Geosyntec consultants

engineers | scientists | innovators

AMERICAN ELECTRIC POWER

BOUNDLESS ENERGY™

ALTERNATIVE SOURCE DEMONSTRATION REPORT – 1ST SEMIANNUAL EVENT 2023

TEXAS STATE CCR RULE

H.W. Pirkey Power Plant
Flue Gas Desulfurization Stackout Area
Hallsville, Texas

Prepared for

American Electric Power
1 Riverside Plaza
Columbus, Ohio 43215-2372

Prepared by

Geosyntec Consultants, Inc.
500 West Wilson Bridge Road, Suite 250
Worthington, Ohio 43085

Project CHA8495B

January 2024

TABLE OF CONTENTS

1. INTRODUCTION AND SUMMARY 1
1.1 CCR Rule Requirements 1
1.2 Demonstration of Alternative Sources 2

2. SUMMARY OF SITE CONDITIONS 3
2.1 FGD Stackout Area Design, Construction, and Closure 3
2.2 Regional Geology / Site Hydrogeology 3
2.3 Groundwater Monitoring System and Flow Conditions 3

3. ALTERNATIVE SOURCE DEMONSTRATION 4
3.1 Proposed Alternative Source 4
3.1.1 Beryllium 4
3.1.2 Cobalt 5
3.1.3 Mercury 6
3.1.4 Conceptual Site Model 7
3.2 Sampling Requirements 7

4. CONCLUSIONS AND RECOMMENDATIONS 8

5. REFERENCES 9

LIST OF TABLES

Table 1: X-Ray Diffraction Results
Table 2: Summary of Key Analytical Data
Table 3: Solid Phase Mercury Data

LIST OF FIGURES

Figure 1: Potentiometric Contours – Uppermost Aquifer June 2023
Figure 2: Beryllium v. Groundwater Elevation
Figure 3a: AD-7 Beryllium v. Calcium and Lithium
Figure 3b: AD-22 Beryllium v. Calcium and Lithium
Figure 4a: AD-7 Seasonal Water Table Geology
Figure 4b: AD-22 Seasonal Water Table Geology
Figure 5: AD-22 Cobalt v. Groundwater Elevation
Figure 6: AD-22 Cobalt v. Calcium and Lithium
Figure 7: Cobalt and Calcium Concentration Distribution
Figure 8: Calcium Time Series Graph

Figure 9: AD-22 Eh-pH Diagram
Figure 10: AD-33 Boron and Sulfate Time Series
Figure 11: Mercury Time Series Graph

LIST OF ATTACHMENTS

Attachment A: Geologic Cross Sections
Attachment B: SP-B2 Boring Log
Attachment C: AD-7 Boring Log
Attachment D: SP-B4 Boring Log
Attachment E: AD-22 Boring Log and Well Installation Diagram
Attachment F: FGD Sludge Materials Analytical Report
Attachment G: AD-33 Soil Samples Analytical Report
Attachment H: AD-33 Boring Log and Well Installation Diagram
Attachment I: Certification by a Qualified Professional Engineer

LIST OF ACRONYMS

Å	angstrom
AEP	American Electric Power
amsl	above mean sea level
ASD	alternative source demonstration
bgs	below ground surface
CCR	coal combustion residuals
EPRI	Electric Power Research Institute
FGD	flue gas desulfurization
GWPS	groundwater protection standard
LCL	lower confidence limit
MCL	maximum contaminant level
mg/L	milligrams per liter
SPLP	Synthetic Precipitation Leaching Procedure
SSL	statistically significant level
SU	standard unit
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
µg/L	micrograms per liter
USEPA	United States Environmental Protection Agency
XRD	X-ray diffraction

1. INTRODUCTION AND SUMMARY

This alternative source demonstration (ASD) report has been prepared to address statistically significant levels (SSLs) for beryllium, cobalt, and mercury in the groundwater monitoring network at the H.W. Pirkey Plant Flue Gas Desulfurization (FGD) Stackout Area in Hallsville, Texas, following the first semiannual assessment monitoring event of 2023. The H.W. Pirkey Plant has four coal combustion residuals (CCR) storage units regulated by the Texas Commission on Environmental Quality (TCEQ) under Registration No. CCR104, including the FGD Stackout Area (**Figure 1**).

In June 2023, a semiannual assessment monitoring event was conducted at the FGD Stackout Area in accordance with Title 30, §352.951(a) of the Texas Administrative Code (TAC, 2020). The monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. Confidence intervals were recalculated for Appendix IV parameters at the compliance wells to assess whether these parameters were present at SSLs above the groundwater protection standards (GWPSs). Seasonal patterns were observed for cadmium, cobalt, and lithium at AD-22 (Geosyntec 2023a). To correctly account for seasonality, confidence intervals for these wells and constituents were constructed using deseasonalized values. An SSL was attributed to a parameter if its lower confidence limit (LCL) exceeded the GWPS (i.e., if the entire confidence interval exceeded the GWPS). The following SSLs were identified at the Pirkey FGD Stackout Area (Geosyntec 2023a):

- The LCL for beryllium exceeded the GWPS of 0.00400 milligrams per liter (mg/L) at AD-7 (0.00406 mg/L) and AD-22 (0.00502 mg/L).
- The deseasonalized LCL for cobalt exceeded the GWPS of 0.0560 mg/L at AD-22 (0.0737 mg/L).
- The LCL for mercury exceeded the GWPS of 0.00200 mg/L at AD-33 (0.00252 mg/L).

No other SSLs were identified.

1.1 CCR Rule Requirements

TCEQ regulations regarding assessment monitoring programs for CCR landfills and surface impoundments provide owners and operators with the option to make an ASD when an SSL is identified:

> In making a demonstration under this subsection, the owner or operator must, within 90 days of detecting a statistically significant level above the groundwater protection standard of any constituent listed in Appendix IV adopted by reference in §352.1431 of this title, submit a report prepared and certified in accordance with §352.4 of this title (relating to Engineering and Geoscientific Information) to the executive director, and any local pollution agency with jurisdiction that has requested to be notified, demonstrating that a source other than a CCR unit caused the exceedance or that the exceedance resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. (30 TAC §352.951(e))

Pursuant to 30 TAC §352.951(e), Geosyntec Consultants, Inc. (Geosyntec) has prepared this ASD report to document that the SSLs identified for beryllium at AD-7 and AD-22, cobalt at AD-22 and mercury at AD-33 are from a source other than the FGD Stackout Area.

1.2 Demonstration of Alternative Sources

An evaluation was completed to assess possible alternative sources to which each identified SSL could be attributed. Alternative sources were categorized into the following five types, based on methodology provided by the Electric Power Research Institute (EPRI 2017):

- ASD Type I: Sampling Causes
- ASD Type II: Laboratory Causes
- ASD Type III: Statistical Evaluation Causes
- ASD Type IV: Natural Variation
- ASD Type V: Alternative Sources

A demonstration was conducted to show that the SSLs identified for beryllium, cobalt, and mercury were based on a Type IV cause and not by a release from the Pirkey FGD Stackout Area.

2. SUMMARY OF SITE CONDITIONS

The FGD Stackout Area design, construction, and closure, regional geology and site hydrogeology, and groundwater monitoring system and flow conditions are described below.

2.1 FGD Stackout Area Design, Construction, and Closure

The Pirkey FGD Stackout Area is an approximately 7-acre former FGD storage area located due west of the Pirkey Plant (**Figure 1**). It was designed for temporary stockpiling of stabilized FGD material placed on the native clay soil in the unit until it could be hauled to the on-site landfill for disposal (Arcadis 2016). Prior to closure, the nature ground surface elevation in the Stackout Area ranged from approximately 360 to 365 feet above mean sea level, and based on lithological borings advanced in the vicinity, the Stackout Area was underlain by approximately 20 feet of clay (Arcadis 2016).

A Closure Plan for the Stackout Area was developed in October 2016 and revised in May 2023 (American Electric Power [AEP] 2023). On September 1, 2023 AEP removed the final volume of CCR from the unit for the purpose of beneficial reuse and commenced closure of the unit in accordance with the requirements of 40 CFR §257.102(c) (which were adopted by the State of Texas under 30 TAC §352.1221) and the certified Closure Plan (AEP 2023). The removal of the remaining CCR material and an additional 12 inches of underlying soil was completed on September 18, 2023, and the removal was certified by Akron Consulting (2023).

2.2 Regional Geology / Site Hydrogeology

The Stackout Area is positioned on an outcrop of the Eocene Recklaw Formation, which consists predominantly of clay and fine-grained sand (Arcadis 2016). The Recklaw Formation is underlain by the Carrizo Sand, which crops out in the topographically lower southern portion of the plant. The Carrizo Sand consists of fine- to medium-grained sand interbedded with silt and clay.

The very-fine- to fine-grained clayey and silty sand located about 10 to 20 feet below the Stackout Area, with an average thickness of approximately 20 feet, is considered to be the uppermost aquifer below this area (Arcadis, 2016).

2.3 Groundwater Monitoring System and Flow Conditions

The Stackout Area monitoring well network monitors groundwater within the uppermost aquifer, Geologic cross sections B-B' and E-E' from Arcadis (2016) show the subsurface structure of the uppermost aquifer (indicated on the figures as clayey silty sand, brown to gray in color) underlying the Stackout Area. These figures and a cross section location map are provided in **Attachment A**. The geologic cross sections demonstrate lateral continuity of the uppermost aquifer at and around the Stackout Area.

Groundwater flow direction at and near the Stackout Area is west-northwesterly (**Figure 1**). Groundwater flow velocities in the uppermost aquifer in the vicinity of the Stackout Area have been reported as approximately 5 to 35 feet per year. The Stackout Area monitoring well network consists of upgradient monitoring wells AD-12 and AD-13 and downgradient compliance wells AD-7, AD-22, and AD-33, all of which are screened within the uppermost aquifer. AD-7 was abandoned following the June 2023 sampling event during Stackout Area closure activities.

3. ALTERNATIVE SOURCE DEMONSTRATION

The ASD evaluation method and proposed alternative source of beryllium, cobalt, and mercury, and future groundwater sampling requirements are described below.

3.1 Proposed Alternative Source

An initial review of site geochemistry, site historical data, and laboratory quality assurance and quality control data did not identify alternative sources for beryllium, cobalt, and mercury due to Type I (sampling), Type II (laboratory), Type III (statistical evaluation), or Type V (anthropogenic) issues. Groundwater sampling, laboratory analysis, and statistical evaluations were generally completed in accordance with 30 TAC §352.931 and the draft TCEQ guidance for groundwater monitoring (TCEQ 2020). As described below, the SSLs for beryllium and cobalt have been attributed to natural variation associated with seasonal effects, which is a Type IV (natural variation) issue. The SSL for mercury has also been attributed to natural variation associated with the lithology of the uppermost aquifer.

3.1.1 Beryllium

SSLs were identified for beryllium at AD-7 and AD-22 (Geosyntec 2023a). Previous ASDs for the FGD Stackout Area showed that beryllium concentrations at AD-7 and AD-22 appear to correlate with groundwater elevations (Geosyntec 2019, Geosyntec 2020a, Geosyntec 2020b, Geosyntec 2021a, Geosyntec 2021d, Geosyntec 2022b, Geosyntec 2023b, Geosyntec 2023c). This relationship generally still holds true (**Figure 2**). Beryllium concentrations at AD-7 and AD-22 are generally correlated with seasonal changes in other relatively mobile cationic constituents, including calcium and lithium (**Figures 3a and 3b**). The correlation between beryllium and both monovalent (lithium) and divalent (calcium) cations suggests that the variability in observed beryllium concentrations is related to cation exchange behavior with clay minerals present in the native soil.

In March of 2020, the geology near AD-7 was relogged at soil boring SP-B2. Silty clay was identified from approximately 2.5-6.9 feet below ground surface (bgs) before transitioning to clay until 18.8 ft bgs (**Figure 4a**). It was also noted that the depth to water fluctuated between approximately 9 and 15 ft bgs. The boring log for SP-B2 is provided in **Attachment B**, and the original boring log and well construction diagram is provided in **Attachment C**. Soil boring SP-B4, which was advanced in March 2020 to re-log AD-22, found that clay materials were present in the seasonally saturated zones above the permanent water table (**Figure 4b**). The boring log for SP-B4 is provided in **Attachment D,** and the original boring log and well construction diagram is provided in **Attachment E**. At AD-22, the depth to water fluctuated between approximately 3 and 12 ft bgs. Clay was identified from approximately 1.5 ft bgs to 13.3 ft bgs, where it transitioned to a clayey silt (**Figure 4b**). Analysis by X-ray diffraction (XRD) confirmed the presence of clay minerals within the seasonal water table and sand within the screened intervals for both AD-7 and AD-22, as summarized in **Table 1**. The clay fraction of the uppermost samples collected from within the seasonal water table was further analyzed to identify the type of clays present. Smectite-type clays, which are 2:1-layer high-activity clays with characteristically high cation exchange capacity (compared to low-activity 1:1 clay minerals), make up the majority of the clay minerals present at those intervals.

Sorption and desorption of beryllium from smectite-type clays is well documented (You et al. 1989, Boschi and Willenbring 2016a). Desorption was found to be affected by pH, with 75% of beryllium desorbing from a smectite-type clay as pH decreased from 6.0 standard units (SU) to 3.0 SU (Boschi and Willenbring 2016b). The pH values recorded at AD-7 and AD-22 for samples collected under the Texas CCR Rule ranged from 4.3 to 5.1 and 3.9 to 5.1 SU, respectively. This suggests that conditions are favorable for beryllium desorption from smectite-type clays. The presence of these exchangeable clays provides further evidence that the exceedances of beryllium at AD-7 and AD-22 can be attributed to the effects on groundwater quality of seasonal groundwater elevation changes and the resulting cation exchange between groundwater and the exchangeable clay within the seasonal water table.

3.1.2 Cobalt

An SSL was identified for cobalt at AD-22 using deseasonalized statistics (Geosyntec 2023a). According to the United States Environmental Protection Agency (USEPA) document Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Unified Guidance (USEPA 2009a), "seasonal correction should be done both to minimize the chance of mistaking a seasonal effect for evidence of contaminated groundwater, and also to build more powerful background to compliance point tests. Problems can arise, for instance, from measurement variations associated with changing recharge rates during different seasons" (USEPA 2009b).

As shown in previous ASDs (Geosyntec 2020a, Geosyntec 2020b, Geosyntec 2021a, Geosyntec 2021b, Geosyntec 2022, Geosyntec 2023b, Geosyntec, 2023c), the cobalt groundwater concentrations at AD-22 also appear to correlate with seasonal changes in groundwater elevation (**Figure 5**). In addition, the cobalt concentrations are well correlated with changes in other cations, including calcium and lithium (**Figure 6**), which suggests that natural variability associated with groundwater-mineral interactions within the seasonally saturated zone is governing dissolved cobalt concentrations.

A sample of the solid FGD sludge material accumulated on the FGD Stackout Area was collected in July 2019 and submitted for laboratory analyses. The solid-phase sample was leached using both Synthetic Precipitation Leaching Procedure (SPLP) analysis (SW-846 Test Method 1312 [USEPA 1994]) and Seven-Day Distilled Water Leachate Test Procedure (7-day leaching procedure) analysis (Appendix 4 of 30 TAC Chapter 335, Subchapter R [TAC 2016]) to evaluate the material as a potential source of cobalt. No changes to material handling or plant operations occurred prior to closure that would have altered the anticipated chemical composition since this sample was collected. Calcium-cobalt ratios for the leached sludge material and site groundwater are displayed on **Figure 7**. The concentration ratio between calcium and cobalt is consistently on the order of 100:1 at both upgradient and downgradient locations (**Figure 7**). Calcium concentrations in groundwater are generally consistent between AD-22 and upgradient well AD-13 (**Figure 8**); however, leached calcium concentrations from the FGD sludge material are approximately two to three orders of magnitude greater than concentrations in site groundwater. The difference between the ratio of calcium to cobalt in the leached FGD sludge material (about 45,000:1) compared to the ratio for groundwater suggests that dissolved calcium concentrations at AD-22 would be significantly higher if the groundwater at this location were affected by leachate.

Siderite and pyrite, both reduced iron-bearing minerals, were identified below the seasonal water table (within the saturated zone) at AD-22 (**Table 1**). Cobalt is known to undergo isomorphic substitution for iron in both siderite and pyrite (Gross 1965, Hitzman et al. 2017, Krupka and Serne

2002). This is due to the similarity of their ionic radii (approximately 1.56 angstrom [Å] for iron and 1.52 Å for cobalt [Clementi and Raimondi 1963]). The proposed substitution of cobalt for iron in the crystal lattice of pyrite has been documented in other ASDs prepared for the Pirkey Plant's East Bottom Ash Pond (Geosyntec 2023d) and West Bottom Ash Pond (Geosyntec 2023e).

Goethite (an iron hydroxide) was identified within the seasonally saturated zone and the screened interval at AD-22 (**Table 1**). The weathering of siderite and pyrite to goethite under oxidizing conditions is a well-understood phenomenon, including in formations in East Texas (Senkayi et al. 1986, Dixon et al. 1982) and may have occurred within the seasonally saturated zone. A review of geochemical conditions at AD-22 shows that the conditions observed at AD-22 are favorable for goethite formation (**Figure 9**). During weathering from reduced (pyrite and siderite) to oxidized (goethite) iron minerals, isomorphically substituted cobalt may be released from the mineral structure into groundwater. The mobilization of cobalt, which was released during weathering of siderite or pyrite to goethite in the seasonally saturated zone, may explain the variability in aqueous cobalt concentrations and their correlation with the groundwater elevation as more or less aquifer solids are saturated with groundwater.

3.1.3 Mercury

An SSL was identified for mercury at AD-33 (Geosyntec 2023a). If the mercury detected at AD-33 were derived from CCR leachate from the FGD Stackout Area, we would anticipate similar effects on the concentrations of other CCR constituents, particularly those known to be more conservative. Boron, a geochemically conservative parameter, has high leachability from FGD material (USEPA 2009b). A release from the FGD Stackout Area would be anticipated to result in higher concentrations of boron and other conservative parameters, such as sulfate; however, the observed boron and sulfate concentrations at AD-33 do not display increasing trends (**Figure 10**). Two samples of FGD sludge material from the Stackout Area were collected in 2019 for characterization to assess if the FGD material was a likely source of mercury to groundwater at AD-33. As summarized in **Table 2**, both the historical average and the most recent boron groundwater concentrations at AD-33 are two orders of magnitude lower than the boron concentrations in leachate generated from both Synthetic Precipitation Leaching Procedure (SPLP) analysis (SW-846 Test Method 1312 [USEPA 1994]) and Seven-Day Distilled Water Leachate Test Procedure (7-day leaching procedure) analysis (Appendix 4 of 30 TAC Chapter 335, Subchapter R [TAC 2016]) of FGD sludge (**Attachment F**). The lack of increasing boron in AD-33 groundwater despite the relatively higher concentration of leached boron from the FGD sludge suggests groundwater at AD-33 is not impacted by the unit.

The FGD sludge material had detectable levels of total mercury at concentrations greater than those reported for two samples of aquifer solids collected from a soil boring advanced adjacent to AD-33 (**Table 3**, **Attachment G**). While the concentration of mercury in the aquifer solids is lower than the total mercury concentration in FGD sludge material, the low mobility of mercury from FGD suggests the FGD sludge is not the source of mercury in groundwater (USEPA 2009b, Hao et al. 2016). As shown in **Figure 11**[1], previous mercury groundwater concentrations at AD-33 were consistently at or above the mercury concentrations of leachate from SPLP analysis of FGD sludge material (**Table 2, Attachment F**). Mercury concentrations of leachate from 7-day leaching procedure analysis of FGD sludge material were below the laboratory detection limit of 0.005

[1] Due to a change in reported concentrations of more recent data, historical mercury data at well AD-33 were truncated to represent current groundwater quality conditions (Geosyntec 2023a).

mg/L. These results are in agreement with previous studies that have found that leached mercury concentrations are not correlated with total solid phase mercury in FGD samples (USEPA 2009b).

Detectable concentrations of mercury in aquifer solids at AD-33 present an alternative source of mercury in groundwater. Mercury is naturally occurring in soils and known to undergo isomorphic substitution for iron in crystalline iron minerals such as pyrite (Manceau et. al 2018). Analysis by XRD of material from the AD-33 soil boring showed detectable levels of pyrite below the seasonal water table (**Table 1**).

Reported differences between the total and dissolved mercury groundwater concentrations suggests that mercury is associated with colloidal material native from the aquifer. Dissolved concentrations of mercury at AD-33 are consistently lower than the reported total values (**Figure 11**), with most dissolved concentrations detected below the MCL of 2 micrograms per liter (µg/L). The method for measuring dissolved mercury in groundwater (EPA Method 245.7 [USEPA 2005]) involves filtering the sample through a 0.45 µm filter prior to analysis, which would remove colloid-sized particles prior to preservation. The inclusion of suspended particles (including colloids) in totals samples is likely to result in an overestimation of metals due to the mobilization of metals from the colloidal or solid to aqueous phase following acid preservation during sample collection. Thus, the lower dissolved mercury concentrations compared to total aqueous mercury suggests that mercury is associated with colloidal material from the aquifer and the SSL of mercury at AD-33 is not due to a release from the FGD Stackout Area.

3.1.4 Conceptual Site Model

The seasonal fluctuations in beryllium at AD-7 and AD-22 and cobalt concentrations at AD-22 can be attributed to variations in the amount of the aquifer solids that are in contact with groundwater as the water table elevation changes. When the water table is higher, more clay material is in contact with groundwater, allowing greater desorption of cations (including beryllium) from the cation exchange sites on the clay. In the case of cobalt, more iron oxides are in contact with groundwater as the water table rises, allowing for the release of cobalt from mineral phases where it has isomorphically substituted for iron. Thus, the observed SSLs were attributed to natural variation associated with seasonal fluctuation of beryllium and cobalt concentrations in groundwater as the amount of aquifer solids that are saturated increases. For mercury, seasonal variations in groundwater concentrations were not observed. The observed mercury concentrations in groundwater at AD-33 were attributed to interactions with mercury-bearing aquifer solids or colloids.

3.2 Sampling Requirements

Because the ASD presented above supports the position that the identified SSLs are not due to a release from the Pirkey FGD Stackout Area, the unit will remain in the assessment monitoring program. Groundwater at the unit will continue to be sampled for Appendix IV parameters semiannually.

4. CONCLUSIONS AND RECOMMENDATIONS

The preceding information serves as the ASD prepared in accordance with 30 TAC §352.951(e) and supports the position that the SSLs of beryllium at AD-7 and AD-22, cobalt at AD-22, and mercury at AD-33 identified during the first semiannual assessment monitoring event of 2023 were not due to a release from the FGD Stackout Area. The identified SSLs were, instead, attributed to natural variation related to desorption of beryllium and seasonal dissolution of cobalt-bearing minerals comprising the aquifer solids. The mercury SSL was attributed to natural variation associated with the aquifer solids of the uppermost aquifer. Therefore, no further action is warranted, and the Pirkey FGD Stackout Area will remain in the assessment monitoring program. Certification of this ASD by a qualified professional engineer is provided in **Attachment I.**

5. REFERENCES

Akron Consulting, LLC (Akron Consulting). 2023. FGD Stackout Area CCR Removal Certification. November.

American Electric Power (AEP). 2023. Closure Plan. FGD Stackout Area. May.

Arcadis. 2016. Stack Out Area – CCR Groundwater Monitoring Well Network Evaluation – H.W. Pirkey Power Plant.

Arcadis, 2022. Landfill – CCR Groundwater Monitoring Well Network Evaluation. H.W. Pirkey Power Plant. January.

Boschi, V. and J.K. Willenbring. 2016a. "The Effect of pH, Organic Ligand Chemistry, and Mineralogy on the Sorption of Beryllium over Time." *Environmental Chemistry* 13(4): 711–722.

Boschi, V. and J.K. Willenbring. 2016b. "Beryllium Desorption from Minerals and Organic Ligands over Time." *Chemical Geology* 439: 52–58.

Clementi, E. and D. L. Raimdoni. 1963. "Atomic Screening Constants from SCF Functions." *J. Chem. Phys.* 38(11): 2686–2689.

Dixon, J.B., L.R. Hossner, A.L. Senkayi, and K. Egashira. 1982. "Mineralogical Properties of Lignite Overburden as They Relate to Mine Spoil Reclamation." In *Acid Sulfate Weathering*, edited by J.A. Kittrick, D.S. Fanning, and L.R. Hossner, 169–191. Soil Science Society of America Special Publications.

EPRI. 2017. Guidelines for Development of Alternative Source Demonstrations at Coal Combustion Residual Sites. 3002010920. Electric Power Research Institute. October.

Geosyntec. 2019. Alternative Source Demonstration Report – Federal CCR Rule. H.W. Pirkey Power Plant. Flue Gas Desulfurization (FGD) Stackout Area. Hallsville, Texas. Geosyntec Consultants. October.

Geosyntec. 2020a. Alternative Source Demonstration Report – Federal CCR Rule. H.W. Pirkey Power Plant. Flue Gas Desulfurization (FGD) Stackout Area. Hallsville, Texas. Geosyntec Consultants. April.

Geosyntec. 2020b. Alternative Source Demonstration Report – Federal CCR Rule. H.W. Pirkey Power Plant. Flue Gas Desulfurization (FGD) Stackout Area. Hallsville, Texas. Geosyntec Consultants. December.

Geosyntec. 2021a. Alternative Source Demonstration Report – Federal CCR Rule. H.W. Pirkey Power Plant. Flue Gas Desulfurization (FGD) Stackout Area. Hallsville, Texas. Geosyntec Consultants. May.

Geosyntec. 2021b. Alternative Source Demonstration Report – Texas State CCR Rule. H.W. Pirkey Plant, Stackout Area. Hallsville, Texas. Geosyntec Consultants. December.

Geosyntec. 2022. Alternative Source Demonstration Report – Texas CCR Rule. H.W. Pirkey Plant. Flue Gas Desulfurization (FGD) Stackout Area. Hallsville, Texas. Geosyntec Consultants. June.

Geosyntec. 2023a. Statistical Analysis Summary – Flue Gas Desulfurization (FGD) Stackout Area. H.W. Pirkey Plant. Hallsville, Texas. Geosyntec Consultants. October.

Geosyntec. 2023b. Alternative Source Demonstration Report – Texas CCR Rule. H.W. Pirkey Plant. Flue Gas Desulfurization (FGD) Stackout Area. Hallsville, Texas. Geosyntec Consultants. January.

Geosyntec. 2023c. Alternative Source Demonstration Report – Texas CCR Rule. H.W. Pirkey Plant. Flue Gas Desulfurization (FGD) Stackout Area. Hallsville, Texas. Geosyntec Consultants. June.

Geosyntec. 2023d. Alternative Source Demonstration Report – Texas CCR Rule. H.W. Pirkey Plant. East Bottom Ash Pond. Hallsville, Texas. Geosyntec Consultants. January.

Geosyntec. 2023e. Alternative Source Demonstration Report – Texas CCR Rule. H.W. Pirkey Plant. West Bottom Ash Pond. Hallsville, Texas. Geosyntec Consultants. January.

Gross, G.A. 1965. Geology of Iron Deposits in Canada, Volume 1: General Geology and Evaluation of Iron Deposits. Economic Geology Report No. 22. Geological Survey of Canada.

Hao, Y., S. Wu, Y. Pan, Q. Li, J. Zhou, Y. Xu, and G. Qian. 2016. "Characterization and Leaching Toxicities of Mercury in Flue Gas Desulfurization Gypsum from Coal-Fired Power Plants in China." *Fuel* 177: 157-163. August.

Hitzman, M.W., A.A. Bookstrom, J.F. Slack, and M.L. Zientek. 2017. Cobalt – Styles of Deposits and the Search for Primary Deposits. United States Geological Survey Open File Report 2017-1155.

Krupka, K.M. and R.J. Serne. 2002. Geochemical Factors Affecting the Behavior of Antimony, Cobalt, Europium, Technetium, and Uranium in Vadose Sediments. Pacific Northwest National Lab, PNNL-14126. December.

Manceau, A., M. Merkulova, M. Murdzek, V. Batanova, R. Baran, P. Glatzel, B.K. Saikia, D. Paktunc, and L. Lefticariu. 2018. "Chemical Forms of Mercury in Pyrite: Implications for Predicting Mercury Releases in Acid Mine Drainage Settings." *Environmental Science & Technology* 52(18): 10286-10296.

Senkayi, A.L., J.B. Dixon, and L.R. Hossner. 1986. "Todorokite, Goethite, and Hematite: Alteration Products of Siderite in East Texas Lignite Overburden." *Soil Science* 142(1): 36–43.

TAC. 2016. Texas Administrative Code, Title 30, Part 1, Chapter 335: Industrial Solid Waste and Municipal Hazardous Waste. June 16.

TAC. 2020. Texas Administrative Code, Title 30, Part 1, Chapter 352: Coal Combustion Residuals Waste Management. May 22.

TCEQ. 2020. Coal Combustion Residuals Groundwater Monitoring and Corrective Action Draft Technical Guideline No. 32. Topic: Coal Combustion Residuals (CCR) Groundwater Monitoring and Corrective Action. Texas Commission on Environmental Quality, Waste Permits Division. May.

USEPA. 1994. Method 1312 – Synthetic Precipitation Leaching Procedure, Revision 0. Update to the Third Edition of the Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. United States Environmental Protection Agency. Publication SW-846. September.

USEPA. 2005. Method 245.7 – Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, Revision 2.0. United States Environmental Protection Agency. EPA 821-R-05-001. February

USEPA. 2009a. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. United States Environmental Protection Agency. USEPA 530/R-09/007. March.

USEPA. 2009b. Characterization of Coal Combustion Residues from Electric Utilities – Leaching and Characterization Data. United States Environmental Protection Agency. USEPA 600/R-09/151. December.

You, C.-F., T. Lee and Y.-H. Li. 1989. "The Partition of Be between Soil and Water." *Chemical Geology* 77(2): 105–118.

TABLES

Table 1. X-Ray Diffraction Results
Alternative Source Demonstration Report
FGD Stackout Area, H. W. Pirkey Plant

Boring Location	**SP-B4**		
Associated Well	**AD-22**		
Depth (ft bgs)	**6-8**	**18-20**	**28-30**
Sample Location	**Within Seasonal Water Table**	**Below Seasonal Water Table**	**Within Screened Interval**
Quartz	28	47.5	95
Plagioclase Feldspar	<0.5	<0.5	1
K-Feldspar	1	0.5	-
Goethite	1	-	2
Hematite	-	-	-
Chlorite	1	-	-
Siderite		10	-
Pyrite	-	2	-
Clays	*	40	2
Kaolinite	13		
Illite/Mica	2		
Smectite	43		
Mixed-Layered Illite/Smectite	11		

Notes:
1. Mineral constituents are reported in percentage.
2. Values shown as less than indicate the mineral constituent is present but below the quantification limit.
*: The clay fraction at SP-B4-6-8 was further analyzed to characterize the types of clays present, as listed below.
-: not detected
ft bgs: feet below ground surface
FGD: flue gas desulfurization

Table 2. Summary of Key Analytical Data
FGD Stackout Area, H.W. Pirkey Plant

Sample	Type	Mercury (µg/L)	Boron (mg/L)
Pirkey Sludge FGD	SPLP	2.272	22.3
	7-Day Leaching Procedure	<5	8.44
Pirkey Sludge FGD 2	SPLP	<0.025	26.7
	7-Day Leaching Procedure	<5	16.4
AD-33	Historical Average	4.92	0.123
	Jun-23	5.6	0.114

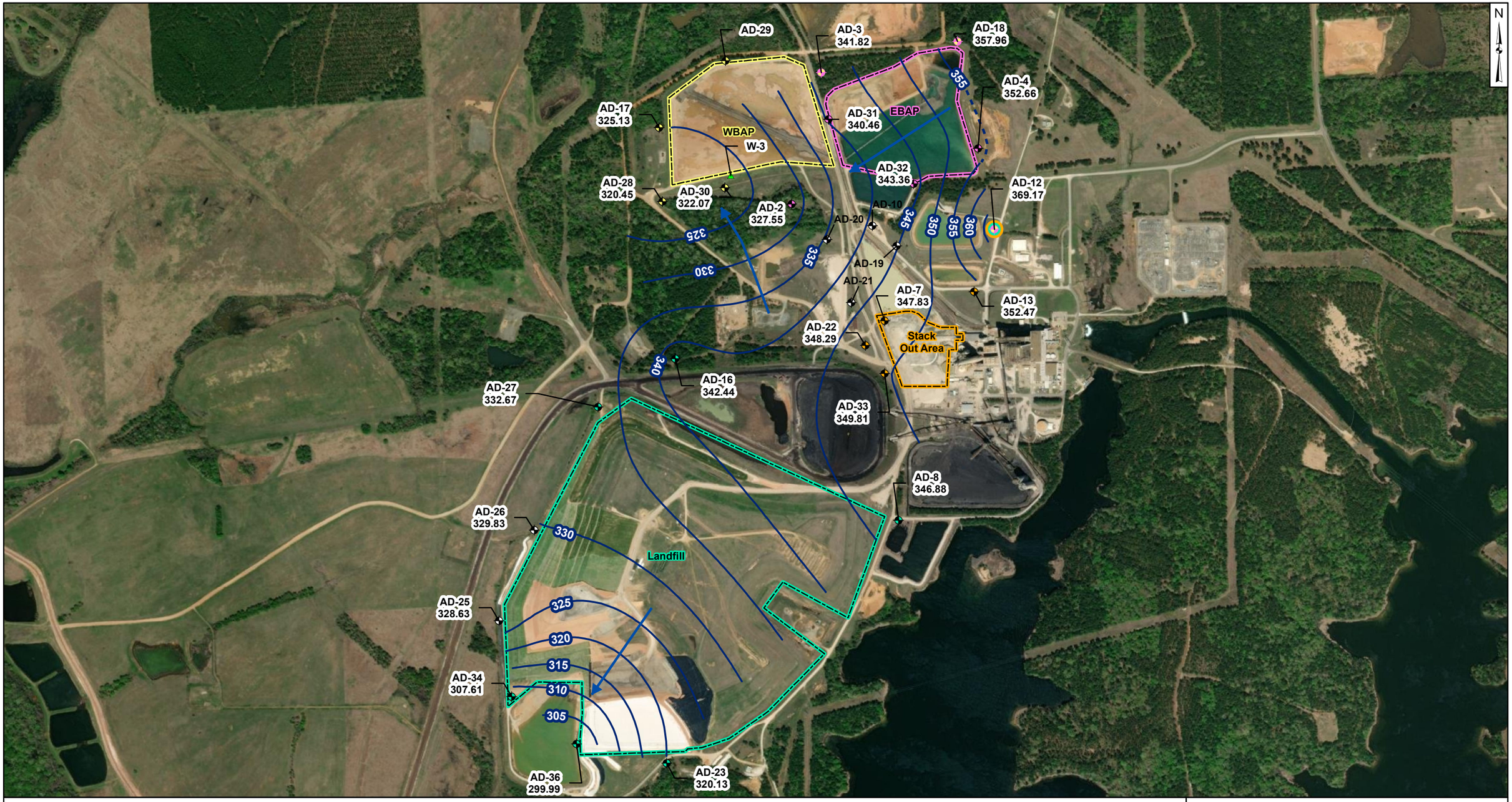
Notes:
1. Average values were calculated using truncated mercury and boron data (March 2020-June 2023).
2. Pirkey Sludge FGD samples were collected on July 17, 2019.
3. Non-detect values reported as less than (<) the detection limit.
CCR: coal combustion residuals
FGD: flue gas desulfurization
mg/L: milligram per liter
SPLP: Synthetic Precipitation Leaching Procedure
µg/L: micrograms per liter

Table 3. Solid Phase Mercury Data
Alternative Source Demonstration Report
FGD Stackout Area, H.W. Pirkey Plant

Location ID	Date Sampled	Sample Depth (ft bgs)	Mercury (mg/kg)
AD-33	4/30/2018	11	0.0026
		21	0.0038
Pirkey Sludge FGD	7/17/2019	N/A	0.653
Pirkey Sludge FGD 2	7/17/2019	N/A	0.606

Notes:
1. For AD-33 locations, samples were collected from additional boreholes advanced in the immediate area of AD-33. Samples were not collected from the cuttings of the borings advanced for well installation.
FGD: flue gas desurfurization
ft bgs: feet below ground surface
mg/kg: milligram per kilogram
N/A: not applicable

FIGURES



Legend

Groundwater Monitoring Wells

- Out of Network
- EBAP
- WBAP
- Landfill
- Stackout Area
- EBAP and WBAP

- All CCR Unit Networks
- Piezometer
- Groundwater Elevation Contour
- Groundwater Elevation Contours (Inferred)
- Approximate Groundwater Flow Direction

Notes

1. Monitoring well coordinates and water level data (collected on June 26 and 27, 2023) provided by American Electric Power (AEP).
2. Site features based on information available in coal combustion residuals (CCR) Groundwater Monitoring Well Network Evaluation Update (Arcadis 2022) provided by AEP.
3. Groundwater elevation units are feet above mean sea level.
4. AD-10, AD-19, AD-20, AD-21, AD-29, and W-3 were not gauged during the June 2023 event.
5. AD-35 was abandoned on November 13, 2018.
6. Removal of CCR plus one foot of material was completed on July 26, 2022 for the West Bottom Ash Pond (WBAP).

EBAP: East Bottom Ash Pond.

1,000 500 0 1,000 Feet

STATE OF TEXAS
BETH ANN GROSS
79864
LICENSED
PROFESSIONAL ENGINEER

Beth Ann Gross
November 9, 2023

Geosyntec Consultants, Inc.
Texas Firm
Registration No. 1182

Potentiometric Contours: Uppermost Aquifer
June 2023

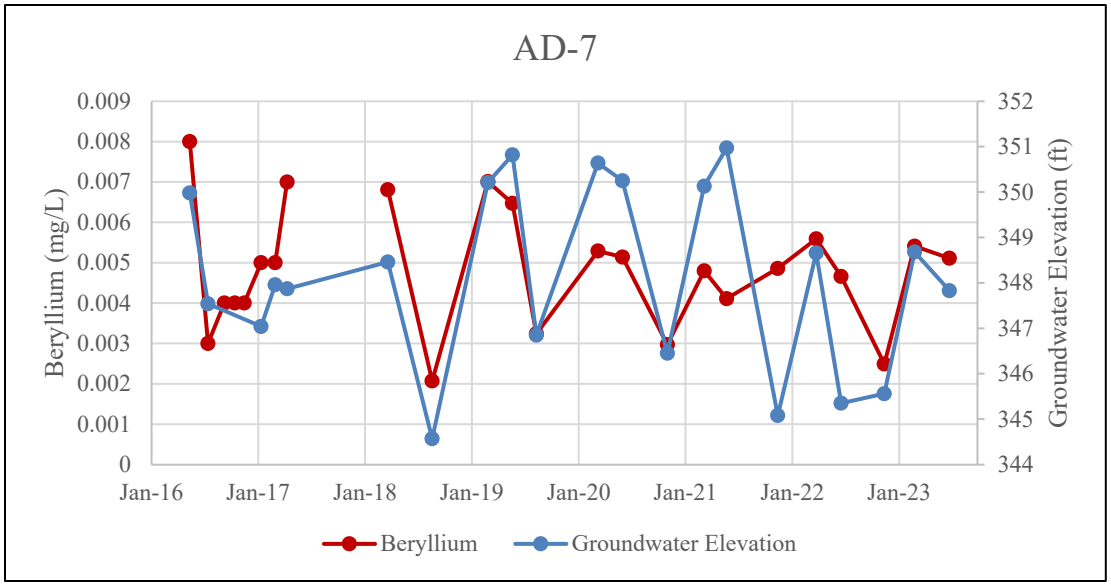
AEP Pirkey Power Plant
Hallsville, Texas

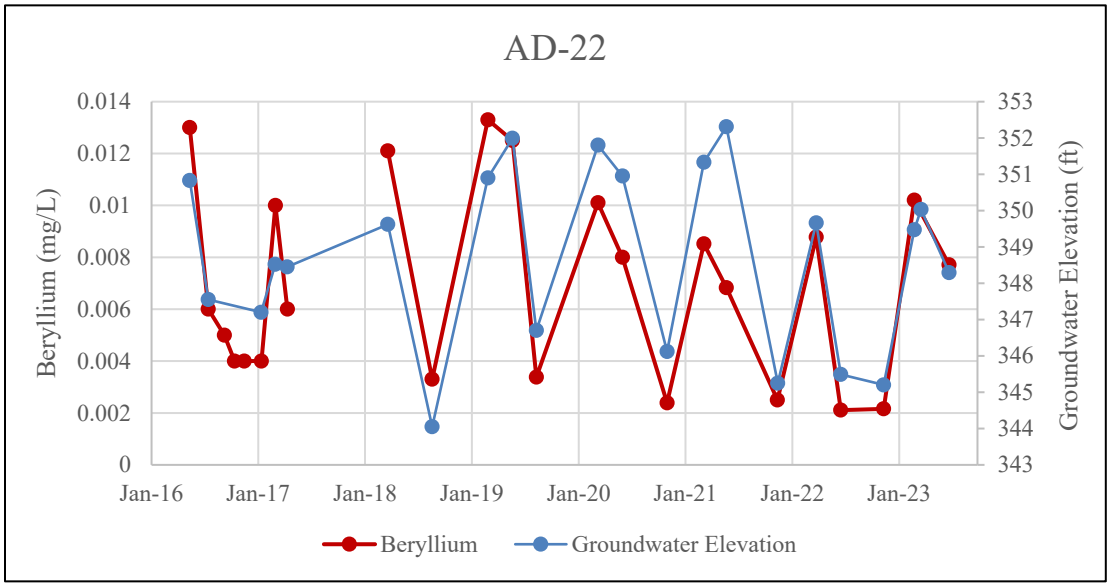
Geosyntec consultants

Columbus, Ohio | 2023/10/06

Figure 1

P:\Projects\AEP\Groundwater Statistical Evaluation - CHA8423\Groundwater Mapping\GIS Files\MXD\Pirkey\2023\AEP-Pirkey_GW_2023-06Pirkey.mxd. ASoltero. 10/6/2023. Project/Phase/Task.





Notes:
1. Beryllium concentrations are shown in milligrams per liter (mg/L).
2. Water level is shown as groundwater elevation in feet above mean sea level (ft amsl).
3. The gap in beryllium data represents the time period in which detection monitoring took place and samples were not analyzed for beryllium.
FGD: flue gas desulfurization

Beryllium v. Groundwater Elevation
Pirkey FGD Stackout Pad

Geosyntec consultants

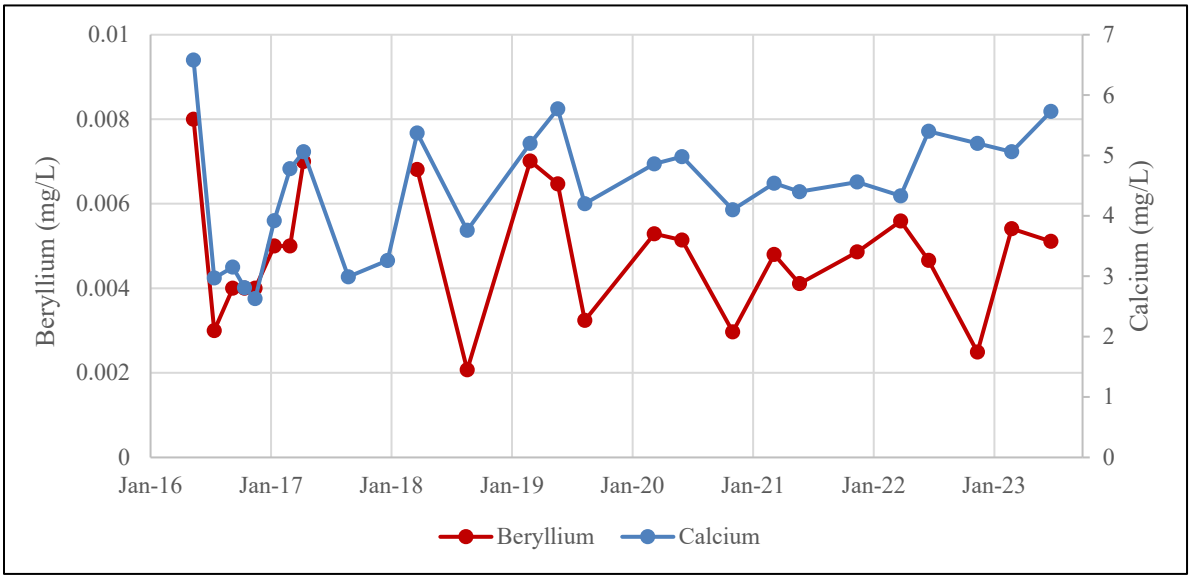
AMERICAN ELECTRIC POWER

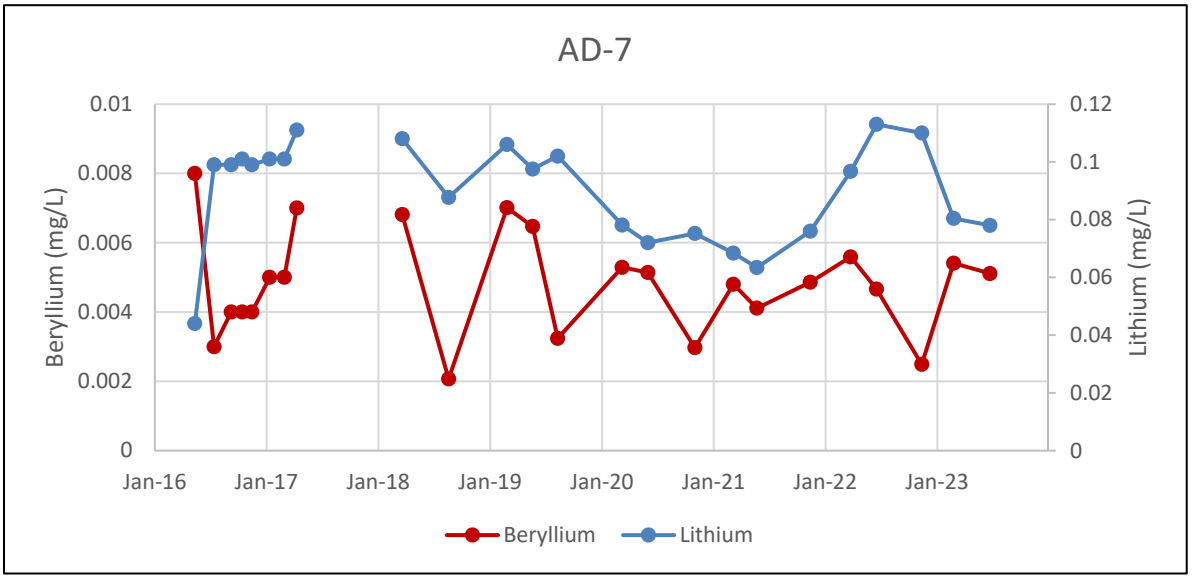
Columbus, Ohio

December 2023

Figure

2





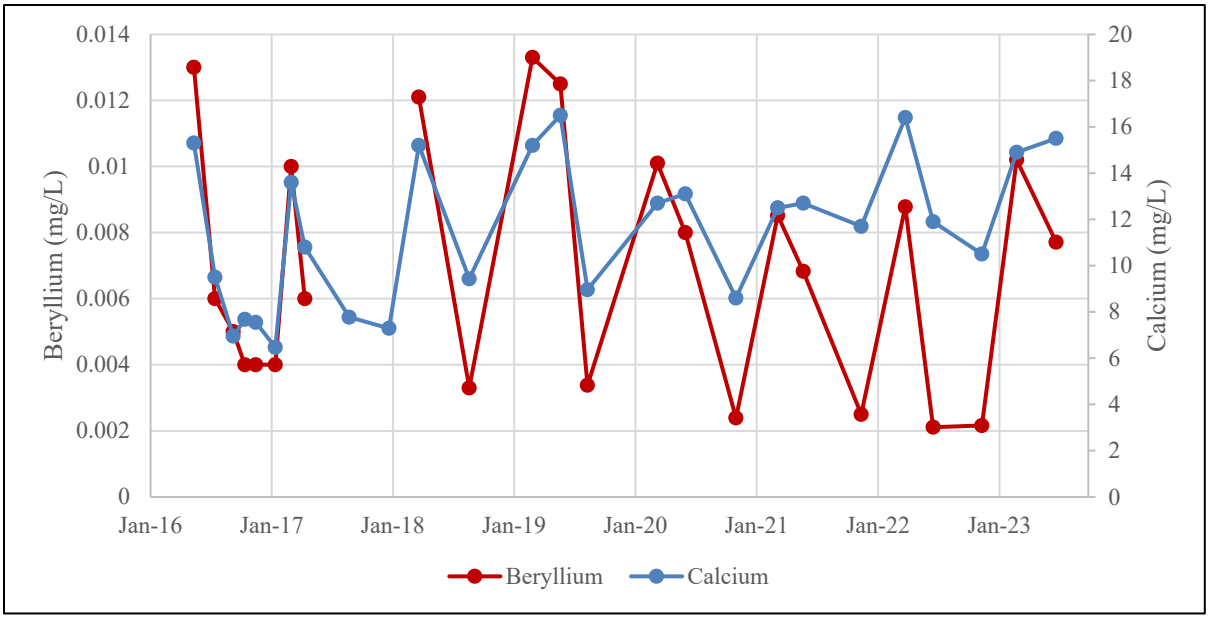
Notes:
1. Beryllium, calcium, and lithium concentrations are shown in milligrams per liter (mg/L).
2. The gaps in beryllium data represent the time period in which detection monitoring took place and samples were not analyzed for beryllium and lithium.
FGD: flue gas desulfurization

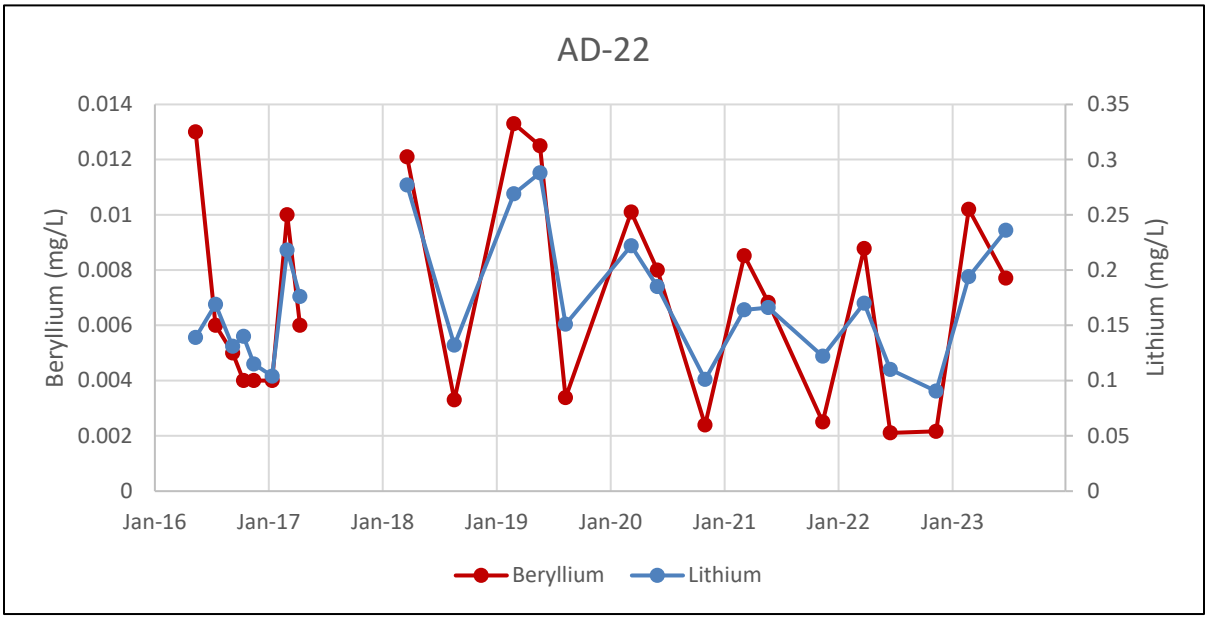
AD-7 Beryllium v. Calcium and Lithium
Pirkey FGD Stackout Pad

Geosyntec consultants | AMERICAN ELECTRIC POWER

Columbus, Ohio | November 2023

Figure **3a**





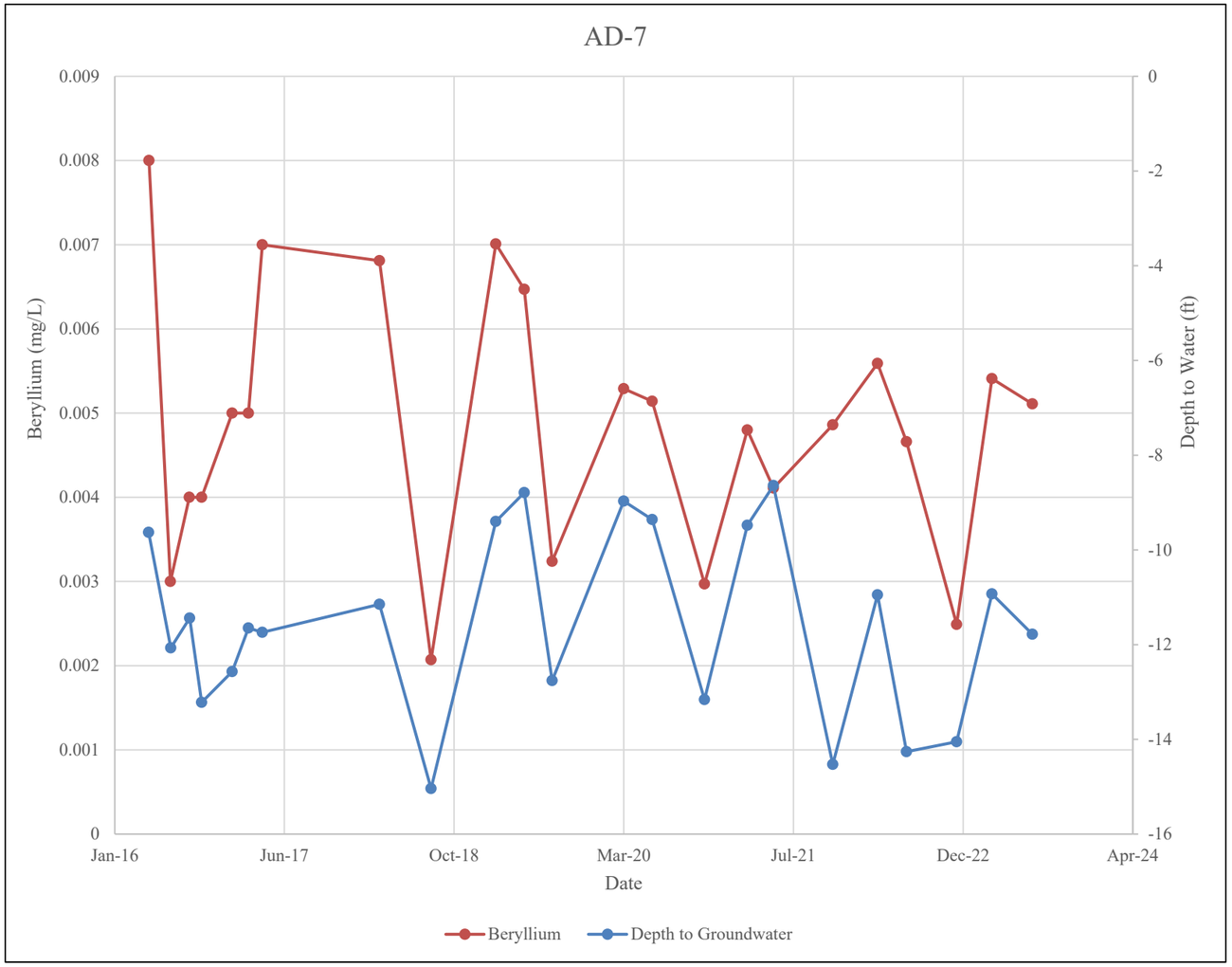
Notes:
1. Beryllium, calcium, and lithium concentrations are shown in milligrams per liter (mg/L).
2. The gaps in beryllium data represent the time period in which detection monitoring took place and samples were not analyzed for beryllium and lithium.
FGD: flue gas desulfurization

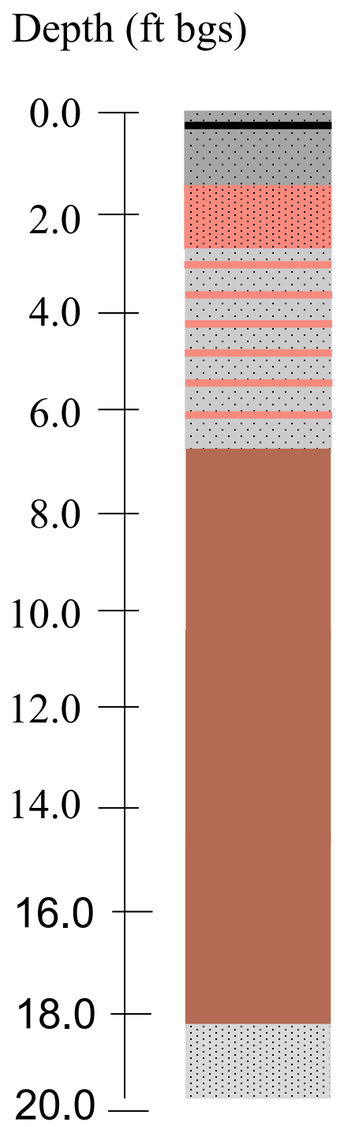
AD-22 Beryllium v. Calcium and Lithium
Pirkey FGD Stackout Pad

Geosyntec consultants | AMERICAN ELECTRIC POWER

Columbus, Ohio | November 2023

Figure **3b**





Silt (Fly Ash)

Brittle grey fly ash with coal dust layer

Silt

1.7’ Brittle red silt

Silty clay

2.6’ Mottled grey/red silty clay

Clay

6.9’ Greyish maroon clay

Clay

10.0’ Stiff greyish maroon clay

Clayey silty sand

18.8’ Light grey very fine grained clayey silty sand

Notes:
1. A sample was collected for analysis of mineralogy from 10-12 ft bgs.
2. This illustration represents the log for boring SP-B2. The full boring log is available in Attachment B.
3. AD-7 is screened at the interval of 19-39 ft bgs.
Ft bgs: feet below ground surface

internal info: Path, date revised, author

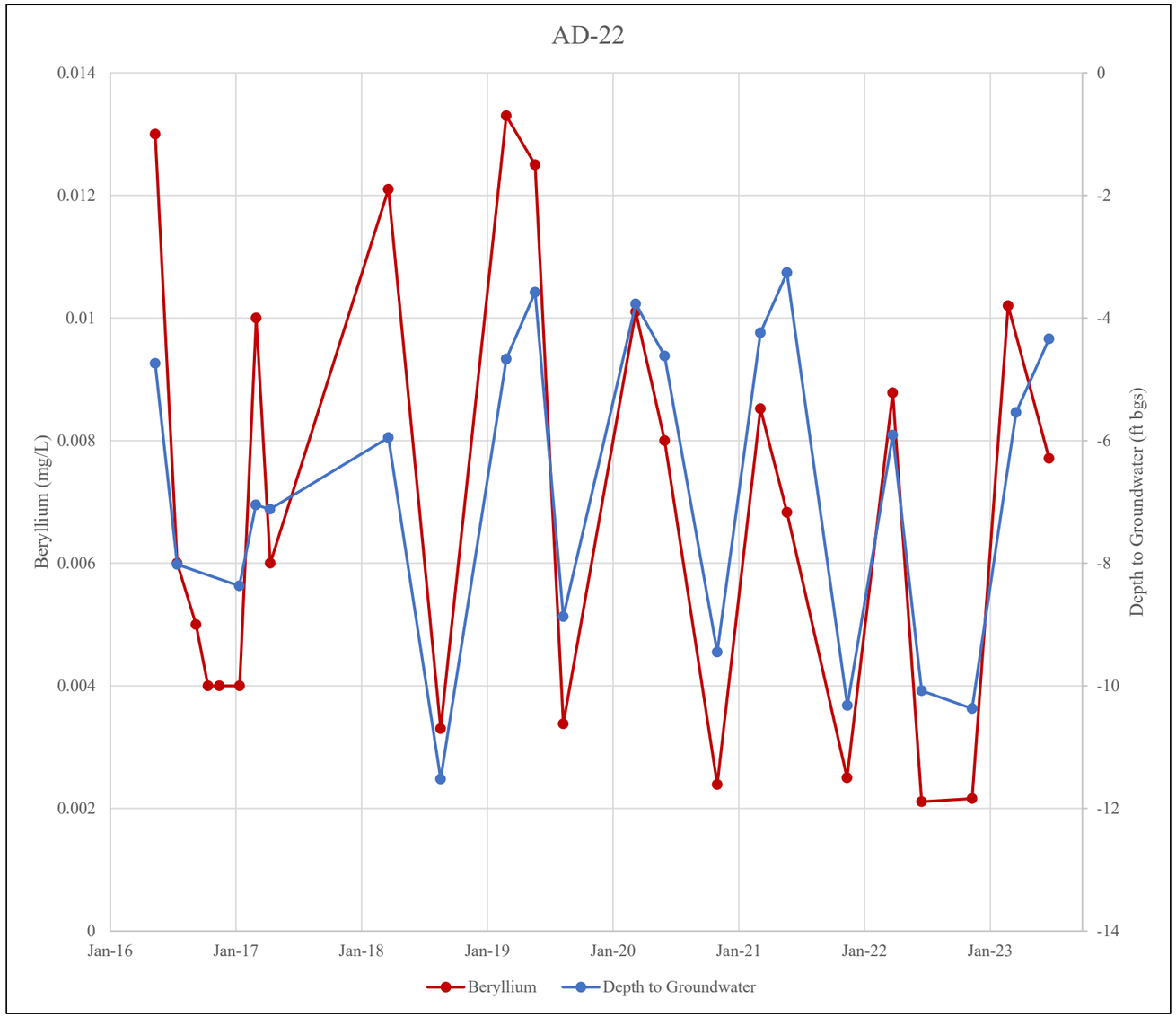
AD-7 Seasonal Water Table Geology

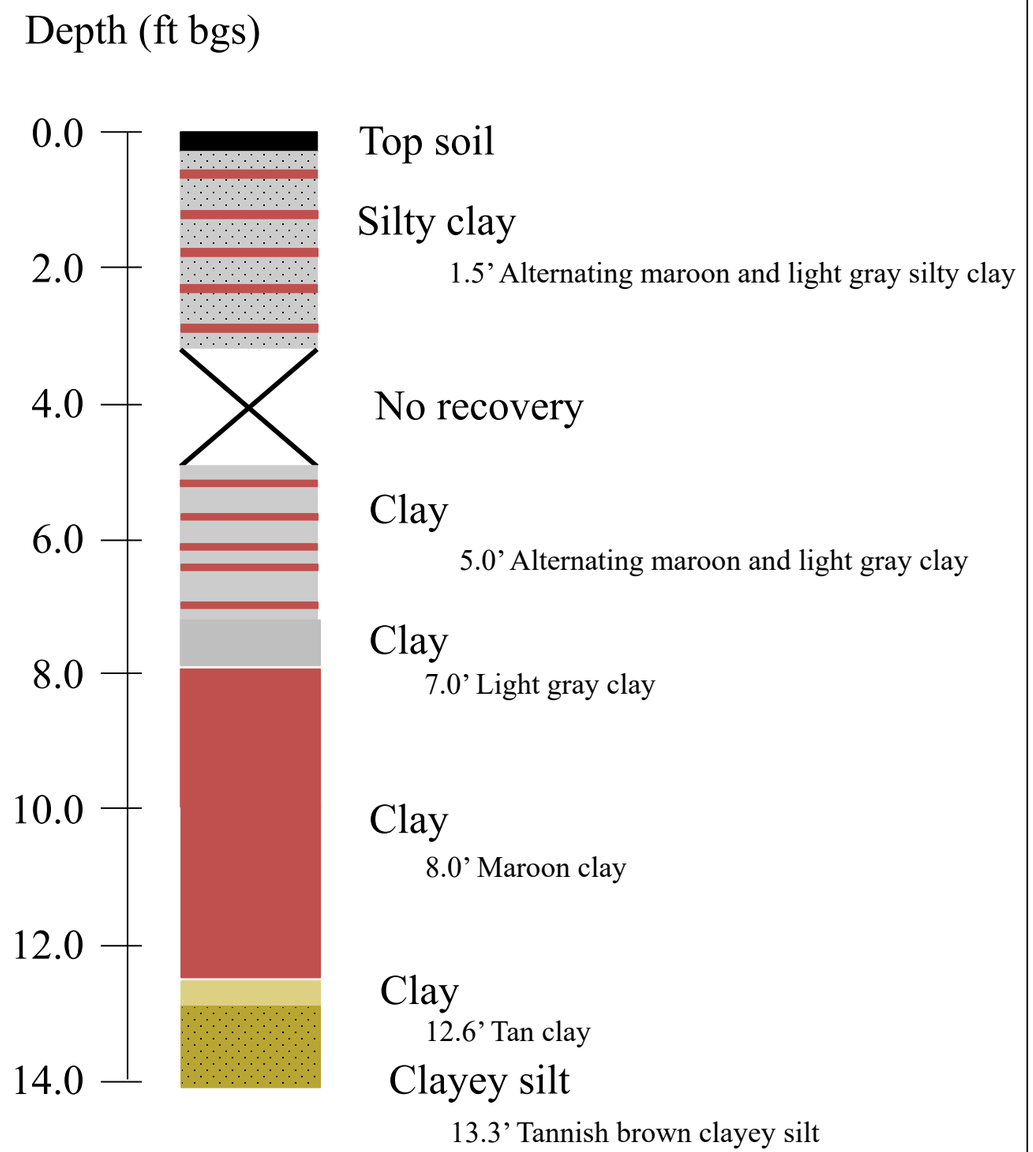
H.W. Pirkey Plant – FGD Stackout Pad

Geosyntec consultants

Columbus, OH | November 2023

Figure **4a**





Notes:
1. A sample was collected for analysis of mineralogy from 6–8 ft bgs.
2. This illustration represents the log for boring SP-B4. The full boring log is available in Attachment D.
3. AD-22 is screened at the interval of 10–30 ft bgs.
FGD: Flue Gas Desulfurization
ft bgs: feet below ground surface
mg/L: milligrams per liter

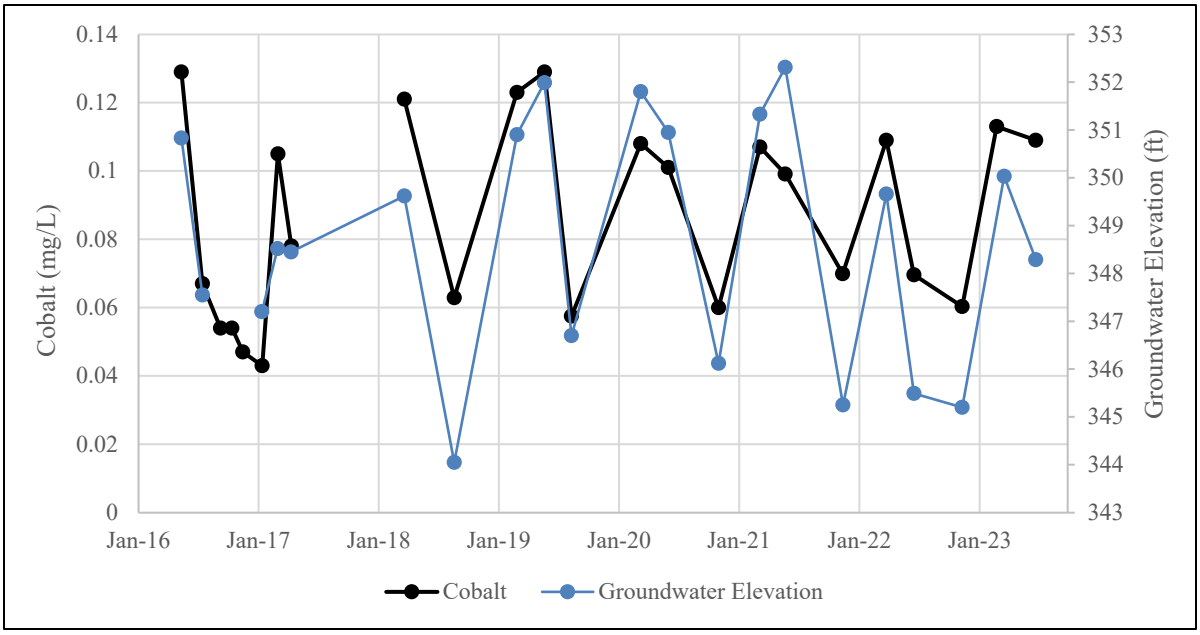
AD-22 Seasonal Water Table Geology

Pirkey FGD Stackout Pad

Geosyntec consultants

Columbus, OH | November 2023

Figure **4b**



Notes:
1. Cobalt concentrations are shown in milligrams per liter (mg/L)..
2. Water level is shown as groundwater elevation in feet above mean sea level (ft amsl).
3. The gap in cobalt data represents the time period in which detection monitoring took place and samples were not analyzed for cobalt.
FGD: flue gas desulfurization

AD-22 Cobalt v. Groundwater Elevation
Pirkey FGD Stackout Pad

Geosyntec consultants

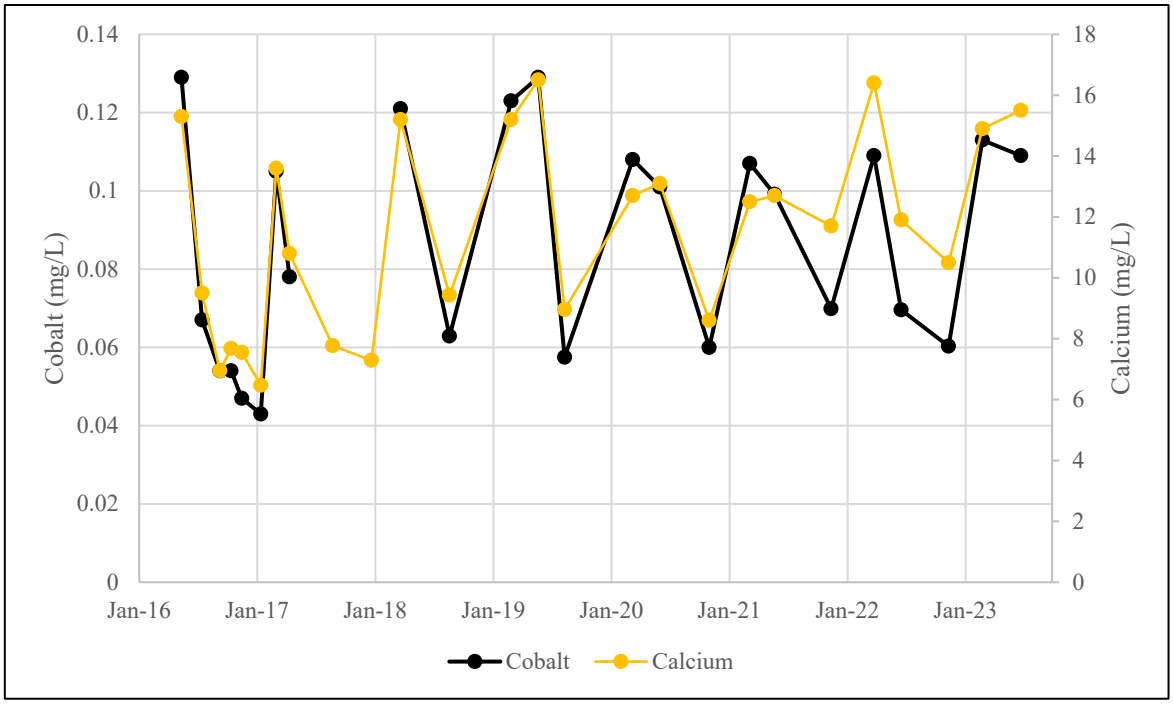
AMERICAN ELECTRIC POWER

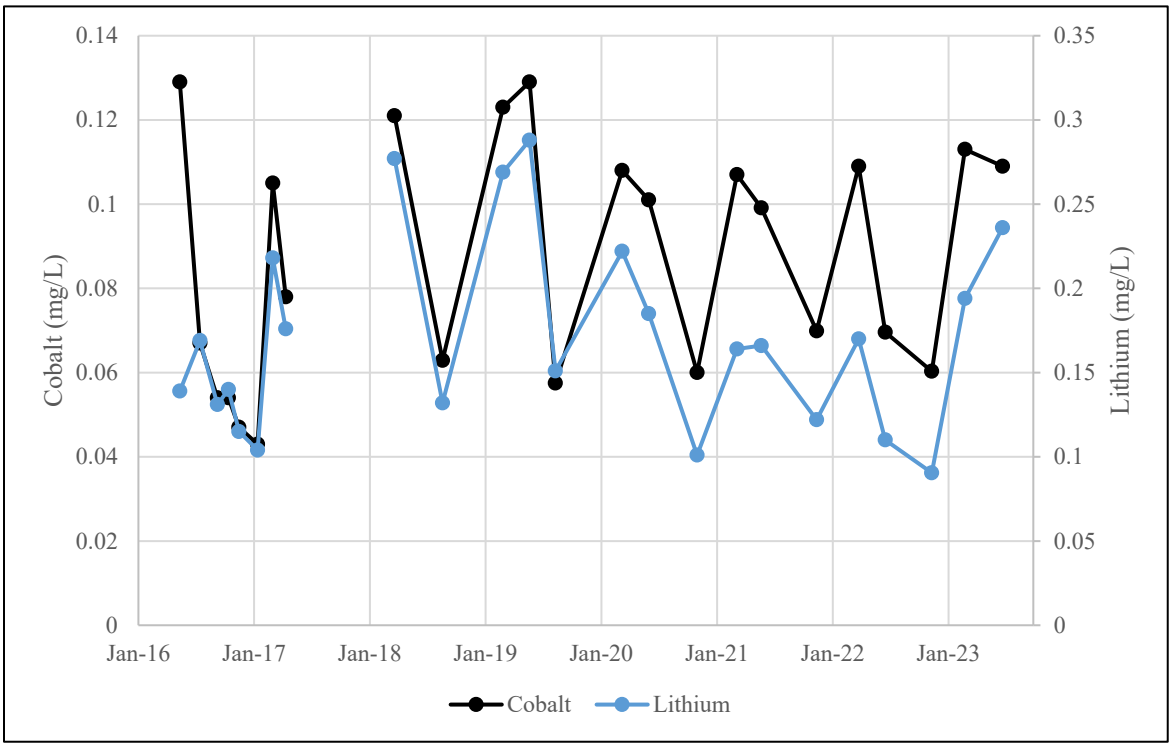
Columbus, Ohio

December 2023

Figure

5





Notes:
1. Cobalt, calcium, and lithium concentrations are shown in milligrams per liter (mg/L).
2. The gaps in cobalt and lithium data represent the time period during which detection monitoring took place and samples were not analyzed for cobalt and lithium.
FGD: flue gas desulfurization

AD-22 Cobalt v. Calcium and Lithium
Pirkey FGD Stackout Pad

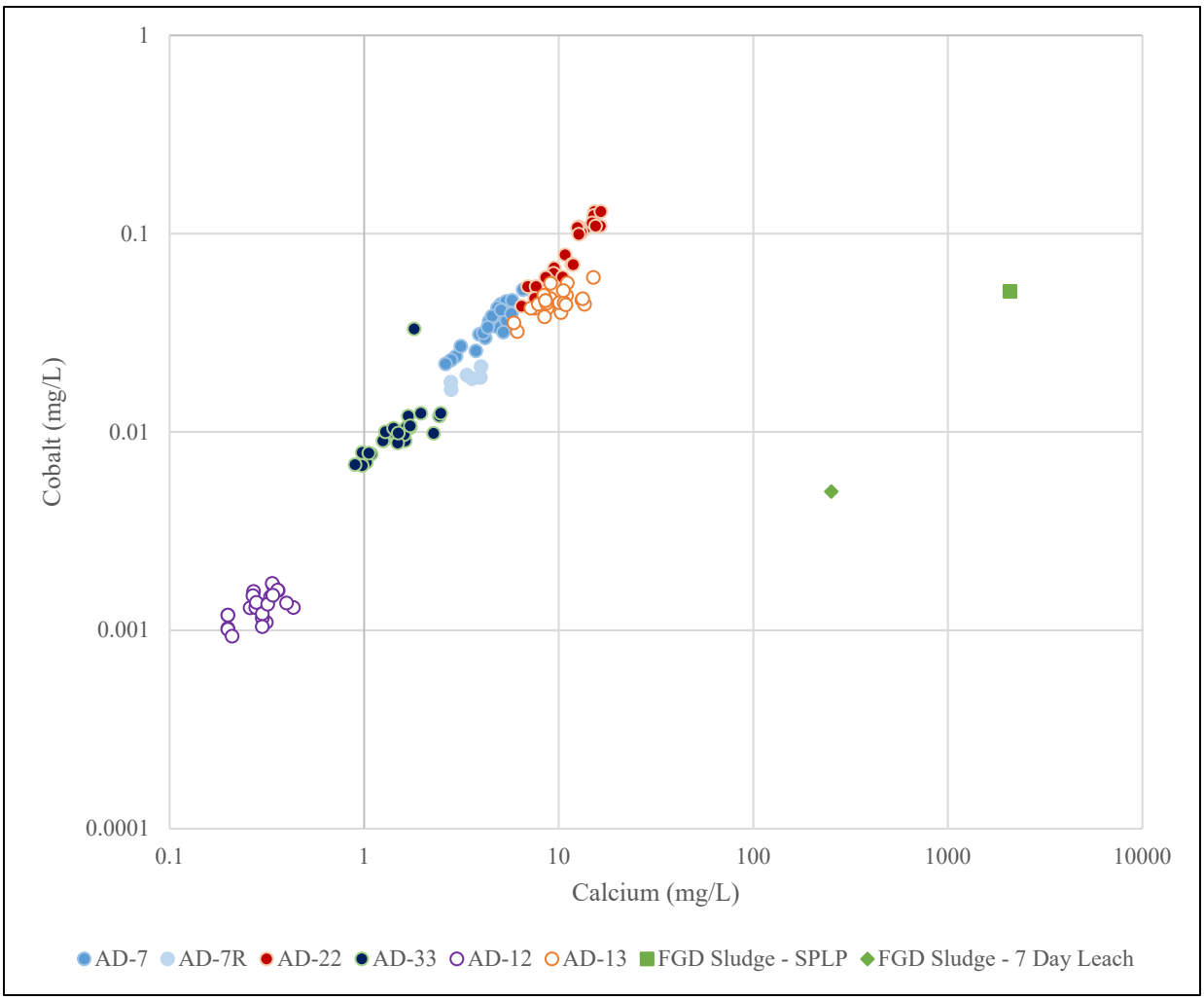
Geosyntec consultants

AMERICAN ELECTRIC POWER

Columbus, Ohio

December 2023

Figure 6



Notes:
1. Cobalt and calcium concentrations are shown in milligrams per liter (mg/L).
2. Upgradient wells are shown with hollow circles.
3. 'FGD Sludge-SPLP' and 'FGD Sludge 7 Day Leach' present the leached concentrations of cobalt and calcium using the Synthetic Precipitation Leaching Procedure (SPLP) (SW-846 Test Method 1312) and the 7-Day Distilled Water Leachate Test Procedure (30 Texas Administration Code 335.521 Appendix 4), respectively.
FGD: Flue Gas Desulfurization

Cobalt and Calcium Concentration Distribution
Pirkey FGD Stackout Pad

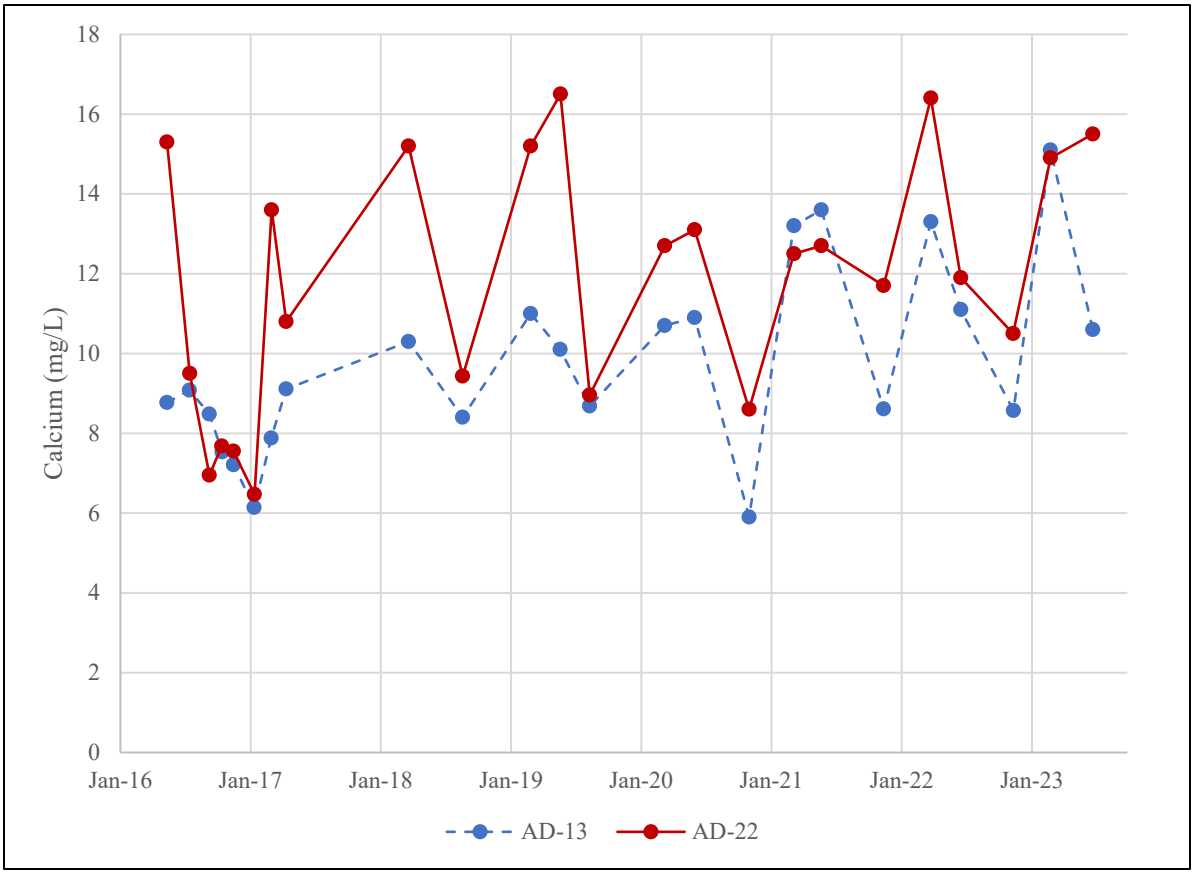
Geosyntec consultants

AMERICAN ELECTRIC POWER

Columbus, Ohio

November 2023

Figure
7



Notes:
1. Calcium concentrations are shown in milligrams per liter (mg/L).
2. Upgradient monitoring well AD-13 is shown with a dashed line.
FGD: flue gas desulfurization

Calcium Time Series Graph
Pirkey FGD Stackout Pad

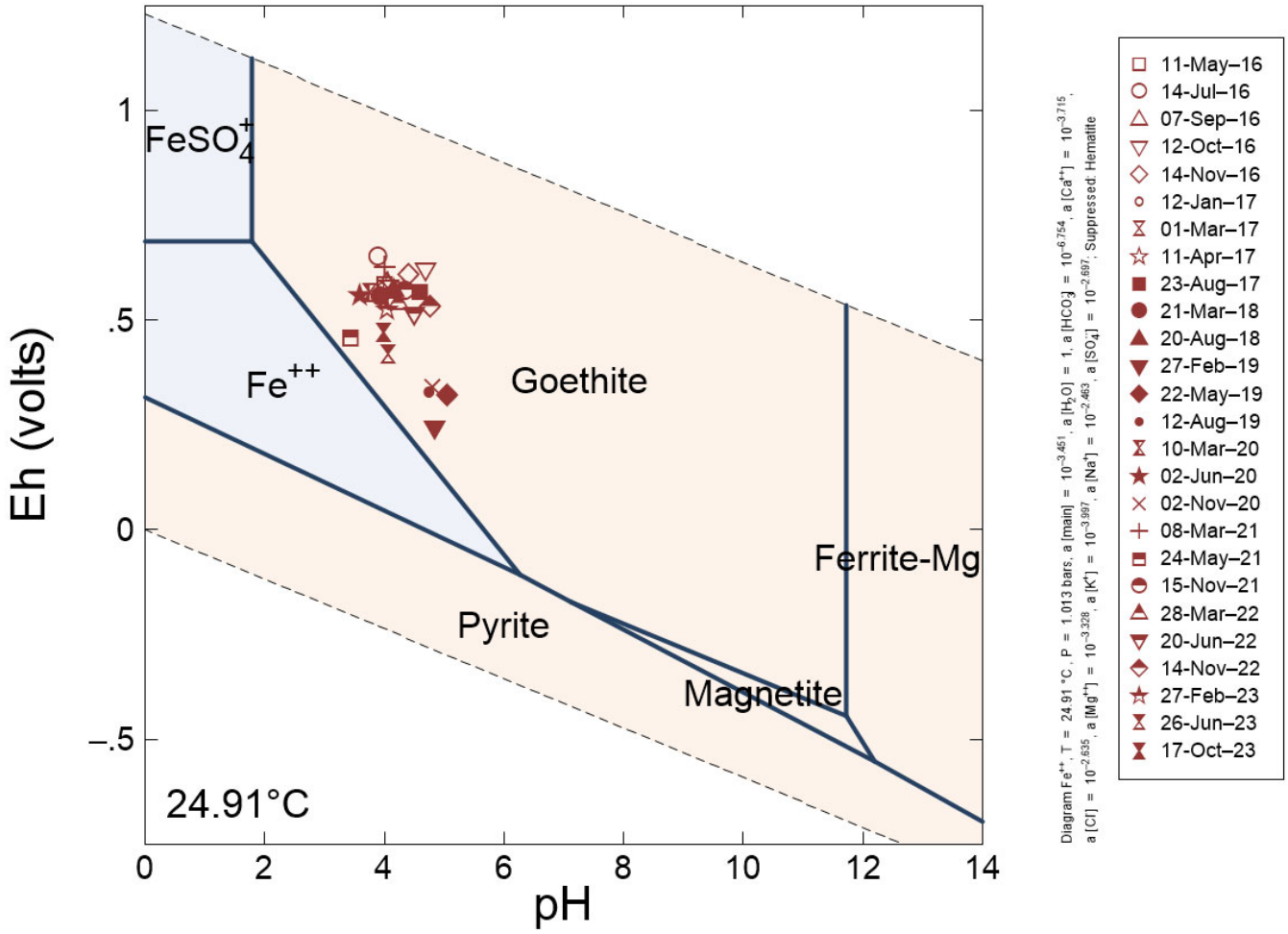
Geosyntec consultants

AMERICAN ELECTRIC POWER

Figure
8

Columbus, Ohio

December 2023



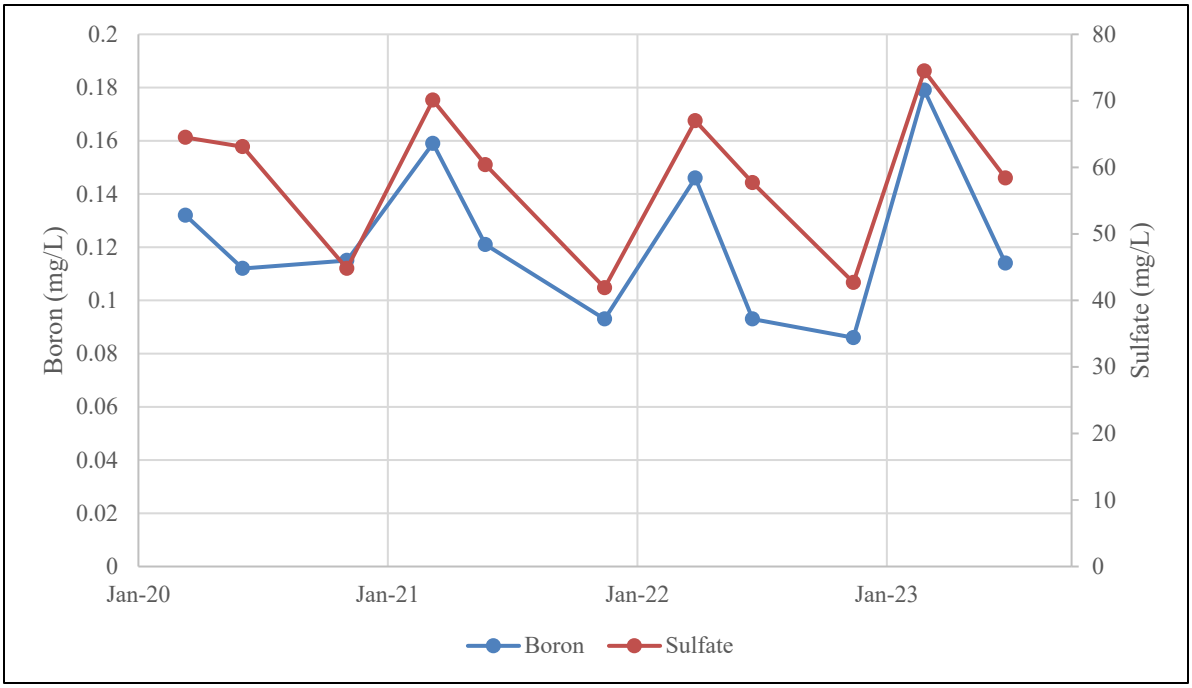
Notes: Groundwater concentrations of major cations and anions at AD-22 from the June 2023 sampling event were used to establish baseline conditions for the diagram. Eh and pH values for sampling dates at AD-22 are shown on the diagram.

AD-22 Eh-pH Diagram
Pirkey FGD Stackout Pad

Geosyntec consultants | AMERICAN ELECTRIC POWER

Columbus, Ohio | December 2023

Figure 9



Notes:
1. Boron and sulfate concentrations are shown in milligrams per liter (mg/L).
FGD: flue gas desulfurization

AD-33 Boron and Sulfate Time Series Graph
Pirkey FGD Stackout Pad

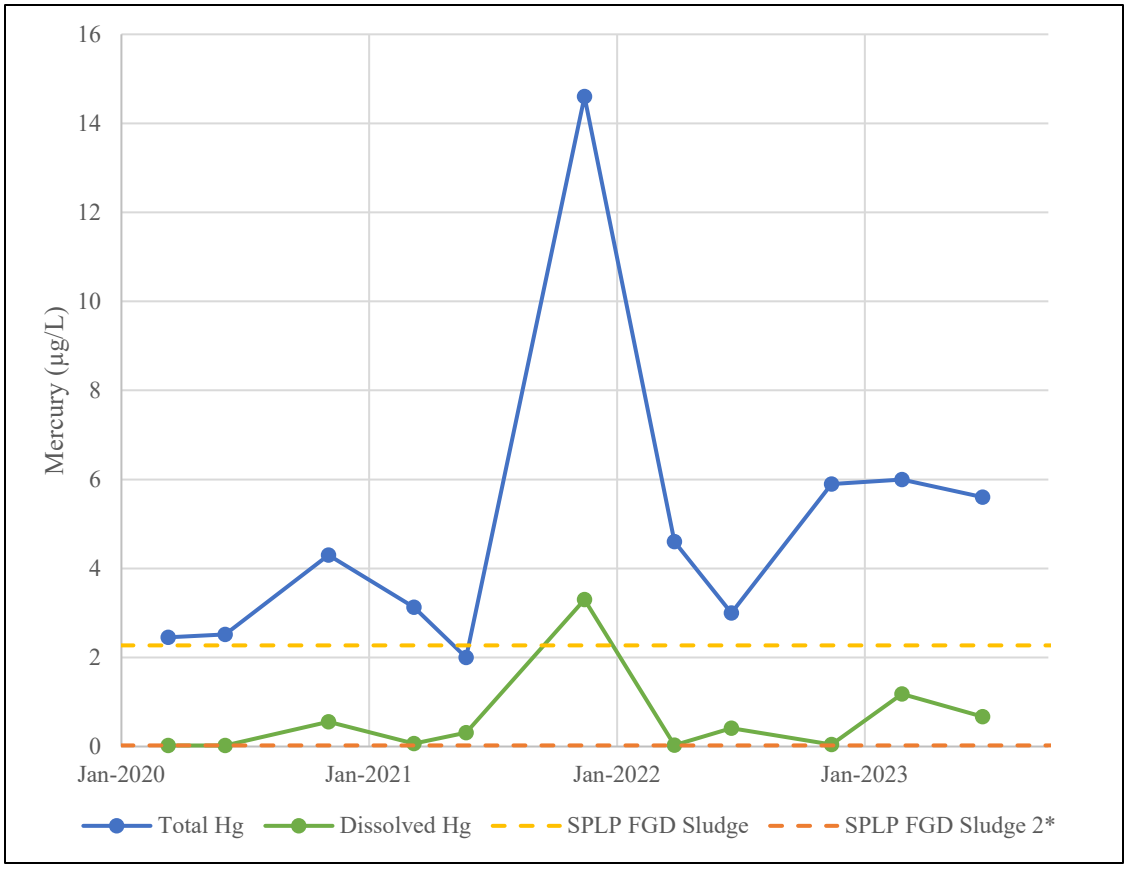
Geosyntec consultants

AMERICAN ELECTRIC POWER

Figure **10**

Columbus, Ohio

December 2023



Notes:
1. Mercury (Hg) concentrations are shown in micrograms per liter (µg/L).
2. FGD sludge samples collected on 7/17/2019.
3. 7-day leaching procedure results were not shown due to non-detects.
*: Non-detect presented as the reporting limit
FGD: flue gas desulfurization
SPLP: Synthetic Precipitation Leaching Procedure

Mercury Time Series Graph
Pirkey FGD Stackout Pad

Geosyntec consultants

AMERICAN ELECTRIC POWER

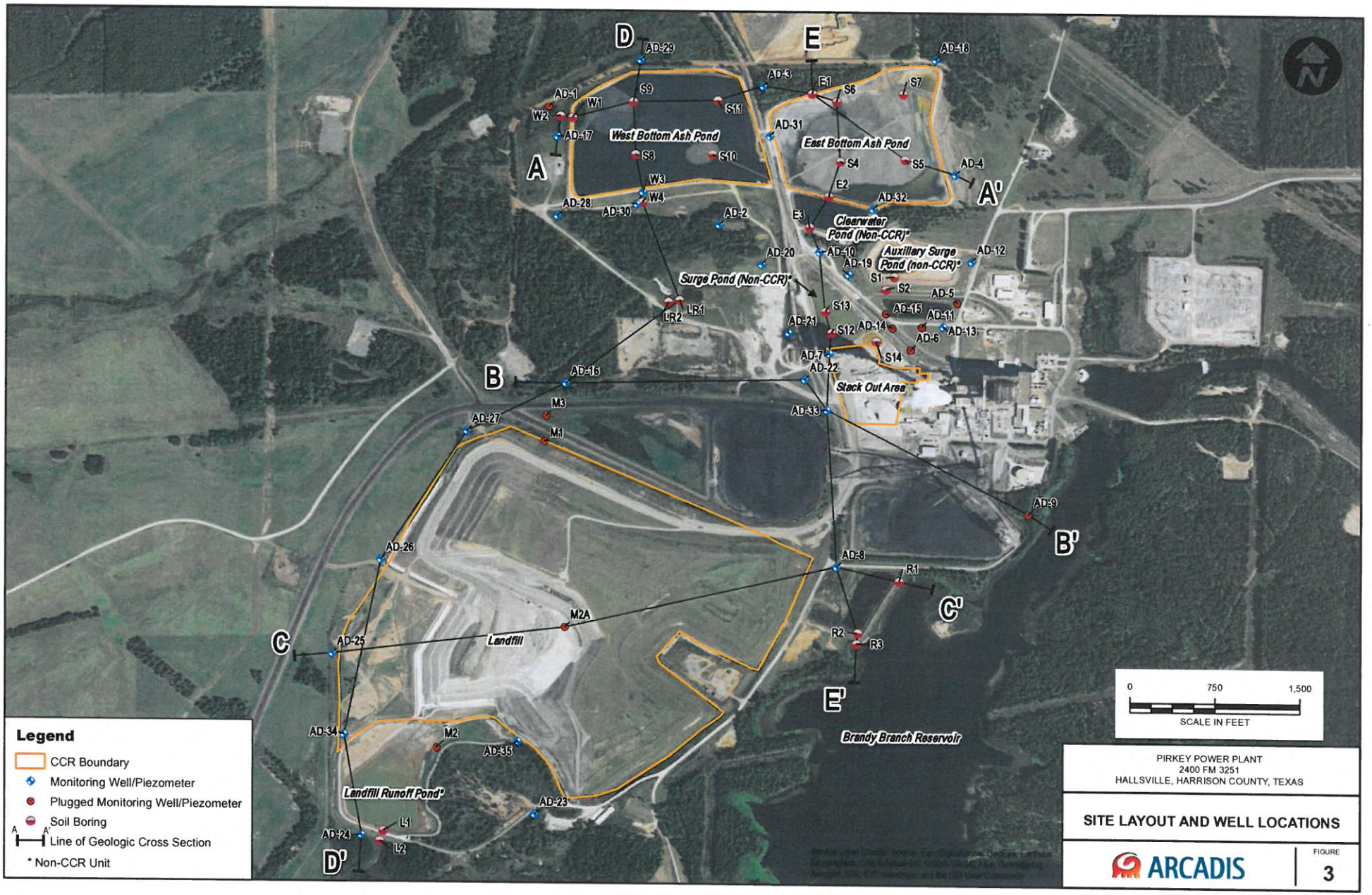
Columbus, Ohio

December 2023

Figure

11

ATTACHMENT A
Geologic Cross Sections



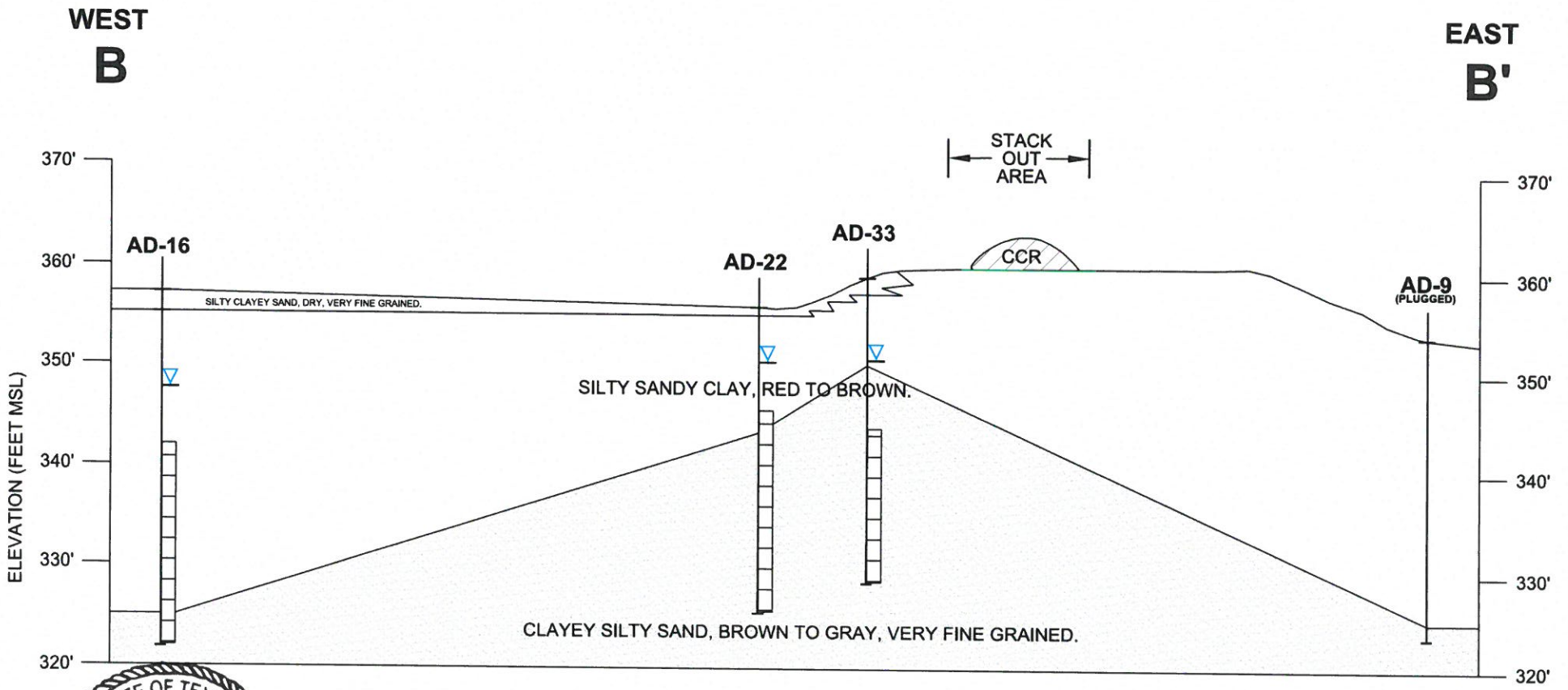
Document Path: Z:\GIS\PROJECTS_ENVAEP\Pirkey Plant\MXD\Figure 3 - Site Layout and Well Locations.mxd

PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS

SITE LAYOUT AND WELL LOCATIONS

ARCADIS

FIGURE 3



STATE OF TEXAS
Kenneth J Brandner
Geology
1797
LICENSED
PROFESSIONAL GEOSCIENTIST

Kenneth J Brandner 5-25-16

LEGEND

- MONITORING WELL SCREENED INTERVAL
- WATER LEVEL IN MONITORING WELL (1/20/16)
- BASE OF CCR UNIT

0 300'
HORIZONTAL SCALE

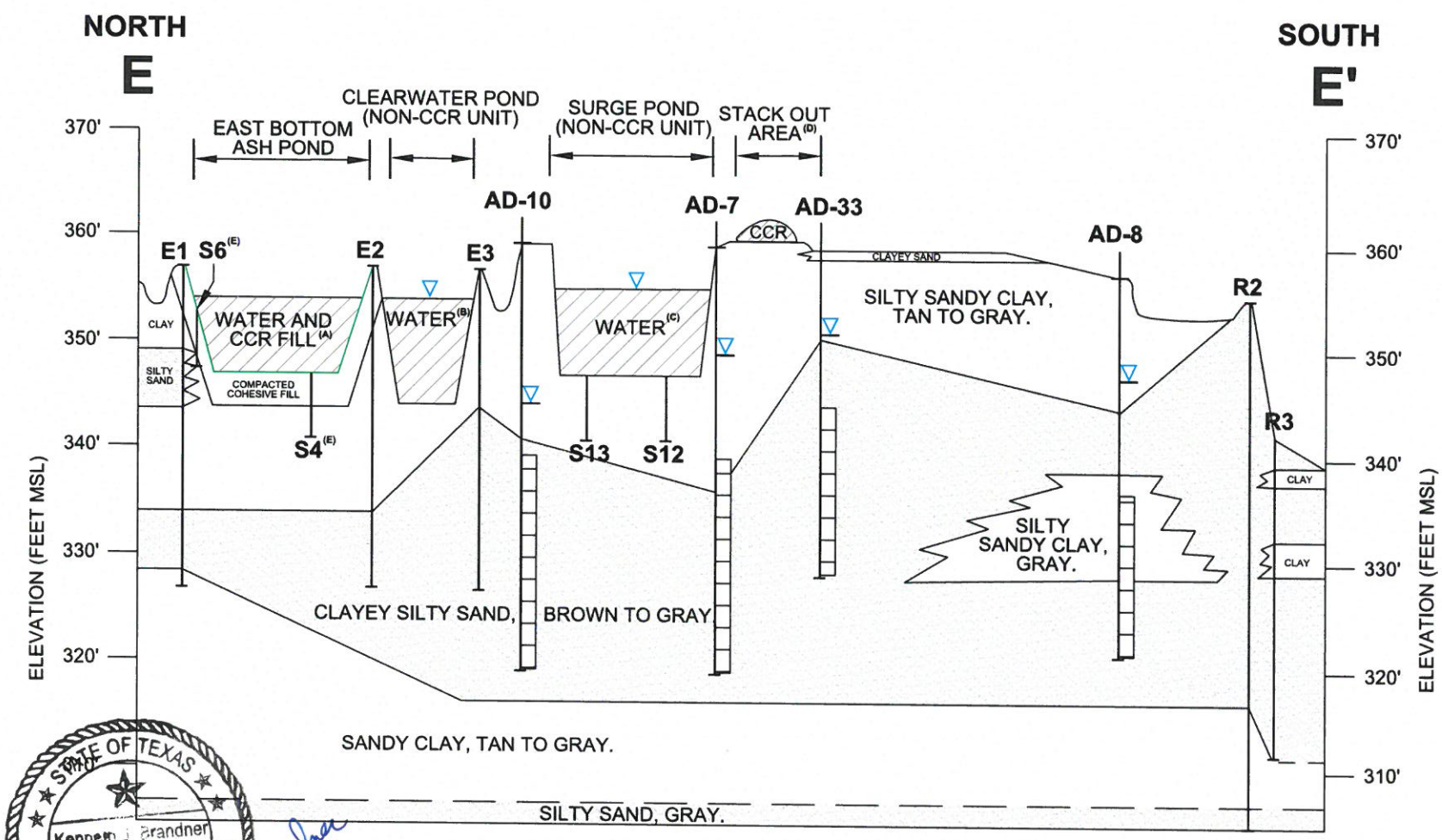
NOTES:
A) BASE OF STACK OUT AREA CCR UNIT LOCATED AT GRADE, ELEVATION TAKEN FROM MAY 2012 AND JUNE 23, 2015 TOPOGRAPHIC SURVEYS BY BEACON AVIATION.
B) ELEVATION OF CCR MATERIAL ABOVE STACK OUT AREA VARIES.

PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS

CROSS SECTION
B - B'

ARCADIS

FIGURE
5



NOTES:

A) TOP OF EAST BOTTOM ASH POND PERIMETER BERM ELEVATION IS 357', OPERATING LEVEL IS 354' (JOHNSON & PACE, MAY 2011); BASE ELEVATION OF EAST BOTTOM ASH POND IS 347' (SARGENT & LUNDY, JANUARY 1983).
B) TOP OF CLEARWATER POND PERIMETER BERM ELEVATION IS 357',OPERATING LEVEL IS 354' (JOHNSON & PACE, MAY 2011). BASE ELEVATION OF CLEARWATER POND IS 344' (SARGENT & LUNDY, JANUARY 1983).
C) BASE ELEVATION OF SURGE POND (347-352'MSL) AND POND DESIGN LEVEL (355'MSL) TAKEN FROM JANUARY 31, 1983 SARGENT & LUNDY REPORT "DESIGN SUMMARY FOR LIGNITE STORAGE AREA AND WASTEWATER POND FACILITIES".
D) BASE OF STACK OUT AREA CCR UNIT LOCATED AT GRADE. ELEVATION TAKEN FROM MAY 2012 AND JUNE 23, 2015 TOPOGRAPHIC SURVEYS BY BEACON AVIATION.
E) SOIL BORING INSTALLED BY SOUTHWESTERN LABORATORIES DURING ASH POND CONSTRUCTION IN 1983.

PIRKEY POWER PLANT
2400 FM 3251
HALLSVILLE, HARRISON COUNTY, TEXAS

CROSS SECTION
E - E'

ARCADIS

FIGURE
8

ATTACHMENT B
SP-B2 Boring Log

Soil Boring Log

Project: AEP Pirkey

Boring/Well Name: SP-B2

Project Location: Hallsville, TX

Boring Date: 3/2/2020

Soil Profile

Depth Scale Feet	Water Table	Description	PID*
		pp= pocket penetrometer	
0		0.0'-0.2': Gray silt, dry, brittle (fly ash)	
		0.2'-0.4': Black, coal dust, strong odor	
		0.4'-1.7': Gray silt, dry, brittle (fly ash)	
		1.7'-2.6': red silt, brittle, dry	
		2.6'-6.5': Gray and red silty clay, high stiffness (pp. 4.0-5.0), low plasticity, iron ore/mottling present	
5		6.5'-6.9': Light gray, red and tan clay, low stiffness (pp. 1.5), moderate plasticity	
		6.9'-10.0': Light gray and maroon clay, moderate stiffness (pp. 3.5), low plasticity, iron ore/mottling present; moist near 9'	
10	▼	10.0'-15.0': Light gray and maroon clay, moderate/high stiffness (pp. 3.5-4.5), low plasticity, iron ore/mottling present; wet	
15		15.0'-18.5': Maroon and light gray clay, moderate/high stiffness (pp. 3.0-4.0), low plasticity; wet	
		18.5'-18.8': Red/brown silt, trace clay, good cohesion	
		18.8'-20.5': Light gray clayey silty sand, very fine grained, moderate sorting, mottling present; wet	
20		20.5'-23.4': Light gray and orange clayey silty sand, very fine grained; mottling present, moderate sorting; wet	
		23.4'-25.0': Maroon and orange silty clay, low stiffness (pp. 0.5), high plasticity; wet	
25		25.0'-29.0': Same as above; interchanging between silty clay and clayey silt throughout interval, iron ore/mottling present throughout	
		29.0'-29.5': Black clay, moderate stiffness (pp.3.0), low plasticity	
		29.5'-30.0': Gray fine grained sand, well sorted; wet	
30		Samples collected at 10-12'; 16-18'; 27-29'	
		TD at 30' bgs	
		*PID readings not collected	
35			

Drill Rig: Geoprobe 3230 DT

Drilling Contractor: C&S

Driller: DJ Diduch

Geosyntec Consultants

ATTACHMENT C
AD-7 Boring Log

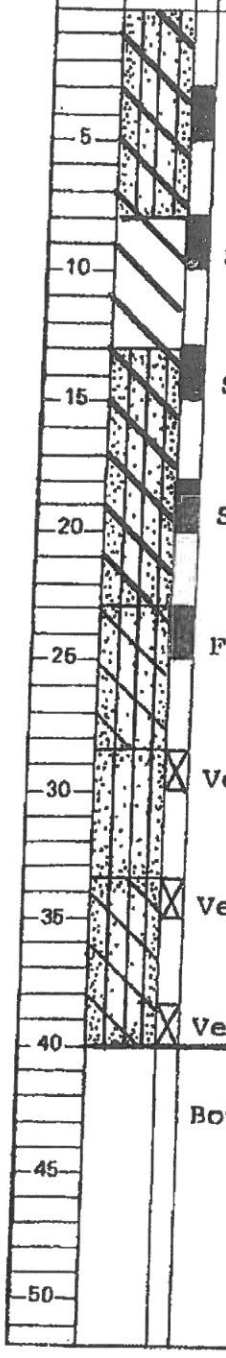
832964

LOG OF BORING

PROJECT: Waste Water Ponds
CLIENT: SWEPCO

BORING NO.: MW-7
LOCATION: Hallsville

Date: 10-3-83 Type: Auger Ground Elevation:



Legend: ■ Sample X Penetration ▼ Water

Description of Stratum
Stiff red, tan and grey sandy silty clay w/iron ore
Stiff tan and grey clay w/iron ore
Stiff tan and grey silty sandy clay lenses w/iron ore
Stiff tan and grey very sandy silty clay
Firm tan and grey clayey silty sand
Very dense grey silty sand 23-27=12" 50 B/F
Very dense grey clayey silty sand 17-35=12" 50 B/F
Very dense grey clayey silty sand 25-25=10½" 50 B/10½"
Bottom of boring at 40 feet.

ATTACHMENT D
SP-B4 Boring Log

Soil Boring Log

Project: AEP Pirkey

Boring/Well Name: SP-B4

Project Location: Hallsville, TX

Boring Date: 3/3/2020

Depth Scale Feet	Water Table	Soil Profile Description	PID*
		pp= pocket penetrometer	
0		0.0'-0.4': Top soil, black silt, vegetation	
		0.4'-0.7': Brown clayey silt, good cohesion	
		0.7'-1.5': Red and light gray silty clay, moderate stiffness (pp. 2.5), high plasticity	
		1.5'-3.7': Maroon and light gray clay, high stiffness (pp. 4.5-5.0), low plasticity; iron ore present 3.1'-3.7'	
		3.7'-5.0': NO RECOVERY	
5		5.0'-7.0': Maroon and light gray clay, high stiffness (pp. 4.5-5.0), low plasticity; iron ore present throughout	
		7.0'-8.0': Light gray clay with iron ore, moderate stiffness (pp.2.5-3.0), moderate plasticity	
		8.0'-10.0': Maroon clay, moderate stiffness (pp. 3.5), moderate plasticity; iron ore present; moist at 9'	
10	▽	10.0'-12.6': Maroon clay, moderate stiffness (pp. 3.5), moderate plasticity; iron ore present; wet at 12'	
		12.6'-13.3': Tan clay, low stiffness (pp.1.5), high plasticity; wet	
		13.3'-18.5': Tan and brown clayey silt, moderate cohesion; iron ore present; wet	
15			
		18.5'-20.3': Maroon silty clay, low stiffness (pp. 1.0), moderate plasticity; iron ore; wet	
20		20.3'-21.1': Dark gray/black clay, trace silt, low stiffness (pp. 1.5), high plasticity; wet	
		21.1'-21.3': Dark gray silt, good cohesion; wet	
		21.3'-21.9': Dark gray silty clay, low stiffness (pp. 1.5), high plasticity; wet	
		21.9'-22.3': Dark gray silt, moderate cohesion; wet	
		22.3'-22.7': light brown silt; low cohesion; wet	
		22.7'-24.4': Dark gray and dark green silty clay, moderate/high stiffness (pp.3.5), moderate plasticity; wet, glauconite present	
		24.4'-27.8': Dark green/gray fine grained sand, well sorted; wet; glauconite present	
25		27.8'-30.0': Red and orange fine grained sand, well sorted, with iron ore; wet	
30			
		Samples collected at 6-8'; 18-20'; 28-30'	
		TD at 30' bgs; refusal	
		*PID readings not collected	
35			

Drill Rig: Geoprobe 3230 DT

Drilling Contractor: C&S

Driller: DJ Diduch

Geosyntec Consultants

ATTACHMENT E

AD-22 Boring Log and Well Installation Diagram

☐ BORING ■ MONITOR WELL

APEX PROJECT NO.: 110-089 BORING NUMBER: ____ MONITOR WELL NUMBER: AD-22

FACILITY NAME: AEP- Pirkey Power Plant FACILITY ID NO.: N/A

FACILITY ADDRESS: Hallsville, Texas

DRILLING COMPANY/METHOD/RIG: Apex Geoscience Inc. / Hollow-stem Augers/ CME-55 Track Rig

DRILLER: Ed Wilson, Apex Geoscience Inc. COMPLETION DATE: 12/16/2010

PREPARED BY: David Bedford LOGGED BY: David Bedford

LATTITUDE: N 32°27'03.3" Datum: WGS-84 WELL LOCATION: Triangle- South side Quansit Hut

LONGITUDE: W94°29'41.3"

DEPTH (FEET)	PID (PPM)	SAMPLE INTERVAL	WELL LOG AND COMPLETION DETAILS	USCS CODE	SOIL DESCRIPTION AND COMMENTS	Odor	Moisture
1			0-0.5	SC	Clayey sand, light brown, very fine grained	None	Moist
2			0.5-12	CL	Lean clay, light brown mottled with light gray	None	Slightly Moist
3							
4					Few iron ore (small) pebbles in clayey sandy streaks		
5							
6							
7							
8							
9							
10							
11							
12							
13			▽	12-20	SC	Clayey sand, grayish brown with orangish brown streaks, very fine grained	None	Slightly Wet
14					Slightly wet @ 12.5' from seepage		
15					Large amount of iron ore 15-17'		
16							
17							
18							
19					Very firm 18-18.5'		
20							
21				20-25	SC	(Dense crystalline rock 21-21.1'), light brown clayey sand, greenish black, mica, black clay streaks, very fine grained, wet @ 20'	None	Wet
22							
23							
24							
25							
26				25-30	SM	Sand, greenish brown (1') grading to orangish brown, silty, very fine grained	None	Wet
27							
28							
29							
30							
31					Boring Terminated at 30'		
32							
33							
34							
35							
36							
37							
38							
39							
40							

Cement Bentonite Filter Sand ▽ Water Level

Apex geoscience inc.

Total Depth: 30 feet Riser Interval: +3 (ags)-10'

Filter Sand (Size/Interval): 8-30' Screen Interval: 10-30'

Grout (Type/Interval): Grout from 0-2'; Bentonite from 2-8' Water level: 12.5'

Surface Completion ☐ Flush ■ Above Ground 3'

Note: This log is not to be used separate from this report.

ATTACHMENT F
FGD Sludge Materials Analytical Report

502 North Allen Ave.
Shreveport, LA 71101
Phone: (318) 673-3802
Fax: (318) 673-3960

AEP ANALYTICAL CHEMISTRY SERVICES
Analysis Report

Report ID : 40143
Date Received: 07/18/2019

Company: SEP - Flint Creek (TW)
Contact: Terry Wehling
Phone: (318) 673-2721

Address: 502 North Allen Avenue
Shreveport, LA 71101
Fax: (318) 673-3960

AEP Sample ID : 227040
Cust Sample ID: Dirt/Sludge
Sample Desc.: Pirkey Sludge FGD Total

Collected Date: 07/17/2019
Location: H.W. Pirkey Power Plant

By: RF
Matrix: Solid

Metals (227040)

Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Aluminum	20500	mg/Kg	12.5	1:2500	EPA 6010B 1996	07/26/2019 0:18		JDB
Antimony	0.993	mg/Kg	0.25	1:50	EPA 6010B 1996	07/26/2019 0:47		JDB
Arsenic	28.3	mg/Kg	0.25	1:50	EPA 6010B 1996	07/26/2019 0:47		JDB
Barium	142	mg/Kg	2.5	1:2500	EPA 6010B 1996	07/26/2019 0:18		JDB
Beryllium	2.12	mg/Kg	0.05	1:50	EPA 6010B 1996	07/26/2019 0:47		JDB
Boron	845	mg/Kg	25	1:2500	EPA 6010B 1996	07/26/2019 0:18	M4	JDB
Cadmium	1.68	mg/Kg	0.05	1:50	EPA 6010B 1996	07/26/2019 0:47		JDB
Calcium	77500	mg/Kg	25	1:2500	EPA 6010B 1996	07/26/2019 0:18		JDB
Chromium	30.6	mg/Kg	0.05	1:50	EPA 6010B 1996	07/26/2019 0:47		JDB
Cobalt	24.8	mg/Kg	0.05	1:50	EPA 6010B 1996	07/26/2019 0:47		JDB
Copper	30.2	mg/Kg	0.05	1:50	EPA 6010B 1996	07/26/2019 0:47		JDB
Dry Weight, Percent	94.7	%	0.001	1		07/22/2019 15:30	T5	JDB
Iron	36300	mg/Kg	12.5	1:2500	EPA 6010B 1996	07/26/2019 0:18	M4	JDB
Lead	5.31	mg/Kg	0.25	1:50	EPA 6010B 1996	07/26/2019 0:47		JDB
Lithium	11.5	mg/Kg	0.05	1:50	EPA 6010B 1996	07/26/2019 0:47	T5	JDB
Magnesium	7150	mg/Kg	25	1:2500	EPA 6010B 1996	07/26/2019 0:18		JDB
Manganese	498	mg/Kg	2.5	1:2500	EPA 6010B 1996	07/26/2019 0:18		JDB
Mercury	0.653	mg/Kg	0.000025	1	EPA 7471B 1998	07/24/2019 14:37		LNM
Molybdenum	8.45	mg/Kg	0.05	1:50	EPA 6010B 1996	07/26/2019 0:47		JDB
Nickel	28.8	mg/Kg	0.05	1:50	EPA 6010B 1996	07/26/2019 0:47		JDB
Potassium	1370	mg/Kg	25	1:2500	EPA 6010B 1996	07/26/2019 0:18		JDB
Selenium	36.4	mg/Kg	0.25	1:50	EPA 6010B 1996	07/26/2019 0:47		JDB
Silver	0.208	mg/Kg	0.05	1:50	EPA 6010B 1996	07/26/2019 0:47		JDB
Sodium	1230	mg/Kg	25	1:2500	EPA 6010B 1996	07/26/2019 0:18		JDB
Strontium	382	mg/Kg	2.5	1:2500	EPA 6010B 1996	07/26/2019 0:18		JDB
Thallium	0.503	mg/Kg	0.25	1:50	EPA 6010B 1996	07/26/2019 0:47		JDB

502 North Allen Ave.
Shreveport, LA 71101
Phone: (318) 673-3802
Fax: (318) 673-3960

AEP ANALYTICAL CHEMISTRY SERVICES
Analysis Report

Report ID : 40143
Date Received: 07/18/2019

Company: SEP - Flint Creek (TW)
Contact: Terry Wehling
Phone: (318) 673-2721

Address: 502 North Allen Avenue
Shreveport, LA 71101
Fax: (318) 673-3960

Tin	1.28	mg/Kg	0.2	1:50	EPA 6010B 1996	07/26/2019 0:47	T5	JDB
Titanium	1360	mg/Kg	2.5	1:2500	EPA 6010B 1996	07/26/2019 0:18	M4	JDB
Vanadium	77.5	mg/Kg	0.05	1:50	EPA 6010B 1996	07/26/2019 0:47		JDB
Zinc	26	mg/Kg	0.25	1:50	EPA 6010B 1996	07/26/2019 0:47		JDB

Waste Characterization (227040)

Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
pH, Soil	8.44	pH		1	EPA 9045D 2002	07/25/2019 12:30		GB

502 North Allen Ave.
Shreveport, LA 71101
Phone: (318) 673-3802
Fax: (318) 673-3960

AEP ANALYTICAL CHEMISTRY SERVICES
Analysis Report

Report ID : 40143
Date Received: 07/18/2019

Company: SEP - Flint Creek (TW)
Contact: Terry Wehling
Phone: (318) 673-2721

Address: 502 North Allen Avenue
Shreveport, LA 71101
Fax: (318) 673-3960

AEP Sample ID : 227041
Cust Sample ID: Dirt/Sludge
Sample Desc.: Pirkey Sludge FGD SPLP

Collected Date: 07/17/2019
Location: H.W. Pirkey Power Plant

By: RF
Matrix: Solid

SPLP (227041)

Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Aluminum	14.2	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 23:09		JDB
Antimony	0.018	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 23:09		JDB
Arsenic	0.015	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 23:09		JDB
Barium	3.46	mg/L	0.05	1:50	EPA 1312/6010B 1996	07/25/2019 20:58		JDB
Beryllium	0.012	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 23:09		JDB
Boron	22.3	mg/L	0.5	1:50	EPA 1312/6010B 1996	07/25/2019 20:58		JDB
Cadmium	0.002	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 23:09		JDB
Calcium	2090	mg/L	0.5	1:50	EPA 1312/6010B 1996	07/25/2019 20:58		JDB
Chromium	0.005	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 23:09		JDB
Cobalt	0.051	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 23:09		JDB
Copper	0.009	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 23:09		JDB
Iron	52.4	mg/L	0.5	1:50	EPA 1312/6010B 1996	07/25/2019 20:58		JDB
Lead	< 0.005	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 23:09		JDB
Lithium	0.146	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 23:09		JDB
Magnesium	62.3	mg/L	0.5	1:50	EPA 1312/6010B 1996	07/25/2019 20:58		JDB
Manganese	2.83	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 23:09		JDB
Mercury	0.002272	mg/L	0.000025	1	EPA 7470A 1994	07/24/2019 14:05		LNM
Molybdenum	0.229	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 23:09		JDB
Nickel	0.054	mg/L	0.025	1	EPA 1312/6010B 1996	07/25/2019 23:09		JDB
Potassium	9.61	mg/L	0.01	1	EPA 1312/6010B 1996	07/25/2019 23:09		JDB
Selenium	0.93	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 23:09		JDB
Silver	< 0.001	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 23:09		JDB
Sodium	35.6	mg/L	0.5	1:50	EPA 1312/6010B 1996	07/25/2019 20:58		JDB
Strontium	12.7	mg/L	0.05	1:50	EPA 1312/6010B 1996	07/25/2019 20:58		JDB
Thallium	< 0.005	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 23:09		JDB
Tin	< 0.005	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 23:09		JDB

502 North Allen Ave.
Shreveport, LA 71101
Phone: (318) 673-3802
Fax: (318) 673-3960

AEP ANALYTICAL CHEMISTRY SERVICES
Analysis Report

Report ID : 40143
Date Received: 07/18/2019

Company: SEP - Flint Creek (TW)
Contact: Terry Wehling
Phone: (318) 673-2721

Address: 502 North Allen Avenue
Shreveport, LA 71101
Fax: (318) 673-3960

Titanium	0.041	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 23:09		JDB
Vanadium	0.269	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 23:09		JDB
Zinc	0.299	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 23:09		JDB

502 North Allen Ave.
Shreveport, LA 71101
Phone: (318) 673-3802
Fax: (318) 673-3960

AEP ANALYTICAL CHEMISTRY SERVICES
Analysis Report

Report ID : 40143
Date Received: 07/18/2019

Company: SEP - Flint Creek (TW)
Contact: Terry Wehling
Phone: (318) 673-2721

Address: 502 North Allen Avenue
Shreveport, LA 71101
Fax: (318) 673-3960

AEP Sample ID : 227042
Cust Sample ID: Dirt/Sludge
Sample Desc.: Pirkey Sludge FGD 7 Day Leachate

Collected Date: 07/17/2019
Location: H.W. Pirkey Power Plant

By: RF
Matrix: Solid

7-Day Leachate (227042)

Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Aluminum	0.563	mg/L	0.005	1	EPA 6010B 1996	08/04/2019 19:35		JDB
Antimony	< 0.005	mg/L	0.005	1	EPA 6010B 1996	08/04/2019 19:35		JDB
Arsenic	0.011	mg/L	0.005	1	EPA 6010B 1996	08/04/2019 19:35		JDB
Barium	0.134	mg/L	0.001	1	EPA 6010B 1996	08/04/2019 19:35		JDB
Beryllium	< 0.001	mg/L	0.001	1	EPA 6010B 1996	08/04/2019 19:35		JDB
Boron	8.44	mg/L	0.5	1:50	EPA 6010B 1996	08/04/2019 17:43		JDB
Cadmium	< 0.001	mg/L	0.001	1	EPA 6010B 1996	08/04/2019 19:35		JDB
Calcium	252	mg/L	0.5	1:50	EPA 6010B 1996	08/04/2019 17:43		JDB
Chromium	< 0.001	mg/L	0.001	1	EPA 6010B 1996	08/04/2019 19:35		JDB
Cobalt	< 0.005	mg/L	0.005	1	EPA 6010B 1996	08/04/2019 19:35		JDB
Copper	0.002	mg/L	0.001	1	EPA 6010B 1996	08/04/2019 19:35		JDB
Iron	0.211	mg/L	0.01	1	EPA 6010B 1996	08/04/2019 19:35		JDB
Lead	< 0.005	mg/L	0.005	1	EPA 6010B 1996	08/04/2019 19:35		JDB
Lithium	0.069	mg/L	0.001	1	EPA 6010B 1996	08/04/2019 19:35		JDB
Magnesium	6.73	mg/L	0.01	1	EPA 6010B 1996	08/04/2019 19:35		JDB
Manganese	0.008	mg/L	0.001	1	EPA 6010B 1996	08/04/2019 19:35		JDB
Mercury	< 0.005	mg/L	0.005	1:200	EPA 7470A 1994	07/30/2019 10:19		LNM
Molybdenum	0.18	mg/L	0.005	1	EPA 6010B 1996	08/04/2019 19:35		JDB
Nickel	< 0.025	mg/L	0.025	1	EPA 6010B 1996	08/04/2019 19:35		JDB
Potassium	4.82	mg/L	0.01	1	EPA 6010B 1996	08/04/2019 19:35		JDB
Selenium	0.208	mg/L	0.005	1	EPA 6010B 1996	08/04/2019 19:35		JDB
Silver	< 0.001	mg/L	0.001	1	EPA 6010B 1996	08/04/2019 19:35		JDB
Sodium	19.8	mg/L	0.5	1:50	EPA 6010B 1996	08/04/2019 17:43		JDB
Strontium	1.6	mg/L	0.001	1	EPA 6010B 1996	08/04/2019 19:35		JDB
Thallium	< 0.005	mg/L	0.005	1	EPA 6010B 1996	08/04/2019 19:35		JDB
Tin	< 0.005	mg/L	0.005	1	EPA 6010B 1996	08/04/2019 19:35		JDB

502 North Allen Ave.
Shreveport, LA 71101
Phone: (318) 673-3802
Fax: (318) 673-3960

AEP ANALYTICAL CHEMISTRY SERVICES
Analysis Report

Report ID : 40143
Date Received: 07/18/2019

Company: SEP - Flint Creek (TW)
Contact: Terry Wehling
Phone: (318) 673-2721

Address: 502 North Allen Avenue
Shreveport, LA 71101
Fax: (318) 673-3960

Titanium	0.015	mg/L	0.005	1	EPA 6010B 1996	08/04/2019 19:35		JDB
Vanadium	0.03	mg/L	0.001	1	EPA 6010B 1996	08/04/2019 19:35		JDB
Zinc	< 0.005	mg/L	0.005	1	EPA 6010B 1996	08/04/2019 19:35		JDB

502 North Allen Ave.
Shreveport, LA 71101
Phone: (318) 673-3802
Fax: (318) 673-3960

AEP ANALYTICAL CHEMISTRY SERVICES
Analysis Report

Report ID : 40143
Date Received: 07/18/2019

Company: SEP - Flint Creek (TW)
Contact: Terry Wehling
Phone: (318) 673-2721

Address: 502 North Allen Avenue
Shreveport, LA 71101
Fax: (318) 673-3960

AEP Sample ID : 227043
Cust Sample ID: Dirt/Sludge 2
Sample Desc.: Pirkey Sludge FGD 2 Total

Collected Date: 07/17/2019
Location: H.W. Pirkey Power Plant

By: RF
Matrix: Solid

Metals (227043)

Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Aluminum	19600	mg/Kg	12.5	1:2500	EPA 6010B 1996	07/26/2019 0:25		JDB
Antimony	0.919	mg/Kg	0.25	1:50	EPA 6010B 1996	07/26/2019 1:26		JDB
Arsenic	22.8	mg/Kg	0.25	1:50	EPA 6010B 1996	07/26/2019 1:26		JDB
Barium	121	mg/Kg	2.5	1:2500	EPA 6010B 1996	07/26/2019 0:25		JDB
Beryllium	1.66	mg/Kg	0.05	1:50	EPA 6010B 1996	07/26/2019 1:26		JDB
Boron	891	mg/Kg	25	1:2500	EPA 6010B 1996	07/26/2019 0:25	T5	JDB
Cadmium	1.37	mg/Kg	0.05	1:50	EPA 6010B 1996	07/26/2019 1:26		JDB
Calcium	84500	mg/Kg	25	1:2500	EPA 6010B 1996	07/26/2019 0:25		JDB
Chromium	28.5	mg/Kg	0.05	1:50	EPA 6010B 1996	07/26/2019 1:26		JDB
Cobalt	20.3	mg/Kg	0.05	1:50	EPA 6010B 1996	07/26/2019 1:26		JDB
Copper	26.9	mg/Kg	0.05	1:50	EPA 6010B 1996	07/26/2019 1:26		JDB
Dry Weight, Percent	97.2	%	0.001	1		07/22/2019 15:30	T5	JDB
Iron	28800	mg/Kg	12.5	1:2500	EPA 6010B 1996	07/26/2019 0:25		JDB
Lead	5.78	mg/Kg	0.25	1:50	EPA 6010B 1996	07/26/2019 1:26		JDB
Lithium	12	mg/Kg	0.05	1:50	EPA 6010B 1996	07/26/2019 1:26	T5	JDB
Magnesium	7070	mg/Kg	25	1:2500	EPA 6010B 1996	07/26/2019 0:25		JDB
Manganese	388	mg/Kg	2.5	1:2500	EPA 6010B 1996	07/26/2019 0:25		JDB
Mercury	0.606	mg/Kg	0.000025	1	EPA 7471B 1998	07/24/2019 14:27		LNM
Molybdenum	11	mg/Kg	0.05	1:50	EPA 6010B 1996	07/26/2019 1:26		JDB
Nickel	25.7	mg/Kg	0.05	1:50	EPA 6010B 1996	07/26/2019 1:26		JDB
Potassium	1460	mg/Kg	25	1:2500	EPA 6010B 1996	07/26/2019 0:25		JDB
Selenium	30.4	mg/Kg	0.25	1:50	EPA 6010B 1996	07/26/2019 1:26		JDB
Silver	0.19	mg/Kg	0.05	1:50	EPA 6010B 1996	07/26/2019 1:26		JDB
Sodium	1780	mg/Kg	25	1:2500	EPA 6010B 1996	07/26/2019 0:25		JDB
Strontium	451	mg/Kg	2.5	1:2500	EPA 6010B 1996	07/26/2019 0:25		JDB
Thallium	0.562	mg/Kg	0.25	1:50	EPA 6010B 1996	07/26/2019 1:26		JDB

502 North Allen Ave.
Shreveport, LA 71101
Phone: (318) 673-3802
Fax: (318) 673-3960

AEP ANALYTICAL CHEMISTRY SERVICES
Analysis Report

Report ID : 40143
Date Received: 07/18/2019

Company: SEP - Flint Creek (TW)
Contact: Terry Wehling
Phone: (318) 673-2721

Address: 502 North Allen Avenue
Shreveport, LA 71101
Fax: (318) 673-3960

Tin	1.06	mg/Kg	0.2	1:50	EPA 6010B 1996	07/26/2019 1:26	T5	JDB
Titanium	1280	mg/Kg	2.5	1:2500	EPA 6010B 1996	07/26/2019 0:25		JDB
Vanadium	68.3	mg/Kg	0.05	1:50	EPA 6010B 1996	07/26/2019 1:26		JDB
Zinc	33.8	mg/Kg	0.25	1:50	EPA 6010B 1996	07/26/2019 1:26		JDB

Waste Characterization (227043)

Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
pH, Soil	8.71	pH		1	EPA 9045D 2002	07/25/2019 12:30		GB

502 North Allen Ave.
Shreveport, LA 71101
Phone: (318) 673-3802
Fax: (318) 673-3960

AEP ANALYTICAL CHEMISTRY SERVICES
Analysis Report

Report ID : 40143
Date Received: 07/18/2019

Company: SEP - Flint Creek (TW)
Contact: Terry Wehling
Phone: (318) 673-2721

Address: 502 North Allen Avenue
Shreveport, LA 71101
Fax: (318) 673-3960

AEP Sample ID : 227044
Cust Sample ID: Dirt/Sludge 2
Sample Desc.: Pirkey Sludge FGD 2 SPLP

Collected Date: 07/17/2019
Location: H.W. Pirkey Power Plant

By: RF
Matrix: Solid

SPLP (227044)

Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Aluminum	10.5	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 23:55		JDB
Antimony	0.017	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 23:55		JDB
Arsenic	< 0.005	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 23:55		JDB
Barium	2.57	mg/L	0.05	1:50	EPA 1312/6010B 1996	07/25/2019 21:06		JDB
Beryllium	0.009	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 23:55		JDB
Boron	26.7	mg/L	0.5	1:50	EPA 1312/6010B 1996	07/25/2019 21:06		JDB
Cadmium	0.002	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 23:55		JDB
Calcium	1960	mg/L	0.5	1:50	EPA 1312/6010B 1996	07/25/2019 21:06		JDB
Chromium	0.004	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 23:55		JDB
Cobalt	0.051	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 23:55		JDB
Copper	0.003	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 23:55		JDB
Iron	47.7	mg/L	0.5	1:50	EPA 1312/6010B 1996	07/25/2019 21:06		JDB
Lead	< 0.005	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 23:55		JDB
Lithium	0.136	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 23:55		JDB
Magnesium	70.2	mg/L	0.5	1:50	EPA 1312/6010B 1996	07/25/2019 21:06		JDB
Manganese	2.87	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 23:55		JDB
Mercury	< 0.000025	mg/L	0.000025	1	EPA 7470A 1994	07/24/2019 14:21		LNM
Molybdenum	0.288	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 23:55		JDB
Nickel	0.071	mg/L	0.025	1	EPA 1312/6010B 1996	07/25/2019 23:55		JDB
Potassium	11.4	mg/L	0.01	1	EPA 1312/6010B 1996	07/25/2019 23:55		JDB
Selenium	0.775	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 23:55		JDB
Silver	< 0.001	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 23:55		JDB
Sodium	56.7	mg/L	0.5	1:50	EPA 1312/6010B 1996	07/25/2019 21:06		JDB
Strontium	13.2	mg/L	0.05	1:50	EPA 1312/6010B 1996	07/25/2019 21:06		JDB
Thallium	< 0.005	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 23:55		JDB
Tin	< 0.005	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 23:55		JDB

502 North Allen Ave.
Shreveport, LA 71101
Phone: (318) 673-3802
Fax: (318) 673-3960

AEP ANALYTICAL CHEMISTRY SERVICES
Analysis Report

Report ID : 40143
Date Received: 07/18/2019

Company: SEP - Flint Creek (TW)
Contact: Terry Wehling
Phone: (318) 673-2721

Address: 502 North Allen Avenue
Shreveport, LA 71101
Fax: (318) 673-3960

Titanium	0.037	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 23:55		JDB
Vanadium	0.194	mg/L	0.001	1	EPA 1312/6010B 1996	07/25/2019 23:55		JDB
Zinc	0.338	mg/L	0.005	1	EPA 1312/6010B 1996	07/25/2019 23:55		JDB

502 North Allen Ave.
Shreveport, LA 71101
Phone: (318) 673-3802
Fax: (318) 673-3960

AEP ANALYTICAL CHEMISTRY SERVICES
Analysis Report

Report ID : 40143
Date Received: 07/18/2019

Company: SEP - Flint Creek (TW)
Contact: Terry Wehling
Phone: (318) 673-2721

Address: 502 North Allen Avenue
Shreveport, LA 71101
Fax: (318) 673-3960

AEP Sample ID : 227045
Cust Sample ID: Dirt/Sludge 2
Sample Desc.: Pirkey Sludge FGD 2 7 Day Leachate

Collected Date: 07/17/2019
Location: H.W. Pirkey Power Plant

By: RF
Matrix: Solid

7-Day Leachate (227045)

Parameter	Value	Unit	Det. Limit	Dil./Conc.	Method	Analysis Date/Time	Codes	Tech
Aluminum	0.994	mg/L	0.005	1	EPA 6010B 1996	08/04/2019 19:45		JDB
Antimony	0.006	mg/L	0.005	1	EPA 6010B 1996	08/04/2019 19:45		JDB
Arsenic	0.031	mg/L	0.005	1	EPA 6010B 1996	08/04/2019 19:45		JDB
Barium	0.121	mg/L	0.001	1	EPA 6010B 1996	08/04/2019 19:45		JDB
Beryllium	< 0.001	mg/L	0.001	1	EPA 6010B 1996	08/04/2019 19:45		JDB
Boron	16.4	mg/L	0.5	1:50	EPA 6010B 1996	08/04/2019 17:53		JDB
Cadmium	< 0.001	mg/L	0.001	1	EPA 6010B 1996	08/04/2019 19:45		JDB
Calcium	633	mg/L	0.5	1:50	EPA 6010B 1996	08/04/2019 17:53		JDB
Chromium	< 0.001	mg/L	0.001	1	EPA 6010B 1996	08/04/2019 19:45		JDB
Cobalt	< 0.005	mg/L	0.005	1	EPA 6010B 1996	08/04/2019 19:45		JDB
Copper	0.003	mg/L	0.001	1	EPA 6010B 1996	08/04/2019 19:45		JDB
Iron	0.225	mg/L	0.01	1	EPA 6010B 1996	08/04/2019 19:45		JDB
Lead	< 0.005	mg/L	0.005	1	EPA 6010B 1996	08/04/2019 19:45		JDB
Lithium	0.1	mg/L	0.001	1	EPA 6010B 1996	08/04/2019 19:45		JDB
Magnesium	9.54	mg/L	0.01	1	EPA 6010B 1996	08/04/2019 19:45		JDB
Manganese	0.015	mg/L	0.001	1	EPA 6010B 1996	08/04/2019 19:45		JDB
Mercury	< 0.005	mg/L	0.005	1:200	EPA 7470A 1994	07/30/2019 10:36		LNM
Molybdenum	0.448	mg/L	0.005	1	EPA 6010B 1996	08/04/2019 19:45		JDB
Nickel	< 0.025	mg/L	0.025	1	EPA 6010B 1996	08/04/2019 19:45		JDB
Potassium	9.02	mg/L	0.01	1	EPA 6010B 1996	08/04/2019 19:45		JDB
Selenium	0.201	mg/L	0.005	1	EPA 6010B 1996	08/04/2019 19:45		JDB
Silver	< 0.001	mg/L	0.001	1	EPA 6010B 1996	08/04/2019 19:45		JDB
Sodium	48.3	mg/L	0.5	1:50	EPA 6010B 1996	08/04/2019 17:53		JDB
Strontium	3.79	mg/L	0.05	1:50	EPA 6010B 1996	08/04/2019 17:53		JDB
Thallium	< 0.005	mg/L	0.005	1	EPA 6010B 1996	08/04/2019 19:45		JDB
Tin	< 0.005	mg/L	0.005	1	EPA 6010B 1996	08/04/2019 19:45		JDB

502 North Allen Ave.
Shreveport, LA 71101
Phone: (318) 673-3802
Fax: (318) 673-3960

AEP ANALYTICAL CHEMISTRY SERVICES
Analysis Report

Report ID : 40143
Date Received: 07/18/2019

Company: SEP - Flint Creek (TW)
Contact: Terry Wehling
Phone: (318) 673-2721

Address: 502 North Allen Avenue
Shreveport, LA 71101
Fax: (318) 673-3960

Titanium	0.02	mg/L	0.005	1	EPA 6010B 1996	08/04/2019 19:45		JDB
Vanadium	0.087	mg/L	0.001	1	EPA 6010B 1996	08/04/2019 19:45		JDB
Zinc	< 0.005	mg/L	0.005	1	EPA 6010B 1996	08/04/2019 19:45		JDB

502 North Allen Ave.
Shreveport, LA 71101
Phone: (318) 673-3802
Fax: (318) 673-3960

AEP ANALYTICAL CHEMISTRY SERVICES
Analysis Report

Report ID : 40143
Date Received: 07/18/2019

Company: SEP - Flint Creek (TW)
Contact: Terry Wehling
Phone: (318) 673-2721

Address: 502 North Allen Avenue
Shreveport, LA 71101
Fax: (318) 673-3960

Quality Control Data

* Quality control units are the same as reported analytical results

Date	Parameter	Sample ID	Blank Value *	Standard			Spike			Surrogate % Recovery	Duplicate % Difference	Tech
				Value *	Recovery*	%	Value *	Recovery*	%			
7/25/2019	Aluminum	226939.1	<0.005	2	2.0229733	101.1	2	2.071639	103.6		0.4	JDB
7/25/2019	Aluminum	227041.1	<0.005	2	2.0229733	101.1	2	2.2242	111.2		0.0	JDB
7/26/2019	Aluminum	227040.1	<12.5	2	2.0358232	101.8	100	132.38333	132.4		1.2	JDB
7/25/2019	Antimony	226939.1	<0.005	0.8	0.8092462	101.2	0.8	0.8159776	102.0		0.2	JDB
7/25/2019	Antimony	227041.1	<0.005	0.8	0.8092462	101.2	0.8	0.7671843	95.9		0.5	JDB
7/26/2019	Antimony	227040.1	<0.25	0.8	0.8071122	100.9	40	32.643192	81.6		1.8	JDB
7/25/2019	Arsenic	227041.1	<0.005	0.8	0.8086795	101.1	0.8	0.7758421	97.0		0.0	JDB
7/25/2019	Arsenic	226939.1	<0.005	0.8	0.8086795	101.1	0.8	0.8086275	101.1		0.1	JDB
7/26/2019	Arsenic	226915.1	<0.25	0.8	0.7906797	98.8	40	40.306278	100.8		0.8	JDB
7/26/2019	Arsenic	227040.1	<0.25	0.8	0.7940238	99.3	40	34.433917	86.1		2.3	JDB
7/25/2019	Barium	226939.1	<0.001	0.2	0.2080557	104.0	0.2	0.209543	104.8		0.1	JDB
7/25/2019	Barium	227041.1	<0.05	0.2	0.2080557	104.0	0.2	0.1829767	91.5		0.4	JDB
7/26/2019	Barium	227040.1	<2.5	0.2	0.2112650	105.6	500	543.5715	108.7		7.2	JDB
7/25/2019	Beryllium	226939.1	<0.001	0.2	0.2122779	106.1	0.2	0.2142832	107.1		0.3	JDB
7/25/2019	Beryllium	227041.1	<0.001	0.2	0.2122779	106.1	0.2	0.1992329	99.6		0.4	JDB
7/26/2019	Beryllium	227040.1	<0.05	0.2	0.2131235	106.6	10	9.40679	94.1		0.2	JDB
7/25/2019	Boron	226939.1	<0.01	0.3	0.2995651	99.9	0.3	0.2984183	99.5		0.7	JDB
7/25/2019	Boron	227041.1	<0.5	0.3	0.2995651	99.9	0.3	0.2855333	95.2		0.5	JDB
7/25/2019	Cadmium	227041.1	<0.001	0.2	0.2069934	103.5	0.2	0.1836838	91.8		0.6	JDB
7/25/2019	Cadmium	226939.1	<0.001	0.2	0.2069934	103.5	0.2	0.2061243	103.1		0.5	JDB
7/26/2019	Cadmium	226915.1	<0.05	0.2	0.1973571	98.7	10	10.058007	100.6		1.8	JDB
7/26/2019	Cadmium	227040.1	<0.05	0.2	0.2013293	100.7	10	8.0453767	80.5		1.6	JDB
7/25/2019	Calcium	226939.1	<0.01	1	1.0087505	100.9	1	1.0243667	102.4		0.9	JDB
7/26/2019	Calcium	227040.1	<25	1	0.8616568	86.2	50	113.63333	227.3		0.8	JDB
7/25/2019	Chromium	226939.1	<0.001	0.4	0.4116387	102.9	0.4	0.4125529	103.1		0.4	JDB
7/25/2019	Chromium	227041.1	<0.001	0.4	0.4116387	102.9	0.4	0.3867339	96.7		0.3	JDB
7/26/2019	Chromium	227040.1	<0.05	0.4	0.40798	102.0	20	17.692233	88.5		1.6	JDB
7/26/2019	Chromium	226915.1	<0.05	0.4	0.4059509	101.5	20	20.758823	103.8		0.8	JDB
7/25/2019	Cobalt	227041.1	<0.005	0.2	0.2043482	102.2	0.2	0.1839347	92.0		0.4	JDB
7/25/2019	Cobalt	226939.1	<0.005	0.2	0.2043482	102.2	0.2	0.2054714	102.7		0.4	JDB
7/26/2019	Cobalt	227040.1	<0.05	0.2	0.2032547	101.6	10	7.7614833	77.6		1.8	JDB
7/25/2019	Copper	227041.1	<0.001	0.3	0.3066399	102.2	0.3	0.2963301	98.8		0.1	JDB

AEP ANALYTICAL CHEMISTRY SERVICES
502 North Allen Ave.
Shreveport, LA 71101
Phone: (318) 673-3802
Fax: (318) 673-3960

Analysis Report

Report ID : 40143
Date Received: 07/18/2019

Company: SEP - Flint Creek (TW)
Contact: Terry Wehling
Phone: (318) 673-2721

Address: 502 North Allen Avenue
Shreveport, LA 71101
Fax: (318) 673-3960

7/25/2019	Copper	226939.1	<0.001	0.3	0.3066399	102.2	0.3	0.3109092	103.6		0.1	JDB
7/26/2019	Copper	227040.1	<0.05	0.3	0.3124104	104.1	15	15.003017	100.0		1.9	JDB
7/25/2019	Iron	226939.1	<0.01	3	3.1158893	103.9	3	3.1231158	104.1		1.0	JDB
7/25/2019	Iron	227041.1	<0.5	3	3.1158893	103.9	150	159.28837	106.2		0.8	JDB
7/26/2019	Iron	227040.1	<12.5	3	3.0861005	102.9					3.1	JDB
7/25/2019	Lead	227041.1	<0.005	1	1.0430644	104.3	1	0.9320653	93.2		0.6	JDB
7/25/2019	Lead	226939.1	<0.005	1	1.0430644	104.3	1	1.0416574	104.2		0.4	JDB
7/26/2019	Lead	226915.1	<0.25	1	1.0147827	101.5	50	51.881956	103.8		1.4	JDB
7/26/2019	Lead	227040.1	<0.25	1	1.0194305	101.9	50	41.227533	82.5		1.1	JDB
7/25/2019	Lithium	227041.1	<0.001	0.2	0.2119096	106.0	0.2	0.2353987	117.7		0.1	JDB
7/25/2019	Lithium	226939.1	<0.001	0.2	0.2119096	106.0	0.2	0.2163799	108.2		0.4	JDB
7/26/2019	Lithium	227040.1	<0.05	0.2	0.211291	105.6	10	11.698417	117.0		2.8	JDB
7/25/2019	Magnesium	226939.1	<0.01	2	2.0868175	104.3	2	2.0877567	104.4		0.2	JDB
7/25/2019	Magnesium	227041.1	<0.5	2	2.0868175	104.3	2	1.9791333	99.0		0.6	JDB
7/26/2019	Magnesium	227040.1	<25	2	2.0570549	102.9	100	76.916667	76.9		1.4	JDB
7/25/2019	Manganese	226939.1	<0.001	0.2	0.2072869	103.6	0.2	0.2077536	103.9		0.2	JDB
7/25/2019	Manganese	227041.1	<0.001	0.2	0.2072869	103.6	0.2	0.16684	83.4		0.7	JDB
7/26/2019	Manganese	227040.1	<2.5	0.2	0.2066368	103.3	500	572.398	114.5		1.1	JDB
7/24/2019	Mercury	227041.1	<0.00002	0.001	0.00097	97.0	0.2	0.16373	81.9		7.0	LNM
7/24/2019	Mercury	227040.1	<0.00002	0.001	0.00097	97.0	0.04	0.0496	124.0		4.4	LNM
7/30/2019	Mercury	227042.1	<0.005	0.001	0.0009	90.0	0.2	0.156162	78.1		4.0	LNM
7/25/2019	Molybdenum	227041.1	<0.005	0.2	0.2067657	103.4	0.2	0.197727	98.9		0.5	JDB
7/25/2019	Molybdenum	226939.1	<0.005	0.2	0.2067657	103.4	0.2	0.2076129	103.8		0.4	JDB
7/26/2019	Molybdenum	227040.1	<0.05	0.2	0.2073308	103.7	10	9.2486833	92.5		0.4	JDB
7/25/2019	Nickel	227041.1	<0.025	0.5	0.5192594	103.9	0.5	0.46183	92.4		0.6	JDB
7/25/2019	Nickel	226939.1	<0.025	0.5	0.5192594	103.9	0.5	0.5209379	104.2		0.6	JDB
7/26/2019	Nickel	227040.1	<0.05	0.5	0.5228273	104.6	25	19.992767	80.0		1.9	JDB
7/25/2019	Potassium	227041.1	<0.01	10	9.3692109	93.7	10	11.11754	111.2		0.3	JDB
7/25/2019	Potassium	226939.1	<0.01	10	9.3692109	93.7	10	9.4631223	94.6		0.2	JDB
7/26/2019	Potassium	227040.1	<25	10	9.1397018	91.4	500	428.035	85.6		2.9	JDB
7/25/2019	Selenium	226939.1	<0.005	2	1.9998495	100.0	2	1.9816300	99.1		0.8	JDB
7/25/2019	Selenium	227041.1	<0.005	2	1.9998495	100.0	2	1.991203	99.6		0.7	JDB
7/26/2019	Selenium	227040.1	<0.25	2	1.9551138	97.8	100	89.733067	89.7		3.0	JDB
7/25/2019	Silver	227041.1	<0.001	0.075	0.0712930	95.1	0.075	0.0708639	94.5		0.2	JDB
7/25/2019	Silver	226939.1	<0.001	0.075	0.0712930	95.1	0.075	0.0714285	95.2		0.1	JDB
7/26/2019	Silver	227040.1	<0.05	0.075	0.0712215	95.0	3.75	3.6188628	96.5		0.5	JDB

AEP ANALYTICAL CHEMISTRY SERVICES
502 North Allen Ave.
Shreveport, LA 71101
Phone: (318) 673-3802
Fax: (318) 673-3960

Analysis Report

Report ID : 40143
Date Received: 07/18/2019

Company: SEP - Flint Creek (TW)
Contact: Terry Wehling
Phone: (318) 673-2721

Address: 502 North Allen Avenue
Shreveport, LA 71101
Fax: (318) 673-3960

7/25/2019	Sodium	227041.1	<0.5	3	3.1384831	104.6	3	2.3746333	79.2		0.0	JDB
7/25/2019	Sodium	226939.1	<0.01	3	3.1384831	104.6	3	2.4693667	82.3		0.1	JDB
7/26/2019	Sodium	227040.1	<25	3	3.1256605	104.2	150	120.525	80.4		1.9	JDB
7/25/2019	Strontium	226939.1	<0.001	0.2	0.2059899	103.0	0.2	0.2081687	104.1		0.4	JDB
7/26/2019	Strontium	227040.1	<2.5	0.2	0.2078256	103.9	500	577.76733	115.6		17.9	JDB
7/25/2019	Thallium	227041.1	<0.005	0.4	0.4152040	103.8	0.4	0.3682771	92.1		1.2	JDB
7/25/2019	Thallium	226939.1	<0.005	0.4	0.4152040	103.8	0.4	0.4171124	104.3		0.0	JDB
7/26/2019	Thallium	227040.1	<0.25	0.4	0.4155052	103.9	20	15.947380	79.7		1.2	JDB
7/25/2019	Tin	226939.1	<0.005	0.7	0.6995446	99.9	0.7	0.6930628	99.0		0.2	JDB
7/25/2019	Tin	227041.1	<0.005	0.7	0.6995446	99.9	0.7	0.644164	92.0		0.2	JDB
7/26/2019	Tin	227040.1	<0.2	0.7	0.6896072	98.5	35	28.438362	81.3		0.8	JDB
7/25/2019	Titanium	227041.1	<0.005	0.2	0.2109341	105.5	0.2	0.2098874	104.9		0.2	JDB
7/25/2019	Titanium	226939.1	<0.005	0.2	0.2109341	105.5	0.2	0.2124567	106.2		0.1	JDB
7/26/2019	Titanium	227040.1	<2.5	0.2	0.2121079	106.1					1.6	JDB
7/25/2019	Vanadium	226939.1	<0.001	0.3	0.3076519	102.6	0.3	0.3104754	103.5		0.4	JDB
7/25/2019	Vanadium	227041.1	<0.001	0.3	0.3076519	102.6	0.3	0.2997157	99.9		0.6	JDB
7/26/2019	Vanadium	227040.1	<0.05	0.3	0.30789	102.6	15	15.291667	101.9		0.0	JDB
7/25/2019	Zinc	226939.1	<0.005	0.2	0.2091679	104.6	0.2	0.2081374	104.1		0.3	JDB
7/25/2019	Zinc	227041.1	<0.005	0.2	0.2091679	104.6	0.2	0.1851907	92.6		0.1	JDB
7/26/2019	Zinc	227040.1	<0.25	0.2	0.2074233	103.7	10	8.4881167	84.9		0.5	JDB

Code ***Code Description***

M4 The analysis of the spiked sample required a dilution such that the spike recovery calculation does not provide useful information. The associated blank spike recovery was acceptable.

T5 This parameter is not included in the Laboratory's LELAP Laboratory Scope of Accreditation.

Jonathan Barnhill
Quality Assurance Officer

05-Aug-19
Report Date

JOB 7-18-19

Figure 1 – Chain of Custody

American Electric Power
Analytical Chemistry Services

CHAIN OF CUSTODY

COC 40143

OPCO/PROJECT NAME	FAX NO.
H.W Pirkey Power Plant	(903) 927-5840
CONTACT PERSON(Please Print)	**PHONE NO.**
Ron Franklin, Randy Rountree, Ben House	(903) 927-5889

SAMPLER(SIGNATURE): Ron Franklin

Metals to analyze for each (Totals, SPLP, Deionized) B, Ca, Sb, Ag, Ba, Be, Cd, Cr, Co, Pb, Li, Hg, Mo, Sc, Te and any other metals in calibration.

DATE	TIME	SAMPLE SOURCE & DESCRIPTION	SAMPLE ID	COMP	GRAB	NUMBER OF CONTAINERS	Total Metals (See for metals)	SPLP	Deionized water leach	pH				Lab Number	REMARKS
7-17-19	1800	Pirkey Sludge FGD	Dirt Sludge		✓		✓	✓	✓	✓	✓			227040-42	Torry Wehling
1" " "	1800	" " "	Dirt Sludge		✓		✓	✓	✓	✓	✓			227043-45	

RELINQUISHED BY (SIGN)	DATE/TIME	RECEIVED BY	RELINQUISHED BY (SIGN)	DATE/TIME	RECEIVED BY
RELINQUISHED BY (SIGN)	DATE/TIME	RECEIVED BY	RELINQUISHED BY (SIGN)	DATE/TIME	RECEIVED BY
RECEIVED FOR LABORATORY: Jonathan Barnhill 7-18-19 1036			COMMENTS		

SHREVEPORT CHEMICAL LABORATORY

502 N. Allen Ave.
Shreveport, LA 71101
Phone 318-673-3802
FAX 318-673-3960

PROJECT RECEIPT FORM

Container Type	Delivery Type
Ice Chest (Bag) Action Pak PCB Mailer Bottle	UPS FEDEX US Mail (Walk in) Shuttle
Other	Other
	Tracking #

Client: Terry Wehling
Received By: JDB
Received Date: 7-18-19
Open Date: 7-18-19

Sample Matrix: DGA PCB Oil Water Oil (Soil)
Solid Liquid Other

Container Temp Read: NA
Thermometer Serial #F04103
Correction Factor
Corrected Temp

Project I.D.

Were samples received on ice? YES (NO)

Did container arrive in good condition?	(YES)	NO
Was sample documentation received?	(YES)	NO
Was documentation filled out properly?	(YES)	NO
Were samples labeled properly?	(YES)	NO
Were correct containers used?	(YES)	NO
Were the pH's of samples appropriately checked?	YES	(NO)

Total number of sample containers: 2

Was any corrective action taken? (NO)

Person Contacted
Date & Time

Comments

Sample ID	Analysis	pH	Preservative Added / Lot #
			/
			/
			/
			/
			/
			/
			/
			/
			/
			/
			/
			/
			/
			/
			/
			/
			/
			/
			/
			/
			/

ATTACHMENT G
AD-33 Soil Samples Analytical Report

Client:	Burns & McDonnell	**Date:**	*08-Jun-18*
Project:	106665 PIRKEY	**Work Order:**	1805081
Sample ID:	AD-33 (11')	**Lab ID:**	1805081-15
Legal Location:		**Matrix:**	SOIL
Collection Date:	4/30/2018 16:05	**Percent Moisture:**	18.1

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Gamma Spectroscopy Results			**SOP 713**	Prep Date: **5/17/2018**		PrepBy: **MRL**
Ra-226	**1.29 (+/- 0.3)**	G	**0.47**	**pCi/g**	NA	6/7/2018 08:54
Ra-228	**1.36 (+/- 0.47)**	G,TI	**0.7**	**pCi/g**	NA	6/7/2018 08:54
ICPMS Metals			**SW6020**	Prep Date: **5/14/2018**		PrepBy: **JML**
ARSENIC	**4.9**		**0.23**	**MG/KG**	10	5/17/2018 01:02
BARIUM	**20**		**0.57**	**MG/KG**	10	5/17/2018 01:02
BERYLLIUM	**0.15**		**0.057**	**MG/KG**	10	5/17/2018 01:02
CADMIUM	ND		0.23	MG/KG	10	5/17/2018 01:02
COBALT	**0.61**		**0.57**	**MG/KG**	10	5/17/2018 01:02
CHROMIUM	**9.5**		**1.1**	**MG/KG**	10	5/17/2018 01:02
LITHIUM	**0.25**	J	**2.3**	**MG/KG**	10	5/17/2018 01:02
MOLYBDENUM	**0.18**	J	**0.23**	**MG/KG**	10	5/17/2018 01:02
LEAD	**3.2**		**0.23**	**MG/KG**	10	5/17/2018 01:02
ANTIMONY	**0.086**	J	**0.11**	**MG/KG**	10	5/17/2018 01:02
SELENIUM	**0.81**	J	**1.1**	**MG/KG**	10	5/17/2018 01:02
THALLIUM	**0.044**		**0.011**	**MG/KG**	10	5/17/2018 01:02
Ion Chromatography			**EPA300.0**	Prep Date: **5/10/2018**		PrepBy: **HMA**
FLUORIDE	ND		1	MG/KG	1	5/11/2018 21:43
Mercury			**SW7471**	Prep Date: **5/11/2018**		PrepBy: **AJL2**
MERCURY	**0.0026**	J	**0.039**	**MG/KG**	1	5/11/2018 16:07

Client:	Burns & McDonnell	**Date:**	*08-Jun-18*
Project:	106665 PIRKEY	**Work Order:**	1805081
Sample ID:	AD-33 (21')	**Lab ID:**	1805081-16
Legal Location:		**Matrix:**	SOIL
Collection Date:	4/30/2018 16:05	**Percent Moisture:**	20.0

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Gamma Spectroscopy Results			**SOP 713**	Prep Date: **5/17/2018**		PrepBy: **MRL**
Ra-226	0.7 (+/- 0.22)	LT	0.37	pCi/g	NA	6/7/2018 08:16
Ra-228	**0.72 (+/- 0.5)**	NQ	**0.67**	**pCi/g**	NA	6/7/2018 08:16
ICPMS Metals			**SW6020**	Prep Date: **5/14/2018**		PrepBy: **JML**
ARSENIC	**12**		**0.25**	**MG/KG**	10	5/17/2018 01:05
BARIUM	**9.1**		**0.62**	**MG/KG**	10	5/17/2018 01:05
BERYLLIUM	**0.09**		**0.062**	**MG/KG**	10	5/17/2018 01:05
CADMIUM	ND		0.25	MG/KG	10	5/17/2018 01:05
COBALT	**0.64**		**0.62**	**MG/KG**	10	5/17/2018 01:05
CHROMIUM	**4.6**		**1.2**	**MG/KG**	10	5/17/2018 01:05
LITHIUM	**0.24**	J	**2.5**	**MG/KG**	10	5/17/2018 01:05
MOLYBDENUM	**0.061**	J	**0.25**	**MG/KG**	10	5/17/2018 01:05
LEAD	**1.5**		**0.25**	**MG/KG**	10	5/17/2018 01:05
ANTIMONY	**0.19**		**0.12**	**MG/KG**	10	5/17/2018 01:05
SELENIUM	**0.42**	J	**1.2**	**MG/KG**	10	5/17/2018 01:05
THALLIUM	**0.03**		**0.012**	**MG/KG**	10	5/17/2018 01:05
Ion Chromatography			**EPA300.0**	Prep Date: **5/10/2018**		PrepBy: **HMA**
FLUORIDE	ND		1	MG/KG	1	5/11/2018 22:29
Mercury			**SW7471**	Prep Date: **5/11/2018**		PrepBy: **AJL2**
MERCURY	**0.0038**	J	**0.04**	**MG/KG**	1	5/11/2018 16:09

ATTACHMENT H

AD-33 Boring Log and Well Installation Diagram

Hydrex ENVIRONMENTAL, INC.

Monitor Well

Monitor Well No.: AD-33

PROJECT INFORMATION

PROJECT:	Pirkey Power Plant
PROJECT NO.:	I-04-1021
LOGGED BY:	Jeffrey D. Sammons, P.G.
SUPERVISING PG:	Jeffrey D. Sammons, P.G.
COMPLETION:	12/11/2015
DEVELOPMENT:	12/16/2015
SITE LOCATION:	2400 FM 3251, Hallsville, Texas
WELL OWNER:	AEP

DRILLING INFORMATION

DRILLER:	Buford Collier
DRILLER'S LICENSE NO.:	60089
RIG TYPE:	Geoprobe 3230DT
METHOD OF DRILLING:	Hollow Stem Auger
SAMPLING METHODS:	Split Core
SURFACE ELEVATION:	382.37 (Top of Casing)
HOLE DIAMETER:	8.25"
LATITUDE	32 27' 38.70" LONGITUDE 94 28' 15.82"

STATE OF TEXAS — JEFFREY D. SAMMONS — GEOLOGY #10070 — LICENSED PROFESSIONAL GEOSCIENTIST — 1.21.16

▼ Water Level Upon Installation ▽ Water Level at Time of Drilling ■ Geotechnical Lab Sample

TBPG No. 50027

DESCRIPTION	USCS	% MOISTURE	% FINES	LL	PL	PI
CLAYEY SAND: very fine to fine sand, some silt, dark brownish black and brown, very moist	SC					
FAT CLAY: trace sand and silt, reddish brown and light gray - some iron ore gravel at 2.0' - some silt and ironstone in thin seams at 2.5', light gray, yellowish brown, and reddish brown,	CH	29	93	74	32	42
CLAYEY SAND: interbedded clays and fine to very fine sand and silt, some iron ore gravel, light reddish brown and light gray	SC					
- some clay and trace of iron ore gravel at 11', light gray and reddish brown, moist		21	35	35	23	12
- trace clay at 13', thin saturated ironstone and gravel seams at 13' to 16', reddish brown, light reddish brown, and light gray - dark reddish brown at 15' - clay lense at 15.5' to 16.5', light reddish brown and light gray						
SILTY CLAYEY SAND: very fine to fine sand, reddish brown, very moist to saturated	SM-SC					
- some clay lenses and iron ore gravel at 20' - clayey at 20.5' to 21' - trace clay at 21', light gray, saturated		23	19	27	18	9
- some iron ore gravel at 28', reddish brown, very moist						
CLAYEY SAND: very fine to fine sand, dark gray and gray, moist	SC	23	30	25	18	7

WELL CONSTRUCTION

- Locking Well Casing Cover
- Locking Well Cap
- Protective Well Casing
- Concrete Pad
- Ground Surface
- Cement
- Bentonite
- 2" Sch. 40 PVC Riser
- 20/40 Silica Sand
- 0.010" Slotted Sch. 40 PVC Well Screen
- PVC Bottom Cap

NOTES: This log should not be used separately from the original report. Not all USCS descriptors were laboratory verified.

ATTACHMENT I
Certification by a Qualified Professional Engineer

CERTIFICATION BY A QUALIFIED PROFESSIONAL ENGINEER

I certify that the above described alternative source demonstration is appropriate for evaluating the groundwater monitoring data for the Pirkey FGD Stackout Area CCR management area and that the requirements of 30 TAC §352.951(e) have been met.

Beth Ann Gross
Printed Name of Licensed Professional Engineer

Beth Ann Gross
Signature

Geosyntec Consultants
2039 Centre Pointe Blvd, Suite 103
Tallahassee, Florida 32308

Texas Registered Engineering Firm
No. F-1182

79864	Texas	January 12, 2024
License Number	Licensing State	Date