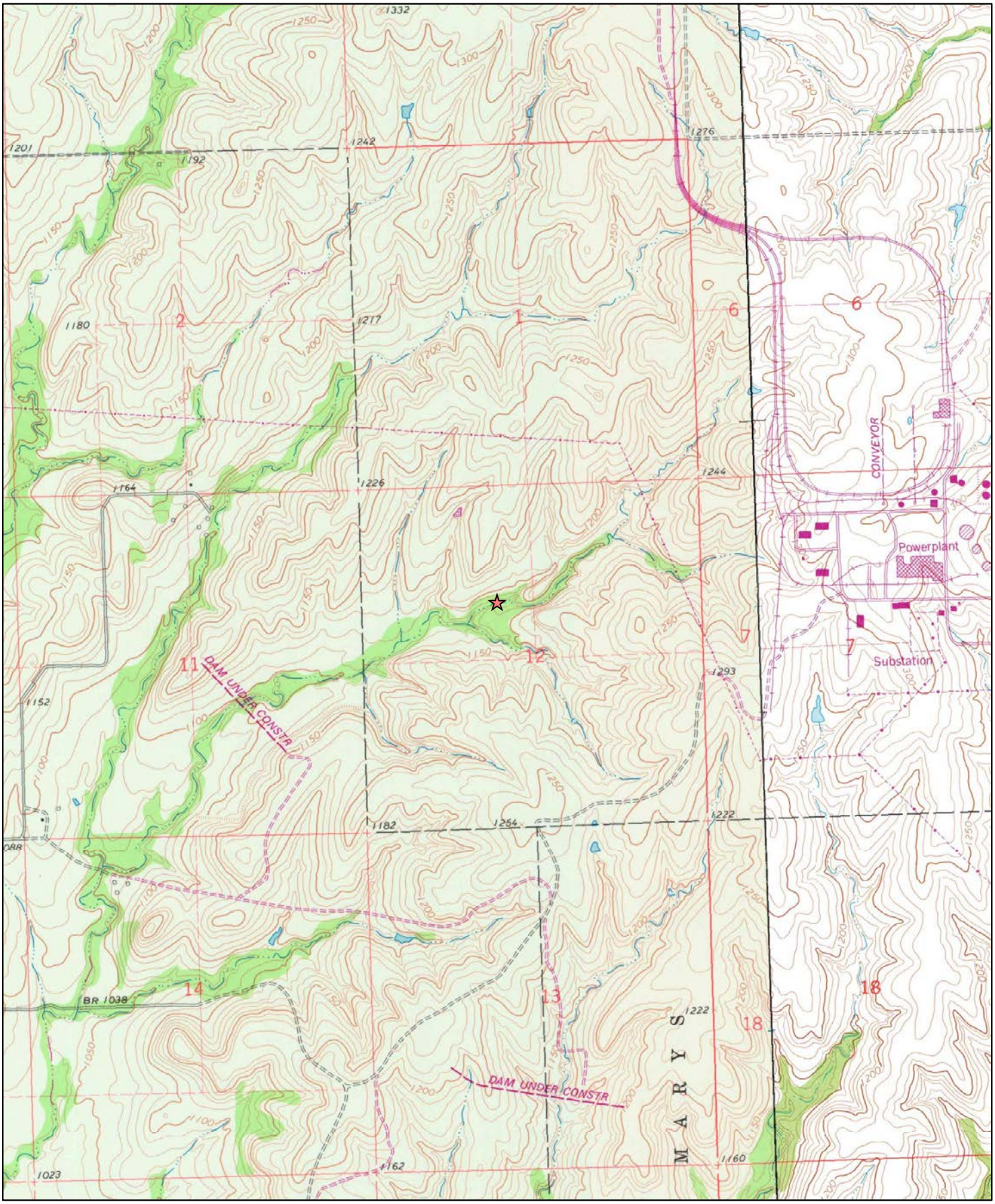
0 0.2 0.4 0.8 Miles

Order No. 20180302344

Quadrangle(s): Laclede,KS

Source: USGS 7.5 Minute Topographic Map

ERIS
ENVIRONMENTAL RISK INFORMATION SERVICE



1978

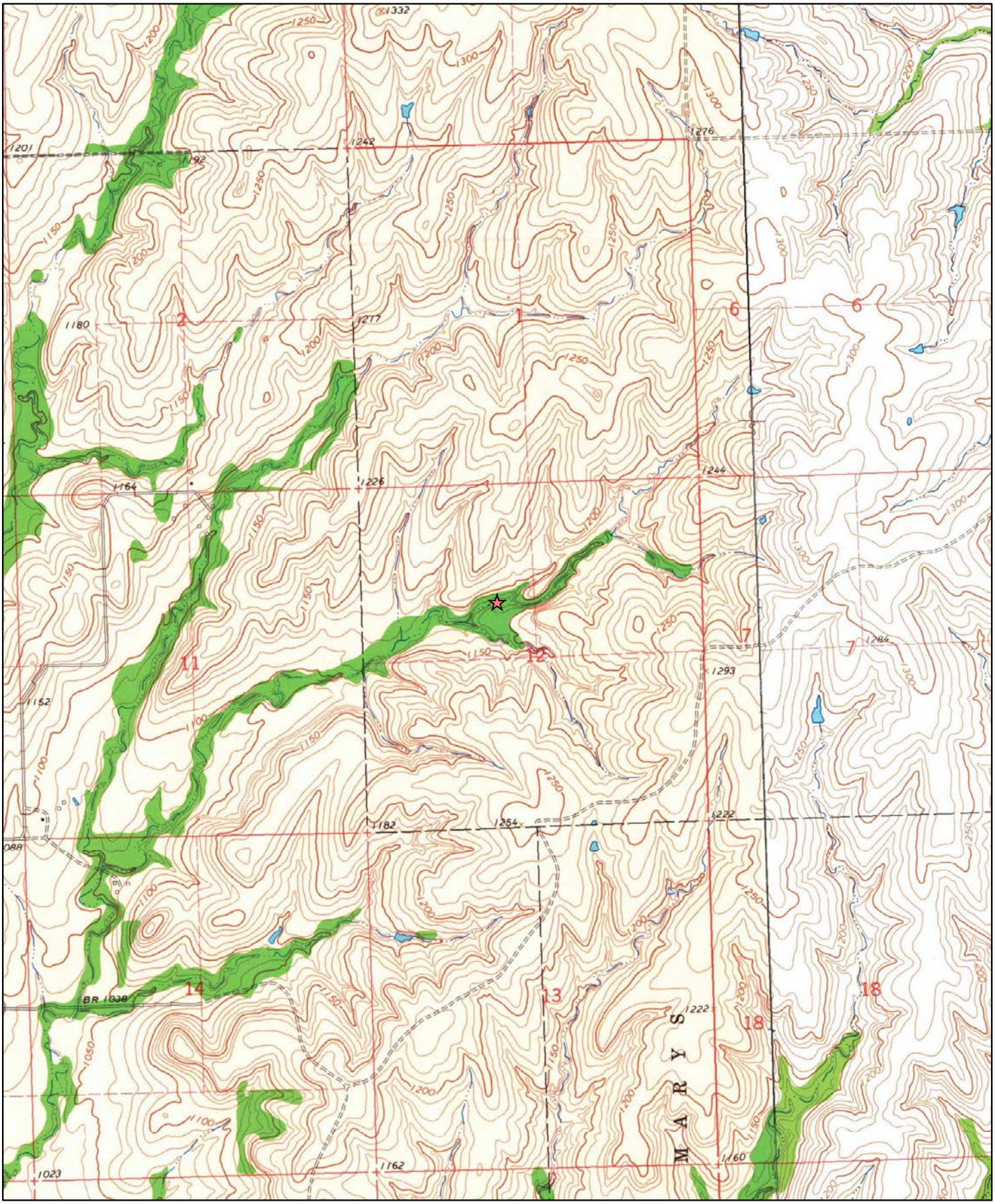
0 0.2 0.4 0.8 Miles

Order No. 20180302344

Quadrangle(s): Laclede,KS

Source: USGS 7.5 Minute Topographic Map

ERIS ENVIRONMENTAL RISK INFORMATION SERVICE



1964

0 0.2 0.4 0.8 Miles

Order No. 20180302344

Quadrangle(s): Laclede,KS

Source: USGS 7.5 Minute Topographic Map

ERIS ENVIRONMENTAL RISK INFORMATION SERVICE

APPENDIX C

Laboratory Reports

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

December 28, 2018

Brandon Griffin
Westar Energy
818 S. Kansas Ave
Topeka, KS 66612

RE: Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Dear Brandon Griffin:
Enclosed are the analytical results for sample(s) received by the laboratory between October 24, 2018 and October 25, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

Revised Report_rev.1 Per the client's request, DI Leachate metals were added to the samples.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Heather M. Wilson

Heather Wilson
heather.wilson@pacelabs.com
1(913)563-1407
Project Manager

Enclosures

cc: HEATH HORYNA, WESTAR ENERGY
Andrew Hare, Westar Energy
Adam Kneeling, Haley & Aldrich, Inc.
JARED MORRISON, WESTAR ENERGY
Melissa Michels, Westar Energy
JD Schlegel, KCP&L & Westar

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

CERTIFICATIONS

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Kansas Certification IDs

9608 Loiret Boulevard, Lenexa, KS 66219
Missouri Certification Number: 10090
Arkansas Drinking Water
WY STR Certification #: 2456.01
Arkansas Certification #: 18-016-0
Arkansas Drinking Water
Illinois Certification #: 004455
Iowa Certification #: 118
Kansas/NELAP Certification #: E-10116 / E10426
Louisiana Certification #: 03055
Nevada Certification #: KS000212018-1
Oklahoma Certification #: 9205/9935
Texas Certification #: T104704407-18-11
Utah Certification #: KS000212018-8
Kansas Field Laboratory Accreditation: # E-92587
Missouri Certification: 10070
Missouri Certification Number: 10090

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE SUMMARY

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Lab ID	Sample ID	Matrix	Date Collected	Date Received
60284822001	**MW-FAA-7 (B-1) 117.5'-120'**	Solid	10/23/18 12:00	10/25/18 15:00
60284822002	**MW-FAA-8 (B-2) 31.5'-34'**	Solid	10/23/18 12:00	10/25/18 15:00
60284822003	**MW-FAA-9 (B-3) 24'-25'**	Solid	10/23/18 12:00	10/25/18 15:00
60284822004	**MW-FAA-10 (B-4) 28'-29.5'**	Solid	10/23/18 12:00	10/25/18 15:00
60284822005	**MW-FAA-11 (B-6) 78.5'-79'**	Solid	10/23/18 12:00	10/25/18 15:00
60284822007	**MW-FAA-7 102'-104'**	Solid	10/23/18 12:00	10/25/18 15:00
60284822009	**MW-FAA-11 61'-61.5**	Solid	10/23/18 12:00	10/25/18 15:00
60284822010	**MW-FAA-7 (B-1) 117.5'-120'**	Water	10/23/18 12:00	10/24/18 15:00
60284822011	**MW-FAA-8 (B-2) 31.5'-34'**	Water	10/23/18 12:00	10/24/18 15:00
60284822012	**MW-FAA-9 (B-3) 24'-25'**	Water	10/23/18 12:00	10/24/18 15:00
60284822013	**MW-FAA-10 (B-4) 28'-29.5'**	Water	10/23/18 12:00	10/24/18 15:00
60284822014	**MW-FAA-11 (B-6) 78.5'-79'**	Water	10/23/18 12:00	10/24/18 15:00
60284822015	**MW-FAA-7 102'-104'**	Water	10/23/18 12:00	10/24/18 15:00
60284822016	**MW-FAA-11 61'-61.5'**	Water	10/23/18 12:00	10/24/18 15:00

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE ANALYTE COUNT

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60284822001	**MW-FAA-7 (B-1) 117.5'-120'**	EPA 6010	EMR	2	PASI-K
		EPA 6010	EMR	2	PASI-K
		EPA 6020	JGP	1	PASI-K
		EPA 6020	JGP	1	PASI-K
		ASTM D2974	DWC	1	PASI-K
60284822002	**MW-FAA-8 (B-2) 31.5'-34'**	EPA 6010	EMR	2	PASI-K
		EPA 6010	EMR	2	PASI-K
		EPA 6020	JGP	1	PASI-K
		EPA 6020	JGP	1	PASI-K
		ASTM D2974	DWC	1	PASI-K
60284822003	**MW-FAA-9 (B-3) 24'-25'**	EPA 6010	EMR	2	PASI-K
		EPA 6010	EMR	2	PASI-K
		EPA 6020	JGP	1	PASI-K
		EPA 6020	JGP	1	PASI-K
		ASTM D2974	DWC	1	PASI-K
60284822004	**MW-FAA-10 (B-4) 28'-29.5'**	EPA 6010	EMR	2	PASI-K
		EPA 6010	EMR	2	PASI-K
		EPA 6020	JGP	1	PASI-K
		EPA 6020	JGP	1	PASI-K
		ASTM D2974	DWC	1	PASI-K
60284822005	**MW-FAA-11 (B-6) 78.5'-79'**	EPA 6010	EMR	2	PASI-K
		EPA 6010	EMR	2	PASI-K
		EPA 6020	JGP	1	PASI-K
		EPA 6020	JGP	1	PASI-K
		ASTM D2974	DWC	1	PASI-K
60284822007	**MW-FAA-7 102'-104'**	EPA 6010	EMR	2	PASI-K
		EPA 6010	EMR	2	PASI-K
		EPA 6020	JGP	1	PASI-K
		EPA 6020	JGP	1	PASI-K
		ASTM D2974	DWC	1	PASI-K
60284822009	**MW-FAA-11 61'-61.5**	EPA 6010	EMR	2	PASI-K
		EPA 6010	EMR	2	PASI-K
		EPA 6020	JGP	1	PASI-K
		EPA 6020	JGP	1	PASI-K
		ASTM D2974	DWC	1	PASI-K
60284822010	**MW-FAA-7 (B-1) 117.5'-120'**	EPA 6020	JGP	1	PASI-K
60284822011	**MW-FAA-8 (B-2) 31.5'-34'**	EPA 6020	JGP	1	PASI-K

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

SAMPLE ANALYTE COUNT

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
60284822012	**MW-FAA-9 (B-3) 24'-25'**	EPA 6020	JGP	1	PASI-K
60284822013	**MW-FAA-10 (B-4) 28'-29.5'**	EPA 6020	JGP	1	PASI-K
60284822014	**MW-FAA-11 (B-6) 78.5'-79'**	EPA 6020	JGP	1	PASI-K
60284822015	**MW-FAA-7 102'-104'**	EPA 6020	JGP	1	PASI-K
60284822016	**MW-FAA-11 61'-61.5'**	EPA 6020	JGP	1	PASI-K

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

PROJECT NARRATIVE

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Method: **EPA 6010**
Description: 6010 MET ICP Red. Interference
Client: WESTAR ENERGY
Date: December 28, 2018

General Information:
7 samples were analyzed for EPA 6010. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 3050 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: 560051

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 60289313002

M1: Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

- MS (Lab ID: 2298530)
  - Calcium

R1: RPD value was outside control limits.

- MSD (Lab ID: 2298531)
  - Boron

Additional Comments:

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

PROJECT NARRATIVE

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Method: **EPA 6010**
Description: 6010 MET ICP, SPLP
Client: WESTAR ENERGY
Date: December 28, 2018

General Information:
7 samples were analyzed for EPA 6010. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

H2: Extraction or preparation conducted outside EPA method holding time.
- MW-FAA-10 (B-4) 28'-29.5' (Lab ID: 60284822004)
- MW-FAA-11 (B-6) 78.5'-79' (Lab ID: 60284822005)
- MW-FAA-11 61'-61.5 (Lab ID: 60284822009)
- MW-FAA-7 (B-1) 117.5'-120' (Lab ID: 60284822001)
- MW-FAA-7 102'-104' (Lab ID: 60284822007)
- MW-FAA-8 (B-2) 31.5'-34' (Lab ID: 60284822002)
- MW-FAA-9 (B-3) 24'-25' (Lab ID: 60284822003)

Sample Preparation:
The samples were prepared in accordance with EPA 3010 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: 560655

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 60289490006

M1: Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
- MS (Lab ID: 2301393)
  - Calcium
- MSD (Lab ID: 2301394)
  - Calcium

Additional Comments:

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

PROJECT NARRATIVE

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Method: **EPA 6020**
Description: 6020 MET ICPMS
Client: WESTAR ENERGY
Date: December 28, 2018

General Information:
14 samples were analyzed for EPA 6020. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:
The samples were prepared in accordance with EPA 3010 with any exceptions noted below.

The samples were prepared in accordance with EPA 3010 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

QC Batch: 561774

B: Analyte was detected in the associated method blank.

- BLANK for HBN 561774 [MPRP/486 (Lab ID: 2306167)
  - Molybdenum

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: 560713

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 60284822001

M1: Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

- MS (Lab ID: 2301591)
  - Molybdenum
- MSD (Lab ID: 2301592)
  - Molybdenum

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

PROJECT NARRATIVE

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Method: **EPA 6020**
Description: 6020 MET ICPMS
Client: WESTAR ENERGY
Date: December 28, 2018

QC Batch: 561774

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 60284822010,60284822016

M1: Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

- MS (Lab ID: 2306171)
  - Molybdenum
- MSD (Lab ID: 2306172)
  - Molybdenum

Additional Comments:

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

PROJECT NARRATIVE

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Method: **EPA 6020**
Description: 6020 MET ICPM, SPLP
Client: WESTAR ENERGY
Date: December 28, 2018

General Information:
7 samples were analyzed for EPA 6020. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

H2: Extraction or preparation conducted outside EPA method holding time.
- MW-FAA-10 (B-4) 28'-29.5' (Lab ID: 60284822004)
- MW-FAA-11 (B-6) 78.5'-79' (Lab ID: 60284822005)
- MW-FAA-11 61'-61.5 (Lab ID: 60284822009)
- MW-FAA-7 (B-1) 117.5'-120' (Lab ID: 60284822001)
- MW-FAA-7 102'-104' (Lab ID: 60284822007)
- MW-FAA-8 (B-2) 31.5'-34' (Lab ID: 60284822002)
- MW-FAA-9 (B-3) 24'-25' (Lab ID: 60284822003)

Sample Preparation:
The samples were prepared in accordance with EPA 3020 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):
All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:
All criteria were within method requirements with any exceptions noted below.

Internal Standards:
All internal standards were within QC limits with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Sample: MW-FAA-7 (B-1) 117.5'-120' **Lab ID: 60284822001** Collected: 10/23/18 12:00 Received: 10/25/18 15:00 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP Red. Interference	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Boron	**49.7**	mg/kg	10.2	1	12/14/18 08:16	12/18/18 13:18	7440-42-8	
Calcium	**7290**	mg/kg	10.2	1	12/14/18 08:16	12/18/18 13:18	7440-70-2	
6010 MET ICP, SPLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010 Leachate Method/Date: EPA 1312; 12/16/18 00:00							
Boron	**0.22**	mg/L	0.10	1	12/17/18 17:30	12/18/18 15:27	7440-42-8	
Calcium	**112**	mg/L	0.10	1	12/17/18 17:30	12/18/18 15:27	7440-70-2	
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010							
Molybdenum	**<3.9**	mg/kg	3.9	1	12/18/18 15:29	12/19/18 15:38	7439-98-7	M1
6020 MET ICPM, SPLP	Analytical Method: EPA 6020 Preparation Method: EPA 3020 Leachate Method/Date: EPA 1312; 12/16/18 00:00							
Molybdenum	**0.0024**	mg/L	0.0010	1	12/18/18 10:47	12/18/18 17:45	7439-98-7	
Percent Moisture	Analytical Method: ASTM D2974							
Percent Moisture	**13.7**	%	0.50	1		12/14/18 12:05		H1

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Sample: MW-FAA-8 (B-2) 31.5'-34' **Lab ID: 60284822002** Collected: 10/23/18 12:00 Received: 10/25/18 15:00 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP Red. Interference	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Boron	**38.8**	mg/kg	8.6	1	12/14/18 08:16	12/18/18 13:20	7440-42-8	
Calcium	**83200**	mg/kg	8.6	1	12/14/18 08:16	12/18/18 13:20	7440-70-2	
6010 MET ICP, SPLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010 Leachate Method/Date: EPA 1312; 12/16/18 00:00							
Boron	**<0.10**	mg/L	0.10	1	12/17/18 17:30	12/18/18 15:30	7440-42-8	
Calcium	**21.0**	mg/L	0.10	1	12/17/18 17:30	12/18/18 15:30	7440-70-2	
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010							
Molybdenum	**8.3**	mg/kg	4.8	1	12/18/18 15:29	12/19/18 15:41	7439-98-7	
6020 MET ICPM, SPLP	Analytical Method: EPA 6020 Preparation Method: EPA 3020 Leachate Method/Date: EPA 1312; 12/16/18 00:00							
Molybdenum	**0.061**	mg/L	0.0010	1	12/18/18 10:47	12/18/18 17:46	7439-98-7	
Percent Moisture	Analytical Method: ASTM D2974							
Percent Moisture	**6.7**	%	0.50	1		12/14/18 12:05		H1

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Sample: MW-FAA-9 (B-3) 24'-25' **Lab ID: 60284822003** Collected: 10/23/18 12:00 Received: 10/25/18 15:00 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP Red. Interference	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Boron	**30.4**	mg/kg	9.2	1	12/14/18 08:16	12/18/18 13:22	7440-42-8	
Calcium	**50600**	mg/kg	9.2	1	12/14/18 08:16	12/18/18 13:22	7440-70-2	
6010 MET ICP, SPLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010 Leachate Method/Date: EPA 1312; 12/16/18 00:00							
Boron	**<0.10**	mg/L	0.10	1	12/17/18 17:30	12/18/18 15:32	7440-42-8	
Calcium	**36.2**	mg/L	0.10	1	12/17/18 17:30	12/18/18 15:32	7440-70-2	
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010							
Molybdenum	**13.6**	mg/kg	4.0	1	12/18/18 15:29	12/19/18 15:42	7439-98-7	
6020 MET ICPM, SPLP	Analytical Method: EPA 6020 Preparation Method: EPA 3020 Leachate Method/Date: EPA 1312; 12/16/18 00:00							
Molybdenum	**0.067**	mg/L	0.0010	1	12/18/18 10:47	12/18/18 17:47	7439-98-7	
Percent Moisture	Analytical Method: ASTM D2974							
Percent Moisture	**10.9**	%	0.50	1		12/14/18 12:05		H1

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Sample: MW-FAA-10 (B-4) 28'-29.5' **Lab ID: 60284822004** Collected: 10/23/18 12:00 Received: 10/25/18 15:00 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP Red. Interference	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Boron	**33.4**	mg/kg	8.4	1	12/14/18 08:16	12/18/18 13:24	7440-42-8	
Calcium	**47800**	mg/kg	8.4	1	12/14/18 08:16	12/18/18 13:24	7440-70-2	
6010 MET ICP, SPLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010 Leachate Method/Date: EPA 1312; 12/16/18 00:00							
Boron	**<0.10**	mg/L	0.10	1	12/17/18 17:30	12/18/18 15:34	7440-42-8	
Calcium	**28.9**	mg/L	0.10	1	12/17/18 17:30	12/18/18 15:34	7440-70-2	
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010							
Molybdenum	**11.0**	mg/kg	5.5	1	12/18/18 15:29	12/19/18 15:43	7439-98-7	
6020 MET ICPM, SPLP	Analytical Method: EPA 6020 Preparation Method: EPA 3020 Leachate Method/Date: EPA 1312; 12/16/18 00:00							
Molybdenum	**0.038**	mg/L	0.0010	1	12/18/18 10:47	12/18/18 17:48	7439-98-7	
Percent Moisture	Analytical Method: ASTM D2974							
Percent Moisture	**11.0**	%	0.50	1		12/14/18 12:05		H1

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Sample: MW-FAA-11 (B-6) 78.5'-79' **Lab ID: 60284822005** Collected: 10/23/18 12:00 Received: 10/25/18 15:00 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP Red. Interference	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Boron	**<82.6**	mg/kg	82.6	10	12/14/18 08:16	12/18/18 14:07	7440-42-8	
Calcium	**119000**	mg/kg	82.6	10	12/14/18 08:16	12/18/18 14:07	7440-70-2	
6010 MET ICP, SPLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010 Leachate Method/Date: EPA 1312; 12/16/18 00:00							
Boron	**<0.10**	mg/L	0.10	1	12/17/18 17:30	12/18/18 15:41	7440-42-8	
Calcium	**16.0**	mg/L	0.10	1	12/17/18 17:30	12/18/18 15:41	7440-70-2	
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010							
Molybdenum	**<3.9**	mg/kg	3.9	1	12/18/18 15:29	12/19/18 15:44	7439-98-7	
6020 MET ICPM, SPLP	Analytical Method: EPA 6020 Preparation Method: EPA 3020 Leachate Method/Date: EPA 1312; 12/16/18 00:00							
Molybdenum	**0.016**	mg/L	0.0010	1	12/18/18 10:47	12/18/18 17:49	7439-98-7	
Percent Moisture	Analytical Method: ASTM D2974							
Percent Moisture	**11.0**	%	0.50	1		12/14/18 12:05		H1

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Sample: MW-FAA-7 102'-104' **Lab ID: 60284822007** Collected: 10/23/18 12:00 Received: 10/25/18 15:00 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP Red. Interference	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Boron	**45.4**	mg/kg	10.6	1	12/14/18 08:16	12/18/18 13:28	7440-42-8	
Calcium	**101000**	mg/kg	10.6	1	12/14/18 08:16	12/18/18 13:28	7440-70-2	
6010 MET ICP, SPLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010 Leachate Method/Date: EPA 1312; 12/16/18 00:00							
Boron	**0.15**	mg/L	0.10	1	12/17/18 17:30	12/18/18 15:43	7440-42-8	
Calcium	**35.2**	mg/L	0.10	1	12/17/18 17:30	12/18/18 15:43	7440-70-2	
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010							
Molybdenum	**9.4**	mg/kg	4.1	1	12/18/18 15:29	12/19/18 15:48	7439-98-7	
6020 MET ICPM, SPLP	Analytical Method: EPA 6020 Preparation Method: EPA 3020 Leachate Method/Date: EPA 1312; 12/16/18 00:00							
Molybdenum	**0.24**	mg/L	0.0010	1	12/18/18 10:47	12/18/18 17:55	7439-98-7	
Percent Moisture	Analytical Method: ASTM D2974							
Percent Moisture	**9.3**	%	0.50	1		12/14/18 12:05		H1

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Sample: MW-FAA-11 61'-61.5 **Lab ID: 60284822009** Collected: 10/23/18 12:00 Received: 10/25/18 15:00 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP Red. Interference	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
Boron	**40.9**	mg/kg	8.5	1	12/14/18 08:16	12/18/18 13:31	7440-42-8	
Calcium	**83600**	mg/kg	8.5	1	12/14/18 08:16	12/18/18 13:31	7440-70-2	
6010 MET ICP, SPLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010 Leachate Method/Date: EPA 1312; 12/16/18 00:00							
Boron	**0.10**	mg/L	0.10	1	12/17/18 17:30	12/18/18 15:45	7440-42-8	
Calcium	**30.1**	mg/L	0.10	1	12/17/18 17:30	12/18/18 15:45	7440-70-2	
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010							
Molybdenum	**8.8**	mg/kg	3.8	1	12/18/18 15:29	12/19/18 15:49	7439-98-7	
6020 MET ICPM, SPLP	Analytical Method: EPA 6020 Preparation Method: EPA 3020 Leachate Method/Date: EPA 1312; 12/16/18 00:00							
Molybdenum	**0.25**	mg/L	0.0010	1	12/18/18 10:47	12/19/18 11:10	7439-98-7	
Percent Moisture	Analytical Method: ASTM D2974							
Percent Moisture	**8.3**	%	0.50	1		12/14/18 12:05		H1

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Sample: MW-FAA-7 (B-1) 117.5'-120' **Lab ID: 60284822010** Collected: 10/23/18 12:00 Received: 10/24/18 15:00 Matrix: Water
Comments: • The analyses completed on this sample are a DI Leachate.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010							
Molybdenum	**3.0**	ug/L	1.0	1	12/26/18 08:16	12/28/18 10:17	7439-98-7	B

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Sample: MW-FAA-8 (B-2) 31.5'-34' **Lab ID: 60284822011** Collected: 10/23/18 12:00 Received: 10/24/18 15:00 Matrix: Water
Comments: • The analyses completed on this sample are a DI Leachate.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010							
Molybdenum	**54.7**	ug/L	1.0	1	12/26/18 08:16	12/28/18 10:23	7439-98-7	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Sample: MW-FAA-9 (B-3) 24'-25' **Lab ID: 60284822012** Collected: 10/23/18 12:00 Received: 10/24/18 15:00 Matrix: Water
Comments: • The analyses completed on this sample are a DI Leachate.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010							
Molybdenum	**58.3**	ug/L	1.0	1	12/26/18 08:16	12/28/18 10:27	7439-98-7	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Sample: MW-FAA-10 (B-4) 28'-29.5' **Lab ID: 60284822013** Collected: 10/23/18 12:00 Received: 10/24/18 15:00 Matrix: Water
Comments: • The analyses completed on this sample are a DI Leachate.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010							
Molybdenum	**30.9**	ug/L	1.0	1	12/26/18 08:16	12/28/18 10:29	7439-98-7	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Sample: MW-FAA-11 (B-6) 78.5'-79' **Lab ID: 60284822014** Collected: 10/23/18 12:00 Received: 10/24/18 15:00 Matrix: Water
Comments: • The analyses completed on this sample are a DI Leachate.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010							
Molybdenum	**11.9**	ug/L	1.0	1	12/26/18 08:16	12/28/18 10:31	7439-98-7	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Sample: MW-FAA-7 102'-104' **Lab ID: 60284822015** Collected: 10/23/18 12:00 Received: 10/24/18 15:00 Matrix: Water
Comments: • The analyses completed on this sample are a DI Leachate.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010							
Molybdenum	**150**	ug/L	1.0	1	12/26/18 08:16	12/28/18 10:33	7439-98-7	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Sample: MW-FAA-11 61'-61.5' **Lab ID: 60284822016** Collected: 10/23/18 12:00 Received: 10/24/18 15:00 Matrix: Water
Comments: • The analyses completed on this sample are a DI Leachate.

Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS	Analytical Method: EPA 6020 Preparation Method: EPA 3010							
Molybdenum	**225**	ug/L	1.0	1	12/26/18 08:16	12/28/18 10:35	7439-98-7	M1

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

QC Batch: 560051 Analysis Method: EPA 6010
QC Batch Method: EPA 3050 Analysis Description: 6010 MET
Associated Lab Samples: 60284822001, 60284822002, 60284822003, 60284822004, 60284822005, 60284822007, 60284822009

METHOD BLANK: 2298528 Matrix: Solid
Associated Lab Samples: 60284822001, 60284822002, 60284822003, 60284822004, 60284822005, 60284822007, 60284822009

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Boron	mg/kg	<10.0	10.0	12/17/18 16:18	
Calcium	mg/kg	<10.0	10.0	12/18/18 13:14	

LABORATORY CONTROL SAMPLE: 2298529

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Boron	mg/kg	100	91.9	92	80-120	
Calcium	mg/kg	1000	971	97	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2298530 2298531

Parameter	Units	60289313002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Boron	mg/kg	ND	77.8	76.8	96.2	78.7	117	96	75-125	20	20	R1
Calcium	mg/kg	11700	778	768	6640	4390	-644	-946	75-125	41	20	M1

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

QC Batch: 560655 Analysis Method: EPA 6010
QC Batch Method: EPA 3010 Analysis Description: 6010 MET SPLP
Associated Lab Samples: 60284822001, 60284822002, 60284822003, 60284822004, 60284822005, 60284822007, 60284822009

METHOD BLANK: 2301391 Matrix: Water
Associated Lab Samples: 60284822001, 60284822002, 60284822003, 60284822004, 60284822005, 60284822007, 60284822009

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Boron	mg/L	<0.10	0.10	12/18/18 15:25	
Calcium	mg/L	0.63	0.10	12/18/18 15:25	

LABORATORY CONTROL SAMPLE: 2301392

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Boron	mg/L	1	0.98	98	80-120	
Calcium	mg/L	10	10.4	104	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2301393 2301394

Parameter	Units	60289490006 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Boron	mg/L	3.7	1	1	4.7	4.7	97	98	75-125	0	20	
Calcium	mg/L	300	10	10	301	295	8	-50	75-125	2	20	M1

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

QC Batch: 560713 Analysis Method: EPA 6020
QC Batch Method: EPA 3010 Analysis Description: 6020 MET
Associated Lab Samples: 60284822001, 60284822002, 60284822003, 60284822004, 60284822005, 60284822007, 60284822009

METHOD BLANK: 2301589 Matrix: Solid
Associated Lab Samples: 60284822001, 60284822002, 60284822003, 60284822004, 60284822005, 60284822007, 60284822009

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Molybdenum	mg/kg	<5.0	5.0	12/19/18 15:36	

LABORATORY CONTROL SAMPLE: 2301590

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Molybdenum	mg/kg	100	97.8	98	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2301591 2301592

Parameter	Units	60284822001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Molybdenum	mg/kg	<3.9	77.3	79.3	52.5	58.8	66	72	75-125	11	20	M1

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

QC Batch: 560745 Analysis Method: EPA 6020
QC Batch Method: EPA 3020 Analysis Description: 6020 MET SPLP
Associated Lab Samples: 60284822001, 60284822002, 60284822003, 60284822004, 60284822005, 60284822007, 60284822009

METHOD BLANK: 2301699 Matrix: Water
Associated Lab Samples: 60284822001, 60284822002, 60284822003, 60284822004, 60284822005, 60284822007, 60284822009

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Molybdenum	mg/L	<0.0010	0.0010	12/18/18 17:43	

LABORATORY CONTROL SAMPLE: 2301700

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Molybdenum	mg/L	0.04	0.039	99	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2301701 2301702

Parameter	Units	60284822005 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Molybdenum	mg/L	0.016	0.04	0.04	0.057	0.056	101	99	75-125	2	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

QC Batch: 561774 Analysis Method: EPA 6020
QC Batch Method: EPA 3010 Analysis Description: 6020 MET
Associated Lab Samples: 60284822010, 60284822011, 60284822012, 60284822013, 60284822014, 60284822015, 60284822016

METHOD BLANK: 2306167 Matrix: Water
Associated Lab Samples: 60284822010, 60284822011, 60284822012, 60284822013, 60284822014, 60284822015, 60284822016

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Molybdenum	ug/L	1.1	1.0	12/28/18 10:15	

LABORATORY CONTROL SAMPLE: 2306168

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Molybdenum	ug/L	40	41.1	103	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2306169 2306170

Parameter	Units	60284822010 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Molybdenum	ug/L	3.0	40	40	43.8	43.7	102	102	75-125	0	20	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2306171 2306172

Parameter	Units	60284822016 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Molybdenum	ug/L	225	40	40	230	231	12	15	75-125	1	20	M1

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

QC Batch: 560153 Analysis Method: ASTM D2974
QC Batch Method: ASTM D2974 Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 60284822001, 60284822002, 60284822003, 60284822004, 60284822005, 60284822007, 60284822009

METHOD BLANK: 2298990 Matrix: Solid
Associated Lab Samples: 60284822001, 60284822002, 60284822003, 60284822004, 60284822005, 60284822007, 60284822009

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Percent Moisture	%	<0.50	0.50	12/14/18 12:05	

SAMPLE DUPLICATE: 2298991

Parameter	Units	60289462009 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	17.0	17.5	3	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALIFIERS

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-K	Pace Analytical Services - Kansas City

ANALYTE QUALIFIERS

B	Analyte was detected in the associated method blank.
H1	Analysis conducted outside the EPA method holding time.
H2	Extraction or preparation conducted outside EPA method holding time.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
R1	RPD value was outside control limits.

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: JEC-FA2 LANDFILL
Pace Project No.: 60284822

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
60284822001	**MW-FAA-7 (B-1) 117.5'-120'**	EPA 3050	560051	EPA 6010	560287
60284822002	**MW-FAA-8 (B-2) 31.5'-34'**	EPA 3050	560051	EPA 6010	560287
60284822003	**MW-FAA-9 (B-3) 24'-25'**	EPA 3050	560051	EPA 6010	560287
60284822004	**MW-FAA-10 (B-4) 28'-29.5'**	EPA 3050	560051	EPA 6010	560287
60284822005	**MW-FAA-11 (B-6) 78.5'-79'**	EPA 3050	560051	EPA 6010	560287
60284822007	**MW-FAA-7 102'-104'**	EPA 3050	560051	EPA 6010	560287
60284822009	**MW-FAA-11 61'-61.5**	EPA 3050	560051	EPA 6010	560287
60284822001	**MW-FAA-7 (B-1) 117.5'-120'**	EPA 3010	560655	EPA 6010	560723
60284822002	**MW-FAA-8 (B-2) 31.5'-34'**	EPA 3010	560655	EPA 6010	560723
60284822003	**MW-FAA-9 (B-3) 24'-25'**	EPA 3010	560655	EPA 6010	560723
60284822004	**MW-FAA-10 (B-4) 28'-29.5'**	EPA 3010	560655	EPA 6010	560723
60284822005	**MW-FAA-11 (B-6) 78.5'-79'**	EPA 3010	560655	EPA 6010	560723
60284822007	**MW-FAA-7 102'-104'**	EPA 3010	560655	EPA 6010	560723
60284822009	**MW-FAA-11 61'-61.5**	EPA 3010	560655	EPA 6010	560723
60284822001	**MW-FAA-7 (B-1) 117.5'-120'**	EPA 3010	560713	EPA 6020	561103
60284822002	**MW-FAA-8 (B-2) 31.5'-34'**	EPA 3010	560713	EPA 6020	561103
60284822003	**MW-FAA-9 (B-3) 24'-25'**	EPA 3010	560713	EPA 6020	561103
60284822004	**MW-FAA-10 (B-4) 28'-29.5'**	EPA 3010	560713	EPA 6020	561103
60284822005	**MW-FAA-11 (B-6) 78.5'-79'**	EPA 3010	560713	EPA 6020	561103
60284822007	**MW-FAA-7 102'-104'**	EPA 3010	560713	EPA 6020	561103
60284822009	**MW-FAA-11 61'-61.5**	EPA 3010	560713	EPA 6020	561103
60284822001	**MW-FAA-7 (B-1) 117.5'-120'**	EPA 3020	560745	EPA 6020	560909
60284822002	**MW-FAA-8 (B-2) 31.5'-34'**	EPA 3020	560745	EPA 6020	560909
60284822003	**MW-FAA-9 (B-3) 24'-25'**	EPA 3020	560745	EPA 6020	560909
60284822004	**MW-FAA-10 (B-4) 28'-29.5'**	EPA 3020	560745	EPA 6020	560909
60284822005	**MW-FAA-11 (B-6) 78.5'-79'**	EPA 3020	560745	EPA 6020	560909
60284822007	**MW-FAA-7 102'-104'**	EPA 3020	560745	EPA 6020	560909
60284822009	**MW-FAA-11 61'-61.5**	EPA 3020	560745	EPA 6020	560909
60284822010	**MW-FAA-7 (B-1) 117.5'-120'**	EPA 3010	561774	EPA 6020	562038
60284822011	**MW-FAA-8 (B-2) 31.5'-34'**	EPA 3010	561774	EPA 6020	562038
60284822012	**MW-FAA-9 (B-3) 24'-25'**	EPA 3010	561774	EPA 6020	562038
60284822013	**MW-FAA-10 (B-4) 28'-29.5'**	EPA 3010	561774	EPA 6020	562038
60284822014	**MW-FAA-11 (B-6) 78.5'-79'**	EPA 3010	561774	EPA 6020	562038
60284822015	**MW-FAA-7 102'-104'**	EPA 3010	561774	EPA 6020	562038
60284822016	**MW-FAA-11 61'-61.5'**	EPA 3010	561774	EPA 6020	562038
60284822001	**MW-FAA-7 (B-1) 117.5'-120'**	ASTM D2974	560153		
60284822002	**MW-FAA-8 (B-2) 31.5'-34'**	ASTM D2974	560153		
60284822003	**MW-FAA-9 (B-3) 24'-25'**	ASTM D2974	560153		
60284822004	**MW-FAA-10 (B-4) 28'-29.5'**	ASTM D2974	560153		
60284822005	**MW-FAA-11 (B-6) 78.5'-79'**	ASTM D2974	560153		
60284822007	**MW-FAA-7 102'-104'**	ASTM D2974	560153		
60284822009	**MW-FAA-11 61'-61.5**	ASTM D2974	560153		

Pace Analytical
www.pacelabs.com

Sample Condition Upon Receipt

WO# : 60284822

60284822

Client Name: Westar Energy

Courier: FedEx ☐ UPS ☐ VIA ☐ Clay ☐ PEX ☐ ECI ☐ Pace ☐ Xroads ☐ Client ☑ Other ☐

Tracking #: _____ Pace Shipping Label Used? Yes ☐ No ☑

Custody Seal on Cooler/Box Present: Yes ☐ No ☑ Seals intact: Yes ☐ No ☑

Packing Material: Bubble Wrap ☐ Bubble Bags ☐ Foam ☐ None ☑ Other ☐

Thermometer Used: T-298 **Type of Ice:** (Wet) Blue None

Cooler Temperature (°C): As-read 1.4 Corr. Factor 0.0 Corrected 1.4

Date and initials of person examining contents: JN 10/25/18

Temperature should be above freezing to 6°C

Chain of Custody present:	☑Yes ☐No ☐N/A	
Chain of Custody relinquished:	☑Yes ☐No ☐N/A	
Samples arrived within holding time:	☑Yes ☐No ☐N/A	
Short Hold Time analyses (<72hr):	☐Yes ☑No ☐N/A	
Rush Turn Around Time requested:	☐Yes ☑No ☐N/A	
Sufficient volume:	☑Yes ☐No ☐N/A	
Correct containers used:	~~☐Yes~~ ☑No ☐N/A	
Pace containers used: JN 10/25	~~☐Yes~~ ☑No ☐N/A	
Containers intact:	☑Yes ☐No ☐N/A	
Unpreserved 5035A / TX1005/1006 soils frozen in 48hrs?	☐Yes ☐No ☑N/A	
Filtered volume received for dissolved tests?	☐Yes ☐No ☑N/A	
Sample labels match COC: Date / time / ID / analyses	☑Yes ☐No ☐N/A	
Samples contain multiple phases? Matrix: SL	☐Yes ☑No ☐N/A	
Containers requiring pH preservation in compliance? (HNO_3, H_2SO_4, HCl<2; NaOH>9 Sulfide, NaOH>10 Cyanide) (Exceptions: VOA, Micro, O&G, KS TPH, OK-DRO)	☐Yes ☐No ☑N/A	List sample IDs, volumes, lot #'s of preservative and the date/time added.
Cyanide water sample checks: Lead acetate strip turns dark? (Record only)	☐Yes ☐No	
Potassium iodide test strip turns blue/purple? (Preserve)	☐Yes ☐No	
Trip Blank present:	☐Yes ☐No ☑N/A	
Headspace in VOA vials (>6mm):	☐Yes ☐No ☑N/A	
Samples from USDA Regulated Area: State: KS	☐Yes ☑No ☐N/A	
Additional labels attached to 5035A / TX1005 vials in the field?	☐Yes ☐No ☑N/A	HMW

Client Notification/ Resolution: Copy COC to Client? Y / N Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: _____ Date: _____

REVIEWED
By hwilson at 10:33 am, 10/26/18

Pace Analytical
www.pacelabs.com

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Page: 1 of

Section A — Required Client Information:

Company:	WESTAR ENERGY
Address:	818 Kansas Ave
	Topeka, KS 66612
Email To:	brandon.l.griffin@westarenergy.com
Phone: (785) 575-8135	Fax:
Requested Due Date/TAT:	7 DAY

Section B — Required Project Information:

Report To:	Brandon Griffin
Copy To:	Adam Kneeling
Purchase Order No.:	10JEC-0000033150
Project Name:	JEC-FAZ Landfill
Project Number:	129778-022

Section C — Invoice Information:

Attention:	Jared Morrison
Company Name:	WESTAR ENERGY
Address:	SEE SECTION A
Pace Quote Reference:	
Pace Project Manager:	Heather Wilson, 913-563-1407
Pace Profile #:	9657, 2

REGULATORY AGENCY

☑ NPDES ☐ GROUND WATER ☐ DRINKING WATER
☐ UST ☐ RCRA ☐ OTHER

Site Location STATE: KS

Section D — Required Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

Z, 0-9 / ,-)
Sample IDs MUST BE UNIQUE

Requested Analysis Filtered (Y/N)

ITEM #	Section D Required Client Information	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED COMPOSITE START DATE	COLLECTED COMPOSITE START TIME	COLLECTED COMPOSITE END/GRAB DATE	COLLECTED COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Y/N	Analysis Test ⇓ Total Boron by 200.7	Total Molybdenum by 200.8	B and Mo SPLP	Residual Chlorine (Y/N)	Pace Project No./ Lab I.D.
1	MW-FAA-7 (B-1) 117.5'-120'	SL	C	10/23	1200				1									X	X	X		60284822 ZPLC 001
2	MW-FAA-8 (B-2) 31.5'-34'	SL	G	"	"	"	"		1									X	X	X		002
3	MW-FAA-9 (B-3) 24'-25'	SL	G	"	"	"	"		1									X	X	X		003
4	MW-FAA-10 (B-4) 28'-29.5'	SL	G	"	"	"	"		1									X	X	X		004
5	MW-FAA-11 (B-6) 78.5'-79'	SL	G	"	"	"	"		1									X	X	X		005
6	MW-FAA-7 76.5'-77'	SL	G	"	"	"	"		1									X	X	X		006
7	MW-FAA-7 102'-104'	SL	G	"	"	"	"		1									X	X	X		007
8	MW-FAA-11 33'-33.5'	SL	G	"	"	"	"		1									X	X	X		008
9	MW-FAA-11 61'-61.5'	SL	G	"	"	"	"		1									X	X	X		009
10																						
11																						
12																						

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS			
Hold remaining sample for possible additional total/SPLP analysis.	Eli Fredrickson HTA	10/25/18	1500	Cindy Pace	10/25/18	1500	1.4	Y	N	Y
Analysis is unknown at present. Hold Samples pending Review										

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER: Eli Fredrickson

SIGNATURE of SAMPLER: [signature] DATE Signed (MM/DD/YY): 10/24/18

Temp In °C | Received on Ice (Y/N) | Custody Sealed Cooler (Y/N) | Samples Intact (Y/N)

APPENDIX D

Well Construction Details

HALEY& ALDRICH

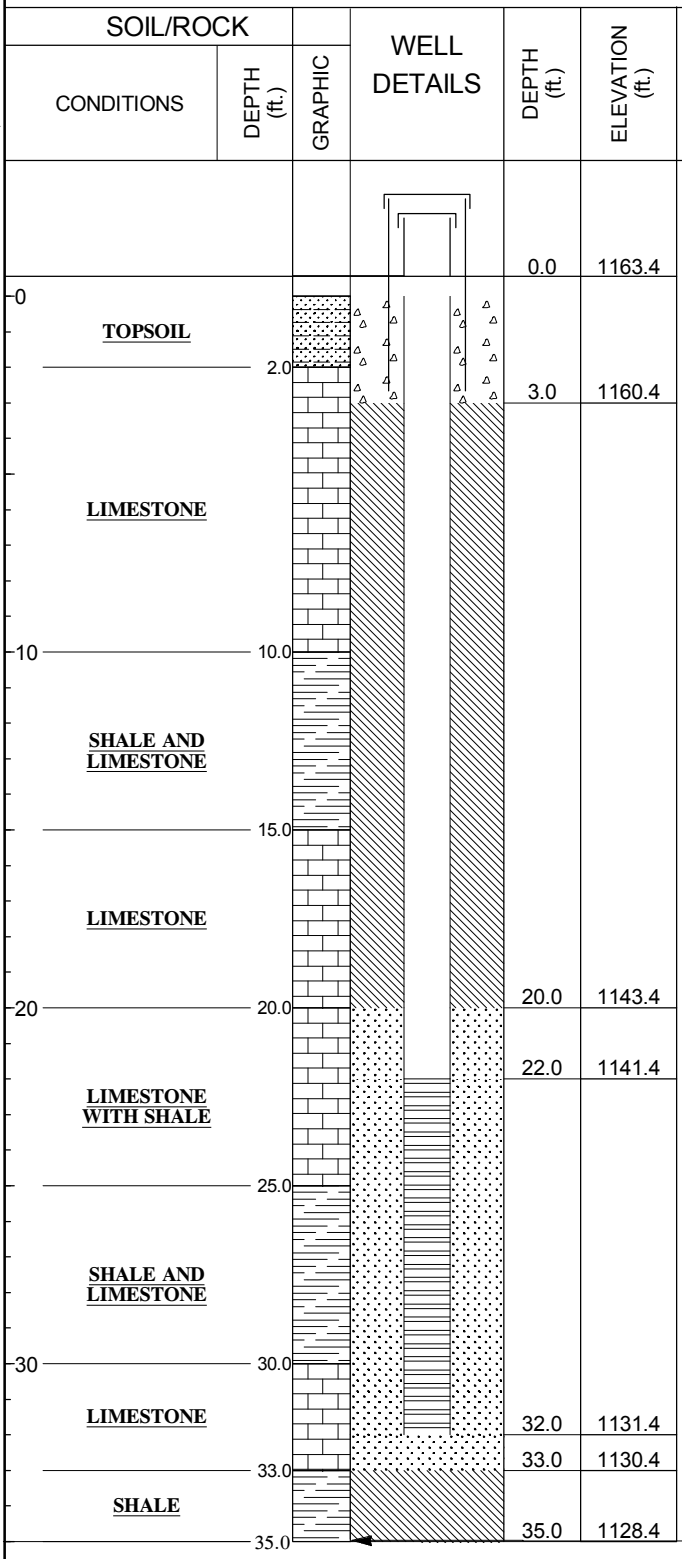
BORING LOGS

Well No. MW-FAA-3

Project	Jeffrey Energy Center Monitoring Well Installation
Location	St. Mary's, Kansas
Client	Westar Energy
Contractor	Associated Drilling, Inc.
Driller	Jeffery

Well Diagram: Riser Pipe; Screen; Filter Sand; Cuttings; Grout; Concrete; Bentonite Seal

File No.	41938-300
Date Installed	21 Mar 2016
H&A Rep.	C. Price
Location	See Plan
Ground El.	1163.4
Datum	NAVD 88



WELL CONSTRUCTION DETAILS

Type of protective cover	Locking Lid
Height of Guard Pipe above ground surface	2.5 ft
Height of top of riser above ground surface	2.0 ft
Type of protective casing	Guard Pipe
Length	5.0 ft
Inside diameter	4.0 in.
Depth of bottom of Guard Pipe	2.5 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	22.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0 ft	3.0 ft
Bentonite	3.0 ft	17.0 ft
Bentonite	33.0 ft	2.0 ft

Diameter of borehole	6.0 in.
Depth to top of well screen	22.0 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	8-12 Silica Sand
Depth to bottom of well screen	32 ft
Bottom of silt trap	NA
Depth of bottom of borehole	35.0 ft

HALEY& ALDRICH

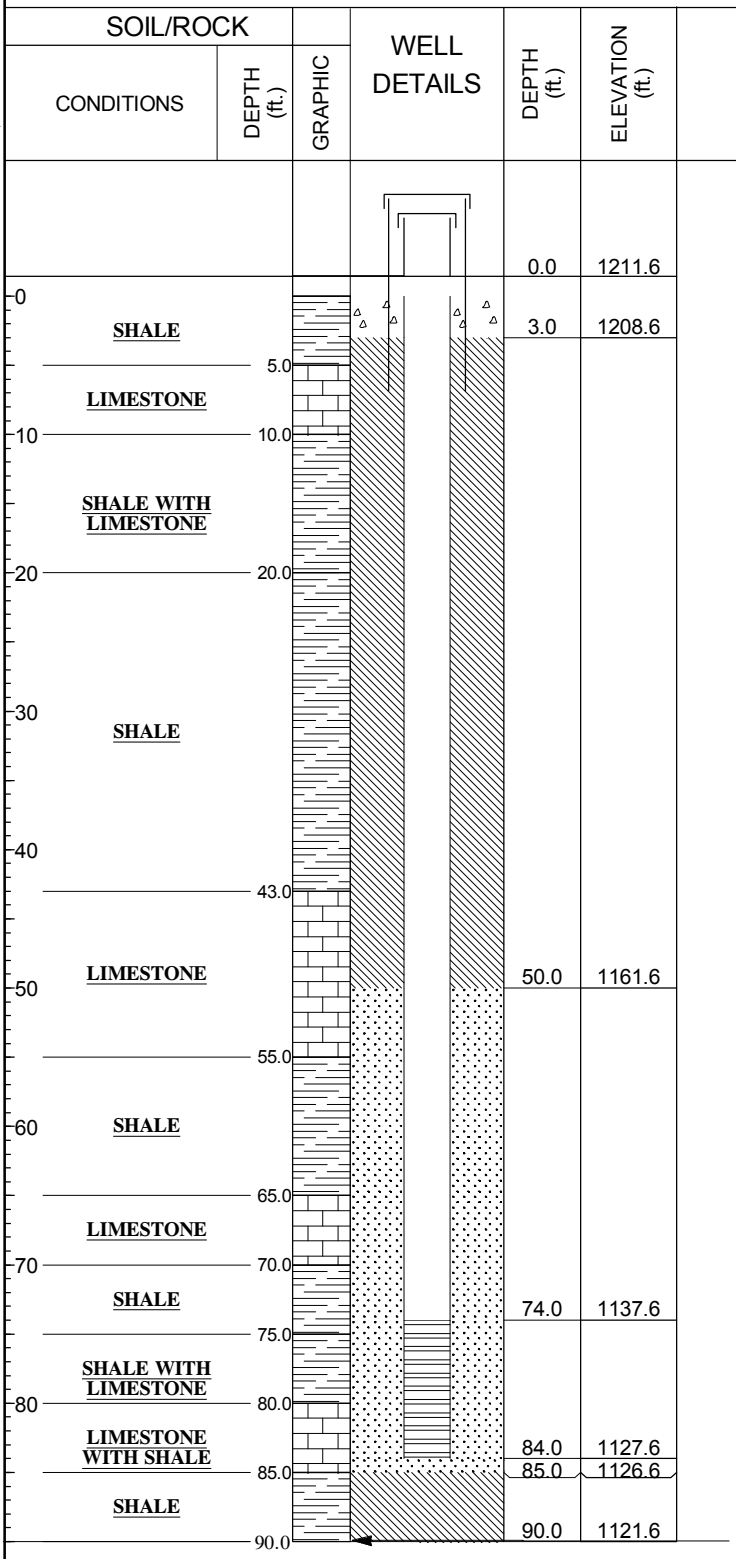
BORING LOGS

Well No. MW-FAA-4

Project	Jeffrey Energy Center Monitoring Well Installation
Location	St. Mary's, Kansas
Client	Westar Energy
Contractor	Associated Drilling, Inc.
Driller	Jeffery

Well Diagram: Riser Pipe; Screen; Filter Sand; Cuttings; Grout; Concrete; Bentonite Seal

File No.	41938-300
Date Installed	21 Mar 2016
H&A Rep.	C. Price
Location	See Plan
Ground El.	1211.6
Datum	NAVD 88



WELL CONSTRUCTION DETAILS

Type of protective cover	Locking Lid
Height of Guard Pipe above ground surface	2.5 ft
Height of top of riser above ground surface	2.0 ft
Type of protective casing	Guard Pipe
Length	5.0 ft
Inside diameter	4.0 in.
Depth of bottom of Guard Pipe	2.5 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	74.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0 ft	3.0 ft
Bentonite	3.0 ft	47.0 ft
Bentonite	85.0 ft	5.0 ft

Diameter of borehole	6.0 in.
Depth to top of well screen	74.0 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	8-12 Silica Sand
Depth to bottom of well screen	84 ft
Bottom of silt trap	NA
Depth of bottom of borehole	90.0 ft

HALEY & ALDRICH

BORING LOGS

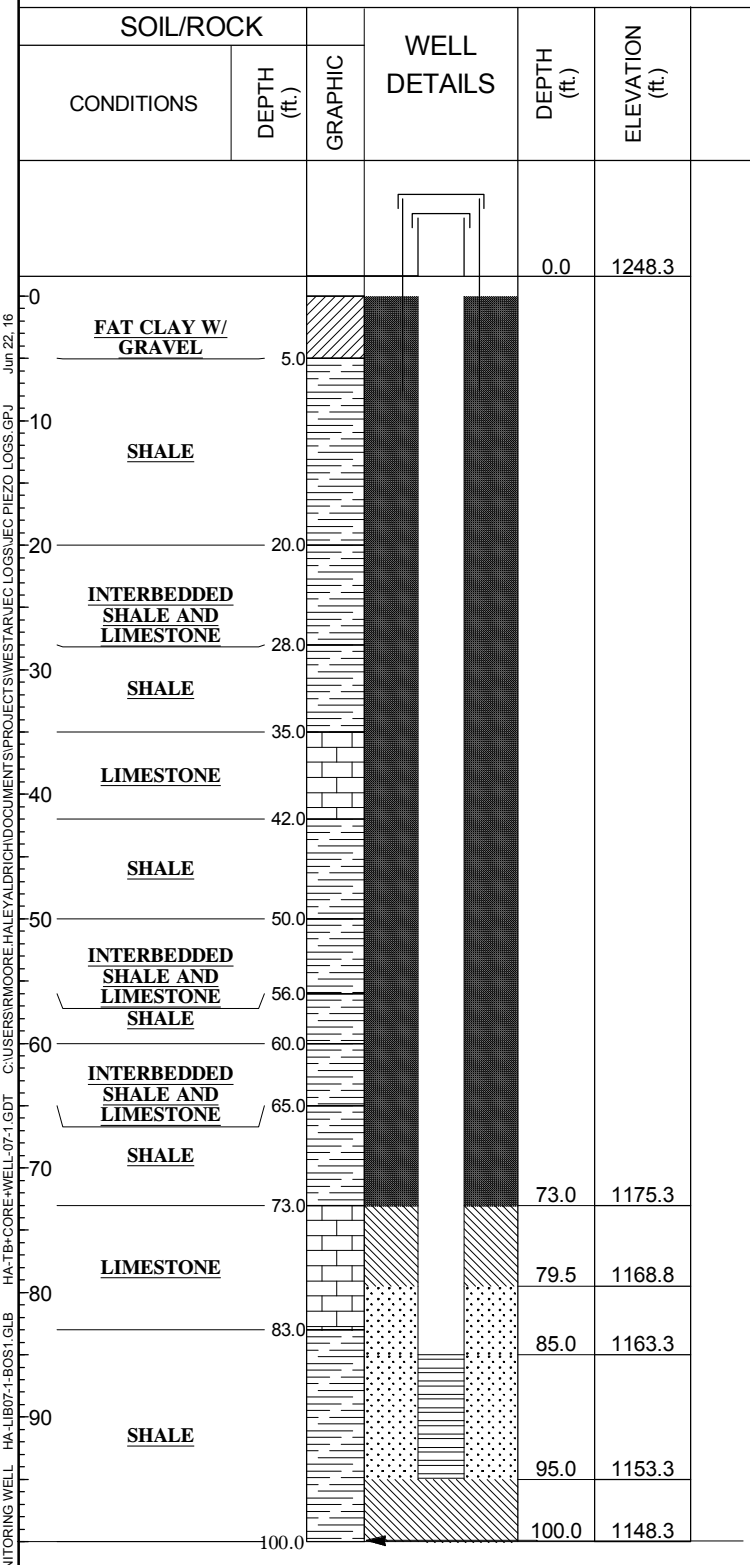
Well No. MW-FAA-5

Project	Jeffrey Energy Center Temporary Piezometer Installation
Location	St. Mary's, Kansas
Client	Westar Energy
Contractor	Associated Drilling, Inc.
Driller	W. Pressley

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No.	41938-003
Date Installed	04 Aug 2015
H&A Rep.	D. Andersen
Location	See Plan
Ground El.	1248.3
Datum	NAVD 88



WELL CONSTRUCTION DETAILS

Type of protective cover	Locking Lid
Height of Guard Pipe above ground surface	2.5 ft
Height of top of riser above ground surface	2.0 ft
Type of protective casing	Guard Pipe
Length	5.0 ft
Inside diameter	4.0 in.
Depth of bottom of Guard Pipe	2.5 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	85.0 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Grout	0.0 ft	73.0 ft
Bentonite	73.0 ft	6.5 ft
Bentonite	95.0 ft	5.0 ft

Diameter of borehole	4.5 in.
Depth to top of well screen	85.0 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.020 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	8-12 Silica Sand
Depth to bottom of well screen	95 ft
Bottom of silt trap	NA
Depth of bottom of borehole	100.0 ft

HALEY & ALDRICH

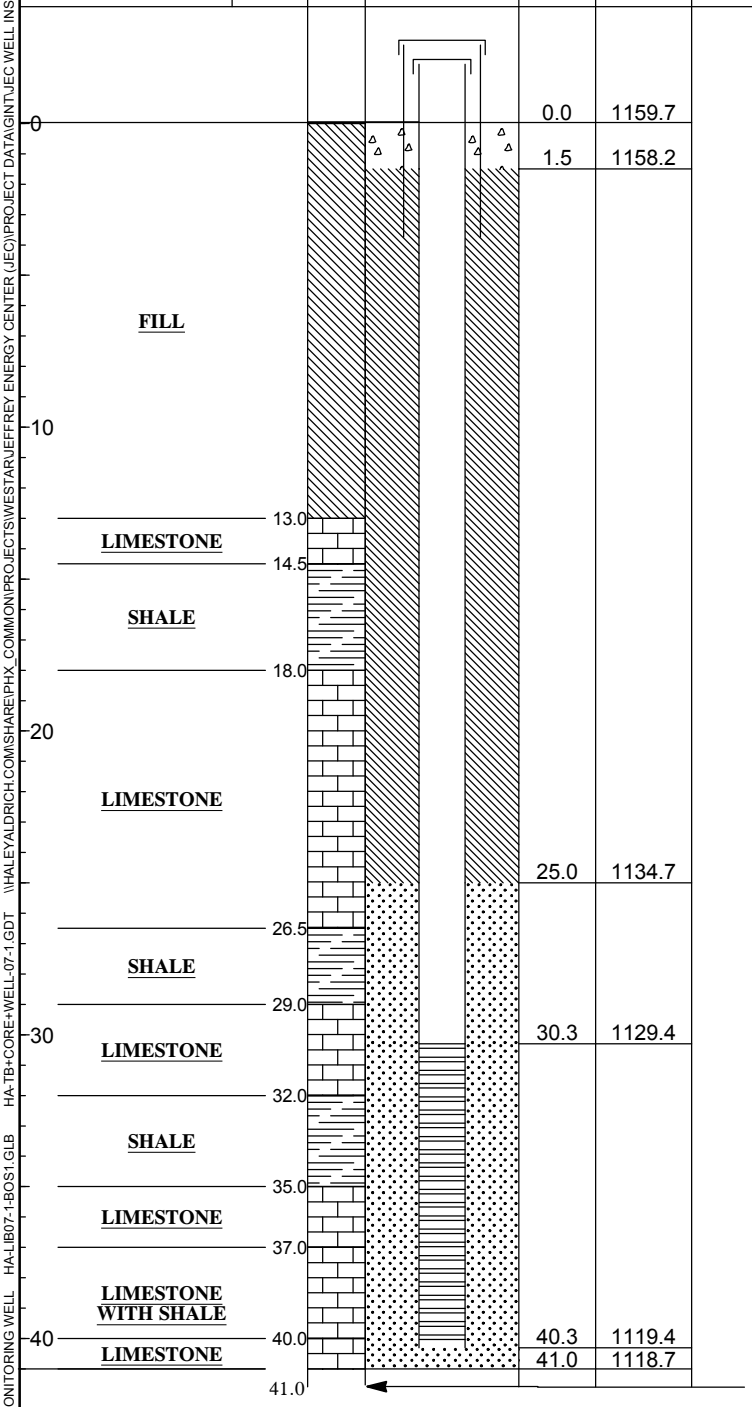
BORING LOGS

Well No. MW-FAA-6

Project	Jeffrey Energy Center Monitoring Well Installation
Location	St. Mary's, Kansas
Client	Westar Energy
Contractor	Terracon
Driller	Jeffery

Well Diagram: Riser Pipe, Screen, Filter Sand, Cuttings, Grout, Concrete, Bentonite Seal

File No.	41938-110
Date Installed	16 Jun 2017
H&A Rep.	K. Ford
Location	See Plan
Ground El.	1159.7
Datum	NAVD 88



WELL CONSTRUCTION DETAILS

Type of protective cover	Locking Lid
Height of Guard Pipe above ground surface	3.0 ft
Height of top of riser above ground surface	2.5 ft
Type of protective casing	Guard Pipe
Length	5.0 ft
Inside diameter	4.0 in.
Depth of bottom of Guard Pipe	2.0 ft
Type of riser pipe	Schedule 40 PVC
Inside diameter of riser pipe	2.0 in.
Depth of bottom of riser pipe	30.3 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0 ft	1.5 ft
Bentonite	1.5 ft	22.5 ft
Bentonite	24.0 ft	1.0 ft

Diameter of borehole	6.0 in.
Depth to top of well screen	30.3 ft
Type of screen	Machine slotted Sch 40 PVC
Screen gauge or size of openings	0.010 in.
Diameter of screen	2.0 in.
Type of Backfill around Screen	8-12 Silica Sand
Depth to bottom of well screen	40.3 ft
Bottom of silt trap	NA
Depth of bottom of borehole	41.0 ft